

Report by the Sustainability Task Force  
**Sustaining New Bedford**

John K. Bullard, Chair  
Edited by Emily Johns and Richard Walega



CITY OF NEW BEDFORD  
MAYOR SCOTT W. LANG

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## **Foreword**

By Mayor Scott W. Lang

Early in my administration, I endorsed the U. S. Mayor's Climate Protection Agreement, resolving to take a proactive approach to addressing the issue of global warming on a local level.

In May of 2007, I asked a group of committed individuals to convene and create a list of ideas and best practices for government around energy use and the environment. The Mayor's Sustainability Task Force, with the chairmanship of former New Bedford Mayor John Bullard, has generated goals and ideas that can bring the City of New Bedford to the forefront of the effort to deter climate change through the adoption of environmentally sound and energy-efficient policies.

As this initiative progresses, I am relying on our most important renewable resource- the knowledge, ingenuity, and ideas of our residents and those invested in the future of our City.

I would like to thank all of the individuals who have contributed their time and talents to the task of creating a set of recommendations that I hope will allow city government to move towards sustainable practices, preserving resources for the future and yielding cost savings. The report also contains suggestions for businesses and individuals, and I hope the community will adopt the practices that make sense for them.

I welcome all comments and suggestions and look forward to working with the community as we begin the implementation process.

A handwritten signature in black ink, appearing to read "Scott W. Lang". The signature is fluid and cursive, written over a faint, large watermark of the word "DRAFT" that is oriented diagonally across the page.

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# For Future Generations

By John K. Bullard

The U.N. Brundtland Commission defined sustainable development as “development that meets our needs without compromising the ability of future generations to meet their own needs.”

So much of our energy - so much of our civic discourse - is focused on the urgent problems of today. Neighborhood security, quality of schools, a deepening recession, the price of gas, all demand our attention. It is hard to look beyond today. As much lip service as we give to our concern for the next generation, we don't spend much time thinking about the world we are creating for them. Native Americans say, “We don't inherit the earth from our ancestors; we borrow it from our children.” This loan is a different kind of mortgage crisis.

If we seek the help of the science community to look at the world two generations hence, at a time when our grand children are our age, what do we see? Scientists, whether gathered in American societies or in the International Panel for Climate Change (IPCC) that shared the Nobel Peace Prize with Al Gore, have a clear and unambiguous message. The atmosphere is warming and we humans are contributing to it with our over reliance on carbon based fossil fuels.

So what is in store for us? And what do we do about it?

As the atmosphere warms several things happen. There is more heat and therefore more energy. The air draws more moisture out of the ocean and out of the land. With more energy and more moisture it means we are in store for more severe weather. It means on average there will be stronger hurricanes that last longer. It means that there will be more of other forms of severe weather - more tornadoes, more drought as the moisture is drawn out of the land, more precipitation and floods as the moisture inevitably returns to earth in buckets. The wildfires consuming the west this summer occur when you combine dried out forests with more lightning strikes. Floods in Iowa, drought in the southeast, wildfires in the west, the effects are here now.

If anyone in our region doesn't think we are feeling the impact now, we just have to look at what the insurance companies are already doing. Insurance companies don't care about an ideological debate. They take a cold, hard look at the science, and they see much greater property losses in the near future. So they are pulling out of coastal areas in Massachusetts. And we are either seeing our premiums jump or we are being shuffled off to the Massachusetts Fair Plan, or both. This may be the first tangible impact we are feeling from global warming in our region. So the effects are here now. We don't have to wait for them.

It is getting warmer. Nine of the ten warmest years on record have occurred in the last ten years. According to the Union of Concerned Scientists, by the end of the century we will have the climate found today in the Carolinas. We don't have to move south. South is moving to us. In the winter, that won't be so bad. South Carolina is mild in the winter. That will be nice. But South Carolina is HOT in the summer. That won't be so nice, especially if you are elderly and don't have air conditioning.

What else happens as the atmosphere warms? Glaciers melt. Almost everywhere. Our children will see the North Pole free of ice in the summer. Melting glaciers don't affect our water supply but they will severely affect the water supply in the American southwest and in Asia. We are very lucky to live in one of the most water rich parts of the world. Others won't be so lucky.

But ice is also melting in Greenland and on the west Antarctic ice shelf. And as that water melts, it adds to the sea level rise caused by the thermal expansion of the oceans. So we can expect, according to the IPCC, a meter rise in sea level by the end of the century. Some scientists feel that understates the very rapid melt going on now in Greenland. Our grandchildren will get to judge who was right. Sea level rise and severe weather means more coastal erosion, significant loss of wetlands and flooding. We will appreciate New Bedford's hurricane barrier more and more as other seaports struggle to build their own.

New Bedford's fortunes have always been tied to the sea, so we should understand what is happening to the ocean environment. As ocean waters warm, fish populations will move to try and keep up. They may adapt fast enough. They may not. Jellyfish are already adapting to warmer waters and we will see more and more of these. While I've eaten jellyfish (it's like eating rubber bands), I wouldn't recommend we count on them to keep our fishermen working.

Besides the ocean temperature, the chemistry is also changing. As the oceans absorb about half of the man made CO<sub>2</sub> (a good thing), they turn more acidic, which is not a good thing if you are a coral, a shellfish or a zooplankton and you make your shell out of calcium carbonate, because like a piece of chalk in vinegar, those shells will dissolve. So we are conducting a chemistry experiment with the base of the ocean food chain. In the scallop capital of the world, we should pay attention.

These are some of the impacts that will affect our children, and us but there are others. With fewer frosts, we will see invasive species spread. It hasn't taken very long for us to lose all the hemlocks east of the Mississippi. It only took four years for West Nile Virus to spread across the country.

I find these impacts alarming and I find our indifference more alarming. CO<sub>2</sub> levels are significantly higher than they have been in the entire course of human history. And yet of the 2500 questions asked by the major press of the Presidential candidates only three concerned global warming, the same number as were asked about UFO's.

The day I write this seems like such a normal day. Just like any other day. How can you sound the alarm when things seem so normal? If we had a day like today and the scientists said there was a hurricane off our coast and headed towards us and it had a lower barometric pressure and therefore higher winds than had ever been recorded and it was going to be on us in three days, what would we do? Would we sit and debate whether it would be a category 3 or a category 5 hurricane? Would we say we needed more information before we acted? Would we wait until it was on us, and all certainty removed, along with all hope? Is that what we would do? No, we would board up our windows, move to higher ground, stock up on milk and batteries and, in general, act like it is an emergency.

We're used to hurricanes, so we know what to do. We hope for the best, but we prepare for the worst. Well here is the storm we are looking at now. For over 650,000 years temperature and CO2 levels have gone up and down together. Through ice ages and warm periods CO2 levels have varied between 180 and 280 parts per million. All through our 250,000 years as the human species on this planet, this range of 180-280 ppm has defined our world. That is the environment we as a species have survived in. Today the CO2 level is 380 ppm. And it is almost certain to go higher than 500ppm even with very aggressive and worldwide mitigation plans. This is not the equivalent of a category 5 hurricane. As far as CO2 levels go, this is "beyond category." We have simply never been here before. There is no scientific debate on this point.

Would you call something that clearly changes our environment the way CO2 does and something that has never occurred before in all of human history alarming? And if it is alarming, should we be acting as if it's another day like any other day?

Some people are reluctant to act because there seems to be uncertainty, if not about CO2 levels, then the cause and therefore our response. But the overwhelming numbers of scientists, scientific institutions, business leaders, and countries agree that the earth is warming because of increased CO2 and that we humans, especially in America, are the main cause. If you have a child who is seriously ill and 99 doctors tell you it is one thing and you need to act and one doctor disagrees, is the safe thing to do to wait?

There are surely people who disagree with this. Just as there are people who think evolution is a "theory." They may hold strong to their opinions. As if strength of feeling were persuasive. But here's the thing with nature's laws. They don't care what you or I think; they just work. It doesn't matter what you may think about the law of gravity. You can like it or dislike it. You can call it a "theory." But it's the law and we are all subject to it.

So what do we do in the face of this truly unprecedented occurrence? The IPCC calls for us to MITIGATE and to ADAPT.

Mitigate means we have to reduce our carbon footprint, especially in the United States where 6% of the world's population contributes 25% of the pollution. We can do this individually by being more energy efficient. We can weatherize our homes, use programmable thermostats, replace incandescent bulbs with compact fluorescents, drive less, bike and walk and telecommute more. We can choose a hybrid car when we next buy a car. We can shop only for Energy Star products. We can buy local foods that haven't traveled across the country to get to our plate. We can use cloth shopping bags instead of paper or plastic. We can recycle more. All of these are doable and laudable and they have an impact. But we need to do more.

We need to demand that our leaders take steps to reduce carbon emissions. Our political leaders need to hear from us that this issue, which will change the lives of our children, **MUST** be a priority. Our bosses at work need to hear from us that getting rid of pollution is not just a way to be a good citizen; it is a way to become more efficient and successful. We led the way in energy when whale oil lamps lit the world. We must lead the way with renewables. We need Cape Wind in Nantucket Sound. But we also need industrial scale wind turbines wherever they can be

responsibly sited. And we should be manufacturing them. There are good new jobs in a green economy. But we need to lead.

But the scientists tell us that mitigation is not enough. We, like other species that share this planet, will have to adapt, to the changes already in the pipeline. We need to be ready for more days over 100 degrees and protect those who can't escape the heat. We need to create alternative insurance models so young people can still get loans to buy houses and start businesses. We need to plan long-term improvements like the railroad to handle a meter of sea level rise.

We are fortunate in New Bedford. We have a leader, Mayor Scott Lang, who has long worked so that future generations can lead fulfilling lives. While he values individual initiative, he has long believed in the power of inspired people working together towards a common and important goal. When Mayor Lang established the Mayor's Sustainability Task Force, he was counting on citizens to recognize the problem we face and the opportunity that is ours if we meet the challenge. And he also recognized that when citizens work together, it elevates the spirit and strengthens the community.

Dozens of citizens from New Bedford and surrounding towns accepted Mayor Lang's invitation to chart a new course for the city. This report is the result of our work to date. In it we define problems, set goals that we hope are measurable, memorable and motivational. And we lay out strategies for government to take and also for businesses and institutions and for us as individuals.

One of the great thinkers on this issue, architect Bill McDonough said, "Our goal is a delightfully diverse, safe, healthy and just world, with clean air, water, soil and power – economically, equitably, ecologically and elegantly enjoyed."

Sustainable development doesn't have to mean a lower quality of life. In fact it means the opposite. As Nobel Prize winner Al Gore pointed out in an address in July of 2008, by transforming our society from one that is dependent on foreign oil to one that harvests abundant renewable energy, we solve three problems at once. We lower dramatically our devastating emissions of CO<sub>2</sub>. We jumpstart the economy with a combination of green jobs and much lower energy costs. And we improve our national security by not having to borrow money from China to buy oil from unstable and unfriendly countries. Even Sheik Yamani recognized the answer in the midst of the 1973 oil crisis, when he said, "We didn't leave the stone age because we ran out of stones."

Think of the New Bedford that our grandchildren will inhabit if we rise to this challenge.

Clean, renewable, inexpensive energy, locally produced.

Clean air and less asthma.

Plentiful supplies of fresh water from protected watersheds.

Fishable and swimable beaches.

Fresh, healthy food locally produced.

Neighborhoods that are safe, because neighbors care for each other.

A transportation system that frees us from the monopoly of the automobile and offers abundant choice.

An educational system that connects children to the world around them, to each other and to their future.

Local jobs weatherizing houses, building electric scooters and wind turbines.

A citizenry informed, empowered, involved and in charge.

There is an adage in navigation that says, “If you don’t change course, you’ll get where you are headed.” We know where we are headed. It is an unprecedented crisis. But inside the crisis lies the opportunity of a lifetime. It’s time right now for a course change.

DRAFT

# **Mission, Values, Vision**

## **Mission**

To generate a positive, practical, consistent message of sustainability through education, empowerment and example set by the City of New Bedford; to set forth actions that citizens, businesses, and government can take to restore the environment, increase economic opportunity and improve social equity.

## **Values**

New Bedford realizes that climate change is real, sustainability is vital, and that local and global natural resources need to be preserved. The City values the goal of sustainability as a priority and shared responsibility for our community. The Mayor's Sustainability Task Force will focus on this goal that merits consideration of allocation of resources and research and implementation of innovative technological and behavioral change citywide. The MSTF commits to developing a framework to reduce greenhouse gas emissions. The process of the Task Force will be inclusive, efficient, transparent, and community-based. We will strive to seek input from and educate residents, businesses, and community groups. We believe that in doing so, while also cultivating connections to local, regional, and global committees, New Bedford reaffirms its integrity and commitment to sustainability as articulated in the Mayor's Sustainability task Force Mission Statement.

## **Vision**

We realize our interconnectedness as residents, not only of New Bedford, but also of Earth, a living organism. We adopt local solutions that ensure economic prosperity, social justice, and community well being, as well as a quality of life for all living things. We use our land and water resources responsibly, and replenish and preserve them for future generations. The energy we use is clean, renewable, and produced in New Bedford. Most of the food we consume is grown locally. We minimize waste through cradle-to-cradle manufacturing, by recycling and by waste-to-energy processes. We are a strong and healthy community with access to affordable housing, transportation, and healthcare. Our public education system prepares our people for productive, meaningful, and fulfilled lives.

# **Introduction: A Sustainable Future for New Bedford**

It is no small irony that New Bedford, itself, is a product of the last major global warming event in earth history, the retreat of the North American glacial cover twelve thousand years ago. Surely New Bedford's natural advantage of a deepwater port and plentiful supplies of water are direct products of the advance and retreat.

The retreat revealed scarification and gouging that shaped major landforms that mark our contemporary northeast, including the city's long and narrow reach to the bay, the Acushnet River estuary, Buzzards Bay, the end moraine Elizabeth Islands chain, Martha's Vineyard and Nantucket. Perhaps the most notable and easily recognizable results of this retreat are none other than Long Island and the sandy spit of Cape Cod.

Intervening history has witnessed flourishing native populations living sustainably and creating a rich cultural heritage at this place we now call our home. Southeastern Massachusetts once occupied the threshold of the New World, served as a major and tragic battleground between Natives and Europeans and has more recently sustained a city that twice achieved the Nation's highest per capita income in the Nineteenth Century. More recently it has served, and continues to serve, as a steppingstone for immigrants seeking to live the American Dream.

New Bedford's historic panorama suggests a hopeful future as people have long-recognized it is a good place to live. New Bedford has always been tolerant and a place where the quest for social justice and equity has received consistent, if not memorable support. In spite of climatic challenges it has been a sustainable and successful home for countless generations of people from many parts of the globe.

New Bedford should be able to once again contribute to the wealth of the Nation. We believe the recommendations noted in this report offer a course toward that end.

The city's advance from an extractive to value added economy can be repeated in a whole new way if it chooses to embrace the 21<sup>st</sup> Century's challenge of sustainability. Although it no longer sits near the center of the Nation's population, it possesses a scale, ocean location and livability unmatched by many communities. While it still successfully extracts protein from the ocean, value added economies have taken on entirely new shapes and forms in an age when powerful ideas gain worldwide attention and currency almost instantaneously.

By embracing sustainability and collectively pursuing its various goals and objectives, New Bedford could become one of a handful of communities around the world whose identity and economy have been transformed into "cutting edge" laboratories and incubators.

What could this mean for New Bedford? We could become:

A city where high-energy prices motivate all manner of public and private conservation and alternative energy responses;

A city whose work force is increasingly engaged in non-transferable jobs retro-fitting, adapting, upgrading and modernizing public facilities, businesses and homes;

A city whose secondary and vocational education institutions are invigorated by the “Big Idea” of national energy self-sufficiency, re-emphasizing reading, writing, mathematics and the sciences by using the community as a virtual laboratory and classroom;

A city whose historic and older housing stock is gracefully and thoughtfully adapted to more energy efficient systems of heating, cooling and air exchange;

A city whose vibrant construction industry and skilled construction labor force is increasingly engaged and enriched by retrofitting and “green” building technology;

A city whose 19<sup>th</sup> Century factories are 21<sup>st</sup> Century incubators of sustainable technologies and manufacturing;

A city whose institutions of higher learning offer its students opportunities to engage in research devoted to alternative energy generation, electrical grid enhancement, hybrid and energy wave technologies, remote energy sensing and management and the myriad of cutting edge ideas emerging from around the world;

A city whose oceanographers and scientists can provide valuable insights on sustaining ocean resources that mean so much to its economic base.

The collective and successful community embrace of sustainability requires vision, leadership and persistence. Citizens have come together to provide the basics of a vision contained in this report. They now look to the City’s officials to exert leadership knowing fully that the goals and objectives expressed here will require persistent effort spanning years, if not decades.

This Nation once embraced the “Big Idea” of space exploration to its enduring benefit. New Bedford should take inspiration from its former Senator, then President John F. Kennedy who successfully sounded that call to go to the moon. Big ideas, when successfully pursued, can produce significant and enduring results.

# **Energy**

## **Nature and Sources of Energy**

The laws of physics tell us that energy cannot be created; it can only be converted from one form to another. All the energy that is available to us comes ultimately from the sun. Energy sources can be classified as either renewable or nonrenewable.

Nonrenewable energy has been stored in various forms, over time frames measured in millions of years. Fossil energy is stored in such forms as coal, oil and natural gas. Nuclear energy is stored in the core of atoms of substances that were a part of the formation of the earth. All nonrenewable sources must eventually be depleted because the rate at which we are using them vastly exceeds the time it takes to replenish them. Thus, their use is inherently unsustainable. Furthermore, the conversion of each of these sources into useful forms such as electricity inevitably involves a negative impact on the environment. When fossil fuels are burned, for example, they generate carbon dioxide (CO<sub>2</sub>), a known greenhouse gas that has been implicated in the phenomenon of global warming. Furthermore, emissions of materials such as mercury, sulfur dioxide, nitrogen oxides and others can lead to serious health problems. When nuclear energy is used to generate electricity in nuclear power plants, there are practically no emissions of CO<sub>2</sub>, but so far in the United States there is no permanent storage facility for the depleted nuclear fuel. The mining, processing and transportation of the fuels and waste materials are also matters of concern in regard to safety and health.

Renewable sources of energy include hydropower, solar, wind, ocean (including waves, tides and thermal), biomass and geothermal. The use of these sources involves far less detrimental impact on the environment and may be seen as sustainable for very long time periods. However, compared with stored fossil or nuclear energy, these renewable sources contain far less energy per unit of material (per unit volume or mass) and thus are more expensive when used to generate the same amount of useful energy such as electricity. Nevertheless, as fossil energy sources deplete and become scarce, renewable sources must be tapped wherever possible to allow our quality of life to be maintained.

Even though humans have been using nonrenewable sources of energy for only a few hundred years, we in the United States reached the peak of our oil production in the 1970's and our easily accessible and relatively inexpensive reserves of oil and gas have been exhausted. It is anticipated that the world will reach its peak oil production within ten years. Much of the world's untapped reserves of oil and gas are in environmentally sensitive areas such as the Arctic Circle, where extracting oil and gas from the depths of the seabed will take many years and require huge sums of money. The countries of the Middle East hold large quantities of oil and gas, but this is the most politically unstable region of the world. Competition for fossil fuels has already led to wars, and as supplies dwindle further, we can expect even more armed conflicts to arise. All of this points to a worsening of the human condition in the midst of potentially catastrophic climate change.

## **New Bedford's Energy Situation**

The residents of New Bedford live in one of the nation's most expensive energy markets. While this is a challenge, it is also an opportunity. The city government is now exploring ways to become more energy efficient. It has been proven locally by the housing authority that energy efficiency can finance the improvements we desperately need to make while producing bottom line savings for taxpayers.

Nearly all energy in New Bedford - from electricity to transport fuel - is imported from distant sources. Conserving energy and generating power locally from renewable sources offer both potential cost savings as well as more predictable power costs for businesses and residents - an important sales point for the city as conventional fossil fuel resources begin to dwindle and become increasingly unstable politically. It also offers possibilities for lower emissions, thereby improving residents' health, and holds great promise as a marketing asset that generates favorable press and helps re-brand the city, particularly in light of New Bedford's history. Furthermore, some power generation options can also reduce the city's waste burden, such as wastewater sludge, which currently is trucked away and incinerated at significant cost.

New Bedford today is heavily dependent on fossil fuels for nearly all of its energy needs. This includes running all the devices that are plugged into wall outlets, keeping water pumps running, operating its wastewater treatment facility, and running the vehicles that operate in the city. Similarly the residents of the city draw very little of their energy requirements from renewable sources. Converting from the current energy supplies to more renewable sources will not be easy. In the rest of this chapter, we will set goals for a more sustainable energy future for the city of New Bedford and its residents, and address the issues related to achieving those goals.

## **GOALS and STRATEGIES**

### **Goal 1: Reduce kilowatt-hours consumed per capita by 20% by 2020.**

By setting the ambitious goal of a 20% per capita reduction in electricity consumption, we recognize that this will not be easy to accomplish. However, by implementing life-style behavior changes aimed at this goal, we should be able to approach this mark. Electricity is the lifeblood of our society. Think of how disruptive it is when the power fails for an extended period. We have become nearly totally dependent on electricity for normal life. The growing dependency on computers for many aspects of our lives only further exacerbates the situation. There are many ways to approach this goal, as the following recommendations show.

#### ***Implementation Strategies***

##### ***Strategy 1: Use compact fluorescent lights (CFL) in homes.***

**Rationale:** A Compact Fluorescent Light (CFL), also known as a compact fluorescent light bulb, is a type of fluorescent lamp designed to replace an incandescent lamp. Many CFLs can fit in the existing incandescent light fixtures. Compared to incandescent lamps of the same luminous flux, CFLs use less energy and have a longer rated life.

NSTAR offers the free installation of CFLs through its MassSAVE home assessments and its ENERGY STAR new construction program. NSTAR also promotes the use of CFLs through its lighting program and lighting catalog. We recommend that consumers visit: [www.myenergystar.com](http://www.myenergystar.com) for more information. The bulb installations are a component of a complete home assessment for which a consumer must be found to be eligible through a screening process. NSTAR does not simply go out and install free bulbs.

The lighting program negotiates significant pricing buy-downs with manufacturers and distributors that are reflected in the reduced pricing of CFLs in the big box stores (some smaller stores have coupons available).

### **Individuals**

- **Contact NSTAR and request a lighting assessment for your home.**

### **Strategy 2: Ban incandescent bulbs.**

**Rationale:** Compact fluorescent light bulbs (CFLs) have proven to save significant energy and to last much longer than archaic incandescent bulbs. Light quality is equal in all but some very specialized uses. Affordability is being improved with the active participation by such giant retailers as Wal-Mart in developing this market. Where there are substitutes for products that do harm to the environment, there is no reason to allow the harm just because of habit. We have banned CFC's everywhere. Communities are banning plastic bags, noise polluting leaf blowers, smoking and all manner of practices that we took for granted at one time. The time for the incandescent bulb has come... and gone.

### **Government**

- **The City of New Bedford will no longer purchase incandescent bulbs.**
- **The City of New Bedford will, by ordinance ban the sale of incandescent bulbs and will ban their possession in 2 years time.**

### **Institutions and Businesses**

- **Stores should stock CFLs and consider pricing them at discount for a limited time.**
- **Stores should agree to take back CFLs after they burn out to avoid mercury pollution.**
- **Institutions should use only CFLs.**

### **Individuals**

- **As incandescents burn out, replace all bulbs with CFLs.**

### **Strategy 3: Adopt new City policy requiring most new buildings to meet LEED certification.**

**Rationale:** The Leadership in Energy and Environmental Design (LEED) Green Building Rating System™ is the nationally accepted benchmark for the design, construction, and operation of high performance green buildings. LEED gives building owners and operators the tools they need to have an immediate and measurable impact on their buildings'

performance. LEED promotes a whole-building approach to sustainability by recognizing performance in five key areas of human and environmental health: sustainable site development, water savings, energy efficiency, materials selection, and indoor environmental quality.

LEED provides a roadmap for measuring and documenting success for every building type and phase of a building lifecycle.

Because LEED is a generally accepted standard that has been proven to be attainable, many governments and institutions have referenced it in their procurement policies, much like Energy Star.

#### **Government**

- **The City of New Bedford could adopt several policies that promote green building using this generally accepted standard.**
- **The City of New Bedford will only build public buildings that are LEED certified.**
- **The City of New Bedford will only provide financial assistance to commercial and industrial building projects over 10,000 square feet if they are LEED certified.**
- **The City of New Bedford will waive building permit fees for LEED certified buildings.**
- **The City will modify its building code to require LEED certification for all buildings over 25,000 square feet.**

#### **Institutions and Businesses**

- **All new construction over 15,000 square feet should be LEED certified.**

#### **Individuals**

- **When building or renovating a home, use the LEED scoring system to plan improvements.**
- **If your place of business or local government is building a new building ask that it be LEED certified.**

**Strategy 4: Conduct energy audits on all public buildings within two years and all buildings within ten years.**

**Rationale:** In addition to achieving the goal of residential energy audits on ALL buildings within 10 years, the City—including the School Department—should, itself, cause a reputable Energy Services Company (ESCO) to conduct a professional audit and initiate energy improvements financed with savings. Implementation of audit findings can result in significant increases in overall HVAC efficiencies as well as the production of clean electricity utilizing a variety of packaged co-gen systems. Compact fluorescent lighting conversions are also an effective menu item offering relatively low payback periods and consistent electrical savings. Finally, the installation of low-flow toilets (both pressurized and traditional), water nozzles and shower heads offer even quicker payback (See Glossary) and greater long-term savings. These improvements likewise can result in significant reductions in residential sewage requiring treatment.

As an example, the New Bedford Housing Authority has increased its overall heating efficiency from approximately 82% to nearly 88% efficient in over 650 of its state financed units over a 24 month time-frame. Similar efficiencies have been achieved over a 10 year period as it converted approximately 1000 of its federally financed units to high efficiency gas fired boilers and furnaces. Four rounds of ESCO-sponsored improvements resulted in over \$10,000,000 of new equipment installations for a scant \$1,200,000 of “equity” investment: the balance was financed through tax-exempt 12-year lease arrangements. The Authority hopes to follow with a fifth round (approximately \$5,000,000) designed to increase heating efficiencies in nearly 400 additional units of family housing while substantially reduce wasteful consumption of water and electricity. Additionally, it is hoped that a third packaged co-generator will be brought on line at the Boa Vista elderly high rise.

Projected energy savings can sustain loan to value ratios of at least 55% to as high as 90%+, thus significantly reducing the city’s initial capital outlay. If the City adopts a “frozen rolling base” of energy expenditures, energy savings over the life of the lease (typically 12 years at anywhere from 3.5% to 4.75%) can be “lock-boxed” for use as seed funds for other energy improvements such as wind or solar energy.

**Strategy 5: After audits, city should seek partnership with energy conservation company to map out savings.**

**Rationale:** When the EPA energy audit currently being conducted on buildings owned by the City of New Bedford is complete, the City will be in a good position to identify and correct building problems associated with wasted energy. The EPA results should be augmented by a table of water usage at each City building and incorporated in a Request for Proposals (RFP) for an Energy and Water Conservation Performance Contract.

The RFP should be publicly advertised in order for the City to obtain the best possible arrangements with respect to financing and engineering and the Proposals that are submitted from Energy Service Companies (ESCOs) should be reviewed by City Facilities Management as well as outside consulting mechanical, electrical, and plumbing engineers to determine which of the proposals received best meets the needs of the City.

It can be expected that every proposal will include upgrades to building lighting and improvements in building mechanical system efficiencies through the use of an automated energy management system, the addition of variable frequency drives, and the replacement of inefficient boilers, chillers, fans, pumps, and motors. In some cases, it may be possible to convert existing heating and cooling systems to cogeneration plants in which both electricity and heat are produced. For example, commercial packaged systems are available on a turnkey basis that can produce impressive electric savings. The high-rise facilities housing the New Bedford Hotel and Tripp Tower have recently installed such systems.

More thoughtful proposals should be recommended to the ESCO bidders in the original RFP however: improvements in building insulation, upgrades of street lighting, installation of geothermal heating or cooling systems in identified City buildings, installation of low-flow toilets and shower heads, installation of waterless urinals, installation of vending misers (to shut

down vending machines when occupants have left the building), re-glazing inefficient single-pane windows with thermo-pane, using seawater to provide air conditioning, installation of heat recovery systems on building exhausts, installation of solar water heaters, installation of “free-cooling” on buildings for days when outside air temperatures are comfortable and filtered outside air can be used directly to meet ventilation requirements, installation of occupancy sensors to turn down mechanical systems and lighting when buildings are unoccupied, installation of rainwater collection systems to provide for lawn and athletic field watering during dry spells, the installation of boilers burning alternative fuels in identified buildings, and more.

Any improvement that results in a net economic gain in energy and water saving technology over the life of the asset would be a candidate for inclusion in the RFP. The committee judging the RFPs should have input into the RFP to ensure that a wide variety of energy and water conservation improvements are considered in the final proposals.

When the best proposal is chosen by the committee, the City should enter into a contract with the winning ESCO who will then proceed to make the agreed upon improvements at no cost to the City. The cost of the improvements would be repaid to the ESCO out of the resultant water and energy cost savings thus avoiding a budgetary increase.

**Strategy 6: PACE, working with NSTAR, should establish light bulb replacement program to save energy, working with 10,000 households.**

**Rationale:** NSTAR already installs free CFLs as part of low-income audits. That said, the Company would be glad to work with PACE on any new initiatives; however, budget impacts must be considered and any new initiatives must also include NSTAR’s lead Low-Income Program Administrator – ABCD (Action for Boston Community Development) into the conversations.

#### **Individuals**

The NSTAR Low-income Energy Efficiency programs in New Bedford are implemented by Citizens for Citizens (CFC), Fall River. The number of households served is based on the budget allotment from ABCD and availability of installers.

**Strategy 7: City should re-lamp all streetlights.**

**Rationale:** A pilot program aimed at proving the technical and economic feasibility of light-emitting diodes (LED) for street lighting should be investigated. Such lights are growing in use because they are far less energy-consumptive than conventional argon-vapor lamps and last far longer, thereby cutting both the operating and maintenance costs compared to today’s lamps. Parking areas at City-owned properties would be a place to conduct such a trial. The MTC might be willing to subsidize the cost of the program.

**Goal 2: Reduce fossil fuel products sold by 20% per capita.**

Fossil fuels are used primarily for transportation and home heating in New Bedford. This includes gasoline, diesel fuel, kerosene, natural gas, liquefied petroleum gas and heating oil. The

amount of these fuels that are consumed are impacted by the number of vehicles in use, the type of vehicle and their fuel efficiency (“gas mileage”), the number of miles driven, the number and types of homes and how well they are insulated, and the weather conditions over the course of a year. We have control over all these factors except for the weather. The following recommendations will move us toward the 20% per capita reduction in fossil fuel consumption.

## **Implementation Strategies**

### **Strategy 1: Install proper insulation in homes/businesses.**

**Rationale:** NSTAR offers a Residential MassSAVE program that includes rebates for and the installation of insulation done in accordance with Building Performance Institute standards. NSTAR Gas offers a rebate for the installation of insulation and weatherization measures, 50% of the cost up to \$1,500.

#### **Individuals**

- **Contact NSTAR and request a complete home energy assessment.**

### **Strategy 2: Install geothermal heating in one or more public buildings.**

**Rationale:** The U.S. Environmental Protection Agency (EPA) has determined that geothermal heat pump systems (GHPs) are the most environmentally benign, most efficient, and most cost-effective means of providing heating and cooling for buildings in the United States. GHPs operate on the principle that heat can be “pumped” from the earth into a building in the winter and from a building into the earth in the summer.

The technology to carry out this operation is well established and is commercially available. In the U.S. alone there are over 1 million GHP systems in operation. [1] There are various ways of transferring the heat to and from the earth involving wells or buried tubing. GHPs can be designed for use in first construction or retrofitted into older buildings. In southern New England, the temperature of the earth at a depth of only 6 feet (2 meters) remains about constant year-round at roughly 45°F (7°C). If one drills to 1500 feet (460 m), the temperature will be 50-55°F (10-13°C).

The savings in energy consumption and in atmospheric emissions are impressive. The EPA tells us that, over the anticipated 20-year life of the system, a *single* typical residential GHP can result in an energy savings of 375 million BTUs for space and water heating and for air conditioning, as well as a reduction of 48,000 pounds (22,000 kilograms) of carbon dioxide emissions and a cost savings of \$7,500.

If wells are the chosen means of conveying the heat, very little land is needed for the well field. Recently the old Trinity Church, a National Historical Landmark in the center of Boston, was converted to GHPs; the wells were drilled around the sides of the building and under sidewalks. The retrofit left the historic church in pristine condition and the new GHP system is totally invisible to churchgoers and visitors.

This year the Noble and Grenough Middle School in Dedham replaced its heating system with a GHP. Although the new system cost \$100,000 more than a conventional system, it will save the school \$17,000 per year in energy costs, yielding a payback of less than 6 years. [6] GHP systems are extremely flexible and may be adapted to industrial and commercial uses besides the ones cited above. Since heating of residences and heat use in industry contribute 30% and 35%, respectively, to the global emissions of carbon dioxide, CO<sub>2</sub>, GHPs have an enormous potential for reducing greenhouse gas emissions.

New Bedford should consider retrofitting one of their most energy-consuming facilities to GHP operation as a demonstration project. If New Bedford were to install 100 GHPs in the city, environmentally this would be equivalent to removing 130 cars from the roads or planting 38,500 trees. Depending on the particular applications, the cost savings to the city could be in the millions of dollars per year.

Another important and often overlooked advantage of geothermal space heating and cooling is that such systems consume less building space than traditional systems, and thus improve space utilization in buildings. In fact, the space-saving contribution was the deciding factor in Trinity Church choosing a geothermal system for their historic building retrofit.

#### **Government**

- **Conduct feasibility studies on retrofitting schools, libraries and other government buildings with geothermal heat pumps.**
- **Require all new buildings to be fitted with geothermal heat pumps.**

#### **Institutions and Businesses**

- **Conduct feasibility studies on retrofitting office buildings, medical centers, banks and other business or institutional buildings with geothermal heat pumps.**
- **All new construction permits will be issued only provided that geothermal heat pumps are included as one option for heating/air conditioning.**

#### **Individuals**

- **All new construction permits will be issued only provided that geothermal heat pumps are included as one option for heating/air conditioning.**

#### **Strategy 3: Create a “weatherization” loan pool.**

**Rationale:** Weatherizing buildings and installing modern appliances and heating and cooling systems are generally seen as the most effective investments to reduce energy use and shrink one’s carbon footprint. Yet the payback, while significant, requires an up front expenditure that many cannot afford. In addition, a substantial amount of weatherization is an opportunity to train and employ local workers on low-technology green jobs.

#### **Government, Institutions and Businesses**

- **The City of New Bedford will partner with local banks, utilities, foundations and other governmental organizations like the Massachusetts Renewable Energy Trust to create a loan pool to finance improvements to homes and commercial/industrial**

**properties that implement recommendations of recognized energy audits. These loans will be repaid by demonstrated savings from these improvements.**

### **Individuals**

- **Get an energy audit on your home and see what improvements would support through savings a loan for the work.**

***Strategy 3: Study carbon emissions of all public buildings with the goal of reducing city's carbon footprint.***

**Rationale:** The burning of fossil fuels is a major contributor to “Global Warming” through the emission of carbon dioxide, CO<sub>2</sub>. This is just one of the so-called “Greenhouse Gases” or GHG, for short, but it is one over which humans have some control. The burning of any fossil fuel (in fact, any organic material) releases CO<sub>2</sub> since fossil fuels and biomass contain carbon as part of their chemical makeup. The carbon combines with oxygen in the air during combustion and forms CO<sub>2</sub>. Unless the CO<sub>2</sub> is captured and sequestered, it will be released to the atmosphere where it forms a layer in the upper atmosphere that allows ultraviolet energy (light) to enter from outer space but prevents to re-radiation of infrared energy (heat) from earth to space.

In order to quantify the effect of replacing fossil fuels by renewable forms of energy that do not emit carbon, it is important to establish baseline data on how much CO<sub>2</sub> the City is currently producing. There are several so-called “Carbon Footprint Calculators” available on the web that facilitate this process. For example, one may refer to The Nature Conservancy’s web site, <http://www.nature.org/initiatives/climatechange/calculator/>, the Carbon Footprint Ltd. Web site, <http://www.carbonfootprint.com/USA/calculator.html> or The World Resources Institute’s Safe Climate web site, <http://www.safeclimate.net/calculator/index.php> for easy-to-use calculators to estimate an individual’s or a household’s CO<sub>2</sub> emissions. The results vary considerably depending on one’s activities, including the amount of travel (by car, bus, train or plane), the type of house one lives in, the type of energy source used for lighting, heating and air conditioning, the amount of insulation used in the building, the type of light bulbs used, etc.

The generation of electricity from fossil fuels results in CO<sub>2</sub> emissions. Companies can provide data on how much is emitted from their power plants as a basis for determining how much of a reduction can be obtained from conservation. For example, Dominion Energy (which offers electricity in the New Bedford area) shows the following graphs on its web site, <http://www.dom.com/about/environment/report/performance/index.jsp#air>

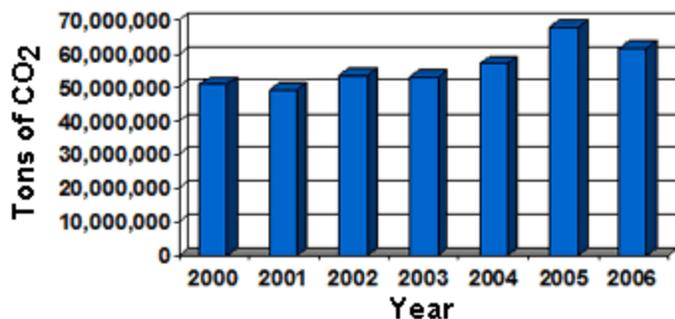


Figure 5.1. Total CO<sub>2</sub> emissions from Dominion Energy plants.

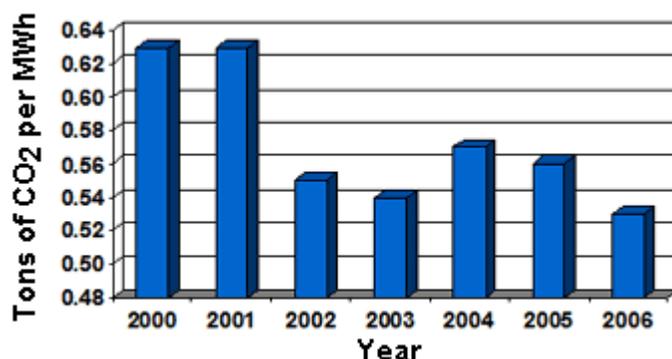


Figure 5.2. CO<sub>2</sub> emissions per unit of electricity generated from Dominion Energy plants.

From Fig. 2 it can be seen that 0.53 tons (1,060 lbs) of CO<sub>2</sub> were produced for each megawatt-hour (MWh) of electricity generated in 2006. On a more realistic scale for individual residents, that comes to about 1 lb per kilowatt-hour (kWh). The monthly home usage of electricity will vary widely depending on what electrical appliances, including space and water heating, are in use. A monthly usage of 500 kWh is not unusual. Thus 500 lbs of CO<sub>2</sub> are released from some power plant each month when this much electricity is used. If conservation measures can reduce the electricity needed by, say, 20%, then 100 lbs of CO<sub>2</sub> emissions would be avoided by that household. The City of New Bedford used 71,363,110 kWh of electricity in Fiscal Year 07; if 20% of that had been obtained from a clean, renewable source, such as wind, then about 14,273,000 lbs of CO<sub>2</sub> emissions would have been avoided by the City, a significant positive effect.

### Government

- **Conduct a study to determine the actual “Carbon Footprint” for the City.**
- **Identify the largest contributors to carbon emissions.**
- **Adopt means to cut carbon emissions from the largest contributors by at least 5% per year.**

### **Institutions and Businesses**

- **Conduct a study to determine the actual “Carbon Footprint” for the businesses and institutions in the City.**
- **Identify the largest contributors to carbon emissions.**
- **Adopt means to cut carbon emissions from the largest contributors by at least 5% per year.**

### **Individuals**

- **Calculate the actual “Carbon Footprint” for your home and your lifestyle using any of the available on-line tools.**
- **Identify your most significant activities that contribute to carbon emissions.**
- **Adopt measures or changes in lifestyle that will result in reducing carbon emissions from the largest contributors by at least 5% per year.**

***Strategy 4: Install ten green roofs and green walls in five years.***

### **Government**

Installing green roofs on City of New Bedford buildings can achieve significant benefits:

- Reduce heating and cooling loads by up to approximately 25%
- Increase the life span of the roof by protecting the waterproofing membrane from extreme temperature fluctuations and UV radiation
- Reduce the urban heat island effect
- Reduce storm water runoff
- Filter pollutants and carbon dioxide out of the air
- Filter pollutants and heavy metals out of rainwater
- Increase wildlife habitat in urban areas
- Provide for community garden space for growing fruits and vegetables
- Provide park space for building occupants

The quantifiable extent to which these improvements can be achieved depend on the specifics of the design but even the most minimal design will achieve all of these benefits to some extent. Unfortunately, it is often difficult or even impossible to install fully green roofing systems on existing buildings since existing buildings seldom have structural systems that can support the additional weight of soil, water, plants and pavers that are required for a fully green roof. Additionally, while a traditional roofing system may cost as little as \$1.25 per square foot, green roofing costs start at about \$8 per square foot and range up to \$15 per square foot. Finally, green roofs are also more expensive to maintain and replace at the end of the life of the waterproofing membrane. But all new buildings should be considered candidates for green roofs and a life cycle cost analysis should be required of every designer of new City buildings to determine whether or not it would be wise to include a green roof in the design of the structure.

Happily, some of the advantages of green roofs may be obtained on all existing buildings when they require re-roofing through the installation of a “partially” green roof. Such a roof utilizes additional lightweight insulation and a white roofing membrane to achieve a significant reduction in heating and cooling loads. By controlling for insulating values and albedo effect,

some of the benefits of green roofs can be achieved at virtually no additional costs over traditional asphaltic roofing materials. These “partially” green roofs should be mandatory on all City buildings that are constructed or rehabilitated.

While some of the green wall technology is fairly new and untested, the City of New Bedford should consider the installation of green walls in selected locations. Green walls may be built on the exterior of buildings to achieve the following benefits:

- Reduce heating and cooling loads by up to approximately 25%
- Increase the lifespan of the building cladding by mitigating temperature fluctuations on the surface of the cladding and reducing UV damage
- Reduce the urban heat island effect
- Improve the aesthetic experience for the public
- Improve the acoustics of the building for occupants
- Filter pollutants and heavy metals from rainwater
- Filter pollutants and exhaust emissions from air
- Provide additional habitats for increasing local biodiversity

Some exterior green wall systems are quite expensive to construct and such systems should probably be avoided. But many green walls involve no or very few additional costs. Allowing ivy, clematis, honeysuckle, morning glories, or wisteria to grow on a masonry wall does little overall damage to the wall if the masonry is intact to begin with and the small amount of damage is offset by the protection that the climbing vines provide. If cladding damage is a concern on a particular building, a trellis of wires can be constructed on the exterior of the building at very low cost to avoid allowing the rootlets to penetrate the masonry and /mortar of the building. It must also be noted that some maintenance effort is required to keep the plant material from blocking doors and windows but such maintenance is not a major cost consideration.

Installing exterior green walls, particularly on south-facing facades, should be considered for all significant City buildings.

Green walls may also be built on the interior of buildings to achieve the following benefits:

- Filter most indoor air pollutants and improving indoor air quality
- Increase indoor air humidity levels
- Improve the aesthetics and acoustics of the building for occupants.

While interior green wall technology is in its infancy, the major potential problems of such wall systems (elimination of invasive species and control of humidity) have been solved.

Although interior green walls are expensive, starting in the \$100 per square foot range, installation of them should be considered for new buildings or significant renovations where buildings are densely populated or have particularly sensitive occupants.

### **Institutions and Businesses**

Adopt green roofs/walls for businesses to achieve energy savings, as described above for city government buildings.

**Strategy 5: Encourage use of hybrid vehicles.**

**Rationale:** Hybrid technology in cars is well proven and increases fuel efficiency. The City should lead the way with its own vehicles and encourage their use among the private sector with incentives because the relatively high cost of hybrids is still a disincentive. While we strongly encourage the use of any waste materials (e.g., used cooking oil) for fueling city vehicles, we are not convinced that growing crops that could otherwise be used for food and converting them into transportation fuel is an environmentally sound approach. Some of the detrimental consequences of such a plan include increasing food prices for the poor, increasing the amount of land dedicated to agriculture (with its known toxic runoffs due to pesticides and fertilizers), and increasing the toxicity of air emissions.

**Government**

- **The City of New Bedford will provide parking at half price for hybrid vehicles in all parking lots.**
- **The City will convert its fleet of diesel vehicles to hybrid or bio-diesel.**
- **The City will reserve some prime taxi stand spaces for hybrid taxis.**
- **The City will purchase hybrid vehicles when ever possible.**
- **The City will reduce the Excise tax on hybrid vehicles.**
- **The City will encourage and promote private companies to sell and distribute bio-fuels.**

**Institutions and Businesses**

- **Purchase hybrids or natural gas powered vehicles for corporate cars.**
- **Provide more convenient employee and customer parking for hybrids.**

**Individuals**

- **Make your next car a hybrid.**

**Goal 3: Get 20% of the city's energy from renewable sources.**

The goal of achieving 20% of New Bedford's energy supply from renewable sources by the year 2020 will be a significant challenge. Considering that the City does not generate any of the energy that it consumes today, to obtain 20% of its electricity and its transportation, heating and cooling energy from hydropower, solar, wind, ocean, biomass and geothermal will certainly not be easy. The goal of 20% was established in recognition of the fact that the City most likely will never be able to meet its entire energy demand solely from renewables. However, owing to the more benign environmental impact of these sources and to their long-term sustainability, such a quest is well worthwhile.

Improved environmental impact will have health benefits for all its citizens and the renewable energy industry will offer employment opportunities for all sectors of the population.

The City does not have meaningful reserves of indigenous energy resources such as hydropower, solar, biomass or geothermal that might be tapped to generate electricity, but it is blessed with a favorable location along the SouthCoast of the Commonwealth where wind energy is abundant and where ocean energy exists in the forms of waves and tides. The City, however, cannot exploit these sources alone as it is not a municipal generation authority (such as Taunton, for example); it must have a private commercial partner in any such venture.

Solar energy in this climate is not as promising for conversion to electricity as are places in the American Southwest, for example, but it may be feasible to exploit solar on a distributed, small-scale basis, for either heat (via solar collectors) or electricity (via photovoltaics) where appropriate. Likewise, there are no high-temperature geothermal resources here such as in California where steam and hot water are being used to produce large amounts of electric power. However, low-temperature geothermal energy is available just a few feet below the surface of the ground that can be employed to vastly improve the efficiency of space heating and cooling systems.

Practically speaking, there is no way for the City to replace its current consumption of fossil fuels for transportation, heating and air conditioning with renewable sources simply because at this time there are no practical means of using any of the renewable energy sources for these applications directly. However, these applications can be served by electricity and obtaining electricity from wind or ocean energy is possible and is becoming more economically feasible as time goes on.

### *Implementation Strategies*

***Strategy 1: Use solar and wind energy in homes/businesses.***

#### **Government**

**A public sector energy audit can thus be a catalyst for assisting in financing a variety of alternative energy endeavors designed to produce electricity. Two obvious candidates for solar energy include the water and sewer treatment plants. Other candidates would include various schools, which enjoy full sun exposure and expansive flat roofs.**

**These large-scale improvements lend themselves to an energy procurement policy, which relies on bulk purchases. The Housing Authority has typically purchased electricity and gas from outside vendors for one-year periods. It has been able to flatten the rising cost curve somewhat with strategic buys that extend their contracts two and three years out at constant, or slightly declining prices per therm or per kilowatt. The NBHA is presently supplied, at known prices, through June 30, 2009 for natural gas and February 1, 2009 for electricity.**

**As energy markets adjust to shifting economic, weather and climate conditions, even mildly aggressive market watching can result in "bargain" forward buys that reduce, or at least flatten, unit prices. Predictability of public sector energy costs is worth a premium.**

A strategy for government would be for the City of New Bedford to provide incentives for homes and business to install solar and wind technologies. This could be in the form of making the permitting much easier for these renewable technologies.

#### **Institutions and Businesses**

Business can be encouraged by receiving not only the energy savings for their facility but should be able to receive a first year city tax break for a percentage of the installed cost for the solar or wind turbine they install. The City should also annually award a first, second and third place recognition award to the business that installs a system with the highest energy reductions.

#### **Individuals**

The individual homeowner should also compete for recognition awards, with some rewards like a plaque, lower first year taxes for a percentage of the installed cost. The solar system can be used to heat a pool in the summer and the home in the winter. This helps eliminate our need to purchase the high cost fossil fuels and protects the environment. Wind turbines for the homeowner should provide energy savings and some tax breaks by the city and the permitting for the homeowner should also be an approved allowable use with minimal approval required. Keep in mind wind has an excellent return. However it needs to be at least 70-100 feet off the ground and if the tower had a stability problem it should fall on the owner's property. Never, if at all possible, attach a wind turbine to a home structure, such as the roof.

**Strategy 2: Install several large wind turbines in two years, for example at or near SMAST.**

**Rationale:** New Bedford and the SouthCoast are astride a heavily traveled ocean transport route for heating oil. We have experienced first-hand the downside of fossil fuel transport – damaging oil spills in Buzzards Bay – which gives rise to an environmental imperative to reduce our dependence on fossil fuels. We thus share with the rest of New England a constant threat exacerbated by our region's importation of nearly all forms of energy.

In the early days of New Bedford's secondary wastewater treatment feasibility analysis, wind energy was deemed desirable but infeasible then because electricity costs were significantly below \$.085/kWh - the break-even point at that time. Times have changed. Wind energy is now a technically and economically feasible alternative in many locations nationwide, and could help to power the city's most prodigious electricity user, the secondary wastewater treatment plant. The City should revisit the establishment of a cutting edge wind facility on Clark's Point, and if the economics are as favorable as we believe, the City should embrace this project.

Likewise, the City's vast watershed landholdings could prove feasible and therefore useful in establishing a wind farm that assists in powering the water treatment plant. While its inland location may not be as desirable as Clark's Point, its relative remoteness could assist in overcoming NIMBY hurdles that have recently plagued other public and privately sponsored coastal wind farms.

To determine whether or not wind is feasible for these locations, both technically and economically, the first step will be to conduct a study by measuring the wind speeds at suitable elevations for a duration of at least one year, using anemometers or other means such as SODAR or LIDAR. Once the data has been gathered and analyzed, a feasibility report will quantify the amount of electricity that could be generated and any potential savings, along with reductions in air emissions that would result from construction of a number of wind turbines. The environmental impact of such a project will be thoroughly explored in the report. To assure full input from the public, a transparent process must be established with the data periodically being posted on a City website and reported in the New Bedford Standard-Times.

There are many positive aspects of utilizing wind power for the City of New Bedford, its residents, and the surrounding communities. One major plus is the spurring of economic development. For example:

For every megawatt (MW) of wind energy produced, \$1 million in economic development is generated. This includes revenue from planning, construction, etc.

Wind energy revitalizes rural communities by providing steady income through lease and royalty payments to farmers and other landowners.

Supplemental income: It is estimated that the income to a landowner from a single utility-scale turbine is approximately \$2000 per year. For a 250-acre farm with income from wind at \$55 per acre, this translates into an annual income from wind leases of \$14,000, with no more than 2-3 acres removed from production.

Jobs: Wind energy resources bring needed jobs to rural communities and bolster farm incomes against bad weather. Worldwide, wind and solar industries are likely to be one of the main sources of new manufacturing jobs in the 21st century.

Consumer Benefits: Wind energy costs for consumers are low and stable. This is particularly beneficial for those on fixed incomes.

As wind energy production becomes more efficient, costs will decline, while fossil fuel prices are expected to rise. Another important aspect of wind power relates to environmental and health benefits. For example:

Low emissions: Reduces smog and eliminates a major source of acid rain; could reduce total US emissions of carbon dioxide (a greenhouse gas) by 33% and world emissions by 4%.

Cleaner air means healthier air, especially for people with respiratory disabilities.

Large-scale wind development along the SouthCoast would allow reduced operations at the fossil-fuel burning power plants in Somerset and Sandwich which contribute massive amounts of air pollution over the greater New Bedford area.

## **Government**

Given these advantages, the city needs to lead by example. An excellent example would be to install three 2-3 MW wind turbines at Fort Rodman. This by itself would encourage institutions and individuals to install sustainable energy wind turbines appropriate to their needs. The Fort Rodman facility would be a behind-the-meter installation where a third party would install these turbines at no cost to the city and share the revenue with the city. All the power would be used on-site, thereby reducing the Waste Water Treatment Facility's operating cost by at least \$1,000,000 per year, and possibly more.



Figure 5.3. Fort Rodman area prior to installing wind turbines, site has excellent wind resources and the largest electrical load in the city used to power the Waste Water Treatment Plant.



Figure 5.4. Photo simulation of three 2.5 MW Wind Turbines at Fort Rodman as seen from Dartmouth.

### **Institutions and Businesses**

**At the same time the city leads by example, many local institutions such as commercial and industrial facilities will evaluate if they too can lower their energy cost and simultaneously help protect our environment. Successful wind turbine projects need areas where the wind is present; fortunately this is the case in many city locations. However, wind turbines also need large plots of land, usually 5 acres or more. Therefore not all sites will be sufficiently sized for the largest commercial wind turbines.**

### **Individuals**

**Residential and small-sized wind turbines can lower energy cost for the individual owners and at the same time protect our environment. Once homeowners see sustainable green energy wind turbines installed by the city and then by institutions, they will be encouraged to install their own wind turbines wherever local bylaws permit. Our building codes should encourage all new buildings to consider many types of sustainable renewable energy including small wind turbines.**

***Strategy 3:* Install photovoltaic and solar hot water on 25% of public buildings in 4 years.**

**Rationale:** Solar photovoltaic systems collect the sun's energy and convert it to electricity. Since the "fuel source" is free, one might imagine that they should be used extensively. Unfortunately, use of such systems designed with today's technology, entails many drawbacks. Mounting the solar panels to maximize access to the sun is not an insurmountable problem but it may compromise roofs or aesthetics in a retrofit situation. The panels themselves are constructed using toxic materials that responsible owners may well want to avoid. Finally, in the latitude of New Bedford, the installation costs are typically too high and the operational cost savings are typically too low to provide cost justification for the installation of such systems.

That said, the technology of solar photovoltaics is proven and is advancing rapidly so the City should monitor technological progress and maintain an open mind about incorporating solar voltaic systems in the future. Additionally, the City of New Bedford should consider installing solar voltaic systems on some specific buildings, like schools, for demonstration purposes.

Solar hot water systems are composed of solar thermal collectors, a fluid system to move the heat from the collector to its point of usage, and a reservoir or tank for heat storage. The systems may be used to heat domestic hot water, swimming pool water, or indoor air if existing heating systems can utilize the water. Solar heating at the latitude of New Bedford could provide between 15 and 25% of building heating energy.

Solar collectors may be mounted on roofs or on south-facing walls or on adjacent land. Heated water may flow through gravity systems (preferred) or be pumped (where required). Some solar collectors can be mechanized to "track" the sun but at our latitude, such systems usually cannot be cost-justified.

Nonetheless, solar hot water systems consistently show a positive life cycle cost advantage when designed simply and used to heat domestic hot water and swimming pool water. Such systems should be installed on all buildings where domestic hot water demand is more than minimal and for all swimming pools. Building designers should be requested to consider solar hot water space heating systems with new buildings or significant alteration projects to determine if such installations would be wise.

Solar air heating systems typically substitute the cladding on a south-facing wall of a new building with translucent material and collect heat in the cavity of the wall for use in supplementing/replacing winter heating systems. While such systems cannot in our latitude eliminate all costs for space heating, they cost no more than conventional building walls so they should always be incorporated on new south-facing walls where fenestration or appearance requirements to do not preclude their use.

### **Government**

**The city, as with wind turbines, should install solar photovoltaic systems at most publicly owned facilities where the roof systems face south and can demonstrate to the public the benefits of clean sustainable solar energy from the sun – even daylight creates photovoltaic energy!**

**At a minimum the city should install photovoltaic systems at all public schools with part of the system being installed on the roof and part in a public central area like an entrance area to ensure the public is aware of the system. A display highlighting the benefits should accompany these areas.**

### **Institutions and Businesses**

**The city leading by example will encourage institutions to become more sustainable. At the same time the state's Renewable Trust and possibly the new Energy Bill will provide incentives. Building codes should also encourage a review all energy strategies prior to allowing a building permit.**

### **Individuals**

**The city doing its part and installing photovoltaic systems will encourage the individual homeowners to install photovoltaic systems whenever possible. The new energy incentives being proposed by the state for 2008, the incentives presently available by the Renewable Trust and the city requiring new home building permits to consider photovoltaic installations are all ways to encourage photovoltaic sustainable energy. It is a known fact that renewable energy installed on a new home will provide lower energy cost on a monthly basis when these systems are part of a long term homeowners mortgage than not have this installed and purchasing energy from the local utility. Energy efficiency is the direction of the future!**

***Strategy 4: Capture methane from landfill.***

### **Government**

**New Bedford is already doing landfill methane collection to make electricity. However, if the city decides to build another landfill site it would be critical to plan the system with a bottom liner and a top liner to capture all the methane which would be produced and use this to make electricity. The existing sewer plant could add an anaerobic digester that would reduce the volume of solid waste and produce methane, which would provide electricity for the site use.**

***Strategy 5: Develop green purchasing policies.***

**Rationale:** The City of New Bedford can influence the market and people's behavior through its own purchasing policies. If it says it will buy hybrids, vendors will work to sell them. If it demands energy from renewable sources, it can influence major utilities. If it says it will buy recycled paper, compact fluorescents, locally grown food, etc. it will become easier for citizens to find these items in local stores. Purchasing policies will be reviewed and changed to support renewable energy and other sustainable practices.

**Government**

- **The City of New Bedford will only purchase or lease vehicles at the top of their class in terms of emissions and fuel efficiency.**
- **The City of New Bedford will purchase or lease only Energy Star products.**
- **The City of New Bedford will require 20% of all electricity it purchases to be from renewable sources by 2010.**
- **The City will buy only recycled paper and print with soybean based chlorine free inks.**

**Institutions and Businesses**

- **Institutions will adopt similar policies for fuel efficiency, recycling, energy star, and renewable energy.**

**Individuals**

- **When you buy your next car, make fuel efficiency a top criteria.**
- **Buy only energy Star appliances.**
- **Reduce packaging by using cloth bags, not plastic and by refusing unnecessary packaging.**

***Strategy 6: Build cogeneration plants that convert trash to energy.***

**Rationale:** The Crapo Hill landfill is already capturing methane from the decay of waste materials and burning it in gas engines to generate electricity. A systematic approach is needed to identifying suitable waste materials including biomass for similar plants in the City.

**Government**

- **The City of New Bedford will make a survey of its current waste streams.**
- **The City of New Bedford will identify those streams suitable for cogeneration.**
- **The City of New Bedford will conduct a feasibility study for a waste-to-energy facility.**

**Institutions and Businesses**

- **Institutions will explore options for on-site cogeneration using existing and/or new facilities.**

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# **Economic Opportunity**

The New Bedford economy is a series of threads in an intricate fabric of commerce that extends past our municipal borders to neighboring activity centers in Dartmouth and Fairhaven, west through Fall River to Providence, east to the Cape and islands, north to the Boston metropolitan area and beyond.

New Bedford has a rich commercial heritage. During the 19<sup>th</sup> century our whaling fleet was valued around the world for its delivery of whale oil and trade. Today, our fishing fleet has made us the top dollar port in the US for many years. Cloth manufacturing in the early part of the 20<sup>th</sup> century brought prosperity to many, and, until recently, so did the manufacturing of clothing. Today we are developing a broader manufacturing base located all over New Bedford as well as in its booming and beautiful industrial park. The Whaling National Historical Park provides focus and energy to the revitalization of New Bedford's downtown. Two UMass Dartmouth satellite campuses together with a satellite Bristol Community Jr. College are helping to rejuvenate New Bedford in many ways, including reviving our fisheries, helping many become lifelong learners, as well as contributing to the commercial life of the City.

However, we haven't kept pace with – let alone anticipated – changing economic conditions that first saw manufacturing move south (and later offshore), the depletion of the fisheries resource or the evolution of an innovation-demanding services-based economy. While much of the state has grown, New Bedford suffers from population loss, above-average unemployment, a workforce that lacks the skills that employers demand, and a weak tax base. In addition, the education system needs to be revitalized and our students need to be rewarded with careers – not just work. Contaminated properties need to be made productive again and aging infrastructure has to be coaxed along and replaced.

New Bedford has tremendous assets that when marshaled, can provide a solid foundation for economic growth. We are the top fishing port in the U.S. and our maritime history is the basis for strong ties to European and Asian countries. Abandoned manufacturing facilities represent an enviable inventory of space that can be revitalized to house 21<sup>st</sup> century industries, or live-work space for artists. Within a decade we will have rail connection to Boston, which in turn will create pressures to maintain our inventory of affordable housing and ensure that the unavoidable growth will not be at the expense of our city's character.

Sustainable economic development is a cornerstone to the City's future. New Bedford's ability to once again become a successful economic center will be dependent on our ability to attract, retain and grow talent and businesses. Our prosperity will evolve from understanding the environmental, social and economic trends that are shaping the economy, and apply that knowledge to the design and operation of enterprises that will thrive. Our framework for economic renewal begins with creating an invigorating vision of our community that energizes and compels action.

## **GOALS and STRATEGIES**

**Goal 1: By September 30, 2008 the City of New Bedford will approve an aggressive, descriptive plan for sustainable economic development that will have been created through an inclusive process that engages businesses, individuals, institutions, unions, non-profit organizations, associations, places of worship, and other stakeholder groups.**

**Rationale:** There are many ideas concerning sustainable economic development. However, the concepts have not been publicly debated, evaluated, compiled and integrated into an understandable picture of what a sustainable New Bedford economy would look like. Without a vivid description of this vision, and explicit plans for its achievement, it is difficult to engage individuals, businesses, government personnel and other interested people in the actions necessary to realize a thriving, sustainable economy.

Goal 1 identifies the City as the lead orchestrator of the Goal and specifies stakeholder involvement; describes the outcome; and establishes a schedule. Additionally, when achieved, this goal will detail a series of milestones and designate those responsible for their achievement. An inclusive process that engages stakeholders with varied interests and capabilities in working toward the revitalization of the City's economy could become a defining moment for New Bedford and a model for other communities to emulate.

### ***Implementation Strategies***

#### **Government**

- **Commit to the visioning and plan development process by involving the Mayor's Office and the City Council, assigning key department management and welcoming interested staff. Marshal the needed technical expertise, economic, and support resources to ensure effective stakeholder engagement, credible evaluation, thorough integration, and ongoing public communication of interim thinking and results.**
- **Build on the New Bedford economic development work of others: reaffirm suitable goals, strategies and programs; identify progress on those; and characterize potential new initiatives.**
- **Envision and concur on the elements of an *integrated* sustainable economy that incorporates key sectors such as energy technologies (including conservation), marine science and technology, resource management, agriculture, aquaculture, fisheries, green building, health care, the arts, travel and tourism, and transportation and distribution.**
- **In concert with the Economic Development Council (EDC), the Workforce Investment Board (WIB), trade unions and educational institutions accelerate the development of a workforce to be ready for today's jobs *and* trained for the envisioned sustainable economy. This can be accomplished by calculating labor force requirements, identifying skills needed for the identified positions, assessing skills gaps and delivering training in the skills for target sectors.**
- **Identify, evaluate and create a program(s) for adaptation required by the effects of climate change that are inevitable (sea level rise, warmer temperatures, and more severe weather, to name a few).**

### **Institutions and Businesses**

- **Become involved in the creation and implementation of New Bedford's Plan for Sustainable Economic Development.**
- **Create and patronize forums both for the focused discussion of sustainable economic issues and informal networking to exchange knowledge and other resources.**

### **Individuals**

- **Become involved in the creation and implementation of New Bedford's Plan for Sustainable Economic Development.**

**Goal 2: By 2015 the City of New Bedford will be home to a thriving economy of profitable businesses engaged in the manufacture, sale and delivery of green products and services.**

**Rationale:** Green products and services include a variety of businesses and trades: energy efficiency specialists, alternative energy manufacturers and installers, green builders, farmers, aquaculturists, resource recovery specialists, and habitat restorers to name a few. Expanding this sector will revitalize New Bedford's manufacturing capacity, supply an increasing local demand, and contribute to satisfying a regional and national demand.

Goal 2 is measurable; however, benchmarks in employment by trades will need to be derived from the labor demand studies that are an outcome of Goal 1. The establishment of a green sector engaged in the manufacturing, sale, and delivery of green products and services would blend technological advances with the rejuvenation of New Bedford's commercial legacy.

### ***Implementation Strategies***

#### **Government**

- **Initially, the City will need to take on a leadership role until a critical mass of green businesses is established. The EDC can develop promotional materials, identify and target sustainable manufacturers, orchestrate 'pitches', and facilitate relocations.**
- **The City will require through ordinance a sustainability assessment by an independent party of any significantly sized or impactful industry or business wishing to locate in New Bedford.**
- **The City will require through ordinance that businesses and industries be financially responsible for any and all damages to people or properties caused by polluting from said business or industry.**
- **The City will require through ordinance that all work contracted for the City using City funds or City derived grants, be granted with preference to businesses and organizations that hire New Bedford residents and/or partner with New Bedford businesses and agencies.**
- **In concert with WIB, unions, and educational institutions, build a capable workforce ready to work in identified green trades and businesses.**
- **Designate green zones, eco-industrial parks for green businesses, and/or green clusters; and ensure suitable infrastructure exists to support green development.**

- Create local incentives for green businesses, and lobby the state Legislature and agencies to increase the value of the incentives. Contribute to the demand for sustainable products and services through retrofits, resource recovery, purchasing of green products, requiring new development and re-development projects to be green (as well as built green), and similar programs.
- Provide training for industry to manufacture “cradle-to-cradle.”

#### **Institutions and Businesses**

- Develop curricula, promote careers in green trades and professions, and ensure graduates’ competencies in needed skills and trades.
- Create a Green Business Development Committee through the EDC. Participate in the recruiting and growing of green businesses.
- Contribute to the demand for green products and services through retrofits, resource recovery, purchasing green products and similar programs.
- Understand the benefits of green facilities, operations, design and technologies that limit our dependence on non-renewable resources.
- Take advantage of tax credits and other incentives for using renewable and green technologies.
- Manufacturers should design for zero waste.
- Adopt product stewardship, taking back products after useful life.

#### **Individuals**

- Patronize local manufacturers, retailers and providers of green products and services, such as purchasing clean energy and locally grown (or caught) foods.

<p><b>Goal 3: By 2018 the City of New Bedford will have remediated and have approved plans for the revitalization of all City owned brownfields.</b></p>
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Brownfields are commercial and industrial properties that are idle or underutilized and that may be contaminated or perceived to be contaminated by pollution and/or low concentrations of hazardous waste. Properties with high levels of contamination are not considered brownfields.

**Rationale:** The City of New Bedford owns approximately a dozen properties that are classified as brownfields. These properties were acquired as a result of previous owners’ failure to pay taxes. Brownfields are often unsightly, and detract from the establishment of a positive image. An even worse problem is the health effects that result from too much exposure to contaminants found on brownfield sites. In order to reposition New Bedford as a community that individuals and businesses are eager to be a part of, it will be necessary to clean up its inventory of brownfields.

This goal establishes a deadline for the City to remediate its brownfields. The goal is memorable because of the prominence of many of the target properties and inspires action as a crucial step in rebranding the City as a desirable community in which to live and conduct business.

#### ***Implementation Strategies***

#### **Government**

- Establish an overall plan for remediating the brownfield sites that takes into account levels of contamination, ease and cost of remediation, demands and appropriate uses.
- Create individual site plans for commercial, recreation and community uses.
- Pursue partnerships to clean and restore individual brownfields, including working with businesses seeking to demonstrate and evaluate promising remedial technologies, with neighborhoods looking to expand amenities, and with recreation users in need of facilities.
- Work with the public and other stakeholders in understanding risks, options for remediation, and potentials for redevelopment.
- Favor brownfield over greenfield development for any governmental expansions, and create incentives that encourage private developers to do the same.

#### **Institutions and Businesses**

- Consider brownfield over green field development for new facilities.
- Partner with the City and neighborhoods in brownfield remediation: participate in site research and analyses, and provide financial resources to assist in brownfield projects.
- Work with the City, agencies and other institutions in the revitalization of properties with low concentrations of contaminants.

#### **Individuals**

- As individuals and through neighborhood associations and other forums advocate for and participate in planning for the remediation of brownfields.

<p><b>Goal 4: By 2013 the waterfront will be revitalized by the re-establishment of New Bedford as a working port that is a competitive alternative to other ports in the Northeast.</b></p>
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**Rationale:** Two centuries ago New Bedford was the most important commercial port in the United States. New Bedford no longer is the whaling capital of yesteryear; however, there are opportunities in sustaining and growing commercial fisheries: marine trades, including marine sciences and technology; short sea routes with intermodal (train, trucking) connections; and enhancing the character of the waterfront.

This goal is readily measurable using indicators, such as catch, shipping tonnage, passengers, marine sales, and marine science and technology metrics. Re-establishing the vitality of the port is compelling because of the City's marine heritage and the contribution that legacy makes to New Bedford's soul and sense of place.

#### ***Implementation Strategies***

##### **Government**

- Create and implement a waterfront plan that reinforces commercial fisheries, marine trades, passenger ferries and freight shipping, research and development in

coastal/marine technologies, and ancillary uses that promote a working port. The plan should include the evaluation of an intermodal hub situated at the harbor, while remaining connected to the downtown and the transportation system.

- Accelerate harbor cleanup efforts, including the elimination of all CSOs.
- Promote New Bedford as a working port, including partnering with other ports on short sea route development.
- Advocate for the protection of fisheries in order to re-establish the vitality – and sustainability – of the resource.

#### **Institutions and Businesses**

- Continue to develop the marine science and technologies industry through the School for Marine Sciences and Technology and the private sector.
- Consider short sea shipping as an alternative to other transportation modes.
- Educate the public about fossil fuel depletion and the need to develop alternative modes of transportation of goods.
- Engage community and campuses in discussions about the potentials of short-sea shipping.
- Participate in the revitalization of the harbor by locating businesses with target trades into the port area.
- Create demand and supply of bio-diesel for marine transportation.

#### **Individuals**

- Participate in waterfront planning to help ensure land use that is thoughtfully integrated into citywide land use and transportation plans.
- Participate in waterfront cleanup efforts.

**Goal 5: By 2018 the New Bedford economy will be dominated by profitable, locally owned businesses that are ecologically and socially responsible.**

**Rationale:** Organizations that understand the economic, social and ecological trends that are affecting their marketplace have an advantage over enterprises that give these conditions little mind. By incorporating best environmental and management practices, sustainable businesses are poised to be resilient in the face of risks; are viewed favorably by their customers and stakeholders; enjoy a strong brand and a competitive advantage. These organizations attract and retain top talent, are at the forefront of innovation, inevitably are active in the community and generate positive cash flow.

Environmental and sustainability audits are effective tools for measuring corporate sustainability; however, it will be challenging to develop accurate aggregated reports until such time as the business community achieves a ‘critical mass’ in embracing sustainability. Implementing sustainable business practices requires acceptance of ambiguity and risk, patience, and persistent communication: it is a value-laden business framework that can energize both individuals and organizations – and reinforce a larger sense of community.

#### ***Implementation Strategies***

### **Government**

- **Recognize that the most effective economic development results from the expansion of existing small businesses that are locally owned. Create programs to recognize and honor significant contributions to sustainable economic development.**
- **In concert with major institutions and businesses develop guidelines and training for qualifying (certifying) businesses as sustainable enterprises.**
- **Increase the fees for collection, treatment, and disposal of waste to discourage its generation. Use some of the income for training to eliminate waste and pollution.**
- **Create procurement standards that require the purchasing of green products, when available, and the purchasing of products and services from sustainable businesses, with preference given to local enterprises.**
- **Re-vision New Bedford as a collection of villages and create land use and economic development plans to ensure that each contains a grocery store, tool sheds, community gardens, and local businesses that serve primary neighborhood needs (as well as the transportation infrastructure to provide ample, convenient connections to outside destinations).**
- **Organize a buy-local campaign, including foods in local schools.**
- **Promote the business case for sustainability by identifying the benefits of ecologic, economic, and social responsibility (The Triple Bottom Line). Support business leaders and managers in transforming their businesses into sustainable enterprises by ensuring that management, legal, financial, marketing, environmental assessment and operational engineering expertise are available.**
- **Require businesses that seek City government support to demonstrate how they are sustainable or how they will become sustainable as a result of the City's investment.**
- *Ensure balance between economic development and environmentalism.*

### **Institutions and Businesses**

- **Understand the benefits of operating as a sustainable enterprise. Transform organizations into sustainable enterprises that are profitable, as well as ecologically and socially responsible.**
- **Educate stakeholders about the importance of supporting the local economy.**
- **In concert with major institutions and governmental agencies develop guidelines for qualifying (certifying) businesses as sustainable enterprises.**
- **Create procurement standards that require the purchasing of green products, when available, and the purchasing of products and services from sustainable businesses, with preference given to local enterprises.**
- **Create formal networks (both virtual and real) that facilitate the exchange of information and resources on sustainable business practices and the transitioning to sustainable operations.**

### **Individuals**

- **Buy sustainably produced goods and services and give preference to local suppliers and producers.**

- **Know the environmental, social and real economic costs of your energy, water, food, and goods sources.**
- **Consider creating cottage industries.**

**Goal 6: Sustainable economic development results in prosperity for New Bedford's residents and businesses.**

**Rationale:** Economic development's ultimate value is the prosperity that it creates and the opportunities it provides. In order for New Bedford to gain value from sustainable economic development it is critical that rewards are distributed to those whose performance deserves economic recognition. Workers who develop their potential by learning and honing skills, applying their abilities and contributing meaningfully to their places of employment and their community, should be rewarded with equitable compensation that contributes to a quality of life.

New Bedford's prosperity can be measured both in aggregate and individually using a variety of indicators, such as compensation (the value of pay + benefits), cost of health care, home ownership and homelessness, business ownership, crime and livability, household income and poverty levels. The goal is memorable as it represents a means for translating larger scale economic benefits to a personal level. It then becomes motivational in terms of how individuals are able to use personal economic resources to reinforce their values, including security, wellness, family time, recreation, fulfillment and learning.

### *Implementation Strategies*

#### **Government**

- **Encourage City workers to learn about building personal wealth.**
- **Evaluate co-housing concepts that can reduce housing costs and accelerate home ownership.**

#### **Institutions and Businesses**

- **Publicize curricula and recruit students for education in wealth-building, home ownership, the arts & crafts and community participation.**
- **Create flexible compensation packages that match the (economic, health, time-off) needs of workers. Ensure health policies and benefits that promote wellness.**
- **Develop motivating career paths; support workers in the acquisition of new and/or enhanced skills.**
- **Support workers in home ownership (acquisition and/or renovation).**
- **Support workers in becoming company owners.**

#### **Individuals**

- **Learn and apply skills needed to leverage personal potential into personal (financial and other) wealth.**
- **Volunteer for projects that foster community values, for example, service projects such as clean-ups, tree maintenance, and rehabilitation of housing stock.**

# Resources & Waste

## **Introduction**

Garbage. Throwaway. Litter. Trash. Refuse. Rubbish. Junk. Scrap. Useless items. Debris. Flotsam and Jetsam. Graffiti. Cigarette butts. Waste.

These words don't conjure up warm and fuzzy feelings. A common reaction is that these words represent the unwanted remains of our personal and work activities, or are others' intrusions: we don't want to think about it.

In 2006 more than 45,000 tons of New Bedford's municipal solid waste was transported to the Crapo Hill Landfill, which is owned (jointly by Dartmouth) and operated by the Greater New Bedford Regional Refuse Management District. Our wastewater treatment plant's sludge was transported to Rhode Island, where it was incinerated. We also generate hazardous medical and electronic wastes that must be disposed of safely, bulky construction debris that is diverted from the landfill, valuable recyclables that could earn the City revenue, as well as compostable materials, such as leaves and grass clippings, that are treasured by gardeners as soil amendments. Even so, not all waste is being disposed of responsibly: waste is not always placed out for collection, prohibited materials (such as hazardous materials, recyclables and yard waste) are mingled with household garbage, and litter is everywhere.

In 2006 businesses and residents recycled 14% of its municipal solid waste (paper, cardboard, metals, plastics and glass), which is better than Fall River and Boston, which recycle 12%; not as good as two 'Pay-As-You-Throw' communities (Taunton, 22% and Worcester, 44%); and less than half of the nation's average. The result is needless demand for space in the Crapo Landfill, whose capacity is limited to about 20 years at current fill rates of about 108,000 tons per year. In order to make progress on the Resource and Waste goals, there needs to be involvement from a broad spectrum of key players including haulers, generators, businesses, government officials and citizens.

A sustainability framework considers waste through a different lens. The perspective is one of optimizing our planet's resources: the raw materials (trees, metals, glass, plastics and by extension the water, energy sources, soils and air needed to process them) are to be protected, used sparingly and replenished. In the old paradigm waste is pollution. It is also a marker of inefficiency. One is throwing away something of value (and paying to do so) that one could not figure out how to use. In the nature's paradigm, waste is food. Bill McDonough describes two infinite cycles: a natural one where waste returns to the earth and an industrial cycle where materials are reclaimed and reborn.

Individuals and businesses can incorporate resource thrift and waste management as part of building a sustainable New Bedford. The logic begins with *avoiding* the acquisition/use of products (Is the acquisition of a product necessary? Can we substitute a scarce material with a used; then *reusing* the product; and lastly *recycling* the product?

An example of resource thrift is the manufacture of Organic Gem, which is a certified-organic bio-stimulant made from fish processing scraps.

## **GOALS and STRATEGIES**

**Goal 1: As an interim goal, by 2011 the City of New Bedford will ensure that the overall weight of municipal solid waste (MSW) buried at the Crapo Hill Landfill will be reduced by 20%.**

**Rationale:** The City's waste generation is uneconomical. Recycling rates, while improving, are feeble. New Bedford is using a disproportionate share of the Crapo Hill Landfill. This will ultimately result in an unnecessarily shortened life for the facility; increased costs for disposal as a new facility is located, permitted and constructed; and strained goodwill with Dartmouth, which shares use of Crapo. New Bedford residents enjoy household waste collection that is paid for via property taxes regardless of the amount of waste that is collected. This establishes no economic incentive to generate less waste and creates inequities in disposal costs. For example, a four-person household that generates one can of garbage pays the same rate as one individual who has four cans of garbage collected.

Goal 1 identifies the City as the lead orchestrator of the Goal; describes the outcome; and establishes a schedule (Note that Goal 2 will suggest additional overall and specific milestones). This goal is noteworthy; however, it won't be as memorable or as motivational as the Pay-As-You-Throw strategy, which is the only likely means of accomplishing this aggressive objective.

### *Implementation Strategies*

#### **Government**

- **Develop and implement a Pay-As-You-Throw solid waste collection program that effectively places the incentive to reduce waste on the solid waste generator. Adjust property tax rates appropriately.**
- **Establish collection-site audits that monitor contents of waste set out for collection. Provide progressive enforcement that starts with educating generators (i.e. simple feedback to correct the generator's disposal of inappropriate wastes that are put out for collection) to progressive fines for excessive amounts of garbage.**
- **Educate solid waste generators through informative materials (including media) that explain ways to reduce waste generation, increase reuse and recycling, and explain how to properly dispose of various kinds of waste.**
- **Require schools, other institutions, hospitals and businesses to implement waste reduction plans that reflect industry benchmarks for best waste management practices.**
- **Establish an aggressive waste reduction and recycling goal for City government. Help (incentivize) city departments to create and achieve their own waste management goals. Holding responsible individuals accountable for achieving the goals would be one way to accomplish this. Provide needed support (e.g. waste audits, information, collection bins, training, etc.).**

- *Deploy recycling bins in suitable (high pedestrian traffic) areas throughout the City to make it easy to recycle glass, plastics and newspaper.*
- **Ban plastic shopping bags.**
- **Prohibit purchase of bottled water by the City.**
- **Publish annually a list of top generators of waste and wastewater, as well as top consumers of water.**
- **Create an anti-littering campaign. Aggressively enforce littering laws citywide. Work with the judicial system on deficient enforcement practices. (See also Litter and Cleanup strategies/programs identified in the Appendix.)**

#### **Institutions and Businesses**

- **Establish training programs to aid your business/institution in developing and implementing waste management plans that reflect best practices and how to approach zero waste.**
- **Each enterprise should establish aggressive waste reduction and recycling goals. Require departments to create and achieve their own goals. Holding individuals responsible for achieving these goals is one way of accomplishing this strategy. Another is to provide incentives. Provide needed support (e.g. waste audits, information, collection bins, etc.).**
- **All schools should have a waste management plan that inspire, educate and train students.**

#### **Individuals**

- **Become educated in best household waste management practices. Support other stakeholder groups, especially schools, in their efforts to generate the least amounts of waste possible (the overall goal being 0 waste), and establish efficient waste management practices, such as comprehensive recycling programs.**
- *Stop drinking bottled water.*
- *Bring your own bags to stores.*

**Goal 2: By June 2009, the City of New Bedford will adopt a comprehensive Resource Thrift and Waste Management Plan that adjusts Goal 1, and specifies aggressive future milestones for MSW reduction and the strategies needed to achieve those goals.**

**Rationale:** The City has limited information on the contents of its waste stream. Consequently, it is difficult to develop goals that reflect probable waste reduction potential (*With this said, it remains the Committee's conviction that Goal 1 be accepted and that implementation of the Pay-As-You-Throw strategy not be delayed*). A waste stream analysis will provide a numerical understanding of the waste generated, which in turn will enable more informed consideration of possible strategies for creating near- and long-term milestones for waste reduction and recycling. Goal 2 identifies the City as the lead orchestrator of the Goal, describes the outcome, and establishes a schedule. This goal will be motivational, memorable. It will support New Bedford's current sustainable waste management efforts, and encourage the expansion of the process of

designing and implementing an even more comprehensive and aggressive waste reduction (hopefully beginning with reduced generation) and recycling plan.

## **Implementation Strategies**

### **Government**

- **Prepare a waste stream analysis that provides sufficient detail to identify strategies and programs for all classes of waste and all classes of generators. Based on the waste stream analyses create an overall plan to guide waste management.**
- **Revise the Resource Thrift and Waste Management Plan in 4 years after sufficient time has elapsed to evaluate the effectiveness of the strategies and implementing programs.**

### **Institutions and Businesses**

- **ABC Disposal and other key players will need to be intimately involved in the plan development and implementation.**
- **Individual enterprises and institutions should be involved in plan development and implementation.**
- **Coordinate an effort with City to map waste streams and raw material streams so resource loops may be closed and appropriate business may be recruited.**

### **Individuals**

- **Individuals should be involved in plan development and implementation.**

**Goal 3: New Bedford residents, businesses, government and other institutions are committed to green building: the efficient use of resources and materials that are used in the construction, renovation and operation of our private and public buildings.**

**Rationale:** Green building is a form of resource-efficiency (See Goal 4) and an emerging niche in the construction industry. It also is rapidly evolving, as product innovations are common. Green construction principles are varied, involving such approaches as the reuse of existing buildings, rather than building new; construction of more compact spaces that require less materials to construct and less energy to heat and cool; designing buildings to take advantage of the sun in the winter and cooling winds in the summer; incorporation of salvaged materials; using natural products such as cork and lumber from sustainably harvested forests; incorporating renewable energy systems and resource-efficient appliances; using natural lighting instead of relying on artificial lighting, to name a few.

One can measure sustainable construction (i.e. green construction as % of new construction and permits); however, it is more difficult to quantify sustainable operations of houses and buildings. The result of the goal will be memorable – in terms of design innovation and aesthetics, because many of the green buildings display an attention to detail and to how individuals relate to the space. It will also be measurable as the amounts of waste generated during construction decrease, and because waste management practices such as increased reuse and recycling efforts

increase the financial bottom lines of building projects, as well as reduce disposable waste amounts.

## Implementation Strategies

### Government

- All new City buildings and renovations should specify green, resource-efficient design and products; they should be LEED certified or the equivalent.
- Collaborate with architects, designers, manufacturers and builders to develop a working understanding of green building and support green building.
- Ensure building codes facilitate green construction.
- Ensure that provisions for design and construction exceptions are processed expeditiously.
- Ensure that City ordinance and regulations support green building practices, and that all personnel are knowledgeable about green building practices.
- Support forums for sharing knowledge about green construction within the industry and with the public.

### Institutions and Businesses

- Create a forum for the exchange of information on green building, such as establishing a chapter of the US Green Building Council.
- Any new construction or renovations (new building projects of any kind) to existing buildings should specify green, resource-efficient design and products, as well as require the use of sustainable building practices.
- Renovations should preserve the ability to reuse or recycle unwanted materials.

### Individuals

- Any new construction or renovations to existing residences should specify green, resource-efficient design and products, and sustainable building practices.

<p><b>Goal 4: New Bedford residents, businesses, government and other institutions are committed to operations that are resource-efficient and socially responsible.</b></p>
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**Rationale:** Resource efficient operations are those that have limited the expenditure of raw materials in performing useful work. The consumption of materials is based on a life-cycle cost analysis that quantifies 1) the inputs during the product design and development, 2) manufacture, 3) packaging and delivery to point-of-use (distribution), 4) installation, 5) actual use, 6) reuse and eventual decommissioning. Determination of social responsibility is evidenced by consumer-friendly design, fair trade practices and the conduct of participating players.

Resource efficiency can be problematic to quantify. Information from the supply chain regarding sources of raw materials, components, and labor can be difficult to acquire (However, there is growing pressure for manufacturers to disclose the ‘footprint’ of their products, in the way, for instance, that food producers display nutrition information). The goal is value-based and for many is more memorable when the goal is ignored (Remember Nike’s brand deterioration when it was revealed that their costly footwear was being produced with sweat shop labor?).

## Implementation Strategies

### Government, Institutions, Businesses and Individuals

- **All should commit to the purchase of resource-efficient and socially responsible products and services. Life cycle cost analysis should be part of green procurement policies (See also Economic Development Goals).**
- **Continue and expand efforts to recognize resources in the waste stream, and to harvest it for productive use.**
- **All should collaborate in the creation and use of resource exchanges that facilitate the disposal for reuse/acquisition of raw materials, unneeded or unwanted products [e.g. old computers, pallets, partial cans of paint, packing pellets and other packaging materials etc.].**

**Goal 5: New Bedford businesses will incorporate sustainable design principles into the products they design and manufacture.**

Every business should adopt product stewardship. That means taking back products after they are used. Business should also take back the packaging of their products.

Ecologically responsible design involves a set of principles that collectively minimize the resource footprint of the product that is being produced. From a life cycle perspective these principles include maximize product safety during all its stages: from procuring raw materials, to consumer use, to disposal.

- Substitute abundant source materials for scarce
- Substitute degradable source materials for persistent
- Reduce dependence on fossil fuels
- Draw renewable resources only from well-managed systems
- Make the product durable
- Make product packaging minimal, reusable, and compostable
- Sustainable design of a product considers reuse, refilling, remanufacturing, recycling and repair

Measurement can be challenging. Design awards are one indicator. The benefit of sustainable design is that the marketplace often associates design excellence with product excellence, enabling the manufacturer to command a premium for the product.

### *Implementation Strategies*

#### **Institutions and Businesses**

- **Create forums for local manufacturers and large businesses on the attributes and benefits of sustainable design.**
- **Recognize and publicize the efforts of local businesses and institutions whose products and services reflect outstanding achievements in sustainable product design.**

**Goal 6: New Bedford's land use, solid waste, economic development and facilities planning will reflect an understanding of waste as resource.**

The City of New Bedford has numerous, diverse resources that are not captured: they are wasted.

These resources include:

- Solar energy potential (that can be captured through collectors)
- Wind energy potential
- High- and Low-temperature heat (such as, stack releases)
- Unconsumed food from restaurants and kitchens (that can be donated to feed the less fortunate)
- Vegetable scraps from restaurants (that can be composted)
- Vacant properties (that can be redeveloped into community gardens, energy farms)
- Vacant buildings (that can be redeveloped into co-housing and other uses)
- Fish processing wastes (that can be reprocessed)
- Construction waste

Initial projects to identify New Bedford's potential resources have been completed; however, they do not represent a comprehensive assessment. Integrating resource identification, use and protection can be demonstrated in City plans. The goal is not as memorable as will be the publicizing of the projects that result.

### *Implementation Strategies*

#### **Government**

- **Incorporate resource identification, protection and use into City plans, policies, programs and actions.**
- **Collaborate with businesses and institutions to accelerate the evaluation and deployment of potential resource-efficient projects.**
- **Ensure that private development projects 1) do not compromise the future availability of resources, 2) that they optimize the generation of renewable energy resources, and that 3) operational wastes are minimized.**
- **Plan a virtual eco-industrial park.**

#### **Businesses and Institutions**

- **Ensure that new development and redevelopment projects do not compromise the future availability of resources, but rather optimize the generation of energy resources, and that operational wastes are minimized.**
- **Educate and exchange information on resource efficiency via forums and conferences and establish networks on cradle-to-cradle design and industrial ecology**

# Water

## **Introduction**

Water is a common chemical substance that is essential to all known forms of life. Human beings can live without food for weeks, but we cannot live without water for more than a few days. Clean, fresh drinking water is essential to all human life.

Additionally, water is needed to support a higher quality of human life in a wide variety of ways: agriculture uses water for irrigation, manufacturing uses water for industrial processes, fishing and aquaculture use water to harvest food, and transportation & commerce use water to provide routes for hauling products to markets. All of us use water to provide recreational opportunities, air-conditioning, heating, and cooking.

It is therefore crucial that we have a sufficient supply of safe drinking water, and it is very important that our non-potable water sources remain suitable for supporting a high quality of life.

When the Water Subcommittee initially met, we focused on ensuring a sustainable supply of high quality drinking water but after a bit of research, we discovered that the City of New Bedford is already endowed with a generous supply of clean drinking water. We therefore expanded our original “Goals” to incorporate surface water clean up per a number of suggestions from various Task Force Members and other Community Members.

## **GOALS and STRATEGIES**

### **Goal 1: Reduce water consumption by at least 20% by 2020.**

**Rationale:** The City of New Bedford has reduced water consumption dramatically over the past decade but, given water shortages in other areas of the country and even in other areas of Massachusetts, additional reductions would still be beneficial.

### **Goal 2: Improve drinking water quality by at least 20% by 2020.**

**Rationale:** City of New Bedford potable water already meets all guidelines for drinking water but perhaps our drinking water can still be improved. Lead sometimes leaches into home water supplies from older supply piping. Currently we use traditional chemical treatments in our potable water; perhaps new technologies can avoid or reduce the use of disinfectants. Drinking water quality may be threatened by run-off or invasive species infestations at the reservoir.

### **Goal 3: Reduce toxic or unsanitary run-off into harbors, rivers, and the bay by at least 20% by 2020.**

**Rationale:** The first source of pollutants in our water system is infiltration into our sewer lines and cross-connections with the storm water system which causes flows to our sewerage treatment plant that sometimes exceed the capacity of the plant to process wastes; this situation can force the release of untreated and unsanitary water at the outflows. These CSO (Combined

Sewerage Outflow) events have been significantly reduced from Clark's Cove and the Inner Harbor, but further work on this problem can eliminate this source of contamination completely.

A second source of contamination is surface run-off that may contain salts, dissolved heavy metals, hydrocarbons, or oxygen-consuming wastes. Filtering surface run-off through marshlands and plant materials can eliminate this source of pollution.

The third source is the well-known historic burden of toxic materials that were deposited along The Acushnet River and in New Bedford/Fairhaven Harbor, including hydrocarbons and PCBs; this existing pollution is currently being professionally removed by the Federal government at a very slow pace. Accelerating this cleanup would be in best interests of everyone.

Finally, a fourth source of waterway contamination is outflows from our marine vessels.

## **Implementation Strategies**

### **Government**

- **Continue the current program to address infiltration and cross-connections into sewer lines.**
- **Continue participating in Oil Spill prevention efforts and local response planning for hazardous materials spills in our waterways.**
- **Advocate for speedier federal cleanup of New Bedford Harbor.**
- **Establish a Water Quality Task Force to research and recommend improvements to our water quality (See Appendix: Water Quality Task Force).**
- **Establish a Denitrification Task Force with Acushnet and Fairhaven to address nitrogen pollution in the harbor.**
- **Establish a Boat Waste Pump-Out Station for commercial and recreational boaters on New Bedford Harbor. Co-locate a Bilge Oil Collection Station.**
- **Institute an educational outreach effort to inform parents and children about how to avoid lead poisoning (See Appendix: Avoiding Lead Poisoning).**
- **Incorporate Green Roofs (See Appendix: Green Roofs), Green Walls (See Appendix: Green Walls), Permeable Paving (See Appendix: Permeable Paving), Dual-Flush Toilets, Waterless Urinals, Low Flow Faucets and Shower Heads, and other Water-Saving or Water-Quality-Improving Features in all new City Buildings or major alterations projects.**
- **Pursue an Energy and Water Conservation Performance Contract (See Appendix: Performance Contracting).**
- **Pursue the recommendations for future improvements outlined in the City of New Bedford CSO Baseline Conditions Report drafted by Camp, Dresser, & McKee:**
  - **Clarks Cove: Consider storage to help limit CSO discharges to the Cove to four overflows per year or fewer. According to annual simulations, approximately 27 overflows occur in an average year to the Cove. Most of the volume discharges through outfalls 003 and 004. A 4 MG storage tank would provide 3-month level of control for these CSOs. An additional 1 MG of storage would be required to capture 3-month overflows from CSOs discharging to Clarks Cove along Clarks Point. Evaluate the potential to**

increase the control level by diverting tank overflows beyond the 3-month storage capacity to the Inner Harbor. This approach is consistent with that recommended in the 1990 Facilities Plan, with the exception of the tank being much smaller (4 to 5 MG rather than 20 MG).

- All Receiving Waters. Evaluate the benefits of increasing conveyance capacity to the WWTP through interceptor improvements. These improvements might extend beyond the planned grit removal project, and may consider new parallel interceptors with steeper slopes.
- All Receiving Waters. Evaluate increasing wet weather treatment capacity at the For Tabor WWTP. This would include the addition of wet weather treatment facilities to enable more flow to be treated at the plant. Also, the plant is rated for 75 mgd, but influent flows only reached 70 mgd during the 2005 metering program. Evaluate the potential to consistently reach the full 75 mgd rated capacity through optimized operations to reduce CSO events to all receiving waters.
- Inner Harbor. Improve upstream conveyance in areas where regulators are activating prior to the WWTP reaching capacity.
- All Receiving Waters. Continue separation projects and system infrastructure improvements where needed to minimize inflow and infiltration to the combined sewer system and alleviate surcharging problems and basement backups.
- All Receiving Waters. Evaluate options for private inflow removal to maximize the benefit of the City's past separation projects.
- Recommend that the City of New Bedford specify permeable pavings in lieu of more traditional paving in all situations where possible. (see Appendix, Permeable Paving)
- It is also recommended that the City of New Bedford recommend the use of permeable pavings to private developers working in the City, and provide incentives, such as a reduction in zoning requirements, to encourage the use of these greener materials, as well as green building practices in general. (see Appendix: Permeable Paving)
- All new buildings should be candidates for green roofs. A life cycle cost analysis should be required of all new City buildings, to determine when or not it would be wise to include a green roof in the design of the structure. (See Appendix: Green Roofs)
- "Partially green roofs" should be mandatory on all city buildings. The advantages of green roofs may be obtained on all existing buildings when they require re-roofing through the installation of a "partially" green roof. Such a roof utilizes additional lightweight insulation and a white roofing membrane to achieve a significant reduction in heating and cooling loads. By controlling for insulating values and albedo effect (see definition: Albedo), some of the benefits of green roofs can be achieved at virtually no additional costs over traditional asphaltic roofing materials. (See Appendix: Green Roofs)
- Installing exterior green walls, particularly on south-facing facades, should be considered for all significant City buildings. (See Appendix: Green Walls)
- *Complete a forestry analysis of our watershed.*

**Institutions and Businesses**

- Investigate sewer lines for cross-connections. If any are found, re-route rainwater drain lines.
- Integrity-test any oil storage tanks and associated piping; if leaks are found, replace the leaking components. Verify compliance with SPCC regulations if applicable.
- Investigate water supply lines and test for lead. If lead is found, replace piping as needed.
- Incorporate Green Roofs (See Appendix: Green Roofs), Green Walls (See Appendix: Green Walls), Permeable Paving (See Appendix: Permeable Paving), Dual-Flush Toilets, Waterless Urinals, Low Flow Faucets and Shower Heads, and other Water-Saving or Water-Quality-Improving Features in all new buildings or major alterations.
- Pursue an Energy and Water Conservation Performance Contract (See Appendix: Performance Contracting).

**Individuals**

- Investigate sewer lines for cross-connections. If any are found, re-route rainwater drain lines.
- Inspect oil storage tanks and piping. If leaks are found, replace the leaking components.
- If you own a boat, consistently adhere to all federal and state regulations for pumping boat wastes and bilge water.
- Educate yourself and your family to avoid lead poisoning (See Appendix: Avoiding Lead Poisoning) and take steps to de-lead your home, yard, and belongings if financially feasible.
- Replace older faucets, showerheads, and toilets with new, low-flow fixtures.
- Plant trees, shrubs and grasses in any bare spots.

# Transportation

New Bedford, like many cities, is perfectly positioned to become a model of sustainability. We have walkable neighborhoods, close to parks, retail centers, jobs, and public transportation. The city developed before the age of the automobile so we are not as dependent upon the car as our suburban neighbors. Re-visioning our need for--and provision of--transit is key to this future. Transportation accounts for a third of greenhouse gas emissions, and is a major contributor to our reliance on foreign oil. Most sustainable transportation plans advocate for far less dependence on the private automobile. Because our built environment caters to the automobile, it is often difficult to vision other possibilities. But the converging forces of climate change, fossil fuel depletion, air quality concerns, and aging infrastructure make such plans imperative.

Therefore, a sustainable transportation plan must include reducing our dependence on the automobile, favoring walking and bicycling as our prime modes of travel, and rebuilding our public transportation systems. Such a plan involves short, medium, and long-term actions as well as continual dialogue with residents, surrounding communities, and regional agencies. Many cities across the country and the world have been revitalizing themselves through sustainability plans, and can provide excellent procedural models.

According to the Global Development Research Center, sustainable transportation projects attract new business, generate sales, encourage local circulation of money, stimulate retail trade, offer cost effective services, encourage high value land use, increase productivity, and reduce transportation costs. They also foster economic development, reduce infrastructure costs, and create jobs. Such a plan also provides the opportunity to look at a number of sustainability issues--including food, economic development, community cohesiveness and health--in a coordinated way.

## GOALS and STRATEGIES

### **Goal 1: Make our neighborhoods places we want to be.**

**Rationale:** A key component of reducing transportation needs is changing our goal from mobility to access. This allows us to focus on bringing to our neighborhoods and city the things that we currently travel to find. As has been suggested elsewhere in this document, we might consider re-visioning New Bedford as a collection of villages, and begin to ensure that most necessary services are within walking distance of village residents, including jobs, libraries, schools, grocery stores, medical care, movie theatres, and community centers.

### *Implementation Strategies*

#### **Government**

- **Encourage through ordinance and regulation mixed-use development.**
- **Consider what roads may be turned into transit ROW's.**

- **Provide free teleconferencing capabilities to promote a decrease in air and commuter travel.**
- **Hire local companies and residents whenever possible.**
- **Conduct neighborhood-by-neighborhood conversations about traffic and community design.**

#### **Institutions and Businesses**

- **Encourage employees to work at home, a day, a week, or more.**
- **Locate in Neighborhoods rather than in outlying areas.**
- **Hire local employees and contractors.**
- **Buy and source goods locally.**

#### **Individuals**

- **Live where you work; work where you live.**
- **Buy Local goods; hire local contractors.**
- **Develop neighborhood sustainability groups to discuss the redesign of streets to accommodate the needs of local residents.**

#### **Goal 2: Increase walking and biking.**

**Rationale:** By re-localizing our neighborhoods, we'll enable residents to conduct much of their business by walking or cycling. "Walkable communities put urban environments back on a scale for the sustainability of resources (both natural and economic) and lead to increased social interaction and physical fitness, while diminishing crime and other social problems." <http://www.walkable.org/> We can also begin to connect our neighborhoods to other towns by working collaboratively and regionally on bike and walking paths. Both the State of Massachusetts and SRPEDD have SouthCoast bike plans that include New Bedford.

#### *Implementation Strategies*

##### **Government**

- **Plow sidewalks as well as streets.**
- **Ensure that all schools are accessible by sidewalks and bike paths, so that walking or biking to school is feasible.**
- **Institute 'traffic calming' measures to encourage use of streets for more than automobiles.**
- **Provide more crosswalks throughout the city.**
- **Investigate public bike systems.**
- **Install bike racks in public areas.**
- **All new street designs should include pedestrian and bicycle areas; redesign existing streets to provide sidewalks as needed.**
- **Require bike racks on buses.**
- **Develop a city bike committee and work with planning agencies and other towns to complete the SouthCoast bike path.**

### **Institutions and Businesses**

- **Provide incentives for employees and students to bike and walk to work and school.**
- **All new construction, including street construction, should include ample spaces for walking/biking.**
- **Consider developing bicycle sales, rentals, and repair shops.**
- **Place bike racks in public areas.**
- **Large employers should accommodate bike commuters with bike racks, showers, and locker rooms.**

### **Individuals**

- **Choose to walk or bike whenever possible.**
- **Begin walking/biking clubs.**
- **Advocate for a walkable city.**

### **Goal 3: Increase sustainable public transportation options.**

**Rationale:** Not all travel is feasible by foot or cycling. In anticipation of rapidly-rising fuel prices, our communities should be working together to develop public transportation systems that are accessible to all residents, traverse the entire city, connect to regional transportation systems, and have convenient schedules.

In addition to the long-term health and environmental benefits of a sustainable public transportation system, the development of this system will increase the numbers of jobs in such fields as design, construction, manufacturing, and operation.

### *Implementation Strategies*

#### **Government**

- **Develop transit-oriented neighborhoods.**
- **Plan for charging stations for plug-in hybrids.**
- **Regionally, plan long term, and in conjunction with adjacent communities.**
- **Use the SouthCoast rail planning process as an opportunity to develop a comprehensive inter-modal plan for the city and the region.**
- **Develop a coordinated land use and transportation plan.**
- **Develop an electric rail or trolley system throughout the city.**
- **Investigate expansion of clean water transportation.**
- **Upgrade the city's fleet of vehicles to electric or hybrid.**
- **Upgrade city and school buses to hybrid or electric; investigate and take advantage of opportunities provided by the state.**

#### **Institutions and Businesses**

- **Create incentives to encourage use by employees of public transport.**
- **Locate near public transport and advocate extension of the public transportation system.**

- Partner with the city on design of routes.
- Large employers should install free charging stations for plug-in hybrids.
- Offer bio-diesel as alternative fuel.
- *Install food and drink kiosks at heavily trafficked bus stops to make them more attractive to potential passengers.*

#### Individuals

- Locate near transit centers.
- Use public transport whenever feasible.
- Make your next car a hybrid.

#### **Goal 4: Aim to be non-automobile centric.**

The next several years will be a time of transition. While encouraging walking, biking, and public transport, we need to develop policies that discourage the use of single-passenger automobiles in the city.

#### *Implementation Strategies*

##### Government

- Zone for dense development (with reduced parking requirements) around future rail stations.
- Reduce parking space per capita ratios to reflect and influence increases in public transportation, foot traffic, and bicycles as main means of movement.
- Investigate tax incentives for hybrid and other fuel-efficient cars.
- Investigate a smart-jitney system that organizes car rentals and sharing.
- Consider turning some streets into no-car zones.
- Lobby our State and Federal governments to develop laws and regulations re: conservation measures, including fuel-efficient cars, higher CAFE standards, and driving at 55 miles per hour.
- Lobby our State and Federal governments for transportation vehicles and systems, which are designed, manufactured and distributed as sustainably as possible. (50,000 lbs. of waste to make one 3,000 lbs. car is not a sustainable practice. *source: Ford motor company*) For example, this would include the development of ‘zero emission’ engines for planes, trains, and automobiles
- Lobby State and Federal governments to require through laws and regulations the incentives needed to spur the development of local sustainable mass transportation options, including trains, local trolley systems, and airplanes.

##### Institutions and Businesses

- Provide incentives for employees to carpool.
- Consider charging higher parking fees to encourage employees to take public transport.
- Develop car-sharing services.

**Individuals**

- **Consider doing without a car, or car sharing.**
- **Make fuel efficiency a prime consideration when buying a car.**
- **Keep your tires inflated.**

DRAFT

# Education

## No Child (in New Bedford) Left Inside

In the mid-1990s, scientists became concerned about global warming caused by increased carbon emissions from the mining and burning of fossil fuels, deforestation, loss of once-fertile farmland, and pollution of the oceans and the air. Realizing that education was the key to responsible stewardship of natural resources, the Clinton-Gore administration commissioned *Education for Sustainability: An Agenda for Action*. This report identified six core themes: (1) lifelong learning, (2) interdisciplinary approaches, (3) systems thinking, (4) community partnerships, (5) multicultural perspectives, and (6) citizen empowerment. Today, with scientists increasingly worried about rapidly accelerating climate change, it is more important than ever that these six sustainability themes be the backbone of our educational system.

Sustainability assumes that ecology, economy and equity are interconnected and have reciprocal impacts on each other. Economies based on consumption and waste as well as exploitation of natural and human resources are not sustainable. Sustainability Education aims to realign human intentions, actions and institutions with the natural systems of Earth through interdisciplinary curricula and pedagogy for schools and colleges that include environmental education but are not limited to environmental science.

Sustainability Education aims to help people understand the inter-relatedness of economics, politics, sociology and environmental science and other subjects which academia has traditionally treated as separate disciplines. According to Dr. Richard Cooper, a Professor of International Economics who teaches a freshman seminar on "Public Policy Approaches to Global Climate Change" at Harvard: climate change is "the perfect subject to make the case for a liberal arts education. You need to have some understanding of about seven subjects to comprehend global climate change" (*The Yard*, fall/winter, 2007, 18).

Unfortunately, environmental education was buried by the Bush Administration's No Child Left Behind Act (NCLB) in 2002, which has had largely negative impacts on public schools, especially urban schools. Fortunately, the pendulum is swinging back. In the summer of 2007, Maryland Congressman John P. Sarbanes and Rhode Island Senator Jack Reed introduced The No Child Left Inside Act, which calls for required environmental education and asks Congress to

provide federal funding to the states for environmental education and teacher training.

In his book *Last Child in the Woods: Saving Our Children from Nature-Deficit Disorder*, educator Richard Louv describes how American children have gradually become estranged from nature. To make up for children's lack of exposure to the outdoors, Louv recommends that schools take students outside for experiential learning. Interdisciplinary projects, which integrate English and math with geography, history, science, economics and the arts, are vital. Some schools encourage students to plant gardens and create ponds on school grounds; other provide field trips to a local river, park, or farm so that students in all grades can study natural ecosystems firsthand. For many city youngsters, outdoor adventures provided by school are their first encounter with open spaces and unspoiled waterways. "I never saw a reservoir before. It was so beautiful, so clean," one inner city child observed during her first field trip (Louv, 213). Such excursions sow the seeds of wonder and respect for the natural world and the ways in which it supports all living beings.

Current research shows that American schools that offer outdoor education have higher test scores, lower drop-out rates, and fewer disciplinary problems. At a Portland, Oregon, school where students learn mathematics, science, social studies and English language arts by studying a local river, 96% of the middle school children exceeded the state standards for math compared to 65% in neighboring schools. A Minnesota high school reported 54% fewer suspensions after an outdoor education-based curriculum was adopted, and a nearby middle school reported that within two years of adopting a similar curriculum, referrals to the principal's office went down dramatically, from a high of 560 to 50 the second year. (Louv, 206).

At the Global Learning Charter Public School in New Bedford, where project-based learning encourages creativity and cooperation, students consistently outperform their peers in New Bedford schools on MCAS tests. Similarly, many students who would be labeled "at risk" in conventional high schools succeed at Greater New Bedford Vocational-Technical School because they have opportunities to connect job-related training with what they learn in academic classes.

Today's businesses want employees to be able to think outside the box—to be creative problem-solvers who can work in teams. Experiential nature-based projects that involve observing real-life phenomena, learning how to evaluate evidence, working cooperatively to find creative ways of solving problems and presenting the results to classmates and teachers provide the cognitive-

affective integration, mind-body balance, and the skills all youngsters need to become imaginative learners and critical thinkers.

Cooperation between local colleges and universities and K-12 schools is crucial for sustainability education to flourish. UMass Dartmouth has recently opened an Office of Sustainability in New Bedford and will soon be offering an undergraduate Minor in Sustainability. The university offers team-taught freshman seminars on such topics as consumption and advanced courses such as “Chemistry and the Environment,” “Sustainability Education and Public Policy” and “The Politics of Everyday Things,”

Partnerships between the university, the schools and the community are increasing as people become aware of the need to understand and deal with climate change. UMass Dartmouth’s marine scientists are mapping the ocean floor and working with fishermen to create sustainable fisheries, and scientists in other university departments are doing research and development of organic fertilizer and rubber-based permeable paving materials. Some UMD students are doing service learning projects at Buttonwood Park Zoo and the City’s recycling center, and others are creating an effective recycling program for the campus or making plans to start an organic farm on the Dartmouth campus.

With its emphasis on environmental stewardship, economic stability and social equity, Sustainability Education can unite people and ensure the continued evolution of animals and plants and the moral evolution of humanity. Only by caring for Earth can humans and other living beings enjoy safe, healthy and productive lives.

### **Sustainable Education in New Bedford: A Natural Balance**

#### **GOALS & REASONS:**

#### **A. Schools will be designed and operated according to sustainable principles and practices and will serve as working physical models and ‘laboratories’ of sustainability.**

Accelerating climate change and current epidemics of childhood obesity, diabetes, ADHD, asthma, autism, various kinds of anti-social behavior and violence sound ample warnings that our reliance on fossil fuels and unsafe commercial products is not sustainable. School buildings will become energy-efficient, green and clean; they will utilize non-toxic

cleaning supplies and safe materials in all school supplies and serve only healthy food and beverages. Reducing their carbon footprint will improve the quality of the surrounding water, soil and air quality; it will also aid in the effort to slow global warming.

**B. Schools will teach the value of biological and cultural diversity, the beauty of Nature, and the interdependence of all life forms on Earth.**

Nature-based projects provide cognitive-affective integration, mind-body balance and social skills. Current research shows that schools offering outdoor education have higher test scores, lower drop-out rates, and fewer disciplinary problems. Teachers in the New Bedford Public Schools will take their students to local cultural institutions and environmental centers, and students will be able to devote time to being outdoors as well as studying science, social studies and other subjects and drawing on community resources

**C. Students, teachers and school staff will be informed advocates for sustainability principles and practices.**

Human survival depends on the health of Earth's natural systems and the protection of our culturally and biologically diverse world. We must adopt a sustainability ethic (see Appendix) that teaches awareness of the limits Nature sets on human behavior and responsibility for our complicity in global warming, chronic health problems and crippling learning disabilities. Only an alliance of concerned individuals and community organizations with educational and governmental officials can ameliorate the inequities of poverty and racism, and reverse catastrophic climate change.

**GOALS & STRATEGIES:** Some general strategies are listed below; the many specific strategies for teachers and students we can think of are too numerous to list here. We hope copies of the final MSTF report will be available to the public at the Free Public Library.)

**Goal 1: Schools will be designed and operated according to sustainable principles and practices to serve as working physical models and 'laboratories' of sustainability.**

*Implementation Strategies*

**Administrators and Schools:**

- **Retrofit the city's schools to follow LEED standards as a minimum.**
- **Eliminate on-site chemicals and toxins.**
- **Plant trees and gardens on school grounds.**
- **Increase the energy efficiency of all school buildings, vehicles and equipment.**

**Teachers, Students and Staff:**

- **Insist that schools be healthy, non-toxic places to work in terms of building design, energy systems, and classroom supplies.**
- **Organize and maintain a comprehensive recycling program.**
- **Insist that school lunches be nutritious and that vending machines dispense only healthy snacks and drinks.**
- **Learn how to make ecologically sensible choices about commercial products, health and nutrition.**

**Businesses and Non-Profits:**

- **Convert all facilities to environmentally and economically sustainable systems.**
- **Work with the School Department to clean up school sites.**
- **Institute training programs related to environmental engineering and technology and assist schools to become more energy efficient and to prepare students for green jobs.**
- **Partner with the schools to develop sustainable solutions.**

**Goal 2: Schools will teach the value of biological and cultural diversity, appreciation for the beauty of Nature and the interdependence of all life forms.**

*Implementation Strategies***Administrators and Schools:**

- **Eliminate federally mandated, high-stakes standardized testing as soon as possible in favor of the following:**
  - 100% high school graduation rates
  - significant increases in career placements
  - significant increases in higher education placements
- **Adopt a comprehensive hands-on, interdisciplinary environmental education curriculum for grades K-12 that integrates the study of local history, marine ecology, fisheries and farms and core curricular subjects such as English Language Arts, math and science.**
- **Provide in-service environmental literacy training for teachers and administrators.**
- **Support professional development for teachers via innovative programs such as SmartFish and Earth Artist, ZERI learning, the Edible Schoolyard, Project Wild, Project Learning Tree, Seed to Table, Hooked on Nature, Roots and Shoots, Schoolyard Habitats and Math Dance.**

**Teachers and Students:**

- **Help schools adopt systems thinking, project-based learning and alternative assessments instead of standardized tests.**
- **Increase environmental literacy through hands-on activities and projects that connect and integrate traditional subjects with sustainability studies.**

- Do a forestry analysis of the watershed and participate in the City's tree planting initiative and proposed tree farm.
- Teach civics, ethics, law, and economics in relation to sustainability principles and goals.

#### **Businesses and Non-Profits:**

- Give grants to teachers to attend environmental education training workshops.
- Increase opportunities for youngsters to attend summer school, outdoor camp, wilderness programs, sea labs, and other summer programs.
- Underwrite gardens, parks and tree farms and pay students to take care of them.
- Pay teachers and parents to supervise after-school and weekend outdoor education programs.

**Goal 3: Students, teachers and school staff will be informed advocates for sustainability principles and practices.**

#### *Implementation Strategies*

##### **Administrations and Schools**

- Create service-learning partnerships with local environmental centers, cultural organizations and colleges to provide experiential learning credits for students.
- Educate the public about the City's sustainability goals and strategies by offering adult education and sponsoring sustainability fairs.
- Integrate sustainability education into all areas of the curriculum and collaborate on sustainable solutions such as learning how to calculate and reduce carbon footprints.
- Keep one or more schools open at night for adult education and community teach-ins on renewable energy, farming, nutrition and family health led by students, teachers and volunteers from New Bedford and surrounding towns.

##### **Teachers and Students**

- Become eco-literate ambassadors who can inform others in the community about sustainability through projects such as teach-ins and ecology fairs.
- Understand how Earth's life support systems make the planet habitable for all species.
- Create a Sustainability Club and website at New Bedford High School where students and teachers can share information and strategies with members of the community.
- Submit articles on sustainability to local newspapers and do radio and television spots and shows on environmental, economic and equity issues for academic credit.

**Businesses and Non-Profits**

- **Hold open houses for high school students to visit your workplace for a day or invite students to see what the people in offices, stores, plants and fishing vessels actually do. Visit the schools to talk about job interviews, careers, and work.**
- **Support the sustainability website and sponsor contests for young people to come up with solutions to the city's transportation, health and housing problems.**
- **Fund a biodiesel-powered Enviromobile to disseminate information about sustainability to the various City neighborhoods.**
- **Support keeping schools open at night on a rotating basis so that programs on energy efficiency, cultural awareness, nutrition and family health can be offered throughout the city.**

## **Food, Fishing, and Agriculture**

New Bedford is surrounded by farms and contains a few small growing operations within the city. As the nation's top-dollar port for eight years in a row, New Bedford's role in food production is international in scope. As a refrigeration port, it serves as a distribution point for both seafood and produce from around the world.

Supporting locally produced food helps preserve local farms, sustains regional jobs, and can improve the health and economic stability of residents. Locally grown food can displace some processed and low nutrient foods, and at the same time allow residents to be more self-sufficient and save on the expense of imported foods. Finally, this region's plentiful local food offerings can boost the branding of New Bedford as a destination with unique features and assets. Working landscapes, whether farms, nurseries, bogs, or our own working waterfront define our character.

Food and agriculture are critical components of a sustainability plan, especially for an urbanized area such as New Bedford. Historically, large urban centers generated much of the food needed by city residents. Many cities in developing countries still continue to produce significant quantities of their own food within a 25-mile circle of the city center. Since most people worldwide will live in cities by the turn of the century, it is imperative that cities consider the production, marketing and distribution of food, as well as the recycling of food wastes within their boundaries and bioregions. Even with this region's short growing season, producing a significant volume of local food is feasible.

New Bedford influences regional agriculture. Many food-related businesses purchase large quantities of fresh food to meet the demand of clientele comprised of residents, regional day workers, and some visitors. Significant institutional purchasing decisions about food are made at schools, grocery stores, city shelters, the prison, and so on. Using locally grown food instead of importing from long distances via land transport will have a major impact on the region's energy budget (the energy used to transport food), regional water quality and wildlife preservation, regional land use, and public health. New Bedford can devise city policies that encourage sustainable agriculture, fishing, and private institutions. Individuals can also make food-related choices that greatly influence aspects of long-term sustainability.

In addition to food purchases, there are local opportunities for greater food production. There is still a significant amount of vacant land, both public and private, that could be used, even temporarily, for food production. Even New Bedford's typically small back yards could be much more productive if residents increased fruit-tree planting and greens crop production. Aquaculture is a worldwide growth industry with almost no presence in New Bedford.

Access to nutritious food is another important consideration. Significant numbers of New Bedford residents, particularly those with low incomes, lack food security. Their access to food that is nutritious, affordable, safe, and culturally responsive must be a principal goal of a plan for sustainability. Food access can be improved through better systems of commercial food

distribution, better transportation for grocery shopping, more grocery delivery services, more nutritious food in corner stores, more farmers' markets, and better utilization of federal food programs. Expanded opportunities for cooperative food purchasing, additional community, school and household gardens, etc., can also increase easier access to good food.

Improved and increased nutrition education, particularly in schools and senior centers, will also contribute to healthier food choices, which will in turn lead to a physically healthier citizenry.

New Bedford will be on the road to sustainability when it creates an environment in which local and regional agriculture can thrive, fish harvests are healthy, and access to safe affordable food for all New Bedford residents is ensured.

## **GOALS and STRATEGIES**

### **Goal 1: Educate the public about the benefits of locally grown food.**

**Rationale:** Education is the key to helping people to understand the benefits of locally grown/produced food and beverages. In our area, local animal and produce farmers, as well as the orchard growers, have always provided education about their operations and products to the public at convenient times, including visits by school children to their farms. Encouraging the expansion of this on-going effort, through in house programs for institutions, senior organizations (many of the seniors probably grew up on farms), and youth programs, would help even more people understand the value of the agricultural resources available in our area.

#### *Implementation Strategies*

##### **Government**

- **Through a public process develop a Food Policy Council that promotes public and private solutions to the barriers and deficiencies of food access for New Bedford residents.**
- **Promote backyard gardening through incentives such as expertise and equipment.**

##### **Institutions and Businesses**

- **Explore local interest in creating a group of concerned citizens to help schools switch to seasonal local food.**
- **Volunteer to be on the Food Policy Council (see above).**
- **Educate adults and children about local food growing practices via schoolyard gardens, community garden workshops, tours of existing growing operations, fish processing plants, etc.**

##### **Individuals**

- **Find out about the Food Policy Council and volunteer to be on it.**
- **Participate in gardening workshops.**
- **Volunteer to help out in a garden at a local school in your neighborhood. (Your help may be particularly needed after school closes down for summer vacation.)**

**Goal 2: Increase availability of locally grown food through a variety of vendors. Create, support, and promote regional sustainable agriculture and fishing.**

**Rationale:** When locally grown fresh food is easily accessible to everyone throughout New Bedford, Sustainable New Bedford will be well on its way to being a reality. This sustainable practice addresses such concerns as 1) the use of soil polluting chemicals used to grow large amounts of the same crop, 2) the diminished nutritional value and overall quality of food stored and transported for long distances, and 3) disruptions of food production around the world, due to drastic weather changes produced by global warming. It also addresses a major concern of all governments: a constant and available food supply for the citizenry.

### *Implementation Strategies*

#### **Government**

- **Assure by ordinance that produce purchased by government, institutions, schools, restaurants, and all food related establishments is regionally and sustainably grown or harvested.**
- **Implement city policy to attempt to source locally grown food for catered events at City functions whenever possible.**
- **Work with AHA or another City occasion to focus on local food and nutrition.**

#### **Institutions and Businesses**

- **Expand the successful, on-going ‘Buy Local’ (produce) aggressive marketing strategy, developing ways for both the public and private sectors to participate in this program.**
- **Expand private sector participation in the ‘Buy Local’ program.**
- **Establish internships in programs for the needy, to teach cooking with regionally grown foods. (Schools / universities, and programs for the disadvantaged would be major implementers for this strategy.)**
- **Establish links between area producers and local establishments.**
- **Encourage area restaurants to use as much locally produced food as possible through a branding program. For example, establish a New Bedford local food challenge whereby stores and restaurants that pledge to use more local food get a specially designed decal for display, receive mention in the press, and are promoted by the city.**
- **Work with area supermarkets and smaller markets to establish “Buy Fresh, Buy Local” corners within a store where shoppers can buy locally grown and harvested foods.**

#### **Individuals**

- **Be engaged in finding out where the food you eat comes from.**
- **When you eat out, ask.**
- **Ask local supermarkets to be specific on signage about where the food they sell is produced.**

**Goal 3: Maximize food and agricultural production within the City itself.**

**Rationale:** Producing local food within City boundaries, which is widely available and easily accessible to all is a sustainable alternative to our current food system, and essential to the establishment of Sustainable New Bedford, especially considering the immediate concern of high-energy costs.

*Implementation Strategies*

**Government**

- **Create ten (10) citizen run community gardens by 2010 and twenty (20) or more by 2020.**
- **Identify spaces for community gardens and incentivize removal of abandoned buildings and remediation of brownfields and lead contaminated sites.**
- **As part of this effort convert several empty lots into community gardens for residents.**
- **Incentives might include providing city-supplied compost, tools and seeds/plants, and offering subsidized rain barrels for irrigation water.**
- **The Mayor's youth summer job program could participate in preparation of garden sites.**
- **Investigate feasibility of including fruit trees in the City tree-planting program. (Consideration must be given to care and the possibility of attracting rodents.**
- **The organization Earthworks Boston provides planting advice re: edible landscapes for urban areas.**
- **Helpful local groups would include Friends of Buttonwood Park, Tree City, and urban tree consultants.**
- **Encourage SMAST and GNBRVTHS to develop aquaculture.**

**Institutions and Businesses**

- **Support the City's efforts to encourage citywide agricultural production.**
- **Become involved in the planning and implementation of this goal by offering time and expertise to the City departments working on this goal.**

**Individuals**

- **Consider planting your own vegetable garden in the sunniest part of your available space, using your own plot of land, pots, etc.**

**Goal 4: Ensure access in New Bedford by all people at all times to enough nutritious, affordable, safe and culturally diverse food for an active healthy life.**

**Rationale:** Food is necessary to the health of a human being through all stages of life. Without an easily accessible, nutritious food supply, life becomes very difficult. Having a supply of the foods one likes to eat is a joy.

## *Implementation Strategies*

### **Government**

- **Map neighborhood populations and food sources.** (see Community Participation Report, Goal H.) A public/private group (the Environmental Stewardship office (GIS) students (GoogleEarth), and food-service programs for the needy) could effectively accomplish this job.
- **Survey users to determine best locations and best vendor options.**
- **Explore possible vendor options:**
  - **Work with growers to provide them with central venues and publicity.**
- **Establish a ‘floating’ vendor, wherein fresh produce is trucked (bussed) into central neighborhood locations at times when local foot traffic is greatest; etc.**
- **Support establishment of vendors through expertise, a program of incentives, etc.**

### **Institutions and Businesses**

- **Assure that all providers of fresh local produce can accept food stamps.**
- **Establish program whereby excess food from restaurants, stores, etc., is distributed to food providing service organizations in the City.**
- **Investigate the feasibility of purchasing shares of a community supported agricultural program (subscription farms, often called CSA’s).**
- **Increase availability and display of locally caught fish.**

### **Individuals**

- **Help with the neighborhood mapping effort.**
- **Help establish a well located (easily accessible to all) neighborhood fruit and vegetable stand.**
- **Lobby elected officials to provide it for all.**
- **“Buy Fresh, Buy Local.”**
- **Join a CSA.**

# Health

The subject of health comes up in our conversations with each other a great deal of the time. It is a subject both interesting and relevant to us all.

The health care industry has been, and still is the most instrumental advocate in the battle to prevent cancer by eliminating smoking in public places as well as among the populace. Doctors consistently offer prevention (of illness) methods, including eat well (watch your weight), gets lots of rest, and do a moderate amount of exercise weekly.

Therefore, it seems natural that when considering creating Sustainable New Bedford, health care issues be addressed. Our city's collective carbon footprint would be addressed were the health care industry to tackle this issue. Additionally, the fact that the health care industry in New Bedford employs more workers than any other industry in our city is another reason for the health care establishment to employ sustainability principles and practices; many health care workers would have to be involved (and consequently educated) in the sustainability effort. The ripple effect throughout the community would be extremely beneficial to us all.

This MSTF Health Report cannot cover all of the pertinent issues and the changes that would need to be made to help the health care industry become sustainable. That action plan would have to emerge from the industry itself, due to the complicated nature of the health care network and the services it offers us all. We merely suggest two of the aspects involved which we believe would help New Bedford's health care system become sustainable: addressing climate change and pollution as a public health concern.

## GOALS and STRATEGIES

**Goal 1: Prepare to meet the challenges to health care that climate change events will most likely produce.**

**Rationale:** We will all be counting on the health care industry in New Bedford to meet the projected health challenges which will most likely occur (according to scientists around the world) from the phenomena we call climate change, including: 1) increasing number of days of 100+ degrees heat; 2) greater numbers of disease bearing organisms due to the increased heat; and 3) increasing numbers of storm related casualties and/or illnesses, again resulting from the unpredictable weather patterns produced by climate change.

### *Implementation Strategies*

#### **Government**

- **Appoint a stakeholders HEALTH Commission to study climate change issues as they relate to the health care community network in New Bedford.**
- **The next step is to draw up plans to meet these challenges through improving emergency care facilities, hospitals, easily accessible clinics, etc. as sustainably as possible.**

### **Institutions and Businesses**

- **Volunteer to be on the commission.**

### **Individuals**

- **Lobby your elected officials to start the planning process. Volunteer to help in any way(s) you believe you can help. Stay healthy!**

**Goal 2: Begin a public health advocacy campaign aimed at reducing the current levels of pollution in our air, water, and soil, as well as the prevention of any more pollution.**

**Rationale:** Many scientists have studied the effects of pollution on health and found substantial causal evidence. Many people today believe that toxics pollutant in our air, water and soil are responsible for at least some if not all the health problems being experienced. This makes polluting and pollution public health issues.

### *Implementation Strategies*

#### **Government**

- **Encourage/incentivize the medical establishment to lobby polluting industries, on behalf of their clients to eliminate all pollutants from the services they offer, including reducing their own establishments' polluting practices and carbon footprint.**
- *Regulate chemicals used in lawn care.*

#### **Institutions and Businesses**

- **Know what's in the products and packaging you sell. Find alternative, non-polluting methods to produce your products/services.**

#### **Individuals**

- **Ask your doctors and other medical personnel about the connection between various forms of pollution and your health.**
- **Use the internet to find out more information.**
- **Form your personal sustainability action plan and implement it.**
- **Explain what you are doing to friends and acquaintances, including medical personnel.**
- *Decrease use of anti-microbial bleach.*

## **Environmental Justice**

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# Community Participation

Our problems are basic and complex. We humans are using up the limited supply of the earth's natural resources available to us, as well as polluting the air, water and soil we all depend on for life. The consequences, such as rising sea levels and global warming, are measurable and have been devastating to many. Scientists around the world agree that we must do something, and that our window of opportunity to stop some of the worst consequences of our behavior is getting smaller every day.

This reality requires that we reinvent/redesign our ways of living so that humans and all other species can thrive. Indeed, Wm. McDonough, architect and designer, who has been working on these problems for since the 1970's uses the following guideline for his work: "How can we love all the children of all the species all the time."

Community participation means that people work together to produce something within the community. In New Bedford many citizens have worked since it was founded to create a place where people could work and live peaceably together, pursuing happiness as best they could. Competition, collaboration, and cooperation were then, as they are now, a part of how we've lived together for centuries. In 1654, twelve families seeking freedom from puritanical ways settled in Olde Dartmouth, a large tract of land that included today's Westport, Dartmouth, New Bedford, Acushnet and Fairhaven. Then the harsh realities of nature and the need to survive required equal parts tenacity, cooperation and perseverance, as well as intelligence and generosity from our founding families.

Community participation caused slavery to be abolished in this country, helped women in many countries gain their rights as citizens and human beings, a fight still being waged everywhere. Community participation secured worker bargaining rights; an early work stoppage seeking a 10-hour day vs. dawn to dusk hours occurred in April 1840 in the New Bedford shipyard owned by Charles W. Morgan. The workers won.

New Bedford's motto, *Luciem diffundo*, meaning 'we spread the light', referred to whale oil and the ships that were sent round the world from our port. We have had the firsthand experience of depleting a source of energy; we know that the discovery of oil in 1859 in Pennsylvania, and the subsequent purification and invention of kerosene right here on Fish Island in New Bedford Harbor, meant that the whaling industry would be over in our city. Those in the industry invented many other uses for the oil, such as oil for machinery, but these would not be able to keep the industry alive in the face of a decimated whale population. People had found a new cleaner and more easily secured source of power, and they leapt on it.

Today, motivated by scientists reporting the results of decades long observations, generational studies and experiments, many citizens have begun accepting the responsibility for the pollution they cause, as well as reinventing how they want to live. Some have chosen non-polluting alternatives to meet their needs, while reducing their personal, and thus the collective carbon footprint. In New Bedford, city departments, businesses and individual citizens have begun instituting changes, motivated by the desire to rise to the challenges presented by climate change,

and to save money, which many of these changes do in the long term. A tree nursery has been established, recycling of waste is increasing, and solar powered trash compactors are being installed on NB streets. Plans are underway to study wind and solar power, and upgrade the city's fleet of vehicles. Methane gas is being captured from our landfill as part of a waste-to-energy conversion process. New Bedford High School is planning a sustainability elective at the high school level.

People are actively looking for ways to finance personal actions to help in this change effort, such as using alternative energies and weatherization. New Bedford's Industrial Park is booming, it's landscaping beautiful and eco-effective because of the many trees left in place. Several businesses began looking into and implementing eco-effective changes such as saving water and electricity many years ago, and are enjoying the financial benefits of their actions today.

In some communities, governments are encouraging and/or requiring sustainable alternatives to replace current ways of living. In others, economics is the deciding factor, and people are content to permit 'market forces' to produce the needed changes. In still other places a combination of these two, plus volunteer citizen participation in the redesign effort, are combining to leverage change through research and discussions resulting in the development of eco-effective/sustainable choices. Examples of the last change model can be found in Seattle, WA, Newton, MA, Portsmouth, NH, and New York City, to name just a few.

Once more, on an historic note, we are reminded of the effort made by a few New Bedford area citizens who began historic preservation here in the 1960's. Believing that it would be in the best interests of the City to protect and preserve the old buildings, they founded WHALE, including re-mortgaging their homes, and set out to save old buildings that conventional wisdom had written off. Dismissed at the time as a fringe movement, the ensuing half-century validated their foresight; we are now the beneficiaries. Today in New Bedford "sustainability" is seen by some as a fringe movement.

Our hope is that one day this eco-effective way of thinking and living will become commonplace. We hope that the growth of positive, eco-effective changes will expand exponentially, and that today's sustainability efforts will become the foundation of many future positive changes in our lives, as unimaginable today as the computer was to most of us twenty years ago. Again, this change will happen much faster if government, business, and residents work closely together, encouraging and challenging each other to implement a society based on economic and social equality, and eco-effectiveness for all.

Will the reality of global warming, pollution of our air, water and soil, the dwindling supply of water, and our ever-growing waste problems be enough to motivate us to create an eco-effective municipality here in New Bedford? We profoundly hope so.

## **GOALS and STRATEGIES**

**Goal 1: Encourage community stakeholder involvement in community sustainability.**

**Rationale:** The issue of sustainability in New Bedford could be a multi-faceted topic around which the community organizes and collaborates to bring about a robust and thriving City.

Community participation will greatly increase the success of any sustainability plan, ensuring it will be implemented much faster by engaging the people who live the reality of New Bedford every day. The network of citizens' groups already in place, including neighborhood improvement associations and faith-based groups, must be involved. Possibilities for resulting action plans include the "eco-municipality" model, the Sustainable City model (San Francisco), GreenNYC 2030 (New York City), Madison (Wisc.) Mayor's Energy Task Force, and so forth.

The Mayor's Sustainability Task Force Plan should be presented to the New Bedford public, as a jumping-off place, an example of a plan around which the community will react, make suggestions for additions or alternatives, and transform this plan into actions by people taking responsibility for the future of our city and region.

### *Implementation Strategies*

#### **Government**

- **Create a Sustainability Council, open to interested people, non-profit agencies, and businesses to develop a plan to enhance New Bedford's sustainability. No less than half of the participants should be people who cannot benefit monetarily from any of the funding sources adopted.**
- **Create a Sustainability Fund geared in a variety of ways to aid people in adopting sustainability initiatives, such as installing renewable energy alternatives to power a home's electrical needs.**
- **Incentivize citizen efforts to implement sustainable changes through provision of expertise and modeling the needed changes.**
- *Hold a regional sustainability summit.*

#### **Institutions and Businesses**

- **Join the Sustainability Council.**
- **Develop a sustainability plan for business.**
- **Implement the plan.**

#### **Individuals**

- *Ask City Council to formally adopt principles of sustainability.*
- **Follow suggestions for businesses.**

### **Goal 2: Reduce New Bedford's collective carbon footprint by 20% of 1990 levels by 2020.**

**Rationale:** Cutting carbon emissions can help slow global climate change. It will become measurable as more and more people learn how to compute their carbon footprints, and then act to reduce them. Motivation to measure carbon footprints include saving money and improving environmental health. Ideally, the city will implement changes that will lead to a reduced carbon footprint, much cleaner air, and a diminishing of global warming.

## *Implementation Strategies*

### **Government**

- **Create or adopt a carbon footprint measurement tool, one that can be easily taught and used by everyone.**
- **Design a citywide campaign to engage voluntary community participation.**
- **Encourage business owners to reduce their business's CF. Provide several incentives for businesses to become a 'cool business', such as tax incentives and favorable publicity.**
- **Officially urge the state of MA to require all power plants to switch to non-polluting renewable energy alternatives.**

### **Institutions and Businesses**

- **Adopt the city's 'cool business' program.**
- **Choose eco-effective ways to provide services to your customers.**
- **Always consider your business's CF as part of your bottom line liability, and seek 'green' alternatives.**
- **Encourage and incentivize employees to come up with ways to 'go green'.**
- **Partner with the City in some way to encourage its efforts to reduce its CF.**
- **Encourage customers to compute their CFs. Provide a variety of incentives.**
- **From cheerful recognition of a customer's effort, to a financial break for those who remember to bring their own shopping bags, every little bit helps.**

### **Individuals**

- **Let our mayor and our city councilors know your appreciation for their leadership.**
- **Compute your CF and take action to reduce it.**
- **Lobby the state of MA to require all power plants in MA to choose renewable alternative energy options for generating power.**
- **Educate yourself so that you understand that personal CF reductions are a positive way to live.**
- ***Lead by example; adopt as many sustainable practices as you can.***

**Goal 3: Establish a minimum of 1,000 green spaces throughout the city of New Bedford by the year 2020. Reaching this goal will be facilitated by a public-private partnership based on the one that is currently producing effective results in the historic preservation sector. Include all kinds of green spaces, including current ones. Establish 20 new community gardens by 2020 to generate a municipal food base here in New Bedford. Furthermore, the City will plant 250 trees annually through 2020 (which can also be counted as green spaces).**

**Rationale:** This kind of commitment to green spaces is happening in urban centers all around the world because it is an effective way to reduce one's CF due to reduced heating and cooling costs, as well as providing beautiful, natural spaces for urban residents to enjoy. Additional benefits include helping to use rainwater better and excess run-off into the sewer system. Motivating reasons to install and maintain green spaces are mentioned above. We will remember

this effort many years from now because a Green Census of these spaces, displayed perhaps on a green spaces city map, combined with on-going CF measurements, will help us to better understand the natural earth systems all living beings depend on for life, as well as make the City a far more beautiful place to live and work in making the city a far more beautiful place to live and work in.

### *Implementation Strategies*

#### **Government**

- **Create a Green Spaces Oversight Board to help facilitate this goal.**
- **Community participation in this effort will be generated through provision of personnel, tools of all kinds, monetary incentives, etc.**

#### **Institutions and Businesses**

- **Donating a patch of land, installing a green roof, planting and caring for a tree are just a few of the projects a business could sponsor, and or actually do.**

#### **Individuals**

- **Volunteer to join the Green Spaces council.**
- **Starting at home, find a green space you think you might be able to plant and maintain. Join an established group in New Bedford like Tree City or the Friends of Buttonwood Park, both of which have planted many trees in the city.**
- **Plant and maintain a green space in your own yard, or wherever one becomes available to you. Call City Hall to find out how you can help maintain publicly owned spaces.**

<p><b>Goal 4: Enhance community involvement and capacity building by creating entities and policies that make government as transparent and supportive of local initiatives as possible.</b></p>
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**Rationale:** New Bedford is a long thin city with distinct neighborhoods and ethnic groups and associated institutions and agencies that often, due to geographic reality or cultural differences, do not mix. Finding common ground and improving communication between constituencies and City Hall will build upon this city's intrinsic value---its human capital and its physical characteristics---to provide this city with its best shot at enhancing its well-being and sustainability. This can also help to keep resources local, which helps end the culture of grant/aid dependence in New Bedford and formalizes the practice of building community capacity.

### *Implementation Strategies*

#### **Government**

- **Establish an outreach council to explore ways to communicate to the public news of funding opportunities, jobs, and new agencies and initiatives. This will study media, networks, and other ways the population learns of opportunities and how best to enhance that.**

- **Establish a policy that any policy-advising body in the City must be publicly announced. Participation in such bodies must engage New Bedford stakeholders: residents, businesses (and any tax-paying entity), and representatives of agencies and government. AI**
- **Establish a policy requiring all work contracted for the City via City funds or City-derived grants will be granted with preference for businesses and organizations that hire New Bedford residents and/or partner with New Bedford businesses and agencies.**

#### **Individuals**

- *Work to stop non-sustainable practices in other states and nations through political action (i.e. lobby Congress).*

## Next Steps

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**Appendix: Community Meeting Ideas  
Buttonwood Senior Center  
7:00pm, November 26, 2007**

*Note: These recommendations may also be found interspersed throughout the text of the report.*

- 1. Stop drinking bottled water.*
- 2. Make sure city redevelopment plans include sustainability.*
- 3. Include global warming in state education frameworks; show connection to state frameworks.*
- 4. Ensure balance (example: economic development and environmentalism).*
- 5. Ask City Council to formally adopt principles of sustainability.*
- 6. Put in more bike racks.*
- 7. Public recycling bins.*
- 8. Kiosks at bus stops to make them more attractive (food, drinks).*
- 9. Individuals should lead by example.*
- 10. Bring your own bags to stores.*
- 11. UMASS Dartmouth- MBA program in sustainability would be helpful.*
- 12. Coastal management approach to sustainability.*
- 13. Regional sustainability summit.*
- 14. Every city employee should lead by example.*
- 15. Create vision statement for New Bedford as sustainable community.*
- 16. Complete New Bedford energy audit by end of FY08 (city buildings).*
- 17. Use natural resources in New Bedford, like wind energy.*
- 18. Do forestry analysis of our watershed.*
- 19. Make all public buildings highly energy efficient by 2020.*

20. *New Bedford should get into co-generation.*
21. *Task Force should deliver recommendations before the State of City address.*
22. *Tie community gardens/ nurseries in with other community projects.*
23. *Focus more on energy productivity (improve energy use in existing buildings).*
24. *Energy audit of private buildings.*
25. *Improve energy productivity of New Bedford area public transportation.*
26. *Decrease use of anti-microbial bleach.*
27. *Regulate chemicals in lawn care.*
28. *Biodegradable bags.*
29. *Education about effects of energy use.*
30. *Affordable personal alternative energy sources.*
31. *Help from Community Foundation design studio to identify common sustainability principles.*
32. *Work to stop non-sustainable practices in other areas/nations- use political pressure (Congress).*
33. *Energy audit in New Bedford schools and public buildings.*
34. *Act locally (example: solar panels, green roofs on New Bedford buildings).*
35. *Learn from other communities.*
36. *New Bedford youth participation in Bioneers in 2008.*
37. *Community gardens at Fairhaven Mills site.*
38. *Think long-term with development.*
39. *Community Supported Agriculture programs, farmers markets: think about food choices/buy local.*
40. *More education on local food options.*

- 41. Use green building materials, new buildings LEED-certified.*
- 42. New city vehicles should be hybrid.*
- 43. Teach youth green building, other environmental technologies as source of jobs.*
- 44. Plug New Bedford youth into sustainability.*
- 45. Green dorm for Youth Build kids.*
- 46. Support Cape Wind project.*
- 47. Promote energy conservation in houses.*
- 48. Make information available widely.*
- 49. Playground downtown.*
- 50. Explain urgency of issue.*
- 51. Identify stakeholders + what might drive them.*
- 52. Tailor communications to individual stakeholders.*
- 53. Create vibrant neighborhoods through sustainability.*
- 54. Remove permitting barriers to green roofs, etc..*
- 55. Make educational programs like Sea Lab available to all who want to participate.*
- 56. Promote urban forestry.*
- 57. Focus on harbor cleanup as economic development.*
- 58. Motivate kids to become involved.*

## **Appendix: Resources & Waste**

### Additional Concepts

#### **Litter and Cleanup**

Adopt neighborhoods for comprehensive cleanups. Lobby to expedite the Federal government's Harbor Cleanup efforts and assist local clean-up efforts of all kinds.

Increase the frequency of hazardous waste collection days, if waste stream analyses determine that hazardous wastes are being put out for collection.

Expand yard waste collection (Those oaks don't *ever* seem to lose their leaves, let alone by mid-December).

#### **Tires**

Evaluate the use of rubber-impregnated asphalt for streets, parking and other surfaces.

## **Appendix: Water Water Quality Task Force**

We recommend that the City of New Bedford establish a Water Quality Task Force to consider making improvements to the city's drinking water supplies.

While current drinking water supplies meet all current legal standards, improvements may be possible and should be investigated in depth.

The task force might be charged with three major goals:

Investigating the mitigation of pollution sources at the Assawompset Ponds Complex (the source of New Bedford drinking water). According to a recent Audubon Society report on the Assawompset Ponds Complex, potential sources of pollution include shoreline development (nutrients, pesticides), road drainage (Routes 18 and 105), power boating and fallout from the nearby SEMASS incinerator. The Mass Department of Conservation and Recreation 2006 Boat Ramp Monitor Report has also discovered contamination by a minimum of 3 invasive species introduced into the system because of an open boat ramp at Long Pond (20% had plant fragments; 6.8% were non-native, 13.6% were of unknown origin).

1. Investigating possible improvements to current water treatment processes. This goal would include consideration of current treatment with Chloramine (chlorine and ammonia in combination) over the past treatment with Chlorine only. The task force should also investigate alternative water treatment possibilities including UV radiation treatment, Ionization, and Ozonization.
2. Benchmarking our water quality (see the Annual Water Quality Report for New Bedford in the Appendix) against communities with excellent water quality to see if we are lagging in any area and, if so, to recommend processing improvements to address any shortcomings.

The task force should also be charged with consideration of related issues such as impending denitrification regulations, the possibilities for selling water supply and wastewater services to other local towns, and the possibility of reducing energy usage required for pumping water supplies.

## **Appendix: Avoiding Lead Poisoning**

Lead poisoning has many possible sources. Children may “pick up” lead when playing in dirt that was saturated with leaded gasoline – a common situation in urban environments. Children may eat paint from toys painted with leaded paints or even swallow toys made of lead. Children may be picking up undue amounts of lead that has dissolved into drinking water from old water pipes that were made of or soldered with lead. Children may pick up lead on their hands when handling comics or any brightly colored item such as food wrappings. Finally, children may ingest leaded paint chips or lead dust from woodwork in older buildings.

Each of these sources can be mitigated and, with recent research linking reduced intelligence and developmental problems from very low lead concentrations, parents need to be informed about how best to protect their children. The Commonwealth of Massachusetts is currently considering lowering the poisoning level from 20 micrograms of lead per deciliter of blood to 10 micrograms of lead per deciliter of blood.

### **Dirt and Dust**

If testing indicates that soils are contaminated with lead, parents may abate the soils where children play. This involves removing the top 6” to 10” of soil and replacing it with uncontaminated soils. For a typical city backyard, the cost for doing this work can be anywhere from \$20,000 to \$50,000.

If this is not financially feasible, parents should make sure that grounds are planted with grass and shrubs or paved to minimize children’s contact with contaminated soils. Parents should also insist that children wipe their feet on doormats when coming into the house and wash their hands thoroughly before eating. In all cases, parents should keep homes as dust-free as possible since air-borne dust particles are often contaminated with lead in urban environments.

### **Toys**

According to *Cookie* magazine, toys made of plastics Nos. 2, 4 and 5 are the safest, longest-lasting items, while those made of Nos. 3, 6 and 7 tend to break down easily and expose kids to potentially harmful chemicals.

You can tell which type of plastic a toy is made of by turning it over and looking at the bottom, where the symbol is usually stamped. If you can't find this information on the toy or on its package try calling the manufacturer or visiting the company's Web site for more information.

High-quality plastics aside, unpainted hard wood is one of the best materials for toys, since you can be sure it has no lead paint or toxic glues.

It is wise to scout for toys labeled "Made in USA" and "Nontoxic." Don't settle for items that carry only one of the labels. Buying handmade toys from small manufacturers is another good idea, because you can easily find a phone number to call and get a live human being to answer your questions.

If you feel like going the extra mile, consider buying toys made in Germany (look for the "GS" safety mark) and other European countries, which often have higher safety standards than the United States does. Some European toy companies are Playmobil, Lego and Ravensburger.

To reduce the chance of friends and family members giving your kids potentially unsafe toys, tell them that the best gifts are books. You can create a book "Wish List" at Amazon.com, making it easy for them to avoid buying books your children already have.

For complete peace of mind, Cookie recommends visiting [www.healthytoys.org](http://www.healthytoys.org). This Web site is managed by The Ecology Center in Ann Arbor, Mich., and has tested more than 1,500 toys for lead and harmful chemicals.

## **Water Supply Pipes**

Use cold water for cooking and drinking. Hot water carries more lead in it than cold water does. Start with cold water to make hot drinks like coffee and tea. It's also a good idea to let the water run before drinking it or using it for cooking. Especially the first thing in the morning, or any time water has been standing in the pipes, turn on the faucet and let it run for one minute or until the water feels much colder on your hand before using it. That way lead in the water from the solder can be flushed out. Fill a pitcher with clean water to use during the day.

If your plumbing is old, both the American Academy of Pediatrics and the U.S. Environmental Protection Agency advise boiling cold water to make baby formula instead of using hot water from the tap. Boiling hot water that is contaminated with lead makes the amount of lead in the water greater because it is more concentrated as the water evaporates. You cannot get rid of lead by boiling.

You can call the Safe Drinking Water Hotline at 1-800-426-4791, 9 a.m.–5 p.m., Monday through Friday ([EPA Ground Water and Drinking Water](#)). The federal government's Environmental Protection Agency (EPA) provides information on this hotline. You can also request a copy of the EPA's book, "Lead and Your Drinking Water," and fact sheets about lead. There is no charge for the call or the information.

There are many different types of water filter systems, which range in price from \$25 to more than \$100. They can be pitchers or containers, attach to your faucet, or go under your sink. If you decide to purchase one of these, be sure that the product information states that it will filter lead out of the water.

You may want to test your drinking water with a do-it-yourself kit. You can also send a water sample to a laboratory for testing. A nonprofit organization, Clean Water Lead Testing in Asheville, North Carolina, was rated highly by Consumer Reports several years ago as providing

the quickest and least expensive reliable analysis. Their test kit costs \$24. You can order it by calling (828) 251-6800. For a list of certified laboratories in New Jersey to test your drinking water for lead, call the Office of Quality Assurance in the New Jersey Department of Environmental Protection at (609) 292-3950.

You can also call your water company or local public health authority if you think there is lead in your pipes. Ask them to come and test the plumbing.

As an alternative, if you are a homeowner, you can replace your water supply piping at a cost ranging between \$5,000 and \$20,000 depending on the extent of the required replacement. If you are a tenant and lead levels are high in your apartment, the health department can order the landlord to correct the problem.

### **Comics and Miscellaneous Sources of Lead**

Keep things that have lead in them away from your children. Have children wash their hands after they have touched comics or comic books (colored newsprint). Children should always wash their hands before eating food.

After you open a food can, take the food out of the can right away. If there is food left over, store it in another container. When food sits in a can with lead solder, the lead can soak into the food. When you eat the food, you eat lead. You cannot tell if food has lead in it by tasting or looking at it.

Do not reuse printed food wrappers. The colored ink may contain dangerous levels of lead. Wipe off the tops of wine bottles before pouring from them; some wine bottle caps are made of lead.

Buy only those cosmetics that list the ingredients, and make sure none of the ingredients is lead. The federal government does not require cosmetics manufacturers to list ingredients, so you may have to look for products that do list them. Do not use foreign eyeliner or face paint or let your children use it.

Test any foreign or old American ceramic dishes for lead. See How do I know if things in my home contain lead? at <http://www.lsnjlaw.org/english/placeilive/index.cfm> for information about two lead testing kits. Hardware and home improvement stores may also carry some testing kits.

Make sure you know exactly what is in a home remedy before taking it. Sometimes lead is called other names. Taking lead, even a little bit, is always harmful. It can never make you better.

### **Lead Paint**

Lead-based paint is not a hazard if it is intact. But if there is serious water damage to lead-based paint or the paint is peeling or flaking, report it to your landlord right away. If the landlord does not respond promptly, report the situation to the health department.

Renovating an older house or apartment can be dangerous if it's not done right. When you disturb old lead paint, you create lead dust. Scraping or sanding old lead paint creates a lot of dangerous lead dust. There are sandpapers that you can buy and use wet. Wet sanding helps keep down the amount of lead dust that can end up on surfaces and the floor where small children might touch it. You need to take precautions so that you do not poison yourself or your family.

If the paint in your home is not peeling, flaking, or loose, and you want to repaint, it may be better to paint over it, or cover it with paneling or drywall, than to try to remove the lead paint first. The U.S. Environmental Protection Agency puts out a pamphlet called "Lead in Your Home: A Parent's Reference Guide" that tells you how to do renovations safely. You can get a copy by calling the National Lead Information Center at 1-800-424-LEAD.

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## Appendix: Permeable Paving

Installing permeable paving in lieu of normal asphaltic or cementitious paving results in improving environmental water problems in several ways:

- Putting storm water in the soil instead of diverting it to the wastewater treatment facilities.
- Putting storm water in the soil instead of allowing it and the surface contamination it can accumulate into open waterways.
- Filtering storm water through the soil before it enters the aquifer.

There are four major options for permeable pavement materials:

- **Porous Asphalt:**

A great advantage to porous asphalt is that the same mixing and application equipment is used as for impervious asphalt. Only the formula for the paving material changes with porous bituminous pavement. The amount of asphalt binder required is about 6% by weight which is somewhat higher than required for standard impermeable asphalt mixes.

Bituminous permeable paving is appropriate for pedestrian-only areas and for very low-volume, low-speed areas such as overflow parking areas, residential driveways, alleys, and parking stalls. Permeable paving is an excellent technique for dense urban areas because it does not require any additional land. With proper design, cold climates are not a major limitation.

Permeable paving is not ideal for high traffic/high speed areas because it has lower load-bearing capacity than conventional pavement. Nor should it be used on storm water "hotspots" with high pollutant loads because storm water cannot be pretreated prior to infiltration.

- **Porous Concrete:**

Again, the same equipment may be used as for standard concrete. Larger pea gravel and a lower water-to-cement ratio is used to achieve a pebbled, open surface that is roller compacted. This material can also reduce solar heat-gain from absorption. Total project costs can typically be reduced because no retention pond or connection to the municipal storm drain system is required when permeable concrete is used.

- **Plastic Grid Systems:**

High strength plastic grids (often made from recycled materials) are placed in roadway areas. Some are designed to be filled with gravel on top of an engineered aggregate material, while others are filled with a sand/soil mixture on top of an aggregate/topsoil mix that allow grass to be planted on the surface. The grids provide a support structure for heavy vehicles, and

prevent erosion. After heavy rains, the grids act as mini holding-ponds, and allow water to gradually absorb into the soil below.

- **Block Pavers:**

This material can be used to create a porous surface with the aesthetic appeal of brick, stone, or other interlocking paving materials. They are most often used for low-usage driveways, entryways, walkways, or terraces to achieve a more traditional, formal appearance.

**COSTS of Permeable Paving:**

Initial costs of permeable paving may be competitive with conventional materials, or somewhat higher. These costs are typically offset when the need for other types of storm water drainage is eliminated.

**RECOMMENDATIONS:**

- It is recommended that the City of New Bedford specify permeable pavings in lieu of more traditional paving in all situations where possible.
- It is also recommended that the City of New Bedford recommend the use of permeable pavings to private developers working in the City and provide incentives such as a reduction in zoning requirements to encourage the use of these greener materials.

## Appendix: Green Roofs

The installation of Green Roofs (see Definition: Green Roofs) on City of New Bedford buildings can achieve significant benefits.

- Reducing heating and cooling loads by up to approximately 25%
- Increasing the life span of the roof by protecting the waterproofing membrane from extreme temperature fluctuations and UV radiation
- Reducing the urban heat island effect
- Reducing storm water runoff
- Filtering pollutants and carbon dioxide out of the air
- Filtering pollutants and heavy metals out of rainwater
- Increasing wildlife habitat in urban areas
- Providing for community garden space for growing fruits and vegetables
- Providing park space for building occupants

The quantifiable extent to which these improvements can be achieved depend on the specifics of the design but even the most minimal design will achieve all of these benefits to some extent.

Unfortunately, it is difficult or even impossible to install fully green roofing systems on existing buildings since existing buildings seldom have structural systems that can support the additional weight of soil, water, plants and pavers that are required for a fully green roof. Additionally, while a traditional roofing system may cost as little as \$1.25 per square foot, green roofing costs start at about \$8 per square foot and range up to \$15 per square foot. Finally, green roofs are also more expensive to maintain and replace at the end of the life of the waterproofing membrane. But all new buildings should be considered candidates for green roofs and a life cycle cost analysis should be required of every designer of new City buildings to determine whether or not it would be wise to include a green roof in the design of the structure.

Happily, some of the advantages of green roofs may be obtained on all existing buildings when they require re-roofing through the installation of a “partially” green roof. Such a roof utilizes additional lightweight insulation and a white roofing membrane to achieve a significant reduction in heating and cooling loads. By controlling for insulating values and albedo effect (See Definition: Albedo), some of the benefits of green roofs can be achieved at virtually no additional costs over traditional asphaltic roofing materials and these “partially” green roofs should be mandatory on all City buildings.

## Appendix: Green Walls

While some of the green wall technology is fairly new and untested, the City of New Bedford should consider the installation of green walls in selected locations.

Green walls may be built on the exterior of buildings to achieve the following benefits:

- Reducing heating and cooling loads by up to approximately 25%
- Increasing the lifespan of the building cladding by mitigating temperature fluctuations on the surface of the cladding and reducing UV damage
- Reducing the urban heat island effect
- Improving the aesthetic experience for the public
- Improving the acoustics of the building for occupants
- Filtering pollutants and heavy metals from rainwater
- Filtering pollutants and exhaust emissions from air
- Providing additional habitats for increasing local biodiversity

Some exterior green wall systems are quite expensive to construct and such systems should probably be avoided. But many green walls involve no or very few additional costs. Allowing ivy, clematis, honeysuckle, morning glories, or wisteria to grow on a masonry wall does little overall damage to the wall if the masonry is intact to begin with and the small amount of damage is offset by the protection that the climbing vines provide. If cladding damage is a concern on a particular building, a trellis of wires can be constructed on the exterior of the building at very low cost to avoid allowing the rootlets to penetrate the masonry and /mortar of the building. It must also be noted that some maintenance effort is required to keep the plant material from blocking doors and windows but such maintenance is not a major cost consideration.

Installing exterior green walls, particularly on south-facing facades, should be considered for all significant City buildings.

Green walls may also be built on the interior of buildings to achieve the following benefits:

- Filtering most indoor air pollutants and improving indoor air quality
- Increasing indoor air humidity levels
- Improving the aesthetics and acoustics of the building for occupants

### **RECOMMENDATIONS:**

While interior green wall technology is in its infancy, the major potential problems of such wall systems (elimination of invasive species and control of humidity) have been solved.

Although interior green walls are expensive, starting in the \$100 per square foot range, installation of them should be considered for new buildings or significant renovations where buildings are densely populated or have particularly sensitive occupants.

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## **Appendix: Performance Contracting**

When the EPA energy audit currently being conducted on buildings owned by the City of New Bedford is complete, the City will be in a good position to identify and correct building problems associated with wasted energy and wasted water. The EPA results should be augmented by a table of water usage at each City building and incorporated in a Request for Proposals (RFP) for an Energy and Water Conservation Performance Contract.

The RFP should be publicly advertised in order for the City to obtain the best possible arrangements with respect to financing and engineering and the Proposals that are submitted from Energy Service Companies (ESCOs) should be reviewed by City Facilities Management as well as outside consulting mechanical, electrical, and plumbing engineers to determine which of the proposals received best meets the needs of the City.

It can be expected that every proposal will include upgrades to building lighting and improvements in building mechanical system efficiencies through the use of an automated energy management system, the addition of variable frequency drives, and the replacement of inefficient boilers, chillers, fans, pumps, and motors.

More thoughtful proposals should be recommended to the ESCO bidders in the original RFP however: improvements in building insulation, upgrades of street lighting, installation of geothermal heating or cooling systems in identified City buildings, installation of low-flow toilets and shower heads, installation of waterless urinals, installation of vending misers (to shut down vending machines when occupants have left the building), re-glazing inefficient single-pane windows with thermo-pane, using seawater to provide air conditioning, installation of heat recovery systems on building exhausts, installation of solar water heaters, installation of “free-cooling” on buildings for days when outside air temperatures are comfortable and filtered outside air can be used directly to meet ventilation requirements, installation of occupancy sensors to turn down mechanical systems and lighting when buildings are unoccupied, installation of rainwater collection systems to provide for lawn and athletic field watering during dry spells, the installation of boilers burning alternative fuels in identified buildings, and more.

Any improvement that results in a net economic gain in energy and water saving technology over the life of the asset would be a candidate for inclusion in the RFP. The committee judging the RFPs should have input into the RFP to ensure that a wide variety of energy and water conservation improvements are considered in the final proposals.

When the best proposal is chosen by the committee, the City should enter into a contract with the winning ESCO who will then proceed to make the agreed upon improvements at no cost to the City. The cost of the improvements would be repaid to the ESCO out of the resultant water and energy cost savings thus avoiding a budgetary increase (see Definition: Performance Contracting).

## Appendix: New Bedford as a Sustainable Learning Community Potential Partners for New Bedford Public Schools

The City of New Bedford is fortunate in having so many non-profits and businesses that offer mini-courses, special interdisciplinary programs, and service opportunities that we will not attempt to list all of them here. These organizations can help to enrich learning by encouraging youngsters to explore the natural environment and connect with their community through real-world learning experiences outside the classroom and the school.

Here are some of the many potential partners for the New Bedford Public Schools.

- \***Access Art-Ahoy!** brings ocean ecology, history and arts to 5<sup>th</sup> graders.
- \***Buttonwood Park Zoo:** features wild animals in outdoor habitats, plus a butterfly garden and a farm; educational programs aligned with state K-12 frameworks, and a chapter of the Jane Goodall Institute's "Roots and Shoots," which includes service projects for ages 12-18.
- \***Coalition for Buzzards Bay:** students do real-world science by participating in a regional water quality monitoring project related to the marine environment.
- \***Community Boating:** teaches sailing, water safety, teamwork, awareness of tides and weather.
- \***Connecting Oceans Academy** offers graduate credits to teachers in courses ranging from marine science and maritime history to cultures of the Pacific, art and water.
- \***Friends of Buttonwood Park** offer tree walks for schools every fall and spring.
- \***Greater New Bedford Regional Refuse Management District** provides safe, responsible disposal and/or recycling of various items, including old computers and assists in setting up recycling programs.
- \***Greater New Bedford Regional Vocational Technical High School:** OSHA and the DOE websites list vocational frameworks that prepare students for careers in sustainable technology.
- \***Lloyd Center for the Environment** is an active nature center in Dartmouth offering trails, marshes, kayaking, etc. Its environmental educators teach the "Turn the Tide" curriculum on site and in local schools.
- \***New Bedford Whaling Museum** offer exhibits, films, workshops and special programs.
- \***Ocean Explorium,** a new interactive marine education center which will offers courses utilizing Science-on-a-Sphere as well as marine touch tanks, fisheries exhibits and film series.
- \***Maxfield Street Peaceworks Garden:** a community garden sponsored by the Boys' & Girls' Clubs, which also sponsors the Agri-Culture /Youth Garden Club and other programs.
- \***Rotch-Jones-Duff House** offers free programs on horticulture, apiaries and bees to 5<sup>th</sup> graders as well as the spring wildflower garden walk.
- \***Schooner *Ernestina*,** Massachusetts' official state ship, offers dockside marine education and educational cruises, when operating.
- \***Sea Lab** offers hands-on, experiential marine science workshops to middle school students.
- \***Trips For Kids** provides mountain bike outings and environmental education .
- \***United Way of New Bedford Community Mini-Grants Program** awards grants of \$500-\$2500 to grassroots groups who apply for projects designed to improve their community.
- \***University of Massachusetts Dartmouth** offers service learning, civic engagement and educational research and collaboration with local public schools.

\***Waterfront National Historic Park** gives tours and sponsors projects such as the whaling trunk project and teachers' guide aligned with the Massachusetts Curriculum Frameworks.

\***Youth Build** provides academic and vocational education to students seeking the GED; students build houses, do energy audits and will soon be learning to install solar panels by practicing on the old schoolhouse where they meet for classes and activities.

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## Appendix: Education

### Suggested reading

- \* “A Sustainability Ethic,” Chuck Dade, for this report.
- \*Bibliography: a sampling of sustainability books.
- \*Education for Sustainability (President’s Council on Sustainable Development, 1996).
- \*“Sustainability goes beyond being ‘green,’” Laurie Robertson-Lorant, op-ed, *Standard Times*, April 16, 2007.
- \*The Talloires Declaration (1990).
- \*The Halifax Declaration (1991).
- \*The Earth Charter (2000).
- \*Petition Calling for the Dismantling of the No Child Left Behind Act ([www.educatorroundtable.org](http://www.educatorroundtable.org)).
- \*“Evaluating ‘No Child Left Behind’”—several articles in *The Nation*, May 21, 2007.
- \*“Yoga helps children soothe away stress,” *Standard-Times*, April 10, 2006.
- \*“The No Child Left Inside Act is introduced in Congress,” August 3, 2007.
- \*“No Child Left Inside,” Chesapeake Bay Foundation ( [www.cbf.org](http://www.cbf.org)).
- \*”No Child Left Inside: Why we need both the No Child Left Inside Act and the National Environmental Education Act, <http://www.naaee.org/ee-advocacy>.
- \*“No Child Left Behind in the Woods,” by Richard Louv ([www.cnaturenet.org](http://www.cnaturenet.org)).
- \*Schoolyard-Enhanced Learning: Using the Outdoors as an Instructional Tool, K-8 ([www.stenhouse.com](http://www.stenhouse.com)).
- \*Excellence in Environmental Education, Guidelines for Learning, pre-K-12.
- \*“Improving Student Achievement with Environmental Education,” Martha C. Monroe, Jeanette Randall and Vicki Crisp, U of Florida Extension (<http://edis.ifas.ufl.edu/FR114>).
- \*Annotated Bibliography of Research Studies on the effects of environmental education, from C&NN’s website (see next entry).
- \*Headlines from the Children & Nature Network Annotated Bibliography stating the conclusions of each study on the effects of environmental education.
- \*Two ASCD “smart briefs.”
- \*Program yields more than dance skills,” Morag Maclachlan, *Standard-Times*, May 23, 2003 (students experience empathy with sea creatures caught in nets).
- \*“Public Education: how we fail our children,” Elizabeth Morse Read, *South Coast Insider*, June, 2007.
- \*“Lessons Learned from Native People,” Kim Ledoux, *South Coast Insider*, June, 2007.
- \*”New farm grows hope for those with autism,” Stacie Charbonneau, *South Coast Insider*, 8/07.
- \*”Environmental Educators Speak Out,” *Education Week*, July 17, 2007.
- \*“Sea Lab: a model program?”
- \*Turn the Tide Education Program, Lloyd Center, Dartmouth.
- \*Maxfield Street Peaceworks Garden brochure and information.
- \*Global Learning Charter Public School environment scavenger hunt rubric & map.
- \*Notes on the “Roots and Shoots” curriculum by Joanne Jarzowski, Director of Marine Education, Provincetown Coastal Studies.
- \*“Why Green Schools?”—Earth Day Network.
- \*The Eco-Municipalities Tree: communities as curriculum.

- \*The Natural Step ([http://en.wikipedia.org/wiki/The\\_Natural\\_Step](http://en.wikipedia.org/wiki/The_Natural_Step)).
- \*The Natural Step Funnel, Dr. Karl-Henrick Robert.
- \*"No Waste Economy," Gunther Pauli, *Resurgence Magazine*, n. d. on photocopy.
- \*Regional Profile for New Bedford.
- \*The SPREDD Futures Report: the section on Education is compatible with this report.
- \*Overview of the Apeiron Institute for Sustainable Living's Sustainable Rhode Island Initiative by Glenn Bachman, New Bedford.
- \*MCAS scores and performance goals gathered by Guillermo Gonzalez, M. D.

The foregoing are representative of the many articles, reports and studies being published every day. A google search of phrases such as "environmental education," "green schools" and "nature-based curriculum" will yield dozens of websites.

## Glossary

### Albedo Effect

The Albedo Effect is the extent to which an object reflects light (and heat) and is defined as the ratio of reflected to incident electromagnetic radiation. It is thus a unitless measure of a surface or body's reflectivity. In temperate regions, a high albedo effect can be achieved using a white or metallic surface coating and can help lower temperatures and air conditioning costs in buildings during summer cooling seasons; in temperate regions, a high albedo effect is a minor consideration during the cooling season since there is little incident sunlight. A low albedo effect may be desirable for buildings in polar regions.

### Biomass

An energy resource based on biological materials. Most often biomass refers to plant matter grown specifically for use as fuel. Basically this is another form of solar energy that has been converted to hydrocarbon molecules through the process of photosynthesis. Biomass can be obtained from many sources that would otherwise be wasted such as agricultural crop residues and residential, municipal and industrial wastes. Biomass can also be obtained from energy plantations, specifically designed to produce crops such as corn, sugarcane, switchgrass, hemp, poplar and willow trees. Biomass is often cited as a "carbon-neutral" fuel because the carbon released upon the burning of biomass balances the carbon absorbed by the plant while growing. However, when a broader view is taken of the entire process of growing the plants, including the carbon released by plowing fields, producing fertilizers, mechanized harvesting and transportation, biomass production and use does contribute to carbon dioxide emissions.

### Carbon dioxide (CO<sub>2</sub>)

A molecule that results from the combustion of materials containing carbon in the presence of air or other oxygen-containing substances. CO<sub>2</sub> is transparent to ultraviolet wave energy (such as incoming sunlight) but opaque to infrared wave energy (such as reflected heat off the surface of the earth. Thus it is one of the so-called greenhouse gases.

### Coal

A fossil fuel formed from decayed plant material under pressure and temperature conditions over eons of time. It contains the highest proportion of carbon by weight of any of the fossil fuels.

### Cogeneration

The simultaneous generation of at least two forms of energy on-site, such as process steam and electricity. Often this can be accomplished using waste materials as fuel.

### Education

Comes from the Latin word *educ*, meaning "to lead out, or away from" ignorance, superstition, false assumptions and bad decisions. Education is a deeper and more inclusive process than schooling or training, though it may include both. Education aims to inspire. It does not comprise all forms of learning, and not all results and benefits of education are measurable. A good education integrates the cognitive and affective faculties of the whole person. The

educated person has broad and deep knowledge and an ability to see connections between seemingly disparate ideas and makes connections across disciplines. The educated person possesses imagination and empathy and the ability to learn as much from the cultures of indigenous peoples as from the theorems of the great nuclear physicists.

### **Energy**

The capability to perform work. Energy may also be used to provide heat for buildings, homes or industrial processes.

### **Energy Management System**

An Energy Management System (EMS) is usually a system of computer-aided tools used by electric grid operators or facilities operators to monitor, control and optimize the performance of electrical and mechanical systems. Considering only the facilities usage appropriate to the City of New Bedford, an EMS could be installed which controlled chillers, boilers, valves, dampers, pumps and engines from a central monitored location to optimize energy savings and energy efficiency for the city. Sensing points would tell the pre-programmed central processor what conditions existed in each area of all buildings and actuating points would turn on or off equipment as needed. If pre-programming were inappropriate (for instance, a DPW building might normally be programmed to be unoccupied over a weekend but an emergency snow storm struck and required the building to be opened), the EMS Operator could override the programming to provide comfortable space heating and cooling for the emergency crew. An EMS also would allow the City to receive utility company rebates during emergency summer brown-out periods: by having the EMS Operator change programs to minimize energy usage by cycling equipment on and off on a pre-ordained schedule, substantial reductions in usage by City buildings would be rewarded with bonuses from NSTAR. N.B. Minimum energy usage programming should not be routinely used since short-cycling large central mechanical plant causes undue wear and tear on the equipment; this is an acceptable strategy only for brief periods of severe need.

### **Fossil energy**

Energy obtained from fuels or materials formed through processes involving fossilized plants or animals subjected to high pressures and temperatures over millions of years. These include coal, oil, natural gas, and all containing carbon and hydrogen elements in their chemical makeup.

### **Geothermal energy**

The thermal energy stored beneath the surface of the earth in the form of hot soils, rocks and fluids. The highest temperature geothermal energy resources are associated with volcanic or tectonically active regions. Moderate temperature resources can be found anywhere depending on the depth below the surface. Low temperature geothermal energy is available everywhere at very shallow depths, no more than a few meters, and can be exploited for heat pumps to heat and cool buildings.

### **Greenhouse gas global warming**

The complex, and as yet not fully understood, phenomenon involving the supposed relationship between the observed increase in the global average temperature and the extraordinary increase in carbon dioxide concentrations in the atmosphere. Given the extremely high CO<sub>2</sub>

concentrations since the end of the last Ice Age, about 11,500 years ago, one would have expected to see much higher increases in global temperatures than so far observed. It has been speculated that the modest temperature increases observed recently will accelerate dramatically and cause the melting of ice in the polar regions and in glaciers resulting in significant rises in sea levels.

### **Green Roofs**

A green roof consists of vegetation and soil, or a growing medium, planted over a waterproofing membrane. Additional layers, such as a root barrier and drainage and irrigation systems may also be included. A partially green roof might be implemented in a situation where an existing building structure cannot withstand the additional load of a full green roof but where energy savings can be achieved through careful color selection utilizing the albedo effect or through the use of heavy insulation.

### **Hydropower**

Electric power generated from falling or moving water. Dams are usually needed to increase the drop distance of the falling water so as to generate significant amounts of power. Dams cause disruption to land usage and can displace residents. Moving water is found in rivers and tidal inlets. Devices to obtain electricity from these hydro sources are submerged below the water line and typically moored to the bottom.

### **Kilowatt**

The amount of power needed to illuminate ten 100-watt light bulbs.

### **LIDAR (LIght Detection And Ranging)**

A non-contact means of measuring wind speed, turbulence, wind veer, and wind shear data using very short wavelength light pulses. See SODAR.

### **Life Cycle Cost Analysis**

Life cycle cost analysis (LCCA) is a method for assessing the total cost of facility ownership or for assessing the provision of a particular facility component. It takes into account all costs of acquiring (including design and financing costs), owning (including factors relating to inflation and the time-value of money), and disposing (or salvaging or recycling) of a building or building system. LCCA is especially useful when project alternatives that fulfill the same performance requirements, but differ with respect to initial costs and operating costs, have to be compared in order to select the one that maximizes net savings. For example, LCCA will help determine whether the incorporation of a geothermal space heating system, which will increase initial cost but result in dramatically reduced operating and maintenance costs, is cost-effective or not. LCCA should be used for consideration of all design alternatives since green technologies often cost more initially but involve sufficiently lower operational costs to more than offset the initial cost advantage of traditional technologies. Additionally, it should be noted that one need not always choose the design alternative with the least overall cost: it may be that the “green technology” is still preferred because it provides a better quality of life for occupants. LCCA however does provide a basis of cost comparison and allows a knowledgeable building owner to know and understand the true value of a given building feature and to make judgments about

whether or not a particular non-objective quality-of-life enhancement is worth the costs being contemplated.

**Measurable**

(In the context of Education.) Is a watchword of the MSTF with which the members of this committee had some trouble. We believe the teachers, students, administrators and community leaders who implement the strategies must assess their success collaboratively, in keeping with best sustainability practices.

**Natural gas**

A form of fossil fuel that consists of a mixture of volatile hydrocarbons, mainly methane, but including many other compounds such as ethane, propane, butane, carbon dioxide, and hydrogen sulfide. This fuel has the lowest proportion of carbon by weight of all fossil fuels.

**NIMBY (Not In My Back Yard)**

A form of citizen protest aimed at preventing projects from being built close to or within sight from their properties. Usually people using this tactic are not absolutely opposed to such projects as long as they are built elsewhere.

**Nonrenewable energy**

Any form of energy that has a finite supply and which is not being regenerated by natural forces on a sufficiently short time scale to be of benefit to humans.

**Nuclear energy**

A form of energy derived from releasing the bonding energy within the nuclei of atoms. First used for destructive purposes in the Atomic Bomb, this energy source can also be used for peaceful purposes, i.e., the generation of electricity. However, largely owing to the image created by its first application, and two notable subsequent accidents (Three Mile Island and Chernobyl), the use of nuclear energy for electricity power production has met with public resistance in many places.

**Ocean energy**

A form of energy associated with the motion and temperature of the oceans. The rise and fall of the tides can be exploited for energy production (Tidal energy), the wave action of the oceans can also be used (Wave energy), and the temperature difference between surface and deep waters can be captured in thermal power plants (Ocean Thermal energy).

**Oil**

A form of fossil fuel that consists of a mixture of volatile and non-volatile liquid hydrocarbons of various chemical arrangements. Commonly occurring as crude oil, petroleum is a complex substance that is refined into a various products such as gasoline, diesel fuel, kerosene, liquefied petroleum gas (LPG), tar and asphalt. Crude oil typically contains sulfur, which can contribute to air pollution when petroleum fuels containing it are burned, resulting in emissions of sulfur dioxide. Petroleum-based fuels have intermediate levels of carbon by weight proportionality among fossil fuels, lying between coal (highest) and natural gas (lowest).

### **Payback Analysis**

Payback analysis is an abbreviated version of Life Cycle Cost Analysis. Payback Analysis considers only first costs (design, construction, financing, etc.) vs. operational costs. This type of analysis is easier to do and can be used effectively for the evaluation of small green initiatives. For instance, one might install a traditional urinal at a total cost of \$400 or one might install a waterless urinal at a cost of \$500. At first glance, the building owner might prefer the conventional urinal but when we point out that the waterless urinal will avoid water supply and sewer charges of \$100 per year (and thus have a payback of one year), the building owner will prefer to specify the green waterless urinal for economic reasons.

### **Performance Contracting**

A method for funding capital projects that have a positive net financial affect. In a performance contract, the contractor implements the agreed upon capital improvement using his own funds and the owner organization pays the contractor back over time utilizing the monetary savings assignable to the improvement. For instance: a contractor pays for and installs high efficiency lighting in a building at a cost of \$100,000; the operational savings from this initiative are shown to be \$20,000 per year; the owner of the building pays the contractor back \$10,000 per year for a period of 12 years (representing repayment of the construction costs, interest and profit). The owner institution immediately starts saving \$10,000 per year on energy bills, gets a new asset, and, after 12 years of contractor repayments, starts saving \$20,000 per year on his/her energy bills.

### **Renewable energy**

A source of energy that is regenerated naturally on a very short time scale, thereby making it useful essentially forever on the time scale of human life. Energy sources that fall into this category include hydro, solar, wind, ocean and geothermal. Biomass is often included as well, but it is different from the ones mentioned in that it involves human activity in the creation of the resource. This means harvesting naturally growing plants, cultivating plants, or collecting organic materials (garbage and trash), and then either burning them directly for their heat content or processing them to release gases that can be used as fuels.

### **SODAR (SOmic Detection And Ranging)**

A non-contact means of measuring wind speed and direction by emitting sound energy vertically and obliquely into the air above a site and measuring the return signal at a receiver. The data is processed to reveal the speed and direction of the wind at various elevations above the ground, say at 30, 40, 50, ..., 160 m.

### **Solar energy**

A renewable energy resource based on the incoming energy from the sun. About 1 kilowatt of solar energy impinges on the top of the earth's atmosphere continuously, but losses from reflection and absorption reduce this to about 500-600 watts at the surface, depending on location. Owing to clouds and the day-night sequence, solar energy is intermittent.

### **Sustainability**

Refers to a realignment of human intentions, actions and institutions to harmonize with the natural systems of Planet Earth. Sustainability means personal and environmental health for all

living beings based on the creation of closed no-waste systems that value and protect human and natural resources with economic and social justice for all people.

The term was coined in 1987, when the Brundtland Commission of the UN met to address “the accelerating deterioration of the human environment and natural resources and the consequences of that deterioration for economic and social development.”

### **Systems thinking**

Is a vital principle of sustainability that models human educational, economic, medical, legal and environmental organizations on closed-loop natural systems and builds homes, schools, hospitals, businesses and industries that are energy-efficient and produce no-waste.

### **Therm**

A unit for measuring heat. One therm is equal to 100,000 British thermal units (BTUs). One therm is roughly the energy released from burning 100 cubic feet of natural gas at standard temperature and pressure (STP).

### **The Three E's**

of the Sustainability Revolution are Ecology, Economy and Equity, to which Education, Empowerment and (civic) Engagement might be added.

### **Triple-bottom-line accounting**

means accounting for environmental and social performance in addition to financial performance (people, planet, profit).

### **Wind energy**

A renewable energy resource based on the temperature and pressure differences created by the uneven heating of the earth by incoming energy from the sun. These pressure differences create movement of air from high to low-pressure regions, commonly called wind. The strength of the winds depends strongly on location and altitude. Since the winds are highly variable in most places, wind energy is intermittent.

## **Useful Links**

“The Green Lantern: Illuminating answers to environmental questions.”

<http://www.slate.com/id/2174662/landing/1>

A nationwide database of alternative energy incentives for financing sustainable projects:

<http://www.dsireusa.org/>

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