Royal Roads University & Sustainability Solutions Group

Sustainable Cities e-Dialogue Series
Preliminary Scan

November 3rd, 2010

This Sustainable Cities Strategic Review is a joint partnership between Sustainability Solutions Group, RRU's Canada Research Chair, and is being funded by the Capital Regional District and the City of Calgary. The terms of reference for the review are to identify key sustainability issues and barriers facing Canadian municipalities and international best practices helping to address these barriers and to build a supportive network of people who are working on sustainability in municipalities across Canada.

This scan of international best practises of sustainable urban development was prepared as a background discussion paper for a series of on-line real-time e-Dialogues between sustainable development officials and city planners from across the country.

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1. Introduction

This document sets out an initial scan of 8 cities and their efforts in developing governing for sustainability. The document forms a key input into the 2nd e-Dialogue of the sustainable cities project, which will inform the selection of a narrower set of cities (three) in which key policies or initiatives can be investigated in further detail.

Each city is described in terms of key sustainability-related projects and highlights, the institutional and administrative features of sustainability governance, climate change mitigation and adaptation programs, and their approaches to engaging the public. Each city has outlined different sets of goals based on the challenges and the priorities they have established.

2. Copenhagen, Denmark

Copenhagen, Denmark's Capital, has a population of half a million, within a wider metropolitan area whose population is over a million. Connections with neighbouring Malmo in Sweden, which is linked by bridge, are very close, and some demographers treat the two cities as a single metropolitan region, with a population of over two million. Copenhagen is the economic and financial centre of Denmark, with a service-oriented economy, and strong recent economic performance.

Summary:

- A world renowned city for cycling, Copenhagen accommodates 150,000 bicycle commuters each day
- Hydrogen and electric vehicle infrastructure and government purchasing policy underway
- District heating supplies 98% of households
- 64% of food served in institutions and 18% of food consumed in households is organic
- 3 new public swimming pools in the inner harbor reflect significant improvements in water quality
- Sustainability and climate change at the forefront of all government decisions, planning and projects
- Culture of integrated planning and interdepartmental collaboration
- Mitigation plan passed in 2009, includes 50 initiatives, goal of first carbon neutral capital in the world by 2025
- Adaptation plan expected early 2011
- Climate Ambassadors pilot project to train youth about climate change
- Intergovernmental collaboration with C-40, Euro cities, Malmo Sweden, and the largest 6 municipalities in Denmark

Key Sustainability Highlights and Initiatives

Copenhagen has taken significant steps to improve the sustainability of its transport and energy systems. The City is constantly improving its cycling infrastructure: each year, many new cycle paths are added, and the city now has to widen its existing paths to accommodate the 150,000 people (37% of population) who commute daily by bicycle. Since 1996, the risk of serious injury has decreased by 67% for cyclists. In 2010, Copenhagen agreed to invest a further 100 Million DKK (Danish Kroner, equivalent to 19 Million CAD) in its cycling infrastructure. Copenhagen is also making strides in sustainable vehicle transportation. In 2009, the city opened its first hydrogen filling station, and introduced 11 electric buses. In 2010, Copenhagen agreed to implement further infrastructure for electric and hydrogen cars by creating up to 500 recharging parking spaces. Come 2011, all new municipal cars will be electric or hydrogen-powered. Copenhagen has a history of sustainable waste management and energy practices: the city has been using non-recyclable waste to partly fuel district heating since 1903. District heating is

common throughout Denmark, in part because of a national heat supply law developed in 1990 to encourage district heating, and district heat supplies 98% of households in Copenhagen. However, Copenhagen is still dependent upon coal and gas for 73% of its energy supply. The city is working towards converting coal power stations to biomass as well as increasing geothermal and wind energy. Copenhagen is also improving the quality of the food its citizens eat. In 2009, 64% of food served in Copenhagen's institutions was organic. At the household level, 18% of food consumed is organic. In addition to these initiatives, Inge Nilsson, Program Manager responsible for the implementation of the City of Copenhagen's climate plan also highlighted the city's efforts regarding water and pollution. In the past few years, the city has opened three public swimming pools in the city's harbour, which may seem trivial; but, in fact, Ms. Nilsson emphasized this represents a significant achievement reflecting years of work improving the water quality in the city's harbour to the extent that public swimming is now possible (Nilsson October 28, 2010).

Organizational Frameworks Used to Support Sustainability

The city has 50 000 employees and seven departments each of which has its own "mayor", except for the Finance Department, which is managed by a "Lord Mayor". Decisions are approved by Council, which has been controlled by the left wing government for many years. Ms. Nilsson advises that the government has been quite stable for a long time, however, if things were to change, for example to a right wing government, "it would have an impact on the sustainability initiatives but not right away." Ms. Nilsson also explained that integrating climate change and sustainability into decision-making has become a matter of tradition. "We have been working on it for so long, It's not an add-on; we take it into account from the beginning. Copenhagen has a strong culture of collaboration between departments in government. We work together all the time." In some cases, such as in Urban Planning, cross-departmental collaboration is mandated by the national government and official steering committees are established. In other cases it is less formal, "we just invite them for a meeting". At what level and how frequently integrated planning processes are needed is decided on "a case by case basis," explained Ms. Nilsson. Inge also stated that in Copenhagen, an integrated approach to planning and policy development is seen as a practical way to ensure that you have an end product that is thorough, widely supported and, therefore, likely to be approved by council. In the case of the Copenhagen Climate Plan, an integrated process definitely played a role in it being adopted unanimously by council in 2009 (Nilsson October 28, 2010).

Scope of Mitigation and Adaptation Strategies or Climate Change Plan

Copenhagen aims to become the first carbon neutral capital in the world by 2025. The Copenhagen Climate Plan of 2009 is the city's mitigation plan. The climate plan includes 50 specific initiatives across six areas: energy, transportation, buildings, public engagement, urban development, and adaptation; and, sets ambitious targets with specific green house gas reduction goals for each of the areas except adaptation. The city is currently examining the risks and tools available, and council will hopefully approve the adaptation plan, in early 2011 (Nilsson October 28, 2010). In order to measure progress towards their goals, Copenhagen conducts an annual "Green Accounts" audit, which it reports publicly.

Methods Used to Engage the Public

The City's political process includes formal procedures governing public hearings allowing for any individual to provide their input to any government decision. To engage youth, the climate plan aims to train 1 500 "Climate Ambassadors". This project is currently in the pilot phase with five students in the 8th grade from four schools receiving the technical knowledge and training to plan campaigns at their schools, and to educate other students. This kind of training is valued not only because it is important that people understand the impacts of their decisions but also because it is important politically for advancing sustainability, "eventually children become voters." Copenhagen is engaged with other governments through the C40 organization and Euro-Cities. Within Denmark, Copenhagen works closely with a group of the six largest municipalities to learn

from each other, and also collaborates with its border-city neighbor, Malmö, Sweden (Nilsson October 28, 2010).

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3. Freiburg, Germany

Freiburg is a city of around 225,000, in the State of Baden-Wurttemberg in southern Germany close to the border of France. It is a university town, and a regional economic, cultural and tourism hub.

Summary:

- Freiburg is a solar power and renewable energy "hot spot". It hosts an extensive network of private and public research institutions investigating renewable energy sources and other aspects of sustainable living.
- The newly constructed neighborhoods of Vauban and Rieselfed are internationally known for their social and ecological achievements, as well as the participatory framework throughout the planning process.
- With 423 motorized vehicles per 1000 people, Freiburg has the lowest motorized vehicle density in Germany.
- Freiburg hosts numerous international trade fairs and conferences with the objective of showcasing how the city has achieved to "unite the administration of a municipality with environmental concerns and make this a financially viable proposition" (Freiburg Green City-Approaches to Sustainability, n.d.).
- Far-sighted planning has been key to Freiburg's success. In order to promote energy conservation, the use of new and renewable technologies, Freiburg mandated all public buildings and facilities to have solar cells and instituted a feed-in tariff program.
- The City aims to reduce its GHG emissions by 40% by 2030.

Key Sustainability Highlights and Initiatives

The City of Freiburg, Germany has been particularly successful in the fields of renewable energy research, and marketing. The city is situated in one of the sunniest regions in Germany (1 800 hrs of sun per year and annual radiation of 1 117 kW per square meter). Freiburg SolarRegion, a long-term development vision adopted by the city, triggered what is now an extensive network of private and public research institutions investigating renewable energy sources. As a result, hundreds of spin-off companies, service providers, and organizations are based in Freiburg and have made the generation of solar energy an integral part of the landscape. For example, the city's Badenova Stadium has its own solar power plant and solar panels are found on City Hall, schools, churches and several private houses. Other unique projects include the world's first energy self-sustaining solar building, the Heliotrope (a rotating solar "tree-house" that follows the

movement of the sun), and the development of the Rieselfeld and Vauban neighbourhoods. Freiburg is also host to ICLEI – Local Governments for Sustainability.

Rieselfeld is the state's largest neighbourhood project (4 200 apartments for 12 000 people). Ecological features include low-energy standards for all houses and district heating, from a combined heat and power station. Next to a 250-hectare natural reserve, the development includes lots of green spaces, open areas, and traffic-calmed streets.

Vauban was built on an old French military base and was designed as a family friendly neighbourhood for 5 000 people. It has gained worldwide notoriety for the participatory framework of the project development as well as for its social and ecological achievements. Ecological achievements of the Vauban project include: 65% of the electricity is produced on-site through photovoltaics and a co-generation plant (80% wood chips, 20% natural gas); all Vauban houses are either low energy standards (65kWh/m2a), passivehouse(15kWh/m2a), or plus energy (generates more energy than is consumed); and, the majority of households do not own a car due to an innovative and participative design process.

As a whole, Freiburg has the lowest motorized vehicle density in Germany with 423 motorized vehicles per 1 000 people. The Freiburg Communal Forest (6 400 hectares, 43% of the territory) serves as a recreational area and is exploited for wood harvest. The Forestry Office is certified Forest Stewardship Council and the felling of eco-labeled timber generates an annual profit of 2 Million Euros.

Organizational Frameworks Used to Support Sustainability

More than 30 years ago, Freiburg successfully campaigned against a proposed nuclear power plant in the region. In 1986, the year of the Chernobyl disaster, Freiburg became one of the first cities in Germany to establish an Environmental Protection Office. That same year, the municipality decided that solar power would become the new principal source of energy. Freiburg SolarRegion aimed to promote energy conservation, the use of new technologies such as combined heat and power, and the use of renewable energy sources such as solar. To this end, Freiburg mandated all public buildings and facilities to have solar cells and instituted a feed-in tariff program. This attracted a “solar crowd” made up of investors, businesses, research organizations, and others. By using government measures to stimulate the solar market, Freiburg's strategy did not depend on core funding. Rather, the strategy was powered by the synergy created by the city's vision among many solar players working together, and who also benefitted from each other's presence. Freiburg Green Party Mayor Dieter Salomon also points to citizen support and participation as key to advancing and shaping the numerous and diverse sustainability initiatives that have continued to this day.

Scope of Mitigation and Adaptation Strategies or Climate Change Plan

In 1996, the municipal council decided to reduce 25% of its CO2 emissions by 2010. Although this target will not be attained, council decided to raise the benchmark to 40% reductions in emissions by 2030. To help achieve this goal, the municipal council has developed the “12-Point Program”, which includes taking into consideration climate protection, energy efficiency and solar optimization at an early stage in all urban developments, urban land use and real estate sales contracts. As well, Freiburg has developed numerous municipal plans aimed at continued development consistent with its self-given label: Freiburg Green City. These include: a Land Use Plan 2020, a Landscape Plan 2020, a Clean Air Plan, an Action Plan on Fine Particle Dust, Soil Protection Measures, and more. Far-sighted planning appears to be a key element of Freiburg's mitigation and adaptation strategies.

Methods Used to Engage the Public

The high level of environmental awareness demonstrated by Freiburg citizens is due in part to the large role the environmental economy plays within the City of Freiburg with 10 000 people employed by 1 500 companies contributing 500 Million Euro to the local economy. The Freiburg Green City Cluster exists to create and maintain future-oriented employment opportunities in the

areas of renewable and solar energy, energy efficiency, sustainable building and planning, as well as environmental technologies. Freiburg hosts numerous trade fairs and conferences with the objective of showcasing how the city has managed to unite the administration of a municipality with environmental concerns and make this a financially viable proposition. As a meeting point of the international solar scene, Freiburg is also a popular tourist destination. Targeted information and public awareness campaigns include CO2LIBRI, which encourages Freiburg's citizen to reduce their CO2 emissions, and the Freiburg CO2 Diet, which is a carbon footprint calculator that also serves as a resource for CO2 reduction.

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4. Sydney, Australia

Sydney, a port city of 4.5 million, is Australia’s largest city. It is state capital of New South Wales, and enjoys its status as a prosperous economic and cultural hub of Australia and the wider region of Oceania. It played host to the Olympic Games in 2000, which catalyzed a construction and infrastructure boom.

Summary:

- $18 million investment to cut CO2 emissions by 20% by 2012 from 2006 levels
- City is committed to reducing its greenhouse gas emissions by 70 per cent over the next 20 years (based on 2006 levels)
- City has claimed to be carbon neutral since 2008, through energy efficiency measures, purchase of green power, and carbon offsets
- Goal to have 25-30% of the city’s energy needs supplied from renewables such as wind, solar, marine and geothermal by 2020
- Comprehensive public engagement
- Variety of government sectors involved in the City’s sustainability plan such as environment, health and infrastructure

- The City is working to increase creative expression by commissioning vibrant and engaging art and urban design and celebrating indigenous culture and telling the story of Indigenous life in Sydney

Key Sustainability Highlights and Initiatives

There are ten major strategic directions that the City of Sydney, Australia is aiming to achieve by 2030, as outlined in its sustainability plan, 2030 Sustainable Sydney. The key areas include: i) creating a globally competitive and innovative city; ii) becoming a leading environmental performer; iii) integrated transport for a connected city; iv) a city for pedestrians and cyclists; v) a lively, engaging city centre; vi) vibrant local communities and economies; vii) a cultural and creative city; viii) housing for a diverse population; ix) sustainable development/renewal and design; and, x) implementation through effective partnerships. Each key area was identified in response to a public engagement process focused around discussing the direction the City of Sydney should take to become a more sustainable city. Major projects have been implemented in a variety of areas including investing $18 million to cut CO2 emissions by 20% by 2012 from 2006 levels. Sydney is looking at expanding their cycling paths and networks. Their goal is to ensure that every citizen lives within a 3-minute walk to a continuous green connection for bicycles and walking. The city is working on water storage and reuse programs such as incorporating green spaces into footpaths to help with storm water runoff and filtration. The City is also working to increase creative expression throughout the city by commissioning vibrant and engaging art and urban design and celebrating indigenous culture and telling the story of Indigenous life.

The city has claimed to be carbon neutral since 2008, through energy efficiency measures, purchase of green power, and carbon offsets.

Organizational Framework Used to Support Sustainability

The Sustainable Sydney 2030 plan is closely integrated in the City's Corporate Plan, a (statutorily required) process through which the city sets out its budget, plans and governs Council's day-to-day operations, activities, and workplans. The Corporate Plan, which is updated annually, includes detailed breakdown of environmental targets, actions, responsible city departments, performance indicators and budget.

Environmental planning is the responsibility of the City's Director of Strategy and Design, and work is overseen by Council Environment and Planning committees. The City of Sydney is also forming partnerships with the State Government, the Australian Government, other Councils in Sydney and the business sector.

Scope of Mitigation and Adaptation Strategies or Climate Change Plan

Climate change mitigation and adaptation issues are addressed within the broad framework of the Sustainable Sydney Plan. As part of the Sustainable Sydney 2030 plan, the city aims to achieve its C02 reduction target of 20% from 2006 levels by 2012 through energy efficiency measures. The City is committed to reducing its greenhouse gas emissions by 70 per cent over the next 20 years (based on 2006 levels). Sydney plans to meet 100 per cent of their energy needs from local generating systems. Projects to date include building retrofits, which have cut emissions by 17% in City buildings. The city has a pilot program for LED street lights, which if successful could improve efficiency of city lighting by 50%. The city is focusing on decentralized energy options including a Green Infrastructure Plan, which outlines directions for using decentralized energy from "trigeneration" an energy generation option that converts natural and waste gas into electricity, heating and cooling. Sydney is also looking at renewable energy with a goal to have 25-30% of the city's energy needs supplied from renewables such as wind, solar, marine and geothermal by the year 2020.

Methods Used to Engage the Public

The 2030 Sustainable Sydney plan was created with an unprecedented amount of multi-stakeholder consultations and citizen involvement. During 18 months of consultation, 12 000 people were directly consulted, the 2030 website received more than 15 000 visitors, and more than 2 000 comments were received through the 'Future Phone' line. The city engaged the citizens, businesses, and community leaders through forums and events. The city is making an effort to address government silos by involving a variety of government sectors such as environment, health and infrastructure into their overall sustainability plan, allowing government staff and officials to engage with each other, and work together to prioritize goals and issues around sustainability (Dale pxii).

In April 2008, Sydney's draft vision was exhibited for six weeks to gain even more feedback from stakeholders and citizens. Over 130 000 people viewed the draft. After feedback and comments were incorporated into the document, the vision was finalized and implemented in June 2008. In 2010, there was an initial review published of the first 18 months in action to inform citizens of the programs that have been started. This progress report is available online and can also be downloaded as a podcast from the website.

There is also a very robust feedback mechanism in this plan, ensuring that those who participated in the initial stages are kept informed and that the plan adjusts itself according to new developments, or glitches in chosen paths. The Mayor and city staff are working to report back to the community on 2030 progress to date. The City of Sydney also hosts approximately 50 public conversations a year. These cover the programs that are being implemented, the progress that is being made towards 2030 goals, and acts as a place to inform and engage citizens and answer questions from the public.

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5. Malmö, Sweden

Malmo, a coastal city that faces Copenhagen across the Oresund Sound, has a population of 290,000. The economy, once heavily industrial, has struggled with a decline in industry and consequent job losses during the 1990s. Since the construction of the Oresund Bridge, linking the city to Copenhagen, the economy has started to revive, with almost 10% of Malmo inhabitants working in Copenhagen.

Sweden has an unusual degree of decentralization in governance, with considerable autonomy granted to municipalities.

Summary:

- The City encompasses 6 km of canals that direct stormwater runoff into ponds for treatment
- The City is committed to reducing its greenhouse gas emissions by 70 per cent over the next 20 years (based on 2006 levels)
- Malmö's schools currently serve 50% organic meals, with 100% organic meals as its goal by 2012
- Malmö University has specific sustainability programs funded in part by the United Nations, including the Regional Centre of Expertise Skåne network
- By 2020, Malmö plans to increase its use of renewable energy and reduce its greenhouse gas emissions by 40% from its 1990 levels
- The GreenClimeAdapt is a program designed to help the City adapt to the impacts of climate change

Key Sustainability Highlights and Initiatives

The City of Malmö, Sweden has many sustainability projects underway. The Augustenborg eco-city is a program designed to make this residential area of Malmö sustainable with residents taking a leading role in the design and implementation of the plan. Spring 2009, citizens helped organize the installation of 450 m2 of solar panels on roofs in the industrial area of Augustenborg, and the local school installed a wind power plant for power generation. Other projects include retrofits to buildings and the construction of a local school made with natural materials, and major use of passive heating and natural light. Individual apartment metering for energy use is in the pilot project phase to help citizens understand their consumption patterns. Accessibility for all age groups is a main theme and concern for city planners, including a new senior centre designed with accessibility and environmental performance in mind. Green roofs now cover 9000 m2 of the city. Currently, the city encompasses 6 km of canals that direct stormwater runoff into ponds for treatment. These canals were designed to work with green roofs and buildings to best capture stormwater, and to provide an aesthetically pleasing environment for residents. Bird and bat boxes have been installed in the parks and green areas of the city, wetlands are a key priority, and there is a strong focus on biodiversity to ensure natural areas for local wildlife. There is a keen interest in organic gardening from citizens in both Augustenborg and in Western Harbour and community space has been allocated for this purpose. Residents can compost green bin materials at 13 compost huts and there is hazardous waste collection. In 2008, Augustenborg was selected as a pilot project for biogas made from compost.

The Western Harbour was built in 2001 and is a former industrial area that has been transformed into a sustainable community through a number of projects. Twenty-six architectural firms have worked on developing the buildings in the Western Harbour. Taller buildings encompass the outside of the city and shield the inner buildings from sea wind. Many houses and apartments have roof solar panels for their energy needs, and re-use energy from ventilation to heat radiators. All of the houses are built to the standards set out in the Quality Programme jointly established by Bo01 Expo, the property developers, and the City of Malmö. The programme sets

guidelines for architectural qualities, choice of materials, energy consumption, green issues and technical infrastructure. An integrated design process helped to ensure that buildings were built, and will continue to operate, as sustainably as possible. The Western Harbour itself has been cleaned and the harbour is now a public swimming area for citizens in the summer.

Malmö also has a large solar park, SegePark, with photovoltaic panels covering 1250 m2 with a 166kW capacity. Malmö's schools currently serve 50% organic meals, with 100% organic meals as its goal by 2012. Malmö University has specific sustainability programs funded in part by the United Nations, including the Regional Centre of Expertise Skåne network, to disseminate learning for sustainable development in various forms of learning both formal, and non-formal education.

Organizational Framework Used to Support Sustainability

Sweden operates a highly decentralized governance model in which political power is strongly devolved to the municipal level. For example, health budgets are made at the local level, and questions of energy use can be mandated at the local level rather than imposed from a provincial or regional grid or energy provider. Malmö has ensured multi-stakeholder involvement by including politicians, citizens, architects and businesses in the design and implementation phases of its projects. The city has numerous steering committees, each responsible for implementing actions. Each steering committee has the flexibility to manage and achieve their targets in the manner that best suits their existing agenda. An Environmental Committee annually monitors the work done by each sector. Furthermore, the Environmental Committee acts in a leading, supporting and coordinating role to help mitigate any problems. Each sector is responsible for publishing its progress to the public at large as programs develop.

Scope of Mitigation and Adaptation Strategies or Climate Change Plan

Over the next 10 years, the city needs to accommodate population growth, urban density and increased transportation needs. The Environmental Programme 2009-2020 outlines the city's goals and projects, and details the existing feedback mechanisms that are in place. The city aims to use the Environmental Programme as a steering document to help guide different sectors to achieve their sustainability goals. By 2020, Malmö plans to increase its use of renewable energy and reduce its greenhouse gas emissions by 40% from its 1990 levels, develop rail and other electrically driven transportation, and is implementing adaptation strategies for temperature change and rising sea levels to help mitigate future costs. The GreenClimeAdapt is a program designed to help the City adapt to the impacts of climate change (including increased rainfall and urban heat island effect) through the use of green tools. Initiatives include creating an open storm water system rich in biodiversity, integrating green facades grown within a wire system on outer walls to help shade and cool buildings and developing green roofs created by locally available materials.

Methods Used to Engage the Public

Malmö has a City green newspaper in distribution for over ten years, which details green events and projects, and provides updates and success stories to keep interested citizens aware and engaged. The 'Helix', Malmö's green centre, is where many green businesses are located. The city is also focusing on greening the tourism industry and has offered courses and information to tourism operators to help them make the industry more sustainable.

The city also engages citizens through different political boards as part of an outreach program. Citizens can approach their board to discuss key issues and concerns, which are then directed to the city council. As well, the city has a website where citizens can log on and contact a communications officer who then directs their questions to the appropriate individual. Malmö also has a door-to-door education program in Western Harbour to facilitate a dialogue with residents and ask if they have any questions regarding recycling, composting or public transportation schedules and location stops. This program was funded by the European Union and the Swedish

government, and D. Skog, Communications Officer with the City of Malmö, noted that the program was acknowledged to be very successful (Skog October 25, 2010).

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6. Vaxjo, Sweden

Vaxjo, in central southern Sweden, is a university town with a population of 55,000. Sweden has an unusual degree of decentralization in governance, with considerable autonomy granted to municipalities.

Summary:

- Construction of a district heating system fuelled by woodchips, and other biomass waste, from local sawmills (it provides approx. 90% of the heating and hot water needs for the City)
- Vaxjo now gathers over 50% of its energy from renewable sources, principally biomass in heating
- Vaxjo plans to be a fossil fuel free city by 2030
- The city uses a financial system called Ecobudget to manage its financial issues, the aim is to manage the City's natural resources with the same efficiency as its financial resources

Key Sustainability Highlights and Initiatives

Vaxjo wholly owns its own municipal energy company, which has developed a number of green energy projects. A major focus for the City of Vaxjo, Sweden has been the construction of a district heating system fuelled by woodchips, and other biomass waste, from local sawmills. This system provides about 90% of the heating and hot water needs for the City, as well as generating power for the grid. Vaxjo now gathers over 50% of its energy from renewable sources, principally

biomass in heating. Transportation still accounts for a large percentage of the City's energy use, with heavy use of diesel and gasoline. The municipality is working on projects to reduce transportation energy and emissions such as municipal car-sharing with environmental vehicles, municipal subsidies for purchasing environmental cars, improving public transportation options, and expanding bicycle infrastructure as an alternate to vehicle use. Biogas produced from sewage treatment is sold as a transport fuel for vehicles adapted to run on gaseous fuels. These projects are financed by the Swedish national government, as well as from the European Union. Smaller scale projects are built into the City budget each year. Vaxjo has also implemented green buildings projects including photovoltaic installations on the town swimming pool and on the Teleborg local school (528 m2 of solar panels).

Organizational Framework Used to Support Sustainability

As discussed for Malmo, Sweden operates a highly decentralized governance model in which political power is strongly devolved to the municipal level. For example, health budgets are created at the local level, and questions of energy use can be mandated at the local level rather than imposed from a provincial or regional grid or energy provider. In Vaxjo, a long history of strong political will, coupled with high citizen awareness and involvement has facilitated an environment where sustainability thrives regardless of changes in a political party. Mayor Bo Frank, attributes this to developments in the 1960's and 1970's, when the city was cleaning up its heavily polluted lake district. There were many young politicians involved in this clean-up project well educated on environmental issues. This new, informal group of emerging political leaders worked together to push for, and create, a thriving environmental contingent in the political sphere that has continued to this day. Mayor Frank also mentioned that there was good co-operation between the old caucus and this new group of political actors (Frank September 24, 2010).

The 'Environmental Program for the City of Vaxjo' is the major strategy document on environmental policy. This is a steering document, with no legislative underpinnings. The two primary mandates of this document are that it: 1. Is to be taken into consideration with all decisions and actions and that it applies to both employees as well as to elected representatives. 2. Provides companies, organizations, authorities and inhabitants with inspiration and guidance. The program includes three guiding principles: goals to be strived towards, goals to be achieved, and actions to be taken. The Municipal Executive Board on sustainability issues is in charge of the coordination of the Program. Each municipal committee has their own responsibilities to make sure that the objectives are followed.

The city uses a financial system called Ecobudget to manage their financial issues; the principal aim of ecoBUDGET is to manage the City's natural resources with the same efficiency as its financial resources.

Scope of Mitigation and Adaptation Strategies or Climate Change Plan

The 'Environmental Program for the City of Vaxjo', discussed above, incorporates the current mitigation and adaptation plan for the city. Mitigation and adaptation are thus framed within a broader sustainability agenda. Specific targets established include reducing fossil fuel carbon dioxide emissions by at least 55% per inhabitant by 2015, compared to 1993 levels, consumption of electrical energy to be reduced by at least 20% per inhabitant from 1993 levels by 2015 and cycle traffic shall increase by at least 20% from 2004 levels by 2015. The plan states that Vaxjo shall be a fossil fuel free city by 2030 at the latest.

Methods Used to Engage the Public

The City of Vaxjo works with education and outreach programs to make citizens aware of what is happening. A bi- yearly survey is sent out asking citizens about the sustainability programs, asking if they are participating, if they are aware of them, if they want to participate, and if they enjoy the programs. Each year, there has been an increase in the number of respondents to the survey, and more positive results regarding compliance with sustainability actions.

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7. Sao Paulo, Brazil

Sao Paulo is Brazil's largest city and economic center, and is the fifth most populated city in the world with a greater metropolitan population of 18.6 million people (the population of Sao Paulo municipality itself is around 11 million). The city is advancing in economic growth and its annual growth in GDP contributes 15% to Brazil's overall GDP. Once heavily reliant on industry, the city's economy is increasingly dominated by the service sector, and it is the financial centre of Brazil. The city is the capital of Sao Paulo State.

Summary:

- Municipal Act on Climate Change is a legal framework that encourages the use and improvement of public transportation, renewable fuels, sustainable construction and purchases, and the conservation of green areas.
- The City plans to reduce carbon emissions from 2009 levels by 30% by 2012
- In partnership with the State of Sao Palo, the City plans to invest 17 Billion USD into subway expansion, re- qualification and expansion of bus rapid transits, electrical buses, and bicycle lanes
- The city has created a Local Committee on Climate Change and Eco-Economics to help unify mitigation policies for the entire city administration under the Local Government Climate Roadmap

Key Sustainability Highlights and Initiatives

Environmental issues including waste management, access to green space, water access and purification, energy consumption, and pollution are connected to the City's high level of population density. Despite Sao Paulo's rapid growth and prodigious economic activity, Sao Paulo is seeing reductions in carbon emissions, and is successfully restructuring its transportation and construction systems. Since 2005, Sao Paulo has seen a 20% reduction in GHG emissions following the start of a landfill biogas generation project. City initiatives include turning an old brown field site into an eco-park to give citizens more access to green space, an amphitheatre,

and a community centre. The park buildings and infrastructure were constructed using recycled wood, local timber, and solar panels for energy and includes a passive water filtration system. The city has created restrictions on traffic during rush hour including a prohibition on the circulation of 20 percent of private cars on the weekdays, as well as emissions inspections of car engines. The city introduced hybrid electric buses to the municipal fleet and also converted private cars from diesel to natural gas. To reduce emissions from waste, the city built a 20MW power plant to harvest the greenhouse gases escaping from the Bandeirantes Landfill; this action reduced the city's emissions by 11 percent. The city also manages an extensive composting program for organic waste.

Organizational Frameworks Used to Support Sustainability

Sao Paulo leans heavily on political will and the implementation of legislation for its sustainability initiatives. In October 2008, the Sao Paulo State Secretary of Environment released sustainability guidelines for all new construction. Sao Paulo has been successful in creating the Municipal Act on Climate Change, which as the first legislation on climate change implemented in Brazil is a legal framework that encourages the use and improvement of public transportation, renewable fuels, sustainable construction and purchases, and the conservation of green areas.

The city has created a Local Committee on Climate Change and Eco-Economics. The objective of this cross- departmental Committee is the implementation of unified mitigation policies for the entire city administration under the Local Government Climate Roadmap. This committee works with and exchanges information on best practices with many cities around the world. To help foster communication, Sao Paulo is a member of ICLEI local governments for sustainability, and the C40 Group of Cities tackling climate change that was established in 2005 by 18 leading world cities that joined to begin combating climate change. The 2011 meeting of the C40 Group of Cities will be held in Sao Paulo.

Scope of Mitigation and Adaptation Strategies or Climate Change Plan

The focus of the Municipal Act on Climate Changes, introduced on June 3, 2009, is on the implementation of policies in energy, transport, construction, and waste management. The Act aims to create binding legislation to help Sao Paulo reduce carbon emissions from 2009 levels by 30% by 2012. The Act has three main focus areas: the first is Principles, which looks at prevention, precaution, and the polluter-pays concept. The second is Concepts, which looks at adaptation, life cycle analysis, strategic environmental evaluation and vulnerability. The final is Guidelines, which looks at who should be involved, feedback mechanisms, planning and economic aspects to the legislation. These focus areas are then further broken down into subsections that deal with goals and objectives, instruments to be used, and final dispositions.

The City of Sao Paulo's greatest challenge is providing public transportation for the 11 million people living in the inner city. Seventy-eight percent of the city's emissions come from transportation, making it an important area for achieving reduction targets. The City of Sao Paulo has partnered with the State of Sao Paulo to begin one of the largest public transportation expansion projects to date. The project will invest 17 Billion USD into subway expansion, re-qualification and expansion of bus rapid transits, electrical buses, and bicycle lanes. Expansion and creation of bicycle lanes and services such as public shared bicycles and bicycle parking places near metro stations are included in the plan. The aim is to encourage residents to use public transport or bicycles and to implement a major publicity campaign to create a culture of respect for cyclists among car drivers.

Methods Used to Engage the Public

Education, communication, and dissemination are emphasized in Sao Paulo's Municipal Act on Climate Change. The promotion of environmental education programs by the municipal government and civil society are explored. The city emphasizes four areas: cause and impact of climate change, vulnerability of the municipality and its population, greenhouse effect mitigation measures, and carbon markets. The city is committed to multi-stakeholder involvement and

feedback mechanisms and has a mandate to publish progress on its sustainability plans every five years as well as annual publications on climate change impacts on health.

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8. San Francisco, USA

The City of San Francisco itself has a population of 800,000, but is situated within the broader Bay Area conurbation, with a population of over seven million. The Bay Area's economy is thriving, and the region boasts a highly educated and traditionally liberal population. San Francisco is a large city on a peninsula surrounded on three sides by coastal water. With rising sea levels stemming from climate change, San Francisco is motivated to adapt and mitigate the effects of climate change.

Summary:

- The City plans to reduce carbon emissions by 20% below 1990 levels by 2012
- San Francisco is focusing on a zero waste program with a goal of zero waste by the year 2020
- The city has created the largest urban food scrap collection system in North America
- The city currently has allocated $6 million in building retrofit incentive programs
- The city's sustainability initiatives are mentioned in the local media daily (ex. 350-400 press mentions each year)
- The environmental education program is currently in over 225 schools in the San Francisco area and reaches approximately 20,000 students a year

Key Sustainability Highlights and Initiatives

San Francisco is working on a variety of environmental issues, and is proud of its claim to be one of the most sustainable cities in North America. San Francisco has enacted a city charter that

outlines the implementation and enforcement of a Sustainability Strategic Plan. From this initial charter, San Francisco now has SForward, an environmental agenda put forward by the mayor, which includes plans to become a carbon neutral city. The Climate Action Plan has also been implemented, which mandates the City to reduce carbon emissions by 20% below 1990 levels by 2012.

The city has implemented multiple ordinances for environmental compliance. These ordinances include:

1. The mandatory recycling and composting ordinance;
2. The 2008 green building ordinance with the intent to "minimize the use and waste of energy, water and other resources in the construction and operation of the city and the County of San Francisco's building stock and by providing a healthy indoor environment";
3. The construction and demolition ordinance that will attempt to utilize "facilities both within the city and in nearby surrounding areas that can effectively reuse, recycle or otherwise recover the constituent elements of the materials generated by construction and demolition activity and thereby divert such materials from landfill";
4. The plastic bag reduction ordinance (this ordinance requires the use of compostable plastic, recyclable paper and/or reusable checkout bags by grocery stores located in the city and the County of San Francisco);
5. The food service waste reduction ordinance (prohibiting the use of polystyrene foam disposable food containers, and requiring the use of compostable, recyclable or biodegradable food containers by all restaurants, food vendors, and city departments).

San Francisco is focusing on a zero waste program with a goal of zero waste by the year 2020. The city has created the largest urban food scrap collection system in North America. Each day over 400 tons of food scraps are sent to the Jepson Prairie Organics composting facility, a subsidiary of Recology, a private company dealing with environmentally responsible waste management. Private owners and farmers in the San Francisco area use the compost on fields where organic food and grapes are grown. The city currently has $6 million in building retrofit incentive programs ($3 million is directed towards incentives and the other $3 million is directed towards technical incentives). Approximately 1 000 businesses take part in this program every year (Broomhead October 28, 2010).

Organizational Frameworks Used to Support Sustainability

Notably, San Francisco has been building on their initial five year Sustainability Plan, a plan mandated by the San Francisco Board of Supervisors who established a commission on San Francisco's environment. The sustainability plan was created using a multi-stakeholder format with over 400 individuals involved in its creation. A variety of interests were incorporated including individuals from the City Planning Department, the Bureau of Energy Conservation, the Recreation and Park Department, and the Solid Waste Management Program; businesses; environmental organizations; elected officials; and concerned individuals.

The Department of the Environment is the main steering committee behind the city's plan. Over the years, it has expanded and now has 120 staff members. A climate manager has recently been hired through the mayor's office and is working directly with the Department of the Environment. Cal Broomhead, Energy Program Manager with the city, indicated that it is unknown how the anticipated departure of the current mayor may change the city's current environmental focus. The Department of the Environment works with community groups as well as different city agencies to increase environmental awareness and develop new programs. All city departments participate in the city's sustainability plan. Mr. Bloomhead noted that the public libraries have even jumped on board and have implemented a special program on the environment. This broad-based participation is creating systematic change and is advancing the city's sustainability agenda (Broomhead October 28, 2010). As discussed above, the City has

adopted a regulatory approach to many environmental issues through the development of ordinances.

Scope of Mitigation and Adaptation Strategies or Climate Change Plan

San Francisco adopted a Climate Action Plan committing the City to reducing greenhouse gas emissions by 20% below 1990 levels by 2012. The plan outlines actions the City can take to meet this goal including developing renewable energy projects, expanding residential efficiency programs, discouraging driving and increasing bicycling and walking as an alternate, increasing the use of public transportation, increasing commercial recycling and composting and supporting and developing green power purchasing.

Other City programs include:

Energy: This program aims to have zero net energy for all buildings and to maximize the efficiency of businesses and residences to achieve annual reductions of 37 000 tons of CO2 by 2012.

Clean air transportation: This program seeks to improve air quality and mitigate traffic congestion in San Francisco. To achieve this, the City promotes alternate modes of transportation other than cars, gives out commuter incentives, and develops the City's alternate fuel sector.

Green building program: This program aims to increase the environmental performance of buildings. LEED certification design is emphasized, as well as all new buildings meet City-mandated credible green building standards.

Environmental justice program: This program aims to overcome the barriers that individuals in vulnerable areas of the city face in accessing transportation, organic foods, healthy lifestyle options, and environmentally sustainable options for all citizens in the city. To accomplish this, the City is funding green building projects in low-income housing areas. As well, they are promoting community gardens and education on the benefits of eating locally grown food.

Methods Used to Engage the Public

The city is currently re-evaluating its public engagement process. The city's sustainability initiatives are mentioned in the local media daily (ex. 350-400 press mentions each year). Public engagement efforts include speaking at community meetings and events, neighborhood council meetings and condominium complexes, 20 staff in the Department of the Environment talking to small businesses, owners and managers regarding retrofits and recycling and tabling at supermarkets (Broomhead October 28, 2010). The environmental education program is currently in over 225 schools in the San Francisco area and reaches approximately 20,000 students a year. The program aims to increase knowledge about recycling, composting, and environmental issues. This is done through school-wide assemblies, classroom presentations, and outreach to teachers. The public was involved heavily in the creation of both the five-year sustainability plan, and proceeding plans. As well, 'Outreach' is one of the goals outlined in the strategic plan. The city hosts a variety of green events, and has a calendar on their website detailing up-coming events for citizens.

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9. Portland, USA

Portland, a major port and largest city in Oregon, has a population of around 580,000. The city’s economy is mixed, with significant employment in the port and shipping sector, the steel industry and IT services, with chip-maker Intel being the city’s largest employer.

Summary:

- The City aims to reduce its carbon emissions to 40% below 1990 levels by the year 2030
- The City aims to reduce its carbon emission by 80% below 1990 levels by the year 2050
- The goal is to have 90% of Portland residents using a bicycle for short trips by 2030 by expanding the bike lane infrastructure
- The city plans to have 43 acres of ecoroofs on buildings by 2012
- The green street initiative is managing stormwater by removing impervious surface along the streets of the city to expose the soil
- All new construction must meet LEED gold for City owned buildings
- Clean Energy Works Portland is a low interest retrofit loan program for home owners

Key Sustainability Highlights and Initiatives

Portland has a history of action on environmental and green issues. While other cities were focusing on highway development and suburban expansion, Portland created an urban growth boundary in 1979 to constrain sprawl, maintain the greenbelt and focus development within the city boundary.

The City of Portland, Oregon, USA aims to reduce its carbon emissions to 40% below 1990 levels by the year 2030 and to 80% below 1990 levels by the year 2050. Portland is looking at ways to make existing buildings more efficient, along with implementing better building guidelines and sustainable elements for new buildings. Currently, all new construction must meet LEED gold for City owned buildings. The city has completed an initial analysis of the benefits and possibility of introducing district heating to the neighbourhood of North Pearl. Early estimates show a 10-70% reduction in energy emissions depending on the fuel source used. Portland has established the Clean Energy Works Portland Program, a low interest retrofit loan program for home owners (Kane November 1, 2010).

The city is setting goals for inner-city transportation. The goal is to have 90% of Portland residents using a bicycle for short trips by 2030 by expanding the bike lane infrastructure. The city is implementing a "20 minute neighbourhood" idea that ensures long trips by car are not necessary for residents to fulfill their basic needs. Grocery stores, pubs, restaurants, drug stores, Laundromats, transit stops, and parks are all to be included in each neighbourhood in the 20-minute neighbourhood plan. Emily Hauth, a Stormwater Specialist with the City of Portland explained that the city is also developing a green stormwater management plan that positively impacts watershed health and increases social capital by beautifying the city. The green street initiative is managing stormwater by removing impervious surface along the streets to expose the soil as well as bringing in additional soil. The city has already implemented this initiative in 900 streets and is planning to green 900 additional streets. As well, the city plans to have 43 acres of ecoroofs on buildings by 2012 with an ecoroof incentive program that pays up to $5 a square foot to owners and developers, as well as plant 80 000 trees (Hauth October 29, 2010).

Organizational Frameworks Used to Support Sustainability

The city has a steering document with prioritized objectives, detailed actions and dates for implementation, and financing options that serves to guide Portland on its journey to sustainability. The city views this document as an iterative process, building on lessons learned wherever possible as well as engaging regional and federal government bodies, local businesses, organizations, and citizens on an on-going basis. The city has set dates for a feedback process, which includes an annual community inventory and progress report to the city council from the Bureau of Planning and Sustainability (it is notable that sustainability is represented alongside planning as a key municipal governance function and exists within the planning department rather than as its own department). Every three years, amendments are made to the plan that include a revision of actions, as well as an evaluation on the methods being used to achieve 2030 and 2050 emission reduction goals. The city will revise the plan in 2020.

Scope of Mitigation and Adaptation Strategies or Climate Change Plan

Portland developed its first climate plan in 1993, well before most other cities had started to engage with climate change as an issue. The most recent Climate Action Plan was revised in 2009, and builds directly on the work of prior climate-protection plans from 1993 and 2001, and on the 2007 recommendations of the 2006 Peak Oil Task Force, a citizen advisory group looking at the impact of rising oil and gas prices on the city and it's residents. A Climate Action Plan Steering Committee was formed in 2007 to help guide the implementation of the Climate Action Plan. There are eight target areas that Portland is working within to achieve their overall goal of an 80% reduction in emissions. These areas include; buildings and energy, urban form and mobility, consumption and solid waste, urban forestry and natural systems, food and agriculture, community engagement, climate change preparation, and local government operations. The plan outlines the total percentage of the city's emissions each sector is allowed to make in order to move toward a 40% emissions reduction target by 2030. Consumption (including extraction and processing of raw materials, manufacturing and distribution of goods including food) and solid waste will be allowed the most emissions (35% of all emissions), and city and council operations will be allowed the least emissions (2% of total city emissions) by 2030. The overall magnitude of emissions reductions, the scale of economic and community benefits, and the ability of local governments to facilitate the implementation process are key challenges the city is trying to creatively address.

Methods Used to Engage the Public

The Climate Action Plan Steering Committee, comprised of members from various city sectors, businesses, and organizations helped guide the development of the 2009 Climate Action Plan with participation from the public, businesses, non-profit organizations, and public agencies. In 2008, the draft plan was put forward for community consultation. City staff and the steering committee reviewed comments and concerns and incorporated them into the final plan. Portland also has a community outreach program to highlight their Ecoroof and Green Streets programs.

City staff reach out to the public and individual owners to educate, motivate and gain their support as residential buy- in is recognized as crucial for the Green Streets program to reduce parking (Hauth October 29, 2010).

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