



## **GOING GREEN AND MAKING GREEN:**

Stimulating Boston's Economy Through Innovative Start-Ups



**Written By:**

Chris Taylor '12

Kathryn Walsh '14

Ken Liu '14

Tia Ray '12

# Table of Contents

1) Acknowledgements.....	Pg 2
2) Executive Summary.....	Pg 3
3) Green Economy.....	Pg 5
• Definition	
• Green economy movers	
• Competent Work Force	
• Loans/Investment	
• Zoning	
• Standards	
• Building codes	
4) Recommendations.....	Pg 12
• Public Works Projects	
- Parks	
- Infrastructure	
- Public Transportation Improvements	
- Housing Development	
• Diversifying Business Plans and Introducing Workforce Training	
• Partnering with Universities and Investing in Green Technology	
• Implementing Green-Friendly Zoning Laws and Cross-Agency Collaboration	
• Loans to stimulate green business	
• Partnership between the private sector and universities for specific research project	
• Retrofitting and Weatherizing	
• Partnership between businesses, public organizations, grassroots organizations, and researchers	
• Standards	
- Alternative Energy Standards	
- Emission Standards	
• Green Infrastructure Standards	
- Transportation Standards	
6) Bibliography.....	Pg 39

# Acknowledgments

A year ago, a group of students embarked on solving a great problem of our time: how does a city attempt to encourage job opportunities in a down economic time? After a year of research, writing, and revision, we have arrived at several answers. While we have managed this project in its entirety, there are several individuals that this project would not have been possible without.

First, we would like to thank the Institute of Politics Director Trey Grayson for his continued support of the Institute of Politics Policy Program. His strong leadership of the IOP gave the policy program the leverage to complete its program.

We thank Catherine McLaughlin, the Executive Director, for her unwavering faith in the policy program. She gave us a chance when there honestly should not have been, and we hope that this work has validated her faith in us.

We would also like to thank Laura Simolaris, our staff person, for continually meeting with us. She was critical to our group's success by getting all the resources necessary to complete the project. Without her, this paper would have gone nowhere fast.

We also thank Alex Fey. He is the former clean tech advisor to the Mayor of Los Angeles and the current business director at Quallion. By reading our drafts and offering critiques, he helped to streamline and focus our work into what it is today.

Finally, we would like to thank Suzanna Cervantes for her work. She contributed with research at the beginning of the project.

# Executive Summary

Building a green economy is critical in strengthening a city's economic climate and ensuring long-term growth. With the green movement making an economic impact nationally, it is paramount for cities to develop a comprehensive plan that will attract and retain both growing and established environmentally-friendly businesses. By creating green-friendly laws, standards, partnerships, and services, the city of Boston will be able to attract new businesses, increase employment across all income spectra, and eventually build a center of clean technology where firms can thrive.

Boston is currently a well-renowned city for promoting green practices and helping provide the tools for businesses and other entities to go green. What Boston is lacking is a specific outline and policies to ensure green practices and to attract green tech businesses to the Boston area. Boston has groups such as RenewBoston and GreenTech that are helping to promote green technology, to provide green guidelines, and to assist businesses in green initiatives. What groups like these and Boston fail to do is provide rules and incentives that will bring green tech businesses to the city. With more green tech businesses and green initiatives in Boston, the city would surge to an even more environmentally successful level.

To make Boston a center of clean technology that will attract green tech business, the city should begin by pursuing at the following recommendations:

1. **Implementing Public Works Projects**
2. **Diversifying Business Plans and Introducing Workforce Training**
3. **Partnering with universities and investing in green technology**
4. **Implementing green-friendly zoning laws and cross-agency collaboration**
5. **Providing loans to stimulate green business**
6. **Encouraging partnerships between the private sector and universities for specific research projects**
7. **Instituting retrofitting and weatherizing**
8. **Promoting partnerships between businesses, public organizations, grassroots organizations, and researchers**

By adhering to and following the policy recommendations listed, Boston will have the foundation to move forward as a clean technology powerhouse. Pursuing green public works projects will help stimulate the economic climate and provide jobs to residents while the research partnership between city government, universities, and businesses will help utilize every city resource available. Diversifying business plans and introducing workforce training will prepare the city for such industries. Furthermore, universities and government can play a joint-role in recruiting green businesses to locate within the area. Zoning and internal governmental agency collaboration both help increase the economic attractiveness and efficiency within the city. In addition, city-supported loans will help increase the flow of capital and help firms expand. Weathering and retrofitting will make the city itself more energy efficient while providing jobs and business for green firms. Finally, when there are partnerships between businesses, public and grassroot organizations, and reasearchers, all the knowledge of the city is combined into one effective channel. By adopting such recommendations, the city will ultimately become more friendly towards, and eventually attract, green businesses.

# Green Economy

## Definitions

To understand the green economy and how it works, it is important first to identify and define relevant terms. The first to explain is the green economy itself. A green economy must support the dimensions of both the environment and jobs. It should be based on the efficient use of energy, reducing polluting emissions, and the use of renewable sources of power. By investing in these energy practices, the green economy creates opportunities and jobs that help people enjoy a good standard of living and basic rights in their workplaces. All of this, in turn, creates a stronger community. (Pollin and Wicks-Lim 2-4)

To support the green economy, there must be a wide range of green jobs available. Green jobs are the kind of family-supporting jobs that anchor the middle class, but in industries of the future. Jobs like construction, manufacturing, installation, maintenance, agriculture, and many others can all fit the category of green jobs if they are contributing towards environmental solutions such as wind turbine manufacturing, solar panel installation, energy efficiency retrofits, and green building. (Apollo 2) In other words, the jobs must contribute to fighting global warming and supporting the green economy. In addition, green jobs must provide a family-supporting wage or an opportunity for individuals to move into higher-skilled occupations. (Apollo 3) Thus, green jobs do not just mean new jobs, but also greater job security for people in these fields already. (Pollin and Wicks-Lim 2-4)

The people who are working green jobs that somehow contribute to the green economy are known as green workers. Green workers can be recruited by going to family-supporting, labor-oriented jobs and finding people to come work at businesses where those jobs will contribute to the green economy.

The green economy uses sectors and clusters to support its growth. The main difference between sectors and clusters is the workforce versus the economy. Sectors are organizing models for workforce development. They target specific industries where they want to grow and improve the workforce. They link workers in that industry with education and training to the demand in a regional labor market. A cluster is connected with economic development. Clusters are groups of geographically and functionally related companies. Generally these companies are

related or useful to each other in expertise and help each other with services, resources, supplies, and labor. (White and Walsh 9)

Another essential aspect of the green economy is for places and companies to go green. Being green versus greening is a cause and effect mechanism. Green products, companies, and producers are all environmentally friendly. Green products are energy efficient and safe for the atmosphere. Green companies have standards in place to use green products and keep their businesses environmentally friendly. Green producers, such as green tech businesses, manufacture the green products. Greening is the process of taking these green products and standards and instituting them into a place or company so that business becomes green. Greening is what causes the effect of a green environment.

One way to be green is to be energy efficient and to conserve energy. Efficiency versus conservation is another cause and effect mechanism. Energy efficiency is the efforts that will reduce the amount of energy used when creating products or providing services. Being energy efficient can also help reduce energy costs, can reduce greenhouse gas emissions, and can allow for conservation. Conservation is the result of the specific efforts that reduce consumption of energy.

### **Green economy movers**

Government, consumer, and private enterprise all play a critical role in building the green economy within the city. Each one of the components all contribute and offer a different set of knowledge and tools that cannot be found elsewhere.

Consumers initiate the green economy movement by creating a demand for a certain green product. Upon this initial movement, firms will be driven to answer by building products to cater to the market demand. For example, if there was a movement to purchase environmentally friendly light bulbs, the demand would drive companies to launch the production of such goods. Once the market is established, it is equally important for the consumers to keep up the demand. Research has shown that green products tend to weather the economic recessions stably. Since the economy largely depends on what's demanded by the purchasers, which include the consumers, products will be built according to the market needs, making consumers critical in driving the green economy.

The city government will also play an instrumental role in driving the economy. It is tasked with creating standards, deciding which kind of jobs to encourage, and initialing

movement among actors to build the green economy. These three tasks will help build a foundation that will allow for green economy to grow.

By establishing a set of standards, the city would be able to dictate their vision of the green economy and concurrently encourage firms to build according to the city's specifications. By modifying the building code to become more green-friendly, the city will not only build a more energy efficient community, but also encourage firms that manufacture such technologies to locate within the city limits. Boston can also increase the alternative energy source requirements, which will help spur the growth of clean energy sources within the area. For example, the City of Los Angeles set a goal of having 20 percent of its energy sources come from renewable sources in the year 2010, which was successfully accomplished despite the higher cost associated with it. Another field which the city could manage is the municipal transportation goals. For example, the city of Boston has already mandated the whole taxi fleet to be hybrid by 2015. Similarly, the city could edit its infrastructure requirements to require more efficient planning within new buildings throughout the city. Finally, the city can incorporate a stricter emission standard throughout the area. For example, if high-polluting diesel or high-consumption gasoline vehicles were tolled near the city center, there may be more fuel efficient vehicles purchased by the commuters that commonly drive there. Another upside of such a policy is the immediate generation of revenue for the city.

The city government also plays a key role in determining what jobs to encourage. For example, if a city decides to encourage green manufacturing jobs, it could ease the entry requirements for such businesses and offer training programs for people interesting in entering this field. By deciding on which direction the city economy moves towards, the city will be setting a tone that can change the kind of businesses that move here.

Finally, the government can also start the green economy by initialing movement between businesses, government, and non-profits. By conducting outreach to businesses both locally and abroad, the city can bring in businesses that otherwise have no preference where they would expand. Furthermore, the city's marketing efforts are also important in gathering media attention, which would gather more attention towards the city's emphasis on building a green economy. By initiating the conversation about the green economy, the city is essentially building the base for future economic developments.

Investment in the green business sector are also critical to long-run success. Venture capital firms could provide funding for start-ups that would otherwise have a limited set of financial resources. Furthermore, banks and other financial institutions help spur the flow of capital within the area. By increasing financial sources and the flow of capital within the city, investment firms are critical in moving the green economy forward.

In an ideal setting, the effective collaboration among the three difference forces, consumers, government, and investment firms, will help attract green businesses and eventually establish a green economy. Consumer's demand of green products initiates the economic interest in establishing firms in this area. When the government creates a set of friendly standards and conduct effective outreach, the economic interests will be driven to be located within the city. Once established, it will be critical for investments, a friendly government, and product demand to continually drive the green economy.

### **Competent Work Force**

Work force development is absolutely critical to the development of a green economy and requires multiple strategies to be effective in training workers for green jobs. Training has to be done in a way that can upgrade the skill sets of current workers while providing re-training to individuals out of work.

Currently employed workers provide a valuable opportunity for employers to enrich employees with expertise in the green economy. It begins with the private sector creating a panel on evaluating labor skills. By evaluating what skills can be incorporated into the firm, training can be targeted at specific workers and reduce resource waste. Once specific skills have been assessed, the private enterprise can then join forces with outside forces to actually perform the training. Depending upon the form of training, this can take the form of community-based organizations, formal classroom re-education and classes, labors and apprenticeships, economic development councils, or in-house training. All of the options allow for both employer and employee motivated training to be handled.

Training also has to be provided for unemployed workers. Workers who are unemployed can receive training in their current fields or new training to make themselves more competitive. Targeting a specific cluster of businesses requires a specifically trained workforce to be able to work in those jobs. Without them, businesses will never come or be able to sustain themselves in the long run. Unemployed workers training has to come at various levels. Businesses require all

levels of labor, from high school workers to workers with post-graduate backgrounds. As such, training needs to occur at all levels to ensure that everyone can learn about green skills.

### **Loans/Investment**

Loans and investments are critical to the development of the green economy. Successful economies have loans and investments that come in various forms to ensure that sound businesses can successfully get the funding they need for their start ups.

Government typically provides multiple loans. First, government needs to provide loans to green businesses specifically with unique incentives to encourage the growth of the green sector. Providing lower interest rates, tax incentives and other promotions will encourage individuals to innovate and create firms for their clean technology. Secondly, government can provide loans to businesses tied to greening practices. These loans can come in the form of building upgrades, store frontal management, or the inclusion of clean technology into their firms. Not all government funding has to be loans, however. While loans assure the ability for the government to regain its investment, the city can also provide grants. The city's grants can come with conditions though, and do usually. Successful green cities will often provide grants to universities and research firms for developing a specific technology for the city. Tying them in gives the city the ability to foster innovation while also gaining either financially, politically, or in tangible public works projects.

The private sector also has to be involved in the economy. Successful growth of the green sector must involve the private sector. Innovation stemmed from the private sector is always successful because it comes from competition with the best ideas surviving. The most critical component of the green economy and its growth is the source of venture capital. All successful firms grow because of the prevalence of venture capital. Green firms typically require more investment than other businesses because it takes longer to develop and research clean tech. Getting other private firms and non-governmental organizations involved will provide the necessary sources of funding to firms, as well. Creating competitions, grants, funding research and loans from the private sector keep government out and allows for dynamic growth to come from the market.

Another critical location for funding is at the university level. In almost all cases, the most successful green economies have research labs and think spaces for innovation. The obvious locations for this would be at the university level. University research is naturally

inclined toward innovation and creation. By providing financial incentive to innovate and invent new technologies, labs provide the research necessary for firms and the city to turn into products while the lab gains increased recommendation.

### **Zoning**

Effective zoning is important for urban planning and development, but it is dire for successful growth of green economies. Zoning must be done in a way where areas are defined as “Green Zones.” These zones become models of regions that are defined as green growth. These zones incorporate think spaces, firms, research labs, and other businesses that are exclusively green. In order for them to be successful, the areas need to be sustainable both environmentally and economically.

Economically, the zone is defined as a green hub. Think spaces and research labs are put into place specifically for innovation in ways to conserve energy and make current technology and buildings more energy efficient. The researchers build connections with firms, also located in the zones for convenience. With public transportation available for the district, there are also homes for the individuals who work that provide models of energy efficiency. These affordable homes are effective in modeling energy efficiency and will provide new markets for other businesses, such as grocery stores and restaurants.

Environmentally, there are other key benefits. The technologies developed in the district can be immediately integrated into the zone. The zone can then serve as a model of environmental consciousness and acting as a guide to eventually spreading itself into the rest of the city. Green zones also tend to reduce impacts of business and production by keeping all key components located in the district without a need for high transportation costs. These zones also mean that there is a concerted effort in dealing with environmental and climate challenges.

### **Standards**

City standards are a simple yet effective measure that can be developed and changed to meet the needs of the growing green industry. The costs of creating standards is low for the city, but the benefits can be incredible both on a monetary level and for the state of green business in general. By implementing standards such as building codes, alternative energy requirements, transportation goals, emissions standards, and infrastructure requirements, the city can make their green goals known and strengthen their green standing. The following green standard on

building codes is what should be implemented in an ideal situation:

### **Building Codes**

At the most basic level, building codes ensure the safety and health of tenants. One of the most positive steps the city can take is to incorporate further green building standards into their existing construction standards. In a perfect system, all new buildings would be built to LEED Standards. LEED standards are developed by the U.S. Green Building Council, and with these standards, buildings are rated for the energy efficiency of design. These buildings have the potential to save businesses money in energy costs as well as provide the opportunity for the city to receive federal funding from sources that are providing opportunities for innovative design. These LEED standards are tailored to specific types of buildings, such as New Construction, Existing Buildings, Schools, Homes, Neighborhood Development, as well as other types of buildings.

Building codes require permitting be obtained for new construction; at this stage, it would require only a small investment to make sure that buildings are constructed to the minimum LEED standards by denying construction permits to buildings that do not meet the design requirements for LEED certification. This would ensure that all new buildings are as up to date as possible with green standards. Cities such as Chicago and Boston provide incentives to new businesses who meet LEED requirements. By providing tax breaks, such as no property taxes on buildings that meet Gold, a mid-to-high range standard, LEED requirements both the city and building owner benefits. These super energy efficient buildings lessen the burden on the energy grid. Ideally, every building would meet these design efficiency standards; currently they are only awarded to buildings that exemplify the best possible design. If building standards are updated to reflect these more stringent requirements, the entire populace would benefit. These standards are not limited to new construction. In fact, there are many LEED requirements that are applicable to areas that are undergoing development. These standards can create a large benefit for the city; older buildings tend to waste more energy due to outdated construction techniques. By mandating that these requirements, the city as a whole is greatly improved.

# Recommendations

## 1. **Public Work Projects**

Public works projects provide invaluable opportunities for green expansion. Public works usually serve both the private and public. They provide immediate jobs for businesses and displaced workers, especially in challenging economic times. The diversification of jobs provides economic relief to businesses and individuals of a variety of different talents. Public work projects include new parks, construction jobs, and city maintenance work. Cities across the country have attempted these projects both as a way to perform needed work in cities and as a way to stimulate business and economic growth in their areas. This marks a unique opportunity to integrate green technology into the city.

Rather than simply hiring businesses to perform public work projects, focus the work on businesses and organizations that provide cost savings through green technological progress. There are a number of ways to accomplish this task. First, provide a competition for individuals and groups to propose a number of public projects that will 1) improve the welfare of the citizens in Boston, 2) provide economic savings to the city and 3) will provide substantial energy benefits. Competition will spur innovation and creation with the promise that projects chosen can be implemented by the winner in the city. Not only does the city allow for the private sector and non-governmental organizations to innovate, but it does so in a way that is guaranteed to provide the city both with economic incentives and energy savings. This plan is not without precedent. New York City created a specific initiative to create public works projects that are specifically designed to combat congestion in the city. In doing so, it will lower transit times and realize economic gains along with sustainability pledges.

There are other added benefits to competition. Innovation that comes from outside of the government has potential for greater investment and diversion of resources that would otherwise be needed from the city. Success by a particular firm in producing a plan for the city in the form of a public works project also gives an institution the ability to market itself to other areas for its work.

Public work projects, as previously stated, provide valuable opportunities to stimulate the local economy with specific jobs. For this reason a diverse series of public work projects needs

to instituted. Limited projects will have only limited impact on the economy. As such, the following kinds of public work projects should be sought:

### ***Parks***

Parks provide free common space to all citizens. They also provide positive environmental impacts by promoting cleaner air and reducing dead space. New York currently has slated that every New Yorker will live within 10 minutes of a park as an aggressive goal toward its sustainability plans. Parks in Boston being within 10 minutes of every citizen is not that unrealistic due to the incredible public transportation system. Turning dead space in Boston into parks has obvious costs to it, but it has unbelievable benefits of providing jobs to landscapers and contractors with innovation being key. Elaborate designs can be designed and submitted from private firms, landscaping programs from universities and private citizens to actively encourage sustainability among the citizenry.

Parks also contribute to a reduction of CO<sub>2</sub> emissions by adding more trees and plants to remove it from the atmosphere. Providing cleaner air adds to the growth of a green city and helps to market the city as an attractive location for green businesses. All efforts to show the work being done to go green will encourage businesses to come to Boston and stay here.

### ***Infrastructure***

The city of Boston has lots of opportunities to provide upgrades to the infrastructure to employ citizens, improve the physical look of the city, and integrate green technology into the city. One way that this can be improved is the implementation of a smart grid system within the city and metropolitan area. Although the city does not own its energy utility, there are still opportunities to be involved in the creation of a smart grid.

The city of Boston, while not directly able to implement a smart grid without control of the energy utility, would be well-served to lobby for the establishment of a smart grid. The 'smart grid' entails bringing energy/electric delivery into the digital age. By establishing these up-to-date energy connections energy use is more easily tracked, power disturbances can be more easily managed, and communication about strategies can be improved. These benefits are clearly gained by the city to improve infrastructure and sustainability, but energy utilities also gain in efficiency. The city and utility will both benefit in the job creation that is available. The smart grid provides job opportunities in the short-run: engineers to design the grid, grid installation, communications and support. While some of these jobs require specific experience,

others long-term jobs involving communications do not. Given that it takes several years to establish smart grids, these short and long term jobs will be beneficial. In a KEMA study that analyzed the benefits of a nation-wide implementation of the smart grid it was noted that funding in the smart grid industry is “hot and heavy”, with many opportunities for outside funding for these projects. Jobs created during the implementation of the smart grid (first three years) would number 278,600 and in the following five years 139,700 would be created for the continued maintenance of the grid. The direct benefits of implementing a smart grid can be seen on the national level, and Boston can be an early city to lobby for the creation of a smart grid by their energy provider.

In addition, there is one project that the city is engaged in that will be complimentary to these efforts. The city works to ensure the upkeep of roads, fixing potholes, etc on a yearly basis. In addition, Massachusetts Bay Transportation Association (MBTA) currently has a project to provide adequate storage areas for bikes at T-stations. This in turn encourages the use of public transportation, and green methods of getting to sustainable public transportation. By encouraging the use of bike and bike lanes, the city makes it easier for individuals to ride bikes from location to location to lower congestion, decrease CO2 output and help increase healthy living. This focus on infrastructure is in the right direction, but would be incredibly strengthened by focusing on lobbying for a smart grid.

Unlike other cities such as Los Angeles, who is the home to the Department of Water and Power, the nation’s largest municipal run utility, the City of Boston, as mentioned earlier, currently does not own or control its utility provider. As a result, the government will have much less leverage over the renewable portfolio requirement. However, one potential way for the City to increase its renewable portfolio is to lobby state legislation to favor the transition towards renewable energy. In 2008, Massachusetts Governor Deval Patrick signed the Green Communities Act, which mandates a requirement for energy providers to invest in energy efficiency when their power pricing is less expensive. This, paired with the Commonwealth’s Renewable Portfolio Standard, are both of the state’s tools to encourage the growth of renewable energy use in the area. Given the City’s large scale of economic influence in the region, by conducting lobbying efforts with state energy requirements, the State would be able to set the mandates for more clean energy development for utility firms while the City could work on establishing the partnership and advertising necessary to achieve a higher renewable energy rate.



### ***Public Transportation Improvements***

The Massachusetts Bay Transportation Association (MBTA) provides one of the best public transportation systems in the country. Even it, however, can be improved. In several cities across America, technology incubators have provided reliable ways to improve the city's utilities and services. For example, the University of Texas-Austin partnered with utilities to form online ways to electronically manage the city irrigation systems. In a similar vein, there are a number of ways to improve the Public Transportation systems that foster innovation from researchers and innovators. One particular way is to provide an electronic T tracker in the subway stations. This tracker can keep accurate times of the next train to arrive in that area along with estimated arrival times. Another possible opportunity to improve would be a trip planner station at stops where individuals are able to plan their trip from that location with a detailed stop list. Finally, introducing mobile applications for phones presents the ability for individuals to know how to get anywhere in the city. All of these applications provide increased opportunities for innovation with particularly low costs to the city with high benefits.

Public transportation also serves a viable opportunity to install clean technology. In order for the city to attract and sustain green business, it must have multiple opportunities to implement its clean technology in the local area. And with Boston currently working on a couple dozen MBTA improvement projects, the city has this opportunity right now. Stimulating the economy through more innovation is a reliable way to be able to retain businesses and bring jobs. Alternative fuel systems for public transportation also makes for cleaner air and makes for a more environmentally friendly system. These systems can be developed with incentive in the Boston area. Alternative fuel systems, while having a high initial cost, can also defray costs for the city in the long term by being less reliant on gasoline. Incorporating these and other ideas into the current and future MBTA projects will create a better environment to entice green tech businesses. Once specific idea is requiring all public fleets (ships, buses, trains, etc.) to use alternative fuels, the city opens up an avenue for firms to create and provide technology. The city of San Jose launched a similar initiative to make all public fleets 100% reliant on alternative energies as a way to foster long term economic growth. As a result of such efforts, the city of San Jose has seen 74 Clean Tech companies relocate or expand, create 4,350 clean tech jobs, and

receive \$5.3 billion in investment funding in 2010. All of this was accomplished in about a 3 year period.

A further incentive for more public transportation improvements and projects is the impact on local jobs. According to a recent study by Cambridge Systematics there are 314 jobs created and \$30 million increases in sales created for businesses for each \$10 million invested in transit capital funding, and over 570 jobs are created for each \$10 million in the short run. These jobs almost all and always benefit local workers. Community members are given jobs associated with the projects such as construction and engineering, and they are given jobs by organizations that support transit such the government. Additionally, in a U.S. World and News Report article, they discuss how with more ease to transport people to work, school, local attractions, and healthcare facilities, nearly every area of city life can be improved. Statistics show that public transit has experienced rapid growth, providing economic benefits to individuals and municipalities alike.

### ***Housing Development***

In the SustainLane 2008 city rankings, Boston is ranked as the 6th most sustainable city in the country. While that ranking is impressive, it actually sagged due to actual problems with affordable housing. The call for affordable housing towards sustainability is required if the city of Boston is to continue to grow. Boston's Redevelopment Authority is currently working on about 120 Housing Developments and will, hopefully, be continuing this progress. This is the perfect opportunity for Boston to begin attracting new businesses because there will be places for workers to live based on fair wages. These projects also present a unique opportunity to inject green technologies into homes.

Instead of simply providing cheap, subsidized housing, the city should make these new housing projects innovative with green technology to reduce the amount of harmful byproducts and make homes more energy efficient. Not only do green technologies reduce energy costs in homes but they provide an opportunity for business growth. New prototypical green homes on the mass scale have not been attempted in the US yet, leading to a unique opportunity for the city of Boston. Providing affordable housing in mass will increase the standard of living, allow for businesses to instantly provide housing to workers and help to curtail urban sprawl.

Green homes require several different steps to implement. First, the city needs to provide specific training opportunities for workers on how to implement and install new technologies.

These trainings have been performed in cities like Chicago, where the city instituted classes through Green Tech University#. The classes were specifically for workers to learn how to implement green technologies, learn the necessary science that is useful for installation, and other necessary knowledge to train individuals in green technology. Completing the training results in certification of workers as marketable skills. This re-education of the workforce is critical in giving workers an edge over other workers in other cities. Boston currently has a program called Renew Boston that provides similar learning to Chicago's Green Tech University. Expanding the program allows for more individuals to get educated will only lead to a stronger work force.

Once workers have been sufficiently educated, private contractors, builders and the city need to get together to plan for new housing. This requires sufficient zoning laws to be passed as well as proposed cost efficient housing located near the subway system. The construction of green homes provides unique benefits. First, it gives immediate jobs and opportunities to firms to build the homes. Plumbers, construction workers, painters and others all work together to build these homes. But the economic benefits do not stop there. These homes also require technology firms to innovate, create, and produce new technologies to be implemented into the homes. This multiple stimulation of the economy provides opportunities to businesses to actively engage green construction.

Depending upon the implementation, there will be costs associated with it. If the city decides to implement this as public housing to insure its affordability, the city then has to pay for and own the housing, incurring debt in a bad economic time. If the private sector is the driving force, there is no guarantee that the housing will be affordable. One possible way to remedy this situation is to allow the private sector to run with it, but to allow for competitions between firms as to who can will get exclusive rights to be able to build the homes in the area. By having multiple plans submitted, the city can be sure that the homes will meet some standard of energy efficiency while also being affordable. The city also avoids having to pay for the venture itself and can allow private investment to drive it while only providing a comprehensive policy that guides construction in a specific area.

## **2. Diversifying Business Plans and Introducing Workforce Training**

Sustainable business practices require both a vision and a diversity of businesses to grow the green economy. By engaging multiple kinds of products, the city of Boston can reach out to different kinds of workers. Diversifying business plans means that it will be easier to find workers by not over-saturating the market in a particular product that breeds over-competition for a specific product.

Diverse firms require trained workers, however. Economic development will need workers from all skill sets to ensure maximum growth. Worker development is a catalyst for economic growth because it is a critical step to bring skilled jobs to the area. Worker training must come in the form of worker training as well as in formal university and college settings. City support for these training options will provide a steady flow of bred workers without need for companies to hire employees from out of state.

Training the workforce is one of the most intensive projects the city can undertake. It requires unique training for each worker. The most important training opportunities will be in construction, plumbing and electrician work. Construction workers need to get the brunt of the focus of clean technology. LEED standards in buildings means that construction workers have to be trained to those standards. The importance is for the city to provide the opportunity so that workers, whether by employer mandate or choice, can pursue the training. Many clean technology firms will require special training for the installation of their technologies. Since there is already a culture of constant education among construction workers, they will have no problem with learning how to install specific technologies in homes, buildings, in the community.

Plumbers also provide a unique work force that can receive new green training. The development of new efficient plumbing pipes mean smarter water usage, a reduction in individual water bills and saving of precious water resources. As newer technology (developed in Boston, no doubt) is developed, plumbers must learn about how to install it correctly to ensure that savings, both environmental and fiscal, are actually realized. In Massachusetts, plumbers are not required to actually be registered to the Board of Building Regulations and Standards as long as they perform work in their own area, making it harder for the state to force plumbers into training. Instead, incentivize clean technology and greening for businesses and home owners only makes plumbers who are state certified with working in green tech that much more valuable.

Another important method of training is to form a panel to ensure that gets the work force for specific kinds of businesses to come. Several states and cities have commissions and groups devoted explicitly to educating the workforce and planning for a specific business to ensure that they will have all of the workers they will need. The state of Washington, modeled below, has a specific process for ensuring that it is able to attract businesses with the proper labor force.



By using a similar method, existing industry partners with workforce development to provide new workers with skills and helps to upgrade skills of current workers to make new forms of production possible. Partnering with the private sector allows for companies to form internship and shadow programs to allow workers to work in jobs that can one day become theirs.

With a strong workforce, Boston must then begin to diversify business and bring companies where these workers can find employment. The first kind of business the city should attempt to bring is focused on the production of technology that greens. Boston already has great building codes that require buildings to be as energy efficient as possible. As such, the city is a prime target for new greening technologies that will make buildings more energy efficient. These include energy efficient panels, revolving doors that trap air from escaping to the outside, wiring that is more environmentally friendly, and others. These technologies instantly have a place that they can be sold and current city policy is conducive to them.

The second kind of business to attract are alternative energy sources, particularly those that will deal with heating problems. Massachusetts has huge heating costs during the winter time and any opportunity to cut them will be welcomed by all members in the area. If firms are attracted to the opportunity to provide alternative energy to help reduce the cost of heating in the

winter, then there is direct incentive for businesses to get involved. The city can get involved in costless ways to generate businesses. The state of Nevada called for 10% of all electricity that is produced to come from alternative energies. The initiative saved millions of dollars for consumers and moved the area toward alternative energies. By calling for a complete energy policy, the city will incentive businesses and researchers to develop alternative energy plans for meet the goals.

Businesses that focus on providing public works would also be effective. If Boston is to grow as a clean tech and alternative energy hub, it will need to revisit its infrastructure and support system. One such system is the development of a smart grid. While the smart grid itself is a project conducted by the city, the actual development will be done through private firms. The most effective thing to do is to have the work done by individuals in the Boston area. By encouraging the development and growth of a smart grid, we not only allow for increased use of alternative energy sources, but we allow for easier control of resources. The nuclear meltdowns in Japan are highlighted because their generators were in basements, which allowed for floods to easily take them out. While Boston is not under as much of a threat from tsunamis and earthquakes as Japan is, the threat of energy disaster does exist. Smart grids allow for better control of resources in the event of disaster and in day to day living. By pushing for these grids, the government will have numerous businesses looking to win contracts. Development by local businesses foster the growth of a company that eventually does such public works projects while also employing people in Boston.

Businesses need to be diversified not only for economic portfolio reasons, but also because of the various forms of workers you have. By becoming a clean tech hub, Boston will be able to attract and retain not only businesses but also labor. The important issue that Boston must tackle is the key issue of creating a desired portfolio of businesses that it wants to see in the city.

### **3. Partnering with Universities and Investing in Green Technology**

Attracting green tech businesses to Boston requires both research and action. With so many colleges and universities in the greater Boston area, there is a built-in labor and think-force that can be utilized. Universities can be used to do research, to brainstorm and create new green technology, and as a marketing tool to attract green tech businesses.

In Los Angeles, California where the city and a group called CleanTech LA are working to drive green tech, partnering with universities has acted as a great advertisement move that has been crucial in getting businesses to come to LA. In Austin, Texas, the city has utilized the University of Texas at Austin by having it partner with the Clean Energy Incubator, a group dedicated to providing businesses with the tools they need to be green. Together, they help grow green tech businesses and promote better energy choices. The University of Texas has the research capabilities to provide the engineering and science necessary for already green firms and for companies that wish to go green. In addition to its work with the Clean Energy Incubator, the University has also partnered with the city's utility companies to be able to do projects specifically for the city. Finally, the University has joined with other companies in the area to provide hard space and research for them.

Like LA and Austin, Boston should partner with its local colleges such as Harvard, MIT, Northeastern, and Boston University to advance its green initiatives. Universities with a strong science basis will be especially vital to Boston's green advancements. Two such programs that are ideal targets for collaboration are the Sustainable Neighborhood Lab (SNL) at Boston University. The SNL is a prime location for the implementation of unique ideas for urban sustainability projects; it seeks collaboration from community stake-holders. The overlap between researching, education, and testing from various actors--researchers and community members--ideas can be implemented on a smaller scale for test-runs and fine-tuning. This allows for the quick commercialization of various research ideas while at the same time considering potential obstacles. Working within the urban neighborhood level affords a grounding in real world problem solving. Expanding and enhancing the SNL to include more universities would allow for greater access to research and opportunities for participation. Through collaboration, many more potential actors can become involved.

Individually, in order to be of effective use to the city, universities need to develop a culture of innovation. One way to do this is by promoting innovative challenges with tangible rewards. Universities could create competitions for students working on developing new green technology with prizes such as grant money to give students extra incentive. Schools could also organizing job and job shadowing opportunities for students to help get them interested in green initiatives.

At the same time as universities are advocating green innovation, Boston needs to create an atmosphere of collaboration among schools. Creating think spaces for university research groups to meet, plan, and design new technologies can start to develop this atmosphere. In addition, Boston should create a database where the City, university researchers, labs, and green businesses currently in Boston can all connect to expand research capabilities. With all of this in place, the city can then dole out citywide tasks to universities to complete using this expansive network, saving itself work, time, and money.

To make the most of Boston's university resources, it is important that the city engages in private investment for research and develops think tanks. With the help of the city, universities should partner with businesses to provide the research aspects that businesses need at no cost to the university. In addition, funding and loans should be provided to firms, researchers, and universities for specific energy projects and green technology with the stipulation that the projects and technology be implemented in the city. This can be integrated into the greening of businesses that is already happening in Boston with groups like GreenTech and RenewBoston. To do so, offering grants to institutions that can provide plans that will make the businesses in Boston more energy efficient will also be helpful. In doing this, buildings will become greener and innovation will be fostered.

There are several financial costs associated with partnering with local colleges and universities. The first is that city funds in the form of prize money, grants, loans and other shapes will need to be provided to schools with the chance that they may not actually produce anything. There will also be a need to create public projects, which will require funding. However, providing grants to research and produce the technology for the city for free while the school or lab patents the product can circumvent this cost. In addition, there may be a need for further administrative work to be done by the city in organizing all of these groups, projects, and in looking for available funding. There will also be a need for bureaucratic engagement and further work to act as a liaison between the private sector, universities, and the city.

By working with universities, Boston will foster networks that recent college graduates can tap into and will help keep graduates in the state. This will allow further innovation and economic growth in the City. The research occurring in the area due to the universities will also provide incentives for businesses, especially green tech businesses, to come to Boston and benefit from the research. Adding in business partnership along with the universities will allow

immediate public services to be implemented by businesses as well as services for the city and for other private entities. With all of this in place, research will not only be cultivated, but green technology will be implemented in Boston, attracting more green tech businesses to the thriving green location.

#### **4. Implementing Green-Friendly Zoning Laws and Cross-Agency Collaboration**

An essential part of ensuring that green tech businesses will be attracted to Boston and that green guidelines will be followed in the City is by instituting laws that promote and protect green standards. This can be done by designating a “Green Space” in Boston and putting specific zoning laws in place in that area to make a green-friendly environment. This should be an exclusive area where green technology innovation, business, and research can thrive in one, centralized location. Having a centralized green location will be a great marketing tool for attracting green tech businesses by allowing them to develop, test, and even implement their technologies in one place.

Redevelopment districts for green purposes has been successfully undertaken in cities such as Chicago, Illinois, Berkeley, California, and Los Angeles, California. Chicago’s main strategy in rezoning was procuring a grant from the state of Illinois and creating a consulting team. This team met with surrounding businesses and residential communities to discuss the area being rezoned and different redevelopment possibilities. This allowed the team to get a good understanding of what laws would work best in the specified area. Similarly, Berkeley set up a Business Improvement District and a Downtown Improvement Program to give businesses incentives to come to Berkeley. In 2008, Los Angeles went even a step further and created a “CleanTech Corridor” where there is space for both manufacturing and a “clean tech incubator” to improve green standards. The City plans on investing over ten billion dollars on clean tech within the next ten years.

By mirroring some of the efforts made by these successful cities, Boston can create its own “Green Space” to attract green tech businesses. The first step in creating a “Green Space” is choosing the area that will undergo redevelopment. With new zoning already being implemented around Boston’s South Station, this would be a prime time and location to add green zoning laws to that region. South Station is attempting to promote economic growth by

attracting biomedical companies to the area. To do so, Boston has made South Station a Planned Development Area (PDA), adding zoning laws about things such as building restrictions, noise limits, and community areas that will accommodate biomedical companies. These zoning laws could be adjusted and more laws could be added at South Station in order to attract and benefit green tech businesses in addition to biomedical companies. Another aspect of South Station that makes it a good choice for green zoning is that it is already Boston's hub for public transportation. With an environmental friendly, energy efficient commuting system already in place, South Station has a strong, green foundation to build on.

In order to solidly implement green zoning laws around South Station or another Boston location, there will need to be cross-agency collaboration. A green business team, like the consulting team formed in Chicago, will need to be created to specifically meet with businesses and community members to work together on initiatives that will bring green tech business to the area. This team can also investigate creating a streamlined system that sends paperwork and information down the pipeline in a clear way where each agency that is relevant to green business actually gets and can utilize the information. Outside consulting will also need to be hired to provide information about development and compatible zoning laws. Finally, if the new zoning is implemented in a newly developing area, there will need to be designated housing zones. This will allow for less urban sprawl and more concentrated areas of populations that can be easily served with public transportation and other services.

The financial aspects of this undertaking would include hiring outside consulting and advising groups and creating a new green business team. There may also be a need for more administrative work to be done by the City to oversee all of the groups, workers, and to make sure that agencies are doing their jobs. To handle these costs, liaisons should be appointed between the Mayor's economic council and specific agencies and business communities.

Together, they can find outside funding or other ways to ensure that all aspects of green projects are covered. Additionally, if the zoning is impacting a newer development area, there will be more costs for upgrading the area and creating new housing projects. However, both of these will eventually be profitable and will lead to economic growth.

The result of creating a "Green Space" in Boston will not only be that more green tech businesses will come to Boston, but also that there will be a collaboration among agencies. This will foster a positive business community that will improve the image of Boston's business

sector. It will also benefit the mayor's office by creating a united team of green businesses that it can utilize in future green projects. This "Green Space" will also contribute to the idea of a "20-minute city" where individuals can live, work, and play all within 20 minutes of each other. Finally, this space will be a clean, green location that will hugely benefit Boston's air and environment.

## **5. Loans to stimulate green business**

The city of Boston is currently running a deficit in its budget. In spite of this, the city is actually outperforming the nation as a whole in the critical areas of unemployment rates, job loss and real estate vacancies. The current downturn in revenue occurred after 13 years of continuous growth beginning in 1996. The city is required to have a balanced budget, which means that any loans or expenditures must be met with equal sources of income.

If there are specific loan programs, these loans must be paid back with interest. Any tax breaks and other city expenditures must be met with equal revenue. The obvious solution is to use the tax revenue generated by potential businesses to actually generate a fund specifically for the public works projects that would bring other jobs into the Boston Market. Boston accounts for more jobs than the population of Boston, meaning that the area is attractive to members outside the Boston area. In addition, Boston accounts for 7% of the economic output in New England and 16% of Massachusetts economic activity. Competitively, it puts Boston in a position that no other location in New England can actually match from sheer economic opportunity.

Why did Boston's income decrease?

Boston has experienced decreases because 1)property tax is down due to vacancies in real estate and 2)because the federal aid to the city was cut. These are the two largest sources of income for the city. Property tax and other tax revenue is a direct result of the worsened economic times. Despite this, the numbers show actual improvement in tax revenue based upon Boston's increase in tax based revenues from 2009 to 2010. Federal aid has also decreased due to

economic downswings. Due to Boston's ability to beat the national statistics economically and its consistent growth from 1996 to 2009, there is no reason to believe that Boston will not be one of the first cities to recognize growth in its budget when an economic upswing begins.

Based on this concept, the city needs to ensure that any expenditures are deficit neutral. In order to effectively do this, all tax revenue from new start ups should be used exclusively to fund new projects while interest on loans can be used to further enhance this fund so that no new expenditures are attached to existing money.

Venture capitalists are very prevalent in Boston. They are without a doubt responsible for the large medical industry boom that has occurred in Boston. There are a large amount of venture capital firms in the area, but the problem is that they are traditionally invested in only the medical industry. The firms have not gotten to diversify themselves in different industries. The Venture capital firms are clearly looking for policies that are in favor of start ups to begin investing in them. In order to do so, the venture capital firms are looking for policies that will actually encourage small business growth.

Most of these policies are national in scope, but some local policies can be put into place to accelerate growth of start ups and ensure that the city is devoted to ensuring the success of a vibrant start up community. The city needs to incentivize individuals to make start ups a priority through smart investment. That means loans at low interest rates and public transportation as a high priority for start ups to be able to build at the community level and expand. The good news for Boston is that as the center of economic activity in New England, nearly all capital is at its disposal if it takes policies seriously that will lead to a start up boom.

For those of you who are skeptical, note that the 1995 to 2005 economic boom was driven almost entirely by start ups. The funding for this can come from a variety of sources, but subsidies and tax breaks to huge companies are key sources of possible income increases.

Loans that come with specific conditions could be effective in both supporting green industry businesses and job creation. City-backed loans that are specifically targeted towards industries such as alternative energy, hybrid technology, and other fields will be an advantage that would drive many startups and established businesses alike into the region. This recommendation will serve in dual purposes, as it will provide funding for the businesses within the city while the business itself will reach the city's loan guideline in job creation, public implementation, or other initiative.

For the city to develop a loan program, the government will need to partner with banks to secure the funding necessary. The loans will need to be easily accessible and needs to have greater advantage than the traditional loans offered by traditional banks- it should have lower interest rates and the conditions should be more flexible. Lower interest rates may convince businesses to loan with the city or the partnered bank in return for fulfilling the pre-set requirements, such as increased job creation, etc. Flexible conditions would allow for businesses to secure loans much easier than through traditional avenues. This may involve less paperwork or a quicker approval process.

If loans are funded by the city, Boston will need to have the money available to loan such funds to businesses. Such cost will be high, but the rewards for such program is high, as demonstrated by city loans in the Bay Area and the fact that other cities within the region do not offer this.

Publicity efforts to advertise this program will also incur costs. Since businesses usually do not think of city government as the go-to source for loans, the city government's economic business team will need to effectively market this to not only local businesses, but to national and international businesses that may potentially relocate to the city. However, with the development of online media, publicity through Twitter, Facebook, and other online sites make the whole project much more financially sustainable.

Providing loans to businesses will bring in many benefits. Providing easily obtainable capital is hard in most major cities, so this would be a unique benefit that is not found in the region. Furthermore, if Boston attaches specific conditions to the loan, such as creating 20 jobs or providing services to the city government, this would help city achieve their own objectives while also improving governmental relationship with local businesses.

## **6. Partnering between the private sector and universities for specific research project**

When the city government creates partnerships between the private sector and universities, this increases the city's business friendliness and ability for cross-collaboration among different organizations. The private sector, especially smaller businesses, may struggle to conduct large scale research or have the knowledge and physical space necessary to construct and test innovation. By creating this partnership, small businesses, startups, and large companies

alike may be interested in locating within the city to gain access to such unique resources. With institutions such as Boston University, Boston College, Northeastern, and a wide variety of institutions such as Harvard, MIT, and the Broad Institute nearby, Boston would be the leading city in the region for such partnership to occur.

For this program to be implemented, the city government will need to initiate contact with local universities and research institutions to build a consortium of research partnership. If necessary, the city could present this as an opportunity for the university to gain experience in research, and also be more involved in businesses. With engineering institutions such as MIT, Harvard, Boston University School of Engineering, Olin College of Engineering, and a variety of other universities nearby, this could become a powerhouse consortium that can technical expertise to businesses. In return for the consortium, the city could actively integrate civic activities with the university. For example, if the city would like to host an economic panel to attract green businesses overseas, they could both invite and involve MIT in the panel. This would be beneficial for the universities, as this would present the opportunity for the university to increase their visibility outside of the academic realm.

Once the consortium is created, the city would then need to advertise search for businesses that could utilize this program. The partnership will begin from there, where cities could provide research referrals for businesses and universities, allowing for the maximization of resources within the area.

By targeting a specific green topic for the consortium, there may be a better chance for the city to become a specialized, successful green consortium. For example, if the City of Boston decides to focus solely on hybrid technology, the universities and businesses could be paired together to conduct research on this specific field. In the long run, this would allow for Boston to have an edge on this specific field over other cities that merely encourage green technology at large, but not a specific sub-sector.

The cost for this program is very low for the city. The only financial burden would involve staff needed to contact the different organizations and the marketing needed for this to happen. The city will need to advertise the partnerships, so that existing and potential businesses will be attracted to the area. Furthermore, this may be costly for the universities, as they will need to re-divert staff to this level of research. However, the benefits for each one of the institutions will ultimately outweigh the staffing costs.

This type of partnership will result in greater research and knowledge produced in the city. In addition, businesses may be more likely to stay within the city limits as this provides an advantage that other locations do not have. Furthermore, universities will be pleased at this offering as they will now be able to conduct practical work with local businesses and network with both local and large businesses. The project is also of low cost to the government, as they will only have to build the partnership, and not need to manage the day-to-day operation of the program.

Universities can also serve as a powerful marketing tool for the city. With many top institutions with world-wide name recognition located within the Greater Boston Area, incorporating them into the partnership will attract many businesses that can easily understand the power of the universities. Many foreign firms may not have the best understanding of how each city is open to green businesses, but the name recognition of universities can easily change the perception of potential businesses towards the city.

## **7. Retrofitting and Weatherizing**

Retrofitting and weatherizing are some of the most effective measures that cities can take in raising their green profile. Building retrofits and weatherizing refer to measures such as: installing more efficient heating and cooling systems, insulation and lighting, weather sealing, replacing insulation in old buildings, and replacing windows and doors. Retrofitting and weatherizing benefit the city by lowering energy usage, and therefore costs, and also by raising awareness about energy efficiency measures that city residents can adopt into their daily lifestyles.

The federal government has already recognized the importance of retrofitting buildings as evidenced by their “Retrofit Ramp-Up” initiative. This initiative is administered under the Department of Energy; it brings together local governments with private sector businesses and non-profit groups to develop new programs for retrofitting neighborhoods and communities. Funds were provided for 25 different communities to fund various initiatives to improve the energy efficiency of commercial and residential buildings. These funds are awarded based on the cities track record with such projects. To benefit from such initiatives it is in the best interest of Boston to intensively focus on retrofitting and weatherizing buildings. At the most basic level an

investment into retrofitting and weatherizing creates energy efficient buildings. Yet, these initiatives are much more than simply upgrading buildings—they impact the entire visibility of green living in the entire city with both businesses and residents.

In order to launch a comprehensive retrofitting program, the city needs to conduct a review of existing city buildings that would benefit most from retrofitting and weatherizing. Many buildings in Boston were constructed prior to any efficiency standards.. This means that there are a large number of buildings that would greatly benefit from retrofits. In order to target buildings that should be focused on in the first wave of retrofits the city must conduct an analysis to find the most frequently used, largest, and most out-of-date buildings. By first focusing on these large energy inefficient buildings the city can then develop parameters to further retrofit and weatherize other buildings. Partnerships with utility companies and consulting firms will be a key way that the city measures the effectiveness of their retrofits.

One of the main concerns with updating buildings in Boston is grounded in the fact that many of Boston's energy inefficient buildings are historical landmarks. Many of these buildings are difficult to retrofit to begin with, and historical societies would likely have concerns over the damage that could be done with improper care of historical architecture. However, institutions and organizations have had to modernize buildings over the years with internal modifications. The Department of Energy awarded Lowell, Massachusetts \$5 million to provide energy efficient upgrades while at the same time preserving the historical integrity of important local landmarks. This work is important as it lends itself to be transferred to buildings of historical significance in Boston.

Both commercial and residential buildings should be targeted for retrofits. The Chicago Region Retrofit Ramp-Up (CR3) is a program that pairs federal funding with local investments to retrofit businesses and homes. The work that is done through this program will retrofit more than 8,000 units throughout the Chicago region and will create a savings of 30% per retrofit building. Boston can provide incentives to tenants of old buildings by incentivizing retrofits and attract new businesses by promising to update outdated buildings that they are moving in to. This benefits the city by attracting new business to the area but also benefits the tenants by lowering their electricity bills. Cities such as Chicago and Berkeley, CA have had success targeting homeowners for retrofitting; however, this programming should be developed after pilot programs are effectively developed in the Boston area.

Besides the energy benefits that come from retrofitting and weatherizing, there are compelling employment incentives to starting these programs in Boston. In Chicago retrofits will create more than 2,000 jobs in various industries such as construction contractors, installers, energy auditors, etc. These jobs will employ individuals in all different fields who can bring their expertise to the energy industry. Beyond simply creating jobs retrofitting can further help stimulate the Boston economy if the materials used in retrofits and weatherizing are produced locally.

One of the first things that must be done to implement an effective retrofitting campaign is to establish a system for rating which buildings are slated for funding. There are existing LEED standards for new buildings established by the . The LEED for Homes Scoring Tool allows buildings that are undergoing renovation to be scored on their current LEED classification and provides helpful information on what types of upgrades would provide the most energy efficiency for new buildings.

The next critical step in determining what retrofitting and weatherizing is possible is the creation of funding opportunities for these initiatives. Residents would benefit most from direct funding for upgrades. Cities such as Berkeley, CA have an application process that provides funds to residents to weatherize their homes. These funds are most accessible to residents in the form of direct grants to provide the upfront monetary funds that are necessary for housing upgrades. While some residents will have large scale upgrades of their residences, in most cases these funds should go to homes that are weatherizing their houses through paneling and installation of insulation. Initially the funding for this project will come from the city itself with funding opportunities later coming from federal sources. Cities like Chicago have put forth the funds for such projects and allowed them to grow. When implementation and success is provable these projects are often funding more handsomely. For businesses, the most effective models are those that loan businesses money to upgrade their buildings. Because businesses will reap more rewards than individual residents, a comprehensive loan program is an effective way to encourage building owners to retrofit their buildings.

Looking forward to the future, Chicago, Illinois provides an inspiring model for retrofitting and weatherization; the Public Building Commission of Chicago has focused on making improvements to existing buildings. Chicago has created a potent combination for energy efficiency by implementing green standards for new buildings and at the same time

focusing on updating efficiency standards in facilities that are due for renovation. As one of the most green conscious and successful cities in the nation it is in Boston's best interest to follow Chicago's lead on updating energy efficient buildings. It may seem as though the "ideal" retrofit for businesses and residents involves the complete replacement of all out-dated structures within buildings. However, what is most feasible economically are upgrades, subsidized by the local government, that provide energy savings to the buildings tenants in the short run.

#### **8. Partnerships between businesses, public organizations, grassroots organizations, and researchers.**

Many of the most successful initiatives in green cities around the country are collaborative projects between the government, private businesses, grassroots organizations, and researchers. However, potential key-collaborators do not have avenues to reach one another within the Boston area. The city government can provide an important role in the green industry by providing space and infrastructure for green minded businesses and individuals. The presence of many large research universities in the Boston area, such as Harvard, Massachusetts Institute of Technology, Boston University, and countless other institutions of higher learning, makes the area particularly fertile for the development of open think-spaces throughout the Boston area.

These areas are as simple as providing a space for individuals to meet and discuss ideas or could be as complex as creating specific areas for technology development and manufacturing. The City of Austin has had success with the Clean Energy Incubator, which was created to grow green technology business and inspire better energy choices. Eventually, the Clean Energy Incubator was taken over by University of Texas at Austin because of their research capabilities. This partnership benefits the businesses, who can utilize the research capacity of UT Austin, and the university, where numerous students are able to obtain hands on experience. Such incubators can also benefit the city when businesses develop programs that will directly benefit the city by partnering with utilities and other government agencies.

Boston currently has a Cleantech Cluster within the Innovation Area, however there are many improvements that can be made to ensure that this area is more than just an area to locate businesses. While the establishment of specific zones for businesses is a crucial component of greening industry in Boston, this is not enough. Currently the Cleantech Cluster is an

arrangement of green businesses in the Innovation Zone. This is missing a critical opportunity for collaboration between the vibrant research base and investors that are looking for green opportunities form partnerships.

A good model for Boston that has provided space for partnerships in the East Bay Green Corridor Partnership, which connects investors, researchers at local universities, and the potential workforce. The East Bay Green Corridor provides swing space for new innovative projects through the Cleantech Incubator and the Green Corridor Beta Test Program. By supporting and encouraging the growth of new projects the EBGC makes it more likely that green programs can be developed and envisioned by constituents. PlaNYC is a comprehensive view of programs within New York that are.

Green projects that are successful engage the community from multiple points of view. Programs cannot be successful without concrete research, comprehensive strategies for implementing the program, and funding. Innovators at multiple levels, no matter how close geographically, often will not come in contact with one another unless their meeting is facilitated.

## **9. Standards**

### ***Alternative Energy Standards***

The City of Boston is committed to moving toward alternative energy requirements. The city needs to progress in two ways. The first set of initiatives must deal with alternative energy creation. For the city of Boston to truly become an effective force in the green movement, it must diversify its energy portfolio. The city currently is the largest municipal purchaser of wind power in New England at 12%#. This is a terrific start, but the city has to grow beyond that. Purchasing alternative power is provides a diversity of energy without relying too much on any one source. While it is not possible for the city to mandate that the energy companies actually have percentage of alternative energy, the city does need to push for it. Other governments that have seen alternative energy requirements have seen huge savings. The state of Nevada recently mandated that 10% of energy produced in the state had to come from alternative sources of energy. While there were initial costs to adjustment, the savings have been immeasurable to consumers. The city of Boston must follow suit. Boston needs to push the state government to

actually support initiatives that would require certain percentages of energy to come from alternative sources. The diversifying of sources decreases dependence on any particular source of energy, leading to a more stable energy portfolio, greater resistance to power outages, and a surplus of energy with savings for consumers. The city should also move toward incentives for alternative energies. The city has already begun moving in this direction by cutting the cost of photovoltaic panels and other hardware from the calculation of project costs, cutting the permit fees for solar panels by 65%. Lowering the cost of entering the alternative energy race will make businesses and others far more likely to actually engage in alternative energies. In order to achieve that, permitting fees for alternative energy sources should be cut as low as possible.

The city cannot simply stop there however. The city must also push toward energy efficiency and conservations strategies. Boston can knock this out in a “one-two punch” strategy. Boston first must incentivize energy efficiency by providing low interest rate loans for businesses attempting to increase the energy efficiency of their buildings. Lowering the interest rate by the percentage of energy efficiency increases is a great way to get a return on the city’s investment. The other push is to propose that buildings have to be evaluated over a set interval to evaluate energy standards. Buildings that pass a certain energy standard will be allowed to continue until next inspection, while those who do not will be required to implement recommended strategies for increasing energy efficiency. Energy conservation is also a viable strategy for the city. The city can introduce new ways to get consumers to conserve energy. One particular way to do this is to offer incentives for individuals who are able to reduce their electric intake for a year by percentages. If a household can reduce its electric intake by 10%, then it can factor into a tax decrease.

### ***Emissions Standards***

Emissions is one of the areas that receives a lot of attention on the federal and state level. Emissions are usually thought of only on a large scale level; however, by considering the impacts that the city can have on emissions Boston can help alleviate some of the problems that accompany transportation and energy use.

Boston has an excellent public transportation system, which eases the burden on fuel efficiency requirements. By mandating that a certain percentage of city cars be high efficiency fuel vehicles or hybrids the city can considerably reduce the impact that the city has on greenhouse gas emissions. Reducing the dependency on vehicles that use large amounts of fuel,

will only help to reduce greenhouse gas emissions as much as possible. In 2009 new energy efficiency standards were enacted that required fuel economy standards to be raised to 35.5 mpg for cars in model years 2012-2016. This effort will save barrels of oil as well as millions of metric tons of greenhouse gases. A large number of people in Metropolitan Boston utilize public transportation to get to and from work. This is in part due to campaigns by institutions such as Harvard University and Boston College that greatly encourage individuals to walk, bike, or take public transportation to work.

Another approach to reducing emissions is mandating stricter energy requirements. The city of New York has expected to reduce energy-use related emissions by 7.5 percent of 2005 energy use levels by the year 2030. This has been accomplished by adopting the most stringent energy efficiency related laws in the country. These laws require greater energy efficiency standards and close loopholes that previously exempted certain construction projects from energy efficiency standards; They have been focusing on the cities largest buildings which constitute roughly half of the cities square footage and represent 45 percent of the greenhouse gas emissions by the city. Due to the focused efforts the city will reduce greenhouse gas emissions by nearly 5 percent.#

Both of these emissions standards work in tandem with previously identified recommendations for the city of Boston. This illustrates that there are a multitude of unintended benefits that can occur when implementing these standards. These recommendations will only work together to create a more green friendly city.

## **10. Green Infrastructure Standards**

In order to attract green tech business to Boston, it is vital to improve our green infrastructure in Boston, green infrastructure being buildings, streets, bridges, etc. that have environmentally-friendly aspects to them. An especially important part of green infrastructure is providing low impact development (LID). LIDs are ways to manage stormwater so that water can be captured, cleaned, reused, or infiltrated into the ground.

Green roofs are one piece of the green infrastructure puzzle. Green roofs are live plant-covered roofs that can capture and reduce runoff and save energy. Cisterns and rain barrels are great ways to capture rainwater and save it for later reuse. Cisterns are generally underground

and collect water that has been directed off the roof and filtered through a sand pit. These are mostly used in larger buildings. Rain barrels are usually used in more residential areas because they are smaller units that stay above ground and catch rainwater from gutters. Another building addition that greatly benefits water reuse is rain chains. Rain chains slow down and direct runoff to the desired location, whether that is rain barrels, cisterns, or something else.

There are also many ways to improve green infrastructure in relation to streets. One is creating porous sidewalks. These sidewalks allow for the absorption of water. As a result, more water infiltrates the soil, in large rain storms, flooding is better controlled, and heat can even be absorbed and reduced. Permeable pavers, an example being cobblestones, also allow water to drain into the ground and provide similar results as porous streets. Vegetated pavers can also help water infiltrate the soil by creating more grass space in paved areas. Vegetated pavers work best in less trafficked areas such as sidewalks and driveways. Spaces between curbs, known as curb cuts, can help direct runoff to more vegetated areas and then infiltrate the soil under the surrounding pavement. A final runoff maintenance tool is tree wells. These are especially useful in urban areas where water needs to be kept out of the streets and the soil under the pavement needs to be watered.

In the city of Chicago, Illinois where much green renovation is being done, they have instituted the use of things such as green roofs and permeable pavement and have been very successful in aiding stormwater management. In the county of Los Angeles, California, they have instituted a LID ordinance to promote LID practices. This ordinance is one of the reasons Los Angeles is becoming so well renowned for its green practices.

Making greener infrastructure requires initiating large and small infrastructure-related Best Management Practices (BMPs) in both business and residential areas in Boston. BMPs should include things such as green roofs, permeable pavements, cisterns, etc. to be used by both public and private entities.

To determine what BMPs will be best incorporated into Boston's current infrastructure, Boston's green-oriented groups such as RenewBoston and GreenTech should work alongside the City Council to develop an LID ordinance to apply to new development areas and green infrastructure laws that can be incorporated into the cities current infrastructure and zoning laws. In order to keep costs down, it will be best to start by applying these ordinances to areas

currently being developed or redeveloped as to avoid the additional cost of taking out infrastructure that is already in place.

### ***Transportation Standards***

By adopting a set of efficient transportation standards, the city would be laying the foundation for both a green economy and a cleaner city. The city could adopt a set of standards that will develop more bike paths and side walks to encourage more walking, improve the mass transit fleet to be more fuel efficient, , create car sharing programs within the city government, and phase out current city vehicles with hybrids and electric vehicles. By using to such standards, the city will demonstrate its commitment to becoming more environmentally friendly and encourage firms to relocate and stay in Boston.

Boston is a leading city in the field of bike-friendliness and sidewalk availability. The Boston Bikes initiative builds a unique opportunity for community to be built around biking. Adopting such a standard will bring benefits including greater living satisfaction and praise from members of the bike industry. Biking and walking initiatives also play a vital role in decreasing congestion, which has been a long standing problem for large cities such as Boston.

Similarly, the city could demonstrate its commitment by adopting a more uniform, green friendly mass transit system. Home to one of the best mass transportation systems in the nation, the Massachusetts Bay Transportation Authority (MBTA) is critical towards providing transportation to commuters and residents alike. Moving forward, the city could encourage the MBTA towards adopting an electric bus fleet, mimicking beta testing underway with the Foothill Transit fleet that services the greater Los Angeles area.

The City of Boston could also update and build the city's fleet with a combination of hybrid vehicles and electric vehicles. By adopting more hybrids, the city is directly supporting green initiatives and driving the green industry towards general acceptance. Such standard will also reduce long-term cost for the city, as hybrids tend to reduce costs for high-mileage vehicles.

To further reduce cost, the city government could also adopt a car-sharing system for internal use, reducing annual cost on vehicle purchases and maintenance. For example, Washington D.C. entered into a contract with ZipCar to provide car sharing services for non-emergence government services, saving the city millions. In addition, this would also help stimulate the car sharing activity in the city, which is a new, innovative way to go green.

By adopting a set of standards in the field of transportation, the City of Boston will

demonstrate its commitment towards building a green economy. The long-term impact of such standards will result in millions saved from vehicle cost for the city, decreased emissions and traffic congestion within the city, and a stimulus to the local economy, as such standards will require a temporary increase in government spending.

# Bibliography

- Centers of Excellence, (2009). Understanding the Green Economy in California.
- City of Boston (2011) A Climate of Progress: City of Boston Climate Action Plan Update.
- Development Projects Board Approved. Boston Redevelopment Authority. Web. <<http://www.bostonredevelopmentauthority.org/DevelopmentProjects/devprojects.asp?action=ViewStatus&StatusID=2>>.
- Energy Information Administration. (2008). Primary Energy Consumption by Source and Sector.
- Environmental Protection Agency, Office of Air and Radiation. (2008). National Energy Plan for Energy Efficiency. Washington, D.C.
- Gordon, K, & Hays, Jeremy. (2008). Green-collar jobs in america's cities.
- Green Communities Act. State Library of Massachusetts. State Library of Massachusetts, 23 June 2010. Web. 13 Dec. 2011. <<http://mastatelibrary.blogspot.com/2010/06/green-communities-act.html>>.
- Hanson, C. (2005, December). Corporate Guide to Green Power Markets.
- KEMA. KEMA. Rep. 13 Jan. 2009. Web. 13 Dec. 2011. <[http://www.mbta.com/about\\_the\\_mbta/t\\_projects/](http://www.mbta.com/about_the_mbta/t_projects/)>.
- Kurtzleben, Danielle. "10 Best Cities for Public Transportation - US News and World Report." US News & World Report. 8 Feb. 2011. Web. 13 Dec. 2011. <<http://www.usnews.com/news/articles/2011/02/08/10-best-cities-for-public-transportation>>
- Makower, J, Pernick, R, & Wilder, C. (2009, March). Clean Energy Trends.
- Navigant Consulting, Inc. (2008, September 15). Economic Impacts of Extending Federal Solar Tax Credits
- Next 10. (2008). California green innovation index.
- Pollin, R, Heintz, J, & Garrett-Peltier, H. (2009, June). The Economic Benefits of Investing in Clean Energy

- Smart Grid | Department of Energy. Energy.gov | Department of Energy. United States Department of Energy. Web. 13 Dec. 2011. <<http://energy.gov/oe/technology-development/smart-grid>>.
- Surface Transportation Policy Project. STPP Transportation Action Network. Transportation Action Network. Web. 13 Dec. 2011. <<http://www.transact.org/library/factsheets/jobs.asp>>.
- Transit Projects. Massachusetts Bay Transportation Authority. Web. <[http://www.mbta.com/about\\_the\\_mbta/t\\_projects/](http://www.mbta.com/about_the_mbta/t_projects/)>.
- White, S, & Walsh, J. (2008). Greener pathways: jobs and workforce development in the clean energy economy.