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PROJECT
"ECO-EFFICIENT AND SUSTAINABLE URBAN INFRASTRUCTURE DEVELOPMENT IN ASIA AND LATIN AMERICA"

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Eco-efficiency and Sustainable Infrastructure in the United States and Canada

Preliminary Report

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Executive Summary

Common Issues to Both Countries

The use of eco efficiency is strongly associated to industrial production following the original idea proposed by WBCSD in 1992 and not so much to urban infrastructure. However, there is an impressive array of initiatives seeking to improve environmental performance of urban infrastructure in the two countries similar to those suggested under eco-efficiency guidelines. Many of them are labeled as green infrastructure or sustainable infrastructure. In other occasions, similar actions and guidelines are used in the design and construction of urban infrastructure without using the green or sustainable label.

Support and promotion of eco- efficiency has concentrated in the private sector seeking to open new markets for this type of products and services.

The market has not been able to integrate a coherent and broad use of eco-efficiency in the design and construction of urban infrastructure in order to introduce changes leading to a sustainable future. Although many cities in the two countries have incorporated some degree of sustainable infrastructure (waste management, energy saving, etc.), those actions are not integrated is a coherent plan to make a difference in the way they growth. There are a limited number of cities with coherent and integrated plans for a sustainable future (some of them have been selected as case studies for this report). There are two important common elements to those cities. On one side, the leadership of their mayor has been essential to build political support among their constituencies to design and implement an ambitious and comprehensive environmental agenda for sustainable growth in their cities. On the other, the mayor of those cities have been able to capitalize on public attention to climate change during the last years in favor of sustainable growth in their communities. The leading role of those cities can foster sustainable and green infrastructure initiatives in many other cities of Canada and the United States. But so far the role of the public sector and regional coalition building with other sectors appears to be a key-missing factor to expand the use of eco- efficiency and sustainable infrastructure at the local level.

Growing political commitment to respond to the challenges of climate change in the U.S. and Canada can become a trigging to expanded efforts towards sustainable infrastructure and adopt eco-efficiency guidelines at the local level in urban areas. Climate change has brought public attention, political capital, and some resources to efforts seeking sustainability and green growth in urban areas.

It is important to highlight the importance of the domestic context in the study of best practices or examples labeled as success stories. The label of success experiences in a country is based on the domestic conditions, values, traditions and ideology. What appears within the political spectrum of the U.S. to be a progressive coalition around egalitarian and ecological objectives might pursue and agenda that would be considered much more limited in other countries (Sellers 2002). Hence, the export and adoption of

successful experiences from one country to another should carefully consider how those experiences could meet and benefit local needs and conditions as a first and fundamental step.

Differences

Cities in the United States generally compete independently for growth whereas provinces more often direct Canadian urban growth strategies

Opportunities

The new Obama administration will put the finishing touches on an economic-stimulus package whose centerpiece is $800,000 million U.S. dollars in spending on water infrastructure, green energy, upgraded highways and public buildings, modernized schools and dramatically expanded broadband networks. That has given a nice lift to stocks in the infrastructure sector -- and to the growing group of funds that invest in them (Norton 2009).

GREEN AND SUSTAINABLE URBAN INFRASTRUCTURE IN THE UNITED STATES

The United States. has very diverse, decentralized and fragmented models of developing and financing city infrastructure. Urban policy makers find themselves in the difficult position of negotiating with neighboring communities, competitive markets and citizens in a fragmented governance system (Pagano and Perry 2008).

The U.S. has gone through significant changes in the way urban infrastructure is financed during the last decades. Federal aid for cities has fallen precipitously since its peak in 1978 when 15 per cent of city revenues (more than 25 per cent in some big cities) to less than 3 per cent in 1999 (Judd and Swastrom 2004). Cities have increasingly relied on state governments for assistance in addressing major problems they confront (infrastructure needs). State aid has remained stable at around 22 per cent of municipal revenue since 1982.

However, the enhanced importance of states comes at a time when cities have lost political strength in state legislatures (Weir et al. 2005) due to population decline to rapid suburban growth. Today, more than one third of cities own- revenue are derived from user fees and charges, one third from property taxes, and approximately one third from local-option sales and income-taxes (U.S. Census Bureau 1972-2002). Cities revenue structure has increasingly dependent on user fees and charges.

Parallel to those transformations in the funding structure of cities, there has been also significant changes in the governance of urban infrastructure. There has been an explosion of public authorities and special districts since the late 1950s. Cities have farmed out services to public authorities and special districts that operate separately from the municipal government. Public authorities and special districts have been created for water and sewer services, mass transit, bridges and tollways, flood control and drainage, and housing and redevelopment. These authorities charge citizens for the provision of a service.

The increasing use of fees and charge as market-like charging mechanism affected the way government officials understood the behavior of citizens as consumers of public services. Cities are appropriating services based on consumers' willingness to pay, moving away from services provision based on the citizen's right to enjoy the service regardless of personal financing means (Bennett 1999). This has led to site-specific programs that link infrastructure investment to specific users rather than the community at large. The result is rapid growth in a number of special districts. Special districts had an increase of 133 per cent during the last 35 years (Pagano and Perry 2008).

There has also been a significant increase in homeowners associations during the last 35 years in the U.S. The number of persons living in homeowners associations has climbed from 2 million in 1970 to 58.8 million in 2007 (Pagano and Perry 2008). Many homeowners associations are charged with infrastructure responsibilities (typically streets, lighting, sidewalks, recreation). Yet, infrastructure ownership in those newly developed associations often reverts to the municipality, requiring the city to maintain and reconstruct the infrastructure.

Population growth has increased the demand of infrastructure in urban centers., aggravating the financial constraints of local government to expand urban infrastructure. As supply fails to keep pace with demand, infrastructure systems begin to accommodate more users than they were originally designed to handle. Such overuse, combined with lack of funding for adequate maintenance, results in accelerated asset deterioration. It is easier to ignore the unseen deterioration of fixed assets rather than siphon revenue of visible city services in many cities with financial problems (Markuson 2008). There is a growing recognition of widespread deterioration of infrastructure in the U.S. The American Society of Civil Engineers (ASCE) suggest there is a $1.6 trillion of infrastructure needs (ASCE 2005), created by deferred maintenance, deterioration of existing infrastructure, and increase demand of urban services (Markuson 2008).

Federal actions (the President's Commission on Critical Infrastructure, the President's Commission on Sustainable Development) have not addressed key obstacles to help urban areas meet their needs in infrastructure (decentralized and fragmented governance system of infrastructure and funding).

The decentralized and fragmented governance of urban infrastructure has created numerous difficulties for local officials to meet the demands of services by their constituencies. There is a strong support for market like approaches in the design of infrastructure financing, linking payment to an asset use under the expectation that consumers will adjust levels of consumption based on their preferences (Joassart-Marcelli and Musso 2005). The "marketized" public policies towards government services today should be balanced to be able to address the needs of segments of the population who are not able to pay their fair share. The public finance system for infrastructure should restore the benefit principle together with the ability- to- pay principle, in many cases replacing the system of convenience and chaos that evolved during the last century (Pagano and Perry 2008).

An additional problem is that the fiscal system in many cities encourages city officials to make infrastructure investment decisions that are anti-regional in character but at the same time are smart choices for the fiscal city health. This is particularly critical given the rapid expansion of metropolitan areas composed by diverse cities.

The fragmented and complex governance of infrastructure development in the U.S. is a major obstacle in the promotion of eco- efficient guidelines and sustainable infrastructure in many urban areas. The strong ideology in favor of a market economy that has led to the marketized public policies towards government services also hiders the promotion and enforcement of green and sustainable principles in the development of infrastructure. Missing in this context is the role of supra local nation-state that can be decisive to alter not just the opportunities but also aims of urban governing coalitions for sustainability.

In contrast, the United States is a leading country in the world in the development of technology, business, and services associated to green markets and sustainable principles. Some of those achievements associated with urban infrastructure are listed below. It is

interesting to note that despite the growing number of business promoting green technologies, those technologies and actions have not permeated in an integrated way into the design and construction of urban infrastructure in the large majority of cities in the U.S.

It is also worth noting the lack of coordination within municipal governments in favor of sustainable growth. Even municipal governments that have promoted and adopted sustainable principles lack balanced strategies among economic development, sustainable growth and social well-being. An integrated perspective is important to reduce conflicts and contradictions among programs and policies managing urban growth and essential to achieve coherence among different aspects of urban infrastructure. This appears to be a difficult task given the decentralized governance structure of urban growth in the U.S., but the examples of New York City, Chicago, and other cities illustrate it is certainly not impossible.

Below are a number of initiatives at the national level in favor of green and sustainable infrastructure in the U.S.

Green Infrastructure is a concept originating in the United Sates in the mid-1990s. The concept highlights the importance of the natural environment in decisions about land use planning. In particular, there is an emphasis on the "life support" functions provided by the natural environment for example; clean water and healthy soils, as well as the more anthropocentric functions such as recreation and providing shade and shelter in and around towns and cities. The United States Environmental Protection Agency (EPA) has extended the concept to apply to the management of stormwater runoff at the local level through the use of natural systems, or engineered systems that mimic natural systems, to treat polluted runoff. The Green Infrastructure approach analyses the natural environment in a way that highlights its function and subsequently seeks to put in place, through regulatory or planning policy, mechanisms that safeguard critical natural areas. Where life support functions are found to be lacking, plans may propose how these can be put in place through landscaped and/or engineered improvements. The term "green infrastructure" is sometimes expanded to "multifunctional" green infrastructure. Multifunctionality in this context refers to the integration and interaction of different functions or activities on the same piece of land.

The U.S. Environmental Protection Agency (EPA) considers that the green infrastructure approaches currently in use include green roofs, trees and tree boxes, rain gardens, vegetated swales, pocket wetlands, infiltration planters, vegetated median strips, reforestation, and protection and enhancement of riparian buffers and floodplains.
Green infrastructure is most effective when supplemented with other decentralized storage and infiltration approaches, such as the use of permeable pavement and rain barrels and cisterns to capture and re-use rainfall for watering plants or flushing toilets. These approaches can be used to keep rainwater out of the sewer system so that it does not contribute to a sewer overflow and also to reduce the amount of untreated stormwater discharging to surface waters. Green infrastructure also allows stormwater to be absorbed and cleansed by soil and vegetation and either re-used or allowed to flow back

into groundwater or surface water resources (http://www.epa.gov/npdes/pubs/gi_intentstatement.pdf). EPA awarded nearly US$1.5m grant for water infrastructure and green innovations in 2008.

One example of federal support for green infrastructure is EPA's grant of US$1,474,500 to the Kansas City, MO, Water Services Department to replace or relocate drinking water mains, sanitary sewers and stormwater sewers as part of the Beacon Hill Redevelopment Project, located west of Bruce R. Watkins Drive from 22nd Street to 27th Street in Kansas City, MO. The project will include green stormwater infrastructure, such as an underground detention basin, bio-retention cells and rain gardens. EPA Region 7 Administrator John Askew said, 'These green innovations will help to ensure our water resources and water infrastructure systems are clean, safe and sustainable for our families, children and grandchildren. Reusing water such as stormwater, whether through bio-retention cells or rain gardens, is an effective strategy.'

Bio-retention cells and rain gardens are small landscaped, graded areas that are constructed with a special soil mix that can absorb and filter runoff. Low maintenance, water-tolerant plants are often used in these rain gardens. These landscaping elements aid in reducing stormwater runoff, removing pollutants and replenishing the aquifer. EPA considers that this broader sustainability initiative will help to reduce stormwater before it reaches the city's stormwater system. It is expected that the project will maximize stormwater infiltration, reduce pollutants from stormwater runoff, improve water quality, and promote plant diversity (http://www.environmental-expert.com/resultEachPressRelease.aspx?cid=7698&codi=35957).

Smart Growth

The concept of smart growth emerged in the 1990s and its use has expanded rapidly in the U.S. Smart growth concentrates growth in the center of a city to avoid urban sprawl and advocates compact transit oriented development, pediestran and bicycle friendly land use, including neighborhood schools, and mixed use development with a range of housing choices. It values long-range, regional considerations of sustainability over a short-term focus. Its goals are to achieve a unique sense of community and place; expand the range of transportation, employment, and housing choices; equitably distribute the costs and benefits of development; preserve and enhance natural and cultural resources; and promote public health (Song 2005, Edwards and Haines 2007).

Waste

Efforts to reduce the generation of waste and expand the reuse and recycled of waste have mixed results among communities in the U.S. Early efforts for waste recycling go back to the 1970s, but they really took off in the 1990s. The rate of recycling stands at 32 per cent in 2007 but some communities have reached 40 per cent of their municipal waste. Some states have set higher targets but they have not achieved them due to declining aid (Kollikkahara et al. 2009). New Jersey was the first state to require mandatory recycling and reached 44 per cent recycling of glass, metal, plastic, and paper

that previously were disposed. 20 years later waste recycling had declined to 34 per cent due to declining state and local aid.

Another problem is that the U.S. is not meeting the requirements of the current federal legislation (RCRA) for the development of markets for recycled materials or meeting specific measures to encourage the development of new uses for recycled materials (GAO 2006).

Additional problems of waste in the U. S. are:

- The per capita waste generated by residents in the U.S. remains at an old time high
- A comprehensive federal waste and recycling plan have yet to materialize in the U.S. Most regional waste management systems have not formed a holistic method for analyzing all spatial, temporal, and qualitative aspects of waste management (Schmelen and Power 2006).
- Environmental laws are formulated often as reactionary responses to control waste management activities with an obvious lack of comprehensive control (Kollikkahara et al. 2009).
- Lack of consistency among the states create problems for recycling companies
- Farming out the collection and treatment of waste to private companies has reduced municipal responsibility over this complex problem. But waste treatment has become a competitive market and interstate commerce of waste has restricted the power of the municipalities to designate the facility to which waste could flow.
- Take back laws of electric and electronic waste have been created only in few states.

Some of the accomplishments so far are:

- Many municipalities have in place mandatory recycling programs especially for paper, plastic, metals, and glass.

- Some municipalities have adopted single-stream collection (easier for households to recycle) in order to encourage recycling.

- There has been significant improvements in products and processes design to reduce the generation of industrial waste during the last two decades.

- A growing number of companies have began to use life cycle assessment of industrial products.

- Waste wise programs, a federal program from the Environmental Protection Agency, targeting the reduction of municipal solid waste and the emission of greenhouse gases.

Municipalities have a mixed and limited success in waste reduction in the U.S. The success stories have not been sustainable in the middle term due to declining financial support. Some of the experiences labeled as success stories under the waste wise program have limited benefits, often limited to the reduction of waste by the municipal, state, and federal authorities, or some business. Missing so far for sustainable environmental improvements are integrated waste management systems at the municipal level that combine waste stream, waste collection, treatment and disposal methods with the objectives of achieving environmental benefits, economic optimization, and societal acceptability (McDougall et al. 2001).

One of the few municipalities with integrated waste systems is Palm Beach, Florida. The Solid waste authority of Palm Beach has progressively expanded the system since 1975. The system currently includes waste to energy plant, a vegetation processing facility, two municipal recycling facilities, household waste collection facilities, and five transfer stations (SWA 2007). Unfortunately few municipalities have similar systems.

Buildings

Buildings in the United States account for 39 percent of total energy use, 12 percent of the total water consumption, 68 percent of total electricity consumption, 38 percent of the carbon dioxide emissions (EPA 2008).

Leadership in Energy and Environmental Design Green Building Ratio System (LEED) is created and supported by the U.S. Green Building Consortium (USGBC). USGBC has more than 17,000 member organizations from every sector of the building industry and works to promote buildings that are environmentally responsible and profitable. It encourages the adoption of green buildings and development practices through the creation and implementation of universally understood and accepted tools and performance criteria. The Green Building Ratio System is applied to homes, neighborhood developments (in pilot), commercial interiors, schools, healthcare, and retail buildings, new buildings, and retrofit of existing buildings. LEED focuses on five key areas: sustainable site development, water savings, energy efficient, material selection, and indoor environmental quality. State and local governments are adopting LEED standards for public-owned and public-funded buildings[1].

Green building brings together a vast array of practices and techniques to reduce and ultimately eliminate the impacts of buildings on the environment and human health. It often emphasizes taking advantage of renewable resources, e.g., using sunlight passive solar, active solar, and photovoltaic techniques and using plants and trees through green

[1] Green building can lead to 1) *reduced operating costs* by increasing productivity and using less energy and water, 2) *improved public and occupant health* due to improved indoor air quality and 3) *reduced environmental impacts* by, for example, lessening stormwater runoff and the heat island effect. Practitioners of green building often seek to achieve not only ecological but aesthetic harmony between a structure and its surrounding natural and built environment, although the appearance and style of sustainable buildings is not necessarily distinguishable from their less sustainable counterparts.

roofs, rain gardens, and for reduction of rainwater run-off. Many other techniques, such as using packed gravel for parking lots instead of concrete or asphalt to enhance replenishment of ground water, are used as well.

The National Association of Green Builders, a trade association representing home builders, remodelers and suppliers to the industry, has created a voluntary residential green building program known as NAHBGreen (www.nahbgreen.org). The program includes an online scoring tool, national certification, industry education, and training for local verifiers. The online scoring tool is free to builders and to homeowners.

The Green Building Initiative is a non-profit network of building industry leaders working to mainstream building approaches that are environmentally progressive, but also practical and affordable for builders to implement. The GBI has developed a web-based rating tool called Green Globes, which is being upgraded in accordance with ANSI procedures.

The United States Environmental Protection Agency Energy Start Program rates commercial buildings for energy efficiency and provides Energy Star qualifications for new homes that meet its standards for energy efficient building design.

In 2005, Washington State became the first state in the United States to enact green building legislation. According to the law, all major public agency facilities with a floor area exceeding 5,000 square feet (465 m^2), including state funded school buildings, are required to meet or exceed LEED standards in construction or renovation. The projected benefits from this law are expected to be: 20% annual savings in energy and water costs, 38% reduction in waste water production and 22% reduction in construction waste.

At the local level, Chaelottesville, Virginia became one of the first small towns in the United States to enact green building legislation. This presents a significant shift in construction and architecture as LEED regulations have formerly been focused on commercial construction.

Energy

Energy Efficient Commercial Building Tax Deduction

The federal Energy Policy Act of 2005 established a tax deduction for energy-efficient commercial buildings applicable to qualifying systems and buildings placed in service from January 1, 2006, through December 31, 2007. This deduction was subsequently extended through 2008, and then again through 2013 by Section 303 of the federal Energy Improvement and Extension Act of 2008 (H.R. 1424, Division B), enacted in October 2008.

A tax deduction of $1.80 per square foot is available to owners of new or existing buildings who install (1) interior lighting; (2) building envelope, or (3) heating, cooling, ventilation, or hot water systems that reduce the building's total energy and power cost by 50% or more in comparison to a building meeting minimum requirements set by ASHRAE Standard 90.1-2001. Energy savings must be calculated using qualified computer software approved by the IRS.

Deductions of $0.60 per square foot are available to owners of buildings in which individual lighting, building envelope, or heating and cooling systems meet target levels that would reasonably contribute to an overall building savings of 50% if additional systems were installed.

The deductions are available primarily to building owners, although tenants may be eligible if they make construction expenditures. In the case of energy efficient systems installed on or in government property, tax deductions will be given to the person primarily responsible for the systems' design. Deductions are taken in the year when construction is completed.

Energy- Efficient New Homes Tax Credit for Home Builders
The federal Energy Policy Act of 2005 established tax credits of up to $2,000 for builders of all new energy-efficient homes, including manufactured homes constructed in accordance with the Federal Manufactured Homes Construction and Safety Standards.

The home qualifies for the credit if:

- It is located in the United States;
- Its construction is substantially completed after August 8, 2005;
- It meets the energy saving requirements outlined in the statute; and
- It is acquired from the eligible contractor after December 31, 2005, and before January 1, 2010, for use as a residence.

Energy Efficient Mortages
Homeowners can take advantage of energy efficient mortgages (EEM) to finance a variety of energy efficiency measures, including renewable energy technologies, in a new or existing home. The U.S. federal government supports these loans by insuring them through Federal Housing Authority (FHA) or Veterans Affairs (VA) programs. This allows borrowers who might otherwise be denied loans to pursue energy efficiency improvements, and it secures lenders against loan default. The FHA allows lenders to add up to 100% of energy efficiency improvements to an existing mortgage loan by insuring a loan of up to 5% of a home's appraised value with certain restrictions. FHA mortgage limits vary by county, state and the number of units in a dwelling.

There are a large number of initiatives within each state. Below are some examples of those initiatives.

California

- The Santa Monica Green Building Program offers financial incentives for buildings and innovative building technologies certified to Leadership in Energy and Environmental Design (LEED) standards, awarding two types of grants to promote green building throughout the city. With respect to renewable energy technologies, LEED awards 1-3 points based on the percentage of the total energy load met using renewable energy, including solar, wind, geothermal, biomass, hydro, and bio-gas strategies. Renewable energy points are awarded for electric

power generation only. However, additional points are available for reducing the overall energy consumption of buildings, which may be accomplished through other renewable energy strategies.

Grants for new private sector buildings are based on the level of certification attained under the LEED standards:

LEED Certified - $20,000
LEED Silver - $25,000
LEED Gold - $30,000
LEED Platinum - $35,000

All new construction and major renovation in commercial, affordable housing, mixed use, and multi-family residential that register for LEED (LEED-NC) certification are eligible to apply. Additionally, grants may be issued for LEED-Homes certified buildings and will range from $2,000 to $3,500 for multifamily projects and from $3,000 to $8,000 for single family homes.

- San Bernardino's Board of Supervisors launched Green County San Bernardino in August 2007. The program includes a number of incentives to encourage residents, builders, and businesses to adopt more sustainable practices. Homebuilders who build homes in the county that meet the California Green Builder Standard will receive expedited plan checks, guaranteed timelines, and priority field inspection service. Residents and businesses in existing buildings can also receive incentives for improving their building's energy use. Permit fees will be waived for the installation of solar energy systems, wind-generated electrical systems, tankless water heaters, and highly efficient heating, ventilation and air conditioning systems.

New York

- **NSERDA Energy Star Buidings**

NYSERDA offers a program to encourage more industry involvement in the building of Energy Star Standard Homes. When a builder is certified as an Energy Star Home Builder and builds a home to Energy Star Standards, he or she is eligible for a direct cash incentive of $750 to $1,500. The actual level of the incentive depends on how efficient the home is. Larger incentives are available for display homes ($2,500) and model homes ($3,000). Non-display, non-model homes built in Westchester, Bronx, Richmond, Kings, New York, and Queens counties receive a $250 bonus incentive.

- Green Building Tax Credit

In 2000, New York enacted a Green Building Tax Credit for business and personal income taxpayers. The credit can be applied against corporate taxes, personal income, insurance corporation taxes and banking corporation taxes. The incentive applies to owners and tenants of eligible buildings and tenant spaces which meet certain "green" standards. These standards increase energy efficiency, improve indoor air quality, and reduce the environmental impacts of large commercial and residential buildings in New York State, among other benefits.

The original 2000 legislation (Period I) allowed applicants to apply for a Credit Component Certificate in years 2001-2004 and to claim the credits over five years. Legislation in 2005 (Period II) extended the program, allowing applicants to apply for a

Credit Component Certificate from 2005-2009. Taxpayers who are issued an Initial Credit Component Certificates for Period II have nine taxable years (2006-2014) to claim the credits. The original law provided for $25 million in credit certificates; the 2005 legislation added another $25 million. Taxpayers who received credits under Period I may not seek additional credits for the same building for Period II.

Owners and tenants must work through an architect or engineer who will help obtain a credit certificate from the state for their project. The credits are distributed over a five year period with any unredeemed portion able to be carried forward indefinitely or transferred to a new owner or tenant.[2]

Washington

- Seattle Density Bonus for Green Buildings

The Mayor of Seattle signed new downtown zoning legislation on April 12, 2006 which established an incentive for the construction of green buildings. The incentive applies to buildings in the central office core and adjoining areas, including Denny Triangle and a portion of Belltown. Commercial and residential buildings in those portions of downtown which achieve a minimum LEED* certification at the Silver level can be built to greater heights and/or greater maximum floor areas. The Downtown Zoning Ordinance allows owners and developers to use either the LEED for New Construction (LEED–NC) or LEED for Core & Shell (LEED–CS) products. LEED–NC covers all building elements, including core and shell and interiors. LEED–CS covers base building elements (structure, envelope and systems).

- **King County LEED Grant Program**

King County's Department of Natural Resources and Parks provides financial grants and free technical assistance to new construction and major renovation commercial building projects in King County, outside the City of Seattle, seeking LEED* certification. Private, nonprofit, and public projects are eligible to apply for grant awards based on the level of certification achieved. Eligible projects can receive a grant in the amount of $20,000 for achieving a certification level of LEED Silver, $25,000 for LEED Gold, or $30,000 for LEED Platinum.

In addition to the measures required for a building to achieve LEED Certification, King County has five other specific requirements for projects to receive grant funding:

- Achieve a minimum 75% recycling rate for all construction and demolition debris
- Reduce landscape irrigation by 50% and building's water use by 20% beyond code requirements
- Demonstrate that the King County 2005 Surface Water Design Manual Standards or equivalent have been met or exceeded
- Demonstrate that the King County Post-Construction Soil Standard has been met or

[2] Note: Although this tax credit can be claimed on personal income taxes, the building eligibility rules are such that it is not available for single-family residential homes.

exceeded
- Increase energy efficiency beyond code requirements to achieve at least four points in the LEED "Optimize Energy Performance category"

- **Seattle Green Grant Program**

The Seattle/King County Built Green Grant Program provides periodic competitive grants for single-family residential and community development projects to help offset the cost of certifying and designing innovative green projects throughout Seattle and King County. The grants are funded through the Department of Natural Resources and Parks, Water and Land Resource Division and Seattle Public Utilities. To be eligible for this grant, buildings need to achieve either Built Green 4-star or 5-star certification. Built Green is an environmentally-friendly, non-profit, residential building program of the Master Builders Association of King and Snohomish Counties, developed in partnership with King County, Snohomish County, and other agencies in Washington State. Certification under Built Green requires achievements in energy efficiency, indoor air quality, the conservation of natural resources and water quality.

Single-family homes which are certified at the 4-Star level can receive a grant of $2,500, or $5,000 if they are certified at the 5-Star level. Single-family developments of 4 or more units can receive $5,000 or $10,000 if they achieve 4-Star or 5-Star certification respectively. Community developments and multi-family developments of 10 or more units can receive $10,000 or $20,000.

Illinois

- **Chicago Green Permit Program**

The City of Chicago encourages building design, construction and renovation in a manner that provides healthier environments, reduces operating costs and conserves energy and resources through their Green Permit Program. The Chicago Department of Buildings (DOB) Green Permit Program provides developers and owners with an incentive to build green by streamlining the permit process timeline for projects which are designed to maximize indoor air quality and conserve energy and resources. Projects accepted into the Green Permit Program can receive permits in less than 30 business days or in as little as 15 business days. The number of green building elements included in the project plans and project complexity determines the length of the timeline. Projects, which meet more stringent sustainability guidelines, may also qualify for a waiver of consultant code review fees.

Interested applicants are encouraged to involve DOB early in the design process. DOB will help to guide the applicant through the process to ensure the shortest permitting process time. Acceptance into the Green Permit Program is based on a series of requirements that qualifies the project for one of the three different Benefit Tiers of green building certification. Commercial projects must earn various levels of certification within the appropriate Leadership in Energy and Environmental Design (LEED) rating system developed by the U.S. Green Building Council. Smaller residential projects must earn a two-star or greater rating under the Chicago Green Homes program. Both

commercial and small residential projects are also required to earn from one to three *menu items* in order to be eligible for permitting privileges. Menu items are additional green design strategies above and beyond certification prerequisites.

Colorado

- **Local Insulation Rebate Program**

The Colorado Governor's Energy Office (GEO) has provided matching grants to establish local insulation rebate programs throughout the state. The residential rebate program, called Insulate Colorado, provides rebates of 20% of the cost, up to $300, to homeowners who increase the insulation and/or air sealing of their homes. This is not a statewide program. To participate, the home must be located within a participating jurisdiction and the homeowner must use a program-approved contractor. The rebate is for attic or exterior wall insulation and air sealing upgrades only, and the insulation must be upgraded to the recommended R-Values presented in the 2006 International Energy Conservation Code (2006 IECC) for the specific climate zone. After the work is complete, the homeowner can receive their rebate check by submitting the rebate form for their particular jurisdiction as well as copies of the installation invoice and the official "insulation card" as proof of the work being completed. Rebates are available through the local jurisdictions on a first-come, first-served basis until program funding is exhausted. Interested homeowners should contact their jurisdiction to ensure that funding is still available.

- **Colorado Spring HomeVantage Home Improvement Financing**

Colorado Springs Utilities, in partnership with a Federal Credit Union provides $1,000 to $50,000 loans to finance energy efficiency projects for its residential customers. The loans may apply to installation of energy efficient kitchen appliances, washer/dryers, insulation and weather stripping, new windows, central A/C, new water lines, water-efficient landscaping, and new propane and septic tanks.

CASE STUDIES

New York City

The mayor of New York announced PLANYC in June 2007. PLANYC (http://www.nyc.gov/html/planyc2030/html/home/home.shtml) is a comprehensive plan of 127 initiatives to help NYC become a sustainable city. The plan brings together a number of programs and initiatives on water, land, transportation, air, energy and climate change. The city has also a permanent information and promotion campaign, GreenNYC (http://www.nyc.gov/html/planyc2030/html/greenyc/greenyc.shtml), to help residents become involve in transforming New York in a green city. Below are the main features of PLANYC. NYC has a broad and diverse approach to integrate and coordinate green and sustainable initiates for the future of the city. Those initiatives include the design of

responses to climate change (mitigation and adaptation) and include the creation of an Office of Long-term Planning and Sustainability which help coordinate actions among different agencies.

Water

New York City receives 1,200 million of gallons of water every day. The water comes from 19 upstream streams, river, lakes, and reservoirs and serves the 8.2 million residents in the city. The plan focuses on three main issues in this sector: the quality reliability of drinking water, to guarantee that the watersheds surrounding the city are clean and accessible to the citizens (water supply, recreation uses, and habitat protection), the use of stormwater.

The water plan includes the following initiatives: watershed protection; construct a ultraviolet disinfection plant for the Catskill/Delaware system; construct a water filtration plant to protect the Croton supply; implement a water conservation program to reduce citywide consumption by 60 million gallons per day; add 245 mgd to the current water supply through increase efficiency in the system; evaluate 39 projects to meet the shortfalls needs of the city during the maintenance and repair of the Delaware aqueduct.; complete the construction of tunnel 3 and the repair of tunnel 1; replace pipelines connecting Staten Island to tunnel 2; accelerate the replacement of existing water pipes (80 miles annually).

The water quality program has the following initiatives: complete the long-term control plans of the 14 New York City watersheds; reduce combined outflow of sewage with more than 185 mgd during rainstorms; increase high level storm sewers where feasible with combined sewer areas citywide and into major new developments; increase the amount of green, permeable surfaces to reduce storm water runoff throughout the city (40 new green street projects)[3]; expand the blue belt system in Staten Island draining precipitation to avoid localized flooding and septic tank failure[4]; the creation of an

[3] Green spaces act as natural storm water capture and retention devices. The 9,000 acres of vegetative cover lost between 1984 and 2002 could have absorbed, according to an analysis by the U.S. Forest Service and the City's Department of Parks & Recreation (DPR), 243 million gallons for every inch of rain. Trees capture rainfall on their leaves and branches and take up water through their roots, and release significant volumes to the air through evaporation. In all, the DPR estimates that city street trees capture 870 million gallons of stormwater each year. At least four million gallons of water are absorbed by soil around street trees during each storm event. Over the next 25 years, NYC will undertake 40 new Greenstreets projects every planting season, bringing the citywide total to more than 3,000 by 2030. A one-acre Greenstreet can hold about 55,000 gallons of storm water. The existing total acreage of Greenstreets sites in New York City is almost 164 acres, which translates into nine million gallon capacity citywide. With an additional 40 new Greenstreet projects, covering 75 acres, the capacity to hold stormwater will increase by four million gallons.In addition to increasing stormwater storage through Greenstreets, NYC will increase the number of trees in the city by one million. New designs for the tree pits could significantly increase this capacity as well.

[4] Nearly 36% of Staten Island's precipitation drains into the current Bluebelt system which covers nearly 10,000 acres. Over the next 25 years, we will seek to add an additional 4,000 acres in the borough, spread

Interagency task force to design and implement best management practices for water quality (BMP)[5]; pilot promising best management practices (introducing 20 m3 of ribbed mussel beds, design five expanded tree pits and monitor impacts, pilot one swale to collect rainwater from roadways, pilot additional MBP; modify the zoning resolution to include design guidelines for off-street parking lots for commercial and community facilities; provide incentives for the installation of green roofs[6]; assess the vulnerability of existing wetlands and identify additional policies to protect and manage them.

The City currently provides incentives for the private development of two BMPs through DEP's Comprehensive Water Reuse Program. This program offers buildings that install "blackwater" or "greywater" systems a 25% discount off their water and sewer charges. "Blackwater" systems capture and treat sanitary wastewater and recycle it within the building for non-potable use. "Greywater" systems capture used water from washing machines, dishwashers, and showers and reuse that water for toilets or other non-potable applications. Since 2007, the City began providing incentives for green roofs, as well. New York City supports the installation of extensive green roofs by enacting a property tax abatement to off-set 35% of the installation cost of a green roof. The pilot incentive will sunset in five years, when it will be reassessed for extension and inclusion of other technologies.

Sustainable Stormwater Management Plan

This plan is key component of PLANYC and the City's plan for greener New York. The basic principle behind the plan is that stormwater runoff does not have to be a problematic by-product of development. Buildings and landscape design that mimic natural systems and infiltrate, retain, or detain rainfall onsite, can reduce excess flow into sewers, streets, and waterways. For every inch of rain that falls on an acre of roof tops or

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across South Beach, New Creek, and Oakwood Beach.To date, the Bluebelt program has saved the City an estimated $80 million in infrastructure costs, and it has also saved homeowners money in flood damage. In addition, property values in the immediate vicinity of the completed Bluebelt drainage corridors have consistently appreciated, enhancing the city's tax base. The program has demonstrated that wetland preservation can be economically prudent and environmentally responsible. In 2005, the EPA recognized the leadership of the Bluebelt by awarding it an Environmental Quality Award.

[5] New York City Interagency BMP Task Force will bring together all relevant City agencies to analyze ways to incorporate BMPs for water quality into the design and construction of projects. The Task Force and its working groups will be coordinated by the Office of Long-Term Planning and Sustainability with participation from the Departments of Environmental Protection, Design and Construction, Transportation, Citywide Administrative Services, Parks & Recreation, Health and Mental Hygiene, City Planning, and Buildings, and the Office of Management and Budget.The Task Force also will create a set of performance metrics to be published annually. Possible metrics include market penetration of BMPs on private development, acres of permeable surfaces, storm water capture rates, and improvement in water quality such as reductions in fecal-coliform levels and increases in dissolved oxygen. It will develop a process to monitor, assess, and report agency and BMP performance, as well as a process to reevaluate and modify the report every two years.

[6] The City is developing four residential and two commercial pilots to analyze the potential cumulative benefits of green roofs on the city's combined sewer system. The expected cost for each is $100,000 for design and $1.3 million for construction and equipment.

other imperious surfaces, the city has to manage 27,000 gallons of water. This plan is the first comprehensive analysis of the costs and benefits of alternative methods of controlling stormwater[7].

The city has already invested in large expensive tanks to store combined flows (sewer and stormwater) and it is planning to invest near $2,000 more in systems upgrades to reduce the combined sewage outflow even further. To forestall the need for further expensive infrastructure, the plan explores the feasibility of source controls such as rooftops that store rainfall and slowly release it to the sewers; green roofs that store rain in soils and use some of it in plants; roadways alterations that allow runoff to infiltrate into the ground; and cisterns that can store water from downspouts. The short-term actions planned include the following initiatives.

Capture the benefits of green initiatives in PLANYC. The plan contains a number of greening initiatives that will capture stormwater including the planting a million of trees, zoning amendments to require street trees and green parking lots, additional green streets, a green roof tax abatement, public plazas in underutilized areas of the roadbed, additional engineered wetlands in the bluebelt system, the conversion of asphalt fields to turf, the conversion of schoolyards into playgrounds, and the protection of natural wetlands.

Continue implementing ongoing source control efforts. These efforts include zoning amendments that prohibit the paving of front yards in private homes and required planted areas in privately owned public plazas, water conservation incentives and initiatives, interagency coordination of construction specifications, the use of High Level Storm Sewers, and measures to reduce flooding.

Establish new guidelines for public projects. The city will release the Street Design Manual, Park Design for the 21st Century, the Sustainable Urban Design Manual, and the Water Conservation Manual.

Change sewer regulation and codes to adopt performance standards for new development.

Improve public communication of combined sewer outflow.

Complete ongoing demonstration projects and other analysis.

Broaden funding options for cost effective source control. The city is considering five potential sources: 1) rate increases, stormwater charges, or a combination of the two approved by the Water Board, 2) the general municipal fund, 3) outside funding, 4) expanding of the federal role in financing infrastructure improvements, and in the future, 5) funds that otherwise would go to build expensive storage tunnels and other conventional infrastructure.

[7] NYC has 14 waste pollution control plants that treat 1,300 millions of water every day. Still, thousands of millions of gallons of combined sewage outflow (CSO) are discharged to New York City waters when excessive levels of stormwater reach the combined sewers. This problem is expected to aggravate by climate change in the near future.

Complete water and wastewater rate study and reassess pricing for stormwater services. The city is analyzing its current expenditures, reviewing the rate of credir programs of other municipal water systems, and estimating the impacts of alternative stormwater rate structures on ratepayers and revenues. This effort will be coordinated with other ongoinf efforts to map imperious areas in the city and to overhaul the program for water bills.

Waste Recycling

New York City has the largest, most ambitious recycling program in the United States. All 3 million households, plus public schools and institutions, receive recycling collection by the Department of Sanitation. All commercial businesses are required to keep separate certain recyclable materials prior to their collection by their private carters. The Department of Sanitation collects the following quantities of recyclables (from NYC residents, agencies, and institutions) and delivers them to private processors under contract with the City: between 366,000 and 423,000 tons per year of mixed paper recyclables. Between 250,000 and 331,000 tons per year of metal, glass, and plastic recyclables. In addition to its curbside recycling program, the Department also collects fall leaves and Christmas trees for composting.

Approximately half the paper that the Department collects for recycling goes to the first five processors. To keep track of tonnage, Sanitation trucks weigh in before delivering paper. The paper processors then separate the paper into various grades to sell on the open market. The majority of the paper received by these processors is sold for export.

All the metal, glass, and plastic recyclables that the Department collects for recycling go to Sims Municipal Recycling. As part of the company's anticipated long-term contract with the City, Sims Municipal Recycling plans to build a new, state-of-the-art materials recovery facility at the South Brooklyn Marine Terminal. The completed facility will further minimize truck traffic because it will be capable of receiving barged materials and shipping out processed materials via both barge and rail. To help New Yorkers understand the recycling process, the company plans to construct a visitor education center on the site.

Until July 1, 2010, NYC residents can discard unwanted or broken electronics (computers, monitors, TVs, cell phones) in the trash, but it has a campaign to recycling these items. The public is also encourage to take advantage of the “take-back” program implemented by electronics manufacturers and retailers (usually via a mail-back program) for recycling. Some retailers and manufacturers charge a fee, some are free, and some will pay for items with value. Some also offer home pickup and/or coupons for discounts on the purchase of new products. Additionally, some retailers will accept electronics for recycling when new purchases are made. Starting late 2009, under NYC's Electronic Equipment Collection, Recycling and Reuse Act (Local Law 13 of 2008), New Yorkers can return used electronics to the manufacturer for recycling.

All City agencies and schools, business and institutions are required to recycle computer equipment, unless it is donated or resold for reuse. The Department of Sanitation does not accept these items in the trash. Rechargeable batteries (found in cell phones, tools, toys, laptop computers, etc.) must be recycled. It is illegal for New York City residents, City agencies, and/or businesses to discard rechargeable batteries in the trash or in residential recycling containers.

Land

New York City needs 265,000 housing units by 2030 in order to meet future needs. The city plans to expand future supply through affordable and sustainable housing, directing growth towards areas served by public transportation. The city has the following housing initiatives related to the topic of this report: Use upcoming rezonings to direct growth toward areas with strong transit access; use transit extension to spark growth; green the cityscape.[8]

Transportation

Increase capacity on key congested routes. The City has been working closely with the Metropolitan Transportation Authority (MTA) and other partners to ensure adequate funding is available to complete the capacity in those routes. In its recently-released 2008-2013 capital program, the MTA proposed a commitment of $1.38 billion in new funding, on top of current funding of $2.96 billion, to complete the first phase of the Second Avenue Subway (SAS). In addition, MTA has dedicated $1.0 billion to begin construction on the next phase of the SAS. MTA also allocated $150 million in funding to advance the Long Island Rail Road's Third Track project.

Improve and expand bus service. New York City and the MTA will launch five BRT routes, one in each borough. They will incorporate many of the most successful proven features from domestic and international systems, including establishing dedicated bus lanes with bright, distinctive signage. The lanes will be marked with red paint to distinguish them from regular traffic lanes, and their exclusive use by buses will be enforced rigorously. BRT service will run along the same routes as traditional buses; but, more buses will run along the routes, and stops will be spaced farther apart than local service, with stations every 10 to 15 blocks. (By contrast, regular buses often stop every two to three blocks.) Electronic message boards will provide riders with real-time updates on arrival times. As illustrated below, the savings in terms of travel times will be significant. By 2014, NYC will expand BRT service by at least five additional routes. It

[8] The Department of Parks & Recreation has planted more than 122,000 curbside trees of more than 30 different varieties during the last decade. It has also added 300 acres of parks in the last years. Current plantings fill 74% of the existing space for street trees. The city has undertaken an aggressive campaign to plant trees wherever possible, in order to fully capitalize on tree opportunities across the city. The goal is to raise the street stocking level from 74% to 100% as part of the overall goal of planting one million more trees by 2030. To achieve this, NYC will plant approximately 23,000 additional trees annually.

will also implement new technologies, including giving BRT vehicles signal priority-which means traffic lights recognize approaching buses and either turn or stay green so that the buses remain on schedule. New York City Department of Transportation (DOT) and the MTA are working together to implement Transit Signal Priority (TSP) in at least 223 locations, allowing buses to move faster by having to stop at fewer red signals.

Address congested areas across the city. Actions under consideration will include new bus, pedestrian and bicycle enhancements, changes to the road design, modification to parking rules to free up curb space, and technological upgrades like computerized signaling systems to facilitate traffic flow. Broader improvements, such as taxi or for-hire vehicle stands, increased transit service, and targeted traffic enforcement, could also be part of the solutions.

Promote cycling. In order to reduce traffic and reach NYC's clean air and greenhouse gas reduction goals, New Yorkers should be given the option of reaching their jobs and major city destinations through cycling. The city will dramatically accelerate the implementation of the City's 1,800-mile bike lane master plan, to ensure that the entire system is in place before 2030.

Energy

New York City faces rapidly-rising energy costs and carbon emissions from an ineffective market, aging energy infrastructure, and growth. The city pursues a two-pronged strategy of increasing sources of clean supply and lowering demand. The city plans the following initiatives:

Create a New York City Energy Planning Board. Working together with state and utilities to plan the city's supply and demand initiatives.

Reduce energy consumption by city government. New York City's government spends nearly $800 million a year on electricity, natural gas, and heating oil-and consumes roughly 6.5% of the city's energy. Investments in LED stoplights and retrofits to City-owned buildings have already saved the City money and reduced the City's energy consumption. The opportunity exists to go much further-but the hurdle has always been the competing priorities that pit energy-saving investments against other uses of City funds. These measures will include creating systems and tools to manage the energy use of City buildings centrally; conducting routine energy audits and tune-ups of City buildings; retrofitting City buildings and improving maintenance to save electricity and heating bills; and converting streetlights to LEDs when the technology becomes available. NYC I committed to reduce the City government's energy consumption and CO2 emissions by 30% within 10 years[9].

[9] The committee submitted a short-term plan to invest $80 million for efficiency projects in 132 buildings and a series of pilots and studies in 2008.

Strengthen energy and building codes for New York City. On July 3 2008, Mayor Bloomberg signed into law the first overhaul of the city's building codes since 1968. The new codes facilitate sustainable building by providing fee rebates for green design, requiring documentation demonstrating compliance with the NYS Energy code, requiring white roofs, and encouraging plumbing systems that conserve water.

Expand peak load management. The electric grid of the city is strained during peak demand and the oldest and least efficient plants must run to meet the city's demand. Those power plants guzzle 62% more fuel and release 140% more CO2 than newer plants. They are also more expensive to run[10]. Peak load management programs are one way to balance electricity supply with demand, reduce the strain on the grid and limit the use of the more expensive and often least efficient plants. The following initiatives will enable 25% of our peak demand to be shaved from the electric load: use of smart meters and voluntary citizens participation in the program; expansion of real-time pricing across the city.

Forest the market for renewal energy. Today, New York City receives over 6% of its electricity from the State's renewable energy resources. In addition, the City recently committed to purchase 20 MW of wind for City government operations starting in 2008. This agreement helped support the development of a second phase of a 107 MW wind farm upstate. Estimates of solar potential by Columbia University, the City University of New York, and NYSERDA range from 6,000 MW to over 15,000 MW, with one study claiming solar can contribute 18% of peak load by 2022. But solar energy is still not as cost-effective as gas-fired electricity. And New York City is uniquely expensive: our taller buildings require more wires and cranes to carry equipment to rooftops, while extensive interconnection requirements and inspections delay implementation. For these reasons, installed costs for solar are approximately 30% higher than in New Jersey and 50% higher than in Long Island. To facilitate the use of solar energy, the Governor signed Bill No. A11202, providing a four-year property tax abatement installation for the installation of photovoltaic panels. The City is undergoing its rule-making process to implement this initiative. Over the next three years, the City will end all methane emissions from sewage processing, and will work to expand the use of digester gas for energy production at a total investment of $35 million over ten years. These projects will result in an annual greenhouse gas emissions reduction of 265,648 metric tons. The City is also initiating a study to explore the feasibility of generating more energy from the gas from its in-city landfills.

The City has begun taking steps to encourage the development of existing and new local markets, job training, and employment opportunities to ensure an adequate skilled workforce for green initiatives. The City has already identified over 40 organizations with existing green collar jobs training programs in place in New York City. It will also

[10] New, natural gas power plants cost $74 to produce one MWh, while the oldest plants, which were designed in the 1960s and 1970s and run on oil, cost over $250 to produce the same amount of electricity.

continue to look for additional opportunities to address the development and support of a green collar workforce for the installation and maintenance of green infrastructure. The city is currently conducting a comprehensive study of green sector jobs to better understand the industry's current activity and to fill any unmet training needs.

Chicago

The City of Chicago is together with New York City the two leading communities with a comprehensive plan to build a sustainable future. These two cities are also leading communities in the U.S. in designing and implementing comprehensive responses to climate change (mitigation and adaptation) in the last years. Chicago and New York City have integrated their green and sustainable infrastructure agenda with those responses to climate change.

Chicago's Green Building Agenda

Chicago was one of the first cities in America to incorporate green strategies and technologies in its public buildings. From the rooftop garden on City Hall to the construction and renovation of "green" municipal buildings and homes, the City's green building experience continues to grow and progress. With the adoption of The Chicago Standard, we demonstrated our dedication to building a healthier, more sustainable environment that improves the quality of life for all of our citizens and conserves our city for the future.

Chicago Green Homes. The purpose of the Chicago Green Homes Program is to encourage residential builders, developers and homeowners to use technologies, products and practices that will: provide greater energy efficiency, provide healthier indoor air, reduce water usage, preserve natural resources, improve durability and reduce maintenance, reduce waste and pollution.

For most projects, certification under the Chicago Green Homes Program is a multi-step process. Projects initially enroll in the program – typically during the design phase. As the project nears completion, the primary applicant should complete and submit the Application for Certification and any final documentation. Once this is approved, the project will be certified by the City of Chicago as a Chicago Green Home.

City Hall's rooftop garden. Like all "green roofs," the City Hall rooftop garden improves air quality, conserves energy and reduces stormwater runoff. The garden, planted in 2000, also helps reduce the urban heat island effect by lowering air temperatures above the garden. Rooftop comparisons between City Hall and the adjacent Cook County Building, which has a traditional black tar roof, indicate that air temperatures above City Hall typically are 10 to 15 degrees lower than those above the County side of the building.

Green Roof Grant Program. Owners of residential and small commercial buildings will have an opportunity to get a $5,000 grant to help with the planning and installation of a green roof. This new grant program will enable home owners and small businesses to

install green roofs. A limited number of grants (20) will be awarded. In addition to supporting residential and small business owners with green roof costs, the City hopes that the grants will increase the public's awareness of green roofs. A written commitment will be required to maintain the green roof project for at least 5 years. Small commercial buildings must be less than 10,000 square feet. As of October 2006, there were more than 250 public and private green roofs totaling more than 1 million square feet. The City of Chicago adopted a policy that encourages and, in some cases, requires green roofs in developments undergoing Department of Planning and Development review. These include private, not-for-profit and public developments receiving financial or other types of public assistance from the City, as well as Planned Developments and Lakefront Protection Ordinance Developments.

Chicago Center for Green Technology. In May 2002, Mayor Daley inaugurated the Chicago Center for Green Technology (Chicago Green Tech) in what had been an abandoned industrial building on an illegal dump site. Chicago Green Tech was the product of a collaboration between government agencies, local groups and private partners who made occupant health, efficient performance and environmental stewardship their top priorities in the building's renovation. The result was the first municipal building and the first renovated building to receive a LEED Platinum rating, the highest rating for green design issued by the United States Green Building Council.

Green libraries, police stations and fire stations. In 2002, the City of Chicago began to use green building strategies and technologies in the construction of new City buildings. Budlong Woods Library, the City's first "green" library, opened in February 2003 on the North Side. The library's features include solar panels on the roof, building materials with a high degree of recycled content and an HVAC system designed to perform nearly 20 percent more efficiently than the Chicago Energy Code requires. A second library with similar features, West Englewood Library, opened on the South Side in August 2003. A third, Oriole Park Library, opened in spring 2004. All three libraries were designed to earn a LEED Certified rating. The City's first "green" police station, the 22nd District Police Station, opened in June 2004. The 22nd District station is virtually identical to the conventionally-built 20th District Police Station, with the same floor plan and number of square feet. The City plans to track energy use, productivity and other factors at both stations for a national case study on green building benefits. The 22nd District station was designed to achieve a LEED Silver rating. A "green" prototype for firehouses has been developed and will be used to guide construction of five new firehouses beginning in 2004. The City also is using sustainable technologies and practices in the renovation of Engine Company 46, as well as Area 1 Police Headquarters.

Other green public buildings. Many of the City of Chicago's sister agencies are incorporating green design into their facilities. The Public Building Commission (PBC), which builds and renovates many City and sister agency facilities, has made LEED Certified the minimum standard for much of its new construction. Chicago Public Schools is working with PBC to build schools that meet or surpass the LEED Certified requirements, with an emphasis on improved indoor air quality, energy efficiency and use of natural light in classrooms. CPS and PBC also are building campus parks by

replacing asphalt with grass, trees and shrubbery, and adding benches, running tracks and playground equipment. The 100th campus park will open in 2004. Other agencies building green include the Chicago Park District, which is incorporating green strategies and technologies in its facilities and pilot testing waterless urinals in some City park restrooms, and the Chicago Transit Authority, which recently installed a rooftop garden on the Clifton Substation.

Air Quality

Chicago Climate Exchange CCX. CCX is a self-regulatory exchange that administers a voluntary, legally binding pilot program for reducing and trading greenhouse gas (GHG) emissions in North America, with participation of Offset Providers from Brazil. In 1995 Chicago took a pioneering step in greenhouse gas mitigation through the Emission Reduction Credit Program (ERC). By making emission reduction credits available to new or expanding companies, the ERC encouraged job creation in the City and improved air quality under the federal Clean Air Act. The City furthered the work of the ERC by becoming a founding member of the CCX in 2001.

Partners for Clean Air. The Chicago Department of Environment (DOE) is an active member of Partners for Clean Air, a coalition of approximately 300 Chicago area businesses, government agencies and environmental groups that promote voluntary actions to improve air quality. Formed in 1995, the primary mission of Partners for Clean Air is to make sure regional air quality never gets above the national health-based standard for ozone air pollution. Since Partners for Clean Air was formed, the total number of days Chicago's air exceeded the health standard has decreased every year.

Chicago Area Clean Cities (CACC). CACC is a voluntary, locally-based coalition dedicated to encouraging the use of clean fuels and clean fuel vehicles in the Chicago metropolitan area. Part of the U.S. Department of Energy's Clean Cities Program CACC supports public-private partnerships that deploy alternative fuel vehicles—such as those using biodiesel, compressed natural gas and propane—and build supporting infrastructure. By encouraging alternative fuel vehicle use, CACC helps enhance energy security and environmental quality at the local and national levels. CACC is one of 83 Clean Cities coalitions across the country. The City of Chicago Department of Environment (DOE) coordinates CACC, whose members represent governments, businesses, educational and research institutions, fuel providers, utilities and environmental organizations.

Diesel Retrofit Program. The City of Chicago Department of Environment (DOE) is retrofitting a portion of the City's diesel-powered fleet using oxidation catalysts (catalytic converters). Oxidation catalysts chemically convert hydrocarbons and carbon monoxide to water vapor and carbon dioxide. Oxidation catalysts reduce particulate matter emissions by 20 – 30%, hydrocarbons by 50% and carbon monoxide by 40%. DOE plans to retrofit the City's entire diesel fleet over time, pending funding availability. The project also will act as a model for other fleets to follow.

Land Use

Brownfields Initiative. The City of Chicago established the Chicago Brownfields Initiative in 1993 to acquire, assemble and rehabilitate properties, returning them to productive use. The Initiative links environmental restoration with economic development by cleaning up and redeveloping brownfields and by improving policies to promote private redevelopment of brownfields. The purpose of the Chicago Brownfields Initiative is to create jobs and generate tax revenues through industrial redevelopment, thereby improving Chicago's environmental and economic health.

Energy

Chicago's Energy Plan. Many of the City of Chicago's energy policies and initiatives originated in Chicago's Energy Plan (2001), an energy strategy to ensure clean, affordable and reliable energy for the city's future. Chicago's Energy Plan sets specific targets for energy production and use, and identifies principles to guide the City of Chicago in responding to federal and state energy plans and proposals. Consumer protection, economic growth and environmental protection are the underlying principles of the plan. The plan seeks to provide 20 per cent of the City's power from renewable resources through a private provider (ComEd). A fund has been created to help attract renewable energy companies. The fund also pays to use green power instead of conventionally produced power.

Chicago Energy Conservation Code. In 2001, the Chicago City Council passed the Chicago Energy Conservation Code, an amendment to the Chicago Building Code that consolidated disparate code requirements to formulate a modern energy-efficiency standard. Modeled after the 2000 International Energy Conservation Code developed by the International Code Council, the Chicago Energy Conservation Code established minimum energy conservation standards for new and renovated buildings. The code's requirements encourage technologies and construction methods that will increase the energy-efficiency of buildings by 10 to 20 percent, reducing energy costs for building owners and decreasing pollution from power plants.

Energy Efficient City Buildings. The City began to audit and retrofit 15 million square feet of public buildings with efficient equipment for heating and cooling, lighting and ventilation. The 15 million square feet are made up of police stations, libraries, fire stations, park facilities, transit facilities, health centers, community/cultural centers, colleges and other types of facilities that are owned by the City, the Chicago Park District, the Chicago Transit Authority or the City Colleges of Chicago.

As of June 2004, more than 5 million square feet of City-owned facilities had been audited and retrofitted. When the project is complete, energy savings to the City and its sister agencies are estimated to be $6 million annually, with $2 - 3 million in savings for the City alone. In addition, the retrofits will reduce pollution each year by an estimated 30,000 tons of carbon dioxide, 84 tons of nitrous oxides and 128 tons of sulfur dioxide.

The City began also to design new municipal facilities—libraries, police stations and other public buildings—to be more energy-efficient. In designing and constructing these facilities, the City used the U.S. Green Building Code's Leadership in Energy & Environmental Design (LEED™) Green Building Rating System. In 2004, the City made this practice official by adopting The Chicago Standard to guide the design, construction, renovation, operation and maintenance of its municipal facilities. The Chicago Standard is based on selected points from LEED that are reasonable and appropriate for Chicago. Adoption of the Standard will result in buildings that save 15 to 20 percent in energy costs annually, conserve water and other natural resources, and provide healthier, more productive indoor environments.

Industrial Rebuilt Program. The City of Chicago Department of Environment (DOE), in partnership with ComEd, the University of Illinois at Chicago's Energy Resource Center and the Illinois Waste Management and Research Center (WMRC), developed a program to help the most energy- and waste-intensive industries in Chicago become more energy efficient. Called the Industrial Rebuild Program, it is modeled after the U.S. Department of Energy Industrial Technologies Program, Industries for the Future. Industries of the Future are industries that use large amounts of heat and energy to physically or chemically transform materials.

Chicago's Industrial Rebuild Program targets these industries for energy-efficiency improvements, and builds on the Department of Energy's vision by identifying pollution prevention and water conservation steps that each can take. The City offers 0% interest loans to those companies who purchase 5% of their electric energy use from renewable energy. Not only does this program help companies become economically competitive by reducing their energy use, it helps create a market for renewable energy in the City. Should the company not take advantage of the renewable energy purchase, the interest on the loan becomes 3%. Depending on which energy conservation measures are implemented, energy savings of between 10% and 25% are anticipated under this program.

Cogeneration. In the 2001 Chicago Energy Plan, the City of Chicago committed to provide 1.5 billion kilowatt-hours of electricity from combined heat and power (CHP) by 2010. To help meet this goal, the City of Chicago is working with the University of Illinois at Chicago Energy Resource Center (UIC-ERC) to identify and administer various CHP programs and initiatives. Hospitals traditionally are good applications for CHP, because their characteristics include long operating hours; a need for reliable electric power; significant thermal loads; and the coincidence of thermal and electric loads. UIC-ERC is administering a program to educate hospital administrators about the benefits of CHP and encourage them to implement CHP at their facilities. The CHP Education & Implementation Program targets financial administrators and facility managers at the more than 50 hospitals in Chicago.

Solar Thermal Grant Program Application. The City of Chicago's Department of Environment has made available 600 solar thermal collectors to be granted to health clubs, laundromats, affordable housing units, and other businesses or organizations that

use a high volume of hot water. Installation costs and any additional non-standard engineering costs incurred are the sole responsibility of the applicant. The award is not transferable or negotiable for cash.

Smart Bulb Program. The City of Chicago has partnered with the Northern Illinois Energy Project (NIEP) and Midwest Energy Efficiency Alliance to promote the use of Compact Flourescent (CFL) Bulbs throughout the Chicago. Free CFL bulbs have been given away at Aldermanic Offices. The use of ENERGY STAR® qualified CFL bulb saves money, uses less energy and helps protect the environment[11].

Chicago Landscape Ordinance. Parkway tree planting is required for: the construction of any principal building (i.e., the main building or use as opposed to accessory structures), additions to a building in excess of 1,500 SF of floor area,
repair or rehabilitation of a building if the cost exceeds $10,000 or 50% of the building's replacement cost, whichever is greater, the construction or installation of any parking area containing more than 4 parking spaces, the repair, rehabilitation or expansion of any existing surface parking area containing more than 4 parking spaces, if such repair, rehabilitation or expansion would increase the number of existing parking spaces by more than 25% or 4 spaces.

Chicago Conservation Corps (C3). The mission of the Chicago Conservation Corps is to recruit, train and support a network of volunteers who work together to improve the quality of life in our neighborhoods through environmental service projects that protect our water, clean our air, restore our land and save energy. C3 is an initiative of the Chicago Department of Environment, which - in collaboration with Partner organizations - supports C3 Leaders by providing training, technical assistance and resources. Its goals are: to promote understanding of how to improve the environment in Chicago, to train volunteers to be environmental leaders in their communities, to boost community-based environmental efforts with technical support, materials, and people.

Waste Management

Chicago's Waste to Profit Network. The network was developed for the benefit of Chicago-area businesses in 2006. A multi-industry collaborative approach will be taken to identify and realize opportunities for cost savings and innovation. At its core, the Network facilitates the transformation of one company's waste, or byproduct, into an industrial input for another company. This process is known as byproduct synergy. Synergies formed between participants in the Network turn costly waste streams into productive revenue streams while reducing the environmental impact of production. Based on the experiences of other similar networks, the Network is likely to be a forum for new business opportunities, such as new product development.

[11] Each CFL can prevent more than 450 pounds of emissions from a power plant over its lifetime. If every citizen in Chicago changed just one light to an ENERGY STAR® qualified CFL bulb, the combined actions would prevent approximately 1,275,301,437 pounds of greenhouse gas emissions and would be enough to light 384,358 homes for a year. Each bulb will save an average of $30 in energy costs over its lifetime plus additional savings from not having to replace bulbs every year.

Recycling

Residential. The City of Chicago offers two possibilities for recycling. The City offers full separate collection system for recycling and yard waste for all residential buildings of four units or less. Residents living in buildings of five units or greater are served by private waste haulers, which are mandated by law to recycle applicable materials. The building management in those units is also required to offer an effective recycling program, which is defined by three things: source reduction and separation, an education program and a written recycling plan.

Commercial.

Construction and demolition recycling. In 2005, the Chicago City Council passed amendments to the Construction and Demolition Site Waste Recycling Ordinance to increase the amount of C&D debris that is recycled in Chicago. Starting with building and wrecking permits applied for March 1, 2006, contractors must keep track of how much waste is generated at project sites and strive to meet the recycling goals set forth in the new ordinance. In 2006, the goal was 25%. Beginning with permits applied for January 1, 2007, contractors must recycle 50% of the C&D debris generated at a job site.

Office buildings. Office buildings that are refuse collection customers are required under the Chicago High Density Residential and Commercial Source Reduction and Recycling Ordinance to provide services for tenant office establishments. Recycling plans for office buildings must also include targeted recycling rates.

Restaurants and bars. All restaurants and bars in Chicago are required to have a recycling program. The Chicago High Density Residential and Commercial Source Reduction and Recycling Ordinance allows establishments to recycle one item if it is established through a waste audit that one recycling item constitutes 51 per cent by weight of the waste stream.

Retail. All commercial business that are required to have a Chicago business license and contract for private garbage collection are required to have recycling programs under the Chicago High Density Residential and Commercial Source Reduction and Recycling Ordinance. The ordinance allows establishments to recycle one item if it is established through a waste audit that one recycling item constitutes 51 per cent by weight of the waste stream.

Hazardous and electronic waste. The city has a collection center for household hazardous waste. The Department of Energy (DOE) holds at least three electronic recycling ("e-cycling") neighborhood events annually to collect, reuse when possible and recycle household electronics. In addition to the neighborhood events, DOE operates the recently inaugurated Computer Recycling Center. Households are welcome to bring unwanted, unused or obsolete computers, and computer peripherals and cell and cordless phones-for reuse and recycling. Commercial and industrial electronics, as well as larger household electronics, such as air conditioners, dehumidifiers and large home appliances, are not accepted at these events.

Chicago's Water Agenda.

The City of Chicago, through its Department of Water Management, has comprehensive agenda to improve the sustainable use of its water resources. Chicago purifies nearly 1 billion gallons of water per day for use by the residents of Chicago and 124 neighboring suburbs. The distribution system contains 4,200 miles of water mains and 12 pumping stations. Chicago's Department of Water Management is implementing a five-year, $620 million capital improvement program that includes replacing approximately 50 miles of old leaking water mains every year. Additionally, the Department is helping other units of local governments examine their distribution systems for leaks. The improvements in Chicago alone will save an estimated 120 million gallons of water each day. Water usage decreased 18.8 per cent between 1990 and 2001 while the city's population increased 4.4 per cent in the same period[12].

Water conservation. The City continues to review its procedures and implement water conservation measures wherever possible in City buildings and services. Many programs to reduce use in City-owned buildings are already underway. Other initiatives to conserve water are: disconnecting downspouts that connect to the sewer system on Park District facilities so that stormwater is used for irrigation and for recharging groundwater; examine the Building Code for opportunities to allow for more efficient fixtures, like waterless urinals and dual flush toilets; explore the potential of installing gray water systems to irrigate landscaping or for flush toilets in public buildings; plant native species that are drought tolerant to reduce the need for watering. The Chicago Department of Environment's Industrial has also incorporated water conservation actions. The program provides large industrial energy users with an energy-and-process audit and interest-free loans to implement the audit's recommendations. So far these audits have identified almost 130 million gallons per year in water savings for 12 Chicago businesses.

Managing Stormwater

The City of Chicago recognizes the importance of the built infrastructure in terms of managing stormwater. The City's Department of Water Management spends approximately $50 million per year to clean and upgrade 4,400 miles of sewer lines and 340,000 related structures. Additionally, the City acknowledges the importance of the Tunnel and Reservoir Plan, known as Deep Tunnel, in the long-term management of stormwater. However, the City believes that the "built" infrastructure alone will not meet all of our needs for managing wastewater and stormwater. Managing stormwater and protecting the quality of water resources will require a combination of upgrading the "built" infrastructure and creating a "green" infrastructure. Through this green infrastructure, the City will demonstrate forward thinking ways to reduce the burden on the sewer system and keep stormwater in the environment.

The City will expand its use of Green Infrastructure techniques to reduce the amount of water that flows into the sewer system during storms. By utilizing innovative stormwater

[12] The city estimates that population in its region will increase by more than 20 per cent by 2030.

management techniques the City will help reduce the incidences of combined sewer overflows to the Chicago River[13].

Rooftop gardens. This initiative mentioned above is part of the green infrastructure in the city. For example, the City Hall rooftop garden features 20,000 plants, of more than 150 varieties, including shrubs, vines, and trees. Stormwater runoff is reduced by an estimated 50%.

New developments. The City encourages large new developments to incorporate green infrastructure into their design. Through the planned development process, the City is working with large developers to recommend ways to manage stormwater on site. Ford Motor Company and Solo Cup are examples of corporate leaders that have incorporated green infrastructure into site designs at their Chicago facilities, reducing significantly the amount of built infrastructure they require. The City of Chicago seeks to require developers to incorporate green design and infrastructure into their site plans. This will reduce the amount of water draining to the sewer system by requiring, where practical, developers to implement best management practices to keep stormwater on site. The Department of Environment is currently working with Northeastern Illinois Planning Commission to develop a manual of stormwater best management practices for urban areas.

Permeable alley. The City is creating a green infrastructure by utilizing unique open spaces to hold water that would normally drain directly into the sewer system. For instance, the City built a new kind of alley in a North Side community as part of a pilot project. The alley, constructed of a rigid grid system and gravel, allows rainwater to soak into the ground—reducing water flow into the sewer system and backyard flooding.

Rain gardens. The City is taking this idea a step further by experimenting with "rain gardens" in the parkways. Rain gardens move water into the ground through natural drainage and by using native plants that store water in their roots. Similar techniques can be employed at many street intersections. Permeable alleys and rain gardens reduce flooding, use rainwater as a resource, and even beautify neighborhood streets. Once tested, these techniques will be applied throughout the city.

Downspout disconnect program. The City of Chicago was the first major metropolitan area in the country to successfully implement an inlet control system to relieve basement flooding. The system works by installing restricters to slow the flow of stormwater into the sewer system. Stormwater is detained on city streets for brief periods before flowing back into the sewer system. This measure helps relieve the burden on the sewer system and reduce the frequency of basement flooding and combined sewer overflows into our waterways.

Wetlands. Chicago has invested both in creating greenspace and in protecting and

[13]In large storms, the City's sewer system can become full and result in the discharge of sewage into the River. In addition to the long-term plans for addressing this issue through hard infrastructure, the city plans to invest in techniques that effectively manage stormwater before it reaches the sewer system.

maintaining our natural areas such as parks and wetlands. Within the City, there are thousands of acres of natural area, many of which help control stormwater and prevent flooding. Wetlands in particular help to filter water naturally and provide unique habitat for plants and animals. In other areas the Park District is planting native plants and wildflowers because they possess longer root systems that hold and filter water. The Chicago Park District's 10-year plan to restore more than 207 acres of lagoons in 16 parks will further contribute to stormwater management and provide homes for diverse plants and animals.

Seattle

The city of Seattle has achieved a reputation of a leading green city in the United States. Mayor Greg Nickels is a founder and a strong promoter of the U.S. Mayors Climate Protection Agreement (http://www.usmayors.org/climateprotection/agreement.htm). A campaign in the U.S. seeking to reduce global warming the campaign has already 900 cities members.[14] Seattle's Green Plan is closely associated with the city efforts for climate protection and it has four major areas: clean energy, smart growth, transportation, and conservation.

Clean energy

As part of its efforts to reduce its emissions of greenhouse gases, Seattle City Lights, a public owned utility serving the city, has achieved net zero greenhouse gas emissions during the last years. The utility reduces its emission of greenhouse gases whenever possible by using renewal resources like hydro and wind powered electric generation. To offset its present emissions, the City Lights buys greenhouse gases emissions offsets credits from organizations that have reduced their own emissions. City Light estimates that its greenhouse gas emissions will be about 100,000 metric tons. The utility purchased 300,000 metric tons of offsets, to cover 2006 and to apply to future years. These offsets result from the capture and destruction of a potent greenhouse gas. These offsets are monitored and verified by a third party.

City Light has purchased offsets from many types of projects. City Light funds the use of biodiesel (which has a much lower emission rate than petroleum diesel) in City vehicles, Seattle Public Utilities solid-waste trucks, and King County Metro buses; provides cruise ships with shore power so they can shut down their diesel engines while in port; and supports the use of cement substitute materials, which both reduce greenhouse-gas emissions and solid waste. The cost of purchasing offsets is about estimated to be $2 a year per customer.

The utility has also implemented Green Up, a voluntary residents and business green

[14] The United States Conference of Mayors is the official non-partisan organization of cities with populations of 30,000 or more. There are 1,139 such cities in the country today. Each city is represented in the conference by its mayor. Miami Mayor Manual A. Diaz, serves as president. Mayor Nickels currently serves as vice president.

power program. Green Up customers make voluntary payments on their electricity bill to cover the slightly higher cost of producing and integrating renewable energy into the Northwest grid. These funds are used to acquire renewable energy equal to the amount of customer demand.

Promoting Clean Energy Alternatives for City Vehicles. The Department of Executive Administration (DEA), through its Purchasing and Contracting Services Division, hosts the Green Purchasing Team, with representatives from several City Departments. The Green Purchasing Team and Purchasing and Contracting Services Division assist City Departments in adopting clean energy alternatives for City vehicles and equipment.

SeaGreen Affordable Housing Guide. It was developed to promote energy conservation, operational savings and sustainable building practices in affordable multifamily housing projects. The strategies included in SeaGreen work to reduce operating costs, promote healthy environments and protect and conserve resources in City funded affordable housing projects. Venturing beyond current practice, these strategies protect and enhance Seattle's affordable housing stock and the community as a whole.

Part of the above-mentioned efforts is the Evergreen Sustainable Development Standard Criteria. The standards has been developed to set a minimum level of sustainable performance for projects applying to the Washington State Housing Trust Fund after July 1, 2008. The City of Seattle Office of Housing has adopted these standards for city-funded projects.

Homewise. Using state of the art equipment, a HomeWise Property Rehabilitation Specialist will conduct a free energy analysis of citizens' homes and recommend a conservation package to fit their needs. An energy conservation package, which includes insulation, venting, weatherstripping, and more, will be installed during your construction project.

Seattle Energy Code. Resolution 30280 (Section 1.B.i) (2006) directs DPD and Seattle City Light to "propose to the City Council…amendments to the Seattle Energy Code…to achieve up to 20% enhanced energy efficiency beyond previous standards. The 2006 Seattle Energy Code has been adopted. The ordinance was effective on 10 November 2007. The grace period ended 8 January 2008.

Smart Growth

Downtown zoning changes. The City council adopted a complex package of regulations in 2006. The complex package of regulations updates rules for the central office core and adjoining areas. Major changes in the new regulations include: greater heights (unlimited for the main office core), greater maximum floor area - required narrow widths for upper levels of residential towers, a new program for market-rate housing to contribute to affordable housing, a new program allowing greater development for environmentally sustainable construction (LEED silver), greater transferable development rights for

historic structures downtown, tower spacing required in some downtown areas[15].

Built Smart Program. BUILT SMART buildings are designed and built to conserve resources while providing a healthy, comfortable living environment. Key features of the program are: extra insulation in floors, walls and ceilings,energy-saving windows, long-lasting, energy-efficient lighting, healthy ventilation and high-efficiency thermostats, energy and water-efficient clothes washers.

Green jobs. The Seattle area is home to a $1 billion (in gross revenues) clean technology industry with over 300 companies. These firms employ over 8,000 people at an average wage $60,000, for a total of nearly $500 million in wages. There is a 64% greater concentration of clean technology, or "green", jobs in the Seattle area than the U.S. average.

Sustainable building and development. The City of Seattle's sustainable building policy requires new City facilities over 5,000 square feet to attain the Silver level of the US Green Building Council's LEED™ rating system. The High Point and Yesler community center projects are LEED™ registered projects.

Seattle's Comprehensive Plan. The Comprehensive (Comp) Plan, *Toward a Sustainable Seattle,* is a 20-year policy plan (2004-2024) designed to articulate a vision of how Seattle will grow in ways that sustain its citizens' values. The City first adopted the Comp Plan in 1994 in response to the state Growth Management Act of 1990. The initial building blocks of the Comp Plan are the "elements" required by the state's Growth Management Act: land use, transportation, housing, capital facilities and utilities. The City's plan also includes elements addressing neighborhood planning, human development, and the environment.

Transportation

Seattle maintains its commitment to, and investment in, improving conditions for bicyclists. More than 4 percent of Seattle residents commute by bicycle, which is 10 times the national average in the U.S. The Bicycle Master Plan lays out a 450-mile bicycling network that is being implemented over the next 10 years. The city has also increased funding and rapid implementation of projects, such as bike lanes, shared lane markings, and multi-use facilities; invested $300,000 in the Bike Smart Seattle program, which will reach every household with bicycling encouragement and education; recreational facilities, such as the Colonnade Urban Mountain Bike Skills Park; and Bike Station Seattle, which offers bike parking, rentals, and repairs downtown.

Conservation

The Mayor has established an aggressive goal of increasing Seattle's tree cover from a

[15] It is projected that by 2024 Seattle will gain 100,000 new residents and 84,000 new jobs, with much of that growth going to the Center City area, which includes the downtown office area and surrounding nine neighborhoods.

current level of 18% to 30% in 30 years, and has launched the Seattle Leaf program to meet this ambitious goal. Seattle city agencies are working on other urban forest efforts that deal with street, back-yard, playground and institutionally-owned trees.

Denver, Colorado

The city has a reputation of being a green city in the U.S. Below are the major actions taken by the municipality to create eco- efficient actions towards a sustainable future. Those actions are concentrated in Geenprint Denver, the plan for a sustainable future in the City and County of Denver (http://www.greenprintdenver.org/).

Greenprint Denver outlines the following action items:

Reduce Greenhouse Emissions. Reduce Denver per capita greenhouse gas emissions by 10 percent below 1990 levels by 2011. Work in partnership with other local governments, universities and the business community to develop and implement effective strategies to reduce the risk of and potential consequences of global climate change.

Increase City Forest Coverage. Plant thousands of new trees annually in our parks, natural areas and on private property, thus increasing Denver's tree canopy from 6 percent to a total of 18 percent tree cover, as identified in the Denver Parks Game Plan.

Reduce Waste. Increase Denver's residential recycling by 50 percent in the next year and reduce total landfilled household waste by 30 percent (130,000 tons) over the 2004 baseline by 2011.

Utilize Renewable Energies. Construct solar and methane power plants capable of powering/heating the equivalent of over 2,500 homes, and generating revenues to help support other Greenprint Denver programs.

Increase Green Built Affordable Housing. Increase the incentives for energy-efficient affordable housing to $1,250,000 within five years. Increase the funding available for energy efficiency improvements for low-income residences.

Implement City Green Building Policy. Require that all new city buildings and major renovations be certified under the U.S. Green Building Council’s LEED Silver standard and meet the EPA's Energy Star® guidelines.

Expand City's Green Motor Fleet. Expand the city's "Green Fleet” by ensuring that when replacing light-duty vehicles (excluding patrol cars), they are replaced with hybrids or the highest-efficiency vehicles available. Continue the recent progress made in shifting all diesel vehicles to biodiesel B20 fuel.

Promote and Leverage Mass Transit. Decrease reliance on automobiles through increased public transit access and use, transit-oriented development, and bike and pedestrian enhancements. Boost mass transit use by city employees by 10 percent within one year, and increase by 20 percent the new development located within a half mile of existing transit stations by 2011.

Improve, Protect and Conserve Water. Significantly improve water quality in the South Platte River by 2011 through a combination of activities, including maintenance and repair of sanitary and storm sewers, education and outreach, and enhanced data collection, analysis and tracking. Use recycled water for parks and public areas, and promote water conservation in both building and landscape use.

Promote Green Industry Economic Development. Partner with the Metro Denver Economic Development Corporation to advance high performance building and energy efficiency in the private sector. Help revitalize 35 acres of formerly polluted lands in Denver (Brownfield redevelopment) to support urban development and environmental equity. Position Denver as a regional center for balanced and renewable energy and green industries by creating 1,000 new training and job opportunities in these areas for metro Denver residents by 2011.

The city of Denver has other initiatives listed below towards eco-efficiency and sustainable infrastructure:

Energy

Insulate and Seal Rebates. This program seeks to improve properly insulation and sealing of homes in an effort to reduce energy consumption, reduce monthly energy bills, and make homes more comfortable. The program is run by Xcel Energy, the electric utility in Colorado, through its Insulate Colorado Homeowner Rebate Program for its residential gas customers who make certain energy efficient improvements to their homes. Installation of insulation must occur between January 1, 2009 and December 31, 2010.

The rebates are issued from Xcel Energy for the installation of either attic or exterior wall insulation and basic air sealing measures, performed by an approved contractor (do-it-yourself projects are not eligible). The rebates cover 20 percent of the total cost of insulation and air sealing upgrades or $300, whichever is less.

Renewable Energy Projects

Landfill Gas –to- Energy Plant. Colorado's only operational landfill gas-to-energy plant began operation in early 2008. Located at the Denver Arapahoe Disposal Site near Hampden Avenue and Gun Club Road in Arapahoe County, it produces 3.2 megawatts of electricity, enough energy for about 3,000 homes.

Landfill gas consists of approximately 50 percent methane, 45 percent carbon dioxide, and other gases. It is produced from the normal decomposition of organic matter. The Denver-Arapahoe site, one of the largest landfills in the nation, generates approximately 1,200 cubic feet of landfill gas per minute. The gas is burned in four combustion engines and converted into electricity. This beneficial use of landfill gas reduces the greenhouse gases produced at a coal-fired power plant through indirect offsets, and similarly reduce other air pollution emissions.

The City & County of Denver sells the landfill gas Waste Management of Colorado, the company that constructed and operates the plant.

Waste Management

Waste Recycling. The city of Denver expanded its recycling program using now a single stream of waste that do not requires sorting waste for recycle in order to encourage citizens to recycle. The recycling program accepts corrugated cardboard, mixed office paper, junk mail, magazines and catalogs, paperboard (cereal boxes, tissue boxes, etc), phone books, brown paper bags, newspapers (including inserts and ads), plastic bottles, glass bottles and jars, aluminum and steel cans, aluminum foil and pie tins, and empty aerosol cans.

Denver's Hazardous Waste Collection Program. To assist Denver residents in proper disposal and recycling of household hazardous wastes (HHW), the City is operating a door-to-door collection program of these materials directly from Denver homes. Residents may only use this program once per year and must be Denver Solid Waste Management customers, residing in a single family home, townhome, or apartment building of 7 units or fewer.

Denver encourages residents to recycle their old televisions and other electronics and not to throw them in the trash. A list of local companies accepting televisions for recycling can be found online in the web site of Denver Recycles'. There is usually a fee in the range of $5 to $50 for recycling televisions and monitors depending on the size, make and model.

Composting Collection Pilot Program. The city began a composting collection through a new pilot program. Organic material, like food, food-soiled paper and yard debris, is the single largest item thrown away in the city's landfill. The residential composting collection pilot program services 3,000 Denver homes in this initial phase. Each home is provided with a green, 65-gallon composting cart and a small kitchen pail to collect organic material inside the home. The green carts are serviced weekly during the growing season, then every-other-week through the winter.

The composting collection program accepts organic material that includes yard debris such as grass clippings, plant trimmings, small branches, weeds and leaves; food such as fruit and vegetable trimmings, meat, dairy, coffee grounds, bread and other processed food; and food-soiled paper such as used paper plates, paper coffee cups, tea bags, coffee

filters, paper milk cartons (no foil lined cartons), paper ice cream cartons and much more. The program strictly prohibits any type of plastic materials, as these are contaminants that prohibit the ability to compost the organic material.

Summary and Lessons

There are lessons that can be obtained from the study of green and sustainable infrastructure in urban areas in the United States.

1- There is an impressive array of green and sustainable infrastructure initiatives in the U.S. The business community has been a major actor in the development of green technology for urban infrastructure through the development of technologies, products, and services. It has also been a major promoter to expand their use among the federal, state, and local governments. The creation of national associations, state and local organizations of professionals, and Non Governmental Organizations (NGOs) and standards (i.e. the LEED green building standard) have been useful tools in the promotion of green products and services for urban infrastructure.

2- Some cities that have achieved a coherent integration of green and sustainable infrastructure in their plans for urban growth and the efforts to build a sustainable future for their communities. New York City and Chicago are the two cities that have better integrated a coherent sustainable agenda with a strong emphasis in green infrastructure. Denver, Seattle, and Portland have also major achievement in integrating green infrastructure and eco-efficiency in their plans for a sustainable growth.

3- A major factor in building comprehensive and integrated responses to sustainable infrastructure has been the leadership of some mayors with a strong vision of sustainability for their communities and political skills to build coalitions with the business community and social organizations. Academic institutions have also played and role in the design and promotion of sustainable infrastructure in those communities. Local universities have had an important role in the design of sustainable initiatives in Chicago, New York, other cities with integrated sustainable plans. The mayors and their staff have had the vision, and skills to add value to the individual contribution of each group of actors towards a common goal of sustainability.

4- Other cities in the U.S. have incorporated some elements of eco-efficiency and green infrastructure but not in an integrated and coherent plan. Green infrastructure has been adopted on ad hoc basis for only specific issues but not as part of an integrated plan towards sustainability.

5- The decentralized and fragmented governance and financing of urban infrastructure in the U.S. have been major obstacles to integrate comprehensive plans for urban sustainability. Building consensus among such a broad and diverse array of actors has been difficult for many municipalities.

6- The increasing use of fees and charge as market-like charging mechanism has also

been an obstacle in the promotion of sustainable infrastructure. Government officials understood the behavior of citizens as consumers of public services and economic variables (cost and revenues) have taken priority over social and environmental considerations.

7- The declining participation of the federal government in funding urban infrastructure and the limited role of state governments have transfer the responsibility and weight of urban infrastructure to the municipal government. Many local governments have not have the resources, vision and skills to foster sustainable initiatives in their plans for urban growth.

8- The case studies described above present useful examples for other cities in the United States and urban areas in other countries.

9- Despite the important role of the business community in the creation and promotion of green technology and related services, the experience of the United States illustrate the limitations of the market in the promotion of sustainable urban growth. The most advanced and comprehensive experiences of Chicago and New York highlight the key role of the public sector in the design, integration, promotion and enforcement of sustainable policies for urban growth. In the absence of a stronger role of the federal and state governments, local governments have assumed a leadership role in those efforts.

10- Urban communities in the U.S. have incorporated environmental considerations in their urban plans during the last three decades. But the incorporation of eco-efficiency and green infrastructure is a rather recent experiences and it will take some time before a larger number of communities construct integrated plans for sustainable urban growth. Growing international and domestic attention to climate change has created a platform to foster initiatives for sustainable urban growth. The rapid growth of the Mayors Alliance for Climate Protection with more than 900 cities members in only 4 years, illustrates the importance, visibility and attraction of this topic. Chicago, New York, Seattle, Denver, Los Angeles, Portland and other cities have used climate change as a platform to build support for sustainable and green infrastructure. It is likely that other members of the Mayors Alliance for Climate Protection will follow the example of these cities and expand their efforts for sustainable infrastructure. Recent changes in the federal administration in the U.S. can redefine the role of the federal government in those efforts. The centerpiece of President's Obama $economic-stimulus package is $800,000 million U.S. dollars in spending on water infrastructure, green energy, upgraded highways and public buildings, modernized schools and dramatically expanded broadband networks. That has given a nice lift to stocks in the infrastructure sector -- and to the growing group of funds that invest in them (Norton 2009). This might be a window of opportunity to promote green infrastructure.

GREEN AND SUSTAINABLE URBAN INFRASTRUCTURE IN CANADA

Green Buildings

Canada has implemented the R-2000 program in 1982 to promote better building codes to increase energy efficiency and promote sustainability. An optional feature of the R-2000 home program is the EnerGuide rating service. This service is available across Canada, allows home builders and home buyers to measure and rate the performance of their homes, and confirm that those specifications have been met. Some Canadian provinces are considering mandatory use of the service for all new homes.

Regional initiatives based on R-2000 energy start for New Homes, Built Green, Novoclimat, GreenHome, Power Smart for New Homes, and GreenHouse. Buildings and Managers Association manages the BOMA BEST (**B**uilding **E**nvironment **St**andards) certification, replacing their Go Green and Go Green Plus programs.

Established in December 2002, the Canadian Green Building Council obtained an exclusive license in July 2003 from the US Green Building Council to adapt the LEED rating system to Canadian circumstances. The path for LEED's entry to Canada had already been prepared by BREEAM-Canada, an environmental performance assessment standard released by the Canadian Standard Association in June 1996. The American authors of LEED-NC 1.0 had borrowed heavily from BREEAM-Canada in the outline of their rating system; and in the assignment of credits for performance criteria. The Canadian LEED for Homes rating system is expected to be released in Spring 2009.

In March 2006, Canada's first green building point of service, Light House Sustainable Building Center opened on Granville Island in the heart of Vancouver, BC. A destination for the public and professionals alike, the Light House resource centre is funded by Canadian government departments and businesses to help implement green building practices and to recognize the economic value of green building as a new regional economy.

- Beamish-Munro Hall at Queens University features sustainable construction methods such as high fly-ash concrete, triple-glazed windows, dimmable fluorescent lights and a grid-tied photovoltaic array.
- Gene H. Kruger Pavillon at Laval University uses largely non-polluting, non toxic, recycled and renewable materials as well as advanced bioclimatic concepts that reduce energy consumption by 25% compared with a concrete building of the same dimensions. The structure of the building is made entirely out of wood products, thus further reducing the environmental impact of the building.
- The City of Calgary Water Center officially opened June 4, 2008 at the Manchester Centre with a minimum Green Building Council of Canada’s Gold LEED (Leadership in Energy and Environmental Design) level certification. The 183,000-square-foot (17,000 m^2) office building is 95 per cent day lit, conserves energy and water and fosters a productive, healthy environment for visitors and employees alike.

The FCM Centre for Sustainable Community Development (CSCD) offers resources for municipal governments to achieve their sustainable development goals. CSCD's range of financial resources, expertise and services supports a growing network of municipal governments pursuing sustainable community development projects.

Case Studies

The City of Toronto

Waste Management

Solid Waste Management Services handles the transfer and disposal of garbage as well as the processing and sale of recyclable materials collected through the blue box program. Solid Waste Management Services also coordinates a variety of 3Rs programs (Reduce, Reuse, Recycle) to help residents and business reduce their production of waste.

Residential recycling.

A total of 367,291 metric tonnes of residential waste was diverted from landfill during 2007 through such programs as the Blue Box, Green Bin, leaf/yard waste and Christmas trees, backyard composting, Community Environment Days, household hazardous waste depots, grass cycling and large appliance/scrap metal pick-up. The various diversion programs that make up the City's Plan, “Getting to 70% Waste Diversion by 2010” are being implemented across the City. These efforts will allow Toronto to reduce dependence on landfill, thereby preserving the long term capacity of the Green Lane Landfill. 2007 waste diversion rates were 59 per cent for single family residential and 13 per cent for multi-family residential (a combined 42 per cent for total residential rate). 2007 was the first year to fully feel the impact of the new LCBO Deposit Return Program introduced by the province, along with the existing Beer Store Deposit Return Program. While these programs divert much of the glass from Toronto’s recycling program, causing our Blue Box tonnage numbers to drop, these items are still being recycled. Overall, glass is diverted for recycling, reducing what goes to landfill for disposal.

The Green Bin Program allows participants to put organics (fruit and vegetables scraps, paper towels, coffee grinds, etc.) out for separate collection along with garbage and recycling. Due to strong participation in the Green Bin Program and the plan to expand this organics collection program to more users, City Council, at its June 2007 meeting, approved building and siting two new facilities to process Green Bin organic material. Each facility will be capable of processing 55,000 tonnes of organic material bringing the City’s processing capacity within city borders up to 110,000 tonnes a year. In order to qualify for City of Toronto garbage/recycling collection services, new developments or redevelopments (buildings) including existing developments must adhere to the City of Toronto.

Four of the City's six HHW depot sites are also HHW reuse depots. Toronto residents can either drop off or pick up the following items for reuse: paints, cleaning products, wood,

stains, solvents and lubricants. Computers or related components can be recycle in certain solid waste drop-off depots. Computers are limited to three units. No TVs, stereos, VCRs, photocopiers or microwaves.

Commercial recycling. Businesses who register with the City for Yellow Bag garbage collection are entitled to free recycling and organics collection. Generally commercial establishments of less than 4 floors and less than 500 square meters ground floor space, qualify for the Yellow Bag program. The City of Toronto does not collect garbage or recycling from industrial locations.

In July 2007, Toronto City Council approved the creation of a 3Rs Working Group (3RWG) to provide input and advice to staff and the Public Works and Infrastructure Committee on the design and implementation of policies and practices to help achieve the goal of 70% diversion from landfill. These initiatives include: source reduction; reuse, disassembly and recycling of durable goods; improved recycling capacity; next generation green bins; new materials for recycling; green bin organics in apartment/condos; on-floor recycling containers for apartment residents; townhouse collection; education, outreach and enforcement of diversion by-law; volume-based solid waste rate structure; and emerging source separation techniques.

In 2002, the City of Toronto established a litter reduction goal of 50% for the period of 2002 to 2007 and mandated litter audits be done on an annual basis. Litter has been reduced by 40% since 2002. Progress can be attributed to collection and enforcement enhancements that were put in place over the past several years. Less litter contributes to a clean city, the foundation for neighbourhood beautification.

Buildings

The City has a number of programs established to encourage and support improvements in the energy efficiency of buildings in Toronto. Building improvements enhance comfort, increase energy efficiency and reduce operating costs[16]. The initiative launched in 2008 offers financial incentives for solar hot water installations on homes in Ward 30 - Toronto-Danforth. Residents can also get assistance with identifying other opportunities to save energy and reduce their home energy bills.

TowerWise Program. Toronto Atmospheric Fund has developed its TowerWise program to focus attention on the need to improve energy performance in high rises.[17] The program offers loans to new and existing buildings that wish to become more energy efficient. Loans are paid back using the utility cost savings that result from a better-built building.

Retrofitting City facilities. The Energy & Waste Management Office (EWMO) in the City of Toronto's Facilities & Real Estate Division is responsible for implementing the

[16] About 25% of Toronto's greenhouse gas emissions come from the residential sector. The energy we use to light, heat and cool our homes generates greenhouse gases that contribute to climate change.

[17] Energy use in high-rise homes is one of the fastest growing sources of greenhouse gases in Toronto.

City's internal energy, water and waste management programs. The EWMO is working with other divisions and agencies to carry out energy retrofits in order to save money and make the City's buildings more energy efficient. The program increased the funding available to retrofit City buildings and facilities to $35 million in 2004. Included in $35 million is an $8.75 million low-interest loan from the Federation of Canadian Municipalities (FCM) to help finance these retrofit initiatives as part of this fund. The city also implemented a $10.2 million retrofit of 89 City arenas, partly financed by $2.52 million of the FCM loan. These retrofits are expected to pay for themselves over approximately eight years as energy use declines.

Better Buildings Partnership- Existing Buildings. The Better Buildings Partnership (BBP) promotes and implements energy efficiency and building-renewal retrofits in industrial, commercial, institutional and multi-residential buildings. The purpose is to make buildings more energy efficient and reduce greenhouse gas emissions. BBP is an innovative private/public sector partnership of the City, the Toronto Atmospheric Fund, energy management firms and the local utilities, working together with building owners and managers. The BBP-EB directs incentives to eligible participants towards the capital cost of initiatives that provide sustainable electricity demand and/or energy reductions in buildings.

Better Buildings New Construction Program. The City's Energy Efficiency Office is promoting improved energy efficiency in building design. Design assistance is provided with the goal of having newly constructed buildings surpass the present Ontario Building Code energy efficiency standards by at least 25 per cent.

Green Development Standard. The Toronto Green Development Standard provides an integrated set of targets, principles, and practices to guide the development of City-owned facilities and to encourage sustainable development in the private sector. This Standard is rooted in the key environmental drivers for the City. These are: better air quality, reduced greenhouse gas emissions and urban heat island effects, greater energy efficiency, improved water quality and water efficiency, less solid waste, protection of the urban forest and wildlife habitat, reduced light pollution[18].

Green Roof Strategy. In June 2007, the City of Toronto won the Federation of Canadian Municipalities' FCM-CH2MHill Sustainable Community Award for its Green Roof Strategy. This award recognizes municipal leadership in sustainable community development and gives national recognition to projects that demonstrate environmental excellence and innovation in service delivery. Green roof demonstration projects can be seen at City Hall and Eastview Community Centre. There are also many other green roofs around Toronto. The Green Roof Strategy is being integrated into the Green Development Standard.

[18] The Toronto Green Development Standard is a "made-in-Toronto" approach that integrates existing City guidelines and targets, popular private rating systems and the experiences of cities from around the world.

Business

Several programs are offered to assist Toronto businesses in reducing their impact on the environment.

Greening Retail. Greening Retail is a Toronto and Region Conservation program that helps retailers implement environmental best practices. Greening Retail works in partnership with sector leaders, government agencies and other organizations to provide retailers with the strategies and tools they need to take action. Greening Retail develops resources and programs and undertakes demonstration projects to help retailers implement environmental best practices.

Saving Water at Work. The industrial, commercial and institutional sectors are also key allies in helping municipalities save money. Reducing water consumption will reduce the need to build new water and wastewater treatment plants -- paid by taxpayers -- which would cost $2.5 billion over the next 20 years.

Water Buy Back Program. The Water Buy Back Program help businesses that use a large amounts of water to identify areas that may be 'wasting' water and offers solutions and cash incentives. This program allows the City to buy back water or sewer capacity that has been freed up by participants who have reduced water use in their operations.

Spray 'N' Save Program for Restaurants. The Spray 'N' Save Program helps restaurant owners to reduce water and gas consumption and to lower operating and sewage costs. Toronto Water is partnering with Enbridge Gas Distribution Inc. to promote this program to restaurant owners in Toronto.

Toilet replacement program. The City of Toronto's Toilet Replacement Program for multi-unit residential, commercial, industrial and institutional buildings promotes the replacement of old toilets with water-efficient six-liter toilets. Participants can receive up to $150 for every old toilet that is replaced in the business or multi-unit residential property.

Washing Machine Rebate Program. The City of Toronto's cash incentive will help businesses to manage the cost of buying or leasing new water-efficient washing machines. Participants can receive up to $125 cash back when a new City-selected washing machine is purchased or leased.

ENERGY

The City is committed to conserving energy within its own operations and encourages residents to make a difference by implementing their own energy saving measures. A number of initiatives to save energy in buildings are listed above. Other initiatives

include the following programs:

Deep Lake Water Cooling Project. This innovative cooling system was launched by Enwave and Toronto Hydro in 2004. The system works by drawing cold water from the depths of Lake Ontario. Through a heat transfer process, cold energy from the lake water - but not the actual water - is used to air condition buildings in Toronto's downtown core. There are 46 buildings signed on to the project, with 27 already connected. Some of the buildings currently connected to the system include the Air Canada Centre, Metro Hall, Metro Toronto Convention Centre and the Steam Whistle Brewery.

Greening Health Care. Greening Health Care is a collaborative program among hospitals in the Toronto area to achieve energy and cost savings while minimizing air pollution. Partners include Power Stream and the Ontario Ministry of Energy. Greening Health Care helps hospitals work together to improve energy and water efficiency and reduce solid waste generation. The program reduces costs, contributes to the health and well-being of communities and demonstrates the health care sector's commitment to fiscal and environmental responsibility. Membership in the Greening Health Care program has grown steadily since its inception in 2004 to its current membership of 44 hospital sites across Ontario. Today there are tremendous pressures on Ontario's Health Care providers to cut costs, address energy shortages and operate more sustainable. These pressures are legislative (Energy Conservation Leadership Act), ethical (global warming) and financial (ever rising utility costs). Greening Health Care helps hospitals work together to improve energy and water efficiency and reduce solid waste generation.

The foundation of Greening Health Care is cooperation between member hospitals through: online energy performance management system, online action planning and benchmarking capabilities, sharing information and experience in quarterly workshops.

Lights Out Toronto. Most migratory bird species are unable to adapt to living in cities. During their biannual flyovers they become confused by the combination of light pollution and the effects of glass in the urban environment. This often results in significant numbers of birds colliding with buildings. One of the key ways to reduce migratory bird deaths is to reduce light pollution, which will also result in energy savings, lower building operating costs and reduced greenhouse gas emissions. City Planning staff set up a committee of staff and community partners to identify bird-friendly development options to be used by architects, planners, urban designers, building owners and managers, tenants and homeowners. The extensively illustrated guidelines identify hazards and appropriate alternatives in building exteriors, lighting techniques, and building management methods.

Light Savers Program. The Toronto Atmospheric Fund's Light Savers program focuses on stimulating market transformation for outdoor lighting. There is a significant opportunity to increase efficiency and reduce emissions through the use of new technology, such as the use of LED lamps and intelligent lighting system controls. A key part of the Light Savers Program will be projects that focus on partnering with GTA municipalities, Toronto business improvement areas and other organizations. These technologies could reduce emissions associated with tasks such as street, park and

parking area lighting by up to 70 percent. LightSavers will combine grants, green procurement, innovative financing, and market research to build market awareness and advance the use of LED lamps and intelligent lighting system controls across the GTA.

Traffic Signals. New lights being installed at the City's traffic signals will result in significant energy savings and a reduction of carbon dioxide emissions. Transportation Services will convert all traffic and pedestrian signals to use LED (Light Emitting Diode) lighting technology, dramatically reducing the energy used and potentially saving the City almost $2 million a year. The new lighting will also reduce carbon dioxide emissions significantly. In 2003, the City's Transportation Division completed a pilot project in conjunction with the Toronto Atmospheric fund, using the new technology at 10 locations. The study determined that the new lighting resulted in an 84 per cent reduction in energy used. As a result, all new signals that have been installed feature the new LEDs. Over the next eight years, Transportation Services will convert the remaining 1,900 traffic and pedestrian signals to the new lighting. The conversion to the new technology will pay immediate dividends. The new lights will save more than 18 million kilowatt hours a year, providing an energy savings of about $1.8 million annually. In addition, a reduction of five million kilograms of carbon dioxide (CO2) emissions is projected as a result of the new lighting.

Toronto's Renewable Energy Target. In 2000, the City made a commitment to obtain a quarter of its energy needs from renewable energy by 2005. That target was not met but several initiatives planned or in progress should help to close the gap. They include a photovoltaic installation at Exhibition Plan, solar-powered lighting in transit shelters, linking Metro Hall to deep lake water cooling, and the purchase of 330 hybrid buses. Work is now underway on a renewable energy action plan that is to be implemented across City divisions and in partnership with partners such as Toronto and Region Conservation and Toronto Hydro.

Exhibition Place Wind Turbine. A joint venture of Toronto Hydro Energy Services Inc. and WindShare (a community based co-operative), the 750 kilowatt wind turbine is the first such device erected in the City of Toronto - and the first in an urban setting in North America. The lakeshore wind turbine operates since 2003 and it generates up to 1,400 megawatt hours of power a year, enough for 250 homes.

Solar Power at Exhibition Place. Exhibition Place is now home to Canada's largest single solar photovoltaic installation. The 100 kilowatt pilot project, is part of a series of innovative energy projects designed to make Exhibition Place energy self-sufficient by 2010. The pilot project will be tested and the performance data will be used for future solar installations. Solar pilot project key numbers: it generates roughly 120,000 kWh of electricity annually, enough for 35 homes, it reduces greenhouse gas emissions by 115 tones annually. The Toronto Atmospheric Fund provided start-up funding for both the solar and wind turbine projects and will continue to work with Exhibition Place on future projects.

SolarCity Program The Toronto Atmospheric Fund's Solar City Program promotes the

use of solar thermal and photovoltaic generation equipment on city and community-owned facilities and residences. Solar power can displace emissions from fossil fuels used for electricity generation or heating, especially during periods of peak summer energy demand when air quality may also be at its worst. A key part of the Solar City program is the promotion of solar hot water heaters in Toronto neighborhoods, through the Toronto Solar Neighborhoods Initiative mentioned above. The Toronto Atmospheirc Fund has also provided grants to a variety of other organizations in support of local solar development.

Transportation

The City supports sustainable means of transportation such as walking, cycling and public transit. Improvements are also being made to the City's fleet of vehicles, making them more efficient and less polluting. Emissions from vehicle idling is also a major concern and a bylaw has been established to prevent unnecessary idling.

Bicycle Lanes. Bicycle lanes are designated space on the roadway exclusively for the use of cyclists. Motor vehicles are not allowed to drive, park or stand in the bike lane, but right-turning cars and trucks can enter the lane at intersections to complete their turn. Currently there are 90 kilometers of bike lanes in Toronto. The City of Toronto continues to expand the bikeway network across the city. More bikes on city streets means less vehicular traffic and, as a result, an improvement in air quality. The city has installed bicycle lockers to secure bicycle parking by improving protection from theft, vandalism and inclement weather. The lockers are designed to hold one bicycle each as well as bicycle gear. Locker locations are increasing across the city.

Hybrid Buses. The Toronto Transit Commission (TTC) is now using hybrid buses as part of its fleet. The hybrid diesel-electric buses use less fuel and have lower emissions than traditional diesel-fuel buses. The energy created by the braking process charges batteries that power an electric motor supplementing the bus's diesel engine.

Bio-Fuel Testing. Toronto's Fleet Services Division and the Toronto Transit Commission (TTC) tested 180 TTC buses over a nine-month period in 2004-05. The results showed that the overall ozone-forming potential of a biodiesel bus was about half that of a bus that uses standard diesel fuel. The City and the TTC have begun using biodiesel fuel in their vehicles, with the intention of increasing the use of biodiesel fuel for their fleets.

Reserved Transit Lanes. The City is exploring the merits and viability of reserving a road lane for public transit. Studies and environmental assessments are being carried out for reserved transit lanes on Yonge Street, Finch Avenue to Steeles, and St. Clair Avenue. An environmental assessment was completed in 2005 for existing bus lanes between Downsview Station to York University.

Vehicle Idling. Contaminants from vehicle exhaust are major contributors to deteriorating air quality in Toronto. The City of Toronto's Idling Control Bylaw is

intended to discourage the unnecessary idling of cars, trucks and buses in the city in order to help combat air pollution. The bylaw limits idling to no more than three minutes in a 60-minute period (with exceptions during extremely hot or cold weather). The City is working in collaboration with the Toronto Police Service to enforce the bylaw, though the emphasis is on public awareness and general support for voluntary compliance. The City (with help from the media) continues to provide general education about the effects of unnecessary vehicle idling.

Green Fleet Transition Plan. The City's Green Fleet Transition Plan, adopted in 2004, is a strategy to reduce emissions from the City's fleet of vehicles. The plan calls for the replacement of old vehicles with biodiesel, hybrid electric and natural gas powered cars and trucks - a process that has already begun at the City of Toronto. In 2005, Fleet Services entered into a partnership with a private-sector company and the federal government to develop a hybrid hydraulic garbage packer for Toronto's fleet of packer trucks.

FleetWise Program. The Toronto Atmospheric Fund's FleetWise program supports projects that further the development and use of hybrid electric and all-electric vehicles in Toronto. The primary focus of this program is on government and corporate fleets. As part of the FleetWise program, funding has been provided for several pilot projects that will test the performance of hybrid and electric vehicle technologies in a variety of fleet applications.

Better Transportation Partnership. The Better Transportation Partnership (BTP), a public private partnership in Toronto, was created to reduce smog emissions. Participants seek out new and emerging transportation technologies such as low and zero emission vehicles and other commercially viable opportunities. The BTP has assisted in the purchase of about 70 light-duty natural gas vehicles for the City of Toronto's fleet.

Water

The City has created water efficiency programs that provide solutions and rebates to reduce water use and save money. Toronto's goal is 15% reduction of water use by 2011. Reducing current residential and commercial water use will ensure that Toronto's water system can meet the needs of a growing city.

WaterSaver Programs Incentives for reducing water use:

Toilet replacement. Toilet flushing in Toronto's residential and commercial buildings uses about 260 million liters of water a day. There are almost half a million inefficient toilets across the city. The Toilet Replacement Program aims to replace the water guzzlers with models that use no more than six liters of water a flush. Toronto residents and owners of larger buildings can receive rebates to help offset the cost of water-efficient toilets. Replacing toilets is expected to reduce overall water consumption by

more than 100 million liters of water a day by 2011.

Better washers. Today's water-efficient clothes washers can use 40 per cent less water and 60 per cent less energy than conventional models. Through the Washer Program, homeowners and the owners of apartment buildings can receive rebates for the purchase of a qualified, water-efficient washer. The City of Toronto offers residents $60 cash back on the purchase of a new high-efficiency, front-loading washer. Compared to conventional washers, high-efficiency models use up to 40 per cent less water and 60 per cent less energy.

Incentives for institutions - The City's Water Buy Back Program offers cash incentives for industrial, commercial and institutional buildings that permanently reduce the use of water. The financial incentives can be substantial and help offset the cost of installing water-efficient equipment.

Watering the lawn - The City encourages homeowners to water their lawns at non-peak hours (7 a.m. to 10 a.m.) to reduce pressure on the municipal water system and to reduce overall water use (and related costs). The City of Toronto's outdoor water program offers a limited number of free lawn and garden audits to educate homeowners on ways to reduce outdoor water use. Rain gauges are available to help residents monitor their use of water for lawns.

Stormwater. A Mandatory Downspout Disconnection Program was approved by City Council on November 20, 2007. Disconnecting roof's downspouts will reduce the flow of storm water into the city's sewer system - which in turn will reduce the pollution of local streams, rivers and Lake Ontario.

Wet Weather Flow Management Master Plan. Toronto's water pollution solution is presented in a long-term master plan to protect our environment and to help keep Toronto's rivers, streams and other bodies of water healthy. The 25-year plan also deals with steps needed to reduce the adverse effects of wet weather flow - water runoff from roofs and roads that is generated when it rains or snows.

Wastewater Master Plan. The City of Toronto is working on a Biosolids and Residual Master Plan that will provide direction on the future management of biosolids and other water-borne residual matter generated by the City's eight water and wastewater treatment plants to the year 2025. The plan will ensure that the City's management of its biosolids and water residuals is cost efficient, environmentally sound and sustainable.

Sewer Use Bylaw. Clean water is everyone's business. The City of Toronto has a Sewer Use Bylaw that requires businesses to plan for pollution prevention when their operations involve discharging wastewater into sewers and watersheds. The bylaw also sets strict limits on waste discharges.

The City of Toronto has also the are the following green initiatives**:**

Tree Planting Program. The City's Trees Across Toronto is a municipal effort that includes a major role by local residents. The City and the general public have planted over 300,000 trees in recent years. The trees are planted along streets and arterial roads, in ravines and in neighborhood parks. The City's Parks, Forestry and Recreation Division works to maintain the city's urban forests. Toronto's local non-profit group LEAF (Local Enhancement and Appreciation of Forests) is dedicated to improving Toronto's urban forest. They offer Toronto residents subsidized backyard tree planting.The service includes on-site advice on appropriate species and planting location, a 1.2 to 1.8m tall native tree, and the planting service. Native shrubs are also available.

Evaluating Sustainable Technologies. A multi-agency undertaking called the Sustainable Technologies Evaluation Program (STEP) is monitoring and evaluating sustainable technologies for water, land, air and energy. Current evaluation projects include green roofs, permeable pavement, sediment control ponds and air bio-filtration. Results from the studies are being used to establish guidelines for the use of these technologies.

Green Purchasing Policy The City of Toronto considers the long-term costs and benefits of the products and services it buys. City Council adopted a policy on responsible procurement in 1999, which helps to guide decisions on purchasing. The Purchasing and Materials Management Division revised basic specifications for contracts and tenders to place an emphasis on purchasing environmentally preferred products and services such as: durable products, reusable products, energy efficient products, low pollution products, products that contain the maximum level of post-consumer waste and/or recyclable content, and products that provide minimal impact to the environment.

Community Gardens Program. Community gardens benefit everyone by creating safe and healthy recreational activity within our parks system, and on other city-owned lands. The Community Gardens Program is cultivating a dynamic community gardening movement across the City. Working in partnership with a wide variety of community groups, the program draws on the collective heritage of gifts from Toronto's distinct cultures. Activities include community garden installation, urban agriculture training and demonstration sites, community greenhouse vegetable production, and the Junior Gardener Program.