THE WAY WE GREEN

THE CITY OF EDMONTON'S ENVIRONMENTAL STRATEGIC PLAN

Approved by
Edmonton City Council
July 2011

THE CITY OF Edmonton

TRANSFORMING | EDMONTON
BRINGING OUR CITY VISION TO LIFE

VISION: 2040

The City of Edmonton's top strategic plan, The Way Ahead, helps us set direction and align priorities as we work to make Edmonton the city we want it to become by 2040. It sets the following vision of Edmonton.

Take a river boat from one shore of the world's largest urban park to the other, from the university to the legislature. From the water, look up and consider the skyline, the bustling core and the towers and urban villages to the east and west.

The people on the sidewalks and trails, from First Nations to new Canadians, linked by a common purpose — to learn, to prosper, to celebrate. Take the LRT in any direction from here and you'll be in the heart of somewhere special. Welcome to Edmonton, the capital of Alberta, a northern city of art and ideas, research and energy.

- Edmonton is an energy city. Energy drawn from the ground and from above; from the sun and wind. But the true power of Edmonton is the democratic spark in its people.
- Edmonton is a city of design — urban design, architectural design, and environmental design. Walk its safe, leafy neighbourhoods, ride its efficient and accessible transportation system. The city has grown up; now we're building smarter.
- Edmonton links the continent with the north and with Asia. This cooperative regional economy is powerful and diverse, oriented toward the future. Visit the universities and colleges, the humming research parks, the downtown office towers: Edmonton is a destination for advanced technologies, health care, and green energy.
- Edmonton is a recreation city, and arts city. It is a city that embraces all seasons. Run, ride or ski on its trails and fields, cheer in its arenas and stadiums. Enjoy the museums, galleries, clubs, and theatres. Read its novels, watch its films. Spend an hour or a week in the glorious North Saskatchewan River Valley, the world's largest preserved urban park.
- Edmonton is a city of many cultures, educational opportunities, and all political and social orientations; yet its citizens are inspired by a shared vision and the certainty that this city on a river is one of the most special places on earth.

The *Way We Green* builds on this vision, describing the sustainable and resilient city we want Edmonton to become.

Edmonton is a sustainable and resilient city. Living within the limits of nature, we have become a leader in energy efficiency and energy conservation. A carbon-neutral city, Edmonton is prepared for disturbances that could result from climate change and peak oil. In the course of everyday life, Edmontonians experience a strong connection with nature and rich biodiversity. Even though our population has increased significantly, our air and water are cleaner and the amount of waste we generate has decreased. Edmontonians have learned to live locally and our food supply is secure. As reflected by our ever-shrinking ecological footprint, Edmontonians live in ways that are equitable to other people and life on the planet. Our journey has transformed us physically, environmentally, socially, and economically. Throughout the journey we have collaborated with other communities and orders of government, helping to create sustainability and resilience in our region and beyond. We have lived our lives sustainably, in ways that have protected the environment for future Edmontonians. Our legacy is a sustainable, resilient city that will support and enrich the lives of future Edmontonians.

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EXECUTIVE SUMMARY

The Way We Green is the City of Edmonton's environmental strategic plan. It sets out principles, goals, objectives and strategic actions and approaches for Edmonton to live in balance with nature. While this approach is crucial for the wellbeing of the environment, it is equally crucial for the wellbeing of our society, economy, and quality of life. In keeping with this theme, *The Way We Green's* two main focuses are: (a) **sustainability:** our society's ability to endure over a prolonged period as an integral part of Earth's natural systems, and (b) **resilience:** the capacity of our city to withstand and bounce back intact from environmental disturbances.

The plan's 12 goals describe what ultimately must be accomplished for Edmonton to be a sustainable and resilient city. They have not been understated or minimized to reflect what we think we can accomplish based on today's limited solutions and resources. Rather, they indicate what many citizens, stakeholders, and experts think must be accomplished for Edmonton to exist in balance with nature and preserve today's outstanding quality of life.

Sustainability and resilience are the ultimate goals of every city. Although their achievement is not a certainty, much can be done to facilitate success. *The Way We Green* proposes a systematic management approach that will be applied over the timeframe of this plan, providing a foundation for success.

Fundamentally important is the understanding that *The Way We Green* is a long term **community plan**. Becoming a sustainable, resilient city will require inspired community effort over the long-term. Success will mean that Edmontonians understand, value, and practise principles of sustainable living. Strong leadership from all community sectors will be needed.

The Way We Green addresses Edmonton's sustainability and resilience challenges, starting with the overarching environmental theme — Healthy Ecosystems, which is covered in three sections:

- Healthy Ecosystems — Land challenges
- Healthy Ecosystems — Water challenges
- Healthy Ecosystems — Air challenges

Delving further, *The Way We Green* responds to three associated challenges (each having biodiversity, land, water, and air implications):

- Energy and Climate Change
- Food
- Solid Waste

While each of these topic areas is essential to Edmonton's wellbeing, the challenges they pose differ in size and urgency. The majority of citizens, stakeholders, and experts who helped develop this plan identified *energy and climate change* as the greatest challenges facing Edmonton. These challenges will require us to design our urban environment to be more energy-efficient, adopt higher energy efficiency standards for buildings, become more energy-efficient in our travel, reduce our dependence on fossil fuels, make lifestyle changes that significantly reduce our energy use, and dramatically reduce, and ultimately eliminate our net emission of greenhouse gases. Achieving these goals by mid-century will require significant resolve, innovation, collaboration, investment, citizen buy-in, and leadership. The resulting changes to Edmonton will be transformational.

HEALTHY ECOSYSTEMS — LAND CHALLENGES

An **ecosystem** is a biological environment consisting of all organisms living in a particular area, including the physical components with which they interact, such as soil, water, air, and sunlight. Ecosystems are the basic systems of life, of which all life is part and all life depends.

Vital for cities to function properly, ecosystems provide four main types of service:

Provisioning Services — crops, wild foods, plant-derived medicines, and fresh water

Regulating Services — pollination, pollutant filtration, climate regulation through carbon storage and water cycling, disaster protection, biodiversity maintenance, and mitigation of heat-island effects

Cultural Services — education, recreation, and maintenance of spiritual and aesthetic values

Support Services — including photosynthesis, soil formation, and nutrient cycling.

The Way We Green responds to concerns involving local and global ecosystem loss, a trend that places our own sustainability and quality of life at risk. While the City of Edmonton has been a leader in stemming the loss of natural areas, in a given year more natural areas are still lost than protected. With biodiversity on the decline around the world and in Edmonton, new tools are needed to achieve the City's biodiversity commitments (as stated in Durban Commitment and signed by the City of Edmonton in 2008).

Over the past decade, Edmonton's outward growth has been a significant factor contributing to this loss. Citizens, stakeholders, and experts who helped develop this plan identified "sprawl" as a key challenge facing the city in the next thirty years. They cautioned that current patterns of growth and development could negatively affect Edmonton's environment through:

- Loss of ecosystem services resulting from the loss of agriculture lands, the urban forest, natural areas, natural connections, and biodiversity
- Higher energy consumption, greater pollution, traffic congestion, and increased health costs, resulting from greater automobile dependency.

Various social and economic drawbacks were also linked with rapid outward growth, including:

- Higher costs for roads, utilities, schools, and other public infrastructure
- Hollowing-out of established neighbourhoods (causing school closures, an underperforming urban core, and derelict central lands)
- Reduced quality of life and economic output as more time is spent driving/traveling and less time is left for economic and social endeavours
- Reduced feasibility of public transit (hindering overall efficient and cost-effective movement of citizens)
- Increased sedentary lifestyles, contributing to a range of health issues and costs
- Financial risks for suburban homeowners as motoring costs go up and property value goes down with the passing of cheap oil.

The Way We Green responds to these challenges, stressing that in order to achieve greater population density in Edmonton's built areas and rein in suburban growth: (a) market prices will need to encourage this shift, (b) mature neighbourhoods will need to offer equal or superior living experiences to those of the suburbs, and (c) new greenfield developments will need to offer even higher standards of sustainability and resilience. As well, *The Way We Green* encourages efforts to:

- Protect, preserve, and restore ecosystems and increase biodiversity
- Protect agricultural lands
- Manage and mitigate brownfields and contaminated sites.

HEALTHY ECOSYSTEMS — WATER CHALLENGES

The North Saskatchewan River is Edmonton's sole water supply. Although the quality of river water has improved significantly over the past half-century, *The Way We Green* identifies challenges related to future growth throughout the entire watershed and possible impacts to the river from climate change.

The Way We Green responds to these challenges with objectives that promote:

- High standards of watershed management, through the City's involvement in the North Saskatchewan Watershed Alliance and EPCOR's Watershed Protection Program
- A stormwater quality control strategy that gives priority to managing stormwater runoff quality using best management practices such as on-site natural features (e.g., low impact development)
- Continual reduction of combined sewer overflows to the North Saskatchewan River
- High standards of treatment and reduced loadings from EPCOR's wastewater treatment plant
- Healthy ecological functioning of the river
- Improved understanding of how climate change could affect North Saskatchewan River flow
- Enhanced knowledge of water quality and quantity in the North Saskatchewan River and its tributaries through partnered monitoring, including the City's Environmental Monitoring Program
- Preventive actions to ensure continuous access to water
- Water conservation and efficient water use.

HEALTHY ECOSYSTEMS — AIR CHALLENGES

Measured by the provincial Air Quality Index, Edmonton's air quality has improved significantly since the 1970s, due largely to vehicle technology improvements. In 2009, the number of "Good" air quality days was approximately 96 per cent.

However, experts consulted in this project feel Edmonton's air emissions are poorly understood due to limitations with the monitoring network.

The Way We Green responds to this challenge with objectives that promote:

- Development of a comprehensive air quality management plan for the airshed, in partnership with regional stakeholders
- An expanded regional air quality monitoring network that is better integrated with the monitoring systems that exist in local industry
- Better monitoring and reporting of air quality as it relates to human health.

ENERGY AND CLIMATE CHANGE CHALLENGES

The Way We Green identifies *Energy and Climate Change* as the top sustainability and resiliency challenges facing Edmonton. The majority of citizens, stakeholders, and experts who helped develop this plan felt strongly that Edmonton's near-total dependence on fossil fuels for energy was not sustainable due to: (a) decreasing global oil reserves, and (b) climate and air quality effects caused by burning fossil fuels. The *Edmonton Sustainability Papers* which served to inform *The Way We Green* (see Appendix A), reference a number of expert opinions that can be summed up generally as follows:

1. Nearly all of Edmonton's energy comes from fossil fuel (oil, gas, and coal), a finite resource that decreases in supply over time.
2. While there is ongoing debate about the quantity of fossil fuels that remains on Earth, it is likely that the easiest and cheapest-to-extract deposits have been developed and that future, yet undiscovered reserves will cost much more to obtain.
3. All decisions we make about Edmonton's future growth and form should be considered within the context of a much more energy-constrained world with much more volatile and higher energy prices.

The Way We Green responds to the energy and climate change challenge with strategies that promote:

- Greater personal awareness of, and responsibility for energy-wise living
- An energy-efficient built environment (urban form)
- Energy-efficient buildings
- Energy-efficient movement/transportation
- Reduced fossil fuel dependency and greater use of renewable resources
- A more resilient electricity generation and distribution system
- A less energy-intensive economy
- Carbon neutrality to help mitigate global climate change
- Initiatives that will help us adapt to local climate change.

FOOD CHALLENGES

Today's food resiliency movement is driven by the following concerns:

- Possible global food market disruptions stemming from climate change
- Increasing and wealthier global populations, resulting in less food available for export to Edmonton
- Potential higher cost of fossil fuels, making it more expensive to grow and transport food from far-away places.

The majority of citizens, stakeholders, and experts who contributed to this plan consider these risks probable and encourage a strong risk management approach. *The Way We Green* responds to these challenges with objectives that promote establishing a Food Charter, a Food Policy Council, and a Food Resiliency Strategy.

SOLID WASTE STRATEGY

Approximately 60 per cent of Edmonton's residential waste is diverted from landfill — twice the Canadian average. An even higher rate of diversion (a remarkable 90 per cent) is expected by 2013 when the City's waste-to-biofuels facility becomes operational.

At the same time, most industrial, commercial, institutional, construction, and demolition waste generated in Edmonton is landfilled. Only an estimated 10 to 15 per cent of construction demolition waste is recycled.

The Way We Green responds to this challenge with objectives that promote:

- High rates of non-residential waste landfill diversion, to mirror residential waste diversion rates
- Continual reduction of waste generated by Edmontonians on a per capita basis.

A FOUNDATION FOR SUCCESS

Becoming a sustainable and resilient Edmonton will require strong community support, with the City of Edmonton responsible for coordinating much of this effort.

To succeed in this role, the City will require:

- **A strong underlying management system** and planning processes that routinely consider sustainability and resiliency as part of day-to-day operations
- **New sustainability tools,** such as life-cycle costing, energy modeling, better baseline information, regulatory tools, and new ways of explicitly valuing environmental attributes of City projects
- **New approaches and ways of thinking** that include leading by example, collaboration, innovation, inspired leadership, education, awareness, and new ways of defining progress.

THE WAY WE GREEN GOALS

The Way We Green sets 12 long-term goals that describe a sustainable and resilient Edmonton.

Healthy Ecosystems — Land

1. ***Goal:*** Edmonton's communities are full of nature — a place where in the course of everyday life, residents experience a strong connection with nature.

Healthy Ecosystems — Water

2. ***Goal:*** Water quality in the North Saskatchewan River sustains healthy people and healthy ecosystems.
3. ***Goal:*** Edmonton's water supply meets its needs.

Healthy Ecosystems — Air

4. ***Goal:*** Edmonton's air sustains healthy people and healthy ecosystems.

Energy and Climate Change

5. ***Goal:*** Edmonton's sources and uses of energy are sustainable.
6. ***Goal:*** Edmonton is resilient to disturbances that could affect its energy supplies and distribution system.
7. ***Goal:*** Edmonton is a carbon-neutral city.
8. ***Goal:*** Edmonton is resilient to disturbances from climate change.

Food

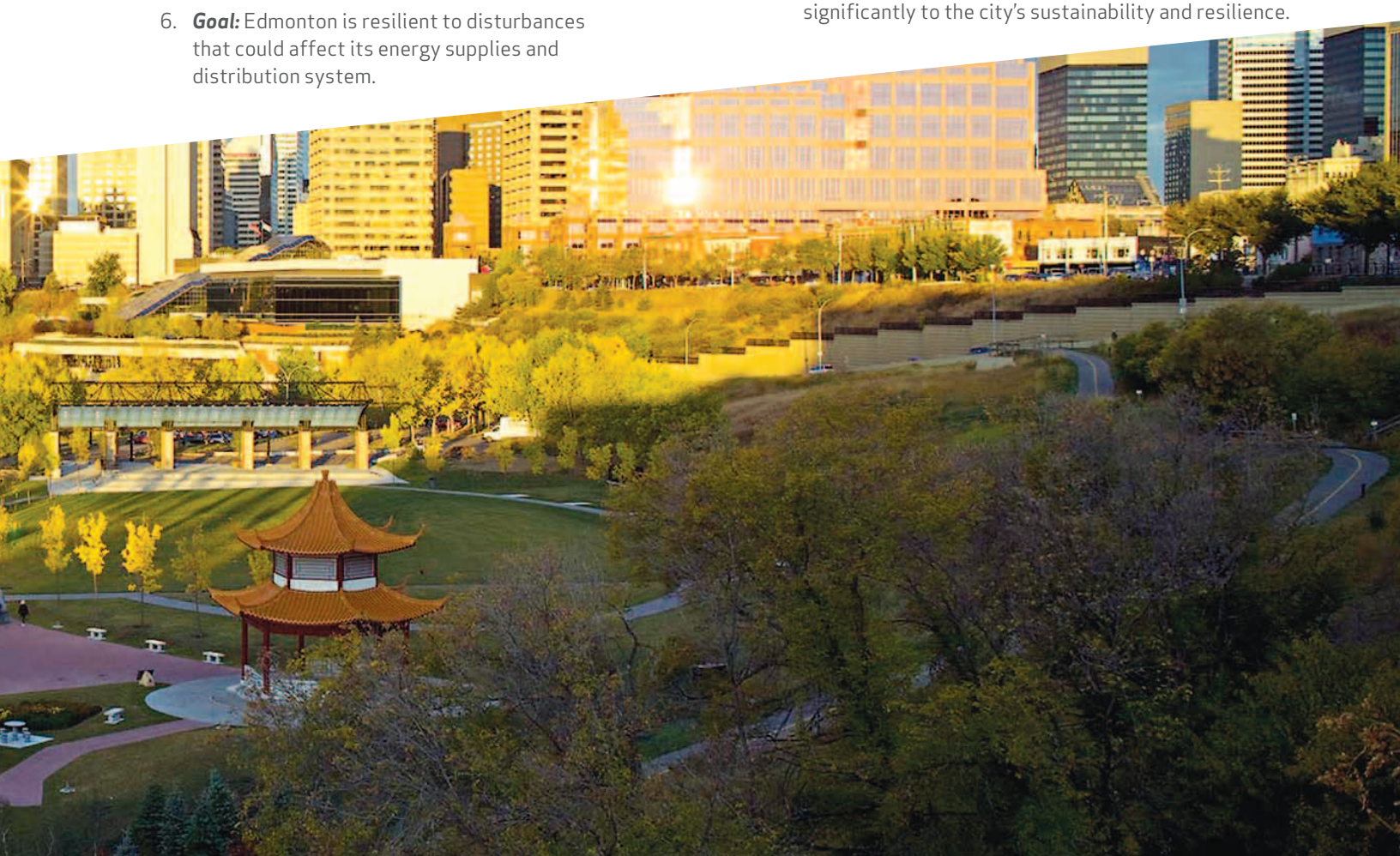
9. ***Goal:*** Edmonton has a resilient food and agriculture system that contributes to the local economy and the overall cultural, financial, social, and environmental sustainability of the city.

Solid Waste

10. ***Goal:*** Edmonton generates zero waste.

Foundation for Success

11. ***Goal:*** The City of Edmonton strives for sustainability and resilience in all it does.
12. ***Goal:*** Lifestyles of Edmontonians contribute significantly to the city's sustainability and resilience.



1.0 INTRODUCTION

1.1 WHAT IS *THE WAY WE GREEN*?

The Way We Green is the City of Edmonton's environmental strategic plan. It calls for strong actions to protect and preserve the environment, encouraging Edmontonians to understand nature's limits and live within those limits. *The Way We Green* also encourages Edmontonians to pursue a vision of **sustainability** (i.e., enduring over a prolonged period as an integral part of Earth's natural systems) and **resilience** (i.e., having the capacity to withstand and bounce back intact from environmental disturbances).

Key directions of this strategy are expressed through a vision statement, Goals, Objectives, and Strategic Actions. *Goals* describe the sustainable and resilient city we strive to be, while *objectives* indicate what needs to be accomplished. Initial ideas about possible targets are discussed under the heading "How far? How fast?"

The plan's 12 goals have not been understated or minimized to reflect what we think we can accomplish based on today's limited solutions and resources. Rather, they indicate what many citizens, stakeholders, and experts think must be accomplished for Edmonton to exist in balance with nature and preserve our outstanding quality of life.

The Way We Green's goals and objectives are extremely challenging. Although their success is not a certainty, much can be done to facilitate success. *The Way We Green* outlines a strong and systematic management approach that will be implemented over the timeframe of this plan, providing a foundation for success.

The Way We Green urges Edmontonians to aggressively pursue and strive to achieve these goals with the expectation that much can be achieved by 2040. Implementation plans supporting *The Way We Green* will establish detailed targets and milestones to guide the long-term journey.

The Way We Green has nine sections. Section 1 introduces the plan, providing background on its integration with the City's other directional plans, the City's strong environmental record, how the plan was created, feedback from Edmontonians, and in general terms how the plan will be implemented.

Section 2 explains the concepts of sustainability and resilience, proposing a comprehensive set of sustainability and resilience principles the City can use in its decision-making processes.

photo: April Scott

Sections 3 to 8 examine Edmonton's sustainability and resilience challenges, starting with the overarching environmental theme — Healthy Ecosystems, which is covered in three section:

- Healthy Ecosystems – challenges involving land (Section 3)
- Healthy Ecosystems – challenges involving water (Section 4)
- Healthy Ecosystems – challenges involving air (Section 5).

Delving further, *The Way We Green* focuses on three associated challenges (each having biodiversity, land, water, and air implications):

- Energy and Climate Change (Section 6)
- Food (Section 7)
- Solid Waste (Section 8)

Section 9 presents a "foundation for success" that is needed over the 30-year timeframe of this ambitious plan.

1.2 ALIGNING WITH EDMONTON'S OTHER STRATEGIC PLANS

The Way We Green is not the City's only plan guiding sustainability and resilience. Many relevant policies already exist in *The Way We Grow, The Way We Move,* and *The Way We Live*. Relevant Goals, Objectives, and Strategic Actions contained in these plans are restated and referenced in *The Way We Green* to provide a complete picture of the City's overall approach to environmental sustainability and resilience.

Sustainability and resilience plans also exist at the departmental-level, addressing environmental challenges ranging from waste management to climate change. As an integrative strategy, *The Way We Green* links and aligns these plans as shown in Figure 1. While some of the plans are in place today or under development, *The Way We Green* calls for the creation of others.

The Way We Green is strongly aligned with the directions of *The Way We Grow, The Way We Move, and The Way We Live.* However, at times it encourages the City to move faster and farther than may have been implied in these plans.

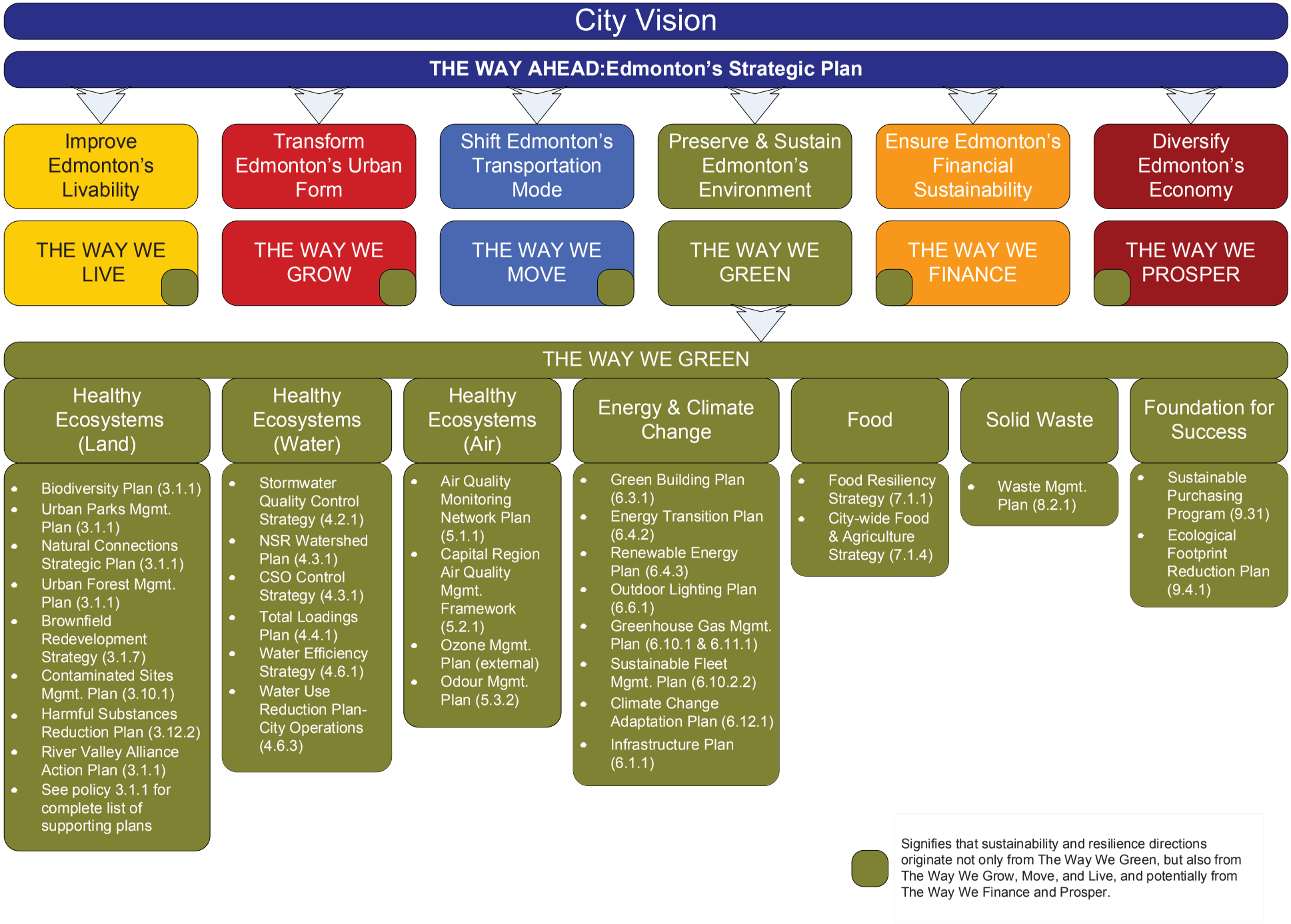
1.3 BUILDING ON A STRONG ENVIRONMENTAL RECORD

The City of Edmonton's reputation as an environmental leader is founded on many green initiatives over the past two decades.

Waste Management

- The Edmonton Waste Management Centre is North America's largest collection of highly-advanced, sustainable waste processing and research facilities.
- Existing facilities divert 60 per cent of residential waste from landfill. Once fully operational in 2013, the new biofuels facility will enable the City to divert 90 per cent.
- Edmonton was one of the first North American cities to launch a curbside recycling program in 1988. The program has a voluntary participation rate of 89 per cent.
- Edmonton's single family households actively reduce waste by backyard grasscycling (36 per cent participation) and composting (30 per cent participation).
- As a founding partner of the Edmonton Waste Management Centre of Excellence, the City is involved in research to support improved processes, technologies, and products for its waste management operations.
- Since 2007, the Waste Management Branch has been accepting construction and demolition (C&D) waste for recycling. This program will be expanded in 2011 to accept mixed materials, with a long-term goal of handling up to 50 per cent of the mixed C&D material generated in Edmonton.
- Close to 350 volunteers contributed more than 5,000 hours of time through the Master Composter/Recycler Program and the Reuse Centre.
- The City has developed a unique program called Capital City Clean Up, aimed at reducing and preventing litter and graffiti and making Edmonton a cleaner, safer, and more livable city.

FIGURE 1: THE WAY WE GREEN — SUPPORTING PLANS AND STRATEGIES



Energy and Climate Change

- Edmonton is the first Alberta municipality to produce electricity from the collection of landfill gas. Each year, enough gas is mined to satisfy the electricity demands of approximately 4,600 homes (which is approximately 1.5 per cent of total dwellings in Edmonton) and eliminate 150,000 tonnes of greenhouse gas emissions.
- More than 800 traffic signals have been converted to light emitting diode (LED) fixtures, saving more than 6.4 million kWh per year and reducing power consumption by 80 per cent.
- Under the Carbon Dioxide Reduction Edmonton (CO_2RE) initiative, 10,000 citizens have joined a community-based program to reduce personal CO_2 emissions by purchasing energy-efficient products, implementing home energy improvements, and using less energy-intensive transportation.
- With the University of Alberta, the City is undertaking research on climate change relative to storm intensity, to understand its potential impacts on infrastructure design criteria.
- Civic buildings have the largest energy consumption that is linked to greenhouse gas emissions. Comprehensive building condition assessments on all City buildings and facilities are complete. Where possible, building components such as furnaces and fixtures have been exchanged for more efficient units.
- By composting organics, the Waste Management Branch has reduced more than 700,000 tonnes of greenhouse gas emissions from landfill.
- In 2010, the City completed five LED street lighting pilot projects. This work will lead to implementation of LED street lights in neighbourhood renewal projects in 2011. Conversion from conventional street lighting to LED technology will result in power consumption savings between 40 to 60 per cent per light, depending on the particular manufacturer.

Water

- Edmonton is a world leader in wastewater recycling. The Gold Bar Wastewater Treatment Plant can supply up to fifteen million litres a day of high-quality treated water to industry, reducing the need to draw water from the North Saskatchewan River.
- Edmonton's residential per capita water use is well below the Canadian average for metered communities and the national average.
- High-intensity ultraviolet light reduces microorganisms in effluent prior to discharge back into the river.
- Approximately 25 kg of mercury have been diverted from sanitary sewers due to 99 per cent compliance of dental amalgam separator requirements.
- The City's Combined Sewer Overflow Control Strategy, Stormwater Quality Strategy, and Total Loadings Plan contribute to a Zero Discharge Vision which aims to reduce total contaminants released into the North Saskatchewan River. The award-winning Kennedale constructed wetlands can capture about 1,100 kg/d of total suspended solids from the Kennedale storm basin. Another end-of-pipe treatment facility, the Groat Road Stormwater Treatment Facility, will be completed in the first half of 2011. It will remove 400 kg/day of total suspended solids from the Groat Road storm basin.
- As part of the City Operations Water Management Strategy, water is diverted and reused from swimming pools and spray decks for irrigation and street cleaning.
- The City is developing Low Impact Development Design Guidelines to reduce stormwater discharge effects on the watershed.
- Grades four, five, and eight students across the city learn about stormwater and wastewater through the City of Edmonton Treat It Right!® education program.
- Each year, thousands of volunteers scour the river valley collecting approximately 5,000 bags of garbage, as part of the River Valley Clean-Up program and the Great Canadian Shoreline Clean-Up program.
- The City of Edmonton partners with the North Saskatchewan Watershed Alliance, EPCOR, and other stakeholders to monitor water quality and improve watershed health and management.

Air

- Edmonton was the first North American city with a population less than one million to build a Light Rail Transit (LRT) system.
- Edmonton's well managed urban forest, inclusive of natural areas and general vegetation, plays a valuable role in cleaning ambient air of pollution.
- Through its work with the Clean Air Strategic Alliance (CASA), the City has helped test after-market vehicle emission reduction technologies (e.g., Diesel Particulate Filters), promote better vehicle emissions standards, and educate citizens on the importance of maintaining older vehicles.
- The City has helped develop emissions inventories, anti-idling education programs, and recommendations for improved air quality monitoring through its active participation on the board of the Alberta Capital Airshed Alliance, a regional air quality management forum.

Biodiversity

- Edmonton's river valley park system is the largest municipally owned park in Canada and the 5th largest municipally owned park in North America.
- Initiated in 2009, the Master Naturalist Program has trained 55 volunteers. Each graduate helps to enhance the environment by providing 35 hours of volunteer service.
- The John Janzen Nature Centre, Valley Zoo, and Muttart Conservatory provide environmental education to the public.
- The City's Neighbourhood and Community Development Branch provides programs that focus on awareness and environmental education in natural areas.
- The City's Urban Forest Management Plan is currently under development.
- The 2010 Corporate Knights Survey ranked Edmonton as Canada's leading city in ecological-integrity, water conservation, and urban biodiversity.

Resource Conservation

- Since 2004, Edmonton is the only North American city to recycle road sand. In 2010, 74 per cent (> 87,000 tonnes) of collected road sand was available for reuse after collection and cleaning.
- Since 1981, the City has recycled asphalt and concrete from City street construction projects. The Aggregate Recycling Program currently diverts approximately 200,000 m^3 of waste products from landfill annually and significantly reduces the amount of aggregate that would otherwise be purchased by the City.

Environmental Management

- The City manages its environmental responsibilities in accordance with the highest international standard for environmental management systems — ISO 14001.
- The City adheres to the highest standard of environmental reporting and disclosure through the production of its annual report on the environment — the EcoVision Annual Report.
- The City contributed to the development of the Cities Biodiversity Index, created by the Singapore National Parks Board and supported by the Convention on Biological Diversity. The City has also implemented the index for Edmonton.

Sustainable Land Development

- The City has a number of major sustainable residential and industrial development projects underway including Oxford, Goodridge Corners, Schonsee, and Rampart, as well as the Station Pointe, City Centre Airport, and The Quarters Downtown redevelopments.

Food

- In 1981, a volunteer organization called the Edmonton Gleaners started the first food bank in Canada in order to share and redistribute food resources in the community.
- Muttart Conservatory partners with an in-house local restaurant, growing herbs and produce that are served in its restaurant.

- The Community Garden Network (CGN) was established in 1999 and, with City support, has seen the establishment of a number of gardens. Recently, CGN amalgamated with Just Food Edmonton and Personal & Community Support Association (PCSA) to promote food security in Edmonton.

1.4 CREATING *THE WAY WE GREEN*

The Way We Green was created using a robust, citizen-focused development methodology that included:

- Reviewing past City of Edmonton public consultations
- Interviewing civic leaders and representatives from stakeholder organizations
- Analyzing sustainability policies and strategies from benchmark municipalities around the world
- Creating a steering committee comprising members of the City's Environmental Policy Leadership Committee
- Creating an external, five-person Expert Panel that provided feedback on proposed policy directions (See Appendix E for details)
- Seeking regular feedback from the City of Edmonton's citizen-based Environmental Advisory Committee and Natural Areas Advisory Committee
- Commissioning 21 discussion papers to examine the wide range of sustainability challenges facing Edmonton (See Appendix A for a detailed listing of the *Edmonton Sustainability Papers*)
- Consulting with thousands of Edmontonians through workshops, focus group sessions, on-line questionnaires, surveys, pubic forums, and a range of community and stakeholder meetings and events to understand their environmental values, concerns, priorities, and preferred policy directions
- Creating *The Way We Green* website to educate, inform, and solicit citizen feedback
- Developing and widely circulating a discussion paper (i.e., White Paper) to test ideas and policy directions
- Broadly circulating this plan (in its draft form) to obtain feedback from citizens and stakeholder groups.

Visit www.edmonton.ca/thewaywegreen for full details of the public involvement process.

1.5 WHAT DID EDMONTONIANS SAY?

Feedback from Three Stakeholder Workshops

In early and late June and November 2010, the City held three workshops (each offered four times) to seek stakeholder advice on a variety of matters involving Edmonton's sustainability and resiliency. The approximately 250 individuals who participated in workshops included representatives from business, industry, environment, education, government, social, community, youth, and Aboriginal organizations.

Workshop participants were asked to consider the following key questions:

- Does Edmonton face sustainability/resiliency challenges?
- How probable is it that these challenges will be serious concerns within 30 years?
- Will these challenges require changes to our infrastructure and lifestyles?
- Which of these challenges are most important for Edmonton to address in *The Way We Green*?
- What policy options exist to address these challenges? Which have the greatest potential value and should be further explored?
- What barriers will Edmonton face in achieving its sustainability and resilience goals?
- Is the current pace of change adequate to address the challenges?

A high percentage of workshop participants indicated that, in their opinion, it was *somewhat* to *highly* probable Edmonton would face serious challenges within 30 years, relative to oil and gas supply/price, climate change, water supply, air and water quality, food security, and environmental challenges from beyond Edmonton's borders. The percentage of participants expressing this opinion ranged from 80 to 90 per cent, depending on the challenge. Similarly, when asked whether these challenges would require major lifestyle or infrastructure changes, the majority (60 to 90 per cent of participants, depending on the challenge) felt this would be the case.

In terms of the relative importance of these challenges, stakeholders indicated the following ranking:

1. **Energy** (1st in importance): Edmonton's fossil fuel dependence could become a serious challenge due to resource depletion and/or climate change.

2. **Water Supply** (2nd in importance): Water demand could exceed supply due to a growing population, receding glaciers at the North Saskatchewan River headwaters, and/or climate change.
3. **Biodiversity** (3rd in importance): Loss of biodiversity and related ecosystem services could seriously affect Edmonton's wellbeing, including loss through habitat destruction, degradation, fragmentation, and/or climate change.
4. **Food** (4th in importance): Edmonton could experience food security challenges due to a growing world population, vulnerable supply lines, loss of local agricultural land, and/or the effects of climate change both here and around the world.
5. **Water Quality** (5th in importance): The City could face challenges in handling its pollution loads to the North Saskatchewan River due to growing population within the watershed and/or reduced flows in the river as a result of climate change.
6. **Ambient Air Quality** (6th in importance): Edmonton's outdoor air quality could be seriously impacted due to a growing population, expanding industry, and/or effects of climate change.

Energy Policy Options — Top Preferences

When asked to indicate policies they favoured for addressing Edmonton's energy challenges, stakeholders identified the following as their top three choices:

- Policies that favour an urban size and form that achieve optimal energy efficiency, e.g., ones that promote greater density and/or reduce sprawl.
- Policies that favour energy-efficient building stock, e.g., ones that promote stronger building codes, higher standards for municipal buildings, and/or zoning regulations.
- Policies that favour a distributed/decentralized energy system that uses renewable energy, e.g., ones that support incentives for solar, municipal feed-in tariff, incentives for renewable energy use, and substitute renewable sources for coal-fired generation.

Go to www.edmonton.ca/thewaywegreen for a full report summarizing and analyzing the results of these three workshops.

Feedback from Public Questionnaires

Approximately 400 citizens responded to two questionnaires that were hosted on *The Way We Green* website from May 20 to August 20, 2010. Questions asked were similar to those posed to workshop participants.

When asked to identify areas most important to Edmonton's sustainability, "energy" was again identified as the City's top sustainability challenge. Water supply, water and air quality, food, and biodiversity trailed by considerable margins. As with workshop participants, 80 to 90 per cent of respondents felt these challenges were *somewhat* to *highly* probable and would require major changes to infrastructure and lifestyles.

Visit www.edmonton.ca/thewaywegreen for the full report summarizing results of the public questionnaires.

Feedback from Public Festivals and Events

During July and August 2010, *The Way We Green* project staff attended local festivals and public events to promote *The Way We Green*, encourage citizen participation, and solicit feedback. The more than 750 citizens who completed iPad surveys indicated strong support for policies that will promote more energy-efficient buildings, greater use of renewable energy, greater urban density, and less outward expansion.

Feedback from the Public Forum

The City of Edmonton hosted a public forum on November 3 and 4, 2010, inviting citizens to City Hall to learn about *The Way We Green* and respond to policy directions contained in a discussion paper (i.e. *The Way We Green* White Paper). More than 325 citizens attended.

The forum format included six topic stations where an overview of each topic was available, along with a response form that allowed participants to indicate their level of agreement with proposed recommendations for that topic. Overall, citizens who attended were highly supportive of proposed Goals, Objectives, and Strategic Actions contained in the White Paper. On average, proposed objectives and policies received more than 90 per cent support.

Visit www.edmonton.ca/thewaywegreen for a full report on the Public Forum.

Feedback from a Representative Survey of 1,000 Edmontonians

Between October 29 and November 5, 2010, one thousand online interviews were conducted to understand:

- How concerned are citizens about Edmonton's environmental sustainability/resilience?
- How concerned are citizens about Edmonton's rapid outward growth?
- What do citizens think are the barriers that prevent them from living in a more sustainable way?

The sample of Edmontonians was drawn to be representative of the Edmonton population with a margin of error of ± 3 per cent, 19 times out of 20.

The results of this representative survey differed considerably from results obtained through the public forum, workshops, and on-line questionnaires. Overall, approximately one-third of Edmontonians surveyed agreed Edmonton faces significant sustainability challenges. However approximately one-third were neutral, and one-third disagreed with assertions that Edmonton faces sustainability challenges.

Researchers who conducted the representative survey concluded:

The survey revealed a critical dichotomy. On the one hand, citizens recognize the severity of global environmental challenges, but on the other hand they tend to believe that Edmonton (and Alberta) can somehow remain largely immune to these problems. This dichotomy is apparent with respect to even such fundamental issues as the energy outlook and the prospect of climate change. The key finding of the research was that while most Edmontonians are conscious of the importance of sustainability issues in principle, they do not necessarily see the relevance of these issues to the local community and to their own daily life.

From a strategic perspective, the difference between expert knowledge and public opinion is of crucial importance because in the final analysis, even scientifically sound and socially responsible sustainability/resilience solutions depend on political decisions and these, in turn, must reflect the choices and preferences of the citizenry. Thus, the City's environmental strategic plan may rightfully call for "strong action to protect and preserve the environment" and assert that "Edmontonians must understand the finite limits of nature and live within those limits", but these concepts will resonate with the public only when and if they appear relevant to the practical daily life of the population. In this context we want to note, based on our extensive survey research experience, that the views expressed by "community leaders" and "activist stakeholders" are not necessarily representative of the opinions held by the general public. Thus, to ensure that The Way We Green is genuinely a community plan, it is necessary to integrate expert knowledge, stakeholder views and public opinion.

The survey research provides significant clues to overcoming public complacency. For one thing, notwithstanding their seemingly indifferent attitudes, the vast majority of Edmontonians appears to have already adopted many "green" practices of their own volition and would be prepared to modify their lifestyle even more in the future. The key is self-interest. While experts and activist stakeholders approach the local action requirements from a global perspective, members of the general public tend to focus on direct economic consequences. When the cost of environmentally profligate activity is high, people will seek lower-cost environmentally sound alternatives. It is disincentives and incentives that provide the driving force of public behaviour more immediately than persuasion or education.

A further clue can be found in the public's positioning of environmental considerations on their mental mapping of issue clusters. "Sustainability" as such does not register and even the generic designation of "environmental protection" receives a relatively low priority rating from Edmontonians. On the other hand, an environmental strategy linked to high-saliency local issues — such as controlling urban sprawl, revitalizing the city core, and improving the quality of urban living — holds out the promise of relevance and immediacy for the citizenry.

Go to www.edmonton.ca/thewaywegreen for full survey results.

1.6 HOW WILL THIS PLAN BE IMPLEMENTED?

Detailed Plans

Implementation of *The Way We Green* is a long-term, undertaking that will be achieved through a set of 30-plus action plans. Some of these plans are in place today or under development, while the development of others has yet to begin. Development of these plans will require the City to collaborate with citizens, community stakeholders, regional stakeholders, and other orders of government to:

- Understand the various options and scenarios that exist to address the challenges
- Estimate the costs and benefits of proposed initiatives to ensure they deliver a net benefit to Edmontonians
- Ensure all three pillars of sustainability (social, economic and environment) are fully considered and respected in determining the best courses of action.

Detailed plans will typically adopt a 10-year time frame and be reviewed and updated at regular short-term intervals. Plans will specify short, medium, and long-term targets, estimates of costs and benefits, financial/budget implications, implementation timeframes, and roles and responsibilities. *(See Figure 1 for a summary of the supporting plans).*

While it is anticipated that many of the goals are achievable within the 30 year timeframe of this plan, some goals may take longer. Timeframes will become clearer as action plans are developed.

The City of Edmonton's Role

Fundamentally important to the successful implementation of *The Way We Green* is the understanding that it is a community plan. Its successful implementation will ultimately depend on inspired community action over the 30-year timeframe of this strategy and beyond. Success will require that Edmontonians understand, value, and practice principles of sustainable living. Strong, sustained leadership from all parts of the community will also be paramount.

Although the City of Edmonton is one of many community players working to achieve sustainability and resilience, its roles as coordinator, facilitator, educator, regulator, influencer, service provider, planner, and innovator are key. In particular, the City will need to:

- Lead by example, adopting green standards in its operations that are consistent with changes it hopes to encourage in the community
- Collaborate with the community in developing the 30-plus action plans that support *The Way We Green* (See Figure 1)
- Facilitate the building of a strong community network that connects sustainability-minded citizens, organizations, and leaders for the purposes of sharing ideas, learning, and forming partnerships
- Actively involve committed community leaders to help lead and oversee the implementation of *The Way We Green*
- Actively assist citizens and organizations in achieving sustainability and resiliency goals that benefit the community
- Work with educators throughout the community to communicate key information about Edmonton's sustainability and resilience challenges, and actions that citizens can take
- Promote sustainable living through its regulatory powers and development planning processes
- Work in partnership with industry, regional neighbours and other orders of governments to achieve sustainability goals and objectives
- Foster innovation within its own organization by cultivating a spirit of proactive problem solving
- Monitor, measure, report, and publicly communicate Edmonton's progress in implementing *The Way We Green*.

Community Support

Successful implementation of *The Way We Green* will need to align with the priorities and values of average Edmontonians. While a large segment of Edmontonians express concern about the potential sustainability and resilience challenges facing Edmonton, an even larger proportion is either neutral or discounts the seriousness of the risks. Building broad community support for *The Way We Green* will require a multi-stage approach that will be reflected in the various action plans.

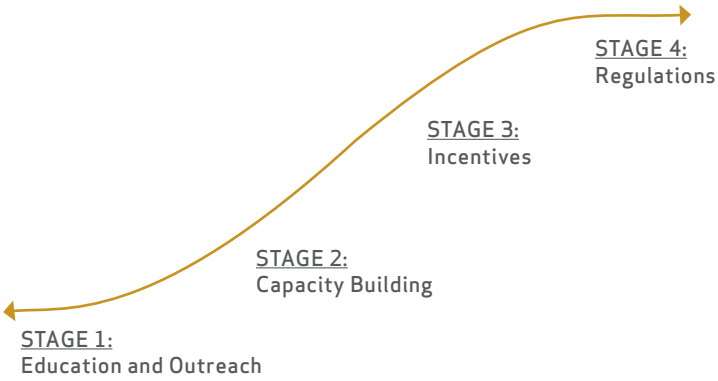
Education and Outreach: Ensuring Edmontonians are in an informed position to evaluate and respond to the challenges raised in this strategy.

Capacity Building: Ensuring Edmonton has the human and technical resources needed to undertake the various transformative changes that may be required.

Incentives: Encouraging early adapters and rewarding them for sustainable behaviour.

Regulations: Using statutory powers where appropriate to discourage non-sustainable behaviours.

FIGURE 2: COMMUNITY TRANSFORMATION "S" CURVE



This four-stage approach will be tailored for each of the sustainability/resilience challenges identified in *The Way We Green* and fully detailed in supporting plans (See Figure 1).

2.0 SUSTAINABILITY AND RESILIENCE

2.1 WHAT IS SUSTAINABILITY?

The following definitions of sustainability and sustainable living were adapted, with minor revisions, from the Office of Sustainability, University of Alberta. They were used as a reference to develop *The Way We Green* and are proposed for the City of Edmonton's ongoing use.

- **Sustainability:** the ability of human society to endure over a prolonged period as an integral part of Earth's natural systems. Sustainability is achieved through the practice of sustainable living.
- **Sustainable Living:** 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.

The Way We Green was developed based on the view that the natural environment is the foundation of human society, including the economy. A strong and enduring society is possible only to the extent that its environmental foundation is also strong and enduring.

Figure 3(a) illustrates this relationship. Three concentric circles convey the idea that the economy exists within society and society exists within the natural environment and is dependent on it.

While a strong and healthy environment is the foundation of our existence, our overall quality of life is a function of all three factors — environment, social, and economic. *The Way We Green* recognizes that being a sustainable community requires each of these pillars to be strong. Figure 3(b) illustrates this concept. *The Way We Green* is designed to keep Edmonton's environmental pillar strong, recognizing that in doing so, the other two pillars must also remain strong. Achieving our social and economic aspirations, while at the same time living in balance with nature, is central to this plan.

photo: Daniel Laubhann

FIGURE 3(a): THE RELATIONSHIP OF ECONOMY, SOCIETY, AND THE ENVIRONMENT

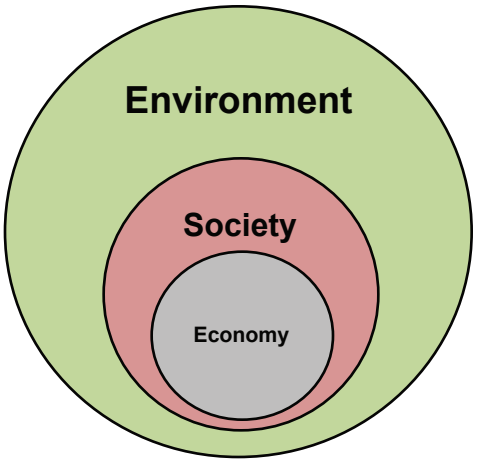
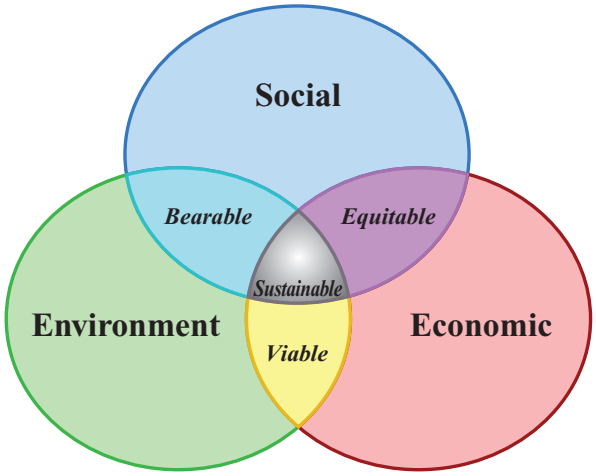


FIGURE 3(b): PILLARS OF A SUSTAINABLE SOCIETY



2.2 PRINCIPLES OF SUSTAINABLE LIVING

Sustainability principles are basic assumptions about the way human society must live in order to endure over a prolonged period as an integral part of Earth's natural systems. The non-profit organization, Natural Step Canada (www.thenaturalstep.org) guides organizations in progressing toward sustainability and endorses the following science-based, socio-ecological principles that the City will apply to pursue sustainability:

Success-Level Principles

1. **Systematic Degradation of Nature**[1]**:** In a sustainable society, nature is not subject to systematically increasing degradation by physical means.
2. **Substances from the Earth's Crust**[2]**:** In a sustainable society, nature is not subject to systematically increasing concentrations of substances extracted from the earth's crust.
3. **Undermining the Capacity of People to Meet their Needs**[3]**:** In a sustainable society, people are not subject to conditions that systematically undermine their capacity to meet their needs.
4. **Synthetic Substances Produced by Society**[4]**:** In a sustainable society, nature is not subject to systematically increasing concentrations of substances produced by society.

Supporting these success-level principles, the City will apply the following strategy-level principles that provide more specific direction on how to achieve sustainability:

Strategy-Level Principles

5. **Biodiversity**[5]**:** Recognize the intrinsic value[6] of biodiversity and natural ecosystems, and protect and restore them. *(Selected from the Melbourne Principles)*
6. **Model Cities on Ecosystems**[7]**:** Build on the characteristics of ecosystems in the development and nurturing of healthy and sustainable cities. *(Selected from the Melbourne Principles)*
7. **Use of Renewable Natural Resources**[8]**:** Renewable resources must be consumed at a rate less than or equal to the rate of natural replenishment. *(Proposed by sustainability educator and author Richard Heinberg)*
8. **Use of Non-Renewable Natural Resources**[9]**:** Use of non-renewable resources must decline at a rate that is equal to or greater than the rate of depletion. *(Proposed by sustainability educator and author Richard Heinberg)*
9. **Future Generations**[10]**:** Actions today must benefit seven generations into the future (i.e., approximately 150-200 years). *(Proposed by Aboriginal Relations Office, City of Edmonton)*

Section 9 of this plan formalizes these principles through policies that direct their use by the City of Edmonton.

2.3 WHAT IS RESILIENCE?

The Way We Green defines resilience as the capacity of a system (in this case a functioning city) to withstand and bounce back intact from environmental disturbances. This concept is central to *The Way We Green,* given potential risks related to climate change, severe weather, energy supply, food supply, and the supply of other renewable and non-renewable resources.

2.4 PRINCIPLES OF RESILIENCE

Success-Level Principles

The following general principles of resilience were used to develop *The Way We Green* and are proposed for ongoing City of Edmonton use.

1. **Carbon Neutrality:** Communities must aim to not increase the net amount of carbon dioxide and other greenhouse gases in the atmosphere. Community design and planning must be based on low fossil fuel use in both building construction and operation.
2. **Redundancy of Systems and Functions:** The downward slope of the peak oil curve combined with increasingly energetic weather means the City and its communities will need to withstand more frequent and powerful environmental stressors. This forces a need for infrastructure system redundancy including electrical power, fresh water and fuel supplies, wastewater processing, and food supply.
3. **Systems Diversity:** Greater diversity brings a greater ability to thrive, survive, and recover from external stressors. The City will need different types of business institutions, food sources, and industries to thrive.
4. **Systems Durability:** In many parts of the world, global warming will increase storm frequency, peak wind velocity, and precipitation volume and duration. As a result, we will require more durable systems and structures to withstand these increased stresses.
5. **Loop Tightness:** A system's ability to detect and respond to changes in its parts is called loop tightness. The more quickly a system detects and responds to changes, the greater its resiliency potential. Therefore, we will need responsive social, economic, and technical systems with tight feedback loops.
6. **Local Self-sufficiency:** The City and its communities need a sustainable supply of goods and services including food, fuel, power, and water, as well as basic manufacturing of clothing, building materials, and tools. Greater self-sufficiency should be encouraged.
7. **Responsive to Natural Systems:** Modeling the City on ecosystems will reduce the cost of creating and maintaining technical infrastructure.

Section 9 of this plan formalizes these principles through the creation of policies that direct their use by the City of Edmonton.

Strategy-Level Principles

To achieve success-level principles of resilience, the following more specific strategy-level principles of resilient urban design are proposed for ongoing City of Edmonton use.

8. **Density, Diversity, and Mixed-use**: Creating resiliency and reducing the carbon footprint of urban development requires space and land use be maximized. A vibrant, densely populated urban environment is well used around-the-clock, every day, and during all seasons.
9. **Active Transportation**: Resilient cities and neighbourhoods should prioritize active transportation 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 to resiliency.
10. **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.
11. **Place Making**: To increase resiliency, Edmonton should focus energy and resources on conserving, enhancing, and creating strong, vibrant places that are a significant component of the neighbourhood's structure and community's identity.
12. **Complete Communities**: Resilient neighbourhoods should provide for the needs of daily living within walking distance. Resilient communities reduce carbon footprints by ensuring people opt to walk or cycle, instead of driving vehicles.

13. **Integrated Natural System**: Resilient cities and their neighbourhoods should conserve and enhance the health of natural systems and areas of environmental significance, as well as aim to mitigate the impacts of climate change.
14. **Integrated Technical and Industrial Systems**: It is important to reduce the negative environmental impacts of economic activities and processes, as well as reduce their fossil fuel dependence. This will require us to develop more integrated and more highly efficient industrial processes and technical systems that ensure maximum efficiency in using materials and energy resources, as well as in eliminating wasteful and potentially harmful by-products.
15. **Local Sources**: Resilient regions, cities, and neighbourhoods should support and encourage growing, producing, and manufacturing the resources they need within close proximity — a 200 kilometre radius of the city.
16. **Engaged Communities**: Development of resilient cities and neighbourhoods requires the active participation of community members at all levels. Residents and stakeholders must be part of planning and designing their cities and communities. They must also be part of delivering a new vision by choosing to walk, engaging each other, generating awareness, and demanding higher standards.
17. **Redundant and Durable Life Safety and Crucial Infrastructure Systems**: Resilient cities and neighbourhoods should plan and design for redundancy and durability of their life safety (e.g., police, fire, and ambulance) and crucial infrastructure systems. Planning and design of these systems will aim for levels of redundancy and durability commensurate with the increasing environmental, social, and economic impacts of climate change and peak oil.
18. **Resilient Operations**: Resilient cities and neighbourhoods should develop building types and urban forms that provide reduced servicing costs and smaller environmental footprints. Urban sprawl is extremely expensive to service and maintain as it results in a disproportionately large amount of land, roads, pipes, and infrastructure required per capita. By contrast, a compact, mixed-use urban environment is far more efficient in its demand for municipal services and infrastructure requirements.

Section 9 of this plan formalizes these principles through policies that direct their use by the City of Edmonton.

2.5 EDMONTON'S SUSTAINABILITY AND RESILIENCE LENS

The principles outlined in Section 2.2 and 2.4 are the essential requirements of a sustainable, resilient society. They are intended to serve as the City's sustainability/ resiliency lens, helping decision makers understand how their choices contribute to (or diminish) Edmonton's sustainability.

Implementation of *The Way We Green* will include widespread efforts to create awareness and understanding about these principles — both in City operations and throughout the community. Principles will be applied to the City's ongoing planning processes and adapted in ways that will help Administration and City Council evaluate the sustainability and resiliency of their decisions on a routine basis. (See Section 9 for further information on how these principles will be applied).

FIGURE 4: EDMONTON'S SUSTAINABILITY LENS

3.0 HEALTHY ECOSYSTEMS — LAND

THE CHALLENGE — GLOBAL AND LOCAL ECOSYSTEMS

Edmonton's sustainability and resilience is inherently tied to the health of global and local ecosystems.

An ecosystem is a biological environment consisting of all organisms living in a particular area, including the physical components with which they interact, such as soil, water, air, and sunlight. Ecosystems are the basic systems of life, of which all life is part and all life depends. A healthy ecosystem is one that can maintain a state of equilibrium between its members over time, in the face of external stress.

Ecosystems are vital to our sustainability, providing four main kinds of services:

- **Provisioning services** — including crops, wild foods, fresh water, and plant-derived medicines
- **Regulating services** — including filtration of pollutants, climate regulation through carbon storage and water cycling, mitigation of heat-island effects, disaster protection through natural drainage areas, and biodiversity maintenance by pollination
- **Cultural services** — education and recreation, as well as maintaining spiritual and aesthetic values
- **Supporting services** — including soil formation, photosynthesis, and nutrient cycling.

A key measure of ecosystem health is its biodiversity — the degree of variation of life forms within a given ecosystem, biome, or entire planet. Greater biodiversity implies greater ecosystem health.

One of the most urgent sustainability challenges facing societies around the world is the systematic loss and degradation of ecosystems. This trend has been ongoing for the past several centuries, evidenced by the loss of natural areas, forests, wetlands, agricultural land, soil, biodiversity, populations, and species. Given the life-sustaining role of ecosystems, any systematic or continual loss should be viewed with concern. Clearly, the sustainability of human societies will require this downward trend to end, a challenge that will only intensify as global populations increase.

photo: April Scott

Recent scientific assessments of global biodiversity find *that species are continuing to decline and that the risk of extinction is growing; that natural habitats are continuing to be lost and becoming increasingly degraded and fragmented; and that the principal direct drivers of biodiversity loss (habitat disturbance, pollution (especially nutrient load), invasive alien species, over-exploitation, and increasingly, climate change) are either constant or intensifying (Butchart et al. 2010, GBO3 2010). Further driving forces include economic and human population growth. The failure to account for the full economic values of ecosystems and biodiversity has been a significant factor in their continuing loss and degradation.*[11]

While Edmonton is vulnerable to ecosystem losses that are happening beyond its borders, it also is experiencing losses locally. Between 2000 and 2007, 31 per cent of Edmonton's Priority Natural Areas on the tablelands were permanently lost to development. At greatest risk are natural areas outside the river valley and ravines. These tableland natural areas make up only 2.3 per cent of Edmonton's protected areas. Wetlands also face a considerable risk, with few protected sites and no policy to prevent net loss.

While the most important contributor to healthy ecosystems is the retention of natural habitats, Edmonton's opportunity to protect its remaining natural habitats will be gone within 15 years, based on projected rates of development.

THE CHALLENGE — GROWTH

Over the past decade, Edmonton's outward growth has contributed significantly to the loss of natural areas and ecosystems. Citizens, stakeholders, and experts who helped to develop *The Way We Green* identified "sprawl" as a top challenge facing the city in the next 30 years. They cautioned that current patterns of growth and development could negatively affect Edmonton's environment through:

- Loss of ecosystem services, resulting from the loss of agricultural lands, the urban forest, natural areas, natural connections, and biodiversity
- Higher energy consumption, greater pollution, traffic congestion, and increased health costs resulting from greater automobile dependency.

They also noted a number of social and economic drawbacks:

- Reduced feasibility of public transit (hindering overall efficient and cost-effective movement of citizens)
- Higher costs for roads, utilities, schools, and other public infrastructure
- Hollowing-out of established neighbourhoods (causing school closures, an underperforming urban core, and derelict central lands)
- Reduced quality of life and economic output as more time is spent driving/traveling and less time is left for economic and social endeavours
- Increased sedentary lifestyles, contributing to a range of diseases and higher health care costs
- Financial risks for suburban homeowners as motoring costs go up and property value goes down as the age of inexpensive oil passes.

Economists who contributed to *The Way We Green* explained that this growth pattern was a logical response to existing regulations and price signals. The main weakness herein, is that market prices are sometimes artificially lower for goods and services that cause environmental harm than for their green alternatives. This is a result of "externalities" — i.e., *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. Similarly, house prices on the edge of a city are often less per square foot than equivalent housing in mature neighbourhoods. To some extent, this discount may be the result of externalities that are not reflected in the price of a suburban house.

Federal, provincial, and local governments have the power to reduce and eliminate externalities through regulations (e.g., setting limits on emissions) and by adjusting market prices to reflect externalities (e.g., special charge, user fee, or tax). This involvement by governments provides a financial incentive for producers to clean up the externality, and creates a level playing field for green products to compete with less green options.

The fact that existing price structures can lead to negative environmental outcomes represents an important key to the solution. It means that sustainable outcomes can be achieved by correcting pricing structures to fairly reflect externalities. Prices are powerful motivators for both profit-maximizing firms and expense-minimizing individuals. The economics are simple: when the price of products and services goes up, less is purchased; when the price goes down, more is purchased. Simply put, prices guide behaviour.

Achieving *The Way We Green*'s 12 goals will require the alignment of market prices to these goals. When prices pull in the same direction as goals, their achievement is far more likely. This advice is consistent with the independent research conclusion presented in Section 1.5 that states: *It is disincentives and incentives that provide the driving force of public behaviour more immediately than persuasion or education.*

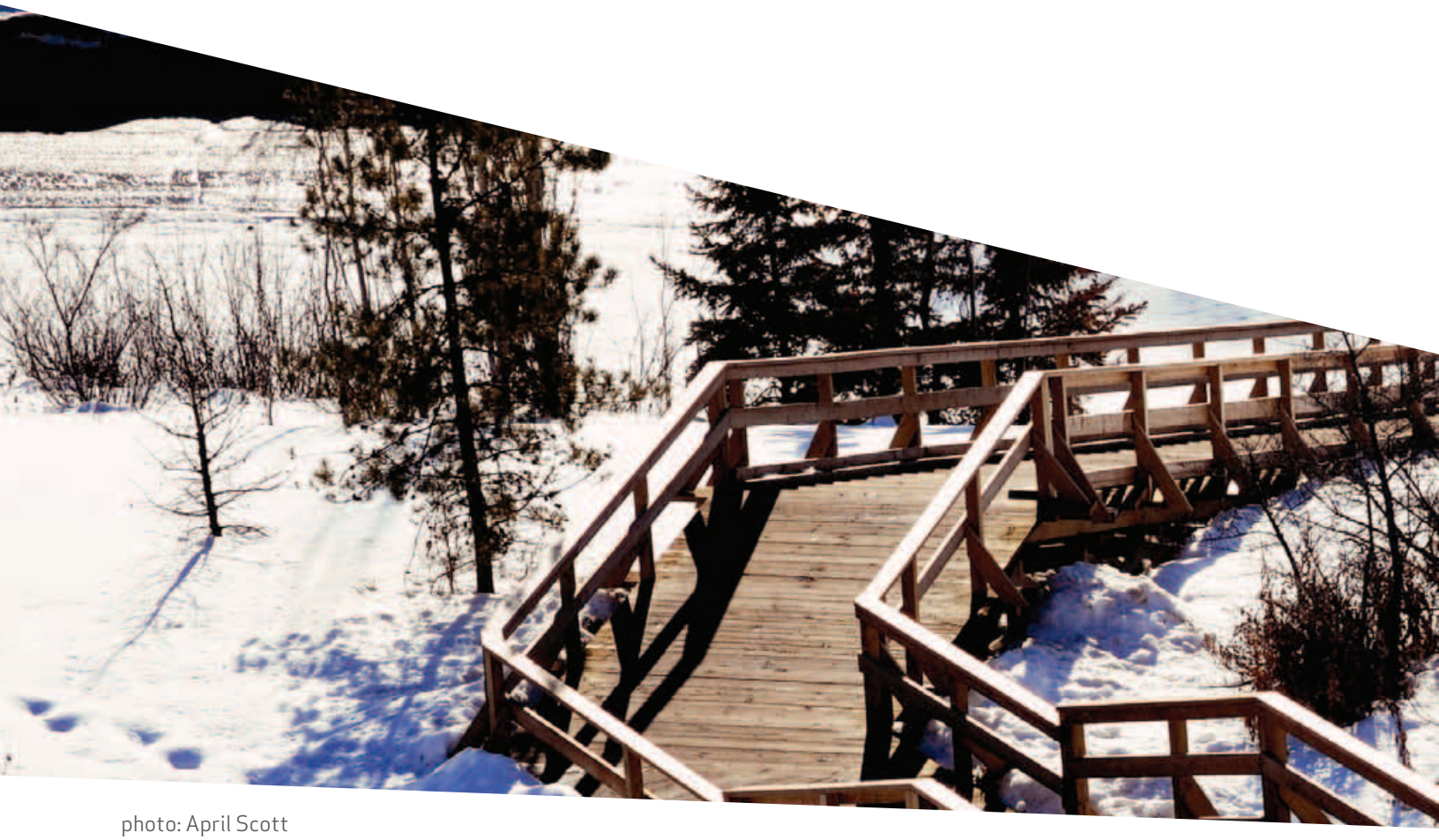


photo: April Scott

In establishing, implementing and maintaining the 30-plus detailed plans that support *The Way We Green* (Figure 1), special attention will be given to existing price structures, ensuring they are supportive of sustainability and resilience goals. New ways of rewarding and encouraging sustainable/resilient outcomes, through financial and non-financial initiatives, will also be actively pursued.

THE CHALLENGE — CONTAMINATED LAND AND BROWNFIELDS

Contaminated lands can adversely impact the urban ecosystem. Leaving a site contaminated without actively managing the impacts can adversely influence groundwater systems which can lead to contamination of drinking water, impacts to aquatic environments, and degradation of utility lines. As well, human health can be negatively affected through vapour penetration into basements, ingestion of contaminated soils, or through direct contact with contaminants. Promoting the responsible management of contaminated sites helps protect human health and maintain the ecological integrity of the urban environment.

In addition to the responsible management of contaminated lands, the redevelopment of brownfield sites is a key contributor to Edmonton's sustainability. However, the development of these sites poses significant challenges. In general, developing these properties is more uncertain and financially risky than greenfield development which is generally less expensive and less complicated. As well, brownfields are generally located in the inner city and, in Edmonton, these sites are small in size, further limiting the financial return on investment. But it is clear these challenges must be overcome because redeveloping underutilized properties in the inner city will lead to denser communities and more compact land use. A commitment to the redevelopment of brownfields can lead to rapid revitalization of areas, residential intensification, and vibrant community growth, all of which are required to meet Edmonton's sustainability goals.

HOW FAR? HOW FAST?

In responding to its healthy ecosystem challenges (involving land), Edmonton will need to:

- Ensure its pricing strategies favour sustainable and resilient outcomes
- Undertake developments within Edmonton's built areas that promote a superior living experience that can compete with the suburbs
- Act quickly to protect priority natural areas which otherwise could be lost permanently by 2025
- Find new ways to increase biodiversity throughout the entire city
- Establish new programs to manage and mitigate brownfields and contaminated sites
- Contribute to regional, provincial, national, and international efforts aimed at protecting, preserving and restoring healthy ecosystems beyond Edmonton's borders
- Exercise greater protection of agricultural lands
- Plant more trees to benefit from the wide range of ecosystem services they provide, including mitigation of the heat-island effect.

GOAL: Edmonton is full of nature — a place where in the course of everyday life, residents experience a strong connection with nature.

OBJECTIVE 3.1

The City of Edmonton understands the ecosystems and ecosystem services upon which Edmonton depends, valuing and protecting them as Edmonton grows.

STRATEGIC ACTIONS:

The City of Edmonton:

3.1.1 Achieves healthy ecosystems through the establishment, implementation, and maintenance of detailed action plans that include:

- Urban Parks Management Plan
- Biodiversity Plan
- Outdoor Lighting Plan
- Natural Connections Strategic Plan
- Urban Forest Management Plan
- Capital Region Air Quality Framework
- North Saskatchewan Watershed Alliance's Integrated Watershed Management Plan
- City and community climate change mitigation and adaptation strategies
- Harmful Substances Reduction Strategy
- Integrated Pest Management Strategy
- Green Building Plan
- River Valley Alliance Action Plan
- Sustainable Sites Plan for City-owned Land
- City-wide Food and Agriculture Strategy
- City-wide Natural Areas Management Plan
- City-wide Restoration Plan
- Wetlands Strategy
- Brownfield Action Plan

3.1.2 Protects ecosystems and ecosystem services by encouraging development and densification of the City's built areas, including:

- Working closely with citizens, school boards, and community stakeholders to establish, implement, and maintain a strategy for attracting families to mature neighbourhoods.
- Establish, implement, and maintain a comprehensive strategy for developing surplus school sites in ways that will help to revitalize mature neighbourhoods and achieve the City Vision.

3.1.3 Encourages renewal and densification of mature neighbourhoods by ensuring superior living experiences that include:

- opportunities to live locally
- special places that foster a sense of authentic human attachment and belonging
- durable buildings and communities that can last many generations
- buildings that are adaptive to different uses over time
- beauty everywhere
- high quality public spaces
- priority to pedestrians and bicycles over automobiles
- natural spaces and biodiversity
- balance (age, demographics, housing, uses)
- opportunities to enjoy winter and experience the full potential of a winter city
- design features that help mitigate climatic effects.

3.1.4 Encourages a minimum of 25 per cent of city-wide housing units growth to locate in the downtown and mature neighbourhoods and around LRT stations and transit centres where infrastructure capacity support redevelopment (*The Way We Grow, Policy 3.1.1.2*).

3.1.5 Supports contiguous development and infrastructure in order to accommodate growth in an orderly and economical fashion (*The Way We Grow*, Policy 3.6.1.6).

3.1.6 Prevents premature fragmentation of agricultural land in the urban growth areas prior to urban expansion (*The Way We Grow*, Policy 3.2.1.5).

3.1.7 Establishes, implements, and maintains a *Brownfield Action Plan* designed to promote the responsible management and return to productive use of Edmonton's brownfields, thus promoting infill on derelict properties over greenfield redevelopment.

3.1.8 Promotes and facilitates brownfield redevelopment to add vitality to established communities (*The Way We Grow, Policy 9.5.1.3*).

3.1.9 Adopts a leadership position in partnership with the Government of Canada, the Government of Alberta, and other local authorities to implement the Plan of Action on Sub-national Governments, Cities, and Other Local Authorities for Biodiversity (*Section X/22 Convention on Biological Diversity*).

OBJECTIVE 3.2

Market prices that are set and influenced by the City of Edmonton are reflective of externalities and aligned with the goals and objectives of *The Way We Green*.

STRATEGIC ACTIONS:

The City of Edmonton:

3.2.1 Sets and influences market prices to reflect environmental externalities and achieve *The Way We Green's* sustainability and resilience goals.

3.2.2 Evaluates and understands the full potential of its statutory tools and those of other orders of government (regulations, taxes, and licenses), applying them and/or lobbying for their use to achieve *The Way We Green's* sustainability and resilience goals.

OBJECTIVE 3.3

The City of Edmonton protects, preserves and enhances a system of conserved natural areas within a functioning and interconnected ecological network. *(The Way We Grow, Strategic Objective 7.1.1)*

STRATEGIC ACTIONS:

The City of Edmonton:

3.3.1 Supports the implementation of the City of Edmonton's Natural Connections Strategic Plan *(The Way We Grow, Policy 7.1.1.1).*

3.3.2 Acquires and manages the most ecologically sensitive areas in Edmonton *(The Way We Grow, Policy 7.1.1.2).*

3.3.3 Develops 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 *(The Way We Grow, Policy 7.1.1.3).*

3.3.4 Determines appropriate buffer areas around the periphery of natural areas identified for protection *(The Way We Grow, Policy 7.1.1.4).*

3.3.5 Acquires critical natural linkages and buffer zones to ensure natural areas of ecological value remain sustainable within an urban context *(The Way We Grow, Policy 7.1.1.5).*

3.3.6 Acts proactively to acquire ecologically sensitive and environmentally valuable land in the North Saskatchewan River Valley where necessary *(The Way We Grow, Policy 7.1.1.6).*

3.3.7 Ensures public projects, new neighbourhoods, and developments 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 *(The Way We Grow, Policy 7.1.1.7).*

3.3.8 Applies ecological information requirements to development proposals that will affect or potentially could affect natural systems or ecological processes *(The Way We Grow, Policy 7.1.1.8*).

3.3.9 Works 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 *(The Way We Grow, Policy 7.1.1.9).*

3.3.10 Utilizes the full legislative entitlement of environmental reserve, in accordance with the Municipal Government Act, during the land development process *(The Way We Grow, Policy 7.1.1.10).*

3.3.11 Requires new developments, adjacent to natural areas, to demonstrate that they have incorporated ecological design best-practices to mitigate negative consequences *(The Way We Grow, Policy 7.1.1.11).*

3.3.12 Takes and protects lands and features that meet the definition of environmental reserve, but are not claimed by the Province *(The Way We Grow, Policy 7.1.1.12).*

3.3.13 Utilizes urban and agricultural lands to complement and enhance biodiversity, linkages, habitat and the overall health of Edmonton's ecological network, its air and water quality and its people *(The Way We Grow, Policy 7.1.1.13).*

3.3.14 Establishes, implements, and maintains policies requiring biodiversity offsets to compensate for trees and wetlands that are lost as a result of the approval of Land Development Applications.

3.3.15 Enhances and maintains functional ecological linkages for the North Saskatchewan River and Ravine System, as well as the associated tablelands through watershed planning including consideration of natural hydrology and maintenance of riparian health and function in land use planning.

3.3.16 Ensures biodiversity corridors are appropriate for all scales of development (neighbourhood to regional) and that infrastructure developments provide appropriate wildlife passage.

3.3.17 Supports ecological connectivity by encouraging and supporting Edmontonians to create natural habitats on their private lands.

3.3.18 Strives to accommodate nature in all aspects of the built environment through building and site design.

3.3.19 Manages Edmonton's ecological network effectively, working collaboratively with other conservation agencies.

OBJECTIVE 3.4

The City restores ecologically degraded and / or damaged ecological systems and linkages to protect, expand and enhance biodiversity *(The Way We Grow, Strategic Objective 7.1.2).*

STRATEGIC ACTIONS:

The City of Edmonton:

3.4.1 Works 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 *(The Way We Grow, Policy 7.1.2.1).*

3.4.2 Restores degraded natural areas and ensures ongoing protection of areas that have undergone restoration, where feasible *(The Way We Grow, Policy 7.1.2.2).*

3.4.3 Finds synergies to reconnect Edmonton's natural systems to increase functional ecological connectivity in the North Saskatchewan River Valley and Ravine System as well as associated tablelands with capital construction projects.

3.4.4 Strives to naturalize land adjacent to major roadways and other transportation and utility corridors to increase natural areas and expand the urban forest.

OBJECTIVE 3.5

The City protects, manages and integrates natural wetlands into new and existing developments as key assets in Edmonton's ecological network *(The Way We Grow, Strategic Objective 7.2.11).*

STRATEGIC ACTIONS:

The City of Edmonton:

3.5.1 Cooperates with the Government of Alberta to actively support and complement its Wetland Policy through the following actions *(The Way We Grow, Policy 7.2.1.1)*:

- In partnership with the Province, the Capital Region Board, and adjacent municipalities, develop a comprehensive plan for wetland conservation and the integration of wetlands into the urban environment.
- Where appropriate, acquire wetlands, riparian areas, and buffers according to the Municipal Government Act definition of environmental reserve.
- 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.

3.5.2 Will dedicate permanent, semi-permanent, and seasonal wetlands (i.e., Class III, IV, and V Wetlands in the Stewart and Kantrud system) and all peatlands as Environmental Reserve upon subdivision of land.

3.5.3 Requires compensation within the borders of the city for wetland drainage or alteration (in full or part) for all non-ephemeral wetlands (i.e., Class II, III, IV, and V wetlands in the Stewart and Kantrud system) and all peatlands in the form restoration or construction of a similarly functioning wetland.

OBJECTIVE 3.6

The City protects, preserves, and enhances its urban forests.

STRATEGIC ACTIONS:

The City of Edmonton:

3.6.1 Establishes, implements, and maintains the Urban Forest Management Plan with the aim to achieve a 20 per cent urban canopy.

OBJECTIVE 3.7

The City protects, preserves, and enhances the North Saskatchewan River Valley and Ravine System as Edmonton's greatest natural asset *(The Way We Grow, Strategic Objective 7.3.1).*

STRATEGIC ACTIONS:

The City of Edmonton:

3.7.1 Establishes, implements, and maintains procedures that make it aware of construction projects in the North Saskatchewan River Valley and its tributary ravines in order to protect and preserve ecological connections.

3.7.2 Works in partnership with local, regional, and provincial organizations to conserve, protect, restore, and enhance the North Saskatchewan River Valley and Ravine System for its ecological, recreational, aesthetic, educational, and natural resource value *(The Way We Grow, Policy 7.3.1.1).*

3.7.3 Undertakes a program to restore creek beds associated or aligned with industrial areas *(The Way We Grow, Policy 7.3.1.2).*

3.7.4 Assigns high corporate priority to protecting and/or restoring ecological connectivity in the North Saskatchewan River Valley — one of the region's key biological corridors.

OBJECTIVE 3.8

The City protects, preserves and improves the North Saskatchewan River Valley and Ravine System as an accessible year-round place for recreation and activity for people of all ages *(The Way We Grow, Strategic Objective 7.3.2).*

STRATEGIC ACTIONS:

The City of Edmonton:

3.8.1 Ensures that the North Saskatchewan River Valley and Ravine System remains 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 *(The Way We Grow, Policy 7.3.2.1).*

3.8.2 Ensures that the North Saskatchewan River Valley and Ravine System remains integrated and connected with other natural areas across the city *(The Way We Grow, Policy 7.3.2.2)* and region (Capital Region River Valley Alliance Plan of Action).

3.8.3 Ensures that the lands within the North Saskatchewan River Valley and Ravine System Area Redevelopment Plan boundary will be acquired for parks purposes and natural areas protection *(The Way We Grow, Policy 7.3.2.3).*

3.8.4 Provides pedestrian bicycle connections to increase movement and accessibility *(The Way We Grow, Policy 7.3.2.5).*

3.8.5 Provides well integrated transitions between sidewalks, the multi-use trail corridor network, other pedestrian networks, transit facilities, parkland, and the river valley and ravine systems *(The Way We Move, Strategic Action 6.1.8).*

OBJECTIVE 3.9

The City mitigates the impact of development upon the natural functions and character of the North Saskatchewan River Valley and Ravine System *(The Way We Grow, Objective 7.3.3).*

STRATEGIC ACTIONS:

The City of Edmonton:

3.9.1 Plans new developments within the North Saskatchewan River Valley and Ravine System according to the following priorities:

- Conservation and protection of natural areas and the connections that link them to, from, and within the North Saskatchewan River Valley and Ravine System.
- 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 *(The Way We Grow, Policy 7.3.3.1).*

3.9.2 Maintains adequate separation between new urban developments and the North Saskatchewan River Valley and Ravine System through the City's Top of Bank Policy, with viewscapes and public access to the River Valley preserved *(The Way We Grow, Policy 7.3.3.2).*

3.9.3 Requires development projects within the North Saskatchewan River Valley and Ravine System to undertake an Environmental Impact Assessment as specified in the North Saskatchewan River Valley Areas Redevelopment Plan (Bylaw No 7188) *(The Way We Grow, Policy 7.3.3.3).*

3.9.4 When City-owned facilities must be located within or adjacent to the North Saskatchewan River Valley and Ravine System they will be located, designed and operated in a way that mitigates ecological impacts *(The Way We Grow, Policy 7.3.3.4).*

OBJECTIVE 3.10

The City utilizes parks and open spaces to complement and enhance biodiversity, linkages, habitat and the overall health of Edmonton's ecological network *(The Way We Grow, Objective 7.4.1).*

STRATEGIC ACTIONS:

The City of Edmonton:

3.10.1 Links parks and open spaces with natural systems through development and design to strengthen the connectivity of Edmonton's ecological network, where feasible *(The Way We Grow, Policy 7.4.1.1).*

3.10.2 Enhances the habitat value of parks by incorporating native plant species into park design; implementing invasive plant removal and restoration programs as needed *(The Way We Grow, Policy 7.4.1.2).*

3.10.3 Maintains 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 *(The Way We Grow, Policy 7.4.1.3).*

3.10.4 Public utility functions will not be considered in parks and open spaces where they significantly compromise ecological value and integrity *(The Way We Grow, Policy 7.4.1.4).*

3.10.5 Design parks and open spaces to include and maximize the use of ecological design best-practices *(The Way We Grow, Policy 7.4.1.5).*

OBJECTIVE 3.11

The City expands and enhances Edmonton's inventory of parks and open spaces for the ecological, health, recreation and educational benefits they provide *(The Way We Grow, Objective 7.4.2).*

STRATEGIC ACTIONS:

The City of Edmonton:

3.11.1 During the residential subdivision process, the City will look first to use its municipal reserve authority to acquire land during the residential subdivision process. Cash-in-lieu of land will be considered only when the acquisition of land is not deemed to further City goals to increase opportunities of park development and expansion *(The Way We Grow, Policy 7.4.2.1).*

3.11.2 Uses cash-in-lieu of municipal reserve received through subdivision of industrial or commercial areas, for the Parkland Acquisition Fund to purchase River Valley land. *(The Way We Grow, Policy 7.4.2.2).*

3.11.3 Actively explores and seeks out new ways of acquiring, funding and managing parks and open spaces *(The Way We Grow, Policy 7.4.2.3).*

OBJECTIVE 3.12

The City promotes the responsible management of contaminated sites to protect public health and the environment *(The Way We Grow, Objective 9.5.1).*

STRATEGIC ACTIONS:

The City of Edmonton:

3.12.1 Establishes, implements, and maintains a Contaminated Sites Action Plan to identify and manage City-owned contaminated sites.

3.12.2 Remediates City-owned contaminated sites to a level suitable for the intended use prior to development or redevelopment *(The Way We Grow, Policy 9.5.1.1).*

3.12.3 Requires investigation of potentially contaminated sites for selected planning applications and requires remediation to ensure site suitability *(The Way We Grow, Policy 9.5.1.2).*

3.12.4 Promotes and facilitates brownfield redevelopment to add vitality to established communities *(The Way We Grow, Policy 9.5.1.3).*

OBJECTIVE 3.13

The City minimizes the impact of lighting and buildings on wildlife.

STRATEGIC ACTIONS:

The City of Edmonton:

3.13.1 Establishes, implements, and maintains lighting design policies and standards based on best practices for minimizing adverse effects on wildlife.

3.13.2 Educates and encourages Edmontonians to adopt environmentally responsible lighting practices.

3.13.3 Recognizes the potential that buildings have to harm wildlife and implements measures to reduce or eliminate these hazards.

OBJECTIVE 3.14

The City continually improves its performance in preventing pollution, managing contaminated sites, and reducing the use of harmful substances.

STRATEGIC ACTIONS:

The City of Edmonton:

3.14.1 Promotes the responsible management of contaminated sites to protect public health and the environment (*The Way We Grow* 9.5.1)

3.14.2 Establishes, implements, and maintains a Harmful Substances Reduction Strategy, aimed at minimizing the use and impact of harmful substances in City Operations and throughout the community.

3.14.2(a) Continually strives to minimize and eventually eliminate the use of pesticides through Integrated Pest Management.

3.14.2(b) Adopts best practice standards for green space maintenance that include enhancing soil quality, planting hardy indigenous plant species, and promoting biodiversity (versus monocultures) as a strategy for reducing Edmonton's use of pesticides.

3.14.2(c) Establishes, implements, and maintains programs that educate and support Edmontonians to limit their use of harmful substances and minimize their adverse effects on the environment.

OBJECTIVE 3.15

The City delivers programs and initiatives that engage and educate citizens about nature.

STRATEGIC ACTIONS:

The City of Edmonton:

3.15.1 Creates, promotes, and delivers nature education programs that stress conservation, preservation, and prevention.

3.15.2 Establishes a comprehensive communications plan promoting nature to citizens.

3.15.3 Establishes an interdepartmental strategy within the City to ensure consistent messaging and no duplication of service.

3.15.4 Actively explores and seeks out new partners within the community to assist with program creation and delivery.

4.0 HEALTHY ECOSYSTEMS — WATER

As Edmonton's sole source of water supply, the North Saskatchewan River is fundamental to our sustainability. In developing *The Way We Green*, the main water-related focuses involved understanding:

- The capacity of the North Saskatchewan River to meet Edmonton's future needs
- The potential for future water supply disturbances and our capacity to withstand them
- The ecological health of the river today and the challenges it might face in the future as growth occurs in its watershed.

THE CHALLENGE — WATER SUPPLY

Water supply has become an increasingly urgent challenge throughout the world due to drought, 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* (around the world) *due to its geographic location, climate, water and wastewater treatment technologies, utility infrastructure, source water protection initiatives, and utility "best management practices" that have been implemented over the past century.*"[12]

Edmonton's current water supply situation is best understood with the following facts[13]:

- Approximately one quarter of the average annual flow of the North Saskatchewan River is allocated through various provincial licenses, but consumptive use for the whole river is less than three per cent (i.e., water taken from the river and not returned, mainly as a result of industrial, commercial, and agricultural processes).
- Edmonton is responsible for only a small portion of this three per cent consumption. EPCOR currently withdraws between two to four per cent of the river flow for treatment and distribution to customers.

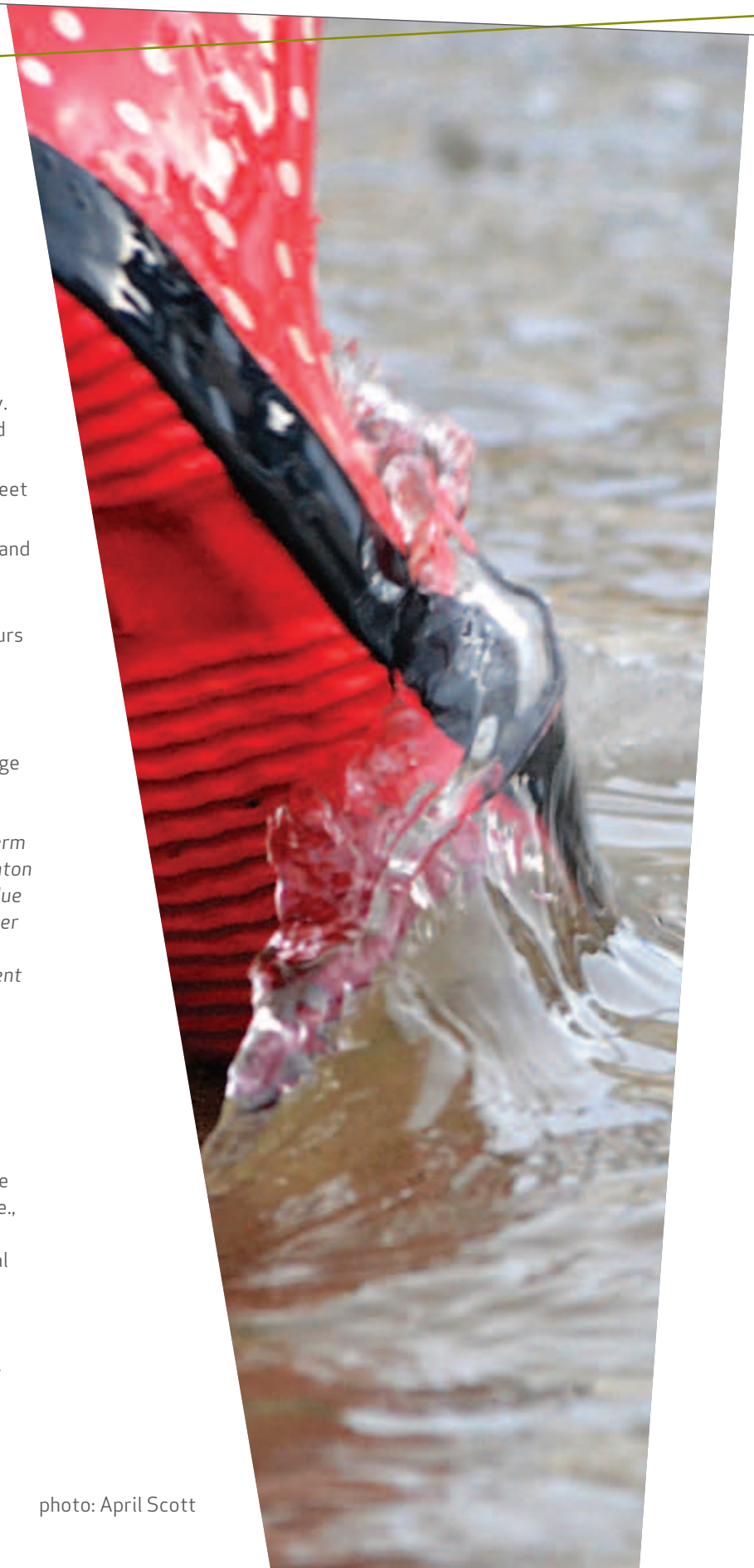


photo: April Scott

However, more than 90 per cent of this is returned to the river (after being used in Edmonton homes and businesses) through the wastewater treatment plants[14]. As such, it is estimated that less than 0.5 per cent of the average river flow is consumed by more than one million people in the Edmonton region.

- In the event of a serious disturbance to Edmonton's water supply, EPCOR has 12 treated water reservoirs that hold more than 800 million litres. This volume is sufficient to meet local demand for approximately three days. The storage is configured so that every community in the city is served by at least two sources. This built-in redundancy ensures continued water supply should one reservoir be unavailable.
- Edmonton's 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 sanitation services. Such water would not be suitable for drinking, but would allow other organizations to provide emergency services.
- Edmonton has historically used less water than the Canadian average due to its well established metering program, rate setting methods, precipitation patterns and relatively short summers. On average, 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 total daily demand for Edmonton water has remained stable at approximately 350 megalitres per day, despite a 10 per cent population increase. Further reduction of water use (on a per capita basis) is expected as pre-1980 homes will be retrofitted with water-efficient fixtures as part of their normal lifecycle upgrade.
- Over the past century, the City and utility have implemented a variety of best management practices to improve water efficiency, including: installing water meters, establishing a leak detection program, constructing efficient water treatment plants, establishing a cast iron water main replacement program, conducting education programs, implementing a low water use efficient fixture bylaw, and constructing City facilities to the LEED Silver standard. Going forward, EPCOR will focus its efforts on customers whose water use is considered wasteful relative 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, *The Way We Green* concludes: (a) Edmonton's water supply is adequate to meet current needs, (b) Edmonton is a water-conserving city — a trend likely to continue as older buildings are retrofitted with more water efficient fixtures and appliances, and (c) Edmonton is resilient to short term water supply disturbances.

Edmonton's long-term water supply situation is best understood with the following facts[15]:

- Under the highest growth scenario over the next 20 years, assuming significant residential and industrial growth in the watershed, consumptive use of the whole river would be six to seven per cent 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 per cent decrease in the North Saskatchewan River'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 based on current rates of consumptions and consumptive use, as Edmonton consumes less than 0.5 per cent of today's average flow. However, research has shown that the river's flows have been extremely variable over the last 1,000 years. As a result, trend analysis over the past 90 years may not adequately characterize the natural river and climate cycles. Research shows that larger trend cycles (for example the Pacific Decadal Oscillation — PDO) strongly determine the North Saskatchewan River's yield. Scientists speculate that a negative shift occurred in 2008 – 09 and this is likely correlated with an expected increase in precipitation for the next 30 years in the basin. This follows the low phase which we have experienced for the previous 30 years.
- Not all declines can be accounted for by global climate patterns and after accounting for PDO, there still remains a residual decline in flow, which we can only explain in terms of the impact of a warming climate. There is an envelope of possible outcomes with ranges

of certainty for predicting water flows under natural conditions, with less certainty as we account for a changing climate regime.

- 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 3 per cent of flow in the North Saskatchewan River. Annual flows are primarily the result of snowmelt and rain events upstream of Drayton Valley in the upper reaches of the watershed.
- Long-term (800 year) data from tree-ring studies show there have been periods of up to 10 – 20 years of extended drought or flood conditions. These could occur in the future and would be difficult to distinguish from climate change-related events.

Given this information, *The Way We Green* concludes there is considerable uncertainty surrounding the scenarios Edmonton could face in the future involving North Saskatchewan River flow. However, current thinking suggests that anthropogenic climate warming will not significantly change the total annual volume of water in the river. It is expected that current watershed hydrology will be affected by less snowpack, more rainfall in the winter, and less in the summer — changes that may impact seasonal water quantity and river water quality. As well, although flows have not presented a challenge over Edmonton's short history, tree-ring records indicate extended periods of drought have occurred in each of the past five centuries. Although the impact of these events on the flow of the North Saskatchewan River is not certain, there is an ever increasing understanding of the drivers of river flow, which will allow for effective adaptive management.

THE CHALLENGE — WATER QUALITY

Edmonton impacts the quality of water and the health of the North Saskatchewan River in four key ways, including discharges from:

- Gold Bar Wastewater Treatment Plant
- Combined sewer overflows
- Storm sewers
- Overland drainage flows (i.e., surface runoff).

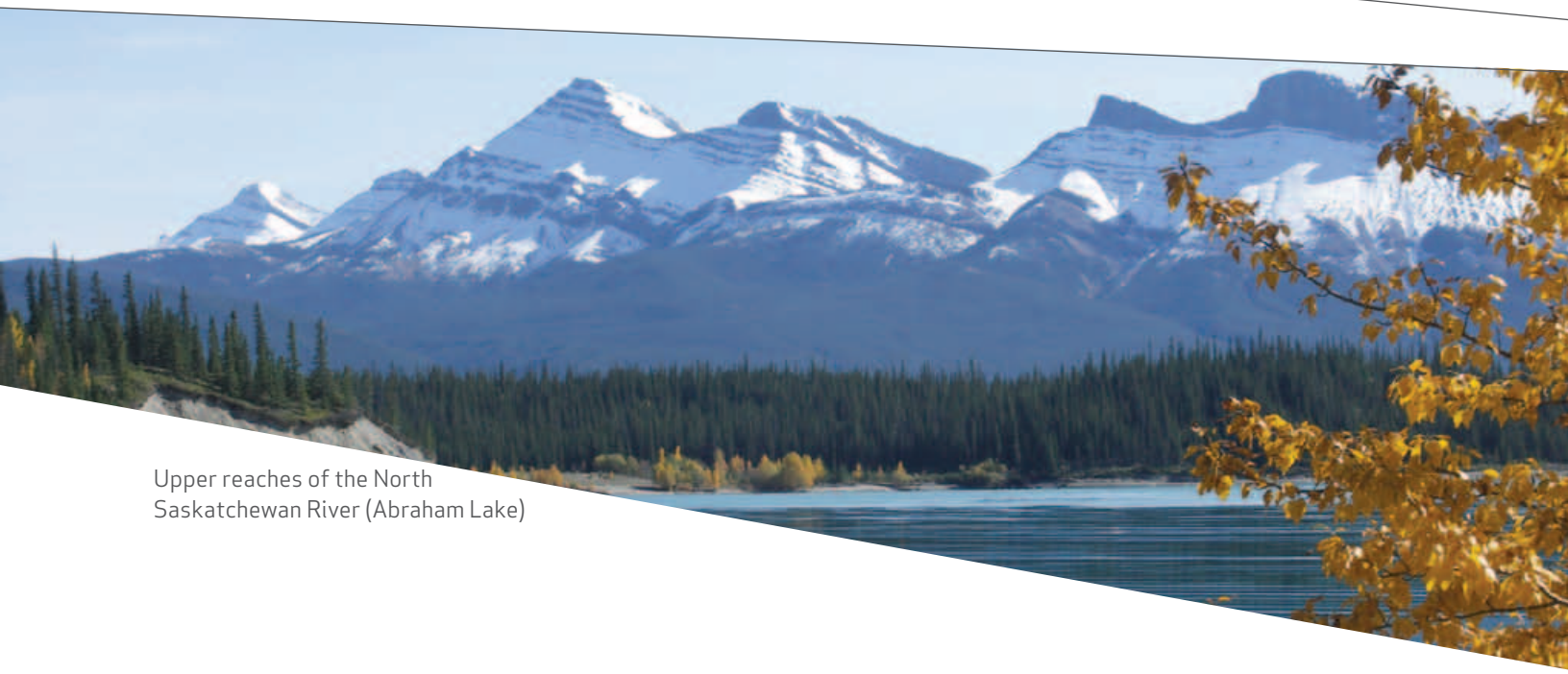
Nutrients, bacteria, sediment, heavy metals, organic matter, oils, litter, pesticides, pharmaceuticals, and many other substances reduce water quality and may harm ecosystem health when introduced to the river through these discharges.

Over the past 40 years, contaminant loadings of bacteria, total suspended solids, and nutrients from the Gold Bar Wastewater Treatment Plant have systematically decreased. The magnitude of these reductions has been impressive, especially in light of Edmonton's growth.

Despite considerable success thus far, 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 EPCOR should continue to maintain and further reduce this loading from the Gold Bar Wastewater Treatment Plant.

Similarly, the City has made great strides in reducing combined sewer overflows to the North Saskatchewan River. Nevertheless, severe rainfall and snow melt occasionally cause flows to exceed the capacity of combined sewers, resulting in water containing untreated waste to discharge directly into the river.

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



Upper reaches of the North Saskatchewan River (Abraham Lake)

In keeping with the principles of sustainable living (Section 2.2) Edmonton, at a minimum, should avoid further increase of total suspended solids load to the North Saskatchewan River. To meet this principle, the City has developed and is implementing stormwater best management practices, as described in the Erosion and Sediment Control guidelines and Low Impact Development (LID) strategy.[16]

Simply capping the current level of suspended solids to the North Saskatchewan River may not be enough. Further reduction of total suspended solids and loading from other contaminants may be needed to protect the river ecosystem. The City has developed and is implementing the Total Loadings Plan in response to this challenge. Determining sustainable discharge loadings will require more in-depth study in partnership with the North Saskatchewan Watershed Alliance and Alberta Environment.

HOW FAR? HOW FAST?

In responding to its water supply and quality challenges:

- Edmonton will need to continually reduce contaminant loadings from the Gold Bar Wastewater Treatment Plant into the North Saskatchewan River.
- Edmonton will need to continually reduce North Saskatchewan River contamination caused by combined sewer overflow and storm sewers.
- Edmonton will need to optimize its already extensive monitoring network and work closely with the North Saskatchewan Watershed Alliance, EPCOR, and Alberta Environment to better understand the North Saskatchewan River watershed's health and take whatever corrective and preventive actions are needed to maintain and improve strong ecosystem health both upstream and downstream of Edmonton.
- Edmonton should continue to support research on the possible effects a prolonged drought could have on the North Saskatchewan River and plan accordingly. *(Studies can be continued over the next five years to better understand the risk and possible mitigation strategies).*
- Edmonton should continue to build on its strong record as a water-conserving city. *(Reducing domestic per person consumption by approximately one per cent a year over this strategy's timeframe will bring Edmonton's water consumption in line with Europe's most water conserving cities).*

GOAL: Water quality in the North Saskatchewan River sustains healthy people and ecosystems.

OBJECTIVE 4.1

The City of Edmonton protects, maintains and continually enhances the water quality of the North Saskatchewan Watershed. *(The Way We Grow, Objective 7.5.2)*

STRATEGIC ACTIONS:

The City of Edmonton:

4.1.1 Takes a leadership role in its partnerships with the North Saskatchewan Watershed Alliance, EPCOR and Alberta Environment to achieve the collective goals of:

- Development, implementation, and enforcement of reach-specific water quality objectives for the mainstem of the North Saskatchewan River, with equal concern for the river upstream and downstream of Edmonton
- Effective programs to monitor and measure total loads from all point sources
- Effective programs to estimate total loads from all non-point sources
- Development, implementation, and enforcement of Instream Flow Needs (IFN) objectives in the mainstem of the North Saskatchewan River
- 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 North Saskatchewan River
- Development of aquatic ecosystem health objectives for all water bodies and riparian areas in the North Saskatchewan River watershed
- Development of programs to maintain, improve, restore, and protect wetlands that are part the North Saskatchewan River watershed
- Development of programs to maintain and improve riparian area health
- Development of a broad range of strategies to prevent/mitigate damage to the watershed from municipal, commercial, industrial, agricultural, and forestry activities
- Establishment and achievement of fish management objectives in the North Saskatchewan River mainstem, tributaries and lakes
- Protecting groundwater quality and quantity in the watershed
- Understanding and minimizing the negative effects of river recreational activities.

4.1.2 Adopts and enforces regulations and guidelines that will enhance the quality of Edmonton's watershed *(The Way We Grow, Policy 7.5.2.2)*.

OBJECTIVE 4.2

The North Saskatchewan River and its tributaries are protected from pollution and erosion caused by stormwater runoff from Edmonton's built areas.

STRATEGIC ACTIONS:

The City of Edmonton:

4.2.1 Establishes, implements, and maintains a Stormwater Quality Control Strategy that gives priority to managing stormwater runoff through the use of on-site natural features (i.e., low impact development) and other best management practices.

4.2.2 Educates Edmontonians to minimize the effects of stormwater runoff from built areas with a focus on source control.

4.2.3 Supports the best management practices and principles of Edmonton's Stormwater Quality Control Strategy *(The Way We Grow, Policy 7.5.3.1).*

4.2.4 Uses ecological design best-practices in the operation and design of City owned and/or managed facilities and infrastructure *(The Way We Grow, Policy 7.5.3.3).*

4.2.5 Designs, arranges, and locates new infrastructure and buildings to mitigate impacts upon the water system *(The Way We Grow, Policy 7.5.1.1).*

4.2.6 Protects the North Saskatchewan River and its tributaries from stormwater runoff and from bank erosion by planting trees, shrubs, and naturalized plantings that increase soil stability and water-holding capacity.

OBJECTIVE 4.3

The North Saskatchewan River and its tributaries are protected from pollution from Edmonton's combined sewer overflows.

STRATEGIC ACTIONS:

The City of Edmonton:

4.3.1 Continually monitors and reduces combined sewer overflows to the North Saskatchewan River with the aim to eventually eliminate all such overflows in a cost-effective way.

OBJECTIVE 4.4

The North Saskatchewan River is protected from pollution caused by discharges from the Gold Bar Wastewater Treatment Plant.

STRATEGIC ACTIONS:

The City of Edmonton:

4.4.1 Works closely with EPCOR to continually reduce loadings of all types from the Gold Bar Wastewater Treatment Plant.

4.4.2 Works closely with EPCOR to monitor water quality and quantify aquatic ecosystem health effects on the North Saskatchewan River downstream of effluent discharges

OBJECTIVE 4.5

Impacts on Edmonton's water resources are mitigated by ensuring that new developments in Edmonton embody an exemplary standard of ecological design. *(The Way We Grow, Objective 7.5.1).*

STRATEGIC ACTIONS:

The City of Edmonton:

4.5.1 Requires new development to demonstrate that it has incorporated ecological design best-practices into the design of neighbourhoods and buildings to reduce stormwater run-off *(The Way We Grow, Policy 7.5.1.1).*

4.5.2 Works proactively with the Province to ensure that Crown interests in water bodies are addressed as early as possible in the planning process *(The Way We Grow, Policy 7.5.1.2).*

4.5.3 Uses environmental reserves to protect water bodies that meet the definition of environmental reserve but are not claimed by the Province *(The Way We Grow, Policy 7.5.1.3).*

Goal: Edmonton's water supply meets its needs.

OBJECTIVE 4.6

Water resources are conserved and used efficiently by the public, industry, and the City of Edmonton *(The Way We Grow, Objective 7.5.3).*

STRATEGIC ACTIONS:

The City of Edmonton:

4.6.1 Continues to work in partnership with EPCOR and other stakeholders to develop water conservation strategies for Edmonton.

4.6.2 Works in partnership with the North Saskatchewan Watershed Alliance and EPCOR to continue to refine understanding of hydroclymatic variability in the North Saskatchewan River and develop a risk management plan to deal with possible reduced flows in the North Saskatchewan River.

4.6.3 Actively explores, tests, and adopts new water conservation technologies that reduce the City's use of water including new technologies that harvest rainwater, grey water, and re-use stormwater.

4.6.4 Integrates indigenous vegetation, specifically low-maintenance drought-tolerant species and, where feasible, includes edible plant species into City and private landscaping *(The Way We Grow, Policy 7.5.3.3).*

4.6.5 Encourages designs and standards that accommodate the exchange of waste and grey water between various businesses and industry in business and industrial areas *(The Way We Grow, Policy 7.5.3.4).*

4.6.6 Collaborates with stakeholders to support the adoption and enforcement of regulations and guidelines that reduce the consumption of Edmonton's water resources *(The Way We Grow, Policy 7.5.3.6).*

5.0 HEALTHY ECOSYSTEMS — AIR

THE CHALLENGE — AIR QUALITY

Measured by the provincial Air Quality Index, Edmonton's air quality has improved significantly since the seventies. The number of "Good" air quality days in 2009 was approximately 96 per cent. Days when air quality was rated "Poor" usually resulted from high levels of particulate matter caused by winter month temperature inversions.

As explained in the *Edmonton Sustainability Papers*[17], *"Although Edmonton has 'good' air quality over 90 per cent of the time, we do have an issue with two specific pollutants — Particulate Matter and Ozone (O_3) — that are components of urban smog. Particulate matter 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."*

Alberta Environment's Particulate Matter (PM) and Ozone Assessment (2006 – 2008) indicated the Edmonton region had an increasing intensity of ground level ozone and that the development of an ozone management plan would be required. In response, the region produced the Ozone Management Plan which the Province approved in late 2009.

Currently, the provincial government and various industrial approval holders jointly operate Edmonton's ambient air quality monitoring network. Three ambient air quality monitoring stations are configured to measure air contaminants and calculate the provincial Air Quality Index (AQI). Alberta Environment directly manages these stations, as well as a fourth that only measures particulate matter.

In addition, seven industry-operated stations are situated in proximity to the city's east and west industrial areas. These stations monitor air quality contaminant concentrations that result specifically from industrial operations to ensure provincially-approved limits are not exceeded.

Overall, Edmonton is exposed to a combination of regulated and unregulated emissions that some experts describe as "poorly understood".

In particular, better information is needed to understand:

- Air quality in places where monitoring does not occur
- Effects of industrial emissions on Edmonton's air quality
- Effects of older vehicles, single occupancy vehicles, and commercial vehicles on air quality adjacent to Edmonton's major roadways
- Effects on regional air quality when exceedences occur in industrial areas.

Being a sustainable city means understanding the region's air quality and using this information to reduce pollution levels that exceed the airshed's dispersal capacity. At the same time, we should not consider an airshed's capacity as a permissible pollute-up-to level. Even at very low levels, many air contaminants cause some level of health or ecosystem risk.

HOW FAR? HOW FAST?

In responding to its air quality challenges, Edmonton will need to improve its knowledge and understanding of Edmonton's air quality and identify any problems that might be undetected today.

In partnership with regional stakeholders, Edmonton will need to:

- Develop, implement, and maintain an air quality monitoring network that can inform decisions on air quality, human health, and ecological management programs. *(An effective air monitoring system could be implemented by 2020).*
- Continue managing the complex interactions of regulated and non-regulated point source and area emissions to achieve high air quality standards. (*An air quality management framework is currently in development through a joint steering committee of local stakeholders, established by Alberta Environment*).
- Establish a logical management system, supported by legislation and policy that clearly outline air quality monitoring and management roles and responsibilities of stakeholders in the region. *(Stakeholder roles and responsibilities could be defined by 2016).*
- Ensure Edmontonians have access to relevant air quality information in a timely manner and are made aware of any related health risks. *(An information system could be implemented by 2020).*

GOAL: Edmonton's air sustains healthy people and healthy ecosystems.

OBJECTIVE 5.1

Edmonton's air quality is effectively monitored to ensure all relevant information is obtained, analyzed, and understood in order to determine whether it is protective of human health and ecosystems. ***(Expanding on Strategic Objective 7.6.1 and policies 7.6.1.1 – 7.6.1.4 in The Way We Grow)***

STRATEGIC ACTIONS:

The City of Edmonton:

5.1.1 Works in partnership with regional stakeholders in a collaborative forum supported by the Province of Alberta to ensure an effective air monitoring system that provides Edmontonians with accurate, timely, and complete information about the air they breathe.

5.1.2 Encourages, undertakes, and supports studies to determine the air quality in Edmonton, the sources of emissions, and their effect on human and ecosystem health.

5.1.3 Works in partnership with regional stakeholders in a collaborative forum supported by the Province of Alberta to monitor and report air quality in a manner designed to help citizens understand how the air quality relates to human health.

5.1.4 Works in partnership with regional stakeholders, including established airsheds and air quality monitoring agencies such as the Strathcona Industrial Association, the Alberta Capital Airshed Alliance, the Fort Air Partnership, and the West Central Airshed Society to achieve regional air quality goals.

OBJECTIVE 5.2

Edmonton's air quality is managed to meet high standards that support human and ecosystem health.

STRATEGIC ACTIONS:

The City of Edmonton:

5.2.1 Works in partnership with regional stakeholders in a collaborative forum, supported by the Province of Alberta, to develop and implement Air Quality Management Plans that address airshed and specific local air quality issues.

OBJECTIVE 5.3

Edmonton's air is effectively managed to minimize nuisance odours.

STRATEGIC ACTIONS:

The City of Edmonton:

5.3.1 Establishes, implements, and maintains odour criteria for Edmonton.

5.3.2 Establishes, implements, and maintains strategies to identify and mitigate nuisance odours produced by City operations.

5.3.3 Accepts and investigates citizen complaints about nuisance odours in the community.

5.3.4 Works with industry and community members to prevent, manage, and eliminate nuisance odours.

6.0 ENERGY AND CLIMATE CHANGE

Energy is central to our society; it is our "master resource", providing us with heat, power, mobility, commodities, and the potential for economic growth.[18] It is, however, a master resource that currently provides us with two key challenges:

- Diminishing supply in relation to increasing demand
- Negative effects on the environment (most notably in the form of *climate change*).

Edmonton's long-term resilience and sustainability calls for a significant response to these challenges.

THE CHALLENGE — ENERGY SUPPLY

Global consumption of fossil fuels has nearly doubled every twenty years since 1900. Fossil fuels (mainly oil, coal, and natural gas) currently provide more than 90 per cent of the world's total energy. While ongoing debate occurs on the quantity of fossil fuels that remain available, there is general agreement that societies that continue to rely on inexpensive oil and gas will become increasingly vulnerable to supply disturbances and higher prices.

In developing *The Way We Green*, various energy outlook scenarios were reviewed from the world's largest energy companies and respected energy analysts. Generally, these scenarios see the world becoming more energy constrained. How this transpires, many suggest, will depend on how effectively various levels of society and government are able to work together to develop a new energy framework.

Royal Dutch Shell's Energy Scenarios to 2050

Royal Dutch Shell, commonly known as Shell, is the largest energy company and the second-largest company in the world (measured by revenue). In 2008, Shell released a public report (*Shell energy scenarios to 2050*), sharing its views about the energy challenges facing the world in the next 40 years. In 2011, its follow-up report (*Signals and Signposts*) reinforced its earlier position.

In these reports, Shell highlights, "Never before has humanity faced such a challenging outlook for energy and the planet. This can be summed up in five words: more energy, less carbon dioxide." Supporting this assertion, Shell explains three "hard truths" about supply and demand:

photo: Edmonton.com

1. ***Step-change in energy use:*** *Developing nations, including population giants China and India, are entering their most energy-intensive phase of economic growth as they industrialize, build infrastructure, and increase their use of transportation. Demand pressures will stimulate alternative supply and more efficiency in energy use — but these alone may not be enough to offset growing demand tensions completely. Disappointing the aspirations of millions by adopting policies that may slow economic growth is not an answer either — or not one that is politically feasible.*
2. ***Supply will struggle to keep pace:*** *By 2015, growth in the production of easily accessible oil and gas will not match the projected rate of demand growth. While abundant coal exists in many parts of the world, transportation difficulties and environmental degradation ultimately pose limits to its growth. Meanwhile, alternative energy sources such as biofuels may become a much more significant part of the energy mix — but there is no "silver bullet" that will completely resolve supply-demand tensions.*
3. ***Environmental stresses are increasing:*** *Even if it were possible for fossil fuels to maintain their current share of the energy mix and respond to increased demand, CO_2 emissions would then be on a pathway that could severely threaten human well-being. Even with the moderation of fossil fuel use and effective CO_2 management, the path forward is still highly challenging. Remaining within desirable levels of CO_2 concentration in the atmosphere will become increasingly difficult.*

Shell forecasts that if the world continues on its business-as-usual path, global demand for energy by 2050 will likely triple from 2000 levels. This increase will be partly offset by natural innovation and competition that spur improvements in energy efficiency. As well, ordinary rates of supply growth are expected to boost energy production by about 50 per cent. However, Shell estimates this still leaves a gap between business-as-usual supply and business-as-usual demand that is about the size of the entire energy industry in 2000. Shell concludes this gap will have to be bridged by some combination of extraordinary demand moderation and extraordinary production acceleration.

Shell identifies two possible scenarios/worlds that could emerge from these pressures. In the first scenario — called **Scramble** — policymakers pay little attention to more efficient energy use until supplies are tight. Likewise, greenhouse gas emissions are not seriously addressed until there are major climate shocks. In the second scenario — **Blueprints** — growing local actions begin to address the challenges of economic development, energy security and environmental pollution. A price is applied to a critical mass of emissions giving a huge stimulus to the development of clean energy technologies, such as carbon dioxide capture and storage, renewable energy technologies, and energy efficiency measures. The result is far lower carbon dioxide emissions.

Shell views the **Blueprints** scenario as offering the best hope for a sustainable future, noting, "the policies in place in the next five years shape investment for the next ten years, which largely shape the global energy picture out to 2050. Speed and direction are significant." Shell poses the questions: "How can I prepare for, or even shape, the dramatic developments in the global energy system that will emerge in the coming years? This question should be on the mind of every responsible leader in government, business and civil society. It should be a concern of every citizen."

BP Energy Outlook to 2030

BP is the third-largest energy company and fourth-largest company in the world, measured by revenue. In its twenty-year outlook (*BP Energy Outlook 2030)* BP discusses global energy and climate change challenges, expressing particular concern about the continued rise of global CO_2 emissions. BP predicts annual global emissions will be 27 per cent higher in 2030 than today. While emissions are expected to be 10 per cent lower in OECD (i.e., *Organisation for Economic Co-ordination and Development*) countries, this reduction will be offset by an expected 53 per cent increase in non-OECD countries. BP concludes that the world is "not on a path that would see CO_2 concentrations level at 450 parts per million" (i.e., the concentration many climate scientists believe is necessary for global temperature to stabilize).

Like Shell, BP identifies two key factors driving energy demand — global population growth (projected to rise by 1.4 billion over the next 20 years) and higher world real income (likely to rise 100 per cent by 2030). Moreover, BP

forecasts the world's primary energy consumption will grow 39 per cent by 2030, with most of this coming from non-OECD countries. Fossil fuels are also expected to continue providing about 80 per cent of the world's energy demand. BP makes special note of the growing importance of natural gas which it foresees to be the fastest growing fossil fuel globally to 2030.

Exxon/Mobil Energy Scenarios to 2030

Exxon Mobil, the largest oil refiner in the world and the largest of the six oil supermajors, also released an energy outlook in 2010 (*2010 The Outlook for Energy: A View to 2030*). Like the other reports, Exxon/Mobil forecasts China will lead a dramatic climb in energy demand as the rising prosperity of its large population is reflected in trends such as increased vehicle ownership and higher electricity consumption. Also predicted is a 35 per cent increase in energy demand by 2030 (from 2005). In its report, Exxon/Mobil explains that this "demand growth would be far higher — with 2030 energy consumption nearly double 2005 levels — were it not for expected improvements in energy efficiency."

Other Energy Outlooks

The *Edmonton Sustainability Papers* contain references from energy analysts, energy industry leaders, and policy makers encouraging society to reduce its dependence on fossil fuels. According to a 2010 study by the United States military, *"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 per cent of the current global consumption)"*. In 2009, the Chief Economist of the International Energy Agency stated, *"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."*

The International Monetary Fund, in its annual *World Economic Outlook, April 2011*, also urged policy makers to strengthen measures to reduce the risks from oil scarcity as a precautionary step and to facilitate adjustment if such shifts are larger than expected or materialize in an abrupt manner. Policies need to be complemented with efforts to strengthen social safety nets, because higher oil prices could lead to shifts in income distribution and to increased poverty.

Edmonton's Advantage

In developing *The Way We Green*, some citizens, stakeholders, and experts pointed to Edmonton's favourable position as the capital city of a province rich in oil, natural gas, and coal. Some felt this would give Edmonton a considerable advantage, and some degree of shelter, in an energy-constrained world.

The Way We Green did not analyze the various economic scenarios facing Edmonton (leaving that work for *The Way We Prosper*). However, it does accept the assumption that Alberta's fossil fuel industries will continue to provide significant employment, investment opportunities, and government revenues well into the 21st Century.

Regardless of how Edmonton's advantage as an energy producer plays out, *The Way We Green* proposes that Edmonton's advantage in this regard does not lessen its need to be more energy conserving and efficient, and to reduce greenhouse gas emissions. Although Alberta's energy industry will continue to provide Edmontonians with jobs, and revenues that support government services, this will not shelter Edmontonians from higher, more volatile world prices. *The Way We Green* assumes that the 21st Century will bring higher energy prices, that future Edmontonians could be significantly impacted by these prices, and that the city we build today should be designed to minimize these negative effects. *The Way We Green* sees this as an exciting, positive challenge — the building of a new-generation, energy-efficient, carbon-neutral city that offers a superior quality of life over 20th Century cities. While Edmonton is positioned to remain an important energy supplier, leadership as a leading "energy city" will require it to be equally successful in managing its own energy demand and greenhouse gas emissions.

See Appendix C for more on this subject.

THE CHALLENGE — CLIMATE CHANGE

Climate change is a global phenomenon, affecting different regions of the world in different ways. In January 2011, NASA's Goodard Institute for Space Studies in New York reported that global surface temperatures in 2010 tied 2005 as the warmest year on record.

In the Edmonton area, mean annual temperatures are predicted to increase 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 (five per cent more by the 2050s) with the greatest increases occurring in summer months. However, because of higher temperatures, higher rates of evaporation are expected that could lead to an overall decrease in soil moisture (Barrow and Yu 2005). Changes in the region's agriculture, vegetation, and water management are a likely outcome of this scenario.

International Commitments

Despite attempts to establish global agreements on stabilizing greenhouse gas concentrations in the atmosphere, carbon dioxide emissions are now 30 per cent higher than they were when the UN Framework Convention on Climate Change was signed in Rio de Janeiro in 1992.

The 55 countries that signed the non-binding Copenhagen Accord in 2010 (including China, the US and all 27 European Union states) are responsible for 78 per cent of greenhouse gas emissions from fossil fuel burning. According to United Nations sources, the pledges made by signatories countries will not be sufficient to prevent the Earth's surface temperature from rising 2°C above pre industrial levels, or 1.3°C (2.3°F) above today's temperatures.

Although climate is an urgent global issue, the international community has experienced difficulty creating a global framework to manage the problem. Concerns surrounding international competition, level playing fields, trade barriers, and wealth transfers have proven to be major barriers to progress. This is evidenced by the scrapping of the US cap-and-trade scheme and the Canadian Senate voting down the Climate Change Accountability Act (Bill C311) in November 2010 – with little fan fair. The closure of the Chicago Climate Exchange (established ten years ago to trade carbon credits) is another recent setback.

Clearly, there is uncertainty going forwards as to where global leadership will come from on this complex issue.

Nevertheless, many international cities have shown leadership on this matter. Copenhagen, Denmark set a goal to become the first carbon neutral capital city by 2025. The United Arab Emirates (UAE) unveiled plans to build the world's first carbon neutral city on Abu Dhabi's desert outskirts. As well, many US cities, including Seattle have expressed goals to reduce emissions by 80 per cent from 1990 levels by 2050 (in alignment with a science-based goal to prevent global temperatures from increasing more than 2°C above pre industrial levels).

Federal and Provincial Commitments

In December 2009, Canada signed the Copenhagen Accord, committing Canada to reduce its greenhouse gas emissions 17 per cent below 2005 levels, by 2020. In signing the Accord, the Federal Government reaffirmed 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. To meet this target, the Federal Government is:

- Implementing new regulations to limit greenhouse gas emissions from the automotive industry
- Implementing renewable fuel regulations
- Working with the U.S. to regulate emissions from heavy-duty trucks
- Introducing new regulations on coal-fired electricity generation that will reduce emissions from the electricity sector
- Continuing to collaborate with the U.S. on matters of clean energy research/development, deployment of clean energy technologies, and advancement of a more efficient electricity grid based on clean and renewable energy
- Investing in green infrastructure, energy efficiency, clean energy technologies, and the production of cleaner energy
- Playing an active role at the UN climate change talks
- Contributing $400 million to developing nations as part of Canada's commitment under the Copenhagen Accord.

In 2008, the Government of Alberta developed a Climate Change Strategy, committing to reduce greenhouse gas emissions by 200 megatonnes by 2050. Carbon capture and storage (CCS), will provide 70 per cent of this reduction. To achieve this goal, the Government of Alberta has created:

- The Carbon Capture and Storage Funding Act, 2010
- The Carbon Sequestration Tenure Regulation to accompany the Act
- A $2 billion CCS funding program
- The Regulatory Framework Assessment.

City of Edmonton Commitments

Edmonton City Council has expressed strong support for action on climate change, including:

- Endorsing the ICLEI Local Governments for Sustainability Declaration on Climate Change and the Urban Environment (1993)
- Endorsing the city to join the Federation of Canadian Municipalities' Partners for Climate Protection Program (1995)
- Approving the city's first greenhouse gas (GHG) emissions reduction plan for City operations (1999)
- Approving a community greenhouse gas reduction plan in 2001 called Carbon Dioxide Reduction Edmonton (CO_2RE)
- Setting goals (in *The Way Ahead*) to reduce greenhouse gas emissions from City operations
- Supporting the Alberta Urban Municipalities Association (AUMA) resolution for climate change initiatives (2007) which states: *"A global reduction in emissions of greenhouse gases is necessary to slow climate change and reduce the risks to human health, the physical environment, economy, and quality of life."*

Key initiatives undertaken by the City of Edmonton to reduce community and City operations greenhouse gas emissions include: composting (versus landfill), collection of landfill gases (and conversion to energy), energy-efficient retrofits of City buildings, construction of new City facilities to LEED silver, LRT construction, purchase of green power, operation of energy-efficient fleet vehicles, community outreach, and financial incentives for various green objectives.

HOW FAR? HOW FAST?

Responding to the energy supply challenge will require Edmonton to:

- Reduce its demand for energy through both conservation and efficiency
- Reduce its dependence on fossil fuels
- Be more resilient to possible energy disturbances.

In particular:

- Edmonton's overall built form and configuration will need to be designed to achieve optimal energy-efficiency. *(Energy modelling tools could be implemented within one to two years, helping the City of Edmonton better understand the energy and greenhouse gas implications of different development options).*
- New buildings will need to be constructed to the highest practical energy efficiency standard. *(Some cities have set a target that all new buildings be constructed to a net-zero standard by 2020 – 2030, with continual improvements being realized in years leading to target dates).*
- Existing buildings will need to be upgraded to improve their energy efficiency.
- Travel in Edmonton will need to be efficient. *(The City of Copenhagen has set a very aggressive target that by 2015, 50 per cent of people travelling to work or to educational institutions will travel by bike).*
- Edmonton will need to transition from fossil fuel to renewable energy sources. *(World renowned sustainability educator and author, Richard Heinberg, recommends sustainable societies should strive to reduce their dependence on all non-renewable resources at a rate equal to or greater than the depletion rate. Simply put, this means that if the world's oil resources decline at 0.5 per cent a year (leading to depletion in 200 years) a sustainable society should reduce its oil use at a rate greater than 0.5 per cent a year. Arguably, a* ***much greater rate of reduction*** *might be advisable given the ramifications of peak production that will occur long before depletion.*
- More decentralized approaches to energy generation will need to be adopted.

Responding to the climate change challenge will require Edmonton to significantly reduce its greenhouse gas emissions over the short-to-medium term, with an ultimate goal of becoming carbon neutral and resilient to climate change disturbances. Adopting a carbon neutral goal may be questionable to some based on concerns that: (a) Canada generates less than two per cent of total human-caused greenhouse gas emissions (even though Canadians are recognized as having one of the largest carbon footprints per person in the world), (b) whatever reductions Edmonton achieves will be relatively insignificant on a global level, and (c) aggressive reductions could reduce the competitiveness of Edmonton's economy. However, adopting a goal to be less than carbon neutral implies that our activities will continue to systematically increase concentration of atmospheric greenhouse gas — a trend that science tells us is not sustainable. In a time when global leadership on climate change is needed, this is an opportunity for Edmonton, the energy city, to lead by example.

In particular:

- City of Edmonton operations will need to significantly reduce greenhouse gas emissions. *(The urgency of this challenge calls for a significant reduction of approximately 50 per cent of 2008 levels by 2020, and carbon neutrality by 2040.)*
- Edmonton as a whole will need to reduce its greenhouse gas emissions significantly. *(The urgency of this challenge calls for a significant reduction of approximately 17 – 20 per cent of 2008 levels by 2020, with carbon neutrality being the ultimate long-term goal. Achieving this goal may take longer than the 30-year timeframe of this plan.)*
- Edmonton will need to aggressively pursue the establishment, implementation, and maintenance of a climate change adaptation strategy *(Climate adaptation planning is becoming more integral to city planning, with cities like New York requiring site specific infrastructure upgrades and strategies to protect against damage caused by a changing climate. Similarly, the Province of Alberta released its Climate Change Adaptation Framework in 2010.)*

GOAL: Edmonton's sources and uses of energy are sustainable.

OBJECTIVE 6.1

Edmonton's overall built environment (i.e., an urban form that includes buildings, roads, and infrastructure) is designed to minimize energy consumption.

STRATEGIC ACTIONS:

The City of Edmonton:

6.1.1 Establishes, implements, and maintains a City-wide Energy Strategy comprising (a) Renewable Energy Plan, (b) Green Building Plan, (c) Energy Transition Plan, (d) Outdoor Lighting Plan, (e) Greenhouse Gas Management Plans, (f) Climate Change Adaptation Plan, (g) Green Infrastructure Plan, and (h) Sustainable Fleet Management Plan.

6.1.2 Plans Edmonton's built environment based on the assumption that the future will be more energy constrained with more volatile and higher energy prices.

6.1.3 Understands existing energy use in Edmonton and is able to accurately evaluate the energy implications of proposed developments and scenarios.

6.1.4 Evaluates and approves development plans based, in part, on their energy implications and their ability to achieve predefined energy expectations.

6.1.5 Actively explores how its statutory powers can be used to encourage city-wide energy conservation and efficiency, and applies these powers where appropriate.

6.1.6 When developing City-owned properties, develops them as models of sustainable living.

6.1.7 Encourages developments that permit Edmontonians to conveniently walk, cycle, and use public transit to get to the places they live, shop, work, learn, and play.

OBJECTIVE 6.2

The City will integrate land use planning and transportation decisions to create an accessible, efficient and compact urban form. *(The Way We Move, Strategic Objective 4.1)*

STRATEGIC ACTIONS:

The City of Edmonton:

6.2.1 Develops integrated transit and land use guidelines *(The Way We Move, Strategic Action 4.1.a).*

6.2.2 Integrates higher density development with Light Rail Transit (LRT) stations and transit centres (*The Way We Grow*, Policy 3.1.1.1).

6.2.3 Encourages land uses that are compatible and complementary to the surrounding transportation network *(The Way We Move, Strategic Action 4.1.b).*

6.2.4 Designs the transportation network to ensure it is compatible and complementary to the surrounding land uses *(The Way We Move, Strategic Action 4.1.c).*

6.2.5 Locates business employment areas relying heavily on goods movement in the vicinity of the Inner Ring Road, Anthony Henday Drive, or Highway Connectors *(The Way We Move, Strategic Action 4.1.d).*

6.2.6 Works with regional partners to implement complementary policies in adjacent municipalities in the Capital Region Plan *(The Way We Move, Strategic Action 4.1.e).*

OBJECTIVE 6.3

Edmonton's building stock is energy-efficient.

STRATEGIC ACTIONS:

The City of Edmonton:

6.3.1 Establishes, implements, and maintains a Green Building Plan to improve energy efficiency and reduce the environmental footprint of Edmonton's building stock.

6.3.2 Collaborates with other orders of government to legislate higher energy performance standards in and around new and existing buildings.

6.3.3 Establishes, implements, and maintains high energy efficiency standards for City-owned buildings and properties that use significant amounts of energy.

6.3.4 Strives for high energy efficiency standards in buildings it leases for City operations.

6.3.5 Encourages high energy efficiency standards for all new buildings constructed in Edmonton.

6.3.6 Leads, promotes, and encourages programs that significantly improve the energy efficiency of Edmonton's existing building stock.

6.3.7 Encourages green building design and development standards as a condition of sale when selling City-owned properties that will be privately developed or redeveloped.

6.3.8 Encourages and assists community partners who operate facilities on City-owned land to achieve high standards of energy efficiency (e.g., community leagues, seniors' centres, recreation organizations).

6.3.9 Encourages and facilitates builders and developers who want to apply new and innovative building standards to their projects, and designs the City's development approval process so that innovative builders and developers will not face unusual barriers.

6.3.10 Encourages the treatment of green space and the use of plantings to reduce energy use.

OBJECTIVE 6.4

A significant and increasing proportion of Edmonton's energy comes from renewable sources, with as much as reasonably possible produced locally.

STRATEGIC ACTIONS:

The City of Edmonton:

6.4.1 Acknowledges the risk of *peak oil* and responds to it with strategies that reduce Edmonton's carbon footprint and shorten supply chains that rely on inexpensive fossil fuels.

6.4.2 Establishes, implements, and maintains a City-wide Energy Transition Plan detailing how Edmonton (including City operations) will reduce its energy demand through conservation and efficiency and transition from fossil fuels to renewable energy sources.

6.4.3 Establishes, implements, and maintains a Renewable Energy Plan detailing the renewable energy options and corresponding transition strategies that are best for Edmonton.

OBJECTIVE 6.5

Travel in Edmonton is energy-efficient and more citizens use public transit and active modes as their preferred choice of transportation.

STRATEGIC ACTIONS:

The City of Edmonton:

6.5.1 Pursues 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 *(The Way We Move, Strategic Objective 5.1, with strategic actions a to f).*

6.5.2 Develops an efficient, effective, accessible, and integrated bus network to serve Edmonton with connections to the Region *(The Way We Move, Strategic Objective 5.2, with Strategic Actions a to i).*

6.5.3 Creates a walkable environment *(The Way We Move, Strategic Objective 6.1, with Strategic Actions a to f).*

6.5.4 Creates a cycle-friendly city *(The Way We Move, Strategic Objective 6.2, with Strategic Actions a to c).*

6.5.5 Creates an integrated network of multi-use trail facilities *(The Way We Move, Strategic Objective 6.3, with Strategic Actions a to d).*

6.5.6 Initiates and supports comprehensive programs for Transportation Demand Management to encourage a reduction in single occupant vehicle use *(The Way We Move, Strategic Objective 7.2, with Strategic Actions a to c).*

6.5.7 Focuses major roadway improvements on the efficient movement of goods, services, and transit vehicles *(The Way We Move, Strategic Objective 7.3, with Strategic Actions a to f).*

6.5.8 Develops 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 *(The Way We Move, Strategic Objective 7.4, with Strategic Actions a to e).*

OBJECTIVE 6.6

Edmonton is conserving and efficient in its use of light.

STRATEGIC ACTIONS:

The City of Edmonton:

6.6.1 Establishes, implements, and maintains an Outdoor Lighting Plan for Edmonton that promotes light use where needed, when needed and no more than is necessary for safety and security.

6.6.2 Explores, tests, and adopts world-class lighting design, technology, and control systems for City-owned facilities (both indoor and outdoor lighting).

OBJECTIVE 6.7

Edmonton's economy is continually diversifying to include less energy-intensive industry sectors and to maximize the value added by its fossil fuel industries.

STRATEGIC ACTIONS:

The City of Edmonton:

6.7.1 Encourages economic development in sectors that are not energy intensive.

6.7.2 Encourages economic development that adds value to Alberta's fossil fuels production.

GOAL: Edmonton is resilient to disturbances that could affect its energy supplies and distribution system.

OBJECTIVE 6.8

The energy generation infrastructure that Edmonton relies upon is increasingly decentralized and distributed.

STRATEGIC ACTIONS:

The City of Edmonton:

6.8.1 Promotes a more distributed energy generation system for Edmonton including micro generation systems in private homes and commercial/industrial operations.

OBJECTIVE 6.9

Edmonton, the energy city, is a leader in studying, testing, and adopting new energy technologies.

STRATEGIC ACTIONS:

The City of Edmonton:

6.9.1 Actively studies, tests, and adopts new energy technologies that reduce the City`s dependence on fossil fuels and energy consumption.

6.9.2 Encourages and assists community partners to explore, test, and adopt new energy technologies that will reduce Edmonton's dependence on fossil fuels and energy consumption.

6.9.3 Encourages the growth of Edmonton's renewable energy industry.

GOAL: Edmonton is a carbon-neutral[19] city.

OBJECTIVE 6.10

City of Edmonton operations are carbon-neutral, causing no net increase to greenhouse gas concentrations in the atmosphere.

STRATEGIC ACTIONS:

The City of Edmonton:

6.10.1 Establishes, implements, and maintains a City Operations Greenhouse Gas Management Plan aimed at significantly reducing greenhouse gas emissions from City operations.

6.10.2 Establishes, implements, and maintains a Sustainable Fleet Management Plan.

OBJECTIVE 6.11

The Edmonton community is carbon neutral, causing no net increase to greenhouse gas concentrations in the atmosphere.

STRATEGIC ACTIONS:

The City of Edmonton:

6.11.1 Leads the establishment, implementation, and maintenance of a Community Greenhouse Gas Management Plan for Edmonton in partnership with citizens and community stakeholder organizations.

GOAL: Edmonton is resilient to disturbances from climate change.

OBJECTIVE 6.12

Edmonton has evaluated the risks of climate change and is prepared for significant risks.

STRATEGIC ACTIONS:

The City of Edmonton:

6.12.1 Leads the establishment, implementation, and maintenance of a Climate Change Adaptation Plan for Edmonton in partnership with citizens and community stakeholders.

6.12.2 Establishes, implements, and maintains emergency response plans in anticipation of severe weather events.

6.12.3 Works with developers, builders, regulators, owners, and consumers to encourage greater durability of buildings.

7.0 FOOD

THE CHALLENGE — FOOD RESILIENCE

"Food resilience" means 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. In North America, food provision is driven by the principle of cost-effective production and economies of scale. This has resulted in an agri-industrial system characterized by an increasing distance and anonymity between producers and consumers.

Currently, Edmonton's food supply is secure. *Edmonton lies in the midst of a vast food surplus producing region — namely the province of Alberta. As a city, Edmonton consumes less than 1/20th of Alberta's beef; 1/10th of its pork; 1/3rd of its dairy and poultry supplies; 1/5th of its potatoes; and 1/700th of the peas produced in the province. Fruits and vegetables are the only food group where Edmontonians consume more than what is produced in Alberta. Many fruits simply cannot grow in the northern Alberta climate characteristic of Edmonton. Vegetable production, while possible, is confronted with major retailers supplied by major global supply chains operating with centralized, high-volume distribution systems that are also low cost. In this scenario, local producers have great difficulty competing, resulting in limited production — a situation that is common to most North American cities.*[20]

Although we currently have virtually unlimited access to the global food system, the Edmonton Sustainability Papers caution that this could change. Risks associated with climate disruptions, international protectionist food policies, and higher priced fossil fuels could reduce our access to global food systems. One response to uncertainty associated with the global food market involves ensuring a reasonable proportion of our food comes from local sources.

HOW FAR? HOW FAST?

The majority of stakeholders who helped to develop *The Way We Green* indicated the City of Edmonton should give greater priority to potential food security issues, focusing attention on preserving agricultural land, promoting local food production, and reducing Edmonton's carbon footprint associated with the food system.

In responding to this challenge:

- The City of Edmonton should take a lead role in establishing a food policy council and developing both a food charter and city-wide food resiliency strategy.

GOAL: 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.

(From the *Way We Grow*, Section 10.0)

OBJECTIVE 7.1

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 *(The Way We Grow, Objective 10.1.1)*.

STRATEGIC ACTIONS:

The City of Edmonton:

7.1.1 Collaborates with citizens and stakeholders to establish, implement, and maintain a Food Resiliency Strategy for Edmonton, aimed at addressing food security risks that Edmonton may face from climate change, high energy prices, increasing world population, geopolitical disturbances, and other price pressures. The strategy will address Edmonton's food system in its entirety — production, processing, storage, transportation, buying, selling, eating, and waste management.

7.1.2 Leads the establishment of an Edmonton Food Policy Council — an organization responsible for assisting in the development of a Food Charter and contributing to the establishment, implementation, and maintenance of Edmonton's Food Resiliency Strategy. *(This policy builds on policies 10.1.1.1 and 10.1.1.2 in The Way We Grow).*

7.1.3 Works with the Region to develop a Regional Food Policy Council and Regional Food Charter *(The Way We Grow, Policy 10.1.1.3).*

7.1.4 Collaborates 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 *(The Way We Grow, Policy 10.1.1.4).*

8.0 SOLID WASTE

THE CHALLENGE — RESIDENTIAL SOLID WASTE

The residential sector is responsible for approximately 40 per cent of all solid waste generated in Edmonton. Close to 60 per cent of this material is diverted from landfills, which is twice the Canadian average. Edmonton's impressive diversion rate is accomplished through recycling (about 20 per cent), municipal composting (about 35 per cent), and waste reduction through composting, grasscycling, and reuse (about five per cent). An even higher rate of diversion (a remarkable 90 per cent) is expected by 2013 when the waste-to-biofuels facility becomes operational.

Even though much of Edmonton's residential waste is diverted from landfill, the quantities generated here are large. Conference Board of Canada (2005 data) indicates Canada annually generates more municipal waste per capita than any of its peer countries and twice as much as Japan, which generated the least of these peer countries. Moreover, based on 2004 data, Albertans produce more waste per capita than any other province in Canada.

Some experts[21] 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 CHALLENGE — NON-RESIDENTIAL SOLID WASTE

An estimated 60 per cent of all waste generated in Edmonton is from the non-residential sector. This 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 region, making it difficult to estimate the total volume and diversion rate for Edmonton's non-residential sector. It is estimated that only 10 to 15 per cent of C&D waste is currently recycled in Alberta.

Edmonton's greatest waste management opportunities lie with non-residential waste and the potential to recycle a significant quantity of the waste which is currently landfilled throughout the region.

HOW FAR? HOW FAST?

In responding to its solid waste challenges:

- Non-residential sectors will need to achieve a much higher waste diversion rate, approaching that of Edmonton's residential sector *(striving for a 90 per cent diversion rate).*
- Edmontonians will need to generate low levels of residential waste *(striving for performance that is among the best in the world for modern industrialized cities).*

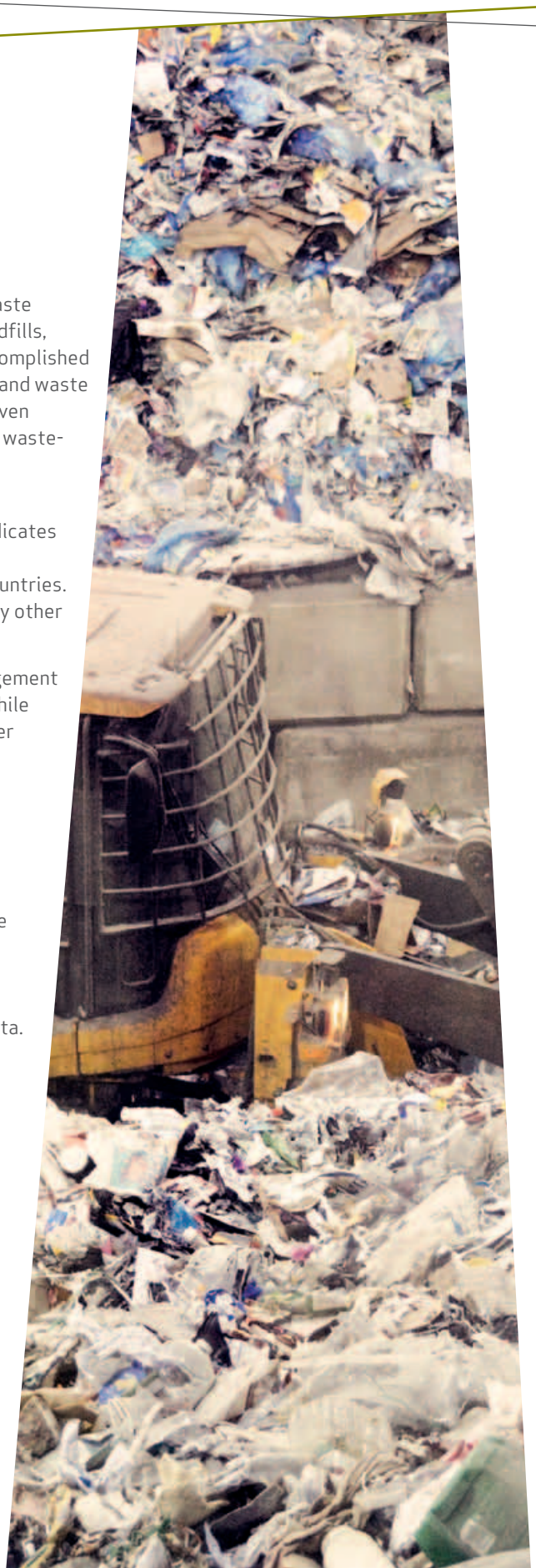


photo: April Scott

GOAL: Edmonton generates zero waste.

OBJECTIVE 8.1

The amount of waste generated by Edmontonians on a per capita basis is continually decreasing.

STRATEGIC ACTIONS:

The City of Edmonton:

8.1.1 Uses incentives, education, and partnerships to increase Edmontonians' participation in waste reduction through grasscycling, composting, reuse, and consumption habits.

8.1.2 Influences and supports other orders of government and industry to reduce packaging and design products that do not require disposal.

8.1.3 Uses incentives, education, and partnerships to increase the non-residential sectors' participation in waste reduction.

OBJECTIVE 8.2

Edmonton's residential and non-residential waste is diverted from landfill, with non-residential sectors achieving the same high diversion rate as Edmonton's residential sector.

STRATEGIC ACTIONS:

The City of Edmonton:

8.2.1 Establishes, implements, and maintains a Solid Waste Management Strategy aimed at diverting residential and non-residential waste from landfill and reducing the amount of waste that is produced by Edmontonians.

8.2.2 Achieves a landfill diversion rate of 90 per cent for residential waste by continuing to focus on recycling, composting, and recovery through the waste-to-biofuels facility.

8.2.3 Attracts private sector companies and partners that process waste into reusable and marketable products.

8.2.4 Provides collection and processing services to businesses to influence the private sector waste companies to recycle more non-residential waste.

8.2.5 Expands its mixed C & D waste recycling operations to handle up to 50 per cent of C&D waste generated in Edmonton.

8.2.6 Expands opportunities for the proper disposal of household hazardous waste to keep this waste out of the environment.

8.2.7 Influences and supports other orders of government to enact legislation and policies that contribute to the diversion of waste from the non-residential sector.

8.2.8 Collaborates with the Edmonton Waste Management Centre of Excellence to attract research and technology demonstration projects that advance Edmonton's position as a world leader in sustainable waste management.

9.0 A FOUNDATION FOR SUCCESS

THE CHALLENGE — BUILDING A FOUNDATION FOR SUCCESS

The Way We Green is a community plan whose implementation will depend on inspired community action. Success will require Edmontonians to understand, value, and practise the principles of sustainable living. It will also require strong and sustained leadership from all sectors of the community.

Although the City of Edmonton is one of many community players working to achieve Edmonton's sustainability and resiliency vision, its roles as a coordinator, facilitator, educator, regulator, influencer, service provider, planner, and innovator are key.

To succeed in this role, the City will require:

- **A strong underlying management system** and planning processes that routinely consider sustainability and resiliency as part of day-to-day operations
- **Sustainability tools** that are applied consistently within this system
- **New approaches and ways of thinking** that engage and support effective community responses to Edmonton's sustainability and resiliency challenges.

A STRONG UNDERLYING MANAGEMENT SYSTEM

- **ISO 14001 Environmental Management Systems**
  An environmental management system is a structured approach, used by organizations to develop and implement environmental goals and policies such as the ones contained in this plan. While various environmental management system options exist, the City of Edmonton has adopted a highly acclaimed international standard called ISO 14001, developed by the International Organization for Standardization.

  The ISO 14001 standard exists to help organizations:

  (a) Minimize how their operations negatively affect the environment

  (b) Comply with applicable laws, regulations, and other environmental requirements

  (c) Continually improve their environmental performance.

  Currently ISO 14001 environmental management systems are implemented and operational in 10 City branches.

  The strength of an environmental management system built to the ISO 14001 standard lies in the way it integrates planning, implementation, checking, and management review functions into a seamless, ongoing, cyclical process. In doing so, the system provides an excellent mechanism for an organization's operational levels to communicate, embrace, and act upon high level aspirational plans like *The Way We Green*. Although the ISO 14001 standard has been adopted in many City branches, it will be expanded to all branches that have significant responsibility for achieving the Goals, Objectives, and Strategic Actions of *The Way We Green*.

- **The Natural Step ABCD Planning Process**
  Creation of *The Way We Green* and its supporting layer of action plans should not be seen as a one-time exercise. Rather, the ISO 14001 environmental management system establishes the planning function and the evolution of existing plans as an ongoing, integral part of this continual improvement cycle. The ISO 14001 standard allows organizations considerable flexibility in how this planning function is carried out. As a result, the City is able to incorporate highly regarded sustainability planning processes such as The Natural Step ABCD Planning Process (see glossary) into its ISO 14001 environmental management system.

The Natural Step ABCD Planning Process is designed to achieve the four success-level principles discussed in Section 2.2, i.e., the basic requirements that must be met in a sustainable society. The four-step "A-B-C-D" process (Figure 5) provides a systematic way of guiding this process:

(A)wareness: understanding sustainability and The Natural Step (TNS) Framework as a shared conceptual model.

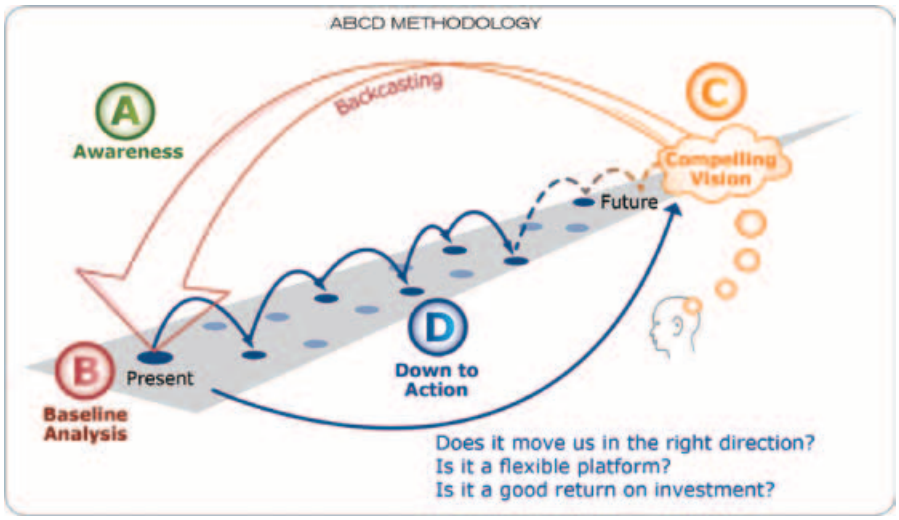
(B)aseline: an assessment of "today" is conducted by listing all current flows and practices that contribute to violations of the four System Conditions, as well as all the assets in place to deal with these problems.

(C)ompelling Vision: possible solutions and innovations for the future are listed, applying System Condition constraints to trigger creativity and scrutiny of suggested solutions.

(D)own to Action: C-list priorities are determined and smart early moves and concrete programs for change are launched. Innovative actions are prioritized by screening through the following three questions: (1) Does it move us in the right direction in regards to the four System Conditions? (2) Is it a flexible platform, i.e., a stepping stone toward future improvements? (3) Does it provide an adequate return on investment to seed future investments?

The Natural Step ABCD planning process was explored and applied in part to develop *The Way We Green*. It was determined to be an effective platform for future planning efforts that will involve maintenance of *The Way We Green* and development of the 30-plus action plans shown in Figure 1.

FIGURE 5 : THE NATURAL STEP PLANNING PROCESS



SUSTAINABILITY TOOLS

- ***Life Cycle Cost/Assessment:*** The purpose of life cycle assessment (LCA) methodologies is to understand the full range of financial (e.g., operating and maintenance), environmental (e.g., costs of carbon and other externalities) and social effects (e.g., health) that result from a particular investment. With this information, organizations are able to select the least burdensome investment. LCA is by definition a decision-making tool that forces the assessor to look at long-term planning and operations, as well as the effects that are caused outside the organization. While the City currently uses LCA in limited ways, *The Way We Green* and *The Way We Finance* will further advance this approach.

  Through the approach, the City will strive to understand the environmental costs of its decisions, and factor these costs into its investment decision-making process wherever practical. For example, in pursuing its greenhouse gas (GHG) reduction goal, the City will stipulate that when evaluating major investments in infrastructure that emit significant amounts of GHG (e.g., buildings, vehicles, machinery, lighting systems), it will factor in a cost of $x/tonne to represent the environmental cost of these emissions. Based on this approach, competing investments/bids/expenditures will be evaluated more fully based on life cycle factor implications that go beyond a simple comparison of initial outlay costs. Applying this approach will require the City to communicate clearly with the business community, indicating exactly how environmental attributes will be valued.

- ***Day-to-day decisions guided by principles of sustainability and resilience:*** The City's decision-making processes will be specifically designed to ensure key decisions are evaluated against sustainability and resiliency principles outlined in Sections 2.2 and 2.4 (Edmonton's Sustainability Lens). In doing so, the City will understand the consequences of all key decisions in terms of whether they make Edmonton a more or less sustainable/resilient city. Ideally, this "lens" will also include social and economic principles from the City's other directional plans. These evaluations will be shared with City Council as a standard component of Council reports.

- ***Better Baseline Information:*** *The Way We Green* calls for better information to aid understanding of the condition of the environment, including ambient air quality, ecological health of the North Saskatchewan River Watershed, the state of biodiversity in Edmonton, and the size of Edmonton's ecological footprint. Enhanced information is also required on energy demand, greenhouse gas, and water use implications of development proposals. *The Way We Green* will champion the advancement of information systems and modeling tools that will help Edmonton understand and lessen its ecological footprint.

- **Aligning Market Prices with Sustainability Goals:** In order to achieve the sustainability and resilience goals put forward in this plan, market prices will need to support this shift (see Objective 3.2). Effective use of pricing tools will be crucial to *The Way We Green's* overall success.

SUSTAINABILITY APPROACHES

- ***Leading by example***

  Successful implementation of *The Way We Green* will require the City to lead by example, adopting the high standards of sustainable living it wants to encourage throughout the community.

- ***Collaboration***

  Achieving sustainability and resiliency will require all facets of Edmonton society to work together for the benefit of the whole. The City will need to be a central facilitator/coordinator bringing government representatives, citizens, and organizations together to create a culture of collaboration that encourages innovation, sharing of resources, and shared accountability. (See Appendix D for more on this subject).

- ***Innovation***

  The City will need to be an innovation leader, continually studying, testing, and applying new technologies and approaches to make Edmonton more sustainable and resilient.

- ***Inspired Leadership***

  Achieving sustainability and resiliency will require the City to demonstrate inspired leadership. This will include encouraging and empowering community leaders to do the same.

- ***A clear definition of progress***

  Sustainable communities measure progress by improvements in the health and wellbeing of their citizens, environment, and economy. The City will need to establish, implement, and maintain a broad set of measures for this purpose.

HOW FAR? HOW FAST?

In order to manage its sustainability and resiliency challenges effectively, the City of Edmonton will need to adopt new processes, tools, and approaches. Much of this structure can be developed over a two to three year time frame.

GOAL: The City of Edmonton strives for sustainability and resiliency in all it does.

OBJECTIVE 9.1

The City of Edmonton establishes, implements and maintains strong and effective management systems to achieve its sustainability and resiliency goals.

STRATEGIC ACTIONS:

The City of Edmonton:

9.1.1 Continually improves its environmental performance by establishing, implementing, and maintaining ISO 14001 environmental management systems in operating areas that have significant environmental impacts.

9.1.2 Applies a systematic approach to achieve sustainability by adopting and applying the sustainability principles listed in Section 2.2 of *The Way We Green* as part of its overall management system.[22]

9.1.3 Applies a systematic approach to resilience by adopting and applying the resilience principles listed in Section 2.4 of *The Way We Green* as part of its overall management system.[23]

9.1.4 Formally evaluates its major decisions in relation to its sustainability and resilience principles and goals, asking as a minimum:

- Is this action consistent with sustainability/resilience principles and does it move the City in the right direction toward its sustainability goals?
- Is the action a flexible platform for future steps toward sustainability?
- Does the action generate a sufficient return on investment to seed future steps toward sustainability?

9.1.5 Fosters a spirit of risk-taking and problem-solving in City operations that encourages innovation.[24]

9.1.6 Applies life cycle costing/assessment methodologies to estimate the full range of financial (e.g., operating and maintenance), environmental (e.g., costs of carbon), and social (e.g., health) effects that result from a particular investment, and communicates clearly with the business community indicating exactly how these attributes will be valued in the City's investment decisions.

9.1.7 Establishes, implements, and maintains monitoring and measuring systems that provide a complete and meaningful understanding about the condition of Edmonton's environment.

9.1.8 Establishes, implements, and maintains modeling tools to understand and compare the environmental effects of development options (involving energy consumption, greenhouse gas production, water use, air quality, biodiversity, and ecological footprint).

9.1.9 Defines and measures progress based on improvements in the health and wellbeing of Edmontonians, the environment, and the economy[25].

9.1.10 Educates City employees to understand, value, and apply the principles of sustainability and resilience.

OBJECTIVE 9.2

The City of Edmonton provides strong leadership in mobilizing the community to achieve its sustainability goals and objectives.

STRATEGIC ACTIONS:

The City of Edmonton:

9.2.1 Leads the community by example, adopting and applying high standards of sustainability in City operations that reflect the high standards it wishes to encourage throughout the entire community, including the "greenness" of buildings it owns and leases, vehicles it operates, infrastructure it builds and maintains, resources, it uses, contractors and suppliers it hires, programs it delivers, and organizational culture it fosters.

9.2.2 Brings government representatives, community members, and organizations together to create a culture of collaboration that values innovation, sharing of resources, and shared accountability.[26]

9.2.3 Participates in international networks that promote global sustainability.

9.2.4 Engages the community in developing action plans that support *The Way We Green*.

9.2.5 Facilitates the building of a strong community network that connects sustainability-minded citizens, organizations, and leaders for the purpose of sharing, learning, and partnering.

9.2.6 Recruits community leaders from all sectors to help lead Edmonton's drive for sustainability and resilience.

9.2.7 Partners with individuals, organizations, and communities to achieve Edmonton's sustainability and resilience goals.

9.2.8 Coordinates its efforts with other local sustainability educators to ensure Edmonton's sustainability education effort is aligned, efficient, and effective.

9.2.9 Ensures that the terms of reference for City boards and authorities contain sustainability and resilience goals where applicable.

OBJECTIVE 9.3

Goods and services purchased by the City of Edmonton are produced and used in accordance with the City's principles of sustainable living.

STRATEGIC ACTIONS:

The City of Edmonton:

9.3.1 Establishes, implements, and maintains a Sustainable Purchasing Policy and standard operating procedures that provide meaningful direction to City employees and contractors on purchasing practices that improve the City's sustainability.

9.3.2 Establishes, implements, and maintains a corporate control system that ensures all purchases meet high standards of sustainability.

9.3.3 Evaluates "environmental performance" as one of the selection criteria when hiring contractors, consultants, construction and maintenance companies, and other service providers.

9.3.4 Requires contractors, whose work can cause significant negative environmental effects, to submit a plan to the City prior to commencing work, detailing the environmental risk(s), how risks will be mitigated, and how potential emergencies will be managed.

GOAL: Edmontonians' lifestyles contribute significantly to the city's sustainability and resilience.

OBJECTIVE 9.4

Edmonton's ecological footprint per person is continually decreasing.

STRATEGIC ACTIONS:

The City of Edmonton:

9.4.1 Establishes, implements, and maintains strategies designed to reduce Edmonton's ecological footprint through social marketing campaigns, outreach, education, awareness, and aggressive demand management for areas within the influence of City operations.

9.4.2 Sets an ecological footprint target for Edmonton and periodically reports on its achievement.

GLOSSARY

Biodiversity the variability among living organisms from all sources including, among other things, terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part, including diversity within species, between species, and of ecosystems

Brownfields abandoned, idle or underutilized commercial or industrial properties where past actions have caused or may have caused environmental contamination, but where there is a potential for development

Built environment artificially created, fixed elements such as buildings, structures, devices, and surfaces that together represent the physical character of the area

Carbon-neutral refers to achieving net zero carbon emissions by balancing a measured amount of carbon released with an equivalent amount sequestered or offset, or buying enough carbon credits to make up the difference

city refers to Edmonton in its entirety including land, building, infrastructure, natural areas, and population within its established boundaries

City refers to Edmonton's municipal government including City Council, the administration it directs, and all related operations

Climate change a long-term change in the statistical distribution of weather patterns over periods of time that range from decades to millions of years. It may be a change in the average weather conditions or a change in the distribution of weather events with respect to an average, for example, greater or fewer extreme weather events. Climate change may be limited to a specific region, or may occur across the entire Earth. In the context of this plan, climate change refers to global warming or anthropogenic global warming.

Corporate strategic action or initiative a specific statement of how the corporation intends to pursue a strategic objective

Corporate strategic goal a general statement describing a desired end-state, ideal, condition, or quality to be sought in Edmonton's physical, social, or economic development that will help achieve Council's vision (without specifying how). Corporate strategic goals are not necessarily achievable in the timeframe of the plan.

Corporate strategic objective a specific statement of what the corporation needs to accomplish in order to achieve a strategic goal. Objectives should be achievable within the timeframe of the plan.

Disturbance a temporary change in average environmental conditions that causes a pronounced change in an ecosystem. Natural ecological disturbances include fires, flooding, windstorms, insect outbreaks, as well as anthropogenic disturbances such as forest clearing and the introduction of exotic species. Disturbances can have profound immediate effects on ecosystems and society. These effects can continue for an extended period of time.

Durability the durability of an item indicates how well it stands up after a period of sustained use. Infrastructure that is durable generally contributes to goals of sustainability and resilience.

Ecological design any form of design that minimizes environmentally destructive impacts by integrating itself with living processes (e.g., low impact development (LID))

Ecological footprint a measure of human demand on the Earth's ecosystems. An ecological footprint compares human demand with planet Earth's ecological capacity to regenerate itself. It represents the amount of biologically productive land and sea area needed to regenerate the resources a human population consumes and to absorb and render harmless the corresponding waste. Using this assessment, it is possible to estimate how much of the Earth (or how many planet Earths) it would take to support humanity if everybody lived a specified lifestyle.

Ecosystem a biological environment consisting of all the organisms living in a particular area, as well as all the nonliving, physical components of the environment with which the organisms interact, such as air, soil, water, and sunlight. A healthy ecosystem is one that can maintain a state of equilibrium between its members over time in the face of external stress (however, no ecosystem is static indefinitely).

Ecosystem services benefits people receive from ecosystems

Edmonton Sustainability Papers a set of 21 discussion papers developed by subject area experts that explore Edmonton's sustainability and resiliency challenges. These papers served as input for community discussion and to generally inform the development of *The Way We Green*. (Available at edmonton.ca/thewaywegreen)

Energy one of the basic human needs, existing in the form of electrical, heat, light, sound, chemical, nuclear and mechanical

Energy density mapping a computer modeling tool used to evaluate existing energy use in a community and plan to improve energy efficiency through different land use and built form patterns, better building standards, transportation options, and the integration of local alternative and renewable energy sources. The approach builds on accepted practices for reducing energy use in efficient ways, such as through reduced demand for transportation and space heating/cooling in buildings. The process incorporates the idea that maximizing energy efficiency of urban form requires integrating transportation issues, addressing improvements to and orientation of the built environments, and ensuring that energy needs of a community are met in the most efficient way possible, such as obtaining the highest and best use from a given primary source of energy.

Energy transition strategy a strategy that responds to the continual decline in net energy supporting humanity. The strategy strives for a future scenario in which humanity has successfully adapted to the declining net fossil fuel energy availability and has become more localized and self-reliant.

Environmental aspect elements of an organization's activities, products, or services that can interact with the environment

Environmental impact any change to the environment, whether beneficial or adverse, wholly or partially resulting from an organization's environmental aspects

Environmental management system part of an organization's management system used to develop and implement its environmental policy

Environmental policy the overall intentions and direction of an organization related to its environmental performance as formally expressed by top management

Externality 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.

Feed-in tariff a policy mechanism designed to encourage the adoption of renewable energy sources and to help accelerate the move toward grid parity. Under a feed-in tariff, eligible renewable electricity generators (which can include homeowners and businesses) are paid a premium price for any renewable electricity they produce. Typically regional or national electric grid utilities are obligated to take the electricity and pay the tariff.

Food resilience the ability at all times to acquire safe, nutritionally adequate, and personally and culturally acceptable foods, produced in ways that are environmentally sound and socially just

Food system consists of production, processing, storage, transportation, buying and selling, eating, and waste management

Green building the practice of creating structures and using processes that are environmentally responsible and resource-efficient throughout a building's life-cycle. From siting to design, construction, operation, maintenance, renovation, and demolition, this practice expands and complements the classical building design concerns of economy, utility, durability, and comfort.

Integrated Pest Management (IPM) a multi-disciplinary, ecological approach to the management of pests based first on prevention and when needed, a control (biological, cultural, physical or mechanical intervention), saving registered pesticide application as a last resort

ISO 14001 a standard developed by the International Organization for Standardization (ISO) that outlines 18 key requirements for inclusion in an organization's environmental management system

Low impact development a land planning and engineering design approach for managing stormwater runoff. LID emphasizes conservation and use of on-site natural features to protect water quality. This approach implements engineered small-scale hydrologic controls to replicate the pre-development hydrologic regime of watersheds through infiltrating, filtering, storing, evaporating, and detaining runoff close to its source.

Mainstem the principal channel within a given drainage basin (e.g., North Saskatchewan River), into which all of the tributary streams in a drainage basin flow

Management system a framework of processes and procedures used to ensure that an organization can fulfill all tasks required to achieve its objectives

The Natural Step Canada a non-profit organization dedicated to helping other organizations and individuals understand and make meaningful progress toward sustainability

The Natural Step Framework a comprehensive model for planning in complex systems

Naturalization the planting of indigenous plant material in a previously disturbed area to establish a more natural plant community

Peak oil the point in time when the maximum rate of global petroleum extraction is reached, after which the production rate enters terminal decline

Pest an organism that causes damage, is a nuisance, or interferes with the health, environmental, functional, or aesthetic objectives of mankind

Pesticide a substance that prevents, repels, alters, or kills unwanted pests. Pesticides include insecticides used against insects, herbicides to control weeds, rodenticides for rodent control, fungicides for fungi and so on

Policy statement a statement describing a preferred course of action regarding a particular issue or situation

Pollution the creation, emission, or discharge of any type of material or waste that adversely impacts the environment. Its source may be known, other living things, or natural events.

Progress measure a meaningful, quantitative indicator of how well a strategic goal is being achieved

Resilience the capacity of a system (in this case a functioning city) to withstand and bounce back intact from environmental disturbances

Riparian zone the area that serves as the interface between land and a river or stream

Significant environmental aspect an interaction with the environment that has or can have a significant environmental impact

Sustainability 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 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).*

Zero waste a philosophy that encourages the redesign of resource life cycles so that all products are reused. Any trash sent to landfills is minimal. This process tries to emulate the way resources are reused in nature.

APPENDIX A: EDMONTON SUSTAINABILITY PAPERS

The Edmonton Sustainability Papers are a set of 21 discussion papers developed by local, national, and international experts to inform the development of *The Way We Green.* They are posted at www.edmonton.ca/thewaywegreen.

DISCUSSION PAPER 1 ***What is a Sustainable City?*** — Richard Heinberg, Post Carbon Institute

DISCUSSION PAPER2 ***The State of Edmonton's Ambient Air Quality*** — Matthew Dance, Tomorrow Foundation

DISCUSSION PAPER 3 ***Edmonton's Water Supply*** — Cindy Shapel, Steph Neufeld & Robert Raimondo, EPCOR Water Services Inc.

DISCUSSION PAPER 4 ***North Saskatchewan River Water Quality*** — Steph Neufeld, EPCOR Water Services Inc.

DISCUSSION PAPER 5A ***Peak Energy & Its Implications for the City of Edmonton*** — David Hughes, Post Carbon Institute

DISCUSSION PAPER 5B ***Peak Oil: The Future for Fossil Fuels and Impacts for Edmonton*** — Chris Bataille, MK Jaccard & Associates

DISCUSSION PAPER 6 ***Climate Change: Projections and Implications for Edmonton*** — Debra Davidson, University of Alberta

DISCUSSION PAPER 7 ***Food Security for Edmonton*** — Becky Lipton, Lipton Research & Consulting

DISCUSSION PAPER 8 ***Urban Biodiversity: Why It Matters & How to Protect It*** — Colleen Cassady St. Clair, University of Alberta

DISCUSSION PAPER 9 ***City Discharges to the North Saskatchewan River: Addressing the Challenge*** — City of Edmonton, Drainage Services Branch

DISCUSSION PAPER 10 ***Sustainable Waste Management*** — City of Edmonton, Waste Management Branch

DISCUSSION PAPER 11 ***Environmental Impacts Beyond Edmonton's Borders*** — Laura Franceschini, Stantec

DISCUSSION PAPER 12 ***Edmonton's Ecological Footprint*** — Mark Anielski, Anielski Management Inc.

DISCUSSION PAPER 14 ***Greener Energy Opportunities & Priorities for the City of Edmonton*** — Tim Weis, Pembina Institute

DISCUSSION PAPER 15 ***Best Practices in Sustainable Cities*** — Amy Seabrooke, The Sheltaire Group / Stantec

DISCUSSION PAPER 16 ***Correct Pricing & Deregulation: The Key to Economic and Environmental Sustainability*** — Lawrence Solomon, Energy Probe

DISCUSSION PAPER 17 ***The Power of Prices & the Failure of Markets: Addressing Edmonton's Environmental & Fiscal Challenges*** — David Thompson, Policy Link Research

DISCUSSION PAPER 18 ***Resilient Edmonton: How and Why?*** — Craig Applegath, Cohos Evamy / Resilientcity.org

DISCUSSION PAPER 19 ***Sustainability Planning: Frameworks, Principles and Management Tools*** — Aviva Savelson & Sarah Buckle, Stantec

DISCUSSION PAPER 20 ***Achieving a Sustainable Building Stock: How Buildings Can Become Part of the Solution*** — Klaas Rodenburg, Stantec

DISCUSSION PAPER 21 ***Towards a Sustainable Transportation System*** — Aryn Machell, City of Edmonton, Transportation Planning Branch

APPENDIX B: THE COST OF SUSTAINABILITY

"How much will *The Way We Green* cost to implement?" The answer to this question is not straight forward, given the different ways society defines and measures cost. The answer is further complicated by uncertainties about the price of future technology, energy, carbon emissions, and natural resources.

When people pose this question they are most curious about the additional initial capital outlay that will be required for the green initiative – i.e., the extra dollars they will need to pay over-and-above the business-as-usual scenario. Unsurprisingly, the initial capital outlay of most green initiatives is greater than the initial capital outlay of their business-as-usual alternative. Various reasons account for higher prices including higher quality materials, more materials, emerging industries that have yet to achieve economies-of-scale, limited market capacity, and short supply. Viewed in this way, green initiatives are often seen as being a high cost option.

However, when examined more fully over their lifecycle, the higher initial capital outlay of green initiatives is usually offset (in whole or in part) with a variety of benefits, including: **operational benefits** (e.g., lower utility and maintenance expenses, longer useful life, and/or increased worker productivity), **social benefits** (e.g., benefits to human health), and **environmental benefits** (e.g., reduced greenhouse gas emissions). Factoring these benefits into the investment decision, along with the initial capital outlay, changes the decision maker's focus from "*What is the lowest initial capital outlay?*" to "*What are the costs and benefits of the competing investment options and which option delivers the greatest net benefit to the community?*"

The Way We Green recommends that "cost" be considered in a more comprehensive context – one that considers initial capital cost along with all other significant lifecycle costs, including externalities.

As well, sustainability investments will need to meet the criteria set out in policy 9.4.1 — providing a flexible platform for future steps, and generating a sufficient return on investment.

The Way We Green's action plans will apply this approach when costing green initiatives and will recommend those that offer value for money. At the same time, action plans will be cognizant of the short-term financial implications of these investments including cash-flow, budgets, and the tax levy.

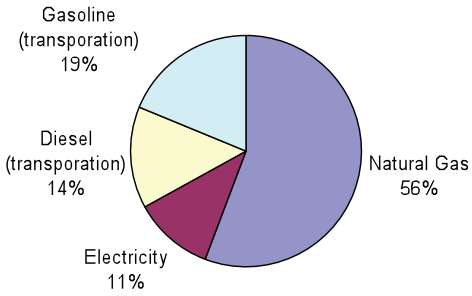
Prudent and effective use of the City's limited financial resources will be key to achieving the vision of *The Way We Green*.

photo: April Scott

APPENDIX C: OVERVIEW OF EDMONTON'S ENERGY CONSUMPTION AND GREENHOUSE GAS EMISSIONS (2009)

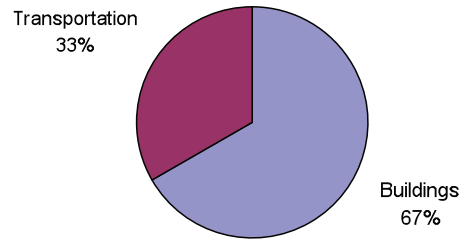
Most of the energy used in Edmonton is sourced from natural gas, gasoline, diesel fuel, and electricity (mainly coal generated).

Energy Use In Edmonton - By Energy Type



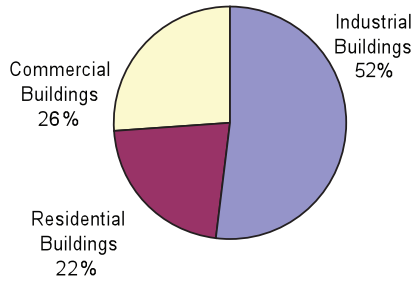
Most of the energy used in Edmonton is consumed in buildings and infrastructure (67%) versus transportation (33%).

Energy Use In Edmonton - Buildings vs. Transportation



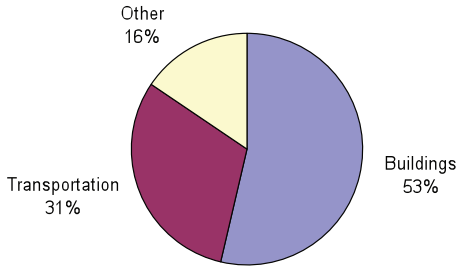
Of the various building types, industrial buildings consume the most energy, followed by commercial and residential.

Building Energy Use In Edmonton - By Building Type



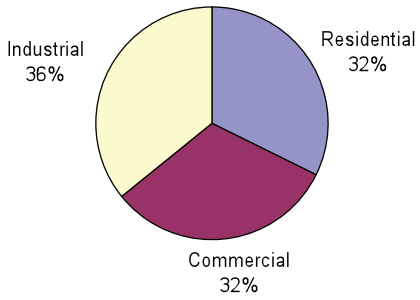
The majority of Edmonton's greenhouse gas emissions come from fossil fuels used to heat, light, and power buildings. (The category "Other" includes emissions from landfill, industrial chemical processes and wood burning).

Greenhouse Gas Emission In Edmonton - By Source



Residential, commercial, and industrial buildings categories emit approximately the same amount of greenhouse gases each.

Greenhouse Gas Emissions from Buildings - By Building Type
Type



APPENDIX D: A REGIONAL APPROACH TO SUSTAINABILITY

Through its strategic actions, *The Way We Green* acknowledges the importance of Edmonton's regional partners in addressing our sustainability challenges. Decisions that are made by other municipalities and regional management organizations like the Alberta Capital Airshed Alliance, the North Saskatchewan Watershed Alliance and the Capital Region Board impact Edmonton and vice versa. That is why *The Way We Green* has been designed to align, in principle, with the provincial Cumulative Effects Management System (CEMS) and the processes established under the Land-Use Framework (LUF) and the Alberta Land Stewardship Act (ALSA). *The Way We Green* was also informed by other regional plans such as *The Capital Region Growth Plan: Growing Forward* and The North Saskatchewan Watershed Alliance's proposed *Integrated Watershed Management Plan (A Discussion Paper)*.

The LUF and ALSA set 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. There are seven regions defined under the LUF based on major watersheds; Edmonton resides in the North Saskatchewan region. As part of this regional planning process a Regional Advisory Council (RAC) will be formed. *The Way We Green* project team has made every attempt to make the document regionally relevant so that the RAC might consider its contents when providing its advice and recommendations on the yet to be created North Saskatchewan Regional Plan (NSRP).

In addition to the NSRP, each region will need to develop sub-regional plans. The Capital Region Board (CRB), a body made up of the City of Edmonton and 24 surrounding municipalities was responsible for creating one of the first of these subplans. *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 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. One of the six principles in the plan is protection of the environment and resources and the plan indicates that implementation will require "significant information and data on the environment including the cumulative environmental effects of development." *The Way We Green* is a source of this information as well as a framework to obtain additional information to inform these sub-regional plans.

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. *The Way We Green* has reflected this *place-based* approach in the various goals, objectives, and strategic actions.

The Way We Green aligns whenever possible with regional plans that have already been completed. At the same time, *The Way We Green* acknowledges that to achieve sustainable end-states, there may be a need to go farther and possibly faster than is suggested in these other plans. Edmonton is not an island, and moving towards sustainability will require action across the region. It is hoped that *The Way We Green* will be a key input document into the NSRP, with its principles, goals, and objectives being considered as direction setting for the entire region.

APPENDIX E: EXPERT PANEL MEMBERS

The Way We Green Expert Panel was established in March 2010 to provide feedback and advice on the policy direction of this strategy.

Debra Davidson
Associate Professor, Rural Economy and Renewable Resources, University of Alberta
Director, Environmental Research and Studies Centre

Debra Davidson is Associate Professor of Environmental Sociology with a joint appointment in the Departments of Rural Economy and Renewable Resources at the University of Alberta. Her primary areas of teaching and research include natural resource politics and governance, social dimensions of global environmental change, environmental risk, and rural sociology. Lately, Davidson has been focusing on social responses to climate change, particularly community-level vulnerability and adaptation. Recent articles published in several journals include *Sociological Inquiry, Canadian Review of Sociology*, and *Organization and Environment*. She co-edits *Consuming Sustainability: Critical Social Perspectives on Ecological Change*, Fernwood Press, 2005.

Pong Leung
Principal Advisor, The Natural Step Canada

Pong Leung is a founding member of The Natural Step Canada. As a principal advisor with The Natural Step Canada, Leung supports communities, businesses, and other organizations with integrated sustainability planning and education. He is working with a wide range of clients to share his expertise on sustainability, governance, and organizational learning including a strategic positioning and organizational change program with ISL Engineering and Land Services, a comprehensive training and visioning program for the Landmark Group of Builders, and an award-winning broad-based community visioning and planning initiative with the City of Williams Lake, B.C. Before rejoining TNS in 2008, Leung was program director of the Strategic Leadership Towards Sustainability graduate program at the Blekinge Institute of Technology in Sweden. He completed his Masters of Science in Environmental Management and Policy at the International Institute for Industrial Environmental Economics at Lund University in Sweden and his Bachelor of Commerce degree from the University of Alberta.

Daniel Smith
Ph.D., P.Eng., RSC, CRC, DEE

Dr. Daniel W. Smith was the Canada Research Chair in Environmental Engineering and a Fellow of the Academy of Science of The Royal Society of Canada. As a University of Alberta Professor of the Environmental Engineering and Science Program, he guided more than 100 masters and 39 doctorate graduate students to degree completion and published more than 480 scientific and technical articles, as well as another 175 reports, books, and book chapters. Smith is one of three principal investigators of the Forest Watershed and Riparian Disturbance (FORWARD) Project studying the impact of forest management practices on water quality. Following receipt of his doctorate in Environmental Health Engineering from the University of Kansas and eight years of service for various agencies including the U.S. Public Health Service, the University of Alaska, Environment Canada, and R&M Consultants of Alaska, Smith joined the University of Alberta in 1978. He has served in numerous other professional capacities and received several awards including: President of the Canadian Society for Civil Engineering in 1987-88, the Rudolph Hering Medal 2002 for the best Journal of Environmental Engineering paper, Elbert F. Rice, Can-Am Awards, and the Harold R. Peyton Award for Cold Regions Engineering (2004) from ASCE, and member of the Water Environment Federation Research and Program Committees.

David Schindler
Killam Memorial Chair and Professor of Ecology,
University of Alberta

Dr. Schindler holds the Killam Memorial Chair and is Professor of Ecology in the Department of Biological Sciences at the University of Alberta. His work on lakes has been widely used in formulating policy internationally. Schindler received his doctorate from Oxford University, where he studied as a Rhodes Scholar. He has served as president of the American Society of Limnology and Oceanography and as Canadian national representative to the International Limnological Society. Schindler is the author of more than 300 scientific publications. He is a Fellow of the Royal Society of Canada and the Royal Society of London, a member of the U. S. National Academy of Sciences, and a foreign fellow of the Royal Swedish Academy of Engineering Sciences. Schindler has received 10 honorary doctorates from Canadian and US universities. He is an Officer in the Order of Canada and a founding member of the International Water Academy. In 2008, he was appointed to the Alberta Order of Excellence. Trent University has recently named an endowed professorship in aquatic sciences after Schindler.

Guy Swinnerton
Professor Emeritus, Faculty of Physical Education and Recreation, University of Alberta

Guy Swinnerton has a Ph.D. in Land Use Studies. His 40 years of academic and professional experience with parks and protected areas has focused on the protection of biodiversity and cultural heritage within lived-in and working landscapes. For the past decade, Swinnerton has been a member of the IUCN's World Commission on Protected Areas International Task Force on Protected Landscapes. In 2007, he received the Canadian Council on Ecological Areas Gold Leaf Award for his work on protected areas in Canada.

APPENDIX F: MESSAGE FROM THE CITY OF EDMONTON'S ENVIRONMENTAL ADVISORY COMMITTEE

The City of Edmonton's environmental efforts are supported by a volunteer committee of citizens — The Environmental Advisory Committee. Its mandate is *to provide a vehicle for the flow of strategic expertise and advice between the community and officials of the City of Edmonton for the continuing development of the Environmental Strategic Plan and other environmental issues that arise*. Members of the Environmental Advisory Committee were actively involved in the development of *The Way We Green*, attending workshops, responding to discussion papers, and providing advice on the final plan. The following is the Committee's response to *The Way We Green*.

The Way We Green is the third iteration of the City of Edmonton's environmental plan. The first plan was approved in 1999, followed by a more robust Environmental Strategic Plan in 2006, which incorporated an environmental management framework to help achieve the plan's objectives.

The Way We Green has been developed under the umbrella of the City's strategic plan, The Way Ahead, which comprises six core plans[27] that will shape Edmonton over the next 10 years. The Environmental Advisory Committee is encouraged by the City's leadership to position this plan as an integral component of the City's values.

The City has completed a number of achievements over the past several years that provide a foundation to move ahead with The Way We Green and solidify Edmonton's position as a leader in environmental sustainability:

- *ICLEI – Local Governments for Sustainability:*
  - *Becoming a member in 1993*
  - *Hosting the World Congress of ICLEI - Local Governments for Sustainability in 2009*
  - *The Mayor being appointed to the 2009-2012 Executive Committee of ICLEI.*
- *Developing The Way Ahead, the City's Strategic Plan that incorporates sustainability as one of its four core principles, along with "Preserve and Sustain Edmonton's Environment" as a strategic goal.*
- *Becoming ISO 14001 certified under the City's environmental management system Enviso, which will be an important vehicle for implementation of The Way We Green as well as communicating back to the citizens of Edmonton.*

We believe all of the above points communicate Edmonton's intentions and values regarding sustainability, both to its citizens and to the international community.

Development of The Way We Green reflects the values and principles of sustainability and resilience by:

- *Incorporating extensive stakeholder engagement for development of policy directions as well as feedback mechanisms. This included surveys, information sessions, and facilitated discussions;*
- *Incorporating contemporary thinking and research to define "sustainability" and to frame policy directions;*

- *Establishing a comprehensive approach for dealing with significant issues within sustainability such as water supply and quality, energy and climate change, biodiversity, food security, air quality, and waste management (including approaches to implement the plan, measure success, and manage associated risks);*
- *Developing an integrative plan with overlapping and integrative policies with the other major City directional plans: The Way We Grow, The Way We Move, The Way We Prosper, The Way We Finance, and The Way We Live. This is reflected in the development of the Sustainability Lens, where the City's social, economic, and environmental sustainability principles are to be applied in all decision making.*

It is this 'lens' that should be effective in shaping Edmonton as a sustainable and resilient city.

As the City moves ahead in realizing its vision of being a world leader, the City needs to consider:

- *The effectiveness of the implementation vehicles so that the values and principles of sustainability and resilience are clearly reflected in the decisions and actions made by employees and citizens*
- *A reporting structure that allows accountability to the sustainability principles and allows the City to be adaptive and dynamic for future growth and to meet environmental outcomes and objectives*
- *The alignment and integration with the five other directional plans (The Ways)*
- *The integration with the regulatory framework of the Province, such as the Land Use Framework, currently in development*
- *The integration with the Edmonton sub-regional planning process and the Capital Region Board*
- *That the principles of sustainability are reflected in City-owned corporations as well as City operations.*

Sustainability is an objective that evolves as our city grows and we try to meet the needs of all our citizens. The model that the City has adopted through its strategic plan and the use of Enviso as a management system provides the means to move towards sustainability.

END NOTES

1 The Natural Step model stresses that ongoing, systematic, degradation of the environment is not sustainable. To reach this desired outcome, a sustainable society must limit physical disruptions to natural systems (e.g., deforestation, development of natural areas, etc.) to levels below natural refresh rates. Adherence to this principle would mean putting firm limits on systematic physical encroachment on nature.

2 The Natural Step Model stresses that a sustainable society must not continually extract substances from the Earth (e.g., metals or fossil fuels) as they will accumulate in nature, eventually reach an eco-toxic threshold, and contribute to a degraded state. Following this principle means reducing extraction and consumption of harmful substances so that they do not result in increasing concentrations in nature and sometimes eliminating the use of substances that are most toxic. As well, it means keeping materials within technical cycles (e.g., reuse of metals) so that they do not accumulate in nature.

3 The Natural Step Model stresses that in order for human populations to live in sustainable ways, barriers must not prevent them from 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 people's ability to meet their basic needs and live in sustainable ways. The Natural Step defines needs beyond basic sustenance to include subsistence, protection/security, affection, understanding, participation, leisure, creation, identity/meaning, and freedom.

4 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 more than 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.

5 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.

6 Intrinsic value is generally defined as the inherent worth of something, independent of its value to anyone or anything else. One way to think about intrinsic value is to view it as similar to the inalienable right to exist. The United Nations Charter for Nation (1982) notes biodiversity's intrinsic value: "Every form of life is unique, warranting respect regardless of its worth to man."

7 This principle tells us to observe and mimic nature when designing human systems. It also implies integration of human built areas with natural systems.

[8] Renewable resources are exhaustible. For example, forests can be overcut, resulting in barren landscapes and shortages of wood. However, a resource may decline 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 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.

[9] 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 greater than the depletion rate. In this way, society's dependence on the resource will be reduced to insignificance before it is exhausted.

[10] 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 of worldview ensures that we are living sustainably and respectfully on Mother Earth (Aboriginal Relations Office, City of Edmonton).

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

[12] 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.)

[13] Facts provided by EPCOR.

[14] Edmontonians currently use an average of 350 million litres per day. This is about the volume it would take to fill the downtown Telus Tower building. More than 90 per cent of this is returned to the North Saskatchewan River through the Gold Bar Wastewater Treatment Plant and Alberta Capital Region Wastewater Treatment Plant.

[15] Facts provided by EPCOR.

[16] Low impact development (LID) is a stormwater 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 stormwater in a manner that helps prevent harm to natural aquatic systems from commercial, residential, and industrial development sites, and includes measures such as green roofs, bioswales, and constructed wetlands. LID supports one of the Melbourne Principles of Sustainability — build on the characteristics of ecosystems in the development and nurturing of healthy and sustainable cities.

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

[18] Canadian Council of Energy Ministers, Integrated Community Energy Solutions: A Roadmap for Action Homer Dixon, Thomas, The Upside of Down (Toronto: Vintage Canada, 2007)

[19] Carbon neutrality refers to achieving net zero carbon emissions by balancing a measured amount of carbon released with an equivalent amount sequestered or offset, or buying enough carbon credits to make up the difference. It is used in the context of carbon dioxide releasing processes, associated with transportation, energy production, and industrial processes. The concept may be extended to include other greenhouse gases (GHG) measured in terms of their carbon dioxide equivalence — the impact a GHG has on the atmosphere expressed in the equivalent amount of CO_2.

[20] Toma & Bouma Management Consultants, Developing a City-wide Food and Agriculture Strategy for the City of Edmonton, Discussion Paper.

[21] Conference Board of Canada, www.conferenceboard.ca/hcp/details/environment/municipal-waste-generation.aspx

[22] Derived from ICLEI (Local Governments for Sustainability) Sustainability Goals & Guiding Principles, October 2010.

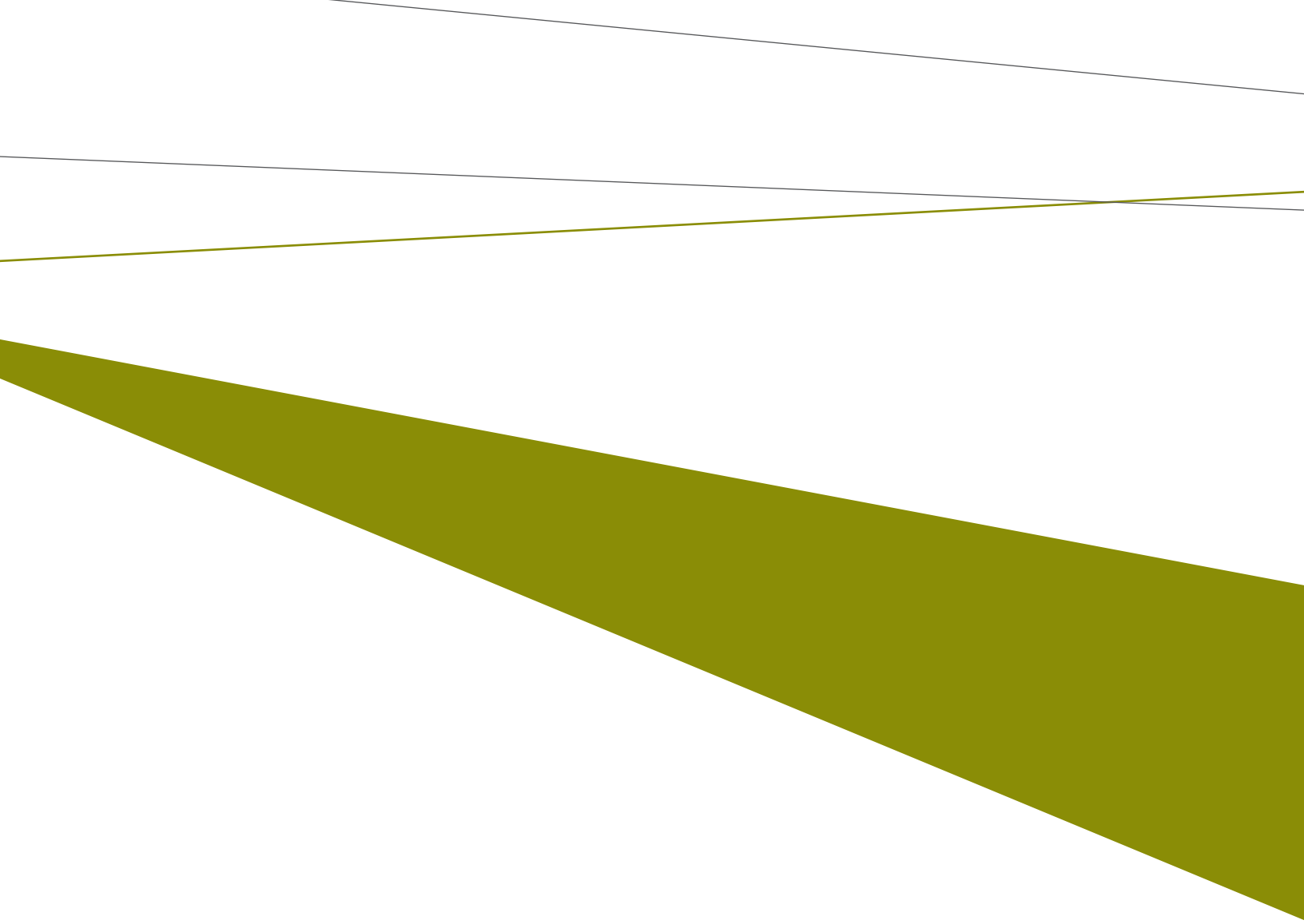
[23] Derived from ICLEI (Local Governments for Sustainability) Sustainability Goals & Guiding Principles, October 2010.

[24] Derived from ICLEI (Local Governments for Sustainability) Sustainability Goals & Guiding Principles, October 2010.

[25] Derived from ICLEI (Local Governments for Sustainability) Sustainability Goals & Guiding Principles, October 2010.

[26] Derived from ICLEI (Local Governments for Sustainability) Sustainability Goals & Guiding Principles, October 2010.

[27] *The Way We Grow, The Way We Move, The Way We Prosper, The Way We Finance, The Way We Live* and *The Way We Green*



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