


6-2012

Sustainable Cities as the Gateway to the Future: A Case Study of New Rochelle

Andrea B. Grenadier

Union College - Schenectady, NY

Follow this and additional works at: <https://digitalworks.union.edu/theses>

 Part of the [Natural Resources Management and Policy Commons](#), [Sustainability Commons](#), and the [Urban, Community and Regional Planning Commons](#)

Recommended Citation

Grenadier, Andrea B., "Sustainable Cities as the Gateway to the Future: A Case Study of New Rochelle" (2012). *Honors Theses*. 826.
<https://digitalworks.union.edu/theses/826>

This Open Access is brought to you for free and open access by the Student Work at Union | Digital Works. It has been accepted for inclusion in Honors Theses by an authorized administrator of Union | Digital Works. For more information, please contact digitalworks@union.edu.

Sustainable Cities as the Gateway to the Future: A Case Study of New Rochelle

By

Andrea Grenadier

* * * * *

Submitted in Partial fulfillment

of the requirements for

Honors Bachelor of Arts in the Department of Environmental Science and Policy

UNION COLLEGE

June 2012

ABSTRACT

GRENADIER, ANDREA Sustainable Cities as the Gateway to the Future: A Case Study of New Rochelle. Departments of Environmental Science and Policy, June 2012.

ADVISOR: Ilene Kaplan

This thesis explores the characteristics of sustainable cities and uses New Rochelle, New York as a case study to further describe initiatives synonymous with green communities. Five prominent topics of sustainable cities and urban planning are discussed within the literature review and later mirrored throughout the case study of New Rochelle. These topics include, smart growth, energy efficiency, green buildings, transportation, and recycling. The mayor of New Rochelle and Sustainability Coordinator completed questionnaires and their responses contributed to an assessment of the contemporary issues facing sustainable cities.

PREFACE

Statement of Purpose: Sustainable urban development is gaining popularity as government leaders realize that cities must live within nature's limits. Thus, the purpose of this thesis is to describe the policies and programs that transform cities into sustainable communities and to analyze the attempts of one city, New Rochelle to attain this goal.

Chapter one begins with background information and an assessment of the environmental problem. The five key topics of smart growth, green buildings, energy efficiency, transportation, and recycling are introduced and described. Relevant and current policies are described along with these topics.

Chapter two focuses on a case study of New Rochelle's sustainability plan GreeNR. Within this case study the five key topics already introduced are discussed in further detail so as to gain insight as to their real world applications. In addition, interview responses from the mayor and sustainability coordinator, which assess GreeNR, are included.

Lastly, chapter three describes future research opportunities, additional sustainable communities, and ends with a personal assessment of the successes and failures of the GreeNR sustainability plan.

Table of Contents

Abstract.....	i
Preface.....	ii
Chapter 1.....	pg. 1
Chapter 2.....	pg. 24
Chapter 3.....	pg. 47
Bibliography.....	pg. 55

Chapter 1: Literature Review

Background

According to data from the United Nations, more than fifty-eight cities worldwide will have a population of five million inhabitants or more by 2015 (United Nations Population Division, 2001). As a result, it will be necessary to prepare for increased rates of urbanization in the coming years. Luckily, government leaders are advocating sustainable urban development as an attractive choice that reaches a compromise between catering to environmental needs without discounting modernity and progress. With the problems modern society faces as a result of increased population growth, climate change, air pollution, and water pollution, the creation and development of sustainable cities seems to be the only practical solution. Cities such as New York, Chicago, and Boston have implemented various sustainable strategies for the purpose of giving their citizens a higher quality of life, and preserving the environment. In addition, the implementation of programs, initiatives, and strategies that aid in this transformation create green jobs, which stimulate the economy and further complete the metamorphosis cities experience when they become sustainable. Thus, the purpose of this research is to explore how cities develop sustainable programs as well as focus on a case study of New Rochelle's sustainability plan and efforts as a microcosm for cities going green in the United States.

A large basis of the theory behind sustainable urban development stems from a "neighborhood as systems" approach, defined by Daniel E. Williams in his *Sustainable Design* textbook. The neighborhood as systems approach emphasizes the interconnection between land, structures, people, cultural activities, business, and education (Williams,

2007). Additionally, a similar approach highlights the notion of urban metabolism. This theory is similar to the Gaia hypothesis, which views the earth as a living, complex system, but in relation to cities, the theory must be applied on a smaller and local scale (Lovelock, 2000). The urban metabolism theory recognizes that cities are similar to individual organisms, “they’re continuously growing, regenerating, coping with threats, and adapting...they process energy and materials and dispose of wastes” (Ayres, 2010). Philosophies like these are familiar to the environmental movement and stress the importance of sustainable urban design as a process to mitigate the interconnected environmental problems disturbing cities. Likewise, these philosophies allow developers to create cities that function more effectively based on the “metabolism” or functioning of the city. To make an impact one would hope these philosophies become mainstream to city managers, developers, contractors, and engineers who realize the importance of maintaining a healthy metabolism. This will instill an environmental ethic that will most certainly drive future growth of self-sustaining systems (cities).

Most cities that are considered sustainable have sustainability plans that outline short term, medium term, and long term goals for achieving broad based sustainable development. Sustainability plans can incorporate a vast array of different initiatives, programs, or policies. Whether it be a green super’s program that educates building superintendants on the most efficient ways to conserve energy and resources, or merely decreasing the amount of parking spots to encourage citizens to walk, sustainability plans seek to find solutions to a plethora of environmental problems. Additionally, cities and towns that are becoming environmentally conscious often hire sustainability coordinators or a team of different professionals who are in charge of planning, proposing,

researching, and enforcing the initiatives outlined in a sustainability plan (Sarte, 2010). Typical team members might include a sustainability consultant, ecologist, planner or architect, geotechnical engineer, or hydrologist, to name a few. Collaboration between individuals with different expertise is important due to the variety of different factors that interplay in the creation of highly functioning sustainable cities (Sarte, 2010). Nevertheless, because of the ambiguities that are implicit within the definition of sustainability, it is hard for cities to develop indicators to measure sustainability. For this reason, sustainability plans, as well as sustainability consultants, have valuable roles in determining sustainability indicators based on the priorities of their respective cities and constituents.

Definitions

In a report by the Design Trust for Public Space, the theory of sustainable development is defined as the “state in which human priorities of social and economic development do not conflict with the protection and functioning of the natural environment” (Hsu, 7). To begin, there is a clear challenge that is present in the preceding definition. Throughout history there has been constant conflict between development and preservation. Developers want to take advantage of every inch of open space available while avid environmentalists find intrinsic value in untouched “virgin” wilderness. As a result one might ask how sustainable development is possible in light of the vast array of different motivations that exist. The answer is different for everyone, although it is clear that if sustainable development is going to occur, environmentalists and developers must learn how to work together to accomplish the same goals. Even more specific to cities, different departments of local government are going to have to come together to

maximize efficiency and strive for sustainability. For instance, a department of public works might strive to install permeable pavement even though sustainability is not a direct mission or goal of their department in government. Compromise between departments is indispensable if cities truly seek to attain sustainability.

Sustainable cities seek to find a compromise between modern humanity's needs and environmental problems. Thus, striving for sustainability in cities will be important for the future of both the planet, and society. Before one can recognize the significance of sustainable cities as the gateway to the future, one must truly understand the definition of the term. In many cases, the word sustainability is merely an advertisement campaign to encourage consumers to buy "sexy" and appealing products that are green. On the contrary, the United Nations, states the definition of sustainability as, "meeting the needs of people today, without destroying the resources that will be needed...by peoples in the future" (Fisanick, 32). In other words, the development of sustainable cities keeps issues of intra-generational equity in mind in all steps of the process; it is seen as a disservice to bequeath to one's children a world that is worse off than when it was inherited. Still, others define sustainability as a system that can endure by sustaining equilibrium between rates of input and output (Ayres, 2010). Once again, it is clear that many entities have conflicting definitions of the term. For this reason, there is room for the interpretation and imagination in determining the role of sustainable urban cities in society. Consequently, the potential of sustainable urban design is limitless.

Legislation

The future of sustainable design requires a complete paradigm shift from the way society normally thinks about construction. Proposed projects must weigh the social and

environmental costs of achieving their goals against the gains of the architectural goal (Segerson, 3/7/12). Realizing that resources are finite forces new criterion for measuring the end architectural result. For this reason, it is the responsibility of architects to perform their work in a way that yields maximum results from the loss of valuable non-renewable resources. Our future is not far away from reaching these goals (Stein, 2010). Policing mechanisms already exist within the environmental policy realm as a way to compare and contrast different environmental risks and decisions. For instance, the National Environmental Policy Act requires Environmental Impact Statements (EIS) for any action that significantly alters the quality of the “human environment” (Koshland, 1978). While programs like these force developers to scrutinize their work, enforcement and regulation is routinely clouded by political and government agendas. The fine line between science and politics often limits the accuracy of an EIS. Ultimately, society must figure out another arena within which developers and contractors alike can be criticized.

Society should overhaul the current paradigm that environmental consideration is not politically acceptable. Instead, politicians should use the sustainable approach, and its growing popularity, to propel sustainable policies as an attractive choice for constituents and cities. Changing the framework of what it means to be sustainable will allow policymakers to more effectively pass legislation with an environmental focus. For instance, the tradeoff should not be the untouched highway with or without wind turbines, but instead should be framed as whether wind turbines are more or less of an eye sore than oil rigs pumping black smoke into the air (Segerson, 2012). When put into perspective, wind turbines are generally considered more appealing than the visual black smoke that contributes to air pollution. Thus, in order to get the desired response from the

public, the options must be portrayed in such a way that the choice becomes an obvious one.

Controversy

A well-known paradox in economics threatens to debunk the entire logical basis for sustainable cities and urban development. In economics, Jevons's paradox illustrates the concept that technological progress, especially that which increases efficiency, tends to consume more resources than the initial technology (Jackson, 2010). Moreover, the majority of technological progress requires the use of finite materials and nonrenewable energy. This paradox, first proposed by William Stanley Jevons, was used to describe how an increase in fuel efficiency doubles the amount of work produced within a given fuel and thus increases consumer demand and overall consumption (Jevons, 1866). This theory can be applied to a much wider range of examples. Analyzing the history of CAFÉ standards in the United States illustrates this pattern in that consumers were able to rationalize driving longer distances as fuel efficiency increased. As a result, this trend led to increased emissions and overall consumption of energy. Indeed this was not the impact that stringent fuel economy standards intended to have.

To avoid getting trapped by this unavoidable paradox, society must think of better ways to achieve sustainability than merely increasing efficiency through technological progress. Instead, sustainability must seek to achieve no extra increase in consumption. For example, many urban planners argue simply that better resource management can seek to increase efficiency without increasing consumption. Efficiency requires less initial energy by using existing technologies and making them more effective. In this

way, a large portion of sustainable urban development must rely on the loophole of Jevons paradox: effective resource management.

Advantages of Sustainable Design

The creation of sustainable cities is becoming more and more appealing as urban planners and city managers realize that the benefits of sustainable urban development truly outweigh the costs. Sustainable design can produce double dividends by decreasing financial cost and fossil fuel consumption over the long run (Ayres, 2010). Hence, sustainable design is becoming a financially appealing route for businesses, corporations, and cities alike. The U.S. Green Building Council published a synopsis of a forum entitled, “Making the Business Case for High Performance Buildings,” that outlined ten major advantages of sustainably designed buildings. These advantages include: recovered up front costs for high performance buildings, lowered ongoing operating cost, higher employee productivity, enhancement of occupant health and well-being, reduction in liability issues, reduced tenant costs, increased property values, availability of financial incentive programs, more predictable results by using best practices, and finally, more attractive aesthetics better advertise developers efforts (Wille, 2003). Note that monetary benefits accounted for at least half of the advantages for green building design. In addition, sustainable cities reduce the probability of “sick building syndrome” and increase citizen health, well being, and morale leading to an overall higher quality of life.

The Environmental Problem

Fundamentally, the creation of sustainable cities stems from a plethora of issues plaguing the environment and general welfare of earth’s inhabitants. Problems such as pollution, air quality, water quality, poor sanitation, energy usage, dirty transportation,

the production of waste, overconsumption, poor food quality, and many others, seek to be remedied by the creation of environmentally conscious and efficient cities. Additionally, the tragedy of the commons further catalyzes these problems in cities with increased populations. Therefore, in an effort to remedy the problems previously mentioned, sustainable cities act like antibodies since they provide health and immunity so cities can run more efficiently. Sustainable approaches can include a wide variety of options. Solutions include anything from incorporating smart growth policies in development to planting trees along the sidewalk of the street. Due to the variety of programs that exist, the focus of this research will primarily explore five of the most promising approaches for achieving sustainability. These five include: smart growth plans of action, green buildings, energy efficiency, recycling programs, and proper transportation policies; these approaches have the potential to transform a city from taking a business as usual approach into cities that are high functioning and well executed.

Smart Growth

The definition of smart growth streets provided by the Environmental Protection Agency states,

Smart growth streets are roadways designed and operated to support compact communities while promoting least-polluting transportation performance and preserving environmental resources within and beyond the right of way (Sarte, 162).

Essentially, smart growth policies focus on developing compact cities, within which all commercial businesses and public transportation remain a walking distance away from residents. For instance, Randall Holcombe describes smart growth as a strategy that “takes place when extensive commercial development occurs in a linear pattern along both sides of major arterial roadways” (Fisanick, 2008). Moreover, smart growth

development encourages commuters to walk to city centers or hubs. Thus there is a consensus among engineers and developers that the main focus of these designs are to concentrate all essential services in one place. For example, grocery stores, hospitals, public transportation, retail outlets, etc. would be located less than a mile to residential neighborhoods. In this way, employment opportunities and economic activity would be focused within the central core of the city, eliminating commutes and pumping money into smaller cities. Smart growth also has the potential to establish cities as destinations to encourage tourism and commerce. Thus, urban developers praise smart growth policies for its ability to decrease traffic congestion, encourage public transportation, reduce suburban sprawl, preserve large areas of open space, and create a convenient urban oasis (Fisanick, 2008). Cities that use smart growth plans of action become a nexus of environmental and architectural progress and innovation.

Many critics of smart growth argue that by creating compact city centers, urban developers are creating congestion. While it is true that more traffic will occur in the major “arteries” of cities, if engineered correctly, smart growth has the potential to eliminate all cause for worry. Additionally, increased foot traffic has the potential to not only decrease auto emissions, but also stimulate the economy in local towns and cities that are bearing the burden of the current economic crisis. By using smart growth principles, urban planners focus on transforming places into destinations that are “sweet to the pedestrians” (Wilson, 2010). In effect, these are streets that encourage walking or biking, and are designed to be transit-friendly. Currently, smart growth streets also focus on making trees and plantings commonplace in the landscape. Consequently, the city’s as

systems approach is highlighted in Clark Wilson's argument that it is smart growth design that seeks to, "balance movement, ecology, and community" (Sarte, 153).

The American Institute for Architects (AIA) has ten principles for livable communities. The AIA principles include: design on a human scale, provide choices, encourage mixed-use development, preserve urban centers, vary transportation options, build vibrant public spaces, create a neighborhood identity, protect environmental resources, conserve landscapes, and create effective designs (Williams, 2007). Urban development using a smart growth approach accomplishes all ten principles. First, designing on a human scale emphasizes pedestrian friendly communities where citizens can walk to stores, public services, cultural centers, and jobs for the purpose of reducing traffic congestion, benefiting individuals' health, and providing a better sense of community to residents. Smart growth design also provides a balance of choices, integrates different land uses and building types, revitalizes urban centers by decreasing sprawl, gives people the option of biking, walking, or mass transit, creates areas that encourage civic participation or face to face contact, provides an affective balance between nature and development, preserves open space, and strives for design excellence (Williams, 2007). In other words, smart growth design emphasizes development that architects and city planners strive for regularly. Thus, society already has the knowledge and desire to implement these principles.

Green Buildings

Construction is a highly polluting industry that consumes vast amounts of energy, material resources, waste, and water (Horvath, 2004). Yet construction remains integral to the development and economy of cities. Green buildings aim to ameliorate this

problem by using innovative technologies to decrease the amount of energy, resources, and water consumed in the construction process. Similarly, the construction of green buildings minimizes waste throughout the building's life cycle. Additionally, there are many other benefits to green building construction that make environmentally friendly buildings alluring to both builders and tenants. These benefits include: decreased construction costs for builders, zero or negative energy and emissions footprints, and lower operating costs, healthcare costs, and maintenance costs for owners and occupants (Caldwell, 2009). If buildings are not initially designed according to green building standards, there are many upgrades that can be made to retrofit the building. For instance incorporating green roofs, low flush toilets, passive solar heating, energy star appliances, properly sealed windows, installing compact fluorescent light bulbs and using only recycled and local materials for new furniture or upgrades are examples of possible retrofits.

Many of these upgrades are qualifications in obtaining Leadership in Energy and Design (LEED) certification. The LEED program created by the United States Green Building Council seeks "to provide building owners and operators with the framework for identifying and implementing practical and measurable green building design, construction, operations, and maintenance solutions" (United States Green Buildings Council, 2/4/12). The LEED certification process is a points system that is allotted based on the categories of sustainable site development, water saving, energy efficiency, materials selection, and indoor environmental quality. Buildings that are eligible for application include retail and service establishments, residential buildings, hotels, and institutional buildings. Credits are assigned on a hundred-point scale according to the

overall weight of the total environmental impact of the construction. For this reason, many critics of the LEED certification process argue that the system is not weighted properly. However, LEED is still better than the status quo. Consequently, many cities are taking the LEED route and using the system to encourage green building development in their local towns and communities (United States Green Buildings Council, 2/4/12).

Additionally, an alternative route to LEED certification is the development of zero-energy buildings. Contractors such as Pulte Homes build low energy houses in which homeowners have the option to go the extra mile and install solar photovoltaic systems on the roof. These houses are then called “energy plus houses” because they produce more energy than they use, allowing the owner to sell the surplus back to the grid (Ayres, 2010). One of the many advantages to low energy buildings are that they are less costly than LEED and have the potential to provide high returns on investment. Similarly, in 2007 a building in San Jose, California opened as a z-squared building because it accomplished both zero net energy and zero carbon emissions using techniques such as optimal use of sunlight (to minimize electric lighting during the day), ground source heat pump cooling, advanced insulation, low energy double pane windows, and green roofs (which take carbon out of the atmosphere). Lastly, the Passive House Project has achieved energy use reductions of 90 to 95 percent compared with existing houses and 50 to 65 percent compared with new houses. The first passive house in the United States was in Berkeley, California in 2009. Undoubtedly, there has been a vast array of innovation in green building design. It will be interesting to see what the design future holds for the construction of green buildings. Architects and contractors should take

advantage of the increase in property values that green building development has the potential to provide.

Recently, there has been a movement towards green building design that mimics nature. This concept, referred to as biomimicry, uses nature's solutions to impact design problems. In Wes Jackson's book, *Consulting the Nature of the Place*, Jackson argues for the application of biomimicry to the agriculture industry by stating that "human invention should be brought in line with nature's own creative patterns" (Jackson, 134).

Biomimicry emphasizes imitating nature through methods such as green chemistry or scaffolding made from natural materials. In addition, the main principles of biomimicry should motivate builders to develop with the entire life cycle of the building in mind. For example, if a builder is utilizing the biomimicry framework, they might consult ecological life cycles in terms of birth and death to internalize that the building must be able to be deconstructed or recycled just as easily as it was constructed, with no environmental degradation. For all intents and purposes builders might use biodegradable building materials to complete the project as opposed to materials that will stay in the earth or atmosphere for long periods of time. In reality, biomimicry is more than just a principle for many builders. It is a philosophy and way of life that highlights the need for harmony with the natural and built environment (NYSERDA, 3/8/12).

Energy Efficiency

There are many problems associated with our status quo of energy usage. First, the majority of the energy consumed by society is generated from fossil fuels, which emit green house gases into the atmosphere, whereby causing global climate change. Second, the energy derived from fossil fuels is limited in that global and domestic supply will someday reach its peak. Third, a portion of the fuel that society uses is obtained from

foreign countries. As they say in political science, politics makes strange bedfellows. Conflict or crisis in the Middle East threatens United States national security. Fourth, mining energy is time consuming, expensive, and wreaks havoc on the environment. The acts of coal mining, strip mining, or hydrofracking, obtain energy but are controversial because of their danger and potential to degrade the environment in communities. Fifth, our current grid is operates at 20 to 30 percent efficiency because the majority of waste energy is lost as heat, as the second law of thermodynamics states (Ayres, 2010). Lastly, the price of energy is currently on the rise. The only way to continue technological and societal growth is to keep energy prices low. Many studies have shown that periods of recession occur when the price of energy is high. Thus, there is a correlation between energy price and the economy (Darco, 2/25/12). For these six reasons, energy policy remains an important aspect to any city that seeks to become sustainable in the near future. While our status seems grim, there are many innovative actions that cities can take to increase energy efficiency and seek to solve many of the aforementioned problems.

In order to account for many of the problems associated with energy use, cities and towns have vowed to increase the percentage of energy they obtain from renewable sources. These sources include wind, solar, biomass, hydropower, geothermal, nuclear, and various forms of cellulosic ethanol. Currently, the price of wind is 2 cents per Kilowatt-hour and likely to decrease in the future (Victor Abate, 2/2/12). Accordingly, wind has the highest potential for future expansion. In the political arena, many renewable energy projects are “Not In My Backyard Issues” (NIMBY). These types of projects are highly controversial in politics because they often stymie the creation of proposed renewable energy projects. If cities truly believe investment in renewable

energy is the way to go, they must work with adversarial communities to make them a part of the legislative process. Individuals are more apt to follow laws that they contributed in drafting. Additionally, it is important to mention again the impact that framing one's choices can have. If policy makers learn how to properly frame the prospects of renewable energy, then renewable projects are more likely to penetrate communities (Segerson, 2012). Another advantage of renewable energy is the potential that investment in these projects has on saving money in the long run. Although projects may initially require a large investment, over a number of years individuals can gain the money they lost back by obtaining tax credits or selling a portion of their electricity back to the grid (Abate, 2/2/12). Consequently, many cities have realized the financial benefits renewable energy projects have and as a result invested money to retrofit buildings hoping to cut their energy bill and save money that can be used for other vital services.

In addition, there are many end uses of energy that government officials have a hard time controlling. Whether homeowners choose to shut off their lights when they are not home is one example of an end use that policymakers may have trouble regulating. Although local governments cannot control energy usage in homes, they can aim to try by providing incentives to conserve or install energy efficient appliances, encouraging green super's programs, or providing classes on energy efficiency in the home. Consumers that are willing to decrease energy consumption in their home have many opportunities, which consist of switching to compact fluorescent light bulbs, buying Energy Star appliances, installing low flush toilets, or using a smart meter. Furthermore, there is still value in energy conservation. Despite the fact that politicians do not value energy conservation as a viable solution because constituents view conservation as a risk

to their quality of life, conservation will always be key. Saving energy decreases emissions and also ensures that there will be a constant supply of energy in the future (Graetz, 2010).

The second law of thermodynamics teaches that the majority of energy is lost as heat. For the purpose of maximizing efficiency, many businesses have begun to use their waste heat to power many processes. This has allowed businesses to save millions of dollars as well as decrease overall total emissions ten fold. Waste heat recycling has the potential to power 10 percent of the United States electricity demand (Ayres, 2010). For this reason, city or county legislators should mandate that large businesses or corporations that exist in one's jurisdiction use the waste heat recycling approach. This approach has the potential to provide double dividends for the both the environment and a corporations bottom line. Recycling waste heat would also increase a city's energy efficiency, decrease consumption of fossil fuels and in turn reduce carbon dioxide emissions. Currently, the City of Rochester has set the precedent for waste energy recycling. The Kodak Corporation recycles 3 million pounds of waste steam, generating electric power that eliminated millions of barrels of oil and saved millions of dollars on its electric bill (Ayres, 2010) If this is true, then the potential that waste heat recycling could have on a city's power generation is immense. Hence, municipalities should follow Rochester's lead and experiment with waste recycling as a viable solution to decreasing energy consumption and more efficiently using all that is available from our current energy supply. For these reasons, it seems as though there are decreased financial costs and zero negative social costs, in the long term, associated with recycling waste energy.

Consequently, recycling waste energy will remain an important and valuable option for the energy future of sustainable cities.

Recycling Programs

In the effort to decrease the amount of refuse that ends up in landfills, as well as decrease solid waste consumption per capita, recycling programs have been put in place in major cities and towns (Gamba; Oskamp, 1994). In 1987, the existence of the Mobro 4000, which created a large barge of garbage that was hauled along the east coast helped citizens and policymakers to acknowledge that nuances existed in solid waste management plans. With no space left in landfills policy makers recognized the need to implement legislation to combat the solid waste disposal crisis (Jackson, 2012). In 1988, as part of the Solid Waste Management Act, legislators mandated that communities in New York needed recycling programs by 1992. As municipalities realized there was a market for recyclable materials, there was an increase in the rate of recycling. However, in the late 90s the rate of recycling took a turn for the worse and the State Attorney General took communities to court to enforce recycling as the law (Deb Jackson, 2012). The Attorney general was successful and recycling campaigns sprouted statewide. Today, cities have municipal solid waste programs in place to collect certain types of plastic, aluminum, paper, paperboard, and glass to be recycled or repurposed into other products.

Even though recycling rates have increased, a large number of people still do not recycle due to lack of knowledge. In order to increase recycling participation, single stream programs, also known as comingled recycling programs, were implemented to make it easier for the consumer to recycle since all recyclable materials are placed in one bin. Hence, city planners often find that recycling increases when the single stream technique is used. Even still, the largest predictor of recycling participation is knowledge

of recycling (Gamba and Oskamp, 1994). While comingled recycling is ideal for residents, bins often become contaminated due to a lack of knowledge about how to properly clean and dispose of plastics. Because the American consumer culture is based around the use of plastics, there seems to be a misconception that plastics make up the majority of municipal solid waste. In reality, the EPA notes that paper and paperboard products make up the largest portion of municipal solid waste (EPA, 3/12/12). Thus, government, colleges, and municipalities have pledged to decrease paperwork and double-side documents. In this way, efforts to recycle take a grassroots approach. Cities seeking to increase recycling programs should educate their citizens and make an effort to practice what they preach.

Numerous policies exist in government to encourage recycling. For example, the birth of Extended Producer Responsibility (EPR) legislation was created due to the fact that individuals lack the knowledge of how to properly dispose of electronics. As a result, EPR laws represent cradle-to-cradle legislation, which requires manufacturers to be held accountable for the complete lifecycle of their products, or set up programs where people can properly dispose of them. For instance, stores that sell recyclable batteries must take them back (Inform Incorporated, 3/12/12). Still, there are many initiatives cities can use to encourage reducing, reusing, and recycling among residents, schools, apartments, and commercial buildings. Recycling campaigns or competitions encourage re-using water bottles, setting printers to print double sided, using rags, or bringing one's own tote bag to grocery stores. These are ways in which recycling can be enforced outside of government regulation and legislation. Another policy created to encourage recycling was the Bottle Bill in 1983, which mandated nickel deposits on bottles, which allowed

companies to make \$85 million dollars on windfall profits. The Bottle Bill was a way to encourage recycling and most bottle returns can be seen at local shopping centers (Debbie Jackson, 2012).

Along with the increase in recycling there has also been an increase in composting. Composting involves the aerobic decomposition of organic materials into a biologically stable material that can be used to increase soil health. Environmentalists and composters often refer to the end product of compost as black gold (Sarte, 2010).

According to Eliot Epstein, author of *The Science of Composting*, “composting is the highest form of recycling and the reuse of resources” (Epstein, preface XV). The act of composting is highly encouraged as a sustainable method because it can fertilize gardens, and reduce the amount of waste that ends up in landfills. Composting can also instill a sense of environmental stewardship among children. Moreover, the process of composting aligns with the philosophies of biomimicry and nature as a systems approach. Composting has played a large role in the organics movement as well since farmers, environmentalists, and consumers recognize the role composting can have in developing healthy soils without the use of chemical fertilizers (Epstein, 1997). On a similar note, the act of recycling food scraps to be re-purposed into fertilizer speaks to the popularity of the repurposing movement, which aims to utilize products for a purpose other than its intended purpose. For example, an old soda container might be repurposed into a new vase or bowl with the proper tools. Furthermore, the repurposing movement has led to innovation, creativity, and environmental harmony.

Transportation and Mobility

Before the evolution of transportation occurs, there must be a change in the current purpose and function of streets. Sustainable street design focuses on redesigning street space for the integration of pedestrian friendly activities and simultaneously allowing for the movement of vehicles and goods necessary in society. In this way, transportation and street planning should take into account a multitude of different users. This approach treats streets as “complete streets,” as they are complete when they account for all users such as, drivers, transit riders, pedestrians, bicyclists, the geriatric, children, and people with disabilities. The complete streets approach also emphasizes the safety of its multiple users by providing crosswalks, bike paths, sidewalks, and bus lanes. In order to properly account for the safety of all users, engineers will have to work with city planners or traffic scientists, illustrating the vast range of expertise required to make cities sustainable. Many benefits exist in relation to the complete streets model. First, developing multiple modes of transportation reduces car travel, which further reduces traffic congestion and vehicle miles traveled. The advantages of these reductions include decreased carbon dioxide emissions, reduced energy consumption, and better air quality. Cities in Oregon, Florida, and South Carolina are experimenting with complete streets as they recognize the advantages complete streets can provide. (Sarte, 2010)

Ultimately, the evolution of transportation is going to be essential if cities want to decrease green house gas emissions and reliance on fossil fuels. The majority of demand for liquid fuels comes from transportation. While it is up to the individual to decide what type of car to drive whether it is a hybrid or an SUV, a variety of methods can be utilized

to decrease the amount of cars on the road. As previously mentioned above development using a smart growth method encourages individuals to walk and use public transportation. Smart growth also promotes the use of complete streets by properly updating infrastructure to encourage other modes of transport. Bike sharing programs is another method to decrease car transport. Many other countries have successful bike sharing programs that not only raise revenue for the city, but also decrease green house gas emissions, and lead to healthier, more productive cities. If the proper infrastructure were put in place for bike lanes, there would be an increase in ridership (Ayres, 2010). Designers have the responsibility to look beyond the paradigm that establishes automobiles as the standard so that individuals will evaluate which form of transportation best suits their needs.

Nevertheless, wherever possible, cities have started to limit the amount of parking available to residents. This has drastically decreased the amount of individuals that drive for short trips as well as the amount of individuals who own cars. If citizens view parking as a hassle, they are more likely to effectively value the “worth” of their car trip. If driving or parking is not worth the time or money, residents will walk. Additionally, in bigger, more spread out cities, cars are often necessary. As a result, these cities have implemented car-sharing programs in addition to bike sharing programs. Zipcar is a program that allows individuals to rent a car for a certain number of miles (Zipcar, 3/12/12). Gas and insurance is included provided individuals return the car to the same reserved spot they received it from. Eventually, car-sharing programs will limit the amount of cars on the road as well as the amount of miles driven. Individuals, businesses,

and universities are using Zipcar programs as they realize the convenience these programs provide.

Additionally, finding ways to increase the efficiency and management of public transportation will endorse ridership among citizens. Engineers are experimenting with bus rapid transit or intermodal transportation systems and light rail to help encourage carpooling and limit emissions from individual consumers. Cities with college campuses and state parks have started to use trolleys, golf carts, or electric vehicles to decrease the amount of cars on grounds when short trips are necessary. Cities have also acquired vehicles that run on alternative fuels such as biodiesel or soybean oil. Local governments have the responsibility to provide money for research and development of alternative fuel sources as well as update the infrastructure to support those sources. It is also important to mention that while electric vehicles decrease the need for international reliance of fossil fuels, they do not lower an individual or city's carbon footprint because the electricity required for charging is most often produced at a coal or natural gas fired power plant. Thus, many cities have switched their fleet of taxi's over to hybrids in the effort to save gas and decrease carbon emissions. Regardless of the solutions chosen it is not impossible for society to decrease reliance on cars while still maintaining freedom and mobility. It is up to sustainability consultants and local governments to steer cities in the right direction.

Conclusions

In conclusion, a number of cities are seeking to implement sustainable programs, as city planners anticipate the need to combat environmental issues, stimulate the economy, and provide a higher quality of life for residents. While only smart growth,

green buildings, energy efficiency, recycling, and transportation are discussed in this literature review, many more aspects of sustainability exist to transform cities into sustainable hubs. The future of sustainable cities looks bright as the sustainability movement is slowly catching on. As of now, cities one by one are slowly morphing to accommodate the principles discussed above. In the future, it would not be surprising if federal or state governments required all municipalities to develop sustainability action plans. These plans would encourage citizens to become stewards of the environment as well as increase awareness of environmental issues. Currently, New Rochelle, New York represents a visionary city that has already incorporated many of these programs into its award winning sustainability plan, GreeNR. A case study of New Rochelle's sustainability plan will provide a lens to use GreeNR as a microcosm to analyze the programs, policies, and overall effectiveness of sustainability plans.

Chapter 2: A Case Study of New Rochelle

Background

The City of New Rochelle, New York is located a half an hour north of New York City and is the seventh largest city in New York State (US Census, 2012). In addition, New Rochelle is often called “the city of the sound” due to its fourteen-mile shoreline along Long Island Sound. New Rochelle is also home to hundreds of acres of parklands, woods, streams, and several lakes. In addition Thomas Paine, Norman Rockwell, and the Dick Van Dyke show, have a rich history in New Rochelle. Due to its large size, population, geographic location, and diverse history, the City of New Rochelle has set many precedents for neighboring towns and communities. For instance, in 1961 the federal government forced desegregation of public schools in New Rochelle. During this time period, after the landmark decision of *Brown vs. Board of Education*, many communities in the North were recalcitrant to desegregate. New Rochelle represented one of the first Northern cities to desegregate and served as a role model and visionary city (Kaufman, 1963).

In an analogous fashion, during the past four years New Rochelle has served as a role model for neighboring towns and cities seeking to become sustainable. Mayor Noam Bramson recently hired a sustainability coordinator to create a draft sustainability plan for the city. *GreenNR*, New Rochelle’s sustainability plan, is an award winning sustainability plan that outlines the necessary actions the city must take to achieve “sustainability”. For these reasons, New Rochelle remains an important part of the fabric of the sustainability movement. A case study of New Rochelle will help to define a deeper understanding of the concept and framework of sustainable cities.

The title page of GreeNR uses the subtitle vision and action for a healthier community. This subtitle implicitly defines the connection between sustainability and well being as the first and most important concept of the plan. The reader is next taken to the table of contents where it is easily seen how GreeNR is organized. The introduction and summary begins with a letter from the mayor. Within this letter the Mayor states, “contained within these pages are scores of specific, achievable recommendations, aimed at improving the environmental, economic, and social health of New Rochelle during the next twenty years and beyond” (GreeNR, 2010). In this way, the Mayor sets the stage for what it is discussed throughout the plan.

After the letter from the Mayor, the sustainability plan highlights key baseline statistics that allow the audience to put their environmental impact in perspective. This section begins with the sentence prompt: “Every single day the average New Rochelle Resident...” and is finished with a sentence describing the energy usage, total emissions, amount of sewage etc. Following the baseline studies is an introduction to the environmental problem stating the importance and justification for the sustainability plan. This is followed by a number of statistics such as population, land area, shoreline acres and more, as an aim to introduce readers that might be unfamiliar with New Rochelle. Next the plan outlines ten goals for 2030. This is followed by the meat of the document; otherwise known as the action plan summary. These summaries outline goals and initiatives within each sector as well as general recommendations. Fun facts can also be found throughout the plan to help allow the reader to put the main issues in context. The action plan is also broken down into short term, medium term, and long-term recommendations. The document ends with a slew of appendices including a glossary,

acknowledgements, a summary of the history of GreeNR, energy graphs, charts of initiatives, and a cornucopia of statistics. The initiatives and programs outlined in the literature review have been applied in relation to New Rochelle's sustainability plan. Therefore it is important to touch on each section to understand how New Rochelle is coping with the challenges that all of these issues present.

The Environmental Problem

New Rochelle, New York is distinguished by its diversity of people, environments, and economies. Large immigrant populations, shorelines on the Long Island Sound, and an economy closely linked to Manhattan, have contributed to high rates of energy and resource allocation. In addition, research predicts that during the next twenty years, New Rochelle's population will increase by approximately 5,000 new residents (GreeNR, 2010). An increase in population will put additional stress and strain on New Rochelle's finite resources. For example, public spaces generate 20 tons of waste per year, with the population likely to grow and no recycling bins present in public locations, the solid waste stream will most certainly increase. Similarly, within 20 years New Rochelle's infrastructure will begin to age, which will lead to a host of new environmental problems that will threaten essential public services and resident's safety. The GreeNR sustainability plan prioritizes economic, social, and environmental issues to provide a lens for which policy makers can address and question these issues.

Currently, the private residential and commercial sectors in New Rochelle account for 97.5 percent of local energy consumption, waste generation, water use and other measures of sustainability. A statistical snapshot of the community highlights exact

numerical figures based on 2005 data and population. The following is a list of the most pertinent statistics noted in the plan:

- The average resident uses 342,301 British Thermal Units of energy per day.
- Every day the average New Rochelle resident emits 49 pounds of carbon dioxide.
- 159 gallons of water are used per day per person
- The average resident disposes of 4 pounds of solid waste per day.
- The average citizen of New Rochelle generates 103 gallons of sewage per day (GreeNR, 6).

These figures should allow policy makers and readers to put the environmental problem in perspective. It is important to note that these figures have most likely increased with the progression of time. Future exacerbation of these issues is justification for GreeNR's mission, "to empower the community as a whole with the information and tools to make sustainable choices" (GreeNR, 5).

In addition, Mayor Noam Bramson of New Rochelle outlines many of his justifications for his commitment to enacting a sustainability plan in his letter to the citizens of New Rochelle. Bramson argues that his rationalization for the project would allow New Rochelle to "align...with municipalities throughout the world that recognize a common obligation to address global challenges of resource depletion, climate change, and social progress" (Bramson, 2010). Furthermore, Noam also mentions that it is with hope that the promise of sustainability outlined in the plan will become fully embedded into the "culture" of New Rochelle. Therefore, readers must not see the environmental problem as one that is isolated or stagnant. Instead readers should use the document as a philosophical framework that implies the problem is complex, interconnected, and adaptive. The initiatives outlined serve to provide environmental, social, and economic advancement while still maintaining the qualities that New Rochelle possesses.

Lastly, the section entitled, “A Vision For New Rochelle,” is useful in providing a better understanding of the environmental problems that plague New Rochelle. Although this section describes future goals for the city, its significance lies in the fact that it implicitly defines what New Rochelle is currently, and explicitly defines what New Rochelle should be in the future. Eight important principles outline the virtues for New Rochelle’s vision. These principles include: an attractive quality of life, a growing economy, a thriving natural environment, healthy families and individuals, diversity of culture and experience, an efficient government, an engaged and informed citizenry, and a model city. These principles are not meant to undermine New Rochelle, for many of these visions already define New Rochelle as a city. Instead, they are merely set out to provide a framework of goals to ameliorate the aforementioned environmental problems. Nevertheless, a plethora of environmental problems exist related to sewage, transit, education, energy use, etc. Although GreeNR provides recommendations for each and every one of the perceived problems of New Rochelle, the following section will discuss the plan of action for the topics previously mentioned.

Plan of Action

The plan of action is formatted like a funnel. The general categories that the initiatives are based on constitute different parts of the action plan. For example, Part one focuses on “Energy and Climate” whereas part two shifts its emphasis to “Resource Conservation and Waste Reduction”. Each part starts off with a list of general goals related to the category. After the category is mentioned the funnel begins to form in that specific initiatives are outlined to achieve the goals of the category. For instance, the initiative related to updating “Green Building Standards” is placed underneath the

category of “Energy and Climate”. Each initiative described follows a specific pattern when the initiative is discussed in the action plan. The pattern is as follows: the initiative is described, a goal is set, and the past actions and achievements as well as the current status of the initiative are highlighted. Underneath the current status are recommended actions. These actions consist of short term, medium term, and long-term recommendations. Accordingly, short term is defined in the plan as occurring within three years, medium term within ten years, and long term within twenty years. After the list of recommendations a progress track that dates to 2030 is provided. This chart helps to identify the progress that needs to be made within the time restraints outlined above. Lastly, each initiative ends with a list of “primary department responsibility, potential partners, potential municipal costs, and potential outside funding sources”. While all of the initiatives stated follow the same pattern, unique graphs, pictures, case studies, and fun facts are occasionally outlined and dispersed throughout the document. Moreover this description describes the action plan in a nutshell. For the purpose of linking back to further discussion it is essential to investigate how New Rochelle handles the environmental problems discussed in the previous literature review.

Smart Growth

In the GreeNR action plan smart growth and economic prosperity are placed together as general concepts that many of the initiatives are based on. In addition smart growth and economic prosperity are assigned the color orange. Hence, whenever the color orange appears in the action plan, the subject matter refers to increasing smart growth or economic prosperity. Moreover, the fact that smart growth and economic prosperity are linked as common objectives implies their interconnectedness. Smart

growth is essentially used as a mechanism to increase economic prosperity and likewise economic prosperity can be used to encourage smart growth principles. To begin the smart growth action plan summary outlines the purpose of employing smart growth in order to encourage density and diversity housing opportunities in areas with access to local goods, infrastructure, and mass transit while also realizing the economic and recreational vitality of access to Long Island Sound. This action plan summary is followed by a list of goals to reach by 2030. These six goals are as follows:

- Open at least one additional mile of the Sound Shore to the public.
- Quadruple the number of local green businesses and green jobs.
- Complete Streetscape improvements on North Avenue, Memorial Highway, and West Main Street (the main arteries of New Rochelle).
- Complete construction of 250 affordable workforce-housing units.
- Triple the number of artists living and working in New Rochelle.
- Construct at least 500,000 square feet of new commercial space in the central business and transit districts (GreeNR, 2010)

These goals will be important in the future for the purpose of measuring the success of smart growth based initiatives.

Although the authors have outlined many of the overall goals related to smart growth, the initiatives based around implementation and enforcement of these policies play a crucial role in the transformation process. Six initiatives related to each of the goals are laid out as building blocks to achieving the aforementioned goals within the next twenty years. A summary and further description of these initiatives are also provided. The proposed programs include increasing transit oriented smart growth, increasing waterfront access and recreation, updating planning standards, creating green businesses and jobs, promoting workforce housing, and attracting creative capital. In order to understand their significance it is necessary to summarize these policies in more

detail. For instance, increasing transit oriented smart growth requires implementing strategies to promote commercial and residential development in proximity to New Rochelle Transit Center while limiting undesired growth in suburban low-density areas. Allowing for better access to Long Island sound requires including at least one additional mile of shoreline to enhance recreation and tourism opportunities. Additionally, increasing planning standards calls on urban planners to diversify land use patterns and architectural design for mixed-use hubs and corridors with an emphasis on contextual design. Also, the creation of green businesses and jobs requires attracting green businesses to New Rochelle as well as enhancing access to training for low skilled or under employed residents. Furthermore creating appropriate workforce housing involves integrating housing units into market rate projects and simultaneously discouraging the concentration of subsidized housing. Lastly, by employing different land uses, marketing mechanisms, and incentives, New Rochelle can attract a creative class to utilize the economic benefits associated with arts and culture. Ultimately, these policies are more generally summarized in the action plan summary and further developed in later sections of the sustainability plan.

The major policies related to smart growth are further discussed in the following paragraphs. In relation to smart growth development two of the most important policies focus on transit oriented development and the creation of green jobs and businesses. The authors first begin by describing the necessary plan of action to stimulate transit oriented smart growth. Using tools such as zoning, parking requirements, and the marketing of sites with high potential for development New Rochelle plans to situate sixty five percent of new housing units within half a mile of the train station as well as situate ninety five

percent of new housing units in areas with convenient non car dependent access to the train station. Ultimately these policies plan to decrease New Rochelle's per capita energy consumption and greenhouse gas emissions by reducing reliance on cars. These plans also aim to stimulate commerce and on street pedestrian activity. Primary department responsibility falls under development with potential costs including consulting, infrastructure, maintenance, and security.

Lastly, initiative 4.28 (GreeNR, 2010) details green business and job creation.

The description defines green jobs as,

those linked to clean energy or resource conservation and may include positions in renewable energy, alternative fuels, building construction and retrofits, building materials and furnishings, waste reduction, material reuse and recycling, habitat protection and enhancement as well as legal or consulting services (GreeNR, 88).

Currently, there exists no local program associated with green business recruitment and retention. The goal of this initiative is to establish New Rochelle as a leader in green economy by attracting a critical mass of green businesses as well as a local workforce that is adept at meeting the demands associated with green jobs. More specifically, GreeNR highlights an overall goal of achieving a four fold increase in the number of green businesses and jobs in New Rochelle and of training at least 500 residents over twenty years with green job skills. A particularly useful short term recommendation establishes a Green Business Council composed of owners or representatives of local green businesses and not for profit organizations, local businesses interested in greening their companies, individual contractors with green job skills, local real estate companies and appraisers, academic experts/representatives, and relevant city officials. Said Green Business Council would be responsible for conducting an inventory of green businesses and jobs, conducting a needs assessment of green job demand as the first step to

developing a green job training program and establishing a strategy for obtaining additional green businesses in New Rochelle. Medium and long-term recommendations include updating the green business and job inventory. Primary job responsibility falls under development with the potential for many partners. Consequently, smart growth development in New Rochelle mirrors that of smart growth development discussed in the literature review.

Recycling

In part 2 called “Resource Conservation and Waste Reduction” of the GreeNR action plan the issues of recycling and composting are addressed. Overall the sustainability plan aims to improve recycling rates. More specifically, by 2030 New Rochelle wants to achieve universal household participation in recycling, encourage at least 500 families to compost their organic waste, and increase the recycling rate fifty percent in municipal and non residential buildings. In order to meet these needs a number of initiatives are proposed. For example, a residential recycling campaign using posters, leaflets, and door hangers combined with issuance of warning and violation notices for failure to comply with local law will promote greater participation in recycling programs. Consequently, an educational campaign coupled with disincentives (warnings) for people who do not comply will serve to increase the community wide recycling rate by fifty percent. Additionally, the city wants to maintain consistent recycling participation from at least 90 percent of New Rochelle’s households.

Short-term recommendations include increasing the frequency and consistency with which warning notices are issued to homeowners who fail to recycle as well as issuing violations to homeowners who have received warning notices and failed to

modify their behavior. Additionally, executing a campaign of public outreach and education about recycling will increase recycling in the short term. Medium-term recommendations emphasize establishing a process to better measure recycling rates by sanitation route, in order to better target enforcement and ongoing education. In the long-term a continuation of these policies and efforts with modifications or improvements will be necessary. Primary departmental responsibility for this initiative falls under public works, sustainability, and marketing.

In addition to increasing household recycling New Rochelle's sustainability plan focuses on increasing community wide recycling. Initiative 2.11, "Public Area Recycling," calls for recycling collection at public locations such as, parks, playgrounds, parking facilities, and commercial streets. The goal of this initiative is to facilitate the recycling of commingled items in public spaces as well as enhance awareness about recycling through visibility of recycling bins and activities. Moreover, these policies would remove four tons of recyclable material from the solid waste stream. Making a list of locations throughout New Rochelle where it will be appropriate to install recycling bins will help to enforce this plan. Additionally, exploring grant opportunities and creating a pilot program are on the list of recommendations to achieve the desired initiative. By 2014 the city aims to start the pilot program with ten additional recycling bins. Eventually by 2020 this number will have increased to 250 and will culminate in 2030 with 500 public recycling bins. Departmental responsibility for this program falls under Public Works and Parks and Recreation.

Lastly Part II of sustainability plan ends with two initiatives to increase household and regional composting. By encouraging at least 500 households to compost the city can

divert 125 tons of kitchen waste and 125 tons of yard waste from the general waste stream, in turn reducing annual waste cost by \$5,000. Five recommendations exist as a step-by-step guide to accomplishing household composting. These recommendations consist of; assembling a community staff committee to assemble information about household composting, disseminate information, use a web based tracking system to create a register of residents who compost, consider the bulk purchase of compost bins with a GreeNR seal, and to encourage local landscapers and gardeners to provide local composting as an option. Similarly, the last initiative focuses on creating a regional composting site for city or other municipalities. In the next couple of years the city will be evaluating the practicality of a regional composting site in terms of available land use and cost of establishment and maintenance. The city will correspond with neighboring municipalities to weigh the costs and benefits of said project. Primary department responsibility falls on public works with costs including land acquisition, initial construction, and ongoing operation.

Green Buildings

Within the GreeNR sustainability plan the topic of green buildings is introduced under Part I, “Energy and Climate”. Thus, there is a clear overlap between green building design and energy efficiency in the sustainability plan. Nonetheless, three initiatives exist within the plan pointed towards increasing green building standards of private, commercial, and municipal buildings. The first deals more generally with green building standards. It requires adopting guidelines to promote energy efficiency and conservation in the construction, renovation, and operation of buildings. Abiding by these guidelines will propel New Rochelle towards a future with lower per capita energy consumption and

greenhouse gas emissions by cutting the energy use per square foot in new construction or major renovation by at least 25 percent relative to the community average. Additionally, adopting green building standards will enhance the marketability of certain properties as well as provide green jobs, an initiative earlier discussed in the *smart growth* section. Recommendations include modeling energy efficiency standards, lighting, and roofing standards off of the LEED framework. Additionally, for all municipal construction the plan recommends a cost benefit analysis of obtaining LEED certification, and proceeding by choosing the most economically feasible option. This initiative also emphasizes obtaining efficient lighting standards for new and major renovations of residential and commercial buildings. Lastly, the initiative requires establishment of administrative procedures to oversee and enforce new standards such as issuing permit or certificates with compliance of the program.

While the previous initiative focused more generally on green building standards, initiative 1.3 is more streamlined to obtaining energy efficiency of municipal buildings. Through a number of retrofits such as insulation, tight air seals, updated HVAC systems, window replacement, efficient lighting, and white roofs overall municipal energy consumption and greenhouse gas emissions are likely to decrease by at least fifteen percent. Said projects will be pursued after issuance of a comprehensive energy audit, which will better determine where need lies. Furthermore, retrofits to municipal buildings will save the city approximately \$75,000 annually on energy bills as well as set a positive example for the larger community. Pertinent recommendations include, once again, implementing an audit of the forty-four municipal buildings within New Rochelle, as well as consideration of applying white coating to roofs of municipal buildings with a

suitable structure. Departmental responsibility falls under Public Works, Sustainability, and Purchasing.

The next initiative deals more generally with residential and building retrofits to reduce energy consumption, greenhouse gas emissions, and waste generation. This initiative focuses on establishing a “GreeNR Seal” certification program to recognize sustainable design or retrofit of residential properties. It is the hope of policy makers that this seal will be listed on websites and included in the marketing of certain properties whereby increasing the resale value and promoting incentives for sustainable design investments. It is estimated that retail value of residential homes will increase by \$50,000 with the previously mentioned retrofits, according to the graph placed in this initiative.

Examples of sustainable features as listed in the sustainability plan include,

energy star appliances, high efficiency HVAC systems, full insulation, skylights, energy efficient lighting, cool/reflective roofs, rain barrels, rain gardens, bamboo or cork flooring, water filters, non-VOC paints and carpets, Forest Council Certified wood products and use of green cleaning products (GreeNR, 34).

Short-term proposals necessitate creating precise GreeNR seal standards as well as creating a mechanism to confirm the use of standards in design, retrofit, or practice. Such mechanism would rely on affidavits from contractors or property owners. Moreover, professionals will have to create a way to market GreeNR sealed properties, increase public awareness of the program, as well as apply the seals on eligible homes and businesses.

Energy Efficiency

Many of the plans to reduce New Rochelle’s energy consumption have already been discussed in relation to green building design. Still there is an array of initiatives not yet discussed that fall under the energy and climate section of the action plan. Overall

these initiatives seek to lower greenhouse gas emissions while transitioning to renewable sources of energy and adapting to probable climate changes. Renewable energy generation is a large initiative within the energy and climate section. This initiative facilitates the generation of renewable energy such as wind, solar, fuel cell technology, and geothermal by addressing obstacles in building and zoning codes as well as exploring opportunities for renewable energy production on public lands or buildings. The installation of renewable energy technologies will also help to facilitate the creation of green jobs. The most pertinent recommendations for enacting this initiative are as follows:

- (1) Conduct an inventory of public buildings and public land to identify locations that may be suitable for renewable energy generation. Conduct feasibility and financial analyses to determine the costs property to private energy producers, including solar power purchase agreements. Adopt and begin to implement a renewable energy generation plan based on these analyses. Reach out to the School District to gauge interest in a similar analysis of School buildings and properties.
- (2) Consider the creation of an electric CHP (Combined Heat & Power), solar-powered or wind-powered charging station at the New Rochelle Transit Center to facilitate the use of electric vehicles by commuters and other drivers. If feasible, then implement as local resources and/or the availability of grants permit (GreeNR, 33).

Consequently, the city is serious about transitioning to renewable energy to provide double dividends of stimulating the economy and creating a clean energy future.

In addition to renewable energy initiatives, upgrading exterior lighting is an initiative based on increasing the efficiency of already installed systems. This policy requires an energy audit that will determine the best energy efficient option for municipal exterior lights including streetlights and parking lot lights. Efficient technology of these light fixtures will reduce energy consumption and greenhouse gas emissions by approximately forty percent as well as receive cost savings of \$550,000 plus additional

savings through reduced lighting maintenance and replacement needs. Through a series of retrofits one hundred percent of exterior lighting fixtures will be replaced by the year 2020. Consequently, carbon dioxide emissions will decrease by 1,072 metric tons.

Primary departmental responsibility falls under Development and Public Works. This initiative for all intents and purposes is proof that little changes can produce huge outcomes.

To finish the “Energy and Climate” section the GreeNR plan ends with a complex initiative termed “efficiency and conservation loans”. This loan program would make energy efficient improvements more affordable for homeowners. By 2030 the plan aims to have encouraged 500 property owners to fund capital improvements to achieve a net reduction in monthly cost for participating homeowners and commercial property owners. This program requires the launch of a pilot program to gauge public interest, resolve problems, and market the program. Additionally, partners with lending ability must be sought out to distribute the loans. A financial model must also be developed to assess potential energy savings and greenhouse gas emissions with capital mobilization and returns for all parties. In theory, this loan program would help to encourage investment in energy efficient appliances or retrofits, as these investments can often be expensive. The loans will be paid back at a lower rate due to energy savings. Programs like these already exist federally but are being challenged or ineffective in producing the desired outcome.

Transportation

Part five of the action-plan addresses transportation and mobility. The main aim of this section is to provide policies that encourage the use of sustainable transportation

options, which are defined as, “walking, bicycling, and mass transit,” according to GreeNR. Reducing traffic congestion and increasing the efficiency of traffic routes are also priorities and goals of the proposed policies. Due to the fact that scores of policies and recommendations are including in this section, only the most applicable and pertinent initiatives will be discussed.

For example, in order to promote bicycle transport the city seeks to create the public and private infrastructure necessary to support bicycle use and storage. This initiative requires the creation of bike routes that will link major institutions, commercial centers, schools and parks. The creation of bike routes will benefit the community in a variety of ways not limited to, decreasing energy consumption, decreasing greenhouse gas emissions, decreasing pollutant discharge, improving public health and decreasing travel times by reducing congestion on major roads. In order to execute this initiative, roads within New Rochelle will have to follow the Complete Streets model to update design standards of roads to comply with multiple pedestrian uses. Additionally, the plan stresses the installation of bicycle racks and the implementation of a “Share the Road” campaign to increase the convenience of bicycle transport within New Rochelle. Once these goals are met in the medium term the city recommends assessing the feasibility of a bicycle sharing program, a bike donation program, and annual cycling events for the purpose of advertising biking as an attractive option for pedestrians.

The next initiative mentioned proposes a jitney service study to assess the feasibility of a free or low cost jitney to serve commuting, commercial, or recreational transportation demand. This service would provide an alternative to single occupancy vehicle transportation, whereby improving air quality, reducing vehicle miles traveled

and traffic congestion. Furthermore, a jitney service would stimulate commercial activity in the downtown area and enhance social equity by providing transportation to residents who do not own cars. Implementation in the short term entails researching the demand and viability of a low cost jitney service by examining relevant models in other communities and estimating routes, hours of operation, and cost to the city and residents. If a positive recommendation is received than the city will continue with implementation or decide whether to modify, expand, or discontinue the service. Three proposed routes are the main commuter roads, water front access roads, and downtown roads.

Finally, although it is initially placed under the “Energy and Climate Change” section of the sustainability plan, initiative 1.4 outlines the establishment of a green fleet of city vehicles, whereby making it relevant to be discussed under the transportation section of this essay. This initiative focuses on replacing or converting city vehicles to improve average gas mileage, utilize alternative fuels and fuel technology, and reduce the emission of air pollutants. Changes will be made on a rolling basis as vehicles end their useful life. Short-term recommendations include a list of six relevant steps essential for transforming the city fleet. These recommendations consist of: conducting a full inventory of the city fleet, eliminating nonessential vehicles or improving vehicle sharing among departments, enhance reliance on segways, bicycles, and other low emission vehicle options, replace city vehicles with fuel efficient vehicles, evaluate the use of fuel catalysts, and lastly, to consider introducing infrastructure to supplement the use of biodiesel. These steps will reduce city gas consumption and increase the amount of renewable fuel vehicles by twenty five percent by the year 2020. Currently, the entire taxi fleet has been transformed to hybrids in order to meet this growing need.

Funding

A large majority of the initiatives proposed in GreeNR are expected to save the city money. On the other hand, many of the initiatives require a large expenditure of money with an expected longer-term payback. In many cases, recommendations that require large sources of money include the phrase, “if resources permit” (GreeNR, 21). Judgment about whether to proceed with these initiatives will be dependent on council and staff opinion. Each initiative also highlights the most probable sources of outside funding. Still, general recommendations in the beginning of the action plan emphasize aggressively pursuing outside funding opportunities not limited to those recommended in the plan. Extra funding sources should include private foundations, corporate grants, and mechanisms for voluntary donation to community goals.

Due to the current state of the economy the city’s present financial situation is severely stressed. Although the city would ideally like to create a new and stable source of revenue to advance GreeNR’s objectives, any new allocation is not likely to happen in the short term. For this reason the city aims to establish a voluntary source of contributions for New Rochelle’s sustainability budget. Thus by aggressively pursuing outside funding and securing consistent and stable local funding, implementation of the objectives described can occur on a need basis. In addition a list of the funding sources can be viewed by scrolling to the appendices section of the GreeNR plan. This list includes local colleges, neighborhood associations, grants, schools, the state, voluntary monies, and county funds.

Enactment

The City of New Rochelle took formal steps to enact their greening plan and to

guide future environmental policies for the town. In order to get primary material on program implementation questionnaires were sent to the two major leaders of the town's environmental program.

Profile of Program Leaders

Deborah Newborn, New Rochelle's sustainability coordinator, was hired three years ago to transform New Rochelle into a burgeoning sustainable community. Her job is a catchall of many different responsibilities related to New Rochelle's environmental impact. Moreover, she has wholeheartedly dedicated herself to the creation and execution of GreeNR. Before becoming sustainability coordinator Deborah was an environmental attorney for twenty years and an environmental scientist prior to going to law school. Ultimately, environmentalism has been a significant part of her life mission and goals.

Deborah works under Mayor Bramson who has served on the city council for ten years prior to becoming Mayor. He is a lifelong resident of New Rochelle and graduated from Harvard University with a degree in public policy. Additionally, he has served as mayor for six consecutive years. Mayor Bramson has also committed himself to pursuing environmental remediation. Bramson has been called a man of "intelligence, drive, and ideas," by the journal news (Noambramson.org). As evidence of his successful career he was asked to deliver Harvard's commencement speech in 1990. He works closely with Deborah to advocate for GreeNR as a framework for New Rochelle's environmental policies.

Questionnaire:

The following questions were asked:

- 1) What do you perceive to be the weaknesses of GreeNR?

- 2) What do you perceive to be the strengths of GreeNR?
- 3) What sort of collaboration between different departments of government was required in the drafting of this document?
- 4) In what ways are the initiatives outlined in the sustainability plan going to be enforced? Are there consequences for lack of enforcement?
- 5) Is there anything that could have been done differently after having drafted and passed the sustainability plan with the city council?
- 6) Was there resistance among the city council to pass a sustainability plan? Were there other difficulties? If so elaborate
- 7) Are you doing any specific assessments of the program now or do you have any future plans to do any assessments?

The responses to these questions are provided in the paragraphs below. Their answers provide crucial insight into the enactment process of the GreeNR sustainability plan.

Strengths and Weaknesses

The enactment of such a large program comes with triumphs and tribulations. The sustainability plan has been met with a fair share of success and failure. Interview responses from Mayor Bramson and Deborah Newborn indicate that the initiatives and metrics are a useful framework for policy discussion and will help shape the administrative and Council Agenda for years to come. The format is user friendly, with educational undertones, and readily accessible to the public. The recommendations are also specific enough to serve as a substantive plan of action. Also, Deborah Newborn highlights a major success to be the fact that “it was a developed as a consensus document with the community at large so it reflects the interests and concerns of our New

Rochelle residents” (Newborn, 2012). On the contrary, Deborah and the mayor both agree that a major failure of the program is lack of funding for implementation. The mayor elaborates to include, that minimal financial resources to support implementation means that the likelihood of achieving long-range goals cannot be gauged with confidence. For this reason, his desire to present practical, achievable, and broadly supported objectives may have diminished the audacity of some suggestions.

Enforcement and Assessment

According to Mayor Bramson and Deborah Newborn (New Rochelle’s sustainability advisor) GreeNR is different from other programs in that, “it relies on voluntary action, encouraged through education and/or incentives, as opposed to mandatory action backed up by enforcement” (Bramson, 2012). The mayor continues to state that any requirements would be embedded in the city’s zoning or building codes or contained within development agreements with standard enforcement mechanisms. Deborah, however, continues by adding that the goal of enforcement was to provide people with the right information so that they could make their own decisions. In doing so GreeNR holds faith in individuals that given the necessary information, citizens will make the right choices. While the sustainability coordinator believes it is too early to do any benchmark assessment, the mayor replies that the council resolution adopting GreeNR requires the city manager to deliver annual progress reports to the council. Additionally, he meets with the sustainability coordinator on a weekly basis, and she monitors initiatives on a rolling basis.

Collaboration and Resistance

Enactment and drafting of the plan also required significant cross-departmental

collaboration. Each department was involved in different committees. The committees also included local experts in areas of law, engineering, policy, health, and input from the community at large. These experts worked to assemble data, assess the merit and feasibility of certain policy recommendations, set goals, and shape the documents content. Each initiative lists the departments and actors expected to engage. Despite the cooperation among members of different departments of government, GreeNR was not approved unanimously. Nonetheless, a six to one majority approved the decision, with some resistance during the review process. This resistance occurred for a variety of reasons. The mayor considers these reasons to be:

general unfamiliarity with the terms and contents of the plan and consequent discomfort; unjust fear that approval of the document would obligate the Council to the expenditure of resources in the future; pressure from a vocal minority in the community that subscribes to baseless conspiracy theories involving ICLEI and the United Nations; and a modest degree of partisan politics (Bramson, 2012).

As a result when asked if anything could have been done differently after drafting and passing the plan the mayor responded that he would have encouraged Council Members to be more involved in shaping GreeNR. In this way, Council discussion and review would have taken less time; and members would have been familiar with the document.

Chapter 3: Discussion and Conclusion

Leadership Responses and Literature Review

An emphasis on collaboration between different members of government to create and enforce GreeNR is highlighted in the responses from both the Mayor and Deborah Newborn. This idea relates back to the literature review in that numerous sources discussed the importance of cooperation from many different arenas in order to find solutions to the plethora of environmental issues plaguing cities. The demonstration in of the significance of alliances between different fields and interests is shown through the execution stages of the GreeNR plan. Consequently, the creation of sustainable cities is not solely a one-person project. Instead, sustainable cities are a reflection of a larger societal goal in which everyone who seeks to contribute is pertinent to the overall process.

Additionally, the resistance from one member of the City Council reflects the larger phenomenon of NIMBY issues. According to the Mayor, the resistance was due to unfamiliarity with terms and contents, the burden of financial responsibility, and partisan politics. The recalcitrant member of City Council most likely had the concern of his constituents from his district in mind when rebutting the sustainability plan. Nonetheless, the Mayor and Sustainability coordinator were able to work with the adversarial district to correct and address their concerns. NIMBY politics will be a major obstacle for policymakers with environmental agendas. Thus, New Rochelle should be looked to as a role model in that they were able to work through the concerns of different citizens as well as members of the City Council.

Successes and Failures

The GreeNR sustainability plan can be analyzed in terms of a variety of successes and failures it has achieved. Overall, New Rochelle policy makers should be proud of their efforts in that they represent a minority of communities seeking to serve as leaders and role models in the sustainability movement. More specifically, there are many successes within the GreeNR plan that should be celebrated and pointed out as part of a relevant analysis of sustainability initiatives from local communities. First, GreeNR is an all-inclusive document that leaves nothing to the imagination. Its detail-oriented nature explains every topic to the audience as well as makes sure that no topic relating to sustainability is left out. Additionally, as the Mayor has stated, one of the major successes of the plan is that it is user friendly. Sections are color coded according to relevant material based on each topic and organized in the same format for each section. Furthermore, it is easy to navigate to the sustainability plan on the City's website, which is an important factor in terms of citizen awareness of the sustainability plan.

On another note, the fun facts dispersed throughout the plan educate citizens on a wide variety of issues relating to the topic discussed. They also help to break up the rigidity and formality of the document as well as provide background information. Similar to the "fun facts," the *current status* section seeks to educate citizens on how New Rochelle is affected or dealing with the particular environmental problem. This is pertinent so that citizens know how these issues relate to their own community for the purpose of providing a sense of "place" to citizens. Moreover, one of the most important successes of New Rochelle's plan is its incorporation of a timeline, which includes short

term, medium term, and long-term goals. This timeline helps organize the City's agenda as well as provide realistic limits and expectations of the City for years to come. In addition, it recognizes the City's commitment to environmental issues in the years to come. Essentially, serving as a legacy for those involved in the drafting and execution of the plan. The incorporation of a timeline and fun facts speak to the many different mediums present in the document, which also includes graphs and charts. This appeals to all different styles of learning, which should mirrored in similar types of documents.

One of the many successes of New Rochelle's sustainability plan is its reliability. Other cities and communities seeking to draft their own sustainability plans can easily adopt the format that New Rochelle uses because it is the same throughout the entire document. In this way, New Rochelle can serve as a role model to other communities, which is the prime object of the sustainability plan to begin with. Ultimately, GreeNR succeeds in empowering individuals and members of the civic community to take action and become educated on the environmental problems that affect the New Rochelle community. This empowerment plays an important role in the execution of various initiatives described in the plan since GreeNR relies on mostly self-will and determination to implement its projects, as there are no mandates or funding for such implementation.

On the contrary, GreeNR has its equal set of failures. First, because the document is extremely specific and detail oriented, a minority of the initiatives are hard for the average person to understand. For example, in initiative 1.8 *Efficiency Conservation Loans*, the description is rather vague and incomprehensible. The description states,

Focus on energy efficiency improvements for which expected monthly savings exceed payments on a medium-term loan, calculated using a standardized model of

anticipated energy savings associated with specific improvements. This model should be the basis for pro forma financial plans that compare the potential energy savings (and greenhouse gas emissions reductions) with hypothetical capital mobilization and prospective returns for all parties, including local financing partners (GreeNR, 38).

While the vast majority of initiatives are understandable, it is disconcerting when individuals come across information they do not understand. Furthermore, if the document is to appeal to the average New Rochelle citizen, then the initiative and others similar should be altered to be comprehensible to the average person. In the same regard, the sustainability plan is one that does not appeal to a wide demographic. This is a failure in that if cities are to truly become sustainable, the effort needs to begin from the ground up. Policy makers in New Rochelle should ask themselves how an elementary student would be able to understand many of the concepts discussed in GreeNR. This may spark new projects to create a “kid friendly” version of the document for the purpose of closing the audience age gap.

Although it is praiseworthy that GreeNR is incredibly detailed and specific, at the same token this can be viewed as a failure. The document might be more inspiring to individuals if it were “short and sweet”. It takes a long time to read and scroll through each initiative and its overall goals and descriptions. This may give the reader “document fatigue,” a similar concept to ballot fatigue when voting. The average citizen is on the go at all times and most likely will not be willing to sit down and read through scores of initiatives and information. Moreover, much of the information is repeated steadily throughout the document. While it is okay to repeat oneself for emphasis, it remains apparent that clearly there is editing that can be done to better ascertain the goals of an initiative without repetition of concepts or phrases.

Lastly, some may argue that New Rochelle's sustainability plan is not radical enough. It does not mandate individuals to change their ways and it does not discuss ethical or philosophical reasons behind the shift to sustainability. Instead it defines sustainability using the basic outdated United Nations definition. In this way, the document is lacking. It has a relatively weak sustainability point of view in that it only asks us to tinker with our paradigms instead of begin to overhaul them. For instance, concepts such as earth jurisprudence, giving nature rights, or biomimicry do not appear throughout the document. This bodes the assumption that policy makers and those committed to creating the document, were merely trying to play it safe. While it is a feat that GreeNR passed through the City Council, there should have been more risks taken. In addition, the document needs to evolve to account for concepts that are relatively new, such as those previously mentioned, to the urban planning arena. Nonetheless the successes and failures described above represent personal opinion and should be taken at one's own regard.

Other Sustainable Cities

A vast amount of communities and cities around the world are becoming sustainable by incorporating a number of the policies and programs discussed in earlier sections to reduce their ecological footprint. The State of New Jersey is a beacon in the sustainability movement through programs such as Sustainable New Jersey (Prosnitz, 2012). Sustainable New Jersey is a "program for municipalities in New Jersey that want to go green, save money, and take steps to sustain their quality of life over the long term" (SustainableJersey.com). This project is part of a voluntary certification plan in which municipalities can qualify through a points system. The grant program is funded by Wal-

Mart and allows cities, townships, or municipalities to achieve grants for sustainability projects. For example, the Township of Teaneck has recently obtained a Sustainable New Jersey Small grant for \$9,000 that will be put towards educational endeavors that will allow students to apply sustainable principles to real world problems. Teaneck was able to earn points by expanding recycling, installing solar panels on municipal buildings, using green cleaning supplies, and recycling food oil for bio-diesel. Thus, Teaneck hopes to set a precedent for other cities seeking to become sustainable.

In the New York region, local communities look to New York City as a role model in sustainable initiatives. New York's sustainability plan "plaNYC" is a long-term sustainability plan that has transformed New York into one of the highest-ranking sustainable cities in the nation (NYC Global Partners, 2010). New York City's plaNYC addresses challenges in five key areas including: land, water, transportation, air, and climate change. Three of the 127 initiatives have gained international media attention for their ingenuity. These initiatives include the Mayor's congestion mitigation proposal to charge cars that enter the central business district, the MillionTreesNYC campaign, which seeks to plant one million trees in the city within ten years, and lastly the initiative that caused the entire NYC fleet of taxis to become hybrid vehicles by 2012. Many of the initiatives proposed are at different stages of being implemented. Additionally, plaNYC has accomplished one of the largest bike sharing programs in the nation. It is through a medley of these programs that New York City has been able to reduce greenhouse gas emissions 13 percent below the 2005 level (NYC.gov). Nonetheless, there is no doubt that New Rochelle gained much of its inspiration from New York City in the drafting and enactment of a sustainability plan.

In addition cities such as Perth, Australia have designed programs that seek to make their communities more sustainable (State of the World, 2010). For instance, the TravelSmart program reaches out to individual households in a letter from the Mayor asking homeowners to participate in the program. Follow up calls are made to gauge citizens interest on receiving information. TravelSmart officers even make house visits to encourage citizens who need extra support. Individuals who participate receive pamphlets and information on the benefits of walking for one's health and sense of community. In communities where TravelSmart has been implemented, there has been a reduction of 12 to 14 percent travel by vehicle. In addition, Australia has developed its TravelSmart program to include a LivingSmart program that requires eco-coaches to aid households in changing their energy use, water practices, amount of waste consumed, and travel methods. This program aims to reduce carbon dioxide emissions by 1.5 tons per household a year. Thus, the initiatives described above are a step in the right direction towards creating cities that are less destructive to the natural world.

Future Research

Future research has the potential to develop in many different directions. For instance, an alternative route might have been to compare and contrast alternative sustainability plans of surrounding towns to GreeNR. In this way, the differences and similarities between both programs would provide crucial insight into the significance of inclusion or exclusion of specific programs and initiatives. Additionally, a comparison of the sort would be helpful to other cities seeking to create sustainability plans, in that it would provide a solid framework for formation of similar literature. This research would

also facilitate the exchange of ideas between different communities taking different approaches to sustainability programs.

Another alternative for future research would be to explore the steps required for creation, implementation, and enactment of sustainability plans. This would include an analysis of the entire process of developing sustainability plans, instead of merely a description of the end result. A project of the sort would highlight a step-by-step plan for communities yearning to incorporate sustainability into their everyday lives. This method takes an all-inclusive approach and would be valuable to specific communities that are having trouble or resistance in the beginning stages of creation. Furthermore, this research would also provide and develop a set of guidelines that cities could reference as a checklist in the development and evolution of their own projects.

Additionally, with substantial funding, a global analysis of sustainable cities would be possible. A global comparison would permit the introduction of novel ideas and policies that do not exist in the United States. This research would be relevant to policy makers in that it would call into question many existing paradigms that are outdated or inefficient, allowing for evolution and change in procedures of the United States or vice versa. Furthermore, it would reveal an entirely different approach to politics as well as creation and execution of different initiatives and programs seeking to transform ordinary cities into sustainable communities.

Lastly, future research might include looking at sustainable cities function and role in the overall sustainability movement. This would require an assessment of the overall effectiveness of sustainable communities in terms of environmental impact and

other relevant factors. An analysis of this kind might include a case study as a microcosm for assessing the general usefulness of sustainable cities. Consequently, this research would justify the role as well as importance of sustainable cities or towns in terms of fulfilling the key principles and themes outlined in the sustainability movement. This research would be especially significant to urban planners in that it would evaluate sustainable cities based on a systems approach.

Bibliography

Abate, Victor. Vice President of Renewable Energy at General Electric, *The Future of Renewable Energy*. (Schenectady, New York: 2/2/12)

Ayres, Robert and Edward, *Crossing the Energy Divide: Moving from Fossil Fuel Dependence to a Clean Energy Future* (New Jersey: Pearson Education Inc., 2010)

Caldwell, James, "Green Buildings and Communities"
<http://e3regenesis.com/pdf_files/Green%20Building%20US%20and%20China.pdf>
(2/24/12).

Darco, Lawrence. Department of Environmental Conservation, Air Quality Division, Sociology Capstone Seminar Notes, (Schenectady, New York: 2/27/12).

Environmental Protection Agency. <<http://www.epa.gov/wastes/nonhaz/municipal/>>
(3/12/12).

Epstein, Eliot, *The Science of Composting*, (Florida: CRC Press, 1997).

Fisanick, Christina, *Eco- Architecture* (Michigan: Greenhaven Press, 2008)

Gamba, Raymond and Oskamp, Stuart. "Factors Influencing Community Residents Participation in Comingled Curbside Recycling Programs" *Environmental and Behavior*, 1994 (26) 5: 587-612

Greatz, Michael, *The End of Energy: The Unmaking of America's Environment, Security and Independence* (Massachusetts: The MIT Press, 2011)

GreeNR; The New Rochelle Sustainability Plan: Vision and Action for a Healthier Community, (2010).

Horvath, Aprad. *Construction Materials and the Environment*. *Annual Review of Environment and Resources*, 2004 (29)181-204

Hsu, David. "Sustainable New York City", (New York: Design Trust for Public Space, 2006).

Inform: Building Environmental Literacy. <<http://www.informinc.org/pages/extended-producer-responsibility.html>> (3/12/12).

Jackson, Debbie. Department of Environmental Conservation, Recycling Bureau, Sociology Capstone Seminar Notes, (Schenectady: New York, 2/13/12).

Jackson, Wes, *Consulting the Genius of the Place* (Berkely: Counterpoint Press, 2010)

Jevons, William S., *The Coal Question: an Inquiry Concerning the Progress of the Nation and the Probable Exhaustion of our Coal Mines*, (London: Macmillan and Co., 1866).

Kaufman, Irving. "The New Rochelle Decision: The Facts, *Journal of Educational Sociology*, 1963 (36) 6: 262-271

Koshland, James. "The Scope of the Program EIS Requirement: The Need for a Coherent Judicial Approach" *Stanford Law Review*, 1978 (30) 4: 767-802.

Lovelock, James, *Gaia: A New Look at Life on Earth*, (New York: Oxford University Press, 2000).

Mayor Noam Bramson. <<http://www.noambramson.org/about/>> (5/27/12).

New York City Global Partners. "Best Practice: PlaNYC: NYC's long-term sustainability plan" 2010.

New York State Energy and Research Development Authority. <<http://www.nysrerda.ny.gov/en/Programs/Research-and-Development/Biomimicry.aspx>> (3/8/12).

NYC.gov, <<http://www.nyc.gov/html/planyc2030/html/theplan/the-plan.shtml>> (5/23/12)

Prosnitz, Howard. "Teaneck Receives Sustainable Jersey Grant for \$9000" 2012. <http://www.northjersey.com/community/136680973_Small_grant_to_be_used_for_educational_program_.html> (5/8/12).

Sarte, S. Bry, *Sustainable Infrastructure: The Guide to Green Engineering and Design* (Hoboken, New Jersey: John Wiley and Sons Inc., 2010)

Segerson, Kathleen, Professor, University of Connecticut. Sociology Capstone Seminar Notes, (Schenectady: New York, 3/7/12)

Stein, Carl, *Greening Modernism: Preservation, Sustainability, and the Modern Movement* (New York: W.W. Norton and Company, 2010)

Sustainable New Jersey. <http://www.sustainablejersey.com/resources.php?sec_num=7> (5/23/12).

United Nations Secretariat, Population Division "2009 Revision of World Urbanization Prospects" *World Urbanization Prospects: The 2009 Revision*, 2010.

United States Census Bureau, Population Division, 2012.

United States Green Building Council. <<http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1988>> (2/4/12).

Wille, Rod in Fisanick, Christina. "Ten Studied Advantages of Sustainable Design" *NAIOP's Development Magazine*, 2003

Williams, Daniel E., *Sustainable Design: Ecology, Architecture, and Planning* (Hoboken New Jersey: John Wiley and Sons Inc., 2007).

Wilson, Clark in Sarte, S. Brye, “Implementing Smart Growth Streets: Balancing Movement, Ecology, and Community. EPA, Smart Growth Division, 2010.

Worldwatch Institute, *State of the World: Transforming Cultures from Consumerism to Sustainability* (New York: W.W. Norton and Company, 2010).

Zipcar. <<http://www.zipcar.com/about/>> (3/12/12).