

THE WAY WE GREEN

CLASSROOM CONVERSATIONS

Teacher's Guide for
High School Studies

TRANSFORMING | **EDMONTON**

BRINGING OUR CITY VISION TO LIFE



THE CITY OF
Edmonton

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CLASSROOM CONVERSATIONS

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High School Studies

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INTRODUCTION

Clean air, land and water are all required for Edmontonians to enjoy healthy lives and a high standard of living that fulfills social and cultural needs. A healthy environment is the foundation for our existence and quality of life.

In this booklet you will find information and questions to spark discussion about Edmonton’s environmental future and Edmonton’s environmental strategic plan, *The Way We Green*.



CONTEXT

The Way We Green (TWWG) is one of six plans the City of Edmonton is developing. These plans are part of the Transforming Edmonton initiative that describes a long-term vision, achievable through careful planning and decision making. The cornerstone of Transforming Edmonton is the City’s strategic plan, *The Way Ahead*. This 10-year planning framework guides the evolution of the City and is accompanied by six detailed plans.

- 1- **The Way We Grow**
(Municipal Development Plan)
- 2- **The Way We Move**
(Transportation Master Plan)
- 3- **The Way We Live** (People Plan)
- 4- **The Way We Finance**
(Financial Sustainability Plan)
- 5- **The Way We Prosper**
(Economic Development Plan)
- 6- **The Way We Green**
(Environmental Strategic Plan)

Learn more about Transforming Edmonton: www.edmonton.ca/transformingedmonton

The Way We Green is Edmonton’s environmental sustainability plan supporting the City’s vision and 10-year strategic goals. It is a bold and visionary strategy for making Edmonton the nation’s leader in setting and achieving the highest standards of environmental sustainability in its own practices and by encouraging the same of citizens, businesses and institutions.

Like each of the other five plans, *The Way We Green* will be revisited and updated as necessary. It is critical that this plan remain current and continue to reflect the changing external pressures, demographics, ideas and values of Edmontonians.

The Way We Green’s two main focuses are: **Sustainability and Resilience**.

RESILIENCE: the ability of a system to maintain itself when pushed and pulled by disturbance and change. For example, how quickly can Edmonton recover from high winds or heavy rains? Or in the context of food, if disruption of shipping by road, rail or ship were to prevent the delivery of food from other provinces or countries to Edmonton, how would Edmonton survive this disruption?

SUSTAINABILITY: the ability of human society to endure over a prolonged period as an important part of Earth’s natural systems. This is achieved through the practice of sustainable living.

SUSTAINABLE LIVING: a conscious way of life whereby humans use physical, natural and social resources in such a manner that these resources are always available or replaceable. This allows the living systems in which humans live to thrive long into the future.



CONTRIBUTING TO THE WAY WE GREEN

We each have a role to play in ensuring a healthy environment. This guide is a great way to familiarize yourself and your students with the goals and actions contained in *The Way We Green*.

The Way We Green plan was accepted by City Council July 20th, 2011. Now it is up to each of us to take responsibility for implementing the plan. The more we learn about Edmonton's environmental challenges, the easier it will be to take action.



CURRICULUM FIT

Career and Technology Studies:

Natural Resources (NAT) -
Environmental Stewardship

Science 10:

Unit B: Energy Flow in
Technological Systems

Unit D: Energy Flow in Global
Systems

Science 14:

Unit D: Investigating
Matter and Energy in the
Environment

Science 20:

Unit C: The Changing Earth

Unit D: Changes in Living
Systems

Science 30:

Unit D: Energy and the
Environment

Biology 20:

Unit A: Energy and Matter
Exchange in the Biosphere

Unit B: Ecosystems and
Population Change

Unit C: Photosynthesis and
Cellular Respiration

Social Studies: the information within this guide, and the online videos and papers by experts, could form the basis of discussion and debates.

English: use the information to develop vocabulary, critical thinking and communication skills.

USING THIS BOOKLET: LEADING A CLASSROOM CONVERSATION

Six broad topic areas are addressed in *The Way We Green*. Within these six topic areas are 12 long-term goals that describe a sustainable and resilient Edmonton.

You might approach these topics in a variety of ways.

A: Weekly Conversations

Spread the learning over several weeks. Each week, choose two or three topics to discuss and eventually your students will have had the opportunity to learn about all of the topics addressed in *The Way We Green*.

B: Small Group Work

Groups of two or three students might choose one or two topics for in-depth study. After each small group has had time to review, research and discuss their topic, they then present their discoveries to the whole class, covering all the topics.

C: Focus on a Few

Using the technique of Small Group Work choose two or three of the topic areas that tie directly with your curriculum and focus your conversation around those. This could naturally lead to whole-room, in-depth discussions about the study concepts.

Encourage further research by visiting **www.edmonton.ca/TheWayWeGreen**. The 21 discussion papers, interviews, videos and summary documents found there provide students with a wide range of information through a variety of media.

For more information on student grants and resources pertaining to sustainability or environmental leadership, please check our website at: **www.edmonton.ca/TheWayWeGreen**
Click the Take Action tab and scroll down to *Green School Programs*.

Share your students' insights and ideas by sending them to:

thewaywegreen@edmonton.ca



EDMONTON

THEN AND NOW

In order to understand the direction Edmonton is heading environmentally, and to truly appreciate the vision for our community contained in *The Way We Green*, we need to understand our city's history.

The earliest people who settled in the North Saskatchewan River Valley had a strong connection with the environment. This location and its resources have been the centre of commerce, industry and excitement for the area that is now called Edmonton.

FACTS TO CONSIDER

- Aboriginal people were drawn to the North Saskatchewan River Valley for thousands of years by the abundant water, shelter and wildlife (including fish). The area of "Rossdale Flats" located in the river valley just below downtown Edmonton was a significant place of gathering, trade, cer-

emony and governance before the arrival of the Europeans.

- The first trading posts in the area were established in the 18th century and flourished thanks to the efforts of Aborigines, who harvested the region's plentiful furs and game to trade.
- In 1795, the Hudson's Bay Company established a trading post named Edmonton House, which became the distribution centre for their operations throughout the northwest, and a major supply centre on their trans-Canada route.
- The discovery of coal deposits in 1841 was a significant source of excitement and pride to the community. Running for a considerable distance along both sides of the river in Edmonton, this resource would later ignite a mining boom in the area.
- With the incorporation of the west into the new Dominion of Canada in 1870, the settle-

ment around Fort Edmonton grew and the northern terminal of the Calgary-Edmonton Railway reached the city.

- After being incorporated as a city in 1904, Edmonton became the official capital of the new province of Alberta in 1905. In 1908, the University of Alberta opened. By 1912, the city's boundaries were expanding in all directions and commerce and construction were booming.
- The outbreak of the First World War in 1914 and the Great Depression of the 1930s hit Edmonton hard. However, recovery came in the 1940s when the Second World War brought a boom to the city as Edmonton became the base of operations for the construction of the Alaska Highway and the CANOL (short for Canadian Oil) pipeline project. Prosperity was ensured with the discovery of oil near Leduc in 1947.
- Edmonton prospered through the 1960s and 1970s as an oil boom created thousands of jobs and brought newcomers to the city. The University of Alberta expanded and the Northern Alberta Institute of Technology was founded to meet the growing need for skilled technical workers. Edmonton became one of Canada's fastest growing cities.
- Edmonton's population growth, which had slowed through the 1980s and 1990s, resumed with the strong growth of the oil industry in the late 1990s through to present day.

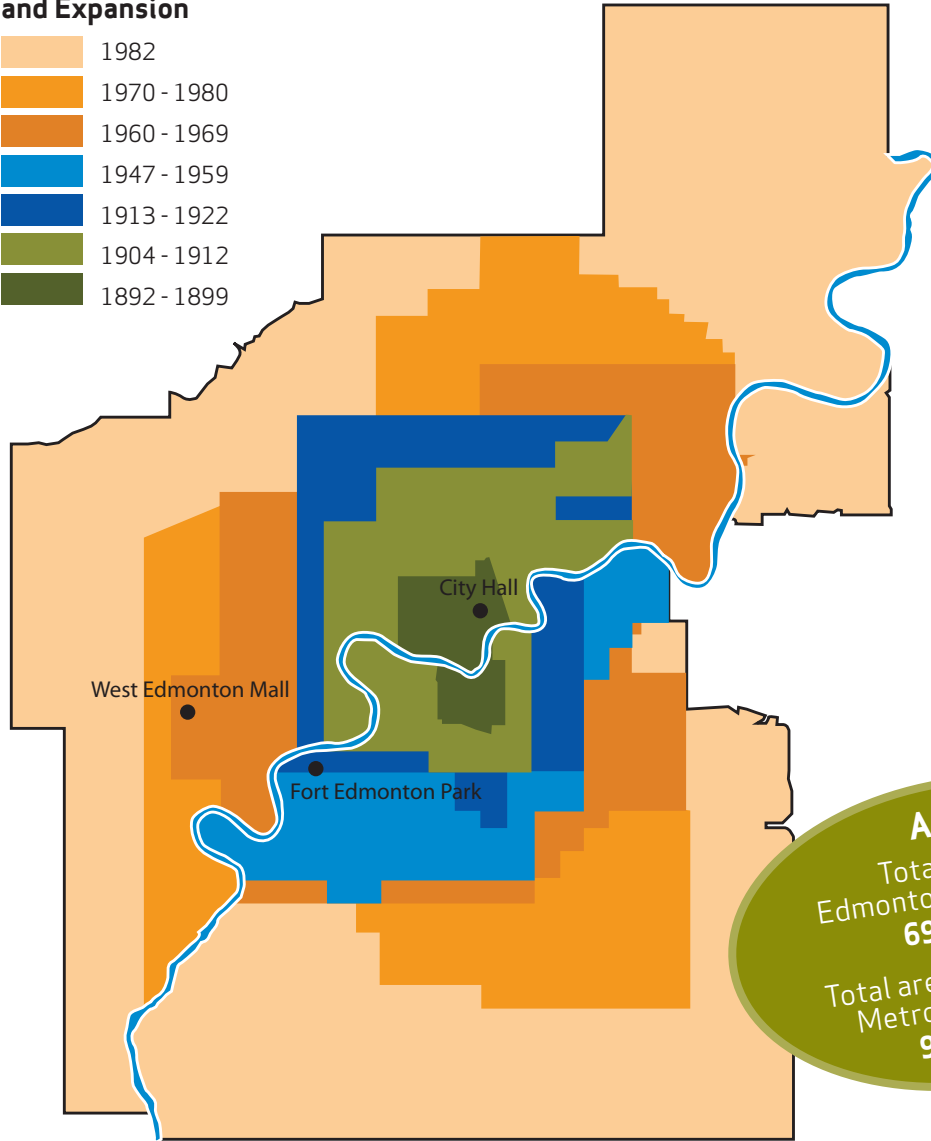


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Edmonton's Growth and Expansion

- 1982
- 1970 - 1980
- 1960 - 1969
- 1947 - 1959
- 1913 - 1922
- 1904 - 1912
- 1892 - 1899



CITY OF EDMONTON ARCHIVES EA-600-8106



PHOTO: ROBERT WASNEA



CITY OF EDMONTON ARCHIVES EA-10-215

THE CURRENT STATE

Edmonton City Council recognizes that the city's past, present and future are interconnected with the continued health of the environment. To that end, *The Way We Green* has been developed to focus on our relationship with the natural world on which we depend, and efforts to increase Edmonton's sustainability and resilience.

Nearly all of Edmonton's energy comes from fossil fuels which are resources that decrease over time and cannot be renewed. This near total dependence on oil, gas and coal makes our city's sustainability and resiliency questionable.

WHAT DOES THE FUTURE HOLD?

During the 1800s and early 1900s, the effects humans had on the environment were not understood or widely known. We know a great deal more now and *The Way We Green* will serve as a framework to help guide Edmonton's decision makers.

The Edmonton Census Metropolitan Area (CMA) is the largest metropolitan area in northern Alberta. The City of Edmonton, which comprises 70 per cent of the region's total population, is one of 25 other municipalities that make up the Edmonton CMA.

www.statcan.gc.ca/cara2006/cma_m-m_rmr/edmontoncmarmr-eng.pdf

TALK ABOUT TWO

1. What are some of the things that occurred during Edmonton's history that affected the North Saskatchewan River valley? How did these events affect modern-day Edmonton's society, structure and economy? Were these effects good, bad or neutral?
2. Are there events and discoveries happening **now** that affect Edmonton in the same way (good, bad or neutral)? How has our knowledge of the environment or human impacts on it changed the way we act on these events?

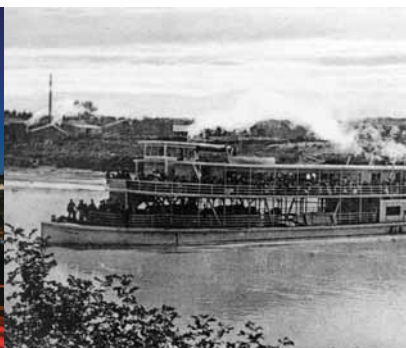
CONTINUE THE CONVERSATION

1. Can you think of something that previous generations did that, at the time, seemed like a great idea or a wonderful invention that turned out to be not so good for the environment?
2. Is there something that we are doing now that we may discover affects the environment in ways we didn't expect?
3. What can you or your classmates do to help Edmonton reach its goals of sustainability and resilience?

STATISTICALLY SPEAKING...

Population:

1892:	700 (Town of Edmonton)
1899:	2,212
1904:	8,350 (City of Edmonton)
1912:	53,611
1959:	260,733
1969:	422,418
1980:	505,773
1982:	551,506
1990:	605,538
2001:	666,104
2008:	752,412
2012:	817,498



THE PLANNING PROCESS

The Way We Green was created using a variety of methods to engage and gather opinions from business, industry, government, social agencies, the community, educational institutions, youth and other organizations.

SOME OF THE WAYS WE DID THIS

- Interviewed numerous stakeholder groups and citizens
- Analyzed sustainability policies and strategies from benchmark cities around the world
- Created a steering committee made up of members of the City's Environmental Policy Leadership Committee
- Formed an external Expert Panel that provided feedback on proposed policy direction
- Commissioned 21 discussion papers to examine the wide range of sustainability challenges facing Edmonton
- Consulted with thousands of Edmontonians through workshops, focus groups, on-line questionnaires, surveys, public forums, meetings and events
- Designed *The Way We Green* website to educate, inform and collect citizen feedback

WHAT DOES IT MEAN?

BENCHMARK: a standard of excellence, achievement, etc., against which similar things might be measured or judged.

INFRASTRUCTURE: the fundamental facilities and systems serving a country, city or area, such as transportation and communication systems, power plants and schools.

POLLUTION: the creation, emission or discharge of any type of material or waste that adversely impacts the environment. Its source may be human-made, other living things or even from natural events.

STAKEHOLDER: a person or group that has an investment, share or interest in something such as a community, business or industry.



QUESTIONS STAKEHOLDERS AND CITIZENS WERE ASKED

- Does Edmonton face sustainability/resiliency challenges?
- How probable is it that these challenges will be serious concerns within the next 30 years?
- Will these challenges require changes to our infrastructure and lifestyle?
- 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 resiliency goals?
- Is the current pace of change adequate to address the challenges?

WHAT DID EDMONTONIANS SAY?

- 80 to 90 per cent of the respondents indicated that it was somewhat to highly probable Edmonton would face serious challenges within 30 years, relative to oil and gas supply and price, climate

change, water supply, air and water quality, food security and environmental challenges from beyond Edmonton's borders.

- The majority of respondents also felt that these challenges would require major lifestyle or infrastructure changes.
- Respondents felt that the challenges that we faced in order of importance were:
 1. **Energy** – Our fossil fuel dependence could become a serious challenge due to resource depletion and/or climate change.
 2. **Water Supply** – Water demand could exceed supply due to growing population, receding glaciers at the North Saskatchewan headwaters and climate change.
 3. **Biodiversity** – Loss of biodiversity through habitat destruction, degradation, fragmentation and/or climate change.
 4. **Food** – We could experience food security challenges due to a growing world population, vulnerable food supply lines, food supply issues, loss of local agricultural land and/or the effects of climate change.
 5. **Water Quality** – Edmonton could have difficulty handling pollution entering the North Saskatchewan River due to a growing population, expanding

industry and/or climate change.

6. **Air Quality** – Outdoor air quality could also become severely impacted due to growing population, expanding industry and/or climate change.

TALK ABOUT TWO

1. Why were so many organizations consulted and such a variety of public involvement methods used to develop *The Way We Green*?
2. How often do experts and members of the public differ in their opinions? Why do you suppose this is so?

CONTINUE THE CONVERSATION

1. Carefully read the key questions that were asked of the stakeholder groups. Choose one and discuss your thoughts on the issue in small groups.
2. Have you been involved in a planning session for a project or an event? What were the difficulties faced during the meeting? What were the outcomes of the project? Do you recall experiencing any difficulties or challenges in the meetings? Explain why you think there were or were not any real challenges.

HEALTHY ECOSYSTEMS – LAND

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

WHAT DOES IT MEAN?

BIODIVERSITY: the variety of life on Earth. It includes terrestrial (land) and aquatic (water) plant and animal species, from the simplest and tiniest to the complex and large.

CONNECTIVITY: the degree to which a landscape enables movement from one space to the next. Connectivity may be provided by corridors of natural areas that allow animals to move from one place to another, like the river valley, or by land uses that are compatible with one another.

ECOSYSTEM: an association of living things and their interactions with each other and the environment. Ecosystems include living organisms (biotic) and the physical environment (abiotic).

PESTICIDE: a substance that prevents, repels, alters or kills unwanted pests. Insecticides used against insects, herbicides to control weeds, rodenticides for rodent control and fungicides for fungi are a few examples of pesticides.

TABLELANDS: the upland areas outside of the North Saskatchewan River Valley and ravines.

to move from one natural space to another, action will be taken to build in allowance for animal movement.

In recent years, various initiatives have been introduced to reduce pesticide use by City operations.

FACTS TO CONSIDER

- Approximately one-quarter of the city is within a 5 minute walk of a secured natural area, and almost half are within a 10 minute walk. Areas greater than a 20 minute walk are usually in industrial areas.
- The majority of protected natural areas can be found in the River Valley and ravines, but there are a growing number of protected areas on the Tablelands.
- The main habitat types in Edmonton include forest, wetland and riparian area. There are also some small areas of peatland, grassland and sand dune formations within the city.
- Edmonton has almost 500 plant species, 50 mammal

THE CURRENT STATE

In 2009, Edmonton City Council approved borrowing \$20 million to secure a number of large natural areas. As of 2011, 3,500 ha of natural area were protected in the River Valley and 400 ha in the Tablelands.

In 2010, the City completed the Wildlife Passage Engineering Design Guidelines to promote a more formal, consistent approach for constructing or preserving wildlife passages where roadway infrastructure affects natural areas. This means that where new roads will disrupt an animal's ability

species, 150 bird species, five amphibian species, two reptile species and 30 fish species. Two species found in Edmonton are considered “At Risk”: the Peregrine Falcon and the Lake Sturgeon.

- Some of the main threats to biodiversity in Edmonton include habitat loss and fragmentation, pollution, erosion, sedimentation, invasive species and climate change.
- Some residents naturalize their yards to make them more wildlife-friendly, creating spaces for animals like rabbits, squirrels, birds and pollinating insects.
- The City of Edmonton Master Naturalist Program, which began in 2009, helps residents learn more about nature and encourages volunteer activities.
- The new ecological network model in new neighbourhoods results in linking open spaces, including natural areas, constructed wetlands, park sites, school sites and linear rights of way. This model moves us closer to connectivity.
- Within the city are contaminated sites that, once remediated, could be put back into productive use and reduce the pressure to expand outward. The City of Edmonton offers an incentive program to make reclaiming these lands - many in the downtown area and mature neighbourhoods - a good environmental, social and economic decision.

WHAT DOES THE FUTURE HOLD?

“If we lose 20% of species by 2050, as some have predicted, our world will change dramatically. This would mark our era as the 6th major extinction episode in the 3.5 billion year history of the Earth, and with those species we will also lose many of the ecological processes on which our own lives depend” (C. Cassady St. Clair, Discussion Paper 8, 2010).

With awareness and action, we have the ability to maintain and improve biodiversity. The Peregrine Falcon, which numbered four nesting pairs in Alberta in the early 1970s, now number over 65 nesting pairs today. Eight pairs are nesting within the City of Edmonton and as recently as August 2010, nesting boxes were secured to the High Level Bridge to improve egg and chick survival for a ninth pair. Many people around the world are working hard to improve the peregrine’s survival and their efforts have had a positive result.

TALK ABOUT TWO

1. What is important to you about biodiversity in Edmonton?
2. What changes, if any, are required to improve biodiversity and ecosystem health in Edmonton?

CONTINUE THE CONVERSATION

1. Is your yard wildlife-friendly?
2. What is your favourite natural area to visit in Edmonton? Describe the location and characteristics or take a photo and tell why it is your favourite. Find a new natural area to explore www.edmonton.ca/environmental/natural_areas/natural-area-parks.aspx

For more information:

City of Edmonton Biodiversity:
www.edmonton.ca/biodiversity

Master Naturalists Program:
www.edmonton.ca/MasterNaturalistProgram



HEALTHY ECOSYSTEMS – Water

WATER QUALITY

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

WHAT DOES IT MEAN?

ECOSYSTEM HEALTH: the well-being of living organisms (biotic) and the physical environment (abiotic), and their ability to interact with each other.

FLOW REGULATION: a way of using structures such as dams, weirs and canals to manage water flow in rivers, streams and other water bodies.

LOW IMPACT DEVELOPMENT (LID): an approach to managing stormwater runoff as close as possible to its source. Where feasible, natural landscape features are preserved and incorporated into a design that will protect water quality.

NON-POINT SOURCE EMISSIONS: emissions that cannot be traced back to a single origin or source. Storm water runoff or vehicle exhaust are examples, since the emissions combine to create area (or non-point source) emissions.

RIPARIAN: the bank of a wet area; could be a wetland, lake or river. It is the area between the water and dry land. Willows and other plants that require, or can survive in, a lot of moisture grow in this area.

WATER QUALITY: relates to the chemical, physical and biological characteristics of water. It is a measure of the condition of water relative to the requirements of one or more biotic species and/or to any human need or purpose.

THE CURRENT STATE

Ongoing improvements to wastewater management and flow regulation beginning in the 1960s have resulted in significant improvements to water quality. On the whole, the North Saskatchewan River has good water quality as a result of a steady natural supply of water and continued progress in reducing pollution.

Current amounts of nutrients in the water are below the maximum levels established in 2010 by the North Saskatchewan River Watershed Alliance (NSWA). The NSWA works to protect and improve water quality and ecosystems in the North Saskatchewan River watershed in Alberta. Several compounds that occur in trace amounts are becoming cause for concern. More research is required to determine the risks of these compounds, which include pharmaceuticals, endocrine disrupting compounds, pesticides and metals.

FACTS TO CONSIDER

- Pollutants from non-point sources such as overland runoff from lands disturbed upstream by agriculture or from poor forest harvesting, enter the water system primarily during spring runoff and heavy rains.
- Within the City stormwater can contain a range of pollutants, including salt,

animal feces, heavy metals, oils and pesticides.

- Individuals can help to reduce the presence of chemicals in the water by applying lawn products with care and/or using alternatives to chemicals. Compost is a natural choice for a lawn or garden to help fertilize and condition the soil to boost its water holding properties.
- Healthy riparian areas are important for trapping sediments and contaminants before they can reach water bodies like creeks, rivers, lakes and wetlands.
- Plants can hold soil in place so it does not erode – long roots are especially important.
- Low Impact Development (LID) is another approach to water management. Many systems use pipes and ditches to drain water in order to prevent flooding, however, LID is constructed with a contoured landscape so that stormwater drains into areas like ponds and constructed wetlands where the water will settle. LID utilizes an understanding of the natural water cycle and tries to mimic it in a small, localized area. Areas that don't naturally funnel water into appropriate locations are being rebuilt and will have suitable drainage constructed. Each LID project can look very different depending on the natural features of the site and end

purpose. For example, the soccer field at Lendrum is designed as a stormwater collection site during heavy rainfall, to prevent nearby basements from flooding. The LID at Terwillegar Recreation Centre is a bioswale replicating a small, marsh which reduces and slows runoff using vegetation and enhanced top soils. Yet another type of LID is the green roof found at the Valley Zoo – a garden on top of a roof that absorbs rainfall.

WHAT DOES THE FUTURE HOLD?

Continued effort is required if we are to maintain water quality in the face of increasing pollution caused by population growth, development and industry. To do this, Edmonton must consider upstream users and our impact on users downstream when managing water use and water quality.

The City of Edmonton's Stormwater Quality Strategy is looking at better ways to manage stormwater that will deal with water quality, as well as handle the increased amounts of water that are added to the system during small and large storms.

TALK ABOUT TWO

1. Do you have any concerns about the quality of Edmonton's water, either river water or tap water?
2. How could Edmontonians change their behaviour to prevent contaminated runoff from entering the river? The City of Edmonton has implemented programs to encourage residents to protect water quality both through the school programming and the *Store It, Don't Pour It* campaign. What else could we do?

CONTINUE THE CONVERSATION

1. What actions do you take to contribute to good river water quality?
2. Do you participate in shoreline clean-ups or other activities to improve river health?
3. Do you make use of the river valley (hiking, photography, etc.) or direct use of the river (boating, fishing, etc.)? Talk about it.

For more information:

North Saskatchewan River Watershed Alliance:
www.nswa.ab.ca

City of Edmonton
Drainage Education:
<http://www.edmonton.ca/drainage/education>

HEALTHY ECOSYSTEMS – Water

WATER SUPPLY

GOAL: Edmonton’s water supply meets its needs.

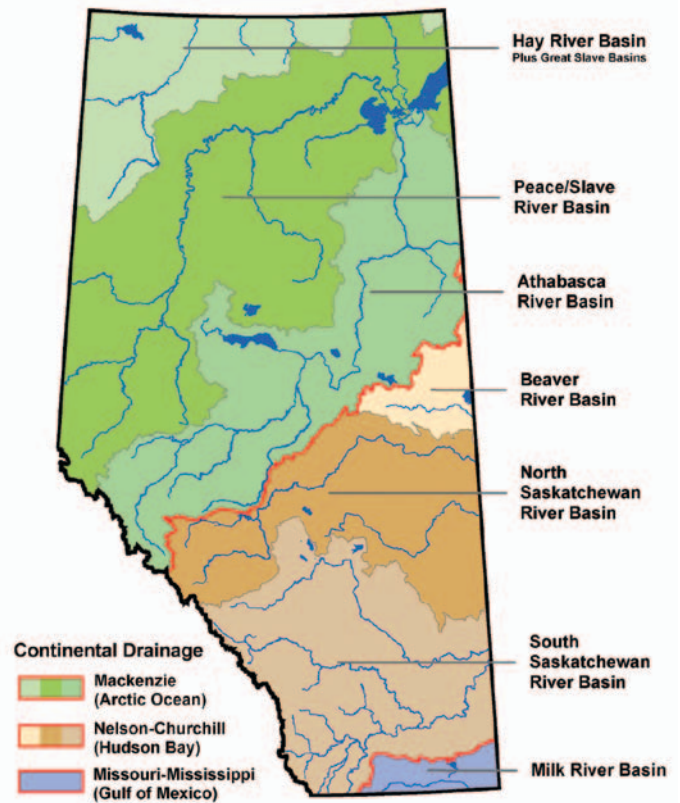
WHAT DOES IT MEAN?

HABITAT: the natural environment in which a particular species of organism lives, or the physical environment that surrounds, influences and is used by a species. Four needs must be met for an organism to survive: food, water, shelter and space. Habitat needs vary for each species, e.g. a northern pike’s habitat is different from that of a bull trout.

POTABLE WATER: water that is safe and suitable for humans to drink.

WATER SOURCE: the water available in the environment for a community or region. It may come from open bodies of water (rivers, reservoirs and lakes) or subterranean locations (groundwater and artesian waters, such as springs). The North Saskatchewan River (NSR) is the source of potable water in Edmonton and its surrounding areas. The NSR receives its water primarily from snowmelt and rain events upstream of Drayton Valley, and about five per cent from glacial melt.

WATERSHED: the area of land that drains into a body of water e.g., a wetland, stream, river or lake. Sometimes it is called a drainage basin. Edmonton lies within the North Saskatchewan River Watershed.



THE CURRENT STATE

There is evidence to show that the annual flow in the North Saskatchewan River (NSR) has decreased by about 13 per cent over the past 90 years. Even if this trend were to continue, the flow would be more than enough to supply Edmonton with potable water. The Edmonton Capital Region currently consumes just 0.5 per cent of today’s average flow. Edmonton customers use an average

of 350 million litres per day, which is enough to fill the downtown TELUS building. More than 90 per cent of that water is returned to the NSR after treatment at the Gold Bar and Capital Region Wastewater Treatment Plants.

Historically, Edmonton has used less water than the Canadian average due to Edmonton's well-established metering program, rate setting methods, precipitation patterns and relatively short summers. Water use tends to increase in summer for any variety of reasons, from filling pools to watering gardens and lawns. Domestic usage of water in Edmonton in 2011 was 202 litres per capita per day (l/c/d), which is a less than the average of fully metered Canadian cities. Even though the city's population has increased by 10 per cent since 2005, the average daily demand for water has not increased.

FACTS TO CONSIDER

- There is a minimum amount of water required in a water body to sustain aquatic organisms – this is known as the instream flow need. Lower flows in the North Saskatchewan River mean shallower water, which tends to warm faster than deep water. Warm water does not hold oxygen as readily as cold water, which can put aquatic organisms at risk. Fish and other aquatic organisms rely on dissolved oxygen in the water to meet their habitat needs.

- Historical evidence indicates that in the past, Edmonton has suffered droughts lasting up to 25 years. Over the past 500 years, extended drought periods have occurred at least once every 100 years.
- Regional cooperation amongst all jurisdictions in the North Saskatchewan River watershed is critical for maintaining sustainable water sources.
- *The Water Efficient Fixtures Bylaw*, implemented in 2008, requires water-efficient appliances and fixtures to be installed in new buildings and in retrofits of residential, commercial and institutional buildings.
- Support for technology and innovation has led to successful partnerships between Edmonton and industry. A local refinery reuses reclaimed water from Edmonton's Gold Bar Wastewater Treatment Plant for its industrial processes.

WHAT DOES THE FUTURE HOLD?

Models indicate that Edmonton could experience increased precipitation in the future and more intense storms. The greatest increases will be in the summer; however, hotter temperatures resulting from global climate change may cause increased rates of evaporation, leaving less moisture in the soil overall.

Future flow rates in the North Saskatchewan River are too difficult to accurately predict with the data currently available. Models indicate that increased volumes of precipitation that occur less frequently could lead to an increase in the range of flows in the North Saskatchewan River resulting in both drought and flooding with greater severity.

TALK ABOUT TWO

1. In view of the current situation and future predictions that water supply should not be of real concern, do you think that the City of Edmonton should place much effort in conserving water and reducing consumption? Why or why not?
2. Do you currently engage in any water conservation practices? If so, what are they and what motivated you to engage in them? If you don't believe that you are currently practising water conservation, what is stopping you?

CONTINUE THE CONVERSATION

1. What are some of the more visible signs of water conservation in your neighbourhood or community?
2. What are some of the more innovative water conservation measures you have read about or experienced from places other than Edmonton? Do you think that Edmonton should investigate these methods for application in our city?

HEALTHY ECOSYSTEMS – AIR

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

WHAT DOES IT MEAN?

AIR QUALITY HEALTH INDEX (AQHI): a measurement that is designed to help you understand what the air quality around you means to your health. It measures the air quality in relation to your health on a scale from 1 to 10. The higher the number, the greater the health risk associated with the air quality. When the amount of air pollution is very high, the number will be reported as 10+.

AIRSHED ZONE: a geographic area established by stakeholders, where air quality is monitored and managed at a local level by an independent, non-profit organization. Edmonton is a member of the Alberta Capital Airshed.

GROUND-LEVEL OZONE (O₂): a colourless gas that forms just above the Earth's surface. It is formed when two primary pollutants, nitrogen oxides (NO_x) and volatile organic compounds (VOCs) react in the presence of sunlight. O₂ is a major component of smog.

NON-POINT SOURCE EMISSIONS: emissions that cannot be traced back to a single origin or source. Storm water runoff or vehicle exhaust are examples, since the emissions combine to create area (or nonpoint source) emissions.

PARTICULATE MATTER (PM): tiny particles of solid or liquid matter suspended in the air or water.

POINT SOURCE EMISSIONS: emissions that can be traced back to the original source.

THE CURRENT STATE

Edmonton's air quality is monitored by instruments that take continuous real-time readings of the air and those that collect readings over a longer time frame. Together, the data from these instruments are analyzed by scientists and reported to monitoring agencies and the province. The near real-time analysis allows the province to monitor various organizations to ensure their operations are not adversely impacting the environment or the health of citizens. In addition, the monitors assess overall air quality which is affected by industrial or vehicle emissions and other sources such as forest fires.

Some of the data from these instruments are immediately analyzed and reported to the public as the Air Quality Health Index (AQHI). The AQHI is a tool designed to help you understand what the air quality around you means to your health. It provides information you can use to protect your health and a forecast of future air quality (two hours ahead) so you can plan your activities for the day.

In 2011, the AQHI reported that the health risk associated with Edmonton's air quality was low 78 per cent of the time, and ideal for outdoor activities. However, for 21 per cent of the time, the air quality posed a medium risk, meaning that at-risk individuals, like people with asthma, should limit strenuous activity outdoors. Only one per cent of the time did Edmonton's air quality pose a high health risk where it was recommended that most individuals consider rescheduling outdoor activities.

Particulate matter and ozone, both components of smog, are becoming an increasing concern in the Edmonton region. In 2008, an Ozone Management Plan was produced for the Edmonton region that called upon industry and government organizations to take voluntary action to reduce ozone levels. In addition, particulate matter levels have reached levels significant enough that the province will soon be developing a plan that will outline mandatory actions designed to reduce this contaminant below the levels determined by the government as being acceptable for an urban area.

FACTS TO CONSIDER

- An increasing proportion of the emissions that adversely impact air quality in the region do not come from industry stacks (point source emissions) but rather they originate from personal vehicle use and the heating of our buildings (non-point source emissions).
- A number of City of Edmonton policies focus on decreasing emissions from both City operations and the broader community. These include: Fuel Sense training for bus and fleet vehicle drivers, Be Idle Free education programs, the anti-idling bylaw at participating schools and hospitals (effective Jan 1, 2013) and a vehicle emissions monitoring program for the City of Edmonton's vehicle fleet.
- Expansion of the LRT and the overall public transit system will provide more Edmontonians with an alternative to driving their vehicles.

WHAT DOES THE FUTURE HOLD?

Diminishing air quality due to high emission levels, as well as from changing climate (which could potentially lead to increases in forest and grass fires due to extremes in dry conditions or drought), require advances in air monitoring

procedures and better, more deliberate action to reduce and remove both point source and non-point source emissions.

TALK ABOUT TWO

1. Are you concerned about air quality in Edmonton? Why or why not?
2. What do you feel would be the fastest way the City of Edmonton could make progress on improving air quality within the city?

CONTINUE THE CONVERSATION

1. What do you think of the anti-idling bylaw that took effect Jan 1, 2013? Remember, *A Minute or Less is Best!*
2. What are some noticeable sources of poor air quality in your neighbourhood? Could action be taken to eliminate these sources? If so, what action?
3. Have you ever traveled to a place where you were concerned about air quality? What do you think was the major contributor to poor air quality? Do you think that could ever happen in Edmonton? Why or why not?

For more information:

Edmonton Air Quality:

www.edmonton.ca/airquality

Alberta Capital Airshed:

www.capitalairshed.ca

ENERGY AND CLIMATE CHANGE

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

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

GOAL: Edmonton is a carbon-neutral city.

GOAL: Edmonton is resilient to disturbances from climate change.

WHAT DOES IT MEAN?

CARBON NEUTRAL: refers to the balanced state in which the net amount of carbon dioxide or other carbon compounds emitted into the atmosphere is balanced by actions to reduce or offset these emissions, thereby achieving net zero carbon emissions.

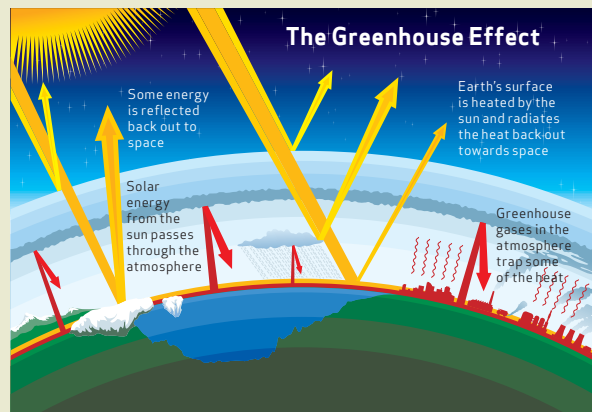
CLIMATE: average weather over a long period of time.

CLIMATE CHANGE: a long-term change in the statistical distribution of weather patterns over periods of time ranging from decades to millions of years. An example of this would be the change in frequency of the average weather, in a region or even planet wide, to more or fewer extreme weather events. Greenhouse gases created by humans are believed to be one of the most significant contributors to a changing climate. Changes in climate have the potential to adversely affect habitat such as creating higher average temperatures and lower precipitation that may make it difficult for plants and animals to survive.

ENERGY SOURCES: all the different energy types, including renewable, non-renewable and other alternatives, that are used to meet Edmonton's energy use demands. Currently, Edmontonians rely primarily on coal for the production of electricity, natural gas for heating and gasoline and diesel for transportation.

GREENHOUSE EFFECT: Greenhouse gases in the atmosphere absorb heat energy that is radiated back

from the surface of the Earth. This absorption of heat is similar to wrapping a blanket around the Earth, keeping it warm and habitable. Without the greenhouse effect, the average temperature of the Earth would be -18°C . Human activities are adding greenhouse gases to the atmosphere, throwing off the natural balance of gases, increasing the greenhouse gas effect and the Earth's temperature.



GREENHOUSE GAS (GHG): a gas in the atmosphere that absorbs infrared (heat) radiation. Carbon dioxide, methane and water vapour are examples of greenhouse gases. These gases are released into the atmosphere when wood, or fossil fuels like coal, oil and petroleum products like gasoline, are burned.

WEATHER: the current or short-term state of the atmosphere, normally factoring in temperature, precipitation and wind.

THE CURRENT STATE

“The use of cheap and abundant energy from fossil fuels has resulted in urban sprawl and low population densities. Energy use increases as services (e.g. power, sewage, water) are extended outward. Low-density development requires people to travel greater distances to school and work, and to find the services they require.”

(M.K. Jaccard & Associates, Discussion Paper 5b, 2010).

FACTS TO CONSIDER

- In Canada, buildings are responsible for 33 per cent of all energy used. According to the Rocky Mountain Institute, about 20 per cent of the energy used in the life of a building is energy consumed in the production, processing and transportation of the materials used to construct it.
- The majority of GHG emissions from City of Edmonton internal operations are from City buildings (48 per cent) (e.g. office buildings, recreation centres, fire stations, etc.) with the bulk of these energy needs being met by natural gas (50 per cent).
- Despite efforts to reduce GHG emissions in both City operations and the Edmonton community, GHG emissions are increasing as population and associated services grow.

WHAT DOES THE FUTURE HOLD?

The availability of fossil fuels is not an immediate problem. However, there are risks in continuing to rely solely on these energy sources. Edmonton relies primarily on the non-renewable resources of coal, natural gas and oil to meet its energy needs. At some point in the future, these resources will no longer be readily available. There are environmental and financial risks in waiting for our energy supplies to run out before we make any changes. If we make changes now, we will be better prepared to transition into a new energy future. (M.K. Jaccard & Associates, Discussion Paper 5b, 2010)

In order to reduce fossil fuel dependence in Edmonton’s cold climate, the need for space heating will have to be addressed. If temperatures increase as predicted, there will also be a need for increased space cooling. By improving the energy efficiency of our homes, schools, office towers and all buildings, as well as the appliances and lighting systems in use, we can significantly reduce our energy needs.

TALK ABOUT TWO

1. The rapid outward expansion of Edmonton is one of its environmental challenges. The energy required to deliver services to the city’s outlying areas increases GHG emissions, water quality issues, loss of biodiversity, loss of agricultural land, traffic congestion, increased costs for transit services and other issues (read more in D. Thompson’s

Discussion Paper 1). Discuss the pros and cons of redeveloping mature neighbourhoods versus building new neighbourhoods at the city’s edge.

2. Creating neighbourhoods that mix residences with small stores, services and restaurants can significantly reduce energy consumption. How do you feel about living in a compact city where yard sizes may be reduced and commercial outlets are clustered short distances from residences, perhaps within cycling or walking distance?

CONTINUE THE CONVERSATION

1. What are some of the actions you take to reduce energy consumption?
2. What types of alternative energy forms (e.g. geothermal, solar, wind) would you be most interested in learning more about, or seeing Edmonton make better use of, and why?
3. What is the energy performance of your school?
4. How do you influence energy use at home or school?

For more information:

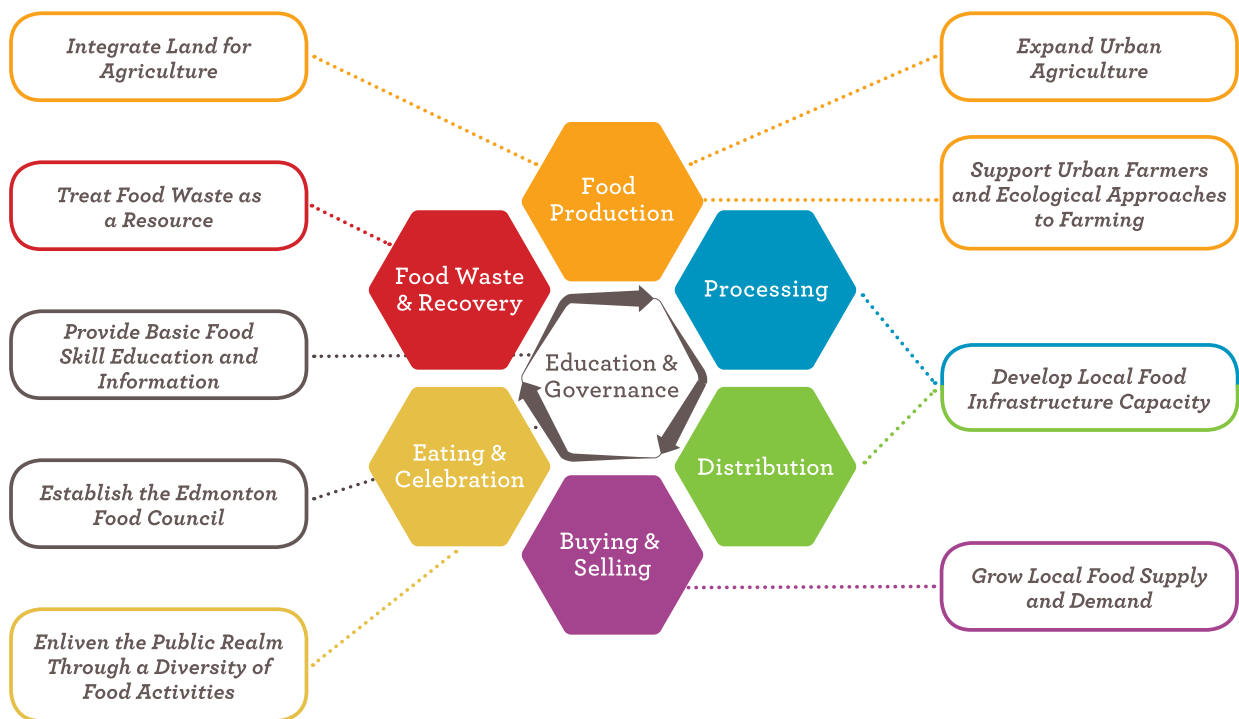
Energy Transition Discussion Papers: www.edmonton.ca/environmental/documents/Edmonton_Energy_Transition_Discussion_Paper.pdf

Green Building Strategy: www.edmonton.ca/GreenBuilding

Renewable Energy Task Force Report: www.edmonton.ca/environmental/documents/RenewableEnergyTaskForceReport.pdf

FOOD

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.



WHAT DOES IT MEAN?

COMMUNITY FOOD NETWORK: a means to connect food producers, food distributors and food consumers. A local food network can enhance the economic, environmental and social health of a particular place. It can include building locally-based, self-reliant food economies or may extend across municipalities in the region. For example, Farmers' Markets are a means to connect food producers with food consumers.

FOOD SYSTEM: the cycle of farming, processing, transporting, distributing, eating and recovering food waste in the context of feeding a population.

THE CURRENT STATE

The majority of food items consumed in Edmonton travel between 2,500 and 4,000 kilometres from field to dinner plate. This means that our current food system extends to the southern United States and around the world. Next time you shop for groceries or look

inside your kitchen cupboards, notice the country of origin on food items and consider how it made its way to Edmonton. In our global food system, affordable food is highly dependent upon cheap energy for transportation. Sometimes it makes more sense to grow food where the climate is favourable and to ship it to its destination, rather than grow it in energy intensive greenhouses in cooler climates, and distribute it using many smaller trucks to multiple destinations.

FACTS TO CONSIDER

- Fossil fuels are used to grow, process and transport all our foods. It takes more than 11 times as much fossil fuel to make one calorie of animal protein as it does to make one calorie of plant protein.
- 41 per cent of farmers are above the age of 55, 50 per cent between 35 and 54 and only nine per cent under the age of 35 (B. Lipton, Discussion Paper 7, 2010).
- Predictions indicate that the food currently on store shelves

would allow a city to feed itself for three days.

- Edmonton benefits from a unique growing micro-climate which is quite different from that of surrounding areas. Edmonton has plenty of water, 140-144 frost free days, higher-than-average sunlight hours per year and much of the soil is rated as Class 1, 2 or 3, which means there are few barriers to agricultural production. The North Saskatchewan River supplies Edmonton with any needed water and irrigation is not difficult.
- If current transportation and energy costs are accounted for, food consumption contributed 21.4 per cent to the average Edmontonian's ecological footprint in 2008 (M. Anielski, Discussion Paper 12, 2010).

WHAT DOES THE FUTURE HOLD?

There are some potential benefits of a warming climate, including a longer growing season. We may experience up to 20 per cent more days per year

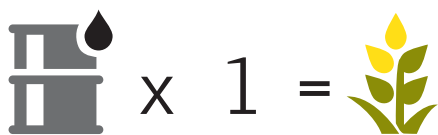
above 5°C by the 2020s, 50 per cent by the 2050s. Some negative aspects to climate change could include insect infestations as species expand their habitat north, or possibly an increase in water evaporation, leading to reduced soil moisture or drought-like conditions.

TALK ABOUT TWO

1. Is a local, sustainable food system important to you? Why or why not?
2. Discuss the most significant challenges you might face if you were to try to eat only foods that were grown within 100 km of Edmonton. Consider the origins of some of your favourite food items and how to store food that is available seasonally.

CONTINUE THE CONVERSATION

1. Does your family grow food on your balcony, in your yard or through a community garden? What made you decide to grow your own food? Or if you don't currently grow your own food, what is stopping you?
2. If the City were to improve food production by creating edible landscapes (for example, planting berry bushes and fruit trees on City property), do you think you might visit these areas to pick your own food? Do you think planting edibles is a good idea for the City to pursue?



SOLID WASTE

GOAL: Edmonton generates zero waste.

WHAT DOES IT MEAN?

BIOFUEL PROCESSES: using materials such as waste to produce a synthetic gas that can then be converted to methanol or ethanol to be used as fuel.

CLOSED-LOOP RECYCLING: recyclables are reprocessed into the same or similar products, which can then be recycled again at the end of their useful life. For example, paper that has been used will be recycled into new paper. This paper will then be sold, used and recycled again in the same process, closing the recycling loop.

DUMP: an area for waste disposal that consists of a pit where waste is buried. Dumps differ from landfills in that they do not possess a liner to isolate waste from the surrounding environment, and therefore are no longer an acceptable method of waste disposal. Old dumpsites in Edmonton are carefully monitored for leachate (liquid waste that might ooze from the site) and for the release of landfill gases (a mix of methane and carbon dioxide (CO₂) produced when organic waste decomposes).

LANDFILL: a pit that has been specifically engineered to receive waste. It is sited on clay soil and lined with a thick layer of clay or may use a heavy plastic barrier to prevent groundwater and the surrounding soil from being contaminated.

RECYCLING: the process of reprocessing waste into usable materials (e.g. plastic pop bottles becoming fibre fill, fleece clothing, rulers or other items).

THE CURRENT STATE

Edmonton has a strong waste management practice with a variety of programs that prevent solid waste from ending up in landfill.

The Edmonton Waste Management Centre (EWMC) is North America's largest collection of modern, sustainable waste processing and research facilities. Edmonton's waste management system has evolved from a single focus on burying waste in landfill just 20 years ago, to today's integrated system that recovers (or diverts) up to 60 per cent of residential waste from landfill. Successful methods to divert residential solid waste from landfill include composting, hazardous waste disposal, recycling and future biofuel processes.

Materials in landfills are often present for hundreds of years because conditions in landfills are generally unfavorable for decomposition to occur. Newspapers that are still readable have been found in landfills after they have been buried for 25 years.

The City of Edmonton's now-closed municipal landfill produces landfill gases as organic waste decomposes inside it. These gases are toxic, flammable and are also greenhouse gases. These gases are mined (drawn out of the landfill) and used to generate 4.8 megawatts of electricity, enough to power over 4,600 homes annually.

FACTS TO CONSIDER

- Rundle Park and Mill Woods golf courses are reclaimed landfills that were actively used to bury waste in the 1950s, 60s and 70s. The City still monitors groundwater and landfill gas emissions at both sites. Edmonton was one of the first municipalities in Canada to start environmental monitoring of landfills.
- The City of Edmonton now provides, upon request, solid waste pick up for the nonresidential sector (industrial, commercial or institutional) that generates an estimated 60 per cent of Edmonton's solid waste. Construction and demolition waste makes up close to one quarter of waste sent to landfills in Alberta. Currently, most of this waste is hauled to privately-owned landfills.
- Reduce and reuse come before recycle because recycling uses energy and water to reprocess materials into new items. A good habit is to reduce. Ask yourself, *do*

I really need this? If you do need it, can the item be reused over and over again, either for the same use or repurposed for something different? Is the item recyclable? After it has been used over and over, it is important to sort it and return it for recycling so that it can be reprocessed into something new.

- There are many services and public programs to help citizens reduce their solid waste generation and disposal. This includes: co-mingled blue bag and blue bin recycling; Reuse Centre for unwanted items that are still useable; Eco Stations for bulky items, electronics and household hazardous waste; residential composting programs; and education programs like the Master Composter/Recycler Program. Since 2009, Edmonton has enjoyed an 89 per cent participation rate of household blue bag and blue bin recycling.
- Recycling is a process that is dependent on 3 parts of a system:
 - a) Ensure materials are taken to where they will be sorted for recycling
 - b) A manufacturer reprocesses materials into new products
 - c) People purchase products made from recycled materials
- Residents are expected to separate their recyclables from the rest of their garbage. The remaining garbage

is sent to a sorting facility where the biodegradable portion is composted and non-biodegradable waste is screened out.

WHAT DOES THE FUTURE HOLD?

Edmonton's residential solid waste that is not recycled or composted is landfilled. In the future, landfill waste that is free of metal, glass and ceramic is well suited to be turned into a synthetic gas that can be converted to energy products like methanol and ethanol. By 2015, the Waste-to-Biofuels facility will enable Edmonton to divert 90 per cent of residential waste from landfill.

TALK ABOUT TWO

1. What can citizens do to *reduce* the amount of waste they generate in the first place, before they even think about recycling it?
2. What would be the most effective way to reduce our dependency on (or use of) landfills?

CONTINUE THE CONVERSATION

1. Which of the 3Rs - reduce, reuse or recycle - do you practise the most?
2. What are some of the most amazing recycled products that you use regularly or know of?

A FOUNDATION FOR SUCCESS

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

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

WHAT DOES IT MEAN?

CARBON FOOTPRINT: the amount of carbon dioxide or other carbon compounds emitted into the atmosphere each year by an individual, company or country.

ECOLOGICAL FOOTPRINT (EF): a measure of human demand on the Earth's ecosystems. It measures the amount of water and land resources that we consume and compares it to the ability of the Earth to regenerate itself and deal with waste and by-products resulting from this consumption. From this measurement (usually in hectares), we can estimate how much of the Earth, or the number of planet Earths, it would take to support the population if everyone lived a specific lifestyle.

would need 3.2 planets" (M. Anielski, Discussion Paper 12, 2010).

- Between 1981 and 2008, Edmonton's EF grew by 43.6 per cent or 1.97 per cent per year, driven primarily by an increase in personal consumption. On a global scale, our EF is larger than the average and is not sustainable.
- Food consumption is a major factor driving Edmonton's EF, contributing 21.4 per cent to the average Edmontonian EF in 2008. The majority of our food is imported from somewhere outside of the Edmonton geographic area and therefore has a high embedded carbon footprint.

FACTS TO CONSIDER

- Richard Heinberg, (Discussion Paper 1, 2010) writes that the essential meaning of the word sustainable is, "able to be maintained over time." We have a shared interest in making our society and our city sustainable, and in avoiding failure or collapse.
- The Natural Step framework advises that we imagine a sustainable future and take

specific actions to reach that vision. These actions must be deliberate and truly sustainable, not simply "less bad".

- In 2008, the Edmonton household's average ecological footprint (EF) was 8.56 global hectares per person (gha/capita). This requires an area which is 92 times larger than the geographic area of the city. **"If everyone on Earth lived like Edmontonians we**

WHAT DOES THE FUTURE HOLD?

While urban communities will continue to depend on imported goods, sustainability requires that we rethink our long range

plans (M. Anielski, Discussion Paper 12, 2010). The recently approved plans *The Way We Grow* and *The Way We Move* both contain elements of this rethinking.

How will Edmonton fare in the future? Will we embrace redevelopment of lands closer to the city centre, or will we prefer to expand outward, creating pressures on infrastructure to service the suburbs? Will we begin to use forms of renewable energy on a community-wide basis, or will we ignore these energy sources until oil reserves drop and oil prices soar? Will we continue to invest in our world-class waste management system which includes composting, recycling, reprocessing and research? Will we learn to buy less and demand less packaging to lessen the amount of waste entering the system? Will we consume goods and throw them away at a rate that cannot be handled by the waste management system? How resilient is our city? Are we prepared to absorb shocks and disturbances, or will these disruptions create havoc for us?

STEPS TO SUCCEED

- **Lead by Example** – Everyone from citizens to City departments need to adopt the standards of sustainable living and encourage them throughout the community.



- **Collaborate** – All facets of Edmonton society need to work together to share resources, ideas and accountability for the benefit of the whole.
- **Innovate** – We need a city of innovative leaders and motivated citizens who are continually studying, testing and applying new approaches to make Edmonton more sustainable and resilient.
- **Inspire Leadership** – Encourage community and individual leaders.
- **Clearly Define Progress** – A set of tools to measure improvements in the health and well-being of citizens, the environment and the economy will need to be developed and used to evaluate our progress.

If the City of Edmonton and its citizens follow these Steps

to Succeed, we will be well on the way to meeting future challenges, and setting an example for other communities.

TALK ABOUT TWO

1. Which of the outlined Steps to Succeed do you think is the most important?
2. What do we, as citizens and as City Administration, need to do to make Edmonton a sustainable city?

CONTINUE THE CONVERSATION

1. What is your Environmental Footprint? Visit this website to find out.

www.onesimpleact.alberta.ca/get-involved/ecoaction.asp

NOTES:

Edmonton: Then and Now

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The Planning Process

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Healthy Ecosystems: Land

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Healthy Ecosystems: Water Quality

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Healthy Ecosystems: Water Supply

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Food

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A Foundation for Success

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General Notes:

ENVIRONMENTAL QUIZ

Use these quiz questions to kick off or wrap up your Classroom Conversation.
(See page 35 for answers.)

1. On average, how far do food items travel to get to our plate in Edmonton?
 - a) Less than 1,000 km
 - b) 1,000 - 2,500 km
 - c) 2,500 - 4,000 km
 - d) more than 4,000 km
2. Edmontonians have an ecological footprint of 8.56 ha/person. If everyone on Earth lived like us, we'd need more than _____ planets.
 - a) 1
 - b) 2
 - c) 3
 - d) 4
3. How can Edmontonians reduce their ecological footprint?
 - a) Reduce use of energy
 - b) Substitute carbon-intensive coal-fired electricity with renewable energy
 - c) Reduce consumption
 - d) All of the above
4. In 2009, air quality in Edmonton was "good" _____% of the time.
 - a) 50%
 - b) 70%
 - c) 90%
 - d) More than 95%
5. Climate change scientists predict that Edmonton's average temperature will increase by _____ degrees Celsius by 2050 (Barrow and Yu, 2005):
 - a) 0°
 - b) 1°- 4°
 - c) 4°- 7°
 - d) 7°- 11°
6. The best place to learn about Edmonton's environmental performance and challenges is:
 - a) edmonton.ca/thewaywegreen
 - b) edmonton.ca/thewaywegreen
 - c) edmonton.ca/thewaywegreen
 - d) edmonton.ca/thewaywegreen

GLOSSARY

Air Quality Health Index (AQHI): a measurement that is designed to help you understand what the air quality around you means to your health. It measures the air quality in relation to your health on a scale from 1 to 10. The higher the number, the greater the health risk associated with the air quality. When the amount of air pollution is very high, the number will be reported as 10+.

Airshed: a geographical area that shares a common flow of air, with all parts of its associated atmosphere being subject to similar conditions such as air pollution, that can be managed at a local level.

Benchmark: a standard of excellence, achievement, etc., against which similar things might be measured or judged.

Biodiversity: the variety of life on Earth. It includes terrestrial (land) and aquatic (water) plant and animal species, from the simplest and tiniest to the complex and large.

Biofuel processes: using materials such as waste to produce a synthetic gas that can then be converted to methanol or ethanol to be used as fuel.

Carbon footprint: the amount of carbon dioxide or other carbon compounds emitted into the atmosphere each year by an individual, company or country.

Carbon neutral: refers to the balanced state in which the net amount of carbon dioxide or other carbon compounds emitted into the atmosphere is balanced by actions to reduce or offset these emissions, thereby achieving net zero carbon emissions.

Climate: average weather over a long period of time.

Climate change: a long-term change in the statistical distribution of weather patterns over periods of time ranging from decades to millions of years. An example of this would be the change in frequency of the average weather, in a region or even planet wide, to more or fewer extreme weather events. Greenhouse gases created by humans are believed to be one of the most significant contributors to a changing climate. Changes in climate have the potential to adversely affect habitat such as creating higher average temperatures and lower precipitation that may make it difficult for plants and animals to survive.

Closed-loop recycling: recyclables are reprocessed into the same or similar products, which can then be recycled again at the end of their useful life. For example, paper that has been used will be recycled into new paper. This paper will then be sold, used and recycled again in the same process, closing the recycling loop.

Community food network: a means to connect food producers, food distributors and food consumers. A local food network can enhance the economic, environmental and social health of a particular place. It can include building locally based, self-reliant food economies or may extend across municipalities in the region. For example, Farmers' Markets are a means to connect food producers with food consumers.

Connectivity: the degree to which a landscape enables movement from one space to the next. Connectivity may be provided by corridors of natural areas that allow animals to move from one place to another, like the river valley, or by land uses that are compatible with one another.

Dump: an area for waste disposal that consists of a pit where waste is buried. Dumps differ from landfills in that they do not possess a liner to isolate waste from the surrounding environment, and therefore are no longer an acceptable method of waste disposal. Old dumpsites in Edmonton are carefully monitored for leachate (liquid waste that might ooze from the site) and for the release of landfill gases (a mix of methane and carbon dioxide (CO₂) produced when organic waste decomposes).

Ecological Footprint (EF): a measure of human demand on the Earth's ecosystems.

It measures the amount of water and land resources that we consume and compares it to the ability of the Earth to regenerate itself and deal with waste and by-products resulting from this consumption. From this measurement (usually in hectares), we can estimate how much of the Earth, or the number of planet Earths, it would take to support the population if everyone lived a specific lifestyle.

Ecosystem: an association of living things and their interactions with each other and the environment. Ecosystems include living organisms (biotic) and the physical environment (abiotic).

Ecosystem health: the well-being of living organisms (biotic) and the physical environment (abiotic), and their ability to interact with each other.

Energy sources: all the different energy types, including renewable, non-renewable and other alternatives, that are used to meet Edmonton's energy use demands. Currently, Edmontonians rely primarily on coal for the production of electricity, natural gas for heating, and gasoline and diesel for transportation.

Flow regulation: a way of using structures such as dams, weirs and canals to manage water flow in rivers, streams and other water bodies.

Food system: the cycle of farming, processing, transporting, distributing, eating and recovering food

waste in the context of feeding a population.

Greenhouse effect: Greenhouse gases in the atmosphere absorb heat energy that is radiated back from the surface of the Earth. This absorption of heat is similar to wrapping a blanket around the Earth, keeping it warm and habitable. Without the greenhouse effect, the average temperature of the Earth would be -18°C . Human activities are adding greenhouse gases to the atmosphere throwing out the natural balance of gases, enhancing the greenhouse gas effect, and the Earth's temperature.

Greenhouse gas (GHG): a gas in the atmosphere that absorbs infrared (heat) radiation. Carbon dioxide, methane and water vapour are examples of greenhouse gases. These gases are released into the atmosphere when wood, or fossil fuels like coal, oil and petroleum products like gasoline, are burned.

Ground-level ozone (O_2): a colourless gas that forms just above the Earth's surface. It is formed when two primary pollutants, nitrogen oxides (NO_x) and volatile organic compounds (VOCs) react in the presence of sunlight. O_2 is a major component of smog.

Habitat: the natural environment in which a particular species of organism lives, or the physical environment that surrounds, influences and is used by a species. Four needs must be met for an organism to survive: food, water, shelter and space.

Habitat needs vary for each species, e.g. a northern pike's habitat is different from that of a bull trout.

Infrastructure: the fundamental facilities and systems serving a country, city or area, such as transportation and communication systems, power plants and schools.

Landfill: a pit that has been specifically engineered to receive waste. It is sited on clay soil and lined with a thick layer of clay or may use a heavy plastic barrier to prevent groundwater and the surrounding soil from being contaminated.

Low Impact Development (LID): an approach to managing stormwater runoff as close as possible to its source. Where feasible, natural landscape features are preserved and incorporated into a design that will protect water quality.

Non-point source emissions: emissions that cannot be traced back to a single origin or source. Storm water runoff or vehicle exhaust are examples, since the emissions combine to create area (or non-point source) emissions.

Particulate Matter (PM): tiny particles of solid or liquid matter suspended in the air or water.

Pesticide: a substance that prevents, repels, alters or kills unwanted pests. Insecticides used against insects, herbicides to control weeds, rodenticides for rodent control and fungicides for fungi are a few examples of pesticides.

Point source emissions:

emissions that can be traced back to the original source. For example, a specific chemical release can usually be traced back to the exact cause of that particular pollutant.

Pollution: the creation, emission or discharge of any type of material or waste that adversely impacts the environment. Its source may be human-made, other living things or even from natural events.

Potable water: water that is safe and suitable for drinking (or consumption).

Recycling: the process of reprocessing wastes into usable materials (e.g. plastic pop bottles becoming fibre fill, fleece clothing, rulers or other items).

Resilience: the ability of a system to maintain itself when pushed and pulled by disturbance and change. For example, how quickly can Edmonton recover from high winds or heavy rains? Or in the context of food, if disruption of shipping by road, rail or ship were to prevent the delivery of food from other provinces or countries to Edmonton, how would Edmonton survive this disruption?

Riparian: the bank of a wet area; could be a wetland, lake or river. It is the area between the water and dry land. Willows and other plants that require, or can survive in, a lot of moisture grow in this area.

Stakeholder: a person or group that has an investment, share or interest in something such as a community, business or industry.

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

Sustainable living: a conscious way of life whereby humans use physical, natural and social resources in such a manner that these resources are always available or replaceable. This allows the living systems in which humans live to thrive long into the future.

Tablelands: the upland areas outside of the North Saskatchewan River Valley and ravines.

Water quality: relates to the chemical, physical and biological characteristics of water. It is a measure of the

condition of water relative to the requirements of one or more biotic species and/or to any human need or purpose.

Water source: the water available in the environment for a community or region. It may come from open bodies of water (rivers, reservoirs and lakes) or subterranean locations (groundwater and artesian waters, such as springs). The North Saskatchewan River (NSR) is the source of potable water in Edmonton and its surrounding areas. The NSR receives its water primarily from snowmelt and rain events upstream of Drayton Valley, and about five per cent from glacial melt.

Watershed: the area of land that drains into a body of water such as a wetland, stream, river or lake. Sometimes it is called a drainage basin. Edmonton lies within the North Saskatchewan River Watershed.

Weather: the current or short-term state of the atmosphere, normally factoring in temperature, precipitation and wind.

ENVIRONMENTAL QUIZ ANSWERS *(from page 32)*

1. On average, how far do food items travel to get to our plate in Edmonton?
c) 2,500 - 4,000 km
2. Edmontonians have an ecological footprint of 8.56 ha/person. If everyone on Earth lived like us, we'd need more than ___ planets.
c) 3
3. How can Edmontonians reduce their ecological footprint?
d) All of the above
4. In 2009, air quality in Edmonton was "good" ___% of the time.
d) more than 95%
5. Climate change scientists predict that Edmonton's average temperature will increase by ___ degrees Celsius by 2050 (Barrow and Yu, 2005):
c) 4°- 7°
6. The best place to learn about Edmonton's environmental performance and challenges is:
a,b,c,d) edmonton.ca/thewaywegreen

Your feedback is important! Please take the time to help us improve the *Classroom Conversations: Teacher's Guide* by completing this evaluation:

<http://s.zoomerang.com/s/TWWGTeachersGuideFeedback>

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