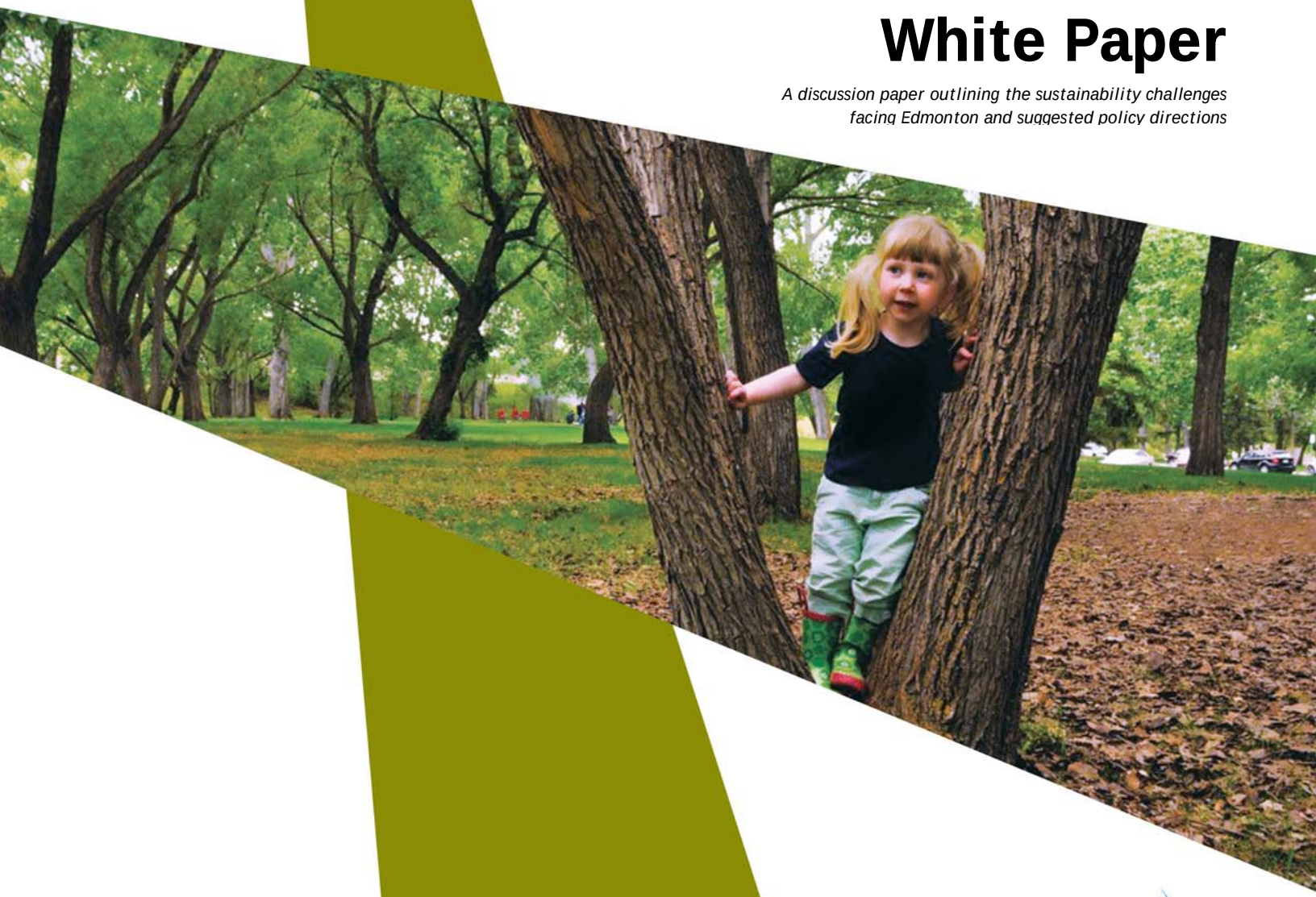
THE WAY WE GREEN

White Paper

A discussion paper outlining the sustainability challenges facing Edmonton and suggested policy directions



THE CITY OF Edmonton

TRANSFORMING | EDMONTON
BRINGING OUR CITY VISION TO LIFE

October 20, 2010

Dear Readers:

Thank you for taking time to consider Edmonton's environmental future and contribute to The Way We Green.

The purpose of this White Paper is to:

- Identify and evaluate sustainability and resilience challenges Edmonton may face in the future;
- Suggest policy directions for Edmontonians and City Council to consider; and,
- Encourage feedback from all Edmontonians on these suggestions.

The White Paper and the feedback it will generate will be used to update the City of Edmonton's environmental strategic plan – The Way We Green.

We encourage you to think about the ideas contained in this paper and to share your responses with us. You can do this by:

- Emailing your comments to thewaywegreen@edmonton.ca;
- Phoning us with your comments (please call 780-496-5684 and ask to speak with someone from The Way We Green project team); and/or,
- Attending The Way We Green Public Forum to learn more about the ideas contained in The White Paper and to register your comments. The forum will be held on November 3rd and 4th, 2010:
    - Wednesday, November 3, 2010 from 4:00 p.m. to 9:00 p.m. at City Hall
    - Thursday, November 4, 2010 from 7:00 a.m. to 6:00 p.m. at City Hall

The project team also looks forward to meeting with interested organization (please call 780-496-5684 to arrange for a meeting where your organization can discuss the paper and provide feedback).

Readers can learn more about sustainability and resilience at The Way We Green website which contains a variety of information on this project including discussion papers (written by subject matter experts), videos, questionnaires, blogs, project information and links to other relevant websites.

We hope you will enjoy reading this paper and look forward to your feedback!

Sincerely,

The Way We Green Project Team

Office of Environment, Deputy City Manager's Office, City of Edmonton

White Paper

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Executive Summary

This White Paper and the feedback it is intended to generate will be used to update the City of Edmonton's environmental strategic plan – *The Way We Green*. The two main focuses of *The Way We Green* will be: (a) **environmental sustainability** (i.e., *understanding the limits of nature and how Edmontonians must live within those limits in order to endure*), and (b) **resilience** (*understanding the environmental disturbances that Edmonton may face and the capacity that is needed to withstand them and bounce back intact*.)

The White Paper discusses the sustainability and resilience challenges facing Edmonton and suggests a strategy for each of the following areas:

- Energy & Climate Change
- River Water Supply & Quality
- Food Security
- Air Quality
- Biodiversity / Healthy Ecosystems
- Waste Management
- One Planet Living

The White Paper builds on Edmonton's strong environmental culture and hundreds of environmental initiatives over the past twenty years that have earned Edmonton the reputation as a municipal environmental leader.

Energy & Climate Change Strategy

The White Paper identifies *Energy and Climate Change* as the top sustainability/resilience challenge facing Edmonton. Experts and stakeholders who contributed to this project felt strongly that Edmonton's near-total dependence on fossil fuels for energy was not sustainable due to: (a) decreasing global oil reserves (and to a lesser extent decreasing natural gas reserves), and (b) climate change impacts caused by the burning of fossil fuels. The White Paper references a number of expert opinions that forecast the world will become more carbon-constrained over the timeframe of this strategy. Fossil fuels (particularly oil) will become scarcer and more costly, and greenhouse gas emissions will be more highly regulated than today. These constraints will affect where people live, how they travel, types of housing they build, types of recreation, food they eat, and how they are employed.

With these challenges in mind, The White Paper proposes two desired end-states (or goals):

1. **Edmonton's use and sources of energy are: (a) sustainable, and (b) resilient to disturbances that might occur to Edmonton's energy supply and/or distribution system.**
2. **Edmonton is: (a) climate change neutral, and (b) resilient to disturbances that might occur as a result of climate change.**

In order to achieve these goals, Edmonton will need to: (a) reduce its dependence on fossil fuels, and (b) become much more energy efficient / conserving (regardless of energy type).

In order for Edmonton to become an energy sustainable/resilient city, it will need to accomplish the following objectives:

- Edmonton's overall built form will need to be planned and designed very deliberately to achieve energy efficiency and minimize Edmonton's overall energy footprint.
- Edmonton's building stock (new and existing) will need to meet higher standards of energy efficiency.
- Edmonton's dependence on oil and natural gas will need to decline significantly, with a much larger proportion of Edmonton's energy ultimately coming from renewable/alternative sources.
- Travel in Edmonton will need to become more energy efficient, with the majority of trips ultimately in the form of walking, cycling and public transit.
- Edmonton's electrical system will need to be more resilient; applying principles of redundancy, diversity, durability, and local self-sufficiency.
- Edmonton's economy will need to diversify, with a greater proportion of its economic activity coming from industries that do not rely heavily on energy as key inputs.
- Edmonton will need to become climate change neutral – with no net contribution to increasing concentrations of greenhouse gases in the atmosphere.

Appendix A of this White Paper suggests a more detailed set of policies and progress measures for making Edmonton more energy sustainable and resilient. Some of these policies exist already (drawn from *The Way We Grow, The Way We Move, The Way We Live* and departmental strategies previously approved by City Council), while some are new.

River Water Supply & Quality Strategy

The North Saskatchewan River is Edmonton's (near) sole water supply, and as such is a fundamental part of Edmonton's sustainability framework. Although the water quality of the river has improved significantly over the past 50 years, this White Paper identifies challenges associated with growth (throughout the entire watershed) and possible impacts to the river caused by climate change (e.g., reduced flows, impact of higher temperature on living systems, etc.).

With these challenges in mind, The White Paper proposes two desired end-states (or goals):

3. **Water quality in the North Saskatchewan River is so high that human and environmental health does not suffer.**
4. **Edmonton has reliable sources of water that meet its needs (i.e., that can be relied on for generations to come).**

Arguably, Edmonton is water sustainable/resilient at its current size and scale (i.e., a City of approximately 750,000 people). However, as Edmonton and communities in the watershed grow, this sustainability/resilience may be challenged. In order for Edmonton to remain a water sustainable/resilient city, it will need to accomplish the following objectives:

- As the largest user of water in the North Saskatchewan River watershed, Edmonton will need to take a leadership role in the North Saskatchewan Watershed Alliance to ensure the highest standards of watershed management. This will include establishing water quality objectives, monitoring loads from point and non-point sources, enforcement of Instream Flow Needs, managing tributaries, setting aquatic

ecosystem health objectives, managing wetlands that are part of the watershed, etc.

- As Edmonton grows and its built area expands, it will need to take steps to address the higher volumes of stormwater runoff that carry pollution to the North Saskatchewan River (or parts of the watershed).
- As Edmonton strives for greater densification of its inner city, it will need to continue its efforts to reduce and eventually eliminate combined sewer overflows to the river.
- Edmontonians will need to continue their leadership role in water conservation, with EPCOR leading targeted community efforts.
- The City of Edmonton and EPCOR will need to further study the possible impacts of climate change on the instream flow of the North Saskatchewan River. If a significant risk is determined to exist, emergency plans will need to be developed.

Appendix A of this White Paper suggests a more detailed set of policies and progress measures for making Edmonton more water sustainable and resilient (some existing, some new).

Food Security Strategy

Driving today's food security movement are concerns about possible disruptions in global food markets stemming from climate change (i.e., reduced food production in areas where Edmonton's food is grown today), increasing global populations (i.e., less food that can be exported to Edmonton), and the potential higher cost of fossil fuels (i.e., making it more expensive to grow and transport food from far-away places). Experts and stakeholders who participated in this project consider these risks probable and have encouraged a strong risk management approach.

With these risks in mind, The White Paper endorses the following goal from The Way We Grow:

5. Edmonton has a resilient food and agriculture system that contributes to the local economy and the overall cultural, financial, social and environmental sustainability of the city.

In order to achieve this end state, Edmonton will need to accomplish the following objective:

- Edmonton will need to establish a Food Policy Council, responsible for overseeing the development of a Food Charter and City-wide Food and Agriculture Strategy. The strategy will need to be comprehensive, dealing with matters of production, processing, distribution, consumption and residuals management[1]. Creation of this organization and determination of its governance structure should be a priority.

Appendix A of this White Paper suggests a more detailed set of policies and progress measures for achieving food security for Edmonton (some existing, some new).

Biodiversity / Healthy Ecosystems Strategy

Biodiversity refers to every form of life on Earth and all of the ecological processes associated with life. It is widely understood that biodiversity is fundamental to human health and human existence.

This White Paper raises concern about biodiversity loss that is happening globally and locally – a trend that places human sustainability at risk. While the City of Edmonton has been a leader in stemming the loss of

[1] Residuals include wastes that are produced from growing and production processes.

natural areas, more natural areas are still lost in a given year than protected. Biodiversity is on the decline around the world and in Edmonton. New tools will be needed to achieve the City's biodiversity commitments (as stated in Durban Commitment and signed by the City of Edmonton in 2007).

With these challenges in mind, The White Paper proposes the following end-states (or goal):

6. Biodiversity is valued and maintained.

In order to achieve this end state, Edmonton will need to accomplish the following (i.e., objective):

- The City will need to integrate biodiversity considerations into all aspects of its governance and development planning.
- The City will need to establish and implement biodiversity offset strategies – ensuring biodiversity lost to development is replaced (in whole or part) elsewhere in Edmonton.
- In keeping with The Durban Commitment, the City will need to establish, implement and maintain an overarching City-wide Integrated Biodiversity Strategy that encompasses the existing Natural Connections Strategic Plan and provides additional focus on non traditional ways of increasing biodiversity in Edmonton.
- Overall, The Way We Green will re-stress the need for the City to: (a) assign an even higher priority to biodiversity, (b) increase efforts to protect natural areas as biodiversity anchors, (c) increase efforts to establish strong natural connections, (d) promote healthy ecosystems everywhere in the city (not just natural areas), (e) establish a strong supporting management system, and (f) consider biodiversity in all of its decision making, plans and designs.

Appendix A of this White Paper suggests a more detailed set of policies and progress measures for achieving food security for Edmonton (some existing, some new).

Air Quality Strategy

Edmonton's air quality, as currently measured, has improved significantly since the 1970s (largely due to vehicle technology improvements). The number of "Good" air quality days in 2009 as measured by the provincial Air Quality Index was approximately 96%.

Currently, the ambient air quality monitoring network in Edmonton is operated jointly by the provincial government and various industrial approval holders. Three air monitoring stations, directly managed by Alberta Environment, are configured to measure air contaminants and calculate the provincial air quality index (AQI). Alberta Environment also operates a fourth station that measures only particulate matter. In addition to the Province's stations, seven industry-operated stations are situated around industrial areas in the east and west areas of the City. These stations monitor air quality contaminant concentrations that are specific to the provincial approvals that relate to each of the industrial operators.

Experts consulted in this project felt that Edmonton's air emissions were "poorly understood", due mainly to a monitoring network that did not function as a whole. As a result, they felt that the following air quality questions remained unanswered:

- What impacts do industrial emissions have on Edmonton's air quality?
- What is the air quality in Edmonton in all of the places where monitoring does not occur? For instance, the ambient air quality monitor in downtown Edmonton is located away from major arteries and on the top of a building; does this adequately reflect the air breathed at street level?

- What is the impact of older vehicles and single occupancy vehicles on air quality adjacent to the major roadways in Edmonton?
- What is the impact on regional air quality when there is a facility exceedence in the industrial areas?

With these challenges in mind, The White Paper endorses the following end state (goal) from the Alberta Capital Airshed Alliance's Strategic Business Plan:

7. Edmonton's air is fresh, clean and safe today and into the future

In order to achieve this end state, Edmonton will need to accomplish the following objective:

- Through partnerships with organizations like the Alberta Capital Airshed Alliance, the City of Edmonton will support and participate in management activities including (not limited to) the development and implementation of air quality management plans that have been developed to address specific local air quality issues. These plans will ensure:
  - *That air quality monitoring in Edmonton be expanded in accordance to the recommended 2009 Ambient Air Management Strategy of Alberta (which recommends that communities of 20,000 to 50,000 should have regional air quality monitors).*
  - *That an expanded regional air quality monitoring network be better integrated with the monitoring information collected by industry, analyzing how this data relates to regional air quality and public exposure.*

Appendix A of this White Paper suggests a more detailed set of policies and progress measures for achieving high air quality for Edmonton (some existing, some new).

Waste Management Strategy

Approximately 40% of all waste generated in Edmonton is from the residential sector. Sixty percent of this is diverted from landfill – twice the Canadian average. Edmonton's impressive diversion rate is accomplished through recycling (approximately 20%), municipal composting (approximately 35%) and an additional 5% waste reduction practiced by residents through composting, grasscycling and reuse. An even higher rate of diversion (a remarkable 90%) is expected by 2013 when the waste-to-biofuels facility becomes operational.

An estimated 60% of all waste generated in Edmonton is from the non-residential sector which includes: (a) industrial, commercial and institutional waste (ICI); and, construction and demolition waste (C&D). While some ICI and C&D waste is delivered to the Edmonton Waste Management Centre (EWMC), the majority is hauled to privately owned landfills in the Capital Region, making it difficult to estimate total volume and diversion rate for Edmonton. It is estimated that approximately 10%-15% of C&D waste is currently recycled in Alberta.

The latest available national data from 2006 by Environment Canada show a waste diversion rate of municipal solid waste, including residential, ICI, and C&D waste streams of 22%. Given this situation, Edmonton's greatest waste management opportunities lie with non-residential waste, and the potential to recycle a significant quantity of waste that is currently being landfilled throughout the region.

As well, the White Paper points out that even though much of Edmonton's residential waste is diverted from landfill, Edmontonians continue to generate large quantities of waste. Based on 2004 data, Albertans produce more waste per capita than any other province in Canada. According to the Conference Board of Canada (2005 data) Canada generates more municipal waste per capita annually than any of its peer countries and twice as much as Japan (who generated the least of the peer countries).

Some experts suggest that to achieve more sustainable municipal waste management practices, the challenge will be to reduce the amount of solid waste generated, while increasing the amount of waste diverted from landfills through recycling and other initiatives in an economically feasible way. The good news is that Edmonton has the second part of this challenge well in hand. It is, and will continue to be a leader in waste diversion.

Also, end states sounds contrived and bureaucratic, especially when (or goals) is repeatedly used in brackets after each use. Why not says goals when you mean goals?

With these challenges in mind, The White Paper proposes two desired end-states (or goals):

8. **Edmonton's residential and non-residential waste is diverted from landfill.**
9. **The amount of waste generated by Edmontonians is continually decreasing (regardless of population and economic growth).**

In order to achieve these end states, Edmonton will need to accomplish the following objectives:

- Non-residential sectors will need to achieve the same waste diversion rate achieved by Edmonton's residential sector.
- Edmontonians will need to generate low levels of residential waste; on par with their waste efficient peer cities/countries.

Appendix A of this White Paper suggests performance a more detailed set of policies and progress measures for achieving high air quality for Edmonton (some existing, some new).

One Planet Living Strategy

Some stakeholders suggested that the levels of consumption typical of an average Edmontonian can lead to an undermining of the environmental resource base, significant ecological disruptions and the exacerbation of global inequities. Moreover, they commented on the size of Canada's ecological footprint noting it was the third largest ecological footprint in the world. Discussion Paper author Mark Anielski explained, *"In 2008, Edmonton's ecological footprint of 8.56 gha/capita was 3.2 times greater than the world's average of 2.7 gha/capita and 4.1 times greater than the planet Earth's biocapacity of 2.1 gha per person."*

Even if Edmontonians were to live in a much more sustainable way, it is likely that their average ecological footprint would still be larger than the world's average given the energy demands of a winter city. This White Paper asks, "Is this a topic The Way We Green should be addressing? Should Edmonton be striving to achieve an ecological footprint that reflects a one-planet lifestyle?"

With this challenge in mind, The White Paper proposes the following desired end-states (goal):

10. **Lifestyles of Edmontonians contribute to: energy sustainability; climate neutrality; clean air; water conservation; clean water; food security; biodiversity; and, effective waste management in a ma*T*nner that promotes global biocapacity equity and one planet living.**

In order to achieve these end states, Edmonton will need to accomplish the following objective:

- Edmonton will need to reduce its ecological footprint through a variety of measures that involve lower consumption, conservation and efficiency

Appendix A of this White Paper suggests a more detailed set of policies and progress measures for achieving high air quality for Edmonton (some existing, some new).

Other Topics Covered in this White Paper

This White Paper also comments on three topics affecting all of the above strategies:

- The regional approach, re: environmental sustainability (Chapter 11);
- Principles of resilience and their application (Chapter 12); and
- Implementing The Way We Green (Chapter 13).

Table 1 provides a summary of all new goals, objectives and policies that are proposed by this White Paper. For a complete summary of new and existing goals, objectives and policies, please refer to Appendix A.

Table 1 – Summary of Suggested Goals, Objectives and Policies

Suggested New Goals *(Outcomes)*	Suggested New Objectives *(How goals/outcomes will be achieved)*	Suggested New Policies *(Mandated methods and approaches for achieving goals/outcomes)*
Goal 1: Energy Edmonton's use and sources of energy are: (a) sustainable, and (b) resilient to disturbances that might occur to Edmonton's energy supply and/or distribution system.	1.1: Edmonton's built form promotes energy efficiency and minimizes Edmonton's energy footprint.	• 1.1.1: The City will evaluate and approve Area Structure Plans, Neighbourhood Structure Plans and neighbourhood redevelopment plans based on their energy implications and ability to achieve predefined energy targets. • 1.1.2: The City will establish development pricing strategies and taxation strategies to encourage densification and discourage outward growth. • 1.1.3: The City Centre Airport Development will be undertaken as a model for future development in Edmonton and a catalyst for creating more market demand for inner city / mature neighbourhood living. • 1.1.4: The City will develop a strategy for retaining and repopulating schools in mature neighbourhoods. • 1.1.5: The City will develop/redevelop inner city neighbourhoods to make them a superior living experience by creating: (a) special places that foster a sense of authentic human attachment and belonging, (b) durable buildings and communities that can last 200+ years, responding to issues of noise, fire, odours, sunlight, and need for privacy, (c) buildings that are adaptive to different uses over time, (d) beauty everywhere, (e) high quality public spaces, (f) less intrusion from automobiles, (g) natural spaces and biodiversity, (h) balance (age, demographics, housing, uses) and (i) design features that help to moderate climate. • 1.1.6: The City will encourage green developments by placing green development requirements on the City owned properties that it sells.
	1.2: Edmonton's building stock is energy efficient.	• 1.2.1: The City will establish, implement and maintain a Green Building Strategy for Edmonton. • 1.2.2: The City will establish, implement and maintain world-class energy-efficiency standards for all City-owned buildings. • 1.2.3: The City will encourage and where appropriate require world-class energy-efficiency standards for all new buildings constructed in Edmonton (e.g., to be zero net energy by 20XX). • 1.2.4: The City will establish, implement, maintain and encourage programs to significantly improve the energy efficiency of Edmonton's existing building stock. • 1.2.5: The City will adopt zoning regulations that promote energy efficiency, e.g., (a) southerly orientation where possible, (b) distance-to-height ratios to prevent shading, (c) passive solar heating and natural lighting, and (d) requirements that new buildings be built "solar ready."
	1.3: Edmonton is not overly reliant on fossil fuels for energy. Much of Edmonton's energy comes from renewable sources that are produced	• 1.3.1: The City recognizes Peak Oil and will respond to this risk with strategies that will reduce Edmonton's energy footprint and shorten supply chains that currently rely on inexpensive energy. • 1.3.2: The City will establish, implement and maintain an Energy Descent Strategy detailing

Suggested New Goals *(Outcomes)*	Suggested New Objectives *(How goals/outcomes will be achieved)*	Suggested New Policies *(Mandated methods and approaches for achieving goals/outcomes)*
	locally.	how Edmonton (including City operations) will reduce its energy footprint and how it will transition to alternative energies and more efficient /effective use of existing fossil fuels (especially coal). • 1.3.3: The City will establish, implement and maintain a Renewable Energy Strategy for Edmonton that considers the use of wind, solar, geothermal, biomass and small-scale district co-generation stations that can use mixed fuels. • 1.3.4: The City will establish green zones where properties will be required to install renewable energy to offset a portion of energy demands. • 1.3.5: The City will create incentives for businesses and residents to install renewable power generating equipment / infrastructure. • 1.3.6: The City will introduce municipal feed-in tariffs. • The City will use local improvement charges to help finance alternative energy development. • 1.3.7: The City will take action to electrify and eventually switch to electricity for all energy end uses in the City.
	1.4: Travel in Edmonton is energy efficient, with the majority of trips made by public transit, walking and cycling.	
	1.5: Edmonton's infrastructure is resilient in its ability to withstand energy disturbances.	• 1.5.1: The City will promote a system of distributed energy generation with combined heat and power, including district heating. • 1.5.2: The City will actively promote the concept of Resilience Centres in new and existing neighbourhoods. • 1.5.3: The City will require new buildings and communities to be durable; able to last 200+ years, and respond to issues of noise, fire, odours, sunlight and need for privacy, • 1.5.4: The City will adopt the *Applegath Principles for Creating Capacity for Greater Resilience* and *Urban Design Principles* as the basis for resilience planning in the City of Edmonton.
	1.6: Edmonton is a leader in the advancement, testing and adoption of new energy technologies, i.e., an Energy City.	• 1.6.1: The City will actively explore, test and (where feasible) adopt new energy technologies that will reduce City operations' dependence on fossil fuels. • 1.6.2: The City will work with community partners to explore, test, and (where feasible) encourage community adoption of new energy technologies that will reduce Edmonton's dependence on fossil fuels and overall energy consumption. • 1.6.3: The City will work to apply the Energy City concept to reduce energy consumption and diversify its economic base.

Suggested New Goals *(Outcomes)*	Suggested New Objectives *(How goals/outcomes will be achieved)*	Suggested New Policies *(Mandated methods and approaches for achieving goals/outcomes)*
Goal 2: Climate Change Edmonton is: (a) climate change neutral and (b) resilient to the disturbances that might occur as a result of climate change.	2.1: City operations are carbon neutral – no net contribution to increased concentrations of greenhouse gases in the atmosphere.	• 2.1.1: The City will purchase green power as required to meet it corporate greenhouse gas reduction targets. • 2.1.2: The City will not sell carbon credits from City operations (apart from those legal contracts that are currently in place). • 2.1.3: The City will establish, implement and maintain world class energy efficiency standards for new City buildings. • 2.1.4: The City will establish, implement and maintain world class energy efficiency standards for City building retrofits. • 2.1.5: The City will establish, implement and maintain world class energy efficiency / carbon emission standards for its municipal fleet and transit.
	2.2: The Edmonton community is carbon change neutral – no net contribution to increased concentrations of greenhouse gases in the atmosphere.	• 2.2.1: The City and community partners will establish, implement and maintain a Community Greenhouse Gas Management Plan for Edmonton.
	2.3: Edmonton is prepared / adapted to all significant risks arising from climate change.	• 2.3.1: The City and community partners will establish, implement and maintain a climate change adaptation plan for Edmonton.
Goal 3: Water Water quality in the North Saskatchewan River is so high that human and environmental health does not suffer.	3.1: The ecosystems of the North Saskatchewan River watershed (in Alberta) are healthy.	3.1.1: The City will work in partnership with the North Saskatchewan Watershed Alliance and Alberta Environment to achieve the COE's goals for: • Development, implementation and enforcement of reach-specific water quality objectives for the mainstem[2] of the NSR; • Effective programs to monitor and measure total loads from all point and non-point-sources to ensure water quality objectives are met; • Development, implementation and enforcement of Instream Flow Needs (IFN) objectives in the mainstem of the NSR; • Effective monitoring and measuring programs to make sure IFN objectives are met; • Development, implementation and enforcement of water quality objectives for all tributaries of the NSR; • Development of aquatic ecosystem health objectives for all water bodies and riparian areas[3]; • Development of programs to maintain, improve, restore and protect wetlands that are part the NSR watershed;

[2] The **mainstem** is the principal channel within a given drainage basin, into which all of the tributary streams in a drainage basin flow

[3] A riparian zone or riparian area is the interface between land and a river or stream.

Suggested New Goals *(Outcomes)*	Suggested New Objectives *(How goals/outcomes will be achieved)*	Suggested New Policies *(Mandated methods and approaches for achieving goals/outcomes)*
		• Development of programs to maintain and improve riparian area health; • Development of a range of strategies to prevent / mitigate damage to the watershed from municipal, commercial, industrial, agricultural, forestry activities; • Establishment and achievement of fish management objectives in the NSR mainstem, tributaries and lakes; and, • Protecting groundwater quality and quantity in the watershed.
	3.2: The North Saskatchewan River and its tributaries are protected from pollution and erosion caused by storm water runoff from Edmonton's built areas.	• 3.2.1: The City will establish, implement and maintain a storm water management strategy that gives priority to Low Impact Development *(LID)* approaches over traditional storm water management approaches. • 3.2.2: The City will establish, implement and maintain LID guidelines for application in all developments in Edmonton.
	3.3: The North Saskatchewan River and its tributaries are protected from the pollution caused by combined sewer overflow.	• 3.3.1: The City will continue to reduce and eventually eliminate combined sewer overflows to the North Saskatchewan River.
	3.4: The North Saskatchewan River and its tributaries are protected from the pollution caused by discharges from the Goldbar Wastewater Treatment Plant.	• 3.4.1: The City will continually reduce loadings of all types from the GBWTP to meet the requirements of a healthy river ecosystem.
Goal4: Water Edmonton has reliable sources of water that meet its needs.	4.1: Water resources are conserved and used efficiently by the public, industry and the City of Edmonton.	• 4.1.1: EPCOR will lead Edmonton's efforts to conserve and reduce water usage, with a goal to reducing water usage in Edmonton. • 4.1.2: The City, in conjunction with EPCOR, will develop a risk management plan to deal with possible reduced flows in the NSR.
Goal 5: Food *Existing Goal from The Way We Grow*: Edmonton has a resilient food and agriculture system that contributes to the local economy and the overall cultural, financial, social and environmental sustainability of the city.	5.1: Existing objective from *The Way We Grow:* Increase access to local food through regional, city-wide and neighbourhood-level approaches to sustainable urban food systems and build resilience into the food and urban agriculture system to withstand both gradual and sudden changes in the food supply.	• 5.1.1: The City will lead the establishment of a Food Policy Council, responsible for overseeing the development of a Food Charter and City-wide Food and Agriculture Strategy. • 5.1.2: The City-wide Food and Agriculture Strategy will give consideration to: - Mapping of the local food system; - Evaluation of the ecological services that urban agricultural lands are currently providing; - Establishment of an Agricultural Lands Trust; - Establishment of a 'Local' labeling system; - Maximizing the potential for food production on City properties and suitable unused

Suggested New Goals *(Outcomes)*	Suggested New Objectives *(How goals/outcomes will be achieved)*	Suggested New Policies *(Mandated methods and approaches for achieving goals/outcomes)*
		lands through projects like edible landscaping and community gardens; - Developing a Small Plot Intensive Farming program which allows urban farmers to grow food on under-used land (through rental or barter arrangements with property owners).
Goal 6: Air: Edmonton's air is fresh, clean and safe today and into the future. (From the Alberta Capital Airshed Alliance).	6.1: Edmonton's air quality is understood and monitored in a manner where all relevant information is available and analysed to determine whether or not the air quality is acceptably protective of human health and the urban ecosystem.	• 6.1.1: The City, in conjunction with the Alberta Capital Airshed Alliance and Alberta Environment, will increase air quality monitoring throughout Edmonton (to a standard that is in line with the recommended 2009 Ambient Air Management Strategy of Alberta) and make information available to Edmontonians on a real time basis. • 6.1.2: The City will encourage, undertake and support studies to determine the air quality in Edmonton and the sources of emissions and determine how they affect the health of Edmontonians and the urban ecosystem. • 6.1.3: The City will adopt and strive to achieve air quality guidelines recommended by the World Health Organization.
	6.2: Edmonton's air quality is managed to meet the highest standards in a manner that supports health and ecosystem well being.	• 6.2.1: The City, in partnership with organizations such as the Alberta Capital Airshed Alliance, will support and participate in management activities including (not limited to) the development and implementation of air quality management plans that are designed to address specific local air quality issues.
Goal 7: Biodiversity Biodiversity is valued and maintained.	7.1: The City integrates biodiversity considerations into all aspects of its governance and development planning.	• 7.1.1: That the City use: (a) biodiversity offset strategies to replace biodiversity that is lost through developments and (b) other appropriate tools as provided for in the Alberta Land Stewardship Act. • 7.1.2: The City will develop an overarching Biodiversity Strategy that encompasses the existing Natural Connections Strategic Plan, providing additional focus on non traditional ways of increasing biodiversity in Edmonton.
Goal 8: Solid Waste Edmonton's residential and non-residential waste is diverted from landfill.	8.1: Non-residential sectors achieve the same waste diversion rate achieved by Edmonton's residential sector.	

Suggested New Goals *(Outcomes)*	Suggested New Objectives *(How goals/outcomes will be achieved)*	Suggested New Policies *(Mandated methods and approaches for achieving goals/outcomes)*
Goal 9: Solid Waste The amount of waste generated by Edmontonians is continually decreasing (regardless of population and economic growth).	9.1: Edmontonians generate low levels of residential waste; on par with their waste efficient peer cities/countries.	
Goal 10: One Planet Living Lifestyles of Edmontonians contribute to: energy sustainability; climate neutrality; clean air; water conservation; clean water; food security; biodiversity; and, effective waste management in a manner that promotes global bio capacity equity and one planet living.	10.1: Reduce Edmonton's Ecological Footprint	• 10.1.1: The City will promote the concepts of one-planet living and how Edmontonians can reduce their ecological footprint through social marketing campaigns, outreach, education and awareness, Incorporate aggressive demand management for things within the influence of City operations. • 10.1.2: The City, in conjunction with citizens, will set an ecological footprint target that represents: (a) the realities of a winter city, and (b) the tradeoffs Edmontonians are prepared to make in moving toward global bio capacity equity (i.e., one planet living). • 10.1.3: The City will incorporate aggressive demand management for things within the influence of City operations.

Chapter 1: Introduction

1.1 Purpose of the White Paper

The purposes of this White Paper are to:

- Identify and evaluate the sustainability/resiliency challenges that Edmonton may face;
- Explore the potential policy solutions that may exist, and
- Encourage feedback from all readers on how to move forward.

This White Paper and the feedback it generates will be used to update the City of Edmonton's environmental strategic plan – The Way We Green.

1.2 What is The Way We Green?

The Way We Green is the City of Edmonton's environmental strategic plan. Along with five other directional plans, it supports the City's most senior strategic plan – *The Way Ahead*.

The purpose of *The Way We Green* is "*to advance the City Vision and ten-year strategic goals (contained in The Way Ahead) through a bold and visionary strategy that will make Edmonton the nation's leader in setting and achieving the highest standards of environmental preservation and sustainability both in its own practices and by encouraging and enabling the practices of citizens, businesses and institutions*."

1.3 What will be the focus of The Way We Green?

The Way We Green will focus on:

- Protecting nature for its intrinsic value, i.e., its right to exist regardless of its perceived worth to humans;
- Understanding the limits of nature and how Edmontonians must live within those limits in order to endure, i.e., sustainability; and,
- Understanding the environmental disturbances that Edmonton may face and the capacity it needs to withstand them and bounce back intact, i.e., resilience.

1.4 The Way We Green: An Integrative Plan

The Way We Green is not the first word on environmental sustainability and resilience. Many environmental sustainability and resilience policies exist already in The Way We Grow, The Way We Move and The Way We Live. As well, comprehensive sustainability/resilience strategies exist at the departmental level, touching on matters ranging from waste management to climate change. In developing The Way We Green, the project team has strived to identify all the various existing strategies that are contributing to Edmonton's sustainability/resilience strategy, along with any gaps that might exist.

The Way We Green should be seen as an 'umbrella' or integrative strategy linking and aligning many other City plans and initiatives. Not wanting to duplicate effort, The Way We Green will directly adopt the goals/objectives/policies that are pre-existing in other plans whenever they align with the proposed sustainability principles. Only when there are gaps will The Way We Green suggest new policy or strategic

direction. Figures 1 and 2 show how The Way We Green integrates and aligns with pre-existing plans. As well, Figure 2 proposes the creation of several new strategic plans, required for Edmonton to be environmentally sustainable.

This White Paper is aligned with the aspirations of The Way We Grow, The Way We Move and The Way We Live. However, in a number of cases the paper encourages the City to go faster and further than what is implied in those plans, given the expanded understanding of sustainability and resilience that has emerged from this project.

1.5 Inputs to this White Paper

The suggested policy directions contained in this White Paper are the result from various analyses, public consultations and expert reviews undertaken during the first half of this project (January 2010 to August 2010), including:

Expert Input

- A five person Expert Panel was created at the outset of the project to provide advice to The Way We Green Project Team. The panel contributed to a number of key decisions including: discussion paper topics and their scope, evaluation of discussion papers, general advice on Edmonton's sustainability challenges, and feedback on this White Paper.
- Twenty-one discussion papers were commissioned (The Edmonton Sustainability Papers) to explore a wide range of environmental challenges involving Edmonton's sustainability – energy, climate change, water supply, water quality, air quality, food security, biodiversity, waste management. Local, national and international experts were asked to evaluate the current condition of the environment, comment on trends and possible future conditions, and offer their best advice on how Edmonton might respond to the challenges.
- Meetings were held with relevant stakeholder organizations to assess the accuracy and feasibility of ideas advanced in the Edmonton Sustainability Papers.
- Extensive literature reviews were conducted by the Office of Environment, City of Edmonton on a wide range of sustainability topics.
- Highly regarded municipal sustainability plans from around the world were reviewed to understand the sustainability strategies of leading communities.

Public Involvement – Consultation with Stakeholder Organizations

- Approximately 200 stakeholder organizations representing a full range of sectors were invited to participate in a series of half-day workshops. In advance of workshops, participants were asked to complete a pre-workshop survey, soliciting opinions on definitions, principles and sustainability challenges Edmonton might face in the future. Workshops 1 and 2 (held in June 2010) explored these subjects in greater detail and examined various policy directions for addressing these challenges. The top five sustainability challenges identified by workshop participants were as follows (listed in order of importance as scored by workshop participants):
    - #1 Challenge – Energy & Climate Change: Edmonton's dependence on fossil fuels will become a serious challenge due to resource depletion and/or the need to reduce GHG emissions (Score: 105).

- #2 Challenge – Water Supply: The demand for water will exceed supply due to a growing population, receding glaciers at the headwaters of the North Saskatchewan River and/or the general effects of climate change (Score: 89).
- #3 Challenge – Biodiversity: The loss of biodiversity and the related ecosystem services will seriously affect Edmonton's wellbeing (Score 89).
- #4 Challenge – Food: Edmonton will experience food security challenges due to a growing world population, vulnerable supply lines, loss of local agriculture land and/or the effects of climate change – here and around the world (Score 68).
- #5 Challenge – Water Quality (North Saskatchewan River): The quality of Edmonton's water will be seriously affected by the growing population within the watershed and/or reduced flows in the North Saskatchewan River (unable to handle pollution loads) (Score 41).

Workshop participants recommended the following policy directions to deal with the #1 challenge (Energy & Climate Change):

- #1 Policy: Favour an urban size and form that achieves optimal energy efficiency.
- #2 Policy: Favour energy efficient building stock.
- #3 Policy: Favour a distributed, decentralized energy system that uses renewable energy.
- #4 Policy: Favour energy efficient travel options.
- #5 Policy: Favour a diversified economy, not largely dependent on fossil fuel extraction and fossil fuel-related industries.

A third stakeholder workshop, scheduled for mid November, will give participants an opportunity to respond to this White Paper and other ideas that are likely to emerge from its discussion.

Public Involvement – Consultation with Citizens

A number of different efforts were undertaken (and will continue through 2010) to consult with Edmontonians on the subject of environmental sustainability, including:

- Community Events: Throughout Summer 2010, information on The Way We Green was taken to citizens at festivals, sporting events, shopping malls and gathering places. Edmontonians were asked to share their ideas on sustainability in writing and/or by completing a survey. Responses from more than 1000 people revealed:
  - 58% of respondents <u>disagreed</u> with the statement*: Edmontonians currently live in a way that is sustainable.*
  - 99% <u>agreed</u> with the statement: *I favour policies that promote energy-efficient buildings*.
  - 98% <u>agreed</u> with the statement: *I favour policies that promote renewable energy.*
  - 78% <u>agreed</u> with the statement: *I favour policies that promote greater urban density and less urban expansion.*
  - 94% <u>agreed</u> with the statement: *The COE has a responsibility to educate citizens about how to live in an environmentally sustainable manner.*

- Community Conversations: Throughout the fall, the Office of Environment will work with interested citizens and organizations that wish to lead or participate in small community discussions about Edmonton's sustainability.
- The Way We Green workshops are planned for city High Schools.
- The Way We Green Speakers Series has given and will continue to give Edmontonians an opportunity to learn from sustainability leaders from around the world, including both live and video presentations.
- In June, 2010, The Way We Green Expert Panel participated in a moderated public panel discussion on sustainability, held at the Art Gallery of Alberta and attended by the public. Like many of The Way We Green events, it was filmed and posted to edmonton.ca/thewaywegreen for public viewing.
- A data base of Edmonton's sustainability Champions is under development. It will provide a comprehensive listing of Edmonton organizations that are working to promote environmental sustainability.
- Six focus group sessions were held in late August, 2010 to more thoroughly evaluate the positions of citizens on the subject of sustainability, the challenges Edmonton might face, and the policy directions they support. The purpose of these sessions was to gain general insights into what citizens were thinking, in order to design a larger, statistically valid survey (to be conducted in September). The following interim findings were reported by the focus group moderator:
  - Focus group respondents acknowledged the importance of each of the environmental areas we measured (river water quality, air quality, food security, energy conservation/greenhouse gas emissions).
  - However, none of these issues appear to be presenting a major problem requiring urgent action at this time. Serious negative impacts, if any, were seen as longer-term, not imminent.
  - Adding "consequences" to the various proposed initiatives had a major negative effect on level of support.
  - Agreement with policy options was markedly higher when there was less of a generic consequence, less of a direct personal consequence or when presented as a "carrot" rather than a stick.
  - The proposals with very strong support included:
    - *Landscape measures to intercept storm water*
    - *Mandatory car emissions testing*
    - *Setting higher air quality standards*
    - *Enacting higher energy efficiency standards for new buildings*
    - *Subsidies to encourage installation of renewable energy system*
- A Citizen Workshop, scheduled for November 3rd and 4th, will give all Edmontonians an opportunity to learn more about and respond to this White Paper and other ideas that are likely to emerge from its discussion in the coming months.

1.6 The Way We Green – A Place-Based Solution

Sustainability and resilience challenges will differ from city-to-city due to the variability of the natural environment. The challenges faced by a sun-belt city at 30 degree latitude are markedly different from those of a winter city at 53 (Edmonton's latitude) degree latitude. For this reason, a cookie-cutter approach to

sustainability is not suggested. Edmonton's environmental strategic plan needs to reflect Edmonton's unique environment strengths, weaknesses, threats and opportunities, including its winter climate, water supply, agricultural land, biodiversity, air quality and energy sources.

Striking a sustainable balance with nature and being resilient to the disturbances that nature can deliver require a made-in-Edmonton approach. As such, *The Way We Green* is intended to be a place-based solution to Edmonton's environmental sustainability and resilience challenges.

1.7 The Challenge of Transformation

This White Paper suggests that sustainability may require transformational efforts on several fronts – social, economic and environmental. In his review of the Edmonton Sustainability Papers, Expert Panel Member Daniel Smith noted the challenge that lies in such transformation, saying:

> *"Review of the (discussion) papers confirms that there are very few if any wonderful or magic solutions to dealing with the realities of the future. … How to balance the need for individual freedom and the structural complications of high population density and limited energy, water and food resources, and at the same time protect health and the environment is a very complex set of challenges. ... How these challenges are dealt with defines communities, their desirability, and the happiness of its citizens."*[4]

The Way We Green is about finding a sustainability and resilience solution that strikes the right "balance" between social, economic and environmental priorities; a balance that will ultimately be determined by the citizens of Edmonton. While this "balance" has yet to be defined, the starting point for such a discussion is clear. Transformation must begin with the best information possible, and meaningful opportunities for citizens to exchange ideas and shape their future. This White Paper is meant to serve as a catalyst for that discussion.

1.8 Timeframe of The Way We Green

The first purpose of The Way We Green is to describe, with as much precision as possible, the desired end-states that represent an environmentally sustainable and resilient Edmonton. These end-states are expressed in ten Strategic Goals (Appendix A).

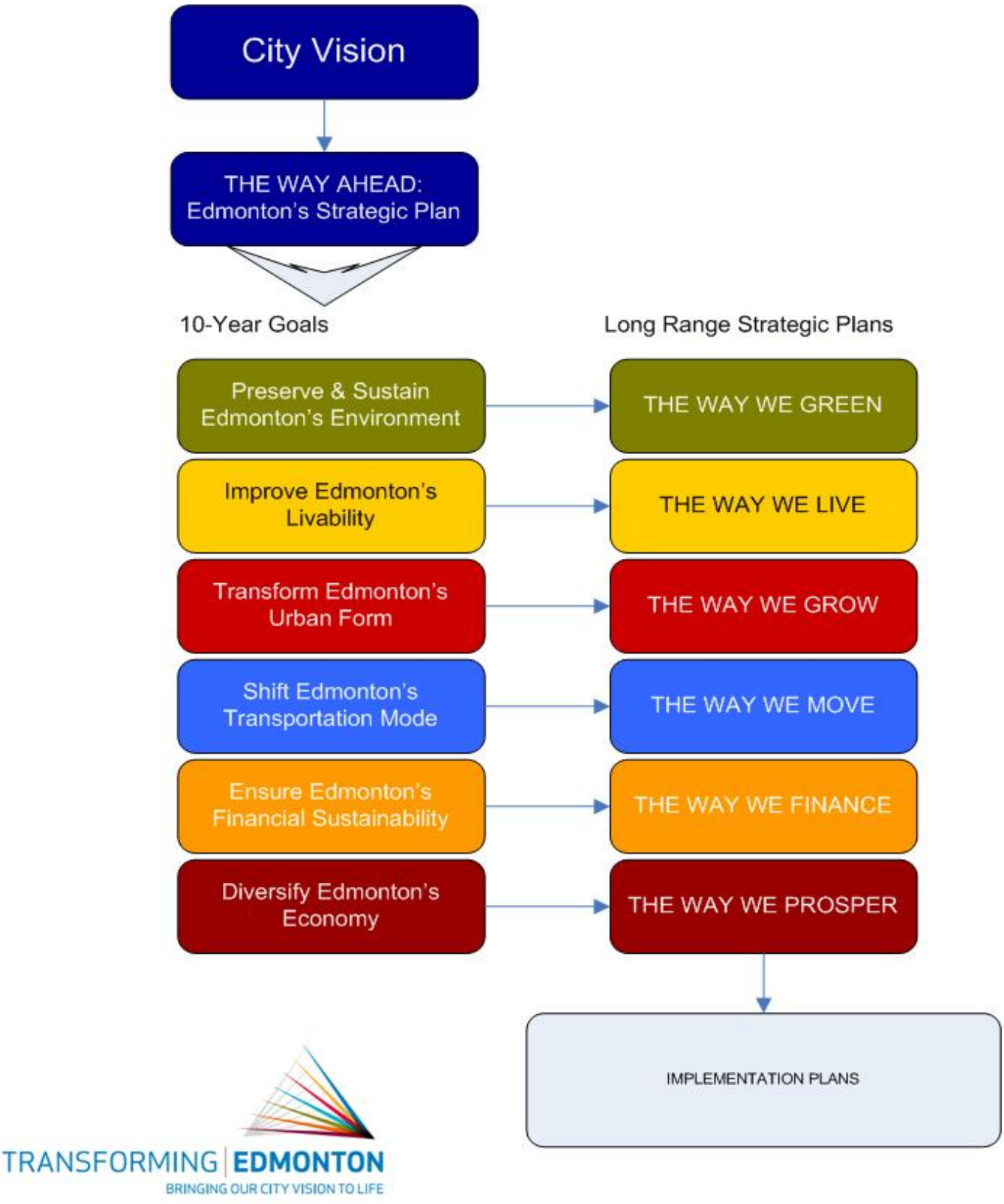
Equally, The Way We Green will contain detailed statements of what the City of Edmonton needs to accomplish in order to achieve these Strategic Goals. These statements of accomplishment are expressed in a number of Strategic Objectives, also contained in Appendix A. In order to give them precision, many of the objectives are expressed in a way that indicates a quantitative outcome. Without such metrics, sustainability is just a concept.

The Way We Green has been developed with a long term view, recognizing that while many of the sustainability goals/end-states can be achieved within the 30 year horizon of The Way Ahead, while others may take longer. The Way We Green will specify clear targets for 2040. However, if the desired end-state is expected to take longer to realize, this will be noted along with the timeframe. As a result, The Way We Green may look farther her into the future than the City's other five directional strategies.

The Way We Green will also describe the intermediate results that are expected on the way to sustainability / resilience. Policies, actions and targets with ten-year timeframes will be proposed (Appendix A).

[4] Expert Panel Feedback, available at edmonton.ca/thewaywegreen

Figure 1: The Way We Green Integrative Plan



Chapter 2: Sustainability Definitions & Principles

2.1 What is sustainability?

The starting-point for *The Way We Green* is a precise definition of *sustainability*. Many of the definitions in use today were derived from the definition of *sustainable development* that was adopted by the United Nations Brundtland Commission on Environment and Development in 1987. It states: *"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts: (a) the concept of 'needs', in particular the essential needs of the world's poor, to which overriding priority should be given; and (b) the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs."*

The City of Edmonton has built on the Brundtland definition in *The Way Ahead* (City of Edmonton Strategic Plan 2009 -2018), defining sustainability as:

- **Definition 1: "***A way of living which meets the needs of the present and does not compromise the ability of future generations to meet their own needs. Urban planning takes an integrated, holistic view of urban environments and defines sustainability in the context of interrelated ecosystems encompassing economic, social, environmental and cultural sustainability. The principle of sustainability also includes financial sustainability, ensuring urban planning recognizes and addresses resource constraints and capacities."*

Other definitions of sustainability that were considered by *The Way We Green* include:

- **Definition 2: "***Sustainability refers to the ability of human society to continue indefinitely within natural cycles."* (The Natural Step)
- **Definition 3: "***Sustainability is the capacity to endure. A sustainable city implies the long-term maintenance of the society's wellbeing, which in turn depends on the wellbeing of the natural world and the responsible use of natural resources."* (**Wikipedia**, May 2010)
- **Definition 4:** Short Form: *"Sustainability is the process of living within the limits of available physical, natural and social resources in ways that allow the living systems in which humans are embedded to thrive in perpetuity."* (**Office of Sustainability, University of Alberta**)
- **Definition 5:** Long Form: *"Sustainability refers to the ability of human society to endure over a prolonged period as an integral part of Earth's natural systems. It is achieved through the practice of sustainable living. Sustainable living is a conscious way of life whereby a human system, on whatever institutional scale, in order to meet its current needs, uses the physical, natural and social resources available to it in such a manner that these resources are available, or replaceable, to enable the living systems in which these humans are situated to thrive, essentially in perpetuity."* (**Office of Sustainability, University of Alberta**)

Suggested Policy Direction:

That the City's definition of sustainability incorporates the concept of humans living within the limits of nature. The two University of Alberta definitions meet this criterion. Adopting these two definitions, (long and short form) would promote consistency in the community.

2.2 What guiding principles of sustainability should Edmonton adopt and adhere to?

While a definition of *sustainability* describes the desired end-state, it says little about how to get there. That's where sustainability principles come in. Sustainability principles are basic truths/rules/criteria that society needs to apply to achieve sustainability. In developing *The Way We Green*, the City of Edmonton will select a manageable number of principles, best suited for the types of decisions made by municipal organizations.

To this point in the project, numerous sustainability principles have been considered from various sources. In some cases there is overlap – different principles saying similar things in slightly different ways. The following ten principles are ones that were supported by *The Way We Green* Project Team and workshop participants.

Selected from the Melbourne Principles

1. **Biodiversity:** *Recognize the intrinsic value of biodiversity and natural ecosystems, and protect and restore them.*

   Explanation: This principle places a value on biodiversity and natural ecosystems, whether or not it directly contributes to or supports human society. This principle is consistent with environmental stewardship.

2. **Model Cities on Ecosystems:** *Build on the characteristics of ecosystems in the development and nurturing of healthy and sustainable cities.*

   Explanation: This principle tells us to observe and mimic nature when designing human systems. The principle also implies integration of human built area with natural systems.

Selected from The Natural Step Framework

3. **Systematic Degradation of Nature:** *In a sustainable society, nature is not subject to systematically increasing degradation by physical means.*

   What Natural Step says: In the Natural Step model, the desired outcome is to avoid ongoing degradation of the environment. To reach this desired outcome, a sustainable society must limit the physical disruptions to natural systems (e.g. deforestation, development of natural areas, etc.) to levels below natural refresh rates. Following through with this system condition would ultimately mean putting firm limits on the systematic physical encroachment on nature.

4. **Substances from the Earth's Crust:** *Nature is not subject to systematically increasing concentrations of substances extracted from the earth's crust.*

   What Natural Step says: According to this principle, a sustainable society must not continually extract substances from the earth (e.g. metals or fossil fuels) as they will accumulate in nature, at some point reach an eco-toxic threshold, and contribute to a degraded state. Following through with this principle on one hand means reducing extraction and consumption of these harmful substances so that they don't result in increasing concentrations in nature, and sometimes eliminating the use of those substances that are most toxic. On the other hand, it means keeping materials within technical cycles, e.g. reuse of metals, so that they don't accumulate in nature.

5. **Undermining the Capacity of People to Meet their Needs:** *People are not subject to conditions that systematically undermine their capacity to meet their needs.*

   What Natural Step says: According to this principle, in order for human populations to live in sustainable ways, barriers must not be placed in the way of them meeting their needs, e.g. supporting authoritarian regimes, supporting unfair working conditions, etc. It is the responsibility of all societies to remove barriers

that inhibit the ability of people to meet their basic needs and live sustainably. The Natural Step defines needs beyond basic sustenance to include: subsistence, protection/security, affection, understanding, participation, leisure, creation, identity/meaning and freedom.

6. **Synthetic Substances Produced by Society:** *Nature is not subject to systematically increasing concentrations of substances produced by society.*

   What Natural Step says: According to this principle, a sustainable society must reduce and eventually eliminate the ongoing accumulation of synthetic substances (e.g. human-made chemicals) that have been shown to persist in nature. Essentially, the Natural Step aims for flows of these materials to be at a rate where an ecosystem is able to absorb and break them down. Currently, it is unknown how many of the over 100,000 human made synthetic chemicals the ecosystem is able break down at the rates they are being introduced. This also applies to naturally occurring substances (e.g. nitrous oxides from internal combustion engines), that society produces at scales which overwhelm natural systems.

Selected from the Writings of Richard Heinberg

7. **Use of Renewable Natural Resources:** *Renewable resources must be consumed at a rate less than or equal to the rate of natural replenishment.*

   What Heinberg says: Renewable resources are exhaustible. [For example,] forests can be overcut, resulting in barren landscapes and shortages of wood. However, a resource may be declining for reasons other than over-harvesting; for example, a forest not being logged may be decimated by disease. If the resource is declining, pursuit of sustainability requires that the rate of harvest be reduced. Sometimes harvests must drop dramatically, at a rate far greater than the rate of resource decline, so that the resource has time to recover.

8. **Use of Non-Renewable Natural Resources:** *Use of non-renewable resources must decline at a rate that is equal to or greater than the rate of depletion.*

   What Heinberg says: By definition, the use of non renewable resources is not sustainable. At any rate of use, non renewable resources will eventually be used up or seriously depleted (e.g., oil). However, a society can move toward sustainability by reducing its dependence on the substance at a rate that is greater than the rate of depletion. In this way, society's dependence on the resource will be reduced to insignificance before the resource is exhausted.

9. **Substances from Human Activities:** *Substances introduced into the environment from human activities must be minimized and rendered harmless to biosphere functions.*

   What Heinberg says: The most serious forms of pollution in the modern world arise from the extraction, processing, and consumption of non-renewable resources. If the consumption of nonrenewable resources declines, pollution should also decline. However, where the consumption of non-renewable resources has resulted in concentrations that threaten basic biosphere functions, significant measures are called for. This is the situation with regard to atmospheric concentrations of greenhouse gases, especially from the burning of coal and other fossil fuels.

10. **Unsustainable Growth:** *Population growth and/or growth in the rates of consumption of resources cannot be sustained.*

    What Heinberg says: Human population growth has been sustained up to the present. How can we be sure that it cannot be sustained into the indefinite future? Simple arithmetic shows that even small rates of growth, if continued, add up to absurdly large – and plainly unsupportable – population sizes and rates of

consumption. For example: a one percent rate of growth in the present human population (less than the actual current rate) would result in a doubling of population each 70 years. Typically, most municipal growth plans as silent on this subject, implying that growth is both inevitable and desirable.

Summing Up

In adopting these, or a set of these principles, the City will need to consider the details of their application. On this matter, Expert Panel Member Daniel Smith said:

> *"It seems that the objectives of sustainability as defined in the paper are good for a country or a large region and should be aspired to by the individuals and communities. The City of Edmonton needs to put them in perspective by defining more precisely what can be done within the boundary of the City and what requires a larger regional vision. Working for this larger regional vision should be an element of the objectives or criteria package."*

Taking this advice, the Project Team felt that principles 1-7 could be applied to decision-making at the city level, while principles 8-10 were better suited to larger scale.

It is the intent of this White Paper that whatever sustainability principles are ultimately adopted by the City, they will be used within the context of a well defined environmental management system (as proposed in Part 13 of this White Paper – *Implementing The Way We Green*). Moreover, detailed procedures will need to be developed as to how, when and where these principles will be applied.

Suggested Policy Direction:

- *That the City adopt the following seven principles to guide its decision-making process: Melbourne Principles (1 and 2), the Natural Step Principles (3,4,5,and 6) and Richard Heinberg's principle (7).*
- *That the City advocate for similar sustainability principles to be adopted in the Alberta Capital Region and throughout the province.*

2.3 Aboriginal Perspectives on the Environmental Sustainability

In developing the Way We Green, advice was sought from Edmonton's Aboriginal community on sustainability principles that have served Aboriginal peoples living in this area for the past 8,000 years. The following is a response provided by the Aboriginal Relations Office, City of Edmonton:

> *Edmonton resides in Treaty Six Territory, a land that Aboriginal peoples have traditionally occupied and sustained themselves on for thousands of years. Cree, Stoney, Blackfoot, Saulteaux, Métis, and many others have hunted, fished, gathered, camped, and practiced forms of environmental stewardship here for generations. Currently, Edmonton has the second largest urban Aboriginal population in Canada, and the City is committed to building and maintaining strong relationships with the Aboriginal community and seeking their guidance on issues that will impact them.*
>
> *After thousands of years of living on this land, Aboriginal peoples have an intimate and intellectual knowledge of the environment and how to live in a sustainable and respectful way. Archaeological evidence indicates that Aboriginal peoples practiced controlled burns to enhance the growth of vegetation*

and influence the movements of animal herds. Oral histories and teachings from the Elders inform us of the locations and uses of medicinal plants, as well as how and when to harvest them. In other parts of the Americas, Indigenous peoples practiced aquaculture and agricultural methods to enhance food production. By the time Europeans arrived in the area now called Edmonton, the buffalo herds and stocks of wildlife were abundant, and the fur trade prospered due to Aboriginal people's management and knowledge of the environment.

Aboriginal peoples' environmental knowledge is anchored in spirituality and the importance of relationships. Aboriginal peoples across Canada have diverse creation beliefs, yet a common foundational belief is that the Creator has placed people in their territories and put them there to be a part of creation and share it with other beings (Joseph 2007: 5). This deep spiritual connection to the land, and the recognition that humans are but one small part of creation, resulted in Aboriginal societies developing and practicing a way of life that maintained a harmonious coexistence between humans and nature (Alfred 2001: 6). A fundamental belief underpinning this way of life is that Mother Earth provides humanity with all of our needs such as food, water, and the air we breathe. Yet we share these resources with other beings, animals, fish, and plants, and thus humans exist, and survive, in relation to others.

All beings on earth are interconnected, and our actions have consequences for others. Since humanity is not elevated above the other beings, and all beings have a spirit, we must maintain and nurture our relationships by respecting Mother Earth and all of the beings that live here. Often when praying Aboriginal peoples will say "All my Relations," referring to the sacredness of our relationships to all beings and our role in maintaining harmony and balance within our environment. A common teaching in Aboriginal communities is that we must ensure that our actions today will benefit seven generations into the future. This type or worldview ensures that we are living sustainably and respectfully on Mother Earth.

Through City Council's Declaration on Strengthening Relationships with Urban Aboriginal Peoples (2005), and the Edmonton Urban Aboriginal Accord (2006), the City of Edmonton has formally committed to engaging Aboriginal Edmontonians, including First Nations, Métis, Inuit, and Non-Status peoples. Through the Accord, the City of Edmonton administration agrees to honour their perspectives as well as their past, present, and future contributions to life in Edmonton. The Aboriginal community also acknowledges and honours the contributions of city staff, and we will work together to honour each other's values, create solutions that work for everybody, and celebrate our successes. As partners, Aboriginal peoples will play a significant role in making Edmonton a more environmentally sustainable city by sharing their values and principles.

Suggested Policy Direction:

- *That the City adopt the Aboriginal sustainability principle that recognizes communities should ensure that their actions today will benefit seven generations into the future.*

Chapter 3: Edmonton's Sustainability Challenges

3.1 What are the key sustainability and resilience challenges facing Edmonton?

Based on advice contained in 21 discussion papers[5], advice from The Way We Green Expert Panel, and input from workshop participants and citizens, The Way We Green Project Team identified a number of sustainability/resilience challenges facing Edmonton

- Energy & Climate Change;
- Water Supply and Water Quality;
- Food Security;
- Ambient Air Quality;
- Biodiversity;
- Waste Management; and,
- One Planet Living.

Of these challenges, experts, citizens and stakeholder organizations generally considered Energy & Climate Change to be the most urgent. Moreover, when considering these challenge areas, experts, citizens and stakeholders often pointed to Edmonton's low density and rapidly growth suburbs as a major contributing factor. Accordingly, this White Paper identifies Energy & Climate Change as Edmonton's top sustainability challenges, with many of Edmonton's sustainability solutions resting on a more sustainable urban form.

[5] The Edmonton Sustainability Papers can be found at http//www.edmonton.ca/thewaywegreen

Chapter 4: Energy & Climate Change

4.1 What are the energy and climate change challenges facing Edmonton? What policy options should be considered?

Energy Challenge – Dependence on Fossil Fuels

Many of the *Edmonton Sustainability Papers* caution Edmonton that its dependence on fossil fuels is unsustainable for reasons of declining oil reserves, increasing world demand, their contribution to climate change, and increasing price volatility.

The most optimistic of the discussion paper authors (Chris Bataille, M.K. Jaccard and Associates) referenced oil industry reports indicating the world's economic oil reserves[6] would last about 70 years or more, with potential economic resources[7] lasting 200 years or more.[8] The same industry sources indicated the world's natural gas reserves would last 150 years (with potential economic resources 500 years) and the world's coal reserves would last 200 years (with potential economic resources of 2000 years or more). Despite this somewhat positive outlook, the author predicted "*an almost complete conversion away from fossil fuels by the end of the century"* due to regulations that would restrict carbon emissions.

A second discussion paper on this subject by David Hughes[9] (a geologist and peak energy educator) responded to Bataille saying, "*The major problem with economists who assert we have centuries to millennia of fossil fuels is they do not differentiate "peak production" from "running out" – we are unlikely to ever "run out" of fossil fuel, however "peak production" will be a watershed in an economic paradigm based on growth.*

Hughes went on to express concern about future **oil supply** quoting a 2010 study by the United States military which states: *"By 2012, surplus oil capacity could entirely disappear, and as early as 2015 the shortfall in output could reach nearly 10 million barrels per day (about 12% of the current global consumption)"*. Also quoted was the Chief Economist of the International Energy Agency who in 2009 said, *"One day we will run out of oil, it is not today or tomorrow, but one day we will run out of oil and we have to leave oil before it leaves us, and we have to prepare ourselves for that day. The earlier we start, the better, because all of our economic and social system is based on oil, so to change from that will take a long time and a lot of money and we should take this issue very seriously."*

In conclusion, Hughes explained that, *"peak global oil production may have occurred globally in 2008 according to many analysts, and will certainly occur before 2020 according to the majority of reports. This will profoundly impact livability of cities like Edmonton as energy prices rise and supply limitations become an issue."*

Contrary to the perception of many Edmontonians, Hughes noted there was no silver bullet waiting in the Alberta oil sands. *"Even if CAPP's unannounced oil sands projects come to fruition, oil sands and all other*

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[6] Oil reserves are the quantities of crude oil estimated to be commercially recoverable. To qualify as a reserve, they must be discovered, commercially recoverable, and still remaining.

[7] Oil Resources refer to estimates of how much crude oil may be in the ground and will eventually become economic to recover.

[8] Dr. Chris Bataille, M.K. Jaccard and Associates, Peak Oil – The Future for Fossil Fuels and Impact s for Edmonton, 2010 Edmonton Sustainability Papers, Discussion Paper 5a, available at http//www.edmonton.ca/thewaywegreen.

[9] J. David Hughes, Peak Energy and Its Implications for the City of Edmonton, 2010 Edmonton Sustainability Papers, Discussion Paper 5b, available at http//www.edmonton.ca/thewaywegreen.

sources of unconventional liquid fuels (heavy oil, biofuels, coal-to-liquids, gas-to-liquids, oil shale, etc.) will make up less than 13% of projected global demand by 2030 according to the U.S. Energy Information Administration."

"The message for the City of Edmonton is that all future expenditures on infrastructure must be made in the context of escalating oil prices and directed towards reducing the energy footprint of the average citizen as well as shortening supply chains based on cheap energy to ensure greater resilience in the event of potential disruptions in the flow of energy."

On the subject of **natural gas**, Hughes described the dwindling supplies in Alberta, noting Alberta Energy Resources Conservation Board's forecast that natural gas production would decrease 30% by 2017 (from 2006 levels). *"The message here for the City of Edmonton is that the natural gas industry is in decline owing to the exploration maturity of the Western Canada Sedimentary Basin, and hence so is the economic activity that is to be derived from this sector. Pricing volatility will increase going forward barring a miraculous bonanza from shale gas, which I class as a long-shot. Investment and policies must be directed to energy conservation and efficiency to reduce requirements for natural gas and diversity from the proportion of economic activity that depends on it."*

On the subject of **coal**, Hughes cautioned readers that decline in oil production would not be made up through liquids from coal. *"This is only true to a limited extent. Even if global coal-to-liquids capacity were increased by twelve-fold by 2030, it would only be about one percent of projected world demand."* His bottom line, *"The message here for the City of Edmonton is that coal will be an important source of energy in medium to long-term but cannot be counted on to be ramped up much beyond today's levels. New coal-burning infrastructure should use distributed configurations with combined heat and power, potentially including district heating, which will lower coal input requirements, offset the need for other hydrocarbons to provide this heat, and result in much lower CO2 emissions. Massive scale carbon capture and storage projects should be rejected in favour of investing in projects that will radically reduce energy footprints."*

How should a sustainable society respond to the peak oil challenge? One of the world's best known sustainability educators, Richard Heinberg, recommends that sustainable societies should apply the following principle, relative to their use of all non-renewable resources: "*the use of non-renewable resources must decline at a rate that is equal to or greater than the rate of depletion.*" Simply put, this means that if the world's oil resources were declining at 0.5% a year (leading to depletion in 200 years as suggested by M.K. Jaccard), a sustainable society should be reducing its oil use at a rate greater than 0.5% a year. Arguably, a **much greater rate of reduction** might be advisable given the ramifications of peak production referred to by David Hughes and many other.

In short, being sustainable means taking timely steps to significantly reduce Edmonton's dependence on all non-renewable natural resources.

Suggested Policy Direction:

- *That the City address the probable outcomes of Peak Oil through strategies that will reduce Edmonton's energy footprint and shorten supply chains that currently rely on inexpensive energy.*
- *That the City respond to the challenge of Alberta's declining oil and natural gas industries with strategies that promote: (a) oil and natural gas conservation/ efficiency, and (b) economic diversification that favours industries that do not rely heavily on natural gas and oil as key inputs.*
- *That The Way We Green recognize that coal will be an important source of energy in at least the medium term and that strategies be employed to: (a) reduce demand for this energy, (b) promote new and efficient*

coal-burning infrastructure that uses distributed configurations with combined heat and power (including district heating) is required. [*Note: Experts have suggested that the City should promote investment in projects that will reduce overall energy footprints; in turn, reducing the demand for coal sourced energy, rather than support large carbon capture and storage programs.*]

Energy Challenge – Vulnerability to Energy Shocks

In addition to the long term stresses that Edmonton may experience relative to "peak oil", discussion paper author Craig Applegath[10] warned that Edmonton was vulnerable to energy shocks due to the small number of coal-fired generators that feed into Alberta's power grid. He noted that demand for electricity in Alberta was growing rapidly, equivalent of adding a city the size of Red Deer to the grid each year. He referred to AESO's recent advisory that rising demand is stressing the existing system and that *capacity would fall short of its reliability requirements by 2014.* He cautioned that this could leave Edmonton vulnerable to energy shocks including rolling brownouts and the possibility of blackouts.

In short, being a resilient city may mean reducing our dependency on Alberta's electrical system which is made up mostly of centralized generation stations feeding into the energy grid through new and decentralized energy sources, which to a large extent would be located in our own community.

Suggested Policy Direction:

That the City recognize the risks associated with Edmonton's dependence on Alberta's large generation stations which feed into the electrical grid through strategies that will increase decentralized generation located in or close to Edmonton.

Climate Change Challenge

Climate change is a global issue that is affecting (and will continue to affect) different regions of the world in different ways. In the Edmonton area, mean annual temperatures are expected to increases 2°C to 4 °C by the 2020s. In addition to the likelihood of more extreme weather, it is expected that warmer average temperatures will cause increased precipitation (5% by the 2050s) with the greatest increases occurring in summer months. However, because of the increase in temperatures, researchers expect that there will be higher rates of evaporation which will lead to an overall decrease in soil moisture (Barrow and Yu 2005). This would likely lead to changes in agriculture, vegetation and water management in the region.

In December 2009, Canada signed the Copenhagen Accord, reaffirming both: (a) its view that anthropogenic (human caused) emissions have contributed to climate destabilization, and (b) the objective to stabilize greenhouse gas concentrations in the atmosphere at a level that would limit the global temperature increase to below 2°C. It is the opinion of many external experts that to meet the 2°C objective, deep reductions in anthropogenic greenhouse gases are urgently required. They also stress that action must be taken immediately in order to mitigate some of the projected negative effects of a destabilizing climate.

Edmonton City Council has expressed this same view of climate change and the need to take local action multiple times since 1993 when it first endorsed the signing of the International Council for Local Environmental Initiative (ICLEI) Declaration on Climate Change and the Urban Environment. City Council

[10] Craig Applegath and Jonathan Yazer, Resilient Edmonton – Why and How?, 2010 Edmonton Sustainability Papers, Discussion Paper 18, available at http//www.edmonton.ca/thewaywegreen.

endorsed the City joining the Federation of Canadian Municipalities Partners in Climate Protection program in 1995. More recently, it reaffirmed its position on climate change when it supported the Alberta Urban Municipalities Resolution for SUPPORT FOR MUNICIPAL CLIMATE CHANGE INITIATIVES (April 20, 2007) which stated: *"A global reduction in emissions of greenhouse gases (GHG) is necessary to slow climate change and reduce the risks to human health, the physical environment, economy and quality of life."*

Most experts, stakeholder organizations and citizen who participated in The Way We Green saw climate change as a serious global challenge and felt that greenhouse gas emissions from human activities were a major contributor to the problem. However, this position was not shared by all. In fact, in his general response to the Edmonton Discussion Papers, Expert Panel member Daniel Smith acknowledged and expressed concern about climate change, but argued that human activity was not the cause.

How should a sustainable society respond to the climate change challenge?

There is strong agreement amongst Edmontonians that climate change is happening and that there is a need for adaptive measures. Moreover, whether the concern is GHG emissions or fossil fuel depletion, there is strong agreement that action is needed to reduce the amounts of fossil fuels we use, and transition away from fossil fuels to renewable energy.

While most will agree there is a need to reduce both the City of Edmonton's and Edmonton's use of fossil fuels, the harder question is how far and how fast do we need to go? The Natural Step Framework provides guidance on this matter in one of its four sustainability principles which states: *In a sustainable society, nature is not subject to systematically increasing concentrations of substances extracted from the earth's crust.*

Simply put, this principle says it is not sustainable for society to continually extract fossil fuels from the earth's crust, combust them, and systematically increase the greenhouse gas concentration in the earth's atmosphere. In keeping with this principle, a sustainable city would take immediate steps to reduce its production of greenhouse gases and eventually eliminate or offset them entirely. Cities throughout the world are commonly setting targets to achieve carbon neutrality in the next 10-20 years, and in some cases, even sooner.

Building on The Way We Green, Greenhouse Gas Emissions Reduction Strategies will be developed for both the community and City operations. Stakeholders suggested a variety of creative initiatives that would help with this reduction. For example, an energy manager for a large international engineering firm calculated that "if we converted 1,000 cabs from a standard cab to a hybrid, we could prevent the emission of about 26,000 tonnes of CO2 per year (based on each cab driving 120,000 km/year; 2 full-time drivers per cab)." He also assumed (not knowing the details of the contract) that removal of the airport authority's contract for cabs would eliminate redundant trips to the airport since every cab currently travels empty each way to and from the airport. Based on 1000 deadhead trips to/from the airport per day at 50km each and 10L/100km average, he estimated a potential avoidance of about 5,300 tonnes of CO2 to the City's overall annual carbon footprint; in addition to benefits from reduced traffic and demand on infrastructure. These two examples serve to illustrate the potential that exists to reduce greenhouse gas emissions in Edmonton.

Suggested Policy Direction:

That the City address the risks of climate change with: (a) strategies that will lead to carbon neutrality (for City operations and eventually all of Edmonton in the near to medium term), and (b) through the development and implementation of a Climate Change Adaptation Strategy.

4.2 What do stakeholders say about the urgency of these energy challenges?

In early June, 2010, *The Way We Green* hosted a set of public workshops (attended by 161 stakeholders) to seek feedback on a range of sustainability issues and questions. In one exercise, stakeholders were asked to consider a list of sustainability challenges that Edmonton might face in the future and indicate which of these were the most important for Edmonton to address. The challenge that received the most support was:

- ***Energy****: Edmonton's dependence on fossil fuels will become a serious challenge (due to resource depletion and/or the need to reduce greenhouse gas emissions/ climate change).*

Challenges related to water supply, food, biodiversity and air quality ranked 2nd, 3rd, 4th and 5th respectively.

Later in June another set of workshops was held (attended by 112 stakeholders). In one exercise, stakeholders were asked to consider a list of eight policy options that potentially could contribute to energy sustainability and select the three they felt would best address the challenge. The three policy directions that received the greatest support were:

- Policy directions that favour an urban size and form that achieve optimal energy efficiency;
- Policy directions that favour energy efficient building stock; and,
- Policy directions that favour a distributed/decentralized energy system that uses renewable energy.

Workshop participants strongly agreed that Edmonton is likely to face energy challenges related to peak oil and/or climate change. Moreover, there was strong agreement that significant changes (lifestyle and infrastructure) would be needed to meet these challenges.

These positions aligned closely with those put forward by Dr. Chris Bataille (Discussion Paper 5b) who recommended that Edmonton:

- Convert municipal fleets to high efficiency vehicles (e.g. cold adapted hybrids) and alternative fuels (natural gas in the short run, electricity and biofuels in the long run). Once the concept is proven, encourage commercial and taxi fleets to follow.
- Adopt advanced energy efficiency standards (or better yet, low and eventually zero carbon emission standards) for all municipal buildings, and eventually for all new buildings. Encourage retrofits of older buildings.
- Work with transit planning and land use authorities to make the city more transit friendly.
- Work with utilities to gradually replace the existing coal driven electricity plants with sources that have lower carbon emissions (e.g. oil sands cogeneration, coal with carbon capture and storage, natural gas driven combined cycle turbines, wind, biomass, solar etc.) with the goal of eventually replacing all electricity sources with renewables. Nuclear power may also need to be considered, but only if the full cost and implications of waste disposal and decommissioning are included.[11]
- Adopt polices to encourage electrification, and the capacity to eventually switch to electricity for all energy end-uses in the city.

[11] Some stakeholders responded to this suggestion saying, "The implications of waste disposal and decommissioning should be considered for all sources."

- Purchase necessary municipal natural gas supply requirements forward on the futures market.
- If feasible, consider implementation of a city carbon charge, one that includes the full cycle carbon content of gasoline, diesel, fuel oil, natural gas and electricity, and use the revenue to reduce property and city taxes and pay for new transit.
- Push for good, reasonable provincial and federal policy for dealing with the changing energy landscape (i.e. carbon pricing, low and eventually zero emission building and vehicle standards, and financial support for technology and infrastructure to help municipalities, households, and firms transition to a low oil, low carbon future).

4.3 What is the most energy efficient design for Edmonton? What tools do we need to make this determination?

"Achieving sustainable energy planning requires improving the efficiency of energy systems and changing the way people access and use energy in their daily lives. For instance, energy planning for sustainability cannot only look at the gasoline, the car and the service station, but must also address the reason roads are constructed and the way they are used.

This hierarchy of energy-related decisions was brought to the forefront in a study prepared in the 1990's by Mark Jaccard, Lee Failing and Trent Berry. The study underscored that urban form influences all aspects of energy use. Specifically, density and land-use patterns, which determine size and types of dwellings, commuting distances, transportation modes, and energy supply systems, significantly influence the energy profile of a community and the ability to achieve greenhouse gas goals and energy reduction objectives".[12]

Several policies are in place at the City of Edmonton (particularly those contained in *The Way We Grow, The Way We Move* and *The Way We Live*) that will move Edmonton toward greater energy efficiency. (*See Appendix A in this paper for a list of existing policies that promote Edmonton's sustainability*).

These policies mandate a range of transformational changes that will make Edmonton more energy efficient and reduce GHG emissions through higher densities, more development in mature neighbourhoods, LRT to all parts of the city, housing growth and densification around LRT and transit stations, mixed use communities, higher energy efficiency standards for buildings, and neighbourhoods where people can walk and cycle to destinations.

Although these policies provide important direction, by design they are high level in nature. Going forward, these broad directions would benefit form modeling tools that can generate reliable estimates of the energy that will be used (and GHGs emitted) under different scenarios involving land uses, built form, transportation, densities and alternative technologies options. With this greater insight, the City will be able to determine the most optimal land use, built form, transportation and alternative energy configurations for achieving Edmonton's energy and GHG objectives. This tool is commonly referred to as **Energy Density Mapping** and is being used increasingly by communities that want to understand the energy and GHG implications of different community design options. One of the many benefits of Energy Density Mapping is that it allows communities to get a better handle on their existing baseline inventory of both greenhouse gas emissions and energy consumptions. It also allow pin point determination of the biggest sources and the development of targeted strategies.

[12] Canadian Urban Institute, The City of Guelph: Energy Density Mapping Strategy (Draft)

With this tool, cities are in a much better position to tackling the best rate of return projects first.

Communities using Energy Density Mapping models have often concluded:

- By acting decisively today, cities can (a) avoid much higher costs in the future related to building retrofits (i.e., it's cheaper to build to the highest possible standard today and avoid costly retrofits in the future), (b) avoid investments in major transportation infrastructure (i.e., sprawl will eventually require a big investment in transportation infrastructure), (c) avoid expensive alternative energies (future energies will be expensive).
- Energy efficiency improvements for all building types offer the most cost effective approach for achieving energy efficiency gains.

Suggested Policy Direction:

- *That the City evaluate and approve Area Structure Plans, Neighbourhood Structure Plans and neighbourhood redevelopment plans based on their energy implications and ability to achieve predefined energy targets.*

4.4 How should the City go about improving the energy efficiency of new and existing buildings[13]?

One of the main requirements of a sustainable northern city is a building stock that is as energy efficient as economically feasible[14]. As noted by discussion paper author Klaas Rodenburg[15], *In Canada, buildings are responsible for: 33% of all energy used, 50% of natural resources consumed, 12% of non-industrial water consumed, 25% of landfill waste generated, 10% of airborne particulates produced, and 35% of greenhouse gases emitted."*

A number of discussion paper authors, including Rodenburg, expressed concern that current building codes were not sufficiently demanding when it came to energy efficiency – resulting in new buildings that were far less energy efficient than what was economically feasible or what was needed in an energy constrained world. According to Rodenburg, *Today it is no longer sufficient to just meet minimum codes, which serve only to reinforce the business as usual scenario. To be accepted as sustainable in today's marketplace and to stay relevant in the future, buildings must exceed existing codes and standards by a significant measure.* Like other authors, Rodenburg encouraged Edmonton to both establish higher standards for new buildings and encourage existing building owners to engage in green renovations.

Rodenburg also stressed that Edmonton could learn from Northern European cities *whose buildings outperform their North American counterparts by a significant margin.* Because building codes changed too slowly, he recommended that *The Way We Green* strategy should rely on *voluntary assessment programs such*

[13] For the purpose of this discussion, the term "buildings" includes all existing residential, commercial and industrial buildings in Edmonton.
[14] For the purpose of this discussion, an economically feasible solution is one in which benefits outweigh costs, using a life-cycle costing approach that considers all direct/indirect financial costs/benefits as well as externalities.
[15] Klaas Rodenburg, Achieving a Sustainable Building Stock – *How buildings can become part of the solution,* Discussion Paper 18, available at http//www.edmonton.ca/thewaywegreen.

as LEED, BOMABEST or the Living Building Challenge, as these rating programs *continually raise the performance bar towards a NetZero end game.*

According to Rodenburg, the City could take the following actions to *transform the City building stock into high-performance buildings over the next 30 to 50-years*:

- Encourage the marketplace to go beyond the minimum requirements of various business-as-usual building codes, striving instead to meet existing and future voluntary rating tools;
- Influence what buildings are constructed through building permits, zoning laws, and how it handles services such as water and waste management, provision of utilities, and construction of infrastructure; and,
- Accelerate the construction of sustainable building stock through the development of green financial tools that provide incentives for building and home owners to upgrade to a more sustainable building.

One of the ultimate goals of a sustainable city is a NetZero building stock. While this would take many years to achieve, the starting point is to require all new buildings to be built to a NetZero standard as soon as possible. The existing, minimally performing, building stock would be replaced by these high performance buildings at the end of their life cycles. In the interim, the City would promote initiatives that would improve their performance until such time as they were replaced.

In response to *The Way We Green*, a Green Building Strategy will be developed[16]. It will outline a set of actions/steps needed to achieve this net zero state.

Suggested Policy Direction:

- *That the City recognize building energy efficiency as the key strategy in reducing Edmonton's energy footprint through strategies that will require new buildings to be built to a NetZero[17] standard in the medium term.*
- *That The City recognize building energy efficiency as the key strategy in reducing Edmonton's energy footprint through strategies that will require Edmonton's existing building stock achieving a NetZero standard in the long term.*

4.5 How should the City go about greening its energy supplies?

Many of the Edmonton Sustainability Papers authors urged Edmonton to reduce its dependency on fossil fuels because of their impact on climate, their increasing scarcity (especially oil), the price volatility that is likely to accompany scarcity, and the exposure to energy shocks from Alberta grid. But what green options are available to Edmonton?

The greenest and most cost effective energy strategy, as explained by several of the discussion paper authors, is the avoidance of energy use in the first place. The greenest building is the one you don't build. Design your city, your buildings, your transportation system and your infrastructure to use as little energy as possible. Encourage lifestyles that actively value and strive to conserve energy.

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[16] Edmonton's green building strategy will address issues of (a) eefficiently using energy, water, and other resources, (b) protecting occupant health and improving employee productivity, (c) reducing waste, pollution and environmental degradation. It will take a life-cycle approach; consider aesthetical values and quality of life issues.

[17] A zero energy building or net zero energy building is a general term applied to a building's use with zero net energy consumption and zero carbon emissions annually.

Discussion paper authors Tim Weis and Kristi Anderson were optimistic in this regard, noting that *staff of the Council of Energy Ministers' Working Group on the Built Environment felt that each industrial sector could reduce energy intensity by between two to four per cent every year for the next 20 years. The Council, which includes every provincial and territorial energy minister, had also outlined achievable targets including such things as ensuring all new buildings and homes would be 50% more efficient than the current average construction, and even "net zero energy" by 2030. Furthermore the average house in Canada today could be retrofitted to reduce its energy use by at least 30 per cent - all of this without compromising any of the lifestyle comforts we are accustomed to.*

Their message – *While we continue to look for alternative sources of energy, we can significantly reduce our energy demand at the same time.*

In their paper, Weis and Anderson discussed the merits of various technologies for use in Edmonton including:

- **Combined heat and power (cogeneration)**: This technology is widely available in parts of Europe, allowing households to generate electricity from their household heating system. District heating systems can work on the same principle.[18]
- **Solar Energy:** Despite being relatively far North with short winter days, Edmonton has a better solar energy resource than many cities that are farther south (Toronto or Tokyo). Solar photovoltaics or PV systems capture energy from the sun and convert it to electricity. Interestingly, they work most efficiently in cold temperatures. The technology is already at work in Edmonton and holds great potential.
- **Ground Source Heat Pumps (geo-thermal)**: These systems use the Earth's energy to warm (or cool) a building – taking heat out of the ground and releasing it into a building. The downside of this technology is that the heat pumps run on electricity produced from coal which produces GHG.
- **Transportation and biofuels**: Two of the most commonly cited biofuels that have the potential for significant emissions reduction include ethanol and biodiesel[19].
- **Bioenergy:** This energy is derived from biomass such as plant or animal based organic matter. Within Edmonton there are many potential sources including sewer gas (i.e., produced from wastewater treatment), landfill gas, forestry and agricultural wastes, and wood wastes.[20]

Weis and Anderson recommended a number of actions municipalities could take to encourage and facilitate the uptake of these and other technologies:

- Set energy use goals for new and existing buildings.
- Use Local Improvement charges to finance energy efficiency improvements in residential or commercial buildings.
- Support the deployment of renewable energy by applying renewable energy requirements to certain development sites and issuing permits only when minimum standards are met.
- Zoning requirements: Require southerly orientation where possible, setting distance-to-height ratios to prevent shading. Require zoning that encourages passive solar heating and natural light.
- Require new buildings to be built "solar-ready."

[18] Reviewers of this White Paper commented that cogeneration would not negate the need for large power production facilities.

[19] In reviewing this White Paper, some respondents expressed concern that biodiesel was not a sustainable solution.

[20] Reviewers of this White Paper commented that the amount of bioenergy available to Edmonton was limited.

- Use zoning to set up green building zones.
- Provide tax credits (property and business) for residents and businesses that install renewable energy systems.
- Provide rebates to encourage initial uptake of renewable energy technologies.
- Establish feed-in-tariffs, revolving fund financing.
- Purchase green power for City operations.
- Facilitate the development of a community energy cooperative. .

In parallel to *The Way We Green*, a renewable energy strategy is under development. The strategy will outline the specific actions/steps that will be taken to transition Edmonton's energy portfolio to renewable energy sources.

In addition to the ideas advanced by Weis and Anderson, other contributors to the Way We Green encouraged consideration of:

- Potential to use existing energy sources more efficiently and effectively including hydro-electric, oil, gas and coal;
- Run of the river hydro-power;
- Intermittent hydro-power for hydrogen projection and storage until needed; and,
- Power cells for the projection of electricity.

Suggested Policy Direction:

- *That the City set: (a) goals/targets to reduce energy use, both in total and per capita, and (b) goals/targets indicating the percentage of Edmonton's energy that will come from renewable sources, and the timeframes in which this will be achieved.*
- *That the City develop an Energy Descent Strategy detailing how Edmonton (including City operations) will reduce its energy footprint and how it will transition toward alternative energies and more efficient and effective use of existing fossil fuels.* [*Note: Edmonton's overall Energy Strategy consists of: (a) GHG Mitigation Strategies for City operations and Edmonton, (b) Sustainable Fleet Management Plan, (c) Brownfield Strategy, (d) Green Building Strategy, (e) Renewable Energy Strategy, (f) Growth Coordination Strategy, (g) Transit Oriented Development Guidelines, and (i) the expansion of LRT. Section 4.1 calls for the Energy Strategy to be expanded to include a Climate Change Adaptation Strategy. The final piece of the overall Energy Strategy is the Energy Descent Strategy.*]

4.6 Is our current urban form helping or hindering our energy efficiency?

In developing this strategy, *The Way We Green* project team examined a range of sustainability issues relating to energy, climate change, water, air, biodiversity, waste management and food security. When challenges were identified by stakeholders, steps were taken to understand their root causes. In many cases, root cause analysis led to a common source, which many stakeholders termed "*sprawl.*" Repeatedly, stakeholders cited "sprawl" as a major contributor to high energy use, high GHG emissions, water quality problems, loss of biodiversity, loss of prime agricultural land and diminished air quality. These concerns reflect suburban expansion that has occurred in Edmonton over the past decade.

With 47 approved Neighbourhood Structure Plans still under construction, there is concern this trend may continue. Together these partially constructed neighbourhoods contain over 5,000 hectares of net developable residential lands, originally designed to accommodate 137,690 units and 478,611 persons. Approximately 80% of this capacity remains (enough to accommodate 98,300 units and 392,000 people). In addition to these approved Neighbourhood Structure Plans, 18 more are awaiting approval.

Given these significant opportunities for continued suburban expansion, the City may find it a challenge to meet its policy: *To encourage a minimum of 25% of city-wide housing units growth to locate in the Downtown and mature neighbourhoods and around LRT stations and transit centres where infrastructure capacity supports redevelopment. (Policy 3.1.1.2 The Way We Grow).*

For Discussion:

How will "a minimum of 25% of city-wide housing unit growth" be attracted to downtown, mature areas and LRT/transit centres, with this much "outward pull" from the suburbs?

David Thompson was one of the several discussion paper authors who explored this issue, stating, *"Edmonton is addressing many environmental issues, but is failing to rein in sprawl and its significant health, environmental and economic costs. Like other environmental problems, sprawl results from rational economic decisions. Attempts to rein in sprawl will continue to fail as long as market prices encourage it. Fortunately, prices can be adjusted to provide an incentive to denser urban development. Environmental pricing reform policies, some of which are briefly outlined in this paper, can be employed by Edmonton to recruit the power of the market to rein in sprawl and address other environmental issues.*[21]

According to Thompson, "*Edmonton is among the most sprawling cities in North America, and sprawl creates a number of related problems:*

- *Sprawl locks in automobile dependency, with resulting higher levels of emissions, traffic congestion and crashes, and environmental, economic and health costs.*
- *Sprawl makes transit less feasible, as it hinders efficient and cost-effective movement of riders.*
- *In the long run, sprawl commits government to expanded "legacy" costs of maintenance, repair and replacement of infrastructure – roads, utilities, schools, etc.*
- *Sprawl causes a hollowing-out of established neighbourhoods, resulting in school closures, an underperforming urban core, and derelict central lands.* [22]
- *Sprawl eats up agricultural land, making residents more dependent on imported food.*
- *Sprawl encourages sedentary lifestyles, which contribute to obesity, diabetes, heart disease and higher health-care costs.*[23]

[21] David Thompson, The Power of Prices and the Failure of Markets – Addressing Edmonton's Environmental and Fiscal Challenges, 2010 Edmonton Sustainability Papers, Discussion Paper 17, available at http//www.edmonton.ca/thewaywegreen.

[22] Some stakeholders disagreed with this comment arguing that it was possible to achieve outward growth without "hollowing out" of established neighbourhoods.

[23] Some stakeholder expanded on this comment saying that while this observation was true for Edmonton, it didn't necessarily have to be so. It is possible for people living in the suburbs to have an active lifestyle provided the neighbourhoods are close to retail and employment. Sedentary lifestyles are more a result of our dependence on the automobile.

- *As the age of cheap oil passes, sprawl creates financial risks for suburban homeowners, whose motoring costs go up while properties lose value."*

Thompson recommended a number of steps to rein in sprawl, including:

- Restructure development cost charges to reward denser development, re-development of brownfield, and greyfields, and development closer to the City centre and transit; and,
- Increase property taxes in outlying areas and decrease it in the city centre to encourage re-development and discourage sprawl.
- Remove hidden subsidies that make it artificially cheap to drive automobiles to and from the suburbs. Consider the use of road pricing, fuel tax and transit subsidies.

Similarly, discussion paper author Lawrence Solomon focused on the negative outcomes of sprawl, citing artificial pricing and regulations as the cause. Commenting on the growth that is anticipated for Edmonton and the region, Solomon said, "*Over the next 30 years, Edmonton's outskirts in the Capital Region are expected to roughly double in population, from approximately 250,000 to approximately 500,000. Most of this growth will be unsustainable, driven and supported by subsidies or cross-subsidies of various kinds. In contrast, the City of Edmonton's population is merely expected to increase by half, from approximately 750,000 to 1,150,000, despite Edmonton's inherent efficiencies. Without the interventions by government, and without the subsidies and cross-subsidies, the picture in 2040 would likely be quite different: the population of 250,000 in the outskirts would likely decline to 200,000 or 150,000. The City's population, meanwhile, would likely double to 1,500,000. This outcome would represent a more natural growth and evolution, one that better reflected the innate capacities of both Edmonton and its environs."*[24]

Like Thompson, Solomon targeted Edmonton's property tax (based on market value assessment) as a main contributor to sprawl. "*The more that land is taxed, the likelier that people and businesses will flee to a less valued, and lower taxed, location. The direction of the flight will be from high to low density. Often this flight will be to a lower taxed jurisdiction. Property taxes are perverse. On the one hand, they penalize those who make improvements to their property or who use their property intensively, discouraging investment by owners. On the other, the units in the compact, intensively use districts that attract the highest property taxes tend to make the fewest demands on urban infrastructure – as a general rule, the higher the density of an area, the lower the cost of delivering a service to a resident of the area. Property taxes are thus both economically and environmentally undesirable in that they discourage efficient use of municipal resources while promoting sprawl."*

More specifically, Solomon recommended:

- Move away from property taxes (he identified a number of ways of replacing this revenue); and,
- Apply road user fees in the form of road tolls, congestion charges; and,

[24] Lawrence Solomon, Correct Pricing and Deregulation – *The Key to Economic and Environmental Sustainability*, 2010 Edmonton Sustainability Papers, Discussion Paper 16, available at http//www.edmonton.ca/thewaywegreen.

Suggested Policy Direction:

That the City evaluate the feasibility of new pricing and taxation strategies to prevent sprawl and encourage higher density development.

For Discussion

The Way We Move (Edmonton's Transportation Master Plan) gives: "diminished focus on catering to commuter vehicle traffic growth through the roadway expansion program." At the same time, an objective exists to facilitate the movement of goods and services: "The City will focus major roadway improvements on the efficient movement of goods, services and transit vehicles." Various participants in The Way We Green wondered how Edmonton's transportation system could be designed to promote efficient movement of goods and services, without doing the same for commuter vehicle traffic?

4.7 A Changing Trade-off between Transportation & Housing Costs – And How this Might Change Settlement Patters

The three largest expenditures for households in Canada are personal income taxes, shelter and transportation. In general, in Edmonton, land values and housing prices decrease with distance from the city center. However, the savings realized is diminished by need to rely on an automobile and the required distance to travel. In the future, there is a potential for an increasing cost of transportation and this may greatly diminish the relative discount realized in shelter costs.

In addition, with rising energy costs, Edmontonian households may be faced with the double negative effect of higher housing costs and higher transportation costs which may diminish savings and restrict spending in other areas. This is especially true in suburban neighbourhoods where houses on average are larger than in established neighbourhoods. In 2008, the average household in Edmonton spent 12.1% of income on transportation and 17.9% of income on shelter.

As compact neighbourhoods are built that have walkable streets, access to transit, and a wide variety of stores and services, there will be increased choices for families. Although these types of developments may cost more for shelter, being able to walk, take transit and own fewer vehicles means a family can spend less on transportation costs. Further benefits also include shorter travel times, improved public health and reduced greenhouse gas emissions.

To help meet the City's policy of 25% of city-wide housing unit growth be attracted to downtown, mature areas and LRT/transit centers, some stakeholders suggested that it would be useful for the City to communicate the total cost of home ownership in different areas of the city. This is one way we can decrease the "outward pull" from the suburbs.

4.8 What can be done to make mature neighbourhoods a better option?

Suggestions from City Centre Airport Finalists

On September 14, 2010, a panel discussion was held at the Art Gallery of Alberta featuring four of the five finalists in the Edmonton City Centre Airport Design Competition. In January 2011, finalists are required to develop and submit their visions for transforming the Airport's 217 hectare site into an environmentally-sustainable, transit-oriented, mixed-use development for 30,000 residents.

In presenting their ideas on sustainable communities, finalists acknowledged a need for pricing and taxation strategies to curtail sprawl (described in Section 4.6). However, they stressed that regulations in themselves were not enough. Most importantly, the inner areas of the city would need to provide outstanding places to work, live and play that were preferable to the suburbs. Key neighbourhood requirements included:

- Special Places/Place Making: Inner city and mature neighbourhoods will need to create special places that foster a sense of authentic human attachment and belonging.
- Quality Buildings: Buildings and infrastructure will need to achieve higher standards of quality. Durable buildings and communities should last 200+ years (a feature that several finalists said was is missing from North American urbanism), responding to issues of noise, fire, odors, sunlight, and need for privacy.
- Adaptive Potential: Buildings and community design will need to be adaptive to different uses over time.
- Beauty: All parts of the community will need to be lovely/beautiful … buildings, streets, public spaces, commercial areas.
- Public Spaces: High quality public spaces are needed to compete with suburbs.
- Cars rule much of the public space in North American cities. That needs to change if we want higher quality public space.
- Nature needs to be incorporated into the community in both traditional and non traditional ways.
- Balance must exist – age of people, demographics, type of housing, mix of uses.
- Neighbourhoods should moderate the effects of climate; creating opportunities to celebrate all seasons and the outdoors.

Several of the finalists stressed the fundamental importance of a prescriptive **Master Plan** to guide the development of the city and in particular redevelopment of mature neighbourhoods. They stressed that the Master Plan should provide:

- A very clear vision of what kind of city Edmonton wants to be;
- A "very sharp" vision for each of the neighbourhoods/districts that comprise the City indicating what type of neighbourhood is desired – special places, types of buildings, types of public spaces, and specific projects and partnerships that would be undertaken to achieve that vision.

Finalists urged the City to work closely with a variety of traditional and non traditional developers to implement the Master Plan.

Effect of School Closures

Throughout this project, participants expressed concern about the closure of schools in mature neighbourhoods – a trend that was possibly making mature neighbourhoods less desirable to families with school age children (and suburban neighbourhoods more desirable).

Since 1973, Edmonton Public Schools has closed more than 25 schools in mature neighbourhoods. Quoted in the Edmonton Journal on April 12, 2010, EFCL Executive Director Allan Bolstad said, "*It is like a tombstone advertising this is an area to stay away from. If you look at a number of areas where schools have closed, they sit there boarded up, and it's a pretty strong advertisement that the neighbourhood is on the decline. It just helps pull the neighbourhood apart. Children don't make friendships, families don't get to know each other.*"

The quality, reputation and location of schools are important factors that young families consider when deciding where to live in Edmonton. Clearly any strategy that hopes to attract families with school age children to mature neighbourhoods must provide educational opportunities (including convenient locations of

schools) that are consistent with those in the suburbs. Otherwise, young families will continue to opt for the suburbs.

Suggested Policy Direction:

- *That the Edmonton City Centre Airport Development be undertaken as a model for future development in Edmonton, and a catalyst for creating much more market demand for inner city/mature neighbourhood living.*
- *That strategies be developed for retaining and repopulating schools in mature neighbourhoods.*
- *That the City develop/redevelop inner city neighbourhoods to provide a superior living experience by creating: (a) special places that foster a sense of authentic human attachment and belonging, (b) durable buildings and communities that can last 200+ years, responding to issues of noise, fire, odors, sunlight, and need for privacy, (c) buildings that are adaptive to different uses over time, (d) beauty everywhere, (e) high quality public spaces, (f) less intrusion from automobiles, (g) natural spaces and biodiversity, (h) balance (age, demographics, housing, uses) and (i) design features that help to moderate climate.*
- *That the City encourage green developments by placing green development requirements on the City owned properties that it sells.*

For Discussion

Do you agree with the need for a Master Plan that has a "sharp vision" right down to the neighbourhood level? Does the Way We Grow/Move/Live provide that sharp vision? Is that sharp vision captured in other plans such as the Capital City Downtown Plan, The Quarters Urban Design Plan, etc.

4.9 What risk does climate change and fossil fuel depletion hold for our economy?

Various participants in The Way We Green stressed that Edmonton was not immune to "peak oil" risks. Although there are significant oil and gas deposits in Alberta today, Edmonton will face the same price pressures faced in other parts of the world as these commodities become increasingly scarce. Moreover, the very sustainability of Edmonton's economy may be at risk as fossil fuel prices increase and supplies decline. Expert Panel member Daniel Smith warned:

> *"The reliance of the city and the Province on the oil and gas industries for continued growth appears to be at odds with the longer term reality that the future of these industries is very limited. The currently accepted growth paradigm will not sustain Edmonton as the cost and availability of all fossil fuels declines."*[25]

The same points were made by discussion paper author David Hughes, who was quoted extensively in Section 4.1.

At the same time, it is the City's visions to be an energy city – "energy drawn from the ground and from above; from the sun and wind." In order to achieve this vision, the City will need to actively explore, test (and where feasible) adopt new energy technologies that will reduce Edmonton's dependence on fossil fuels.

[25] Expert Panel Feedback, available at edmonton.ca/thewaywegreen

Suggested Policy Direction:

- *That The Way We Prosper (Edmonton's Economic Development Plan; currently under development) recognize the era of cheap fossil fuels may be coming to an end, and the implications of this trend on Edmonton's economy.*
- *The City will actively explore, test and (where feasible) adopt new energy technologies that will reduce the dependence of City operations on fossil fuels.*
- *The City will work with community partners to explore, test, and (where feasible) encourage community adoption of new energy technologies that will reduce Edmonton's overall dependence on fossil fuels.*

4.10 What goals, objectives, policies and targets should Edmonton adopt relative to the energy and climate change challenges it faces?

Potentially, these challenges are amongst the most serious that society will face in the 21st Century. If, as a society, we believe these challenges are real, it follows that we should act quickly and decisively.

Appendix A provides a first draft of goals, objectives, policies and targets that might serve Edmonton on the path to energy and climate sustainability. Their purpose is to provoke discussion and define areas of community interest and support.

Chapter 5: River Water Supply / River Water Quality

5.1 What are Edmonton's sustainability issues surrounding water?

As the North Saskatchewan River (NSR) is Edmonton's sole water supply, it is fundamental to our sustainability. We rely on it for:

- Sufficient quantities of water to meet residential, industrial and regional needs; and,
- A standard of cleanliness so that human health and environmental health do not suffer.

In developing *The Way We Green,* the main focuses around water were to understand:

- The capacity of the NSR to meet Edmonton's future needs;
- The potential for future shocks/disturbances involving water supply and our capacity to withstand them; and,
- The ecological health of the river today, the challenges the river might face in the future as growth occurs in the river basin, and the steps that are being taken today to mitigate those impacts.

5.2 How is the NSR watershed managed and regulated?

"The North Saskatchewan River Watershed in Alberta drains 80,000 km which comprise just over one tenth of Alberta's land mass. The river originates at the Saskatchewan Glacier in the Columbia Icefields in Banff National Park and descends almost 900 meters in elevation over 1,000 kilometres to the Alberta/Saskatchewan border. It joins with the South Saskatchewan River in Saskatchewan east of Prince Albert, flows into Lake Winnipeg in Manitoba and eventually empties into the Hudson Bay via the Nelson River."[26]

A complex body of provincial legislation/direction guides watershed planning in Alberta:

- **The Water Act:** This Act gives the provincial cabinet (and the Director) broad discretion to adopt regulations governing licensing and other water management functions. It also commits to establishing water management tools including a *framework* for water management planning and a *strategy* for protecting the aquatic environment. The framework suggests that regional strategies, developed in collaboration with stakeholders and affected communities will guide planning within each region (i.e., Land-use Framework regional plans).
- **Environmental Protection and Enhancement Act (EPEA):** This Act promotes and supports the protection, enhancement and wide use of the environment. It gives the Minister power to develop environmental objectives, standards, practices, codes of practice, guidelines and methods to meet the government's environmental goals. Although it does not specify requirements related to watershed management planning, in-stream flow needs, or healthy aquatic ecosystems, it does suggest that such objectives developed through an integrated watershed management plan could be adopted through this legislation.

[26] Steph Neufeld, North Saskatchewan River Water Quality, 2010 Edmonton Sustainability Papers, Discussion Paper 16, available at http//www.edmonton.ca/thewaywegreen.

- **Water for Life Strategy (WFL):** The Government of Alberta initiated collaborative watershed planning in 2003 when it adopted its policy of Water for Life: Alberta's Strategy for Sustainability. Building on this strategy, the government prepared an Action Plan in 2009 which stated, *The Government of Alberta intends to improve and maintain the health of our aquatic ecosystems by managing the cumulative impacts of point and non-point-sources, promoting watershed management and establishing water conservation objectives on all major basins.* A key action in the strategy is to prepare water conservation and production plans for all water using sectors by 2010. These plans will contribute to the strategy's target of 30% improvement in overall water efficiency and productivity form 2005 to 2015.
- **Land-use Framework (LUF):** LUF defines the concept of Regional Strategies which involves development of seven land-use plans based on seven land-use regions across Alberta. The LUF recognizes the limitations of Alberta's current regulatory system in assessing impacts of new developments on a project-by-project basis (as legislated under EPEA) and identifies a need for a cumulative effects management approach to address the impacts on both existing and new human activities taking place over time.
- **Cumulative Effects Management Strategy (CEMS):** As stated in LUF, this strategy is about anticipating future pressures and establishing limits on the effects of development on the air, land, water and biodiversity of the affected region. Threshold-based ecosystem management at the local level will be required to establish those limits. The setting of thresholds for ecosystems in regional plans will be supported by watershed planning and the adoption of integrated watershed management plans that include objectives for water quality, in-stream flow needs and healthy aquatic ecosystems.
- **Alberta Land Stewardship Act (ALSA):** The purpose of this Act is to enable the Government of Alberta to identify economic, social and environmental objectives, and enable sustainable development by taking into account and responding to the cumulative effects of human activity and other impacts. It makes regional plans binding on Albertans. ALSA transforms Alberta's planning process, allowing watershed plans to be inserted into regional plans.
- **Municipal Government Act (MGA):** The Act defines the broad powers or general jurisdiction of municipalities, requiring every municipality to have a land-use bylaw, and larger municipalities to adopt a Municipal Development Plan. Municipalities will have to align their plans, bylaws and decisions with regional plans.

5.3 What is the North Saskatchewan Watershed Alliance, and why is Edmonton's involvement in this organization so important.

In keeping with the WFL Strategy, the Government of Alberta appointed the North Saskatchewan Watershed Alliance (NSWA)[27] to serve as the Watershed Planning and Advisory Council (WPAC) for the NSR watershed and prepare its integrated watershed management plan (IWMP). The City of Edmonton is represented on both its Board of Directors and its Steering Committee (as is EPCOR).

Since 2005, the NSWA has worked to develop the IWMP for the NSR watershed. Currently in draft form, it proposes the following goals:

- Maintain and improve the current water quality of the mainstem of the NSR by managing point and non-point-source loads entering the river;

[27] The NSWA is a nonprofit society founded in 1997 by EPCOR and Trout Unlimited Canada, appointed by the Government of Alberta in 2005 to serve as the Watershed Planning and Advisory Council for the North Saskatchewan River watershed.

- Maintain and improve water quantity(flow) in the mainstem of the NSR through the use of Instream Flow Need objectives;
- Maintain and improve water quality, quantity and ecosystem health throughout the NSR watershed;
- Protect groundwater quality and quantity in the NSR watershed; and,
- Implement cumulative effects management at the regional scale.

Following a public consultation process that will extend to late 2010, the IWMP will be submitted to the Minister of Environment for review. It is unclear whether the plan will become mandatory or be voluntary.

The Way We Green encourages the City of Edmonton and Edmonton to pursue its interests in the NSR through active participation in the NSWA, given the NSWA's strong planning mandate for the river's entire Alberta watershed. This appears to be the most effective way of working with regulators, government agencies, municipalities, industries, and the many stakeholders who share an interest in the river. Moreover, it makes sense to focus on the river in its Alberta entirety, not just those segments intersecting Edmonton. *The Way We Green* stresses the strategic importance of the City of Edmonton having a strong voice at the NSWA table and an active role in influencing the implementation of much needed watershed management practices throughout the entire watershed, including:

- Development, implementation and enforcement of reach-specific water quality objectives for the mainstem of the NSR;
- Effective programs to monitor and measure total loads from all point and non-point-sources to ensure water quality objectives are met;
- Development, implementation and enforcement of Instream Flow Needs (IFN) objectives in the mainstem of the NSR;
- Effective monitoring and measuring programs to make sure IFN objectives are met;
- Development, implementation and enforcement of water quality objectives for all tributaries of the NSR;
- Development of aquatic ecosystem health objectives for all water bodies and riparian areas;
- Development of programs to maintain, improve, restore and protect wetlands that are part the NSR watershed;
- Development of programs to maintain and improve riparian area health;
- Developing a range of strategies to prevent / mitigate damage to the watershed from municipal, commercial, industrial, agricultural, forestry activities;
- Establish and achieve fish management objectives in the NSR mainstem, tributaries and lakes; and,
- Measures that will protect groundwater quality and quantity in the watershed.

Suggested Policy Direction:

That the City establish a policy that would see the City work actively with stakeholders within the NSWA framework to promote needed watershed management practices (listed above).

5.4 How does Edmonton affect water quality and the health of the North Saskatchewan River?

Edmonton impacts the quality of water and the health of the North Saskatchewan River in three key ways:

- Discharges to the NSR from the Gold Bar Waste Water Treatment Plant;
- Discharges to the NSR from the city's combined sewer overflows; and,
- Discharge to the NSR from the city's storm sewers.

Many substances are introduced to the river through these discharges (e.g., nutrients, bacteria, sediment, heavy metals, organic matter, oils, litter, pesticides, pharmaceuticals, etc.) that can reduce water quality and harm ecosystem health.

5.5 What approach should a sustainable society take in managing its river water quality and river health?

The Natural Step Framework provides guidance in the form of a sustainability principle that states: *"Nature is not subject to systematically increasing concentrations of substances produced by society."*

The City's efforts in treating wastewater are consistent with this principle. Over the past 40 years, contaminant loadings from the Gold Bar Wastewater Treatment Plant and from Combined Sewer Overflows have systematically decreased relative to nutrient loads (Kjeldahl Nitrogen, Ammonia and Phosphorous), bacteria load and total suspended solids loads. The magnitude of these reductions has been impressive, especially in light of Edmonton's growth.

At the same time, sediment loads from storm sewers have steadily increased as Edmonton has grown. While many citizens consider storm water to be harmless (coming from rain water and snow melt) this is not the case. Storm water contains a wide range of pollutants washed off urban surfaces including litter, organic matter, salt, animal feces, nutrients, heavy metals, oils and pesticides. Their impact to water quality and ecosystem health can be significant. This challenge will only intensify as the City continues to develop, and more hard surfaces are constructed.

Principles of sustainability suggest that the City, at a minimum, should stop increasing its total suspended solid load to the North Saskatchewan River. In order to meet this principle, the City would likely need to pursue a Low Impact Development (LID) strategy.

Low impact development is a storm water management and land development strategy that emphasizes conservation and use of natural features, integrated with engineered controls to more closely mimic pre-development hydrology. The goal of LID is to manage storm water in a manner that helps to prevent harm to natural aquatic systems from commercial, residential and industrial development sites and includes measures such as green roofs, bioswales and constructed wetlands. The adoption of a LID strategy would also support one of the Melbourne principles of sustainability – *Build on the characteristics of ecosystems in the development and nurturing of healthy and sustainable cities.*

But simply capping the current level of suspended solids to the NSR may not be enough. Significant reduction of this load or the load from other contaminants may be needed to protect the river ecosystem. Determining sustainable discharge loading will require more in-depth study in partnership with the North Saskatchewan Watershed Alliance and Alberta Environment.

Despite the City's considerable success in reducing loads from the Gold Bar Wastewater Treatment Plant (nutrients, bacteria, total suspended solids), the City's ability to continue this trend will be challenged as

Edmonton grows. In the absence of new strategies and technologies, loads will start to rise simply as a result of growth. *The Way We Green* suggests that the City should set a goal to maintain and further reduce this loading (from the Gold Bar Waste Water Treatment Plant).

Similarly, the City has made great strides in preventing combined sewer content from entering the NSR. Nevertheless, situations still occur today where flows exceed the capacity of the combined sewers (e.g., during rainfall and snow melt events) and water containing untreated waste water is discharged directly to the river.

Suggested Policy Direction:

That the City continually reduce pollution loads entering the North Saskatchewan River from its storm sewers, combined sewers and the Goldbar Wastewater Treatment Plant through (a) aggressive implementation of a LID strategy, (b) eventual elimination/containment of combined sewer overflows, and (c) ongoing investment in the drainage collection, transmission and treatment systems.

5.6 Does Edmonton face a serious risk relative to its current water supply?

Water supply is becoming an increasingly urgent problem throughout the world due to droughts, pollution and ever-increasing levels of human consumption.

"Many communities face tough decisions regarding the long-term sustainability of their water supply. Fortunately, Edmonton is in better shape than many others due to its geographic location, climate, water and waste water treatment technologies, utility infrastructure, source water protection initiatives and utility "best management practices" that have been implemented over the past century."[28]

Edmonton's current water supply situation is best understood with the following facts[29]:

- Approximately 30% of total NSR flow is allocated through various provincial licenses, but consumptive use for the whole river is less than 5% (i.e., water taken from the river and not returned as a result of irrigation and/or industrial processes).
- Edmonton is responsible for only a small portion of the 5% consumption referred to above. EPCOR currently withdraws between 2%-4% of the river flow for drinking water. However, more than 90% of this is returned to the river (after being used in Edmonton homes and businesses) through the waste water treatment plants. This means that less than 0.5% of the average river flow is used up by more than one million people in the Edmonton region. Edmonton customers currently use an average of 350 million litres per day. This is the approximate volume that would fill the downtown Telus Tower building. More than 90% of this is returned to the NSR through the Goldbar Wastewater Treatment Plant.
- In the event of a serious disturbance/shock to Edmonton's water supply, EPCOR has 12 treated water reservoirs which hold more than 800 million litres. This volume is sufficient to meet local demand for approximately 3 days. Similarly, local communities supplied with EPCOR water have their own treated water reservoirs. The storage is configured so that every community in the city is served by at least two sources of water supply. This is built in redundancy should one reservoir be unavailable.
- System resiliency includes two water treatment plants, each capable of supplying the entire city. In a worst-case scenario, EPCOR can supply untreated water throughout the system for fire fighting and

[28] Susan Ancel, Les Gammie, Scott Lundy and Tarra Kongsrude, EPCOR Review of Stakeholder Workshop Summary Materials, (submitted to the Office of Environment on August 16, 2010.)
[29] Facts were provided by EPCOR.

sanitation services. Such water would not be suitable to drink, but would allow other organizations to provide emergency services.

- Edmonton has historically used less water than the Canadian average due to Edmonton's well established metering program, rate setting methods, precipitation patterns and relatively short summers. Edmonton domestic residents use 226 litres per capita per day (l/c/d), which is approximately 40 l/c/d less than the daily average of large metered Canadian cities. For the past five years, the average daily demand for Edmonton water has remained stable at approximately 350 megalitres per day, in spite of a 10% increase in population. Further reduction of water use (on a per capita basis) is expected as homes built in the 1970's are retrofitted with water-efficient fixtures.
- Over the past century, the City and utility have implemented a variety of best management practices to improve water efficiency, including: installation of water meters, establishment of a leak detection program, construction of efficient water treatment plants, establishment of a cast iron water main replacement program, education programs, implementation of a low water use efficient fixture bylaw and City facilities built to LEED Silver standard. Going forward, EPCOR will focus its efforts on customers whose water use is considered wasteful when compared to their customer peer groups.
- Recent upgrades to the E.L. Smith water treatment plant are designed to provide Edmonton region with a reliable supply of drinking water for at least the next 25 years based on current customer demand growth forecasts. Minor capital modifications in 25 years will expand capacity for another 50 years.

Given these facts, Edmonton's current water supply from the NSR is more than adequate to meet current needs. The vast majority of water that Edmonton draws from the NSR is returned. Edmonton has long been a Canadian leader in water conservation and this trend is likely to continue as Edmonton's older building stock is retrofitted with more water efficient fixtures and appliances.

For these reasons, Edmonton appears resilient in its ability to withstand short term water supply disturbances and shocks.

5.7 Does Edmonton face a serious risk relative to its long term water supply?

Edmonton's long term water supply situation is best understood with the following facts[30]:

- Under the highest growth scenario over the next 20 years (that would see significant residential and industrial growth in the watershed), consumptive use of the whole river would be 6-7% based on current flows (note: this percentage would increase or decrease if the total flows of the river change).
- Data over the last 90 years shows an approximate 13% decrease in the NSR's average flows. If this trend were to continue, it would be significant over the next 100 years, but not critical to Edmonton's drinking water supply, as Edmonton consumes less than 0.5% of today's average flow.
- While there has been some speculation about the impact of climate change on glaciers, it is important to note that glacier melt accounts for about 5% of flow in the NSR. Annual flows are primarily the result of snowmelt and rain events upstream of Drayton Valley in the upper reaches of the watershed.
- Long-term (c. 500 year) data on NSR flows from tree-ring studies shows there have been periods of extended drought (10-20 years) or flood conditions, so these could occur in the future and would be difficult to distinguish from climate change-related events.

[30] Facts were provided by EPCOR.

Clearly there is uncertainty surrounding the different scenarios that Edmonton could face in the future regarding flows in the NSR. Over Edmonton's short history, flows have not been an issue. However, tree-ring records indicate that extended periods of drought have occurred in each of the past five centuries. The impact these events had on the NSR flow is uncertain.

Suggested Policy Direction:

That the City develop a risk management plan to deal with possible reduced flows in the NSR. The plan should address:

- *What is the worst-case scenario for the NSR (i.e., if a severe drought were to last for 10-20 years)?*
- *What is the likelihood of such an event?*
- *How would Edmonton respond and remain sustainable?*
- *What should a resilient city be doing in advance of such an event if the risk is deemed to be significant?*
- *What impact would pollution loads from the Goldbar Wastewater Treatment Plant have on the health of a lower flowing river?*

Chapter 6: Food Security

6.1 What is Food Security and how is it a sustainability issue?

"Food security" is a concept that involves people being able (at all times) to acquire safe, nutritionally adequate, and personally and culturally acceptable foods, produced in ways that are environmentally sound and socially just. A "food system" consists of production, processing, storage and transportation, buying and selling, eating, and waste recovery. The topic of food has social, community health, environmental, economic and land use aspects. In general, food security is foundational to sustainability; a society simply cannot endure without adequate access to food.

Driving today's food security movement are concerns about possible disruptions in global food markets stemming from climate change, growing global populations, and ever-increasing cost of fossil fuels (i.e., mainly fertilizer and transportation). *"In order to make one unit of food energy it takes 10 units of fossil fuels and 80% of the total increase in energy use between 2002 and 2007 occurred in the food system. The majority of food items travel between 2500 and 4000 kilometers to get to your plate."*[31] A central theme of today's food security movement is that planned relocalization of the food economy can help transition society to a carbon constrained world.

In addition to providing food, agricultural land can provide environmental services to an urban area in a similar manner as natural areas. Farm and ranch lands provide food and cover for wildlife, help control flooding, protect wetlands and watersheds and help maintain air quality. They can also sequester carbon, absorb and filter wastewater and provide groundwater recharge. These non-market ecological services are essential to a sustainable city.

In developing *The Way We Green,* our main focus around food was to better understand:

- What are the risks associated with the food system and how resilient is Edmonton in the face of energy shocks or climate change related global food system disruptions?;
- To what degree the local food economy has already been established in Edmonton. *"Alberta is a top* ***exporter in agricultural products*** *with the 2nd highest exports in Canada"*[32], so wouldn't we be able to feed ourselves? What are the challenges facing the local food system?;
- Do people believe it is necessary or is there a desire to preserve prime agricultural land within the urban boundary? Is there an awareness of the ecological services that urban agricultural land provides? What are the challenges in doing so?; and,
- What is the role of the municipality in ensuring a food secure Edmonton?

[31] Becky Lipton, *Food Security for Edmonton – Is this Something We Should Care About,* 2010 Edmonton Sustainability Papers, Discussion Paper 7, available at http//www.edmonton.ca/thewaywegreen.
[32] Becky Lipton, *Food Security for Edmonton – Is this Something We Should Care About,* 2010 Edmonton Sustainability Papers, Discussion Paper 7, available at http//www.edmonton.ca/thewaywegreen.

6.2 How is the food system vulnerable as result of climate change and increased scarcity of fossil fuel inputs?

Climate Change and Food

Several discussion paper authors expressed concern about the impact that climate change could have on Edmonton's food supply. Laura Franceschini said, *"Climate change, soil depletion, and changes in water supply are all negatively impacting [global] food production"*[33]. Debra Davidson supported this position stating, *"One of the most immediate impacts to quality of life in Edmonton [as a result of climate change] will be increases in the cost of living as a result of…increasing costs of food at least intermittently in response to crop failures"*[34]. Compounding the risks of climate change, other authors, including Becky Lipton, expressed concern about Edmonton's reliance on the global food market, estimating that Canadian cities can only feed themselves for about 3 days with the amount of food currently on store shelves. Mark Anielski calculated that: *"With a per capita food footprint of roughly 1.8 gha/capita and only 0.04 gha/capita of agricultural land available within Edmonton, means that Edmonton is, at best, almost 98% dependent on imported 'food land.'"*[35]

Fossil Fuels and Food

Discussion paper author David Hughes explained that the global food system is enormously dependent on fossil fuels both as an energy source and for agricultural inputs to boost production (e.g. fertilizers*),* reminding readers that, *"Hydrocarbons (oil, gas and coal) represent a one-time legacy of fossilized sunshine that has fuelled an unparalleled expansion of population, industrial output and food production over the past two centuries*. *The City of Edmonton, unfortunately, has been built around the growth paradigm of the ever expanding availability of cheap energy. The City far outstrips its capacity to sustain its citizens from locally produced food and other commodities."* Expressing similar concerns about our fossil fuel dependency and its food security implications, Laura Franceschini wrote, *"Food transportation is also becoming an increased challenge. On average, most food in Canada travels 2,400 kilometers to get to your plate*."

A common theme that ran through the Edmonton Sustainability Papers was that although we currently have virtually unlimited access to the global food system; climate disruptions, international protectionist food policies, and ever decreasing fossil fuel availability will likely continue to degrade that level of access. A response to the uncertainty associated with the global food market is to ensure a reasonable percentage of our foodstuffs are sourced more locally.

Suggested Policy Direction:

That the City facilitate efforts to reduce Edmonton's dependence on the global food system (i.e., re-localize its food system) in response to climate change and risks stemming from energy/fossil fuel inputs.

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[33] Laura Franceschini, *Environmental Impacts Beyond Edmonton's Borders – Why we should be worried about butterflies in Africa,* 2010 Edmonton Sustainability Papers, Discussion Paper 11, available at http//www.edmonton.ca/thewaywegreen.
[34] Debra Davidson, *Climate Change – Projections and Implications for Edmonton,* 2010 Edmonton Sustainability Papers, Discussion Paper 6, available at http//www.edmonton.ca/thewaywegreen.
[35] Mark Anielski, *Edmonton's Ecological Footprint,* 2010 Edmonton Sustainability Papers, Discussion Paper 12, available at http//www.edmonton.ca/thewaywegreen.

6.3 What challenges are there around the food system and environment? Is there sufficient information to make informed decisions?

In developing *The Way We Green,* research and stakeholders have highlighted the following priority challenges around food and the environment:

1. **Information gaps:** There is an absence of reliable information on the existing local food system and the benefit of preserving agricultural land within the urban boundaries both to supply food and ecological services. There is not a clear understanding of the extent to which neighbourhood-level food production is contributing to food security. Food system 'mapping' for the City and region would ensure decisions are made on accurate information.
2. **Agricultural Land Preservation and Land Valuation:** Edmonton has lost 74% (17,000 Ha) of its Class 1 soils since 1982 (City of Edmonton, 2009). There are various difficulties in preserving this land for agricultural use. Appropriately valuing land within the City of Edmonton for agricultural use purposes (and possibly the ecological services it provides) is a challenge. As indicated by the Greater Edmonton Alliance in The Way We Eat*, "Of great concern to the City of Edmonton is the financial impact to current land owners [if land was to continue to be used for agricultural purposes]"*. Mechanisms need to be explored to value land appropriately and determine how prime agricultural land can be preserved[36].
3. **Carbon footprint and Energy:** The global food market is energy intensive which increases the ecological footprint of Edmontonians. Eating local, sustainably farmed food and growing your own food offers an opportunity to lower the ecological footprint. Food consumption makes up 21% of a typical Edmontonians Ecological Footprint which was measured to be 7.94 ha/capita in 2009 which is well beyond 'one-planet living' of about 2.1 ha/capita (Mark Anielski, Discussion Paper 12).
4. **Capacity building:** Edmontonians are becoming more disconnected from the food supply and many do not have the skillset to grow their own food or the desire to become involved in agri-business. It has been reported that 41% of farmers in Alberta are above the age of 55, 50% between 35 and 54, and only 9% under the age of 35 (Becky Lipton, Discussion Paper 7). In addition, there is dispersed ownership of the food agenda within the City of Edmonton organization and it is not clear if the capacity and expertise for sustainable urban farming and food systems planning is held within the organization.

Suggested Policy Direction:

That the City collaborate with the University of Alberta, the Capital Region Board, neighbouring municipalities and economic development authorities, and the Government of Alberta to support research surrounding the local food system. Also the City of Edmonton partner with the Government of Alberta and the Capital Region Board to assess mechanisms to better value and preserve urban agricultural land in Edmonton and the region and reduce the carbon footprint of the food consumed in Edmonton and the region.

6.4 What do stakeholders say about the urgency and priority of addressing shortcomings in the local food system?

In early June 2010, *The Way We Green* hosted a set of public workshops to seek feedback on a range of sustainability issues and questions. In one exercise, stakeholders were asked to consider a list of sustainability

[36] This is an area that is being explored by governments around the world. The use of non-market valuation techniques that assign monetary value to nonmarket goods and services is something that could be explored.

challenges that Edmonton might face in the future and indicate which of these were the most important for Edmonton to address. Food was ranked the 3rd highest challenge after energy and water supply.

Later in June another set of workshops were held. Stakeholders were asked to consider food security and what types of policies Edmonton should consider. The majority indicated that the City of Edmonton should moderately or urgently increase the pace of working on food security issues and focus its attention on preservation of agricultural land, promoting local food and reducing carbon footprint associated with the food system. In addition to food being an issue in itself, stakeholders often indicated re-localizaton of the food system as a policy option that must be considered when responding to energy concerns and climate change.

6.5 How should a sustainable society respond to the challenges of food security?

Throughout this project, experts and stakeholders expressed support for a more sustainable local food system in Edmonton. Similar concern was raised by *The Way We Grow,* and a City-wide Food and Agricultural Strategy may be initiated in 2011. Despite strong support for agricultural land to be preserved (for purposes of food security and other ecosystem services) many other Edmontonians believe we can rely on food imports from the region and the globe.

Several discussion paper authors stressed the need to preserve prime agricultural soils. Agricultural class soils are essentially non-renewable within a human timeline, as soil formation takes thousands of years and a complex interplay of climate, biological processes and parent geological material. Becky Lipton (Discussion Paper 7) explained:

> *"Take an apple and pretend it is the Earth. Now, 75% of the world is water, so cut it in quarters and throw away 3 slices. Cut the remaining quarter in half and throw one chunk away because 50% of dry land is mountains, desert etc. Now cut the 12.5% you have left in half, because that land is too steep, rocky, or wet for food production. Less than the 6% of skin you have left has to grow all of the world's food. Only a small portion of that is Class 1, the high quality premium soils that we are blessed with here in Edmonton."*

Once the lands have been developed, it would require significant, costly reclamation to become productive land again, if ever. The city has lost 75% of its Class 1 soils since 1982. The reality is that the decisions we make today are the decisions that Edmontonians will need to live with into the future because once the agricultural land is gone, it is essentially gone forever.

Suggested Policy Direction:

Recognize that high quality premium soils currently used for agriculture are a limited and valuable resource, necessary for human sustainability. Recognize that once they are gone, they are gone forever. Consider these implications when developing agricultural lands and demonstrate that their removal will not diminish Edmonton's long term sustainability.

6.6 What is the municipality's role in establishing a Food Secure Edmonton?

As the Planning and Development Department indicated in its report to Executive Committee on June 16, 2010 on developing a City-wide Food and Agriculture Strategy, many city departments can play a role in developing the strategy and no one department has ownership of the food agenda. In addition, other orders of government, the region, non government agencies and communities all have roles in Edmonton's food system.

While there are many stakeholders involved in a sustainable local food system, the City can play a key role through: land use planning, coordination and partnerships, policies and regulations, education and promotion and researching and implementing mechanisms designed to preserve agricultural land.

The City of Edmonton can play an important role in the advancement of a food security strategy in Edmonton, with the aim to establish a Food Policy Council and Food Charter. Key steps towards this Council / Charter might include:

1. Develop a stakeholder list including subject matter experts.
2. Form the Food Policy Council from the stakeholder list including subject matter experts and City representatives. Ideally the Council would include a diverse group of 10 to 12 people who would bring knowledge and expertise relating to issues connected to the development of a resilient food and agriculture system in Edmonton. Membership could include representatives from all parts of the food system (production, food processing, storage and transportation, selling and buying, eating and waste recovery) as well as individuals with expertise in the areas of public education, economic development, urban planning, landscape architecture, social planning, food security, land development, nutritional health, public health, food research, agrology, etc.[37]
3. Develop a Governance Framework for the Food Agenda (including City Administration).
4. The Edmonton Food Policy Council could have the following functions:
    - Obtain baseline information on urban and peri-urban farms and the overall local food system.
    - Develop the City-wide Food and Agricultural Strategy in close consultation with the City, relevant landowners, and the development and agricultural communities.
    - Develop a Food Charter.
    - Provide input to City Council and City departments in the formulation of Food and Urban Agriculture principles, guidelines and policies.
    - Make recommendations to Council as to changes to other existing bylaws and City policies relevant to Food and Urban Agriculture.
    - Work with City departments to animate and engage the participation of community groups and citizens in supporting the development of a sustainable and local food system.
    - Develop a partnership model for food & agriculture initiatives
5. Develop a sustainable funding model for the organization.

Suggested Policy Direction:

That the City of Edmonton work to establish a Food Policy Council and Food Charter. (Do you agree this is the role of the municipality? Are there other stakeholder groups that are more equipped to lead this endeavour? Is there a partnership model that could be pursued?)

[37] This section was developed in consultation with the Greater Edmonton Alliance

Chapter 7: Air Quality

7.1 Air Quality in Edmonton

Achieving good air quality in an industrialized society is a complex challenge – requiring an understanding of the sources of emissions and the specific geographical conditions of the region.

Edmonton lies within the Alberta Capital Airshed. Adjacent to it are the Fort Airshed and the West Central Airshed. Experts suggest that as Edmonton grows from one to two million people (and beyond), new approaches will be needed to monitor air quality and manage their cumulative effects. In developing *The Way We Green,* our main focus around air was to understand:

- The quality of the air and to what extent air quality in Edmonton is being effectively monitored (i.e., is current monitoring and data analysis sufficient to understand emissions sources and determine whether air quality is protective of human health and ecosystems);
- The challenges associated with maintaining or improving the air quality in the face of future growth both in Edmonton and the surrounding region and the steps that are being taken today to mitigate those impacts; and,
- The roles and responsibilities of various groups in monitoring and managing air quality in Edmonton.

7.2 How is the air quality in Edmonton as measured today?

Edmonton's air quality, as currently measured, has improved significantly since the 1970s (largely due to improvements in vehicle technology). The number of "Good" air quality days in 2009 as measured by the provincial Air Quality Index was in the range of 96%. In general, the majority of days with poor air quality involved particulate matter and can largely be attributed to temperature inversions during the winter months.

According to Matthew Dance, *"Although Edmonton has 'good' air quality over 90% of the time, we do have an issue with two specific pollutants - Particulate Matter (PM) and Ozone (O3) – that are components of urban smog. PM is emitted by combustion from a number of sources including vehicles and wood burning (it is also a component of road dust and can be formed by atmospheric photochemical processes). Ground Level Ozone is not emitted by a source, but occurs as a result of a photochemical reaction between vehicle emissions (including oxides of nitrogen), sunlight and heat."*[38] Alberta Environment's PM and Ozone Assessment (2006 – 2008) indicated that the Edmonton Region had an increasing intensity of ground level ozone that required the development of an ozone management plan. In response, the region produced an Ozone Management Plan that was approved by the province for implementation in late 2009.

7.3 Is today's monitoring and data analysis sufficient?

Currently, the ambient air quality monitoring network in Edmonton is operated jointly by the provincial government and various industrial approval holders. There are three ambient air quality monitoring stations that are configured to measure air contaminants and calculate the provincial air quality index (AQI). These three stations are directly managed by Alberta Environment. Alberta Environment also operates a fourth station that measures only particulate matter (Edmonton McIntyre).

[38] Matthew Dance, *The State of Edmonton's Air Quality,* 2010 Edmonton Sustainability Papers, Discussion Paper 2, available at http//www.edmonton.ca/thewaywegreen.

In addition to the Province's stations, there are seven industry-operated stations that are situated around industrial areas in the east and west areas of the City. These seven stations monitor air quality contaminant concentrations that are specific to the provincial approvals that relate to each of the industrial operators.

The City of Edmonton has a combination of regulated and unregulated emissions sources that experts have said "are poorly understood" and given the number of stakeholders conducting monitoring the network is not currently cohesive and functioning as a whole. According to Matthew Dance (Discussion Paper 2) the situation raises many questions, including:

1. What impact do industrial emissions have on Edmonton's air quality?
2. What is the air quality in Edmonton in all of the places where monitoring does not occur? For instance, the AAQ monitor in downtown Edmonton is located away from major arteries and on the top of a building; does this adequately reflect the air that we breathe at street level?
3. What is the impact of older vehicles and single occupancy vehicles on air quality adjacent to the major roadways in Edmonton?
4. What is the impact on regional air quality when there is a facility exceedence in the industrial areas?

Suggested Policy Direction:

- *That air quality monitoring in Edmonton be expanded in accordance to the recommended 2009 Ambient Air Management Strategy of Alberta (which recommends that communities of 20,000 to 50,000 should have regional air quality monitors).*
- *That an expanded regional air quality monitoring network include the monitoring information collected by industry, analyzing how this data relates to regional air quality and public exposure.*

7.4 What challenges are there for maintaining or improving air quality in Edmonton?

There are four main challenges for maintaining and improving air quality in Edmonton:

1. Developing, implementing and maintaining an air quality monitoring network that can inform decisions on air quality, human health and ecological management programs;
2. Continuing to manage the complex interactions of regulated and non regulated point source and area emissions to maintain high air quality standards that contribute to high quality of human and ecological health in a region that is growing both in industrial emissions as well as nonregulated emissions;
3. Establishing a logical management system that is supported by legislation and policy that clearly outlines the roles and responsibilities of stakeholders around air quality monitoring and management in the region; and,
4. Ensuring Edmontonians have access to relevant information in a timely manner so that they can be aware of the relative health risks associated with current air quality.

7.5 What do stakeholders say about the urgency of these air quality challenges?

In early June, 2010, *The Way We Green* hosted a set of public workshops to seek feedback on a range of sustainability issues and questions. In one exercise, stakeholders were asked to consider a list of sustainability challenges that Edmonton might face in the future and indicate which of these were the most important for Edmonton to address. Air quality was the 5th highest ranked challenge after energy, water supply, food, and biodiversity.

Later in June another set of workshops were held. Stakeholders were asked to consider air quality and what types of policies Edmonton should consider. The majority of stakeholders (>%75) indicated that the City of Edmonton should moderately or urgently increase the pace of working on air quality issues and focus its attention on regulations, promoting technological changes and public awareness.

7.6 How should a sustainable society respond to these air quality challenges?

"The most important thing that can be done in managing Edmonton air quality is to understand in greater detail where the problems are and what their cause is" (Matthew Dance, Discussion Paper 2). It is generally true that you cannot manage what you are not effectively measuring. It is also true that in order to communicate potential risks to the population there must be confidence in the measurement that is being used to determine that risk. An effective air quality monitoring network is required for this to happen.

It is also clear that there is a limit to the amount of growth in emissions that the local airshed will be able to absorb and disperse. There must be tools in place to manage the growth in a manner that adverse cumulative effects are prevented. The Natural Step Framework provides guidance on this matter in one of its four sustainability principles that states: *In a sustainable society, nature is not subject to systematically increasing concentrations of substances extracted from the earth's crust.* Simply put, this principle says it is not sustainable for society to be continually extracting fossil fuels from the earth's crust, combusting them, and systematically increasing the criteria air contaminant concentrations in the earth's atmosphere. This principle is also consistent with the provincial Cumulative Effects Management System that is currently being implemented.

Being a sustainable city means taking steps to sufficiently understand air quality in the region and reduce our pollution levels so that they do not exceed the natural capacity of the airshed to disperse them. At the same time we need to understand that we should not see the capacity of an airshed as pollute-up-to levels, as many of the criteria air contaminants cause some level of health or ecosystem risk even at very low levels (i.e. non-threshold).

7.7 How is air quality managed and regulated in Alberta?

The monitoring and management of air quality in the Edmonton region is the shared responsibility of multiple parties including Alberta Environment, various industrial approval holders, and the provincially endorsed Alberta Capital Airshed Alliance (ACAA), which is a multi-stakeholder group that provides a forum for local stakeholders to design solutions to local air quality issues. The City of Edmonton participates in various air quality management programs as an active member of the ACAA and the Strathcona Industrial Association (SIA).

A sizable body of provincial legislation/direction guides airshed planning in Alberta:

- **Environmental Protection and Enhancement Act (EPEA):** This Act promotes and supports the protection, enhancement and wide use of the environment. The Act gives the Minister power to develop

environmental objectives, standards, practices, codes of practice, guidelines and methods to meet the government's environmental goals.

- **Management frameworks currently in effect in Alberta:**

1. **Acid Deposition Management Framework:** Acid deposition results when acid forming pollutants are deposited on the earth's surface. Sulphur dioxide (SO_2) and oxides of nitrogen (NO_x) are the main acid forming pollutants. Many activities, both personal and industrial lead to the emission these compounds. In Alberta, a management framework has been developed and is based on four levels of acid deposition: pre-industrial deposition (background), current level of deposition, target load, and critical load: Each of the levels of deposition corresponds with specific management practices.
2. **Emissions Management Framework for the Alberta Electricity Sector:** This framework is aimed at continuous improvement of air emissions standards for electricity generation.
3. **Particulate Matter and Ozone Management Framework:** Smog is an air quality issue in Alberta, across Canada, and around the world. Fine particulate matter (PM2.5) and Ozone (O3) are two principal components of smog. In June, 2000, the Canadian Council of Ministers of the Environment established the Canada-wide Standards for Fine Particulate Matter and Ozone. The CASA (Clean Air Strategic Alliance) Particulate Matter and Ozone Management Framework is Alberta's commitment to achieve Canada-wide Standard levels by the 2010 target date. Under the Particulate Matter and Ozone Management Framework, Alberta Environment performs annual assessments of PM2.5 and ozone.
4. **Clean Air Strategy for Alberta:** Alberta's first Clean Air Strategy was published in 1991 and since then, many initiatives and programs have led to improved air quality in the province. Alberta Environment, on behalf of the Government of Alberta, is accountable for air quality in the province; however, the province supports a partnership model, based on consensus decision making for local stakeholders to develop local solutions to local air quality issues (i.e. the airshed model).

   Airsheds were born out of the original 1991 Clean Air Strategy and continue to be the primary model in place in Alberta to monitor air quality and act on local air quality issues. The Clean Air Strategic Alliance submitted a report to the provincial government in 2009 that will be used to inform the update of the 1991 Clean Air Strategy. The report outlined 14 goals, one of which was for municipal planning and design to incorporate sound air quality management principles.

   An ancillary document was produced in support of the Clean Air Strategy, the Ambient Monitoring Strategic Plan (which is also in the process of being updated and a CASA report has been submitted to the province). This document outlines strategies to ensure effective air quality monitoring.
5. **Land-use Framework:** LUF defines the concept of Regional Strategies which requires the development of seven land-use plans based on seven land-use regions. It recognizes the limitations of Alberta's current regulatory system in assessing impacts of new developments on a project-by-project basis (as legislated under EPEA) and identifies a need for a cumulative effects management approach to address the impacts on both existing and new human activities taking place over time.
6. **Cumulative Effects Management Strategy (CEMS):** As stated in LUF, this strategy is about anticipating future pressures and establishing limits on the effects of development on the air, land, water and biodiversity of the affected region. Threshold-based ecosystem management at the local level will be required to establish those limits. The setting of thresholds for ecosystems in regional plans will be supported by watershed planning and the adoption of integrated watershed management plans that include objectives for water quality, in-stream flow needs and healthy aquatic ecosystems.

7. **Alberta Land Stewardship Act (ALSA):** The purpose of this Act is to enable the Government of Alberta to identify economic, social and environmental objectives, and enable sustainable development by taking into account and responding to the cumulative effects of human activity and other impacts. It makes regional plans binding on Albertans. ALSA transforms Alberta's planning process, allowing watershed plans to be inserted into regional plans.
8. **Municipal Government Act (MGA):** The Act defines the broad powers or general jurisdiction of municipalities, requiring every municipality to have a land-use bylaw, and larger municipalities to adopt a Municipal Development Plan. Municipalities will have to align their plans, bylaws and decisions with regional plans. The MGA does not specifically outline a municipality's responsibility around air quality management.

7.8 What is the Clean Air Strategic Alliance, what is the Alberta Capital Airshed Alliance, and why is Edmonton's involvement in these organizations so important?

The Clean Air Strategic Alliance (CASA) is a multi-stakeholder partnership, composed of representatives selected by industry, government and non-government organizations, which recommends strategies to assess and improve air quality in Alberta. A City of Edmonton Councillor is currently representing the municipal sector on the Board of Directors of CASA. Airshed zones, of which the Alberta Capital Airshed Alliance (ACAA) is one, are local organizations that enable stakeholders in a shared geographical area to identify air quality concerns and implement suitable management solutions. In the Business Plan for 2003-2006, Alberta Environment restates that it "support(s) development of a comprehensive network of airshed alliances."

Recognizing the importance of addressing urban air quality, a group of stakeholders (including the City of Edmonton) came together to form an airshed in the part of the Edmonton CMA not yet served by an airshed. This led to the formation of the ACAA in 2006 through the commitment of a number of key stakeholders in the Edmonton area. Since that time the organization has grown and completed a significant piece of work: an ozone management plan for the Edmonton CMA.

The zone approach to managing air quality in Alberta was first proposed in the 1991 Clean Air Strategy, and the primary objective of the Zone Air Quality Management System (CASA, 2003) was to "establish a new approach for dealing with identified air quality problems in specific zones throughout Alberta." The first formal use of airshed zones for this purpose didn't appear until 2003 with the CASA consensus recommendations included in the Particulate Matter and Ozone Management Framework (CASA, 2003). The City of Edmonton participated in the development of the ozone management plan in conjunction with the ACAA and continues to be active in the airshed as it sits on its Board of Directors.

The business plan of the ACAA has the following goals:

1. Ensure comprehensive Air Quality Management in the region
2. Implement a program to measure , monitor and collect scientifically defensible data related to ACAA regional air quality
3. Provide comprehensive and timely air quality information and reporting that is transparent, high quality and accessible.

Suggested Policy Direction:

- *That the City work actively within the Alberta Capital Airshed Alliance to achieve the City's air quality objectives.*

(The roles and responsibilities associated with air quality management are evolving as the province implements the Land Use Framework and the Cumulative Effects Management System. Through an established provincial partnership model, the City of Edmonton is in a position to work closely with the regional body (i.e. the Alberta Capital Airshed Alliance provided the forum for local stakeholders to develop local solutions to air quality issues).

Chapter 8: Biodiversity / Healthy Ecosystems

8.1 What is "biodiversity"?

Key Definitions:

- Biodiversity: *The variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.* (UN Convention on Biological Diversity)
- Ecosystem: *A dynamic complex of plant, animal, and microorganism communities and the non-living environment interacting as a functional unit.*
- Ecosystem Services: *The benefits people receive from ecosystems.*

In her discussion paper, Colleen Cassady St. Clair explained "*biodiversity is a comprehensive concept, encompassing every form of life on Earth and all of the ecological processes associated with life.* [39]

8.2 Why is biodiversity important?

Interdependence between the human species and ecosystems is at the basis of human survival. So closely is biodiversity intertwined with human needs, that it can be considered an element of basic national security and future global prosperity. Yet, around the world, the number of species, the genetic variations within them, and the range of habitats are being affected by human activity. Overpopulation, deforestation, pollution – of the air, water and soil – along with global warming are exerting a cumulative effect on biodiversity. As species disappear, the world's ecosystems are become less stable and more fragile. Living within and sustainably developing the biodiversity around us is central to human existence.[40]

Biodiversity delivers ecosystem services that are sometimes grouped into four categories: (1) Provisioning (goods obtained from ecosystems such as food, fresh water, timber and fibre), (2) Regulating (benefits obtained from natural processes such as climate, disease, erosion, water flows and pollination, (3) Cultural (non-material benefits obtained from ecosystems such as recreation, spiritual values and aesthetic enjoyment, and (4) Supporting natural processes such as nutrient recycling and primary production that maintain all other ecosystem services. Many scientists think that ecosystem services extend beyond the ones mentioned here, including ones that we have yet to discover, understand and appreciate.

8.3 What are Edmonton's biodiversity challenges? What are the challenges from beyond our borders?

Colleen Cassady St. Clair's discussion paper commented on a number of biodiversity challenges facing Edmonton:

- *Between 2000 and 2007, 31% of its designated natural areas were permanently lost to development. This rate of loss exceeds the rate at which other natural areas have been protected at a ratio of 5:2.*

[39] Colleen Cassady St. Clair, *Urban Biodiversity – Why it matters and how to protect it*, 2010 Edmonton Sustainability Papers, Discussion Paper 8, available at http//www.edmonton.ca/thewaywegreen.
[40] From the Website of The National Round Table On the Environment and the Economy, August 30, 2010.

- *Natural areas outside the river valley and ravines, the so-called tablelands, are most at risk. Only 2.3% of the protected areas in Edmonton fall into this category.*
- *Wetlands are also at considerable risk with few protected sites and no policy of preventing net loss of wetlands, in contrast to Calgary.*
- *The most important contributor to biodiversity is the retention of natural habitat and the window is closing on Edmonton's opportunity to protect what remains.*
- *More often, potential natural habitat is degraded by procedures like mowing and pesticide application to support human activities or traditional aesthetic values. In the US, over 80% of US households apply fertilizer to their lawns and about 65% apply pesticides.*
- *In Edmonton, mowed parkland has dramatically fewer small mammals and bird species than grassland habitat that is not mowed. Additional degradation of habitat occurs passively through the spread of noxious weeds, competition with aggressive urban-exploiting species, and the insidious effects of climate change.*
- *One of the most prevalent forms of habitat degradation is seldom acknowledged; it is caused by the dissection of natural areas to support the transportation network. This problem is already prevalent in the city core, but it is rising rapidly on the fringes of the city to support the sprawl of residential neighbourhoods.*

A recent article in Science magazine (May 28, 2010, Volume 328) provided this global perspective on biodiversity loss:

> *In 2002, world leaders committed, through the Convention on Biological Diversity, to achieve a significant reduction in the rate of biodiversity loss by 2010. We compiled 31 indicators to report on progress toward this target. Most indicators on the state of biodiversity (covering species' population trends, extinction risk, habitat extent and condition, and community compositions) showed declines, with no significant recent reductions in rate, whereas indicators of pressures on biodiversity (including resource consumption, invasive alien species, nitrogen pollution, overexploitation, and climate change impacts) showed increases. Despite some local successes and increasing responses, (including extent and biodiversity coverage of protected areas, sustainable forest management, policy responses to invasive alien species, and biodiversity-related aid),* ***the rate of biodiversity loss does not appear to be slowing.*** [41] (bolded for emphasis)

While it is unclear how much biodiversity loss can be sustained on Earth before there are serious consequences for human society, there is no doubt that this trend is not sustainable. Arguably, biodiversity loss on the planet is one of the most serious challenges facing Edmontonians over the long term.

8.4 What commitments has Edmonton made to biodiversity?

The City of Edmonton's commitment to biodiversity is best exemplified by its signing of **The Durban Commitment – Local Governments for Biodiversity** in 2008. In signing this commitment, the City formally acknowledged:

- Biodiversity is increasingly under pressure with unprecedented rates of loss due to human activities including the over-consumption of natural resources;
- Increasing global trends towards urbanization are placing increased direct pressure on biodiversity at both the local area level and globally through increased resource consumption and ecological footprints;

[41] Sturt H.M. Butchart et al, Global Biodiversity: Indicators of Recent Declines, Science, Volume 328, May 28, 2010.

- The impacts of climate change on biodiversity pattern and process will be significant and therefore we need to build appropriate programs to address, mitigate and adapt to these changes;
- Future sustainable development and human well-being are dependent on our ability to meet the biodiversity challenges we face;
- Ecosystem services can play an important role in poverty alleviation and as a result the consequences of biodiversity loss and ecosystem disruption are harshest for the poor;
- It is our collective responsibility to reverse the current trends of biodiversity loss; and
- Local government, which works most closely with communities and biodiversity, has a critical role and responsibility (globally, nationally and locally) to ensure that biodiversity is conserved, protected, restored and used in sustainable ways for the benefit of current and future generations.

In signing this Commitment, the City also agreed to carry out a number of actions including, but not limited to:

- Promoting, increasing and enhancing biodiversity within the City's administrative area and integrate biodiversity considerations into all aspects of our governance and development planning.
- Regularly publish *biodiversity reports* on the state of biodiversity within our administrative area and our progress in protecting biodiversity, which will stand as public record;
- Contribute towards the formulation of globally relevant local authority biodiversity good practice guidelines;
- Develop and implement a long-term local *biodiversity strategy* for our administrative area and governance practices, which will address, for example:
- The consideration of biodiversity in all aspects of local planning including, amongst other things: land-use planning, mobility planning, economic development planning, and conservation planning;

In addition to this declaration, the City has taken many tangible steps to protect/preserve/enhance natural areas and ecological networks, restore ones that are damaged, and protect wetlands and the river valley.

- Prior to endorsing the Durban Commitment In 2007, City Council passed the Natural Area Systems that lays out the City's commitment to protecting the last of our natural space and endorsed the Natural Connections Strategic Plan which lays out the City's strategy to protect nature. The implementation strategy is outlined the City's Biodiversity Action Plan.
- In 2009 City Council passed the Natural Areas Acquisition Strategy and authorized the Administration to borrow $20 million to accelerate the purchase of natural areas before they are lost, as well as an ongoing commitment of $1 million per year to purchase significant wetlands.
- The City of Edmonton fostered the creation of the Edmonton and Area Land Trust. A community-based non-profit company, it is designed to conserve natural areas.
- One of City Council's 3 year priority goals is to increase citizen access to ecological systems.
- The City continues to make significant advances in securing natural areas. In 2009, 110 ha were secured for a total of 3715 ha. This area represents 5.3% of Edmonton area that is secured in a natural state, relative to the target of 8%.
- The Province is currently reviewing the planning section of the Municipal Government Act and will likely introduce a new Provincial Wetland Policy in 2010. Positive changes will grant broader authority to municipalities to protect nature. (Note: As the Alberta Land Stewardship Act takes precedence over other

provincial legislation including the MGA, there will be a need to undertake a careful review of this new legislation and the implications that it will have for biodiversity protection.)

- In new neighbourhoods at least one natural area is conserved as part of the City park system, (as per the Natural Areas Systems Policy and the Natural Connections Strategic Plan that were approved in 2007).

Despite these outstanding accomplishments and the City's leadership in the field, Edmonton continues to lose natural areas faster than they are being secured.

8.5 What more can the City do to achieve its Durban Commitment – to increase biodiversity?

The City of Edmonton's commitment to "increase" biodiversity represents a sizable challenge. As cities expand outward and intensify, lands that are rich in biodiversity are developed for other uses. While the City of Edmonton has been a leader in stemming the loss of natural areas, more natural areas are lost than are protected in any given year. New tools will be needed to achieve its Durban Commitment – to actually "increase" biodiversity.

Biodiversity Offsets

Experts generally agree that the best practice for promoting biodiversity is to prevent or minimize the loss of biodiversity in the first place. Nevertheless, some losses are unavoidable, and other forms of compensation are required when these losses occur. One strategy that is commonly used around the world involves "biodiversity offsets". A biodiversity offset is *"an action undertaken to counterbalance an impact that causes a loss of biodiversity values"* (Queensland Government, Australia).

Currently, the Government of Alberta requires offsets for wetlands that are lost in Edmonton. According to this regulatory requirement, developers must restore or create wetlands elsewhere to compensate for ones lost, i.e., no net loss. While the City would prefer the offsets to be located within Edmonton, the Province often allows them in locations that are far from Edmonton. The City of Calgary has taken measures to counteract this practice, requiring full compensation for wetland losses to occur within Calgary. Some stakeholders who participated in The Way We Green project encouraged the City of Edmonton to consider a similar offset policy for Edmonton wetlands and forests.

Edmonton is also experiencing biodiversity loss (trees, shrubs, tree canopy) in its inner neighbourhoods due to intensification. As in the case of wetlands, offsets may be a useful strategy for stemming further loss of tree canopy. In jurisdictions where this approach is used, developers are required to replant/replace trees and shrubs that are lost through development. Currently, the City requires trees and shrubs to be planted in some land use zones as a condition of obtaining a development permit. However, there is no consideration given for the planting of native species. However, this practice is not universal. Some stakeholder who participated in the Way We Green project encouraged the City to apply this approach more widely to the entire development permitting process.

Suggested Policy Direction:

- *That the City use: (a) biodiversity offset strategies to replace biodiversity that is lost through developments and (b) other appropriate tools as provided for in the Alberta Land Stewardship Act.*

8.6 Would the City benefit from a more unified strategy for managing Edmonton's biodiversity?

The City's main strategies for conserving biodiversity are outlined in the Natural Connections Strategic Plan and the accompanying Biodiversity Action Plan. These plans focus principally on natural areas with some acknowledgement of the importance of biodiversity throughout the City. The City of Edmonton is the largest landowner is Edmonton and administers numerous biodiversity related activities and applications that are subject-specific, including: the Urban Forest Management Plan, Zoning Bylaw landscaping requirements, parks landscaping requirements in the Blue Book, and planting for the LRT.

While the City has developed an excellent set of policies to protect/preserve/manage natural areas, some stakeholders encouraged the expanding of this strategy to address biodiversity in its entirety with a unified strategic approach. Questions that would be addressed in such a strategy would include: Should Edmonton have more trees? Where should they be located? Should Edmonton have more ecological connectivity? What is the appropriate mix of native and non-native species? Should there be more green roofs and green walls? How can we design and build our infrastructure in ways that support ecological function?

One approach for addressing these issues would be the development of a **City-wide Integrated Biodiversity Strategy** that lays out the City's biodiversity aspirations and the detailed strategies for achieving them. A key component of this plan would be the ongoing monitoring and measurement of biodiversity throughout Edmonton, including: Are we losing or gaining trees and shrubs? Are some species showing signs of stress because of climate change? How is biodiversity being protected/enhanced/lost on both private and public lands? The introduction of this approach could lead to significant biodiversity gains for Edmonton whereby the whole could be greater than the sum of the parts.

Suggested Policy Direction:

- *That the City, in keeping with The Durban Commitment, establish, implement and maintain an overarching City-wide Integrated Biodiversity Strategy that encompasses the existing Natural Connections Strategic Plan, providing additional focus on non traditional ways of increasing biodiversity in Edmonton.*

In keeping with the need for a greater focus on biodiversity, The Way We Green will provide an umbrella strategy statement that placing increased emphasis on the following items:

- *The need for Edmonton to assign even higher priority to biodiversity: The strategy will recognize the central importance of biodiversity (locally, regionally and globally) to Edmonton's sustainability.*
- *The need to protect natural areas as anchors: The strategy will recognize the need for protected areas that serve as anchors for Edmonton's biodiversity system (taking a "no net loss" approach and a "no further loss of priority natural areas" approach). The strategy statement will also stress the importance of this approach throughout the region and beyond.*
- *The need for strong natural connections: The strategy will recognize that in isolation, individual protected areas are not self-sustaining. They need to be connected to other natural areas in the region and beyond. This requirement applies equally to protected areas in the river valley /ravines and tablelands. The strategy will recognize the need to work actively to protect, preserve and create natural connections throughout the city, region and beyond that will support high levels of biodiversity.*
- *The need for areas that surround natural areas to also be healthy, i.e. conservation planning for whole landscapes: Recognize that the health of these protected areas depends on the health of the land around them. Much can be done to improve the health of surrounding roads, parking lots, buildings, residential yards and commercial / industrial areas. Work aggressively to improve biodiversity in all parts of Edmonton, including efforts to significantly increase Edmonton's forest cover from 10% to 20%-30%.*

<u>The need for a strong supporting management system</u>: The strategy will stress the need for a management system to implement the existing body of biodiversity policies, previously approved by the City (as per Part 13 of this White Paper). [Expert panel member, Guy Swinnerton, stressed "It is critical that this supporting management system includes a comprehensive assessment and reporting system that monitors the on-going success of the suggested policy direction actions and ensures timely feedback in order that an effective adaptive management approach is adopted in protecting biodiversity."]

- *The need to consider biodiversity in all of its decision making, plans, and designs.*

The main driver of this strategy is the serious loss of biodiversity that is happening globally. The strategy will call for strong local action to stop biodiversity loss (i.e., think globally, act locally) and the need for Edmonton to advocate for biodiversity protection regionally and beyond.

Chapter 9: Waste Management

9.1 What waste management challenges/opportunities face Edmonton?

The City of Edmonton has developed a national/international reputation for its leadership in waste management. While its success has been largely in the area of residential waste and its diversion from landfill, it is now in the early stages of expanding services to include non-residential waste (and similarly, its diversion from landfill).

Residential Waste

An estimated 40% of all waste generated in Edmonton is from the residential sector. Sixty percent of this is diverted from landfill – twice the Canadian waste diversion rate average. Edmonton's impressive diversion rate is accomplished through recycling (approximately 20%), municipal composting (approximately 35%) and an additional 5% waste reduction practiced by residents through composting, grasscycling and reuse. An even higher rate of diversion (a remarkable 90%) is expected by 2013 when the waste-to-biofuels facility becomes operational. This facility will process non-recyclable and non-compostable waste, converting it to alcohol. It will be the first municipal waste-to-biofuels facility that accepts processed mixed residential waste.

Non-residential Waste

An estimated 60% of all waste generated in Edmonton is from the non-residential sector which includes:

- Industrial, commercial and institutional waste (ICI); and,
- Construction and demolition waste (C&D).

While some ICI and C&D waste is delivered to the Edmonton Waste Management Centre (EWMC), the majority is hauled to privately owned landfills in the Capital Region, making it difficult to estimate total volume and diversion rate for Edmonton. It is estimated that approximately 10%-15% of C&D waste is currently recycled in Alberta. The latest available national data from 2006 by Environment Canada show a waste diversion rate of municipal solid waste, including residential, ICI, and C&D waste streams of 22%.

Given this situation, Edmonton's greatest waste management opportunities lie with non-residential waste, and the potential to recycle significant quantities of waste that are currently being landfilled throughout the region The City is keenly aware of this challenge and is aggressively pursuing solutions such as the development of a commingled C&D waste recycling operation that will handle up to 50% of material generated in Edmonton. As well, City services are being expanded to include additional collection and processing of non-residential refuse and recyclables.

Similarly, the Provincial Government's waste strategy, *Too Good to Waste*, identifies a goal of recycling and recovering 80% of Alberta's waste. A provincial C&D waste reduction program will help provide incentives to reduce, reuse, and recycle more of this waste stream. This program is expected to be implemented by the Province in late 2011 or 2012. One of its key recommendations is a deposit-refund program whereby builders apply for a refund of their pre-development deposit by submitting documentation of material diverted for recycling and waste sent for disposal.

A second important opportunity involves residential waste. Although Edmonton's waste management technologies and systems have made it a leader in waste diversion from landfill, Edmontonians still continue to

generate large quantities of waste. Based on 2004 data, Albertans produce more waste per capita than any other province in Canada. According to the Conference Board of Canada (2005 data) Canada generates more municipal waste per capita annually than any of its peer countries and twice as much as Japan (who generated the least of the peer countries).

Also, according to the Conference Board of Canada, "To achieve more sustainable municipal waste management practices, the challenge will be to reduce the amount of solid waste generated, while increasing the amount of waste diverted from landfills through recycling and other initiatives in an economically feasible way."[42] The good news is that Edmonton has the second part of this challenge well in hand – it is and will continue to be a leader in waste diversion.

9.2 How should a sustainable society respond to this waste management challenge?

Why should Edmontonians be concerned about the increasing amount of waste they are generating, as long as it can be composted, recycled or converted to biofuels? Mainly because high levels of waste mean high levels of consumption, and all indicators tell us that Edmontonians are consuming resources at a level that is unsustainable. As noted by Discussion Paper author Laura Franceschini, *"The most significant environmental challenge facing humanity today is natural resource depletion, which contributes to all other global environmental issues. Tied into natural resource depletion is the issue of waste management, as consumption of natural resources produces large amounts of waste. Currently the footprint of humanity is larger than the global carrying capacity of the Earth, which means that we are consuming resources faster than they can be produced or processed."*

In 1988, Edmonton collected 164,000 tonnes of residential waste. The total is about 40% higher today. While this increase is generally in line with Edmonton's population increase, the trend is not sustainable. Continual increase in the amount of waste we generate is counter to a number of the sustainability principles in Section 2.2 of this paper, most notably Principle #10 by Richard Heinberg which states: *Population growth and/or growth in the rates of consumption of resources cannot be sustained.*

Some experts on this subject suggested that this high amount of waste was probably a combination of our own behaviour and what industry provides through packaging. It was felt that packaging represented a large percentage of the problem and that amendments to provincial and federal standards would need to address it.

Suggested Policy Direction

- *That the City develop and administer programs to encourage reduction of residential waste production per person with a goal to reduce residential waste produced in Edmonton regardless of population and economic growth.*
- *That the City work with the non-residential sectors to achieve the same waste diversion rate that will soon be achieved by Edmonton's residential sector.*
- *That the City work to influence provincial and federal legislation and standards to reduce the amount of packaging waste.*

[42] Laura Franceschini, Stantec Consulting Ltd, *Environmental Impacts Beyond Edmonton's Borders – Why we should be worried about butterflies in Africa,* 2010 Edmonton Sustainability Papers, Discussion Paper 11, available at http//www.edmonton.ca/thewaywegreen.

Chapter 10: One Planet Living

10.1 Global Biocapacity Equity

A number of the Edmonton Sustainability Papers talked about the average Canadian's large ecological footprint. Laura Franceschini[43] said, *"The average Canadian has the third largest ecological footprint in the world – 7.25 hectares per person. This means that we consume a disproportionate share of the earth's resources – almost 4 times the average. We are fortunate that Canada is a vast and sparsely populated country, thus we technically have a domestic surplus of natural capital. However, this pattern is not sustainable is not equitable.* Discussion Paper author Mark Anielski expanded the discussion saying, *"In 2008, Edmonton's ecological footprint of 8.56 gha/capita was 3.2 times greater than the world's average of 2.7 gha/capita and 4.1 times greater than the planet Earth's biocapacity of 2.1 gha per person."*

Anielski also raised the question, "should we feel comfortable enjoying a healthy biocapacity surplus or feel an ethical and ecological sense responsibility to other world citizens to reduce our footprint to a one-planet lifestyle.

Clearly this is a complex and controversial topic. Even if Edmontonians were to live in a much more sustainable way, their average ecological footprint would still be much larger than the world's average, given the energy demands of a winter city. Is this a topic The Way We Green should be addressing? Should Edmonton be striving to achieve an ecological footprint that reflects a one-planet lifestyle?

Expert Panel Member, Pong Leung (Principal Advisor, The Natural Step Canada) offered his insights on growth, stating, *"I like the idea of reframing growth away from GDP, towards genuine progress indicators."* He suggested that society should consider the possibility of defining growth in terms of *the things that are most important to us …protection, security, affection, understanding, participation, leisure, recreation, identity and freedom."*

Suggested Policy Direction:

That the City, working closely with citizens, set an ecological footprint target that represents: (a) the realities of a winter city, and (b the tradeoffs it is prepared to make in moving toward global biocapacity equity (i.e., one planet living).

For Discussion: *Sustainability experts suggest that we need to start to look at what prosperity could look like without growth and that we need to acknowledge that promoting unlimited growth in a finite world is problematic from an environmental conservation and preservation perspective. Is this a concept that should underlie long-term environmental sustainability planning in The Way We Green?*

[43] Laura Franceschini, Stantec Consulting Ltd, *Environmental Impacts Beyond Edmonton's Borders – Why we should be worried about butterflies in Africa,* 2010 Edmonton Sustainability Papers, Discussion Paper 11, available at http//www.edmonton.ca/thewaywegreen.

Chapter 11: The Way We Green – A Regional Context

The Way We Green will focus primarily on the environmental sustainability challenges facing Edmonton and their corresponding strategies. Despite this "Edmonton" focus, The Way We Green understands that Edmonton's environment is part of the global ecosystem and must be considered within a larger regional, provincial and global context. Think globally, act locally.

While it is beyond the jurisdiction of the City of Edmonton to control environmental matters beyond its borders, this White Paper identifies a number of areas where it is important for Edmonton to partner with stakeholders in the Alberta Capital Region and other Alberta regions to achieve objectives related to biodiversity, air quality, river ecosystem health and food security.

In recent years, a regional planning framework has been established that will allow Edmonton to promote its environmental goals to the region. The following is an overview of that framework.

Alberta Land Stewardship Act

On October 1, 2009, the *Alberta Land Stewardship Act (ALSA)* was proclaimed. The ALSA sets out a regional planning process developed to improve the management of land and natural resources. ALSA provides direction for the development of regional plans, including strategies that will need to be implemented as part of regional plans. ALSA requires that these plans account for the cumulative environmental effects that planned activities have on the land. Although municipalities have the same decision-making authority as they did before the ALSA, they will have to align their plans, bylaws and decisions with regional plans.

Land Use Framework

Prior to the ALSA being proclaimed, the province developed the Land-use Framework (LUF). The LUF "is a comprehensive approach to planning to better manage public and private lands and natural resources to achieve Alberta's long-term economic, environmental and social goals." There are seven regions defined under the LUF based on major watersheds; Edmonton resides in the North Saskatchewan region. LUF and the *Water for Life Action Plan* call for the completion of a management plan for the North Saskatchewan River focusing on cumulative effects. Each region will eventually need to develop a regional plan as well as sub plans.

Capital Region Board and the Capital Region Growth Plan

In April 2008, the Province of Alberta passed legislation creating the Capital Region Board (CRB), a body made up of the City of Edmonton and 24 surrounding municipalities. The CRB was tasked to create one of the first of the aforementioned sub plans. *The Capital Region Growth Plan: Growing Forward,* was submitted to the Minister of Municipal Affairs in stages beginning on April 2, 2009 and ending on December 31, 2009. The CRB was required to include four component plans in the Capital Region Growth Plan:

- A comprehensive, integrated regional land use plan that identifies priority growth areas and sets density targets;
- A regional inter-municipal network transit plan;
- A plan to coordinate geographic information services; and,

- A plan for social and market affordable housing.

The Province adopted the *Capital Region Growth Plan* by regulation effective March 31, 2010. *The Capital Region Growth Plan* sets the stage for growth in and around Edmonton and will have a direct link to Edmonton's long term environmental sustainability.

The Capital Region Growth Plan and Environmental Sustainability

The following Land Use Principles were adopted by the CRB to guide the decisions in the Capital Region Growth Plan:

1. Protect the Environment and Resources
    a. Preserve and Protect the Environment
    b. Preserve Agricultural Land
    c. Protect Natural Resources
    d. Minimize the Impact of Development on Regional Watersheds and Airsheds
    e. Minimize the Impact of Heavy Industrial Developments
2. Minimize Regional Footprint
3. Strengthen Communities
4. Increase Transportation Choice
5. Ensure Efficient Provision of Services
6. Support Regional Economic Development

Agricultural Land

Although the growth plan does not directly deal with agricultural land, the CRB has indicated its willingness to work with the province on establishing mechanisms and approaches to preserving agricultural land. The CRB recommended that the province provide legislative provisions for the preservation of agriculture land, in the context of the Land Use Framework, by end of 2010.

Public Transit

The Inter-municipal Transit Network Plan is being promoted as improving the long-term sustainability of Alberta by aligning with the provincial Energy Strategy and policies targeted at reducing Greenhouse Gas (GHG) emissions. The plan states that a more effective, higher usage regional transit system will consume less energy, emit fewer GHGs and emit fewer pollutants.

Implementing Regional & Sub-regional Plans: Cumulative Effects Management

The Cumulative Effects Management System (CEMS) has been developed by the province to assist in implementing the regional and sub-regional plans. The CEMS defines a formal process that considers *place-based* environmental outcomes in the context of continued economic prosperity and promotion and development of liveable communities. The CEMS is intended to acknowledge the limits of local ecosystem capacity and shift away from single medium, incremental environmental management to multi-media, cumulative effects management.

Chapter 12: Principles of Resilience & their Application

Resilience is *the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks.* As explained in Section 1.3, Edmonton's resilience will be one of the main focuses in The Way We Green.

Previous sections of this White Paper outlined sustainability and resilience challenges Edmonton might face relative to energy, climate change, river water quality and supply, air quality, food security, and biodiversity. They also proposed policy directions aimed at making Edmonton a more sustainable and resilient city.

Without repeating these challenges and proposed policies, this section highlights some general approaches to becoming a resilient city, as proposed in one of the Edmonton Sustainability Papers: *Resilient Edmonton – How and Why*, by Craig Applegath.

12.1 Principles for Creating Capacity for Greater Resilience

Applegath suggests there are *"seven key planning and design principles that apply to creating the capacity for greater resilience in cities"*:

1. ***Carbon neutrality:*** *Clearly, we must aim not to increase the net amount of carbon dioxide or other greenhouse gases in the atmosphere. Design and planning must be predicated on low fossil fuel usage in both the construction and operation of buildings and the cities they comprise.*
2. ***Redundancy of Systems and Functions:*** *The downward slope of the peak oil curve, in combination with increasingly more energetic weather, means cities and their communities will need to withstand more frequent and powerful environmental stressors. This forces a need for redundancy of infrastructure systems—including electrical power, fresh water supply, fuel supply, waste-water processing and, most importantly, food supply.*
3. ***Systems Diversity:*** *This is important because with greater diversity comes greater ability to thrive, survive and bounce back from external stressors. In the case of cities, we will need different business types, institutions, food sources, and industries.*
4. ***Systems Durability:*** *In many parts of the world, global warming will increase the frequency of storms, the velocity of peak winds, and the volume and duration of precipitation. As a result, we will require more durable systems and structures that can withstand these increased stresses.*
5. ***Loop Tightness:*** *This is a system's ability to detect and respond to changes in its parts. The more quickly a system detects and responds to changes the greater its potential for resilience. Hence, we will need social, economic, and technical systems with tight feedback loops.*
6. ***Local Self-Sufficiency:*** *Cities and their communities will need a sustainable supply of goods and services including food, fuel and power, water—and basic manufacturing of clothing, building materials, and tools. In larger cities, self-sufficiency should be aggregated at the neighbourhood level.*
7. ***Responsive to Natural Systems:*** *This will reduce the cost of creating and maintaining technical infrastructure. It should, for example, incorporate passive solar energy into urban planning – the layout of streets and neigbourhoods – and building design.*

12.2 The Concept of "Resilience Centres"

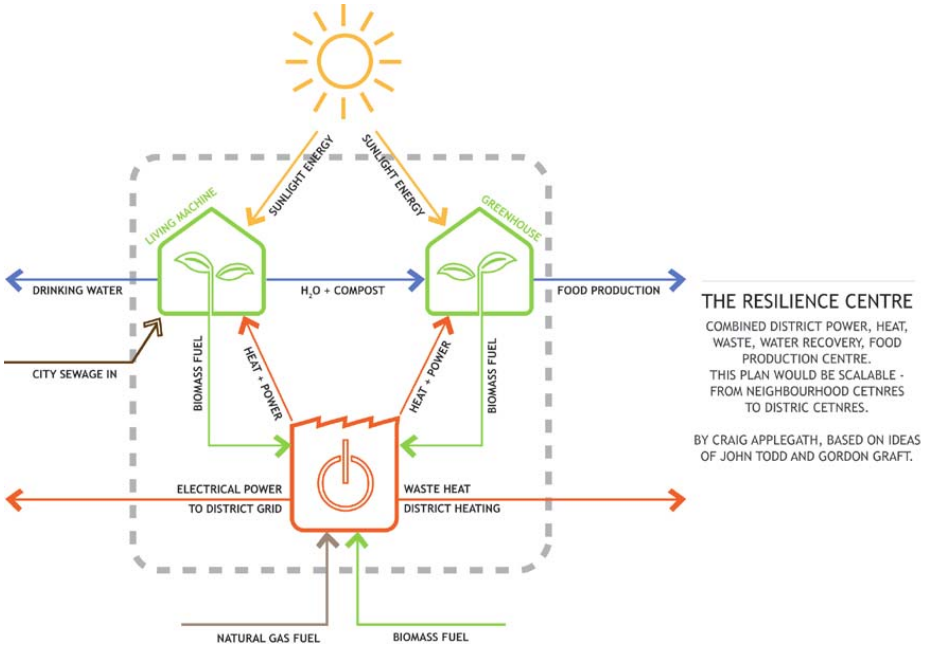
Building on these principles, Applegath undertook a Threats, Weaknesses, Opportunities and Strengths (TWOS) analysis in five areas: (1) water, (2) food, (3) energy, (4) transportation and (5) miscellaneous. From this, he sketched out how Edmonton might be able to implement some of the key opportunities using what he termed "Resilience Centres" (i.e., neighbourhoods that integrate opportunities for capacity-building in three critical systems – water, energy, and food – into a single, self-contained unit.)

Key features of Applegath's Resilience Centres included:

- Integrated use of a district co-generation, able to burn both natural gas and biomass as fuel;
- A biological waste water reprocessing unit (often referred to as a Living Machine); and
- A hydroponic greenhouse for food production. These centers could be implemented at either a neighbourhood scale or a district scale.

Expected benefits of these centres included :

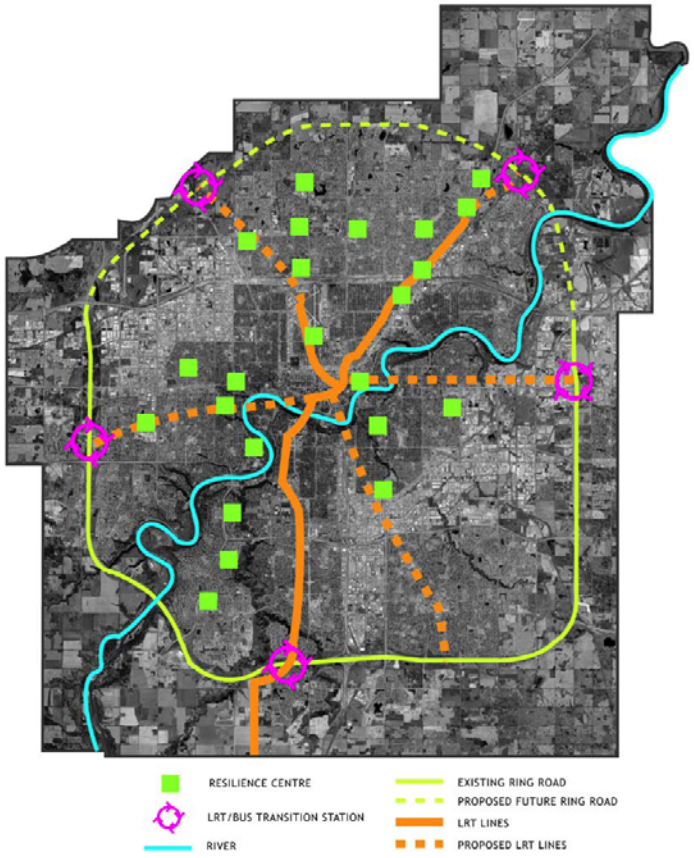
- Reprocessing and conservation of water – potable water could be extracted from waste water.
- Creation of biomass for use as fuel and as compost
- Creation of district electrical power – from either natural gas or biomass [44]
- Creation of district heat – as a byproduct of the creation of electricity
- Creation of food – as a by-product of waste heat, and compost.



[44] Reviewers of this White Paper commented that the amount of biomass available to Edmonton was limited.

Applegath expanded on this model, noting, "*… extensive oil refinery operations in Refinery Row in the Southeast end of Edmonton produce a tremendous amount of hot water that could be used for district heating. In fact, just next-door is Sherwood Park, is an industrial park that could be heated with this waste heat. A modified Resilience Centre could take advantage of this wasted heat, capturing it for greenhouses that could be set up for the production of food. As a discussion paper by the Pembina Institute observes, this kind of co-generation offers considerable potential for reducing emissions because it is highly efficient, loses less power from transmission, and burns biomass or natural gas, which produces as much as 50% fewer greenhouse gas emissions than coal-burning. And the emphasis on district power provides the city a chance to promptly address priority areas with more urgent problems instead of waiting for larger, more distant power plants to come online. For example, the southwest and northeast Edmonton has experienced brownouts due to insufficient power supply. Using a Resilience Centre to provide district power in the four quadrants of Edmonton would allow the city to address this problem immediately.*"

Strategy Map Showing Possible Location of Resilience Centres



12.3 Urban Design Principles

Applegath's discussion on resilience with a set of Urban Design Principles which he recommended for Edmonton:

1. ***Density, Diversity and Mixed-use****: Creating resiliency and reducing the carbon footprint of urban development requires the use of space and land to be maximized. A vibrant and sufficiently densely populated urban environment, by contrast, is well-used around-the-clock, all days of the week, and during all seasons.*
2. ***Pedestrians First****: Resilient cities and neighbourhoods should prioritize walking as the preferred mode of travel, and as a defining component of a healthy quality of life. Reducing car dependency is a key objective and imperative.*
3. ***Transit Supportive Planning****: Resilient cities and neighbourhoods should be planned and developed to be transit supportive. After walking and cycling, public transit is the most sustainable mode of transportation.*
4. ***Place Making****: To increase its resiliency, Edmonton should focus energy and resources on conserving, enhancing and creating strong, vibrant places which are a significant component of the neighbourhood's structure and of the community's identity.*
5. ***Complete Communities****: Resilient neighbourhoods should provide for the needs of daily living within walking distance (a 500 m radius)[45]. Resilient communities reduce their carbon footprint by ensuring people opt to walk or cycle, instead of using a car.*
6. ***Integrated Natural System****: Resilient cities and their neighbourhoods should conserve and enhance the health of natural systems and areas of environmental significance and aim to mitigate the impacts of climate change.*
7. ***Integrated Technical and Industrial Systems****: The importance of reducing negative environmental impacts of economic activities and processes, as well as reducing their dependence on fossil fuels will require us to develop more integrated and more highly efficient industrial processes and technical systems that ensure a maximum of efficiency in the use of both materials and energy resources, as well as the elimination of wasteful and potentially harmful by-products.*
8. ***Local Sources****: Resilient regions, cities and neighbourhoods should support and encourage growing, producing and manufacturing the resources they need in close proximity (200 kilometre radius).*
9. ***Engaged Communities****: The development of resilient cities and neighbourhoods will require the active participation of community members at all scales. Residents and stakeholders must be part of planning and designing their cities and their communities. They must also be part of delivering a new vision: by choosing to walk, by engaging each other, by generating awareness and by demanding higher standards.*
10. ***Redundant and Durable Life Safety and Critical Infrastructure Systems****: Resilient cities and neighbourhoods should plan and design for redundancy and durability of their life safety and critical infrastructure systems. Planning and design of these systems will aim for levels of redundancy and durability that are commensurate with the increasing environmental, social and economic stresses associated with the impacts of climate change and peak oil. Key infrastructure such as drinking water supply, electrical power, and residential heating in winter and key life safety systems such as police, fire and emergency response services ...*

[45] In its review of this White Paper, the City's Transportation Planning Branch noted that 800m (not 500m) is the distance most widely accepted by the planning profession.

11. ***Resilient Operations**: Resilient cities and neighbourhoods should develop building types and urban forms that provide for reduced serving costs and reduced environmental footprints. Urban sprawl is extremely expensive to service and maintain – the amount of land, roads, pipes and infrastructure required per capita is disproportionately large. A compact, mixed-use urban environment, by contrast is far more efficient in its demand for municipal services and infrastructure requirements.*

Suggested Policy Direction:

- *That the feasibility of Resilience Centres be formally evaluated.*
- *That Applegath's Principles for Creating Capacity for Greater Resilience and Urban Design Principles be adopted as the basis for resilience planning in the City of Edmonton.*

Chapter 13: Implementing *The Way We Green*

13.1 Key Success Factors in Implementing The Way We Green

The Way We Green is a transformative plan that will take 30 years (or more) to fully implement. It will fundamentally challenge the way Edmontonians think about the environment and how they live within its limits. Implementation of this multi-faceted plan will require a deliberate, designed and sustained effort, with special consideration for the following:

- A well defined management/implementation process;
- Leadership;
- Community engagement; and,
- Statutory tools.

13.2 A Well Defined Management / Implementation Process

Building on the ISO 14001 Standard

For any strategic plan, the ultimate measure of success is the achievement of its stated goals / outcomes. In order for The Way We Green to be successful, it will need to do more than just describe sustainability/resilience goals and the path leading to them. It will need to establish, implement and maintain a process that will continually move Edmonton along this path; not stopping until the goals are reached. Generally, this will involve: (1) continual effort to implement the policies contained in The Way We Green, (2) regular checking to assess whether desired results are achieved and implementation is being carried out as intended, (3) periodic management review to evaluate the effectiveness of the strategy and the implementation process, and (4) periodic revision of the strategy and implementation process to reflect new information and lessons learned. (See Figure 3)

This cyclical process is part of many management systems including the City's ISO 14001 environmental management system (i.e., Enviso). ISO 14001 is an international standard, designed to help organizations continually improve their environmental performance. It is built on a continual improvement model developed by William Deming in the 1950s – the same model used to transform the Japanese auto industry in the 1960s and 70s.

The following are some of the key requirements of ISO 14001 that could be used in implementing The Way We Green:

- Edmonton's sustainability/resilience goals (i.e., ultimate end states), objectives (i.e., how these end states will be accomplished) and performance measures / targets will be documented in The Way We Green, as approved by City Council. Responsibility for establishing, implementing and maintaining The Way We Green should be formally assigned to a senior level manager or committee (such as the Environmental Policy Leadership Committee).
- Detailed plans should developed for each of the objectives contained in The Way We Green. Responsibility for establishing, implementing and maintaining these plans should be formally assigned (perhaps at the General Manager or Branch Manager level). Responsibility for implementing the

various initiatives in these plans should also be specifically assigned (perhaps to Director-level staff) along with implementation timeframes and resources.

- Implementation of the various initiatives should be effectively managed / controlled according to the risks they pose. In particular, competencies related to the various initiatives should be determined and met, training and awareness needs would be determined and met, operational control procedures would be developed where needed, documents and records would be controlled, communication plans would be developed to ensure staff was appropriately informed about the plan and its progress.
- Processes should be established to ensure implementation occurs according to plan, including: (a) monitoring/measuring tools to let management know whether initiatives are being completed according to budget and schedule, (b) monitoring/measuring tools to let management know whether targets (related to objectives and goals) are being met, and (c) internal audits to let management know whether the implementation process is being carried out as intended.
- The Way We Green should undergo formal management reviews at least once a year. These reviews should begin at the branch and department level, focusing on the detailed plans developed for each of the objectives in The Way We Green. As part of these reviews, management would evaluate the achievement of goals and objectives, the overall effectiveness of individual initiatives, the need to revise the strategy based on new information, and the overall effectiveness of the implementation process. This information would be summarized in the City's annual report on the environment (i.e., Ecovision Annual Report) for: (a) review by Environmental Policy Leadership Committee, (b) approval by the Corporate Leadership Team, and (c) information to City Council. Any proposed changes in Council-approved direction would be tabled with City Council for review and approval.
- The Way We Green would be updated on an ongoing basis to reflect any approved change in strategy.
- This cyclical, continual improvement process would continue throughout the life of The Way We Green.

Figure 2 presents an implementation model for The Way We Green that is based on the ISO14001 system.

The Sustainability Toolbox

Although an ISO14001 environmental management system is an important framework for implementation of The Way We Green, other more specific tools will be required within its framework. A variety of tools that can support the implementation were evaluated as part of The Way We Green development process. The recommended tools and a short description of each are below:

- ***Triple Bottom Line Framework:*** A Triple Bottom Line (TBL) framework establishes a methodology that can be consistently applied to ensure that "environmental, social and economic impacts are taken into consideration in all aspects of local government service delivery and operation. This approach is a way of implementing sustainability practically and methodically"[46]. The philosophy behind TBL is that there needs to be a full valuation and accounting for non-market and non-financial aspects of performance. The TBL framework is often challenged to consistently value non-market items such as ecosystem services; however, this is can be overcome by managing, measuring and publicly reporting on the TBL conclusions. The system is one that is designed to evolve as the organization gets more sophisticated and the global financial system begins to account for externalities (e.g. costs of carbon).

[46] Discussion Paper 19

- ***Life Cycle Assessment:*** The ultimate goal of a life cycle assessment (LCA) is to compare a range of financial (e.g. operating and maintenance), environmental (e.g. costs of carbon) and social effects (e.g. health) that can be assigned to infrastructure construction or other relevant products and services that are being considered for purchase and then use that information to choose the least burdensome option over the life cycle of the asset. LCA is by definition a decision making tool that forces the assessor to look at long-term planning and operations. The City of Edmonton is using LCA to varying degrees throughout the organization. A consistently applied, financially viable LCA tool that can incorporate externalities is required.
- ***Energy Density Mapping:*** Energy Mapping provides the information necessary to provide direction to the City and inform the private sector about the potential to reduce greenhouse gas emissions and encourage the use of alternative energy systems through considerations such as the design of buildings and encouragement of more compact, mixed-use and high density communities. Recent energy mapping that has been done has also included transportation and water mapping in its analysis. Energy mapping is an essential tool to make informed decisions about urban form and how a City the size of Edmonton can make an economical transition to a more sustainable energy system.
- ***Sustainability Project Evaluation Methodology:*** Well defined sustainability principles (as discussed in Section 3.2) are important not just for visioning and setting high-level strategic goals but also as a means to evaluate decisions; a lens through which to look at each and every thing that the organization does. This being said, it can be a challenge to implement/operationalize principles and make sure they are consistently applied on a day to day basis.

  As part of the Natural Step framework there is a process that is followed to evaluate major decisions in the context of the established sustainability principles. The sustainability evaluation "incorporates organizational learning and change methods, essential elements to move people into new ways of thinking and working together."[47] Operationalizing the sustainability principles will help the City of Edmonton stay on course and contextualize day- to-day operations and projects with the long-term planning.

  Although The Way We Green is transformational in many respects, it is unrealistic to expect the achievement of sustainability goals will occur immediately; rather, it will take systematic and consistent decision making over a long period of time. The Natural Step calls this "systematically making investments that will provide benefits in the short-term, while also retaining a long-term perspective." In order for the City of Edmonton to achieve this operationalization of the long-term sustainability principles, an evaluation methodology is required. This may take the form of an easy to use checklist or in some circumstances it may require something more complex (e.g. a process similar to value management).
  More work is required to develop these tools for their application within the City of Edmonton; therefore, the development of these tools has been captured as an implementation planning action. It should be noted that the tools that have been recommended are the key corporate level tools that are believe to be required to ensure consistent application of the principles of The Way We Green; this is not to say that other important and relevant tools may not emerge as implementation plans are formalized.

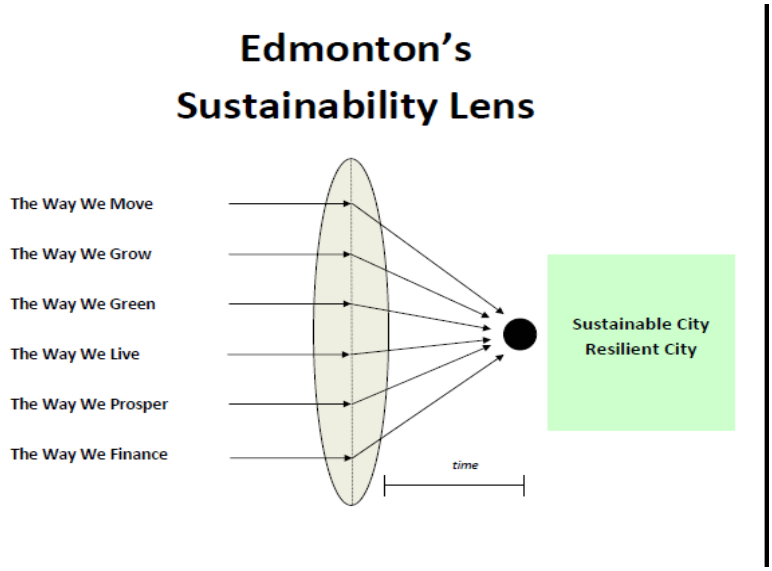
[47] The Natural Step http://www.thenaturalstep.org/ (Accessed August 31, 2010)

Applying Sustainability Principles

All major decisions made by the City should help to make Edmonton more sustainable; not less. The Way We Green Management System (Figure 4) is a principle-based system that calls for all major decisions to be judged relative to a set of sustainability principles suggested in Section 2.2 of this Paper. According to this model, all major operating and capital decisions would be formally evaluated against these principles at some early point in the investment approval process. While this Paper does not spell out an exact procedure for applying sustainability principles, the idea is that formal written analyses would be produced by expert staff and submitted to senior decision makers for final review and approval.

This concept is conveyed graphically in Figure 3. The City's environmental sustainability principles are represented by the lens, through which all decisions must pass. Compliance with these principles, over time, would lead to a sustainable and resilient city.

Figure 3



13.3 Leadership

Transformation is a journey that calls for leaders – Edmontonians who are eager to lead hundreds of initiatives that will make Edmonton a more sustainable and resilient city. Expert Panel member, Pong Leung (Principal Advisor, The Natural Step Canada) encouraged a process that would allow community leaders to help shape and take ownership of The Way We Green. That is precisely the purpose of this White Paper. In coming months, community leaders will be asked to read and respond to the paper, make suggestions, and identify initiatives they want to lead.

Mr. Leung also explained that in order for community leaders to embrace The Way We Green, the City of Edmonton would need to be credible in terms of its sustainability decisions and practices. *"This means demonstrable leadership commitment from Council, but also, more importantly, that every interaction with the City needs to be consistent with sustainability. This implies creating a culture of sustainability and the change in the status quo will take time."*

In implementing The Way We Green, the City of Edmonton will actively seek out community leadership by:

- Inviting community leaders to refine the White Paper and help define the Way We Green;

- Inviting community leaders to suggest and lead sustainability initiatives in areas where they are most interested and inspired;
- Assisting/facilitating community leaders with these initiatives by providing information, advice and/or resources;
- Connecting /networking leaders to one another to foster partnerships; and,
- Profiling the success of community leaders to the larger community.

13.4 Community Engagement

Becoming a sustainable city means building a culture of sustainability at the citizen level. Sharing his thoughts on this matter, Expert Panel member Pong Leung noted, *"There seems to be a growing sentiment that in large cities it makes more sense to work at the neighbourhood level. This is consistent with the ideas of resilience centres in the White Paper as well as movements like the eco-districts movement in the Pacific Northwest."* He also noted that community engagement would require effective, ongoing communication with citizens: *"I think it will be important to have an easily accessible (web based) system to monitor and report on progress. Ideally there would be a system that the community can easily access and monitor to understand Edmonton's progress towards sustainability. A great example is with the Resort Municipality of Whistler's Whistler2020 site."*

In implementing The Way We Green, the City of Edmonton will strive to engage citizens and build a sustainability culture by:

- Supporting and encouraging the development of grass root/neighbourhood programs that promote Edmonton's sustainability;
- Delivering education/awareness programs that help Edmontonians understand and respond to sustainability/resilience challenges; and,
- Reporting regularly to citizens on the implementation of The Way We Green.

13.5 Statutory Tools for Implementing The Way We Green

The statutory tools available to implement the policies and strategies described in this Paper are provided by the *Municipal Government Act (MGA)*. The *MGA* authorizes certain powers for Alberta municipalities. These powers provide Edmonton the ability to (among other things): regulate, tax, and license within our jurisdiction.

Regulation

The legal powers given to the City of Edmonton under the *MGA*, are broad, so as to provide Councillors the ability to respond to present and future issues within our city.[48] The safety, health and welfare of Edmontonians are inextricably linked to the health and welfare of the environment in which we live. The *MGA* provides Edmonton with the jurisdiction to pass **bylaws** for the safety, health and welfare of people and property.[49] Bylaws are powerful tools. They are regulatory laws passed by Council. They provide the ability to

[48] Section 9, *Municipal Government Act,* R.S.A. 2000, c. M-26
[49] Section 7, *Municipal Government Act,* R.S.A. 2000, c. M-26

regulate, prohibit, as well as deal with any development, activity, industry, or business.[50] Edmonton has the power to both create new bylaws and amend existing ones.

Barriers: Though bylaws are powerful tools, they are limited in their scope. A bylaw cannot conflict or supersede Federal or Provincial legislation and regulations. If there is an inconsistency between a bylaw and a Provincial or Federal enactment, the bylaw is of no effect to the extent of the inconsistency.[51] What this means is that Edmonton bylaws cannot exceed requirements of Provincial or Federal regulations. The *Alberta Building Code 2006* is an example of a standard developed under Provincial legislation (*Safety Codes Act*). If a bylaw purports to regulate a matter that is regulated under the *Safety Codes Act*, the bylaw may be deemed to be inoperative.[52]

Overcoming barriers: Although Edmonton does not have to power to regulate matters that are under the jurisdiction of Provincial and Federal enactments, the City does have the ability to influence these issues indirectly. Edmonton cannot set standards on these regulated matters, but can: 1) Set standards for matters that can influence regulated standards but which themselves are not regulated; and 2) Create general requirements that speak to regulated matters without specifying how to achieve the results.

Taxation

The *MGA* provides Edmonton the ability to levy taxes. These taxes are used to pay for municipal services. One form of taxation available to Edmonton is collecting property taxes. Property tax rates are calculated and assigned based on property assessments of either residential, non-residential, farm land and machinery and equipment. Council, by bylaw, can divide residential and non-residential assessment classes into subclasses on any basis it considers appropriate.[53] The tax rate for these subclasses may be different.[54]

Other forms of taxation available to Edmonton are collecting business taxes and local improvement taxes. Local improvement taxes are taxes for projects that are considered to be a greater benefit to a specific area of Edmonton rather than to the whole municipality. Streetscaping is an example of a project subject to a local improvement tax.

Barriers: Edmonton is limited on the type of taxes it can implement. For example, Edmonton cannot levy taxes on goods and services (which are taxed at a federal level) or retail sales (which are taxed at a provincial level).

Overcoming Barriers: Though Edmonton is limited on what taxes it can implement, Edmonton has a great deal of flexibility in how it will administer the taxes under its control. For example, Edmonton historically imposed a business tax. However, at the end of a four year phase-out (2008-2011) the business tax revenue will be fully shifted to property taxes (decreases in business taxes will be offset by an increase in non-residential property taxes).

Licensing

Licences are documents that grant permission to do a specific activity. The *MGA* provides that Council may in a bylaw provide for a system of licences, permits or approvals. This includes: establishing fees; providing terms and conditions that may be imposed on any licence, permit or approval, the nature of the terms and

[50] Section 8, *Municipal Government Act,* R.S.A. 2000, c. M-26
[51] Section 13, *Municipal Government Act,* R.S.A. 2000, c. M-26
[52] Section 66, *Safety Codes Act*, R.S.A. 2000, c. S-1
[53] Section 297(2), *Municipal Government Act,* R.S.A. 2000, c. M-26
[54] Section 354(3), *Municipal Government Act,* R.S.A. 2000, c. M-26

conditions and who may impose them; and setting out the conditions that must be met before a licence, permit or approval is granted or renewed, the nature of the conditions and who may impose them.[55] Edmonton issues licences for the development, construction and use of all commercial, industrial, institutional or residential properties and buildings. Edmonton also requires all business owners to have a Business Licence.[56]

Barriers: As stated previously, a bylaw cannot conflict or supersede Federal or Provincial legislation and regulations. As licensing is done through a bylaw, Edmonton cannot refuse a licence based on requirements that exceed requirements of Provincial or Federal regulations.

Overcoming Barriers: Although Edmonton cannot impose conditions on licences that exceed requirements under Provincial and Federal laws, the City does have the ability to impose conditions on matters that are not regulated by other laws. For example, the *Edmonton Business Licence Bylaw No. 13138* places conditions on After Hours Dance Clubs. These conditions require compliance with an approved noise control plan, etc. Similarly, Edmonton could place various conditions on business licences for implementing strategies in this Paper such as pollution testing of business/fleet vehicles.

Implementation Examples

Example #1: NetZero New Homes, Energy Efficient Building Stock, and Green Roofs

The implementation of these strategies requires the ability to control, to some extent, how buildings are constructed and renovated.

Barriers: The Alberta *Safety Codes Act* is the enabling legislation for various Regulations that establish Codes (such as the *Alberta Building Code 2006*). These Codes provide the minimum standards of construction. All commercial and residential construction, including new buildings, renovations, and alteration of existing structures, must follow the Codes. Edmonton does not have the jurisdiction to make construction standards that are in excess of Code requirements, such as more energy efficiency buildings. A bylaw regulating energy efficiency would be dictating matters that are regulated under the *Safety Codes Act,* and would therefore be inoperative. This is significant as zoning and municipal development plans are done by bylaw. Therefore, Edmonton cannot require higher energy efficiency standards through obvious instruments such as development approvals, building permits, or zoning laws.

Overcoming barriers: Though Edmonton does not have the jurisdiction to dictate how a building is to be constructed (as it is regulated provincially), Edmonton does have the ability to impose requirements and conditions on matters that are not regulated by other enactments. These matters can indirectly, without specifying how, influence energy efficiency. For example, Edmonton could not dictate that buildings require Green Roofs. However, Edmonton could create a bylaw for improving, beautifying and maintaining rooftops over a certain size. Such a bylaw could accomplish the same outcome (Green Roofs) without specifying how to achieve the result. By not dictating the construction aspects for the roof (which would be found in the Building Code), the bylaw would not be in conflict with Provincial legislation.

Example #2: Increase property taxes in outlying areas and decrease it in the city centre to encourage re-development and discourage sprawl

[55] Section 8(c), *Municipal Government Act,* R.S.A. 2000, c. M-26

[56] Section 4, *Edmonton Business Licence Bylaw No. 13138:* No Person shall engage in or operate a Business in the City unless the Person holds a Licence authorizing the Person to engage in or operate that Business.

Edmonton has the ability to control how properties will be taxed. Edmonton can tax certain properties at a higher rate than others. This can be accomplished by dividing residential property into subclasses, such as city centre or suburban. Edmonton can then set different tax rates for these subclasses (i.e. a lower tax rate in the city centre).

Example #3: Introducing a City Carbon Tax

Introducing a carbon tax, for example on the price of gasoline and diesel, would require the ability to tax the sale of those products.

Barriers: Municipalities do not have the ability to tax goods, services or retail sales.

Overcoming barriers: Though Edmonton could not impose an additional sales tax on the carbon content of fuels; there are means available to indirectly achieve a similar outcome. Edmonton has the power to establish fees for licences, including business licences. One possible means is a higher licensing fee for businesses such as fuel stations. Another possible method is to divide non-residential property into subclasses and create a fuel station subclass. This new subclass could then be taxed at a higher rate.

13.6 What will it cost to implement The Way We Green?

In developing this White Paper, some stakeholders suggested that the Project Team should estimate the costs of the various suggested policies, i.e., how much more will it cost (over and above what is spent today) to become this resilient and sustainable city? This section of the White Paper responds generally to that question, assuming that the following suggested policies may have the most significant financial implications:

- A more energy efficient built form (for the entire city);
- A more energy efficient building stock (city buildings and Edmonton's overall building stock);
- A Green Building Strategy for Edmonton;
- Greater use of renewable energy;
- A more distributed energy system;
- Diversification to industries that are less energy intensive;
- Requirements for buildings to be more durable, to last 200+ years;
- Leadership in testing new energy technologies;
- Purchase of green power (City operations);
- Elimination of carbon credit sales by City departments;
- Efforts to better understand and manage the health of the North Saskatchewan River watershed.
- Stormwater management strategies;
- Continued reduction / elimination of combined sewer overflows;
- Continued investment in wastewater treatment plant (capacity and new technology);
- Support and involvement in a local Food Policy Council;

- Investments in air quality monitoring, and subsequent actions that may follow based on better information and the adoption of higher standards
- Increased efforts to protect, maintain and enhance current levels of biodiversity. .

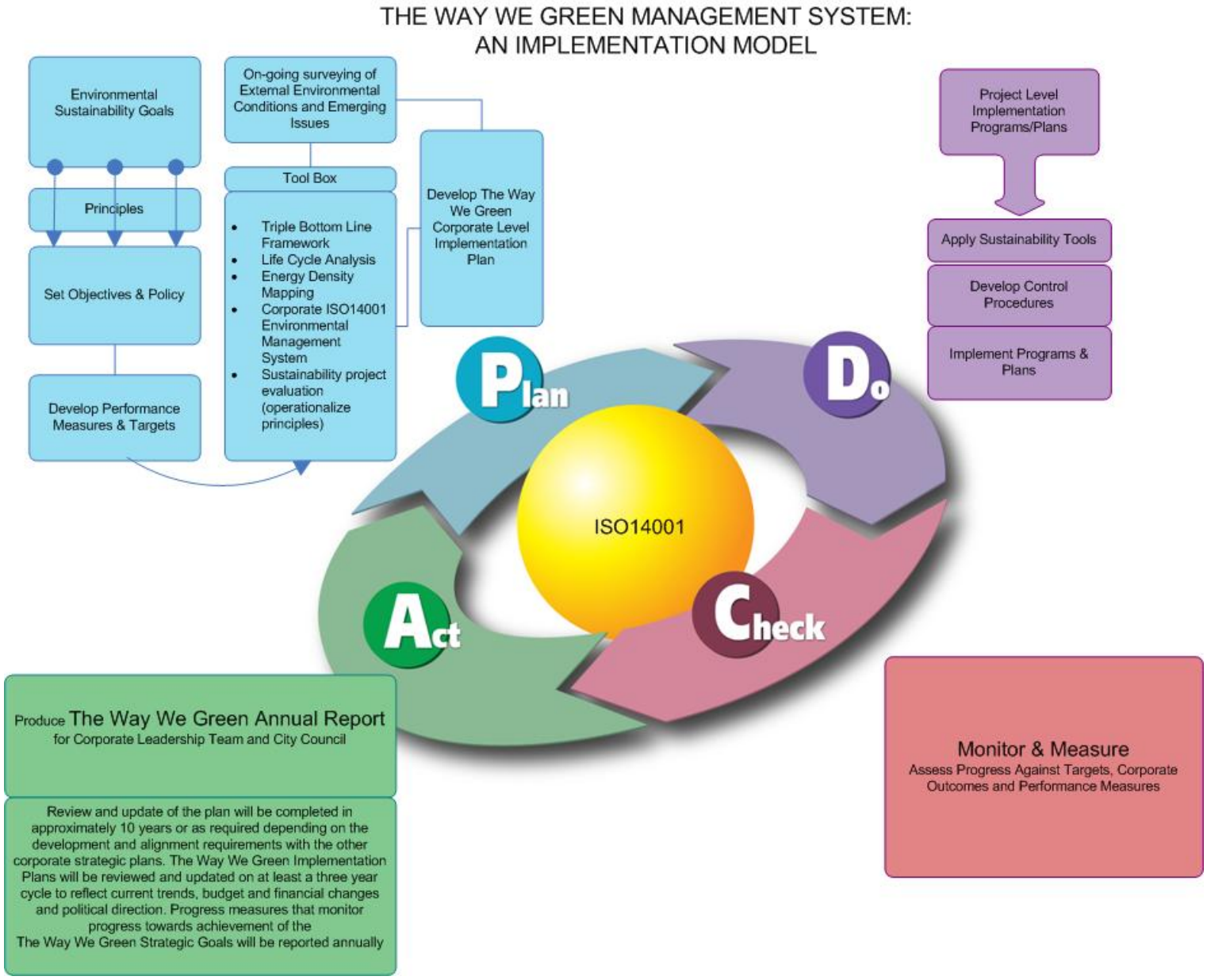
As a rule, the initial capital outlay for high-standard, green infrastructure will be greater than for infrastructure built to a less sustainable standard. However, based on limited analysis undertaken by the Office of Environment and other Canadian municipalities, it appears in many situations that the higher, green standards may be more economical when considered over the long term lifecycle of the investment. Moreover, when externalities[57] are factored into the decision, greener alternatives becomes even more attractive. The City of Edmonton's Greenhouse Gas Management Strategy (currently under development) takes this life-cycle costing approach in analyzing and recommending actions that are most cost effective.

As explained in Section 4.3 of this Paper, communities are coming to realize that green solutions can also contribute to financially sustainable*: "By acting decisively today, cities can: (a) avoid much higher costs in the future related to building retrofits (i.e., it's cheaper to build to the highest possible standard today and avoid costly retrofits in the future), (b) avoid investments in major transportation infrastructure (i.e., sprawl will eventually require a big investment in transportation infrastructure), (c) avoid expensive alternative energies (future energies will be expensive)."* In other words, there appears to be a strong correlation between environmental sustainability and financial sustainability.

In building a resilient and sustainable city it will be necessary to advance our decision making process beyond traditional financial thinking that place disproportionately high importance on initial outlay costs. New decision making models will need to adopt a lifecycle approach that includes consideration of externalities and an overall triple bottom line assessment (social, economic and environmental). While this may not result in the lowest capital outlay for every investment, it will lead a sustainable solution that is aligned with the City's social, economic and environmental principles.

[57] An **externality** is a cost or benefit, not transmitted through prices, incurred by a party who did not agree to the action causing the cost or benefit. For example, the costs associated with climate change are generally borne by all of society in a variety of ways, and are not reflected in the price of a litre of gasoline.

Figure 4 – The Way We Green Management System



Chapter 14: Sustainable City Benchmarks

Table 2 provides a summary of what some benchmark cities around the world are doing to be sustainable and resilient, with Edmonton comparing favourably in many of the categories. The new policies that are proposed in this discussion paper will be put Edmonton on the path to becoming one of the most sustainable cities in the world.

Criteria	Benchmark	Edmonton
Energy – City-wide Conservation	In Copenhagen, Denmark large scale cogeneration power plants collect the waste heat that is produced and distribute it into buildings throughout the city. Due to cogeneration of electricity and heat, the fuel use is 94% efficient, and now 97% of buildings in Copenhagen are heated this way.	Edmonton's efforts in this area include: • Construction of buildings (and major retrofits) to the LEED Silver level as well as 30% more energy efficient than the national building code. • Hybridization of the City's light duty fleet. • Incentives in the form of residential rebates; Green new home construction, energy efficient furnace and washer rebates. Home$avers booklets on all aspects of home energy-efficiency are made available free of charge to the public. Support for commercial energy-efficiency initiatives. Education programs with schools and outreach events and public access to CO_2RE programs through the 311 hotline. • The City has started work on a green building strategy, a comprehensive City-wide guide for green, energy-efficient new building.
Energy – Peak Oil	Portland, Oregon has developed an 86 page document in response to Peak Oil called: "Descending the Oil Peak: Navigating the Transition from Oil and Natural Gas." It focuses on the issues around peak oil and suggests policies and actions to move forward.	Although Edmonton currently does not have a peak oil declaration, the policies put forward in *The Way We Green* are part of transitioning Edmonton away from fossil fuel dependence and towards renewable energy and lower consumption.
Energy – Use of Renewable	Oakland, California has over 650 solar roof installations that produce over 7,000 KW of electricity. 17% of the total electricity being used by the city is from renewable sources. The City of Calgary currently has a goal for all electricity used by City operations to come from green sources by 2012.	Edmonton's Renewable Energy Task Force is currently evaluating the opportunities, barriers and potential technical, economic, and policy solutions for the generation and use of renewable energy in Edmonton. The City's Solar Electric Pilot Project, implemented in 2010 has provided financial incentives in the form of residential and commercial rebates aimed at boosting renewable energy generating capacity in Edmonton. Both programs are now fully subscribed.
Climate Change – Adaptation	Toronto has developed a 46 page document in response to climate change called "Ahead of the Storm, Preparing Toronto for Climate Change." The report details the potential issues surrounding climate change and suggests short and long term action plans to deal with them.	Although Edmonton has no official climate change adaptation document, the policies put forward in *The Way We Green* address many of the concerns inherent in climate change adaptation. Some of these policies include: increasing green space and strengthening our food security.

Criteria	Benchmark	Edmonton
Climate Change – Mitigation	Copenhagen, Denmark has a goal to become the first carbon neutral capital city by 2025. The city has presented 50 specific initiatives that will lower their GHG emissions. Some of these include; transition to renewable energy, cogeneration facilities, more green spaces and encouraging alternative transportation. Vancouver has the lowest GHG emissions per capita at 4.6 TCO_2e	Edmonton's current community GHG emissions are at 23.1 TCO_2e per capita, over 5 times as much as Vancouver. Policies put forward in *The Way We Green* aim to lower our emissions by increasing efficiency and practices in many industries.
Water – Pollution from Waste Water	In London, England the Thames and Wandle river were both declared biologically dead, with the Wandle river even being zoned as an open sewer in the 1960s. Recent efforts to reduce pollution have restored the cleanliness and biodiversity throughout the city.	Since water quality measurements started in the 1940s, the North Saskatchewan River has become much cleaner. Strict regulations around water quality and the world class Goldbar Waste Water Treatment Plant are ensuring that the river remains clean. The city is currently upgrading combined sewers to lower the storm water overflow during high rain periods.
Water – Conservation	In Copenhagen, Denmark personal water use dropped from 174L/day in 1985 to 110L/day in 2007. This was achieved through public awareness campaigns, new policies and the installation of water meters to monitor household use.	Edmonton's current per capita water consumption is 223L/day. Although the number is much larger than that of Copenhagen, the North Saskatchewan River supplies Edmonton with much more available water and over 95% of the water we consume is treated and returned to the river.
Air Quality – Standards	Vancouver, BC maintains excellent and constantly improving air quality standards. Their clean air has been achieved through cooperation between businesses and residents through the entire Greater Vancouver area. Vancouver has adopted extremely high air quality standard put forward by the World Health Organization.	Air quality in Edmonton is considered 'good' over 96% of the time. Low population density in Edmonton has the effect of spreading any emissions but also requires people drive further causing more emissions. The large amount of green area in Edmonton creates a healthy natural lung that helps keep our air clean.
Air Quality – Monitoring	In 1994 Vancouver, BC became the first Canadian city to adopt an Air Quality Management Plan. Since then they have continued to improve and maintain high standards of air quality. An online website is available for anyone to view up to date air quality measurements for whole areas or for any specific monitoring station.	Edmonton has four air quality monitoring stations. Although our air is considered 'good' over 96% of the time, the quality of measurements still needs to improve. Current stations are located away from high traffics areas and may not accurately represent the air quality where people are breathing it in.
Biodiversity – Natural Areas	Stockholm, Sweden has green spaces covering over 40% of the inner city area. They have also conducted a large scale study to understand and catalog the biodiversity within the city.	Edmonton's river valley, at 7,400 ha, is North America's largest stretch of urban parkland, and makes up a major part of the green spaces covering 20% of the city. In 2006 Edmonton released an updated State of Natural areas report, updating and cataloging the biodiversity and conditions of all ecosystems in Edmonton.
Food Security	Vancouver has an active Food Policy Council that meets regularly and is open to the public. Initiatives so far have included the development of over 2000 community gardens as well as policies allowing citizens to raise chickens in the city.	Edmonton has been developing a food strategy as part of the Municipal Development Plan. Guided in part by the Greater Edmonton Alliance, Edmonton has released a series of policies concerning food security.

Criteria	Benchmark	Edmonton
Ecological Footprint	Although many cities have a much lower ecological footprint than Edmonton, it is important to compare Edmonton to cities with a similar climate and size. Stockholm, Sweden has an ecological footprint of 5.1 global hectares/capita. That is significantly lower than Edmonton's EF, but still nearly doubles the global average.	Edmonton's ecological footprint is estimated to be 8.56 gha/capita. This is over 3 times the global average of 2.7 gha/capita and over 4 times larger than the estimated biocapacity of earth at 2.1 gha/capita. All of the plans and policies in *The Way We green* work towards lowering our impact on the environment.
Waste – Diversion from landfill	Waste management facilities in Yorkshire, UK divert approximately 80% of the waste they receive.	Edmonton is a world leader in waste management. With our current recycling and composting facilities, over 60% of residential waste is diverted away from landfills. With the completion of the waste-to-biofuels facility finishing in 2012, we expect to divert over 90% of residential waste.
Waste – Amount Generated	Freiburg, Germany has had aggressive waste reduction targets for over a decade. Through public awareness campaigns, separate collection of recyclables and a tax on non recyclable waste; per person waste was reduced from 205Kg in 1996 down to 100Kg in 2007.	Although there is currently a small downward trend, Edmontonian's produce an average of 350Kg/person. *The Way We Green* is proposing policies and encouraging everyone to reduce their personal waste.
Environmental Management	Copenhagen, Denmark has ISO 14001 certified environmental management programs operating in 5 out of 7 municipal departments.	Edmonton has high standards for environmental management and has ISO 14001 certified programs in all relevant branches of the city.

The Office of Environment retained a consultant (who was familiar with sustainability initiatives around the world) to help identify communities that were considered to be sustainability leaders. Calgary, Copenhagen, Helsinki, Kingston (Ontario), Malmo, Minneapolis, Montreal, Newcastle, Ottawa, San Francisco, Toronto and Vancouver were short-listed for further review. The following plans were reviewed to better understand sustainability initiatives and approaches in those cities.

- Calgary: *Imagine Calgary 2006, Calgary MDP, 2009*
- Copenhagen: *Our Vision for Copenhagen 2015, 2007*
- Helsinki: *The Helsinki Action Plan for Sustainability, 2002*
- Kingston: *Sustainable Kingston, 2010*
- Malmo: *Environmental Programme for the City of Malmo, 2009-2020*
- Minneapolis: *Minneapolis GreenPrint, 2009 Report*
- Montreal: *Montreal's First Strategic Plan for Sustainable Development, Aprils 2005*
- Newcastle: *Sustainable Community Strategy, March 2010*
- Ottawa: *Getting Greener: On the Path of Sustainability, 2007*
- San Francisco: *2010-2012 Strategic Plan, 2009*
- Vancouver: *Vancouver 2020: A Bright Green Future,*

Appendix A

Suggested Goal, Objectives, Policies and Progress Measures

Energy & Climate Change

Suggested Goal 1: Edmonton's use and sources of energy are: (a) sustainable, and (b) resilient to disturbances that might occur to Edmonton's energy supply and/or distribution system.

Possible Progress/Performance Measures:

- *Edmonton's energy footprint: Reduced energy consumption in Edmonton by x% (from 2008 levels) by 20XX*
- *Per person energy footprint: Reduced per capita energy consumption in Edmonton by x% (from 2008 levels) by 20XX*
- *Reduced dependence on oil: Reduced use of oil(total) in Edmonton by x% a year*
- *Energy efficient building stock: Improve energy efficiency of existing building stock by x% by 20XX*
- *NetZero new homes: New buildings constructed in Edmonton are net-zero by 20XX*
- *Shift to renewable energy: x% of Edmonton's energy is renewable by 20XX*
- *Local generation of electricity: x% of Edmonton's electricity is generated locally*
- *% of trips made by walking / cycling / public transit*
- *Average length of trips / Average energy consumption per trip*

Suggested Objective: Edmonton's built form is designed to promote energy efficiency and minimize Edmonton's energy footprint.

Existing Policies Promoting Sustainability (and this Objective)

- **TWWGrow: Policy 3.1.1.6:** Develop a growth coordination strategy to address timing and phasing of new residential growth in developing and planning neighbourhoods. The strategy will relate to the City's strategic goals, current and future public infrastructure investment, long term financial sustainability and the amount, location and pace of population and employment growth.
- **TWWGrow: Policy 3.2.1.1:** Ensure a combination of single family and multi-family housing development potential is available for the next 30 years.
- **TWWGrow: Policy 3.6.1.6:** Support contiguous development and infrastructure in order to accommodate growth in an orderly and economical fashion.
- **TWWGrow: Policy 3.1.1.1:** Integrate higher density development with LRT stations and transit centres.
- **TWWGrow: Policy 3.1.1.2:** Encourage a minimum of 25 percent of city-wide housing units growth to locate in the Downtown and mature neighbourhoods and around LRT stations and transit centres where infrastructure capacity supports redevelopment.

- **TWWGrow: Policy 3.2.1.5:** Develop the Edmonton City Centre Airport lands over time to create a complete and sustainable residential and business community that is transit oriented, through the provision of mixed use, medium to higher density residential, business and institutional uses.
- **TWWGrow: Objective 3.3.1:** Edmonton's transit system becomes the primary framework for urban form.
- **TWWGrow: Policy 3.3.1.1:** Promote medium and higher density residential and employment growth around LRT stations and transit centres (see Map 5) to support and ensure the viability of transit service.
- **TWWGrow: Policy 3.3.1.7:** Consider the need for family oriented housing and the infrastructure necessary to support families with children in the preparation of TOD plans.
- **TWWGrow Objective 3.4.1:** Create a strong downtown characterized by high density, mixed-use, transit and pedestrian orientation and excellent urban design.
- **TWWGrow: Policy 3.4.1.2:** Promote the Downtown as the prime focus of Edmonton's central growth.
- **TWWGrow Objective 3.5.1:** Establish neighbourhoods gain a greater portion of new growth, accommodating changes and growth with certainty.
- **TWWGrow: Policy 3.5.1.1:** Support redevelopment and residential infill that contribute to the livability and adaptability of established neighbourhoods(Map 1) and which are sensitive to existing development.
- **TWWGrow: Policy 3.5.1.1:** Direct the location and design of residential infill in mature neighbourhoods (Map 3) through planning and design guidelines supported by regulation.

Suggested Additional Policy Direction

- ✓ The City will evaluate and approve Area Structure Plans, Neighbourhood Structure Plans and neighbourhood redevelopment plans based on their energy implications and ability to achieve predefined energy targets.
- ✓ The City will establish development pricing strategies and taxation strategies to encourage densification and discourage outward growth.
- ✓ The City Centre Airport Development be undertaken as a model for future development in Edmonton and a catalyst for creating more market demand for inner city / mature neighbourhood living.
- ✓ The City will develop a strategy for retaining and repopulating schools in mature neighbourhoods.
- ✓ The City will develop / redevelop inner city neighbourhoods to make them a superior living experience, by creating: (a) special places that foster a sense of authentic human attachment and belonging, (b) durable buildings and communities that can last 200+ years, responding to issues of noise, fire, odours, sunlight, and need for privacy, (c) buildings that are adaptive to different uses over time, (d) beauty everywhere, (e) high quality public spaces, (f) less intrusion from automobiles, (g) natural spaces and biodiversity, (h) balance (age, demographics, housing, uses) and (i) design features that help to moderate climate.
- ✓ The City will encourage green developments by placing green development requirements on the City owned properties that it sells.

Suggested Objective: Edmonton's building stock is energy efficient.

Existing Policies Promoting Sustainability (and this Objective)

- **TWWGrow: Objective 5.1.1:** Embrace high quality urban design throughout Edmonton.
- **TWWGrow: Policy 5.1.1.1:** Establish City expectations for high quality urban design through the preparation of city wide urban design guidelines.
- **TWWGrow: Policy 5.1.1.5:** Take a leadership role in facilitating the creation of environmentally sustainable neighbourhoods, buildings and public space s and encourage private sector approaches to environmental sustainability.
- **TWWGrow: Policy 5.1.1.6:** Coordinate significant urban design projects and planning initiatives with the direction of the Great Neighbourhoods Initiative.
- **TWWGrow: Policy 5.1.1.8:** Encourage urban design that reflects Edmonton is a winter city, allowing residents to enjoy the city in all seasons.
- **TWWGrow: Policy 5.6.1.5:** Ensure new City owned facilities and major renovations to City owned facilities are designed and bult to meet or exceed the Leadership in Energy and Environmental Design Green Building Rating System silver standard.

- **TWWGrow: Policy 3.1.1.6:** The City will develop and implement design guidelines for new neighbourhoods, which will include the flowing elements: … higher density mixed-use development where an LRT station or transit centre is to be located ... the protection of natural and built heritage features within the neighbourhood to provide a physical identity or marker for the community … multiple transportation options for residents including: walking, cycling, driving and transit … the reduction and mitigation of the environmental impacts of new neighbourhoods … sustainable building design.
- **TWWGrow: Policy 5.6.1.5:** Encourage new buildings and public spaces to incorporate design features that mitigate impacts on the natural and ecological environment.
- **TWWGrow: Policy 6.3.1.10:** Evaluate and adapt infrastructure standards and promote site and building design based on eco-industrial development methods and sustainable building standards.
- **TWWLive: Objective 6.2:** The City of Edmonton is an environmentally sustainable society.
- **TWWLive: Policy 6.2.10:** The COE promotes environmental best practices in urban design, construction and re-use of materials.
- **TWWLive Policy 6.2.11:** The COE promotes the use of the highest environmental standards through a civic culture of environmental planning, conservation, preservation and protection.
- **TWWGrow: Policy 3.1.1.6:** The Growth Coordination Strategy will address demand for land, housing units, and housing choice at the region, city-wide and sector level.

Suggested Additional Policy Direction

- ✓ The City will establish, implement and maintain a Green Building Strategy for Edmonton.
- ✓ The City will establish, implement and maintain world-class energy-efficiency standards for all City-owned buildings.
- ✓ The City will encourage and where appropriate require world-class energy-efficiency standards for all new buildings constructed in Edmonton (e.g., to be zero net energy by 20XX).
- ✓ The City will establish, implement, maintain and encourage programs to significantly improve the energy efficiency of Edmonton's existing building stock.
- ✓ The City will **adopt zoning regulations** that promote energy efficiency, e.g., (a) southerly orientation where possible, (b) distance-to-height ratios to prevent shading, (c) passive solar heating and natural lighting, and (d) requirements that new buildings be built "solar ready".

Suggested Objective: Edmonton is not overly reliant on fossil fuels for energy. Much of Edmonton's energy comes from renewable sources that are produced locally.

Existing Policies Promoting Sustainability (and this Objective)

- None

Suggested Additional Policy Direction

- ✓ The City recognizes Peak Oil and will respond to this risk with strategies that will reduce Edmonton's energy footprint and shorten supply chains that currently rely on inexpensive energy.
- ✓ The City will establish, implement and maintain an Energy Descent Strategy detailing how Edmonton (including City operations) will reduce its energy footprint and how it will transition to alternative energies and more efficient /effective use of existing fossil fuels (especially coal).
- ✓ The City will establish, implement and maintain a Renewable Energy Strategy for Edmonton that considers the use of wind, solar, geothermal, biomass and small-scale district co-generation stations that can use mixed fuels.
- ✓ The City will establish green zones where properties will be required to install renewable energy to offset a portion of energy demands.
- ✓ The City will create incentives for businesses and residents to install renewable power generating equipment / infrastructure.
- ✓ The City will introduce municipal feed-in tariffs.
- ✓ The City will use local improvement charges to help finance alternative energy development.
- ✓ The City will take action to electrify and eventually switch to electricity for all energy end uses in the City.

Suggested Objective: Travel in Edmonton is energy efficient, with the majority of trips made by public transit, walking and cycling.

Existing Policies Promoting Sustainability (and this Objective)

- **TWWGrow: Policy 5.2.1.8:** Identify and encourage the creation of key pedestrian streets in each quadrant of the city to provide a focus for a walkable urban lifestyle.
- **TWWGrow: Policy 5.7.1.2:** Support the design of street systems to be easily navigated by pedestrians, cyclists and vehicles and to provide clear and direct connections between major activity areas in the community.
- **TWWGrow: Policy 5.7.1.4:** Support opportunities to reallocate existing road space for use by pedestrians, cyclists and transit service.
- **TWWMove Objective 5.1:** The City will pursue expansion of the LRT to all sectors of the city with a goal to increase transit ridership and transit mode split and spur the development of compact, urban communities. (Includes: developing the LRT as shown in Figure 5.1, developing new LRT lines that do not tie into the existing system using low floor technology, pursuing an urban style system for the existing LRT and new LRT lines, assessing/developing a central area circulation concept, providing feeder bus service to provide direct or near-direct access to the LRT for neighbourhoods surrounding LRT stations/stops, pursuing opportunities, alone or in partnership with others to provide and improve pedestrian and cycling connections between LRT stations/stops, transit centres and adjacent developments._
- **TWWMove Objective 5.2:** The City will develop an efficient, effective, accessible and integrated bus network to serve Edmonton with connections to the Region. (Note: includes expanding the bus network, optimizing route design, improving reliability and efficiency of the services through transit priority measures, providing premium transit along high passenger corridors … pursuing opportunities to provide and improve pedestrian and cycling connections to bus stops and transit centres.)
- **TWWMove Objective 5.4:** The City will develop Park and Ride facilities located towards the extremities of LRT lines or at key transit centres where land cannot be used for more intensive transit orientation development. (Note: This includes developing a Park and Ride Strategy, developing Park and Ride facilities in conjunction with LRT extension to attract regional commuter trips to locations where the land cannot be used for TOD, particularly with the TUC, etc.)
- **TWWMove Objective 5.5:** The City will implement essential supporting measures to enhance the viability and success of the Public transportation system. (Note: This includes: Progressing towards and working with the Capital Region to implement a regionally integrated, easily understood cashless transit fare system.)
- **TWWMove Objective 6.2:** The City will create a cycle-friendly city. (Note: This includes adopting and implementing a bicycle transportation plan …, designing and constructing bicycle facilities in accordance to Crime Prevention Through Environmental Design Principles, and developing and reviewing best practices adapted to the Edmonton context to increase the attractiveness and safety of cycling.
- **TWWMove Objective 6.3:** The City will create an integrated network of multi-use trail facilities. (Note: This includes developing a coordinated network of multi-use trails throughout the city; planning constructing and maintaining these trails; integrating them with LRT and transit corridors; making them safe and secure.)
- **TWWMove Objective 7.1:** The City will develop a comprehensive program to continually optimize the efficiency of the existing roadway system using traffic management and transportation supply measures. (Note: This includes developing a program to proactively identify, evaluate and design projects to optimize the operation of the roadway in key corridors and areas of congestion using traffic management and transportation supply measures; developing and implementing transit priority corridors; using transportation supply management strategies to promote increased use of travel modes other than the single occupant vehicle including reallocation of existing road space; supporting continued development of the Traffic Management Centre; etc.)
- **TWWMove Objective 7.2** The City will initiate and support comprehensive programs for Transportation Demand Management to encourage a reduction in single occupant vehicle use. (Note: This includes initiating and coordinating coherent and comprehensive programs for TDM for both the City as a corporate entity and a municipality as well as for major employers and institutions; systematically undertaking and expanding TDM pilot projects; developing measures that support walking, cycling, public transit, carpooling and tele-working.
- **TWWMove Objective 7.3** The City will focus major roadway improvements on the efficient movement of goods, services and transit vehicles. (Note: This includes giving priority to maintaining or improving the level of service for transit and goods and services movements; focusing road capacity improvements on the Inner Ring Road and Highway Connectors; giving

diminished focus on catering to commuter vehicle traffic growth through the roadway expansion program; completing City obligations for staged construction of 4 lane arterial roadways to provide basic access to new neighbourhoods; undertaking roadway and intersection improvement projects to address safety concerns, transit priority or good and services movements…)

- **TWWMove Objective 7.4** The City will develop a parking management strategy through a combination of Bylaws and Policies to ensure the livability and economic vitality of the city and to promote appropriate land use and public transit initiatives. (Note: This includes managing on-street and on-site parking; developing land use and parking policies that manage the supply of parking provided for a development with a focus on providing only essential parking and supporting Transportation Demand Management; developing a parking policy including parking pricing strategies to discourage the use of single occupancy vehicles in appropriate locations in favour of other modes; modifying local and collector roadway designs to rationalize the roadway infrastructure space provided for on-street parking; recognizing winter city requirements within parking policies …)
- **TWWLive: Objective 6.2:** The City of Edmonton is an environmentally sustainable society.
- **TWWLive: Policy 6.2.10:** The COE provides and promotes facilities for active transportation modes.

Suggested Additional Policy Direction

- ✓ None

Suggested Objective: Edmonton is resilient in its ability to withstand energy disturbances.

Existing Policies Promoting Sustainability (and this Objective)

- None

Suggested Additional Policy Direction

- ✓ The City will promote a system of distributed energy generation with combined heat and power, including district heating.
- ✓ The City will actively promote the concept of Resilience Centres in new and existing neighbourhoods.
- ✓ The City will require new buildings and communities to be durable; able to last 200+ years, and respond to issues of noise, fire, odours, sunlight and need for privacy,
- ✓ The City will adopt the *Applegath Principles for Creating Capacity for Greater Resilienc*e and *Urban Design Principles* as the basis for resilience planning in the City of Edmonton.

Suggested Objective: Edmonton is a leader in the advancement, testing and adoption of new energy technologies, i.e., an energy city.

Existing Policies Promoting Sustainability (and this Objective)

- To be discussed further with EEDC.

Suggested Additional Policy Direction

- ✓ The City will actively explore, test and (where feasible) adopt new energy technologies that will reduce City operations' dependence on fossil fuels.
- ✓ The City will work with community partners to explore, test, and (where feasible) encourage community adoption of new energy technologies that will reduce Edmonton's dependence on fossil fuels and overall energy consumption.
- ✓ The City will work to apply the Energy City concept to reduce energy consumption and diversify its economic base.

Suggested Goal 2: Edmonton is: (a) climate change neutral and (b) resilient to the disturbances that might occur as a result of climate change.

Possible Progress/Performance Measures:

- *GHG emissions: Reduce GHG emissions from City operations (from 2008 levels) by x% by 2020*
- *GHG emissions: City operations are carbon neutral by 20XX.*
- *GHG emissions: Reduce community GHG emissions (from 2008 levels) by x% by 2020.*
- *GHG emissions: Edmonton is carbon neutral by 20XX.*
- *GHG emissions per person.*

Suggested Objective: City operations are carbon neutral – no net contribution to increased concentrations of greenhouse gases in the atmosphere.

Existing Policies Promoting Sustainability (and this Objective)

- None

Suggested Additional Policy Direction

- ✓ The City will purchase green power as required to meet it corporate greenhouse gas reduction targets.
- ✓ The City will not sell carbon credits from City operations (apart from legal contracts that are currently in place).
- ✓ The City will establish, implement and maintain world class energy efficiency standards for new City buildings.
- ✓ The City will establish, implement and maintain world class energy efficiency standards for City building retrofits.
- ✓ The City will establish, implement and maintain world class energy efficiency / carbon emission standards for its municipal fleet and transit.

Suggested Objective: The Edmonton community is carbon change neutral – no net contribution to increased concentrations of greenhouse gases in the atmosphere.

Existing Policies Promoting Sustainability (and this Objective)

- None

Suggested Additional Policy Direction

- ✓ The City and community partners will establish, implement and maintain a Community Greenhouse Gas Management Plan for Edmonton.

Suggested Objective: Edmonton is prepared / adapted to all significant risks arising from climate change.

Existing Policies Promoting Sustainability (and this Objective)

- None

Suggested Additional Policy Direction

- ✓ The City and community partners will establish, implement and maintain a climate change adaptation plan for Edmonton.

Water Quality & Supply

Suggested Goal 3: Water quality in the North Saskatchewan River is so high that human and environmental health does not suffer.

Possible Progress/Performance Measures:

- *Loading to the NSR from the GBWTP*
- *Loading to the NSR from storm sewers*
- *Loading to the NSR from CSO*

Suggested Objective: The ecosystems of the North Saskatchewan River watershed are healthy.

(Existing objective from The Way We Grow, Objective 7.5.2) Protect, maintain and continually enhance the water quality of the NS Watershed.

Existing Policies Promoting Sustainability (and this Objective)

- **TWWGrow: Policy 7.5.1.2:** Work proactively with the Province to ensure that Crown interests in water bodies are addressed as early as possible in the planning process.
- **TWWGrow: Policy 7.5.1.3:** Use environmental reserve to protect water bodies that meet the definition of environmental reserve but are not claimed by the Province.
- **TWWGrow: Policy 7.5.2.1:** Work proactively with provincial, regional and municipal neighbours, citizens and non-profit groups, such as the River Valley Alliance, by participating in activities and supporting organizations that work to maintain the integrity of the NS Watershed.
- **TWWGrow: Policy 7.5.2.2:** Adopt and enforce regulations and guidelines that will enhance the quality of Edmonton's watershed.

Suggested Additional Policy Direction

The City will work in partnership with the North Saskatchewan Watershed Alliance and Alberta Environment to achieve the COE's goals for:

- ✓ Development, implementation and enforcement of reach-specific water quality objectives for the mainstem of the NSR;
- ✓ Effective programs to monitor and measure total loads from all point and non-point-sources to ensure water quality objectives are met;
- ✓ Development, implementation and enforcement of Instream Flow Needs (IFN) objectives in the mainstem of the NSR;
- ✓ Effective monitoring and measuring programs to make sure IFN objectives are met;
- ✓ Development, implementation and enforcement of water quality objectives for all tributaries of the NSR;
- ✓ Development of aquatic ecosystem health objectives for all water bodies and riparian areas;
- ✓ Development of programs to maintain, improve, restore and protect wetlands that are part the NSR watershed;
- ✓ Development of programs to maintain and improve riparian area health;
- ✓ Development of a range of strategies to prevent / mitigate damage to the watershed from municipal, commercial, industrial, agricultural, forestry activities;
- ✓ Establishment and achievement of fish management objectives in the NSR mainstem, tributaries and lakes; and,
- ✓ Protecting groundwater quality and quantity in the watershed.

Suggested Objective: The North Saskatchewan River and its tributaries are protected from pollution and erosion caused by storm water runoff from Edmonton's built areas. (Existing objective from The Way We Grow, Objective 7.5.1) Mitigate impacts upon Edmonton's water resources by ensuring that new developments in Edmonton embody an exemplary standard of ecological design.

Existing Policies Promoting Sustainability (and this Objective)

- **TWWGrow: Policy 7.5.1.1:** Require new developments to demonstrate that it has incorporated ecological design best-practices into the design of neighbourhoods and buildings to reduce stormwater run-off.
- **TWWGrow: Policy 7.5.1.2:** Work proactively with the Province to ensure that Crown interests in water bodies are addressed as early as possible in the planning process.
- **TWWGrow: Policy 7.5.1.3:** Use environmental reserve to protect water bodies that meet the definition of environmental reserve but are not claimed by the Province.
- **TWWGrow: Policy 7.5.3.1:** Support the best management practices and principles of Edmonton's Stormwater Quality Control Strategy.
- **TWWGrow: Policy 7.5.3.2:** Ecological design best practices will be used in the operation and design of City owned and / managed facilites and infrastructure.

Suggested Additional Policy Direction

- ✓ The City will establish, implement and maintain a storm water management strategy that gives priority to Low Impact Development approaches over traditional storm water management approaches.
- ✓ The City will establish, implement and maintain LID guidelines for application in all developments in Edmonton.

Suggested Objective: The North Saskatchewan River and its tributaries are protected from the pollution caused by combined sewer overflow.

Existing Policies Promoting Sustainability (and this Objective)

- None

Suggested Additional Policy Direction

- ✓ The City will continue to reduce and eventually eliminate combined sewer overflows to the North Saskatchewan River.

Suggested Objective: The North Saskatchewan River and its tributaries are protected from the pollution caused by discharges from the Goldbar Wastewater Treatment Plant.

Existing Policies Promoting Sustainability (and this Objective)

- None

Suggested Additional Policy Direction

- ✓ The City will continually reduce loadings of all types from the GBWTP to meet the requirements of a healthy river ecosystem.

Suggested Goal 4: Edmonton has reliable sources of water that meet its needs.

Possible Progress/Performance Measures:

- *Amount of water taken from and not returned from the North Saskatchewan River: x% of average river flow*
- *Amount of water used per person per day: x litres/capita/day*

Existing objective from The Way We Grow, Objective 7.5.3: Water resources are conserved and used efficiently by the public, industry and the City of Edmonton.

Existing Policies Promoting Sustainability (and this Objective)

- **TWWGrow: Policy 7.5.3.1:** Support the best management practices and principles of Edmonton's Stormwater Quality Control Strategy.

- **TWWGrow: Policy 7.5.3.2:** Ecological design best practices will be used in the operation and design of City owned and / managed facilites and infrastructure.
- **TWWGrow:** Policy 7.5.3.3: Integrate indigenous vegetation, specifically low-maintenance drought tolerant species, and where feasible include edible plant species into City and private landscaping.
- **TWWGrow: Policy 7.5.3.4:** Encourage designs and standards that accommodate the exchange of waste and grey water between various businesses and industry in business and industrial areas.
- **TWWGrow: Policy 7.5.3.5:** Design, arrange and locate new infrastructure and buildings to mitigate impacts upon the water system.
- **TWWGrow: Policy 7.5.3.6:** Collaborate with stakeholders to support the adoption and envforcement of regulations and gudelines that reduce the consumption of Edmonton's water resources.

Suggested Additional Policy Direction

- ✓ EPCOR will lead Edmonton's efforts to conserve and reduce water usage, with a goal to reducing water usage in Edmonton.
- ✓ The City, in conjunction with EPCOR, will develop a risk management plan to deal with possible reduced flows in the NSR.

Food Security

Existing Goal 5: Edmonton has a resilient food and agriculture system that contributes to the local economy and the overall cultural, financial, social and environmental sustainability of the city[58].

Possible Progress/Performance Measures:

- Amount of edible landscaping: City facilities to include at least x% edible landscaping by 2020
- Number of community gardens: xx community gardens by 2020
- Preservation of prime agricultural land: Preserve ___% of prime agricultural land by 2020
- Reduced carbon footprint for food: Reduce the carbon footprint of Edmonton food by xx% by 2020

Existing objective from The Way We Grow: Increase access to local food through regional, city-wide and neighbourhood-level approaches to sustainable urban food systems and build resilience into the food and urban agriculture system to withstand both gradual and sudden changes in the food supply

Existing Policies Promoting Sustainability (and this Objective)

- **TWAhead:** Liveability Principle: Environment: An environment sustained for current and future generations through responsible practices. Clean air and water, access to local food supplies and the healthy co-existence of natural and urban environments
- **TWWGrow: Objective 10.1.1.1:** Support, in principle, the establishment of a community based Edmonton Food Policy Council, through mechanisms that may include clerical support and/or meeting space.
- **TWWGrow: Objective 10.1.1.2:** Work collaboratively with the community to create and endorse an Edmonton Food Charter

[58] Quoted from The Way We Grow: Municipal Development Plan Bylaw 15100: Goal 10

- **TWWGrow: Objective 10.1.1.3:** Work with the Region to develop a Regional Food Policy Council and Regional Food Charter
- **TWWGrow: Objective 10.1.1.4:** Collaborate with the Government of Alberta, Alberta Health Services, the Food Policy Council, and other stakeholders to develop and implement a City-Wide Food and Agriculture Strategy. This strategy could include: (i) Overall principles for food and urban agriculture in the city, (ii) An examination of the agricultural potential of peri-urban agricultural lands in the northeast, southeast and southwest Urban Growth Areas, (iii) Models for integrating food systems into urban development, based on best practices from other jurisdictions, (iv) Mechanisms for addressing food systems in statutory plans for new and retrofitted urban development, (v) Guidelines to protect agricultural operations, (vi) Community engagement and education, (viii) Coordination with the regional plans and strategies.
- **TWWGrow: Objective 10.1.1.5:** Assess the economic development potential in agriculture and food related industries to identify key opportunities and challenges for expansion of these companies and businesses.
- **TWWGrow: Objective 10.1.1.6:** Establish guidelines for integrating urban agriculture into public realm and private improvements and developments.
- **TWWGrow: Objective 10.1.1.7:** Collaborate with communities, landowners and other organizations to identify potential areas to develop temporary or permanent urban agriculture.
- **TWWLive: Objective 6.2:** The City of Edmonton is an environmentally sustainable society.
- **TWWLive: Objective 6.2.8:** Partner to educate Edmontonians about the importance of a community food network.
- **TWWLive: Objective 6.2.9:** Promote sustainable urban agricultural practices.
- **Capital Region Growth Plan:** There is a land use principle established in the plan around air: Protect the Environment & Resources: b.Preserve Agriculture Lands.

Suggested Additional Policy Direction

- ✓ The City will lead the establishment of a Food Policy Council, responsible for overseeing the development of a Food Charter and City-wide Food and Agriculture Strategy.
- ✓ The City-wide Food and Agriculture Strategy will give consideration to:
  - Mapping of the local food system;
  - Evaluation of the ecological services that urban agricultural lands are currently providing;
  - Establishment of an Agricultural Lands Trust;
  - Establishment of a 'Local' labeling system;
  - Maximizing the potential for food production on City properties and suitable unused lands through projects like edible landscaping and community gardens; and,
  - Developing a Small Plot Intensive Farming program which allows urban farmers to grow food on under-used land (through rental or barter arrangements with property owners).

Ambient Air

Suggested Goal 6: Edmonton's air is fresh, clean and safe today and into the future[59]

Possible Progress/Performance Measures:

- *Air Quality Index in Edmonton indicating good air quality at least 97% of the time.*
- *Always meet or exceed World Health Organization air quality guidelines, which are stronger than Canadian guidelines*
- *Assess and implement the network improvement recommendations for an effective monitoring network for the region by ____.*

Suggested Objective: Edmonton's air quality is understood and monitored in a manner where all relevant information is available and analysed to determine whether or not the air quality is acceptably protective of human health and the urban ecosystem

Existing Policies Promoting Sustainability (and this Objective)

- **TWAhead:** Livability Principle: Environment: An environment sustained for current and future generations through responsible practices. Clean air and water, access to local food supplies and the healthy co-existence of natural and urban environments
- **TWAhead:** Environmental health of the city improves (e.g. air and water quality, hazardous waste) Indicators: 1. Air quality index Three-year priority goals: Improve air, water and soil quality (in city operations)
- **TWWGrow: Objective 7.6.1:** Monitor and improve air quality in Edmonton
- **TWWGrow: Policy 7.6.1.1:** Establish baseline air quality levels for the city and collaborate with other orders of government by supporting initiatives to reduce carbon dioxide and protect air quality for future generations by supporting environmentally progressive design (including City Policy – Leadership in Energy and Environmental Design (LEED) Silver), public transportation, car pooling, walking or cycling and by reducing travel distances by encouraging infill.
- **TWWGrow: Policy 7.6.1.2:** Partner with government agencies, public agencies, industry and others to monitor and maintain standards for good air quality.
- **Capital Region Growth Plan:** There is a land use principle established in the plan around air: Protect the Environmental & Resources: d. Minimize the impact of development on regional watersheds and airsheds.
- **Alberta Capital Airshed Alliance** Three Year Business Plan (the mandate of the ACAA is derived from the Provincial Clean Air Strategy) Goals:
    i. Ensure comprehensive Air Quality Management in the region
    ii. Implement a program to measure , monitor and collect scientifically defensible data related to ACAA regional air quality
    iii. Provide comprehensive and timely air quality information and reporting that is transparent, high quality and accessible.
- Alberta Capital Airshed Alliance through Capital Air Partnership is implementing the ozone management plan. The Ozone Management Plan outlines 19 recommendations with 32 activities to be undertaken in the near and long term. Implementation is being undertaken jointly by the Alberta Capital Airshed Alliance (ACAA), Fort Air Partnership, West Central Airshed Society, Alberta Environment and the various municipal and industrial partners.

Suggested Additional Policy Direction

[59] This is the goal of the Alberta Capital Airshed Alliance of which Edmonton is a member

- ✓ The City, in conjunction with the Alberta Capital Airshed Alliance and Alberta Environment, will increase air quality monitoring throughout Edmonton (to a standard that is in line with the recommended 2009 Ambient Air Management Strategy of Alberta) and make information available to Edmontonians on a real time basis.
- ✓ The City will encourage, undertake and support studies to determine the air quality in Edmonton and the sources of emissions and determine how they affect the health of Edmontonians and the urban ecosystem.
- ✓ The City will adopt and strive to achieve air quality guidelines recommended by the World Health Organization.

Suggested Objective: Edmonton's air quality is managed to meet the highest standards in a manner that supports health and ecosystem well being.

Existing Policies Promoting Sustainability (and this Objective)

- **TWWGrow: Policy 7.6.1.3:** Support a reduction in residential, industrial, institutional and commercial building emissions through the promotion of Leadership in Energy and Environmental Design Green Building Rating System
- **TWWGrow: Policy 7.6.1.4:** Utilize the Leadership in Energy and Environmental Design Green Building Rating System in all new City facilities.
- **TWWGrow: 8.1.4.4** Work with the Capital Region to monitor the Region's air quality.
- **TWWLive: Objective 6.2:** The City of Edmonton is an environmentally sustainable society.
- **TWWLive: Policy 6.2.10:** The COE promotes environmental best practices in urban design, construction and re-use of materials.
- **TWWLive Policy 6.2.11:** The COE promotes the use of the highest environmental standards through a civic culture of environmental planning, conservation, preservation and protection.
- **TWWMove Policy 6.1** The City will create a walkable environment.
- **TWWMove Policy 6.2** The City will create a cycle-friendly city.
- **TWWMove Policy 7.1** The City will develop a comprehensive program to continually optimize the efficiency of the existing roadway system using traffic management and transportation supply measures.
- **TWWMove Policy 7.2** The City will initiate and support comprehensive programs for Transportation Demand Management to encourage a reduction in single occupant vehicle use.

Suggested Additional Policy Direction

- ✓ The City, in partnership with organizations such as the Alberta Capital Airshed Alliance, will support and participate in management activities including (not limited to) the development and implementation of air quality management plans that are designed to address specific local air quality issues.

Biodiversity

Suggested Goal 7: Biodiversity is valued and maintained.

Possible Progress/Performance Measures:

- *Total Priority Natural Aras Secured: 8% of city area (currently at 3715 ha; needs to go to 5600 ha)*
- *Priority Natural Areas secured in the NS River Valley (currently 3336 ha; needs to go to 4800 ha)*
- *Priority Natural Areas secured in the Tablelands (currently 379 ha; needs to go to 800 ha)*
- *Amount of natural area protected in the region*
- *Measures of protected area connectivity*
- *Measures of biodiversity in protected areas and within the city as a whole*
- *Canopy cover*

Existing objectives from The Way We Grow, Objective 7.1.1: Protect, preserve and enhance a system of conserved natural areas within a functioning and interconnected ecological network.

Existing goals form the Natural Connections Strategic Plan: Goal: Secure a functioning ecological network: The City of Edmonton will secure a protected and functional ecological network. Goal: Manage Edmonton's ecological network: The City of Edmonton will manage Edmonton's ecological network effectively and will work collaboratively with other conservation agencies to do so. Goal: Engage Edmontonians: The city of Edmonton will work with the community to support conservation goals, and will form partnerships with conservation leaders in the community.

Existing Policies Promoting Sustainability (and this Objective)

- **TWWGrow: Policy 7.1.1.1:** Support the implementation of the City of Edmonton's Natural Connections Strategic Plan.
- **TWWGrow: Policy 7.1.1.2:** Acquire and manage the most ecologically sensitive areas in Edmonton.
- **TWWGrow: Policy 7.1.1.3:** Develop procedures to support, encourage and promote innovative ways to acquire, preserve and maintain natural areas and connections on private and public lands, such as land swapping, easements, buffers and bylaws.
- **TWWGrow: Policy 7.1.1.4:** Determine appropriate buffer areas around the periphery of natural areas identified for protection.
- **TWWGrow: Policy 7.1.1.5:** Acquire critical natural linkages and buffer zones to ensure natural areas of ecological value remain sustainable within an urban context.
- **TWWGrow: Policy 7.1.1.6:** Act proactively to acquire ecologically sensitive and environmentally valuable land in the NS River Valley where necessary.
- **TWWGrow: Policy 7.1.1.7:** Public projects, new neighbourhoods and developments will protect and integrate ecological networks, as identified in the Natural connections Strategic Plan, by adopting an ecological network approach to land use planning and design.
- **TWWGrow: Policy 7.1.1.8:** Apply Ecological Information Requirements to develop proposals that will affect, or potentially could affect natural systems or ecological processes.

- **TWWGrow: Policy 7.1.1.9:** Work with the Capital Region Board and adjacent municipalities to acquire, protect and restore natural systems and linkages, recognizing that Edmonton's ecological network is part of a larger regional network (Map 17).
- **TWWGrow: Policy 7.1.1.10:** Utilize the full legislative entitlements of environmental reserve in accordance with the MGA during the land development process.
- **TWWGrow: Policy 7.1.1.11:** Require new developments adjacent to natural areas to demonstrate that they have incorporated ecological design best practices to mitigate negative consequences.
- **TWWGrow: Policy 7.1.1.12:** Lands and features that meet the definition of environmental reserve but are not claimed by the Province should be taken by the city as environmental reserve and protected.
- **TWWGrow: Policy 7.1.1.13:** Utilize urban agricultural lands to complement and enhance biodiversity, linkages, habitat and overall health of Edmonton's ecological network its air and water quality and its people.
- **TWWLive: Objective 6.2:** The City of Edmonton is an environmentally sustainable society.
- **TWWLive: Policy 6.2.4:** The City of Edmonton builds on the City's leadership role in environmental best practices.
- **TWWLive: Policy 6.2.5:** The City of Edmonton provides programs and education to businesses and residents about the importance of individual environmental responsibilities.
- **TWWLive: Policy 6.2.7:** The City of Edmonton enforces community standards through municipal by-laws for environmental best practices.
- **TWWLive: Policy 5.3.1:** The COE designs, builds and partners to protect and maintain city boulevards and green spaces and the North Saskatchewan River Valley as an integral part of an attractive city.
- **TWWLive: Policy 5.3.2:** The COE **designs, builds, provides and protects public access to the top of bank and ravine system.**
- **TWWLive: Policy 5.3.3:** The COE provides activities and events in city green spaces throughout all seasons.
- **TWWLive: Policy 5.3.4:** The COE promotes the river valley as the centrepiece of an integrated regional park system.
- **TWWLive: Policy 5.3.5:** The COE promotes the beauty of our green spaces, parks, aquatic and natural areas.
- **TWWLive: Policy 5.3.6:** The COE promotes the enhancement and protection of significant lands, trees, views and streets in its neighbourhoods.
- **TWWLive: Objective 6.2:** The City of Edmonton is an environmentally sustainable society.
- **TWWLive: Policy 6.2.2:** The City of Edmonton protects, maintains, conserves and restores the biodiversity of Edmonton's natural environment.
- **TWWLive: Policy 6.2.3:** The City of Edmonton protects, preserves and expands its parks, green and natural areas.
- **TWWLive: Policy 6.2.6** The City of Edmonton maintains and conserves natural spaces and ecological connectivity in the NS River Valley.

Suggested Objective: The City integrates biodiversity considerations into all aspects of its governance and development planning.

Suggested Additional Policy Direction

- ✓ That the City use: (a) biodiversity offset strategies to replace biodiversity that is lost through developments and (b) other appropriate tools as provided for in the Alberta Land Stewardship Act.
- ✓ The City will develop an overarching Biodiversity Strategy that encompasses the existing Natural Connections Strategic Plan, providing additional focus on non traditional ways of increasing biodiversity in Edmonton.
- ✓ As well, The Way We Green will emphasize the key importance of biodiversity in Edmonton's sustainability framework, including:
    - *Recognize the central importance of biodiversity (locally, regionally and globally) to Edmonton's sustainability.*
    - *Establish protected areas as essential anchors for Edmonton's biodiversity system (taking a "no net loss" approach and a "no further loss of priority natural areas" approach). Encourage the same approach throughout the region and beyond.*

- *Understand that in isolation, individual protected areas are not self-sustaining. They must be connected to other natural areas in the region and beyond. This principle applies equally to protected areas in the river valley /ravines and tablelands. Work actively to protect, preserve and create natural connections throughout the city, region and beyond that will support high levels of biodiversity.*
- *The health of these protected areas depends on the health of the land around them. Much can be done to improve the health of surrounding roads, parking lots, buildings, residential yards and commercial / industrial areas. Work aggressively to improve biodiversity in all parts of Edmonton, including efforts to significantly increase Edmonton's forest cover from 10% to 20%-30%.*
- *Establish procedures to measure / gauge biodiversity in Edmonton and the region. Establish procedures for monitoring, measurement, and reporting the state of biodiversity in Edmonton. Also establish formal procedures that require developments to undergo thorough reviews to evaluate their impacts on biodiversity (with the goal of achieving 'no net loss" and "no loss of priority natural areas".*

Existing Objective from The Way We Grow, Objective 7.1.2: Restore ecologically degraded and / or damaged ecological systems and linkages to protect, expand and enhance biodiversity.

Existing Policies Promoting Sustainability (and this Objective)

- **TWWGrow: Policy 7.1.2.1:** Work in cooperation with developers, land owners and conservation organizations to encourage the reintegration of native and / or semi-native vegetation into Edmonton's ecological network.
- **TWWGrow: Policy 7.1.2.2: Re**store degraded natural areas and ensure ongoing protection of areas that have undergone restoration where feasible.

Suggested Additional Policy Direction

✓ None

Existing Objective form The Way We Grow, Objective 7.2.1: Protect, manage and integrate natural wetlands into new and existing developments as key assets in Edmonton's ecological network.

Existing Policies Promoting Sustainability (and this Objective)

- **TWWGrow: Policy 7.2.1.1:** Cooperate with the Government of Alberta to actively support and complement its Wetland Policy through the following:
  - In partnership with the Province, the Capital Region board and the adjacent municipalities, develop a comprehensive plan for wetland conservation and integration of wetlands into the urban environment.
  - Where appropriate, acquire wetlands, riparian areas and buffers according to the MGA definition f environmental reserved.
  - Where privately held wetlands cannot be protected through other means, encourage their dedication through conservation easements.
  - Work with land owners to see that compensation required by the Province as a result of the alteration or destruction of wetlands is carried out within city boundaries.

Suggested Additional Policy Direction

✓ None

Existing Objective from The Way We Grow, Objective 7.3.1: Protect, preserve and enhance the NS River Valley and Ravine System as Edmonton's greatest natural asset.

Existing Policies Promoting Sustainability (and this Objective)

- **TWWGrow: Policy 7.3.1.1:** The City will work in partnership with local, regional and provincial organizations to conserve, protect, restore and enhance the NS River Valley and Ravine System for its ecological, recreational, aesthetic, educational and natural resource value.
- **TWWGrow: Policy 7.3.1.2:** That the City undertake a program to restore creek beds associated or aligned with industrial areas.

Suggested Additional Policy Direction

✓ None

Existing Objective from The Way We Grow, Objective 7.3.2: Protect, preserve and enhance the NS River Valley and Ravine System as an accessible year round place for recreation and activity for people of all ages.

Existing Policies Promoting Sustainability (and this Objective)

- **TWWGrow: Policy 7.3.2.1:** Ensure that the NS River Valley and Ravine System remain primarily an area of unstructured, low-intensity and passive recreation, while accommodating appropriate balance of recreation activity within park nodes as described in the Urban Parks Management Plan and the Ribbon of Green.
- **TWWGrow: Policy 7.3.2.2: E**nsure the NSRV&RS remains integrated and connected with other natural areas across the city.
- **TWWGrow: Policy 7.3.2.3:** Ensure that the lands within the NSRVRS Areas Redevelopment Plan boundary will be acquired for parks purposes and natural areas protection.
- **TWWGrow: Policy 7.3.2.4:** Make selected areas of the NSRVRS accessible to all citizens regardless of age or mobility, where feasible.
- **TWWGrow: Policy 7.3.2.5:** Provide pedestrian and bicycle connections to increase movement and accessibility.
- **TWWGrow: Policy 7.3.2.6:** Provide and maintain space for multi season users.

Suggested Additional Policy Direction

✓ None

Existing Objective from The Way We Grow, Objective 7.3.3: Mitigate the impact of development upon the natural functions and character of the North Saskatchewan River Valley and Ravine System.

Existing Policies Promoting Sustainability (and this Objective)

- **TWWGrow: Policy 7.3.3.1:** New development within the NSRV&RS will be planned according to, and will demonstrate that it embodies the following priorities:
  - Conservation and protection of natural areas and the connections that link them to, from and within the NSRV&RS.
  - Low intensity, passive outdoor and trail based recreation or educational opportunities and appropriate facilities to service these.
  - Facilities that provide passive recreational or educational services to the public.
  - Public utilities installations, services and facilities.
- **TWWGrow: Policy 7.3.3.2:** Maintain adequate separation between new urban developments and the NSRV&RS through the City's Top of Bank Policy and viewscapes and public access to the River Valley preserved.
- **TWWGrow: Policy 7.3.3.3:** Require development projects within the NSRV&RS to undertake an Environmental Assessment as specified in North Saskatchewan River Valley Area Redevelopment Plan.
- **TWWGrow: Policy 7.3.3.4:** When City owned facilities must be located within or adjacent to the NSRV&RS they will be located, designed and operated in a way that mitigates ecological impacts.

Suggested Additional Policy Direction -

- ✓ None

Existing Objective from The Way We Grow, Objective 7.4.1: Utilize park and open spaces to complement and enhance biodiversity, linkages, habitat and the overall health of Edmonton's ecological network.

Existing Policies Promoting Sustainability (and this Objective)

- **TWWGrow: Policy 7.4.1.1:** Link parks and open spaces with natural systems through development and design to strengthen the connectivity of Edmonton's ecological network, where feasible.
- **TWWGrow: Policy 7.4.1.2:** Enhance the habitat value of parks by incorporating native plant species into park design; implementing invasive plant removal and restoration programs as needed.
- **TWWGrow: Policy 7.4.1.3:** Maintain a healthy urban forest by continuing to invest in and expand the City's tree inventory and adopt a "no net loss: approach to the replacement of public trees.
- **TWWGrow: Policy 7.4.1.4:** Public utility functions will not be considered in parks and open spaces where they significantly compromise ecological value and integrity.

TWWGrow: Policy 7.4.1.5: Design parks and open spaces to include and maximize the use of ecological design best-practices.

Suggested Additional Policy Direction

- ✓ None

Existing Objective from The Way We Grow, Objective 7.4.2: Expand and enhance Edmonton's inventory of parks and open spaces for the ecological, health, recreation and educational benefits they provide.

Existing Policies Promoting Sustainability (and this Objective)

- **TWWGrow: Policy 7.4.2.1:** During the residential subdivision process, the City will look first to use its municipal reserve authority to acquire land. Cash-in-lieu of land will be considered only when the acquisition of land is not deemed to further City goals to increase opportunities for park development and expansion.
- **TWWGrow: Policy 7.4.2.2:** Cash-in-lieu of municipal service received through subdivision of industrial or commercial areas will be used for the Parkland Acquisition Fund to purchase River Valley land.
- **TWWGrow: Policy 7.4.2.3:** Actively explore and seek out new ways of acquiring, funding and managing parks and open spaces.

Suggested Additional Policy Direction

- ✓ None

Existing Objective from The Way We Grow, Objective 9.1.1: Mitigate the negative impacts of resource extraction activities to protect people and the natural environment.

Existing Policies Promoting Sustainability (and this Objective)

- **TWWGrow: Policy 9.1.1.1:** Resource extraction is prohibited within the NSR&RS in order to preserve its ecological value except where resource material is required to be removed to the extent necessary to accommodate an approved development.
- **TWWGrow: Policy 9.1.1.2:** Protect for future use significant deposits of natural resources such as sand and gravel and promote appropriate rehabilitation and reclamation after extraction.

Suggested Additional Policy Direction

- ✓ None

Existing Objective from The Way We Grow, Objective 9.5.1: Promote the responsible management of contaminated sites to protect public health and the environment.

Existing Policies Promoting Sustainability (and this Objective)

- **TWWGrow: Policy 9.5.1.1:** Remediate contaminated sites to a level suitable for the intended use prior to develop or redevelopment.
- **TWWGrow: Policy 9.5.1.2:** Require investigation of potentially contaminated sites for selected planning applications and require remediation to ensure site suitability.
- **TWWGrow: Policy 9.5.1.3:** Promote and facilitate brownfield redevelopment to add vitality to established communities.

Suggested Additional Policy Direction

- ✓ None

Waste Management

Suggested Goal 8: Edmonton's residential and non-residential waste is diverted from landfill.

Possible Progress/Performance Measures:

- *90% diversion of residential waste from landfill by 2013*
- *100% diversion of residential waste from landfill by 20XX*
- *x% diversion of residential waste from landfill by 2020.*
- *100% diversion of residential waste from landfill by 20XX*

Suggested Objective: Non-residential sectors achieve the same waste diversion rate achieved by Edmonton's residential sector.

Existing Policies Promoting Sustainability (and this Objective)

- To be determined

Suggested Additional Policy Direction

- To be determined

Suggested Goal 9: The amount of waste generated by Edmontonians is continually decreasing (regardless of population and economic growth).

Possible Progress/Performance Measures:

- *x kg of residential waste generated per Edmontonian by 2020*
- *x tonnes of residential waste (total) generated in all of Edmonton by 2020*
- *x kg of non-residential waste generated per Edmontonian by 2020*
- *x tonnes of non-residential waste (total) generated in all of Edmonton.*

Suggested Objective: Edmontonians generate low levels of residential waste; on par with their waste efficient peer cities/countries.

Existing Policies Promoting Sustainability (and this Objective)

- To be determined

Suggested Additional Policy Direction

- To be determined

Note: The City of Edmonton's Waste Management Strategy is currently undergoing revision. Details of that plan will be shared ASAP.

One Planet Living

Goal 10: *Lifestyles of Edmontonians contribute to: energy sustainability; climate neutrality; clean air; water conservation; clean water; food security; biodiversity; and, effective waste management in a manner that promotes global biocapacity equity and one planet living.*

Possible Progress/Performance Measures:

- *Ecological Footprint of X by 20___; or,*
- *Reduce Ecological Footprint X by _____*

Suggested Objective: **Reduce Edmonton's Ecological Footprint**

Existing Policies Promoting Sustainability (and this Objective)

- Sustainable Purchasing Policy C556

Suggested Additional Policy Direction

- The City will promote the concepts of one-planet living and how Edmontonians can reduce their ecological footprint through social marketing campaigns, outreach, education and awareness, Incorporate aggressive demand management for things within the influence of City operations.
- The City, in conjunction with citizens, will set an ecological footprint target that represents: (a) the realities of a winter city, and (b) the tradeoffs Edmontonians are prepared to make in moving toward global biocapacity equity (i.e., one planet living).
- Incorporate aggressive demand management for things within the influence of City operations.