Winter Cities

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ICE & WINTER

From the Editor's Desk

This is the fourth edition of Winter Cities magazine that I have edited, and each issue brings with it some unique challenges. My original intention was to publish a set of papers from the 2001 Winter Cities International Conference held in Quebec City last February, but for various reasons it was only possible to include two papers that were presented. Jennifer Milton, a meteorologist with Environment Canada, provides some interesting insights into the apparent increase in extreme weather events in the province of Quebec. Many northern residents appreciate the brief respite that a sudden thaw brings in mid winter, but such events can create problems for our urban infrastructure. This is the topic of the first of a two-part article by Heather Auld, who also works for Environment Canada. Heather argues that with the increase in extreme weather events, we need to improve our building codes.

Pat Coleman, a former President of the Winter Cities Association, provides a planner's perspective on the need for cities to consider the needs of pedestrians. My article examines the efforts at downtown revitalization in three Canadian prairie winter cities and concludes that a booming metropolitan economy that increases the demand for downtown housing is a key factor in any revitalization effort. Greg Poelzer, a political scientist at the University of Northern British Columbia in Prince George, reports from a recent visit to Finland and the their new University of the Arctic.

One of the challenges of editing a magazine is finding appropriate articles to publish. If you have any ideas for articles that would be of interest to our readership, please contact me. Alternatively, if you would like to write an article for the magazine please let me know your topic in advance. In either instance I can be reached by e-mail at mbroadwa@nmu.edu.

Michael J. Broadway

Correction: In the last issue of the magazine, Jack Royle's name was spelled incorrectly. We regret the error. Our apologies go out to Jack. — MB

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Winter Cities Association is dedicated to realizing the unique potentials of all northern communities. Through publishing, networking, organizing conferences, facilitating research and other means, the Association seeks to make available solutions and to promote awareness of opportunities associated with the winter season.

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PRESIDENT'S NOTEBOOK

By ANNE MARTIN

Another Winter Cities Forum has come and gone! Quebec City hosted the 2001 Forum around the theme of Global Climate Change and its impact on northern communities. The speakers gave us many practical suggestions on adapting urban systems to the impacts of a changing climate, together with ideas for changing the human activities that are inducing global warming. The technical tours, trade show and social events were all greatly appreciated, and our congratulations go to everyone involved in putting on this successful event.

Several members of the Association's Board were in Quebec and met informally to discuss Patrick Coleman's decision to step down as President. His resignation was reluctantly accepted and I agreed to take his place. During his term of office, Patrick developed a strategic plan that helped the Board focus on the work to be done. He also explored ways of collaborating with the International Association of Mayors of Northern Cities. We have just received confirmation from the IAMNC President, Mayor Katsura Nobuo of Sapporo, that our Association will co-host the IAMNC Conference in Anchorage, Alaska, in 2004. Thank you, Patrick, for all you have done over the years to further the work of the Association, and for your continued involvement.

As I was born and brought up in southern England, you might wonder what I am doing in the Winter Cities movement. Before coming to Canada in 1958, my only winter experience was a skiing holiday in Austria. Then I worked in northern Ontario and Montreal, and became enthralled by the winter landscape and the visual beauty of ice and snow that enhances both the natural and the built environment. A few years followed in Victoria, British Columbia, where I was married and where my two sons were born, but where the absence of four distinct seasons was always in the background. When we moved to Prince George in 1965, it was like coming home, and now we have retired here.

I first heard about the Winter Cities movement in 1990 when I became a City Councillor and my first Forum was in Sault Ste. Marie the next year. As a result I got to know Harold Hanen, Norman Pressman and others with professional and personal interests in the Association. Since then, I have enjoyed making new friends at other conferences and meetings around North America and in China and Sweden. I was on the Board of Governors of the University of Northern British Columbia for several years, and became interested in their northern studies programs and their relationships with other universities throughout the circumpolar north. The City of Prince George has its own Winter Cities committee, and it has undertaken several initiatives, producing Climate Sensitive Design Principles, a set of guidelines for developers and others, and a Web site, which was launched at the Quebec City Forum. It can be found through the City's Web address at www.city.pg.bc.ca.

In the months ahead, your Board will be considering ways of improving communications, marketing our Association and identifying new sources of revenue. The Web site needs to be updated and developed, a host city for the biennial Forum in 2003 needs to be confirmed and new ways of generating public interest and awareness must be explored. One suggestion is to put on small conferences throughout the year in different locations to promote the goals of the Association. If you are interested in helping to develop and/or host such an event in your community, we would like to hear from you.

We are very pleased to be in touch with Jack Royle, the founding President. He is sending us archival material from his records, and the Secretariat is planning to catalogue this. It is important to preserve the history of this unique Association.

I look forward to my term as President and I invite you to contact me with your ideas, suggestions and offers of help. I can be reached through the Secretariat's office or by e-mail: nechakoriver@home.com. I hope to hear from you.

ICICLES

What's Up in the Winter Cities

Geothermal Heating System

Alternatives to the use of fossil fuels were considered at the Quebec Winter Cities 2001 Conference. Geothermal heating and air conditioning was described as a good technology for northern climates because heat below the ground is stable at about 8° C, even when the air temperature is very low. A presenter from the Energy Diversification Laboratory, Ministry of Natural Resources, Canada, explained that geothermal systems harness the relatively constant renewable energy source and use it for heating, air conditioning and hot water.

Geothermal systems circulate a water-based solution through a loop of small-diameter underground pipes. This solution absorbs heat from the earth and carries it to a ground source heat pump. Through a process of vapour compression, the extracted heat is converted to a higher comfortable indoor temperature for home heating. In the summer, the process is reversed and cool dehumidified air is delivered to the home. In the winter, the ground is used as a heat source. In the summer, the ground becomes a heat sink.

The Biosphere in Montreal uses this technology. A new planned community in Kamloops, British Columbia, Sun Rivers Resort Community, is using a geothermal system to heat and cool 2,000 homes planned for the 460-acre site on the South Thompson River. Compared to the costs of high-efficiency natural gas units, total savings on combined heating and air conditioning costs will be more than 40 percent.

More information can be found at the following Web sites: www.earthenergy.ca (Earth Energy Society of Canada); http://retscreen.gc.ca (Renewable Energy Project Analysis Software); www.iea.org (International Energy Agency); and www.ashrae.org (case studies).

Livable Winter Cities Association Annual General Meeting

Anne Martin, President of the Livable Winter Cities Association, has announced that the Association's annual general meeting will be held on Saturday, September 15, 2001, at 1:00 pm Pacific Standard Time in Prince George, British Columbia.

For those persons unable to make the journey to Prince George, you can call using the number listed below. If you need to know the location for the meeting you can e-mail Anne at nechakoriver@home.com.

Dial-In Number

604-899-1159

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94158#

Extreme Winter Climatic Events in Quebec

By JENNIFER MILTON

In the last 10 years, global climate change has attracted a lot of attention due to the media's reporting of extreme weather events around the world. The public has become familiar with such terms as greenhouse gas emissions and El Niño, as well as the potential for destructive and sometimes beneficial effects of extreme weather events. Today's weather forecast is no longer sufficient for our planning needs; we are now interested in knowing what the weather will be 20, 50 or 100 years from now. The IPCC, or Intergovernmental Panel on Climate Change, an organization that was set up by the World Meteorological Organization and the United Nations, along with many national institutions, is attempting to determine the possible changes in our climactic systems. At issue is the degree to which our existing buildings and infrastructure will be able to withstand the natural variability of climate and extreme weather events.

Quebec's citizens, like many others around the globe, have first-hand experience of extreme weather events such as the Saguenay floods of July 1996 and the January 1998 Ice Storm. This article examines the impact of recent extreme weather events in southwestern Quebec.

The January 1998 Ice Storm

Weather and Climate

Weather refers to the daily or hourly expression of the interaction of atmospheric conditions with a local environment, while climate is the average long-term weather conditions specific to an area and also includes the possible variability in weather conditions. Quebec's climate, as in other nordic areas, encompasses a great range of events as seasons are very distinct from one another. Extreme winter weather conditions in the province are classified as follows:

1. Severe winds
2. Snow storms and snow squalls
3. Heavy downpours
4. Ice storms
5. Extreme temperatures and their fluctuations
6. Blizzard or blowing snow conditions

Today's weather forecast is no longer sufficient in our planning needs; we are now interested in what the weather will be 20, 50 or 100 years from now.

The impact of these weather events will be determined by their duration and intensity as well as the capacity of existing infrastructures to deal with the event.

The January 1998 Ice Storm

The January 1998 Ice Storm is one of the worst weather disasters to have hit a major part of Canada's population. This storm resulted in 28 persons losing their lives and nearly 5 million people in Canada and the United States losing their electric power for many days. South of Montreal, residents had to deal with no electrical power for more than a month in the "heat" of winter. The storm also resulted in agricultural losses and disrupted schools and local

Table 1: Significant Ice Storms of Southwestern Quebec

Date	Probable Amount of Freezing Rain (mm)	Wind Gust (km/hr)	Major Consequences
December 1942	20-50	65	power shortages, but limited as coal used for heating
February 1961	30-40	130	power shortages, damage to trees cost at least $7 million (1961)
March 1972	15-40	50	20,000 without power cost $3 million (1972)
December 1983	30-50	45	500,000 without power cost at least $7 million (1983)
January 1997	20-40	55	power shortages, damage to trees cost at least $1,2 million
January 1998	maximum up to 110	approx 55	28 deaths hydro-electric loss, infrastructures, etc. cost at least $3 billion

businesses. The Nicolet Commission estimated the storm's losses to Quebec at nearly 3 billion dollars (Canadian).

The south shore of Montreal, encompassing suburbs and farming communities, was the worse hit with over 80-100 mm of freezing precipitation falling during the 5-day period. Although few specific freezing rain measurements had been obtained during previous ice storms, climatological analysis of other freezing rain events shows that the January 1998 Ice Storm is by far the worst ice storm to effect southwestern Quebec in the last 45-50 years, not only with respect to the amount and duration of the freezing rain but also in the area coverage of the storm (Table 1).

January 1996: Heavy Rains and Mild Weather

On January 19, 1996, after more than 48 hours with above freezing temperatures and total rainfall amounts of 30 to 55 mm (versus the normal monthly rainfall of 20.8 mm), a vigorous cold front swept across southwestern Quebec (Figure 1). At the Montreal-Dorval weather observing station, temperatures plummeted rapidly from a mid-day high of 13°C to -7.5° during that evening. The rapid thaw coupled with heavy rains led to increases in snowmelt and water load. This resulted in major flooding of the Chateauguay river, south of Montreal, and damage to the local infrastructure.

Temperature Extremes

Winter's great range of temper-

Figure 1: Hourly Temperature Trend Measured at Montreal-Dorval Airport from January 16-20, 1996

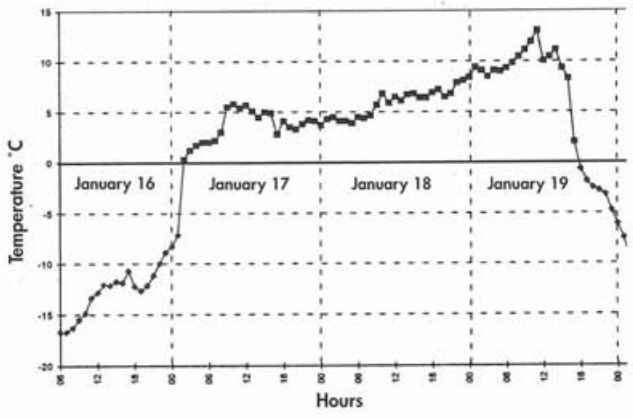
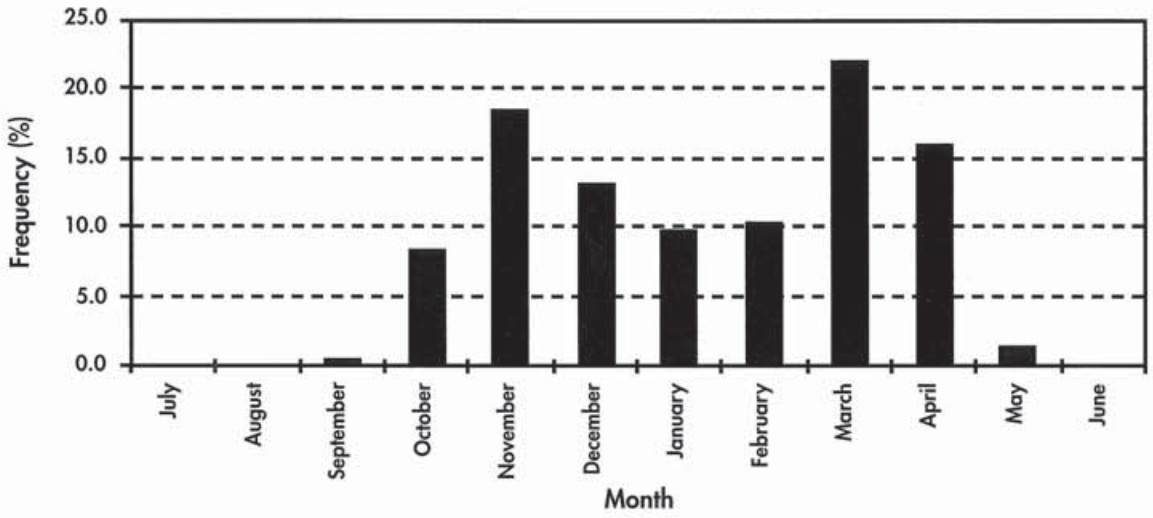


Figure 2: Annual Distribution of Freeze-Thaw Days (0° baseline)
Montreal-Dorval A - 1942-1999



atures has both immediate and long-term consequences. Cold temperature extremes occur periodically every winter, and although nordic populations have adapted to such cold outbreaks, fatalities still happen as a result of cold temperatures. Statistics Canada reports that countrywide 82 yearly deaths can be attributed to intense cold periods, which quite often occur with moderate to strong winds. Of these fatalities, 78 percent are due to hypothermia. Mishaps related to intense cold also include frostbite, cardiac arrest and general discomfort. Populations most at risk are children, the elderly, outdoor workers and the homeless. The costs to businesses due to lost time and broken equipment are also considerable.

At the other extreme, warm winter temperatures can result in flooding and an initial start (and usually later aborted) to the growing season. The effects of these thawing events depends upon location, timing, the simultaneous occurrence of significant rainfall, the persistence of ice cover in lakes and rivers, and the extent of snow or ice still on the ground; all these factors have the potential to contribute to an increase in runoff or ice jams for a specific location.

The 1980- 81 Winter Season

Southwest Quebec experienced some of the strongest temperature extremes during the 1980-81 winter season. It was defined by very cold temperatures in December and January followed by a considerable warming trend in February. In fact, maximum temperatures of December 1980 and January 1981 are among the coldest observed in Montreal and Quebec City. Snowfall was minimal and about 175 percent less than normal for the combined three months.

The average monthly maximum temperature for February 1981 in the Montreal area was the warmest on record and measured 2.7°C. This is about seven degrees above the normal temperature for the month. Long-term records indicate that Montreal can usually count on 27 days with maxima above 0°, eleven of these days normally occur in December, eight in January, and eight in February. In the 1980-81 winter season, the number of days with maximum temperatures above 0° surprisingly equals the normal values for December to February as February's daily temperatures compensated for the rest of the season. The sudden warm-up in temperatures combined with rainfall to increase melting and water runoff. Major flooding occurred, and rivers in the Ottawa and lower Laurentian regions overflowed due to ice jams and break up.

Forests and apple orchards also suffered from the adverse climate conditions of the 1980-81 winter season. More than 15 percent of apple orchards (or 240,000 trees) in southwestern Quebec died following this long-lasting winter thaw event that was preceded by the exceptionally cold temperatures of December 1980 and January

1981. Later estimates from the Federation of Apple Producers of Quebec indicated that more than 30 percent of apple orchards died in the four years following this long lasting mid-winter thaw event.

Scenes from the the January 1998 Ice Storm in Montreal.

Winter's Freeze-thaw Events

Appreciated by many, warm winter days can disrupt nature and damage infrastructure through the mechanism of the daily freeze-thaw event. A freeze-thaw period is when the temperature oscillates at least once across the freezing point during a 24-hour period. A freeze-thaw day thus occurs when the daily maximum temperature is greater than zero degrees while the daily low is zero or below.

The annual frequency of these freeze-thaw days for southwestern Quebec is shown in figure 2 and may vary slightly according to the geographical characteristics of a site. For the Montreal-Dorval site, the month of March shows the greatest number of days with more than 20 percent of days with freeze-thaw events. To prevent highway damage, Quebec's Ministry of Transportation limits trucking weights during this period for most of its road system.

Preliminary work studying long-term variations of freeze-thaw events for the Montreal area shows an upward trend in the number of these freeze-thaw days since 1942. Reasons for this are unclear and further study must be done to ascertain if this tendency is due to urbanization or other factors.

Future Challenges

This article has provided an overview of Quebec's climate variability and its impact upon physical, social and biological infrastructures. In view of the inherent variability of climate and the possible drastic changes associated with greenhouse gas emissions, the main challenge for winter city decision makers is to identify the deficiencies and vulnerabilities that face cities with respect to past, present and future climate. By doing so, we will be better equipped to adopt realistic and efficient strategies to adapt to climate change without jeopardizing the equilibrium between economic, physical, social and living systems.

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Designing Infrastructure for a Changing Climate

By HEATHER AULD

In Canada the costs of weather-related disasters are doubling every 5 to 10 years. Most of these disasters have resulted from infrastructure failures under weather extremes. One of the main reasons for increases in weather disaster costs is the increasing vulnerability of infrastructure to severe weather events. Damage costs have risen as a result of an increasingly urbanized affluent population, and with more people owning more things, the number of vulnerable targets has increased. Another factor driving up losses is the age of the infrastructure. A recent study showed that most infrastructure systems are now very old and the percentage spending on infrastructure is less than half what it was in the early 1960s. Canadians also appear to be less aware of extremes than in the past and hence are less prepared and more vulnerable. So even if weather extremes do not increase, it is quite likely that losses from weather disasters will rise simply by virtue of an increase in population and property ownership. But if the incidence of extreme weather increases as a result of climate warming, the losses from weather-related disasters will be even higher. This is the first of a two-part article that examines the challenges posed to Canada's infrastructure by a changing climate.

Designing Resilient Infrastructure

One of the most successful means of protecting communities is through the development and adoption of good engineering codes and practices. Infrastructure needs to be designed and constructed to withstand the freaks of nature, including the extremes of cold, snow, rain and wind. Building codes have been developed cooperatively by three levels of government for half a century to prescribe minimum safety requirements. By law, they require the incorporation of design information about the climate. Other major infrastructure components, including communication towers, transmission lines, highways, bridges and dams, are designed in a similar fashion to meet national standards.

One of the main reasons for increases in weather disaster costs is the increasing vulnerability of infrastructure to severe weather events.

The basis for safe design is a set of climatic and seismic design values. Quantities like the 10-, 30- or 100-year worst storm, wind or rainfall are used as design values and reflect an acceptable risk. The storm or risk that is considered acceptable depends on the structure and its use. A school, a hospital or other post-disaster structure that has to be more resilient to the elements is designed to a lower acceptable risk or a greater storm i.e. to a 100-year windstorm, while a house is designed to the 30-year storm.

In the end, decisions on how to build structures are primarily driven by the need to build both safely and economically. The appropriate balance must be struck between strength or safety and serviceability over the life of the structure. While structures can always be "over-designed" to protect against natural hazards, the economic costs of over-design can be prohibitive. Conversely, while the cost of designing against the worst of the weather elements is high, the costs of disasters can be even higher.

Construction Codes and Climate

The National Building Code Commission lists climate design values for some 640 sites in Canada. Climate varies considerably from one location to another, requiring that site specific values be provided for regional design. Snow and wind loads are critical to the safety of a building and in the case of flat roofed buildings, rain loads are also important.

The failure of a building to withstand winds can be catastrophic. As a result, building codes require that this risk be negligible. All structures must withstand the pressures and suctions caused by the strongest gust of wind likely to blow at the site in many years. In Canada, building codes use the strongest winds expected in 30 years for most structures. In the United States, 50-year wind gusts are used. In Canada, for post disaster buildings like hospitals and schools, the strongest winds in 100 years are used.

Since one of the primary requirements of buildings is to keep interior spaces dry, all roofs and walls must shed rainwater. As a result, we have weather information on short 15-minute rain storms (10-year return period events) and on one-day rain storms (30-year return period events).

Snow Loads

Snow can effect buildings, particularly roofs, in many ways. It can cause the collapse of roofs due to heavy snow accumulation; ice and ice dams that result in water leakage under shingles and over flashings; snow slides from sloped roofs and skylights, endangering pedestrians; drifting around building, hindering access by people and vehicles; and wetting inside buildings from infiltration of wind-blown snow.

Snow loads are typically the greatest weather loads that buildings have to withstand. To design against roof collapses, the roof should be able to support the greatest weight of snow likely to accumulate on it. In Canada, engineering practice currently uses the 30-year greatest weight of the snow on the ground. Building codes require that the roof hold up a portion of this weight. The portion that is assumed to sit on the roof varies with the type of roof, roof materials, pitch and windiness.

Winter Storms and Infrastructure

Winter storms — snow and ice — can quickly cripple our modern infrastructure. In late December 1996, the city of Victoria, British Columbia, received close to 1 m of heavy wet snow, which was a lot for a city with only one snowplow in its inventory. Like many communities along the coast of southern British Columbia, Victoria had developed an elaborate response emergency plan for a big earthquake, but it was not prepared for a snowfall of this magnitude. Within a couple of days, roads were impassable, building roofs began to collapse, gas leaks erupted from the collapses, the military was called in, and people sometimes had to be hauled to hospitals by hand sled. The city's fire department had to resort to older horse-drawn equipment to get around. The city declared a disaster. In the midst of all this, Victoria learned the critical importance of an emergency response communication plan. Because the electricity, radio and TV infrastructure remained intact, the media played a valuable role in emergency response. One radio station suspended its programming to become a phone-in clearing house for residents with problems and emergencies who were looking for solutions.

The lesson learned from this event is that every community emergency plan needs to include plans for at least one good winter storm. Winter storms usually effect large areas and cross municipal and provincial jurisdictions — making coordination of responses essential. Unfortunately, one of the first pieces of infrastructure to go are the critical ones like electricity, phone lines and telecommunications structures, and it is hard to respond to emergencies without good communications. It is essential therefore that telecommunications infrastructure like TV, radio and cell telephone towers remain standing after severe weather. Communities should include practicing for a big winter storm in emergency response plans and ensure that links with the local weather office are maintained during and preceding an emergency.

Heather Auld (MSc-Meteorology) is a meteorologist and climatologist with the Meteorological Service of Canada, Environment Canada, and is currently responsible for climate and extreme weather issues for Ontario Region. Since joining Environment Canada in 1979, she has worked as a meteorologist in Edmonton, Vancouver, Toronto, with the Canadian military and as a climatologist dealing with engineering and climactic design values, national construction codes and standards and climate change issues.

Pedestrian-oriented Kiruna Centrum.

Pedestrian Mobility in Winter

By PATRICK J. COLEMAN, AICP

One of the keys to being a "good winter city" is to question and reconsider all municipal actions relating to the winter season. Considerable attention, resources and energy have been devoted to improving urban infrastructure, transportation and urban design in the winter city. Some winter cities have addressed winter pedestrian conditions by completely sheltering pedestrians from the cold and snow in underground passages or above-grade walkways. Outside of these interventions, little has been done to influence pedestrian conditions in North American winter cities. This article will describe the problems of pedestrian mobility, and identify some innovations, approaches and projects that can improve pedestrian conditions in winter cities.

Winter and the Pedestrian — The Problem

Winter greatly affects the mobility of pedestrians in northern cities. Cold, snow and decreased light limit the ability of people to walk and their desire. Cold weather is not so bad by itself, as people can wear the right clothing and be comfortable. When cold is combined with wind, walking can become uncomfortable and dangerous. Pedestrians are more susceptible to auto collisions under decreased light levels. It becomes difficult to see ice and obstacles unless the walkway is well lighted.

Snow and the condition of the walking surface also affect mobility.

A packed snow surface is one of the best walking surfaces, but adding four centimeters of fresh snow to a sidewalk makes walking more difficult. If the snow is old or has thawed, and the surface is icy, then walking again becomes difficult and dangerous, especially when combined with a sloped surface. Ladies shoe and boot fashions discourage winter walking since most women's boots have smooth soles and are not suitable for walking on slippery surfaces.

Among winter cities there is a range of winter climatic conditions. Conditions vary from very cold with little snowfall (for example, Winnipeg, Canada) to moderately cold with much snow (for example, Aomori, Japan, and Marquette, Michigan, USA). The latter conditions provide the greatest challenge for communities attempting to provide a good walking environment.

It is generally recognized that most northern cities were not designed for winter. Older cities, frequently have walkways, but in snowbelt areas, the space used for the walkway becomes important for snow storage. In newer suburban areas, walkways are frequently not constructed at all.

If the city were to be designed for the pedestrian, the walkway would take on more prominence, with separation from traffic, windscreens using earth forms, evergreen trees, and adequate snow storage along streets.

Cultural Barriers to Pedestrian Mobility

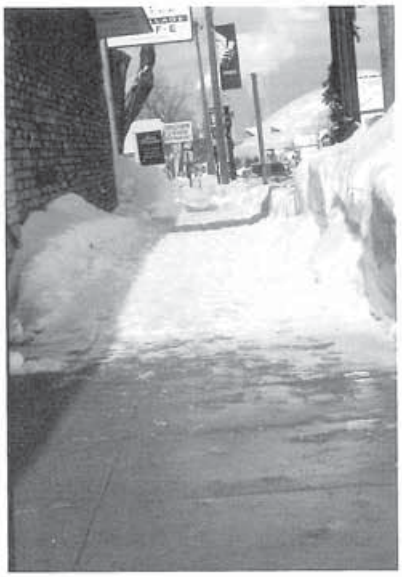
In the North American automobile-oriented culture, many northern cities have ignored the pedestrian in wintertime, with most resources being devoted to keeping streets and highways clear of snow and ice. Most suburban commercial developments are constructed without pedestrian connections or any means of walking between businesses and neighboring residential areas.

North Americans' dependence on cars and related roads and parking facilities means that drivers' needs outweigh the needs of pedestrians. Parking requirements for public and private facilities, often legislated by the city government's own zoning and land use controls, have created unrealistic perceptions by the public that walking is undesirable.

People expect to be able to park by the front door of their destination; anything farther is inconvenient. This perception further erodes the economic viability of the traditional downtown shopping district (where parking is often in ramps and distant surface lots) in favor of malls and big box retail centers located at the urban fringe.

This total dedication to the auto is changing as more persons are choosing to walk in winter cities and demanding better pedestrian conditions. This change is driven by the need and desire of many to walk for health benefits. Providing people with the opportunity to walk also influences a city's ability to attract new investment in business, jobs and residents to the downtown, as more people desire to live near where they work and spend less time commuting.

Creating a good walking environment requires a commitment to



Typical, inconsistent maintenance.

Snow-obscured pedestrian crossing sign.

A snowblower attachment cleared snow from this walkway.

maintain the walking surface for pedestrians. City governments in snowbelt areas generally have been reluctant to commit to walkway maintenance because of cost, and the belief that "people do not walk in the winter."

In some winter cities, the burden of sidewalk winter maintenance is left to the property owner, while others have ordinances or bylaws relating to maintenance of walkways; however, these are not always enforced.

The question of liability also affects winter maintenance of walkways. In the United States' litigious society it seems that someone else is always to blame for misfortunes, and slip and fall accident claims are common in the courts. If it is the city's responsibility for maintenance, then the city government may be liable for injuries due to accidents, and many local governments are reluctant to assume that liability.

Improving Pedestrian Mobility

In winter cities around the world, there is a wide disparity in their commitment to create good pedestrian conditions and a variety of solutions and techniques to create better pedestrian mobility.

At the dawn of the winter cities movement, much attention was focused on the winter needs of the central business district by linking various buildings together to reduce the need for people to walk outside. A number of northern cities created indoor and elevated pedestrian movement systems in the central business districts.

Minneapolis/St. Paul, Minnesota, and Calgary, Alberta, Canada, pioneered linking buildings together to create an indoor walkway system. Today, one finds these elevated walkways in many cities, including Duluth and Rochester, Minnesota, USA, and Edmonton, Alberta, Canada.

Handrails are a nice feature on this downtown Marquette walkway.

In Houghton, Michigan, a small city (population 7,000) in the Lake Superior snowbelt, a system of overhead walkways and "doors between stores" was created in the mid-1980's. This project won an award for urban infrastructure at the 1988 Edmonton Winter Cities conference for its creativity and adaptability to large and small towns everywhere.

Toronto and Montreal, both major population centers in Canada, have linked vast areas of their downtowns with walkways that double as shopping arcades and malls.

While underground, above-grade and through building arcades and walkways have benefited the downtown areas of cities, some question their value. The primary criticisms are that they often reduce street level animation and life, and create negative impacts on street-level retail establishments. Retail becomes focused inward, rather than making the street an interesting place. And it widely recognized that street animation is a vital component of a healthy downtown.

Much can be learned about pedestrian mobility from the cities of northern Scandinavia. Here there are positive examples of a physical and cultural bias in favor of the pedestrian.

Traffic calming improvements, such as raised crosswalks at street intersections, are employed to slow down vehicles and provide a dry walking surface for the pedestrian to cross the street. In Lulea, Sweden, much of the main shopping district is free from cars, with a total pedestrian orientation.

In Kiruna, Sweden, major traffic changes some years ago resulted in a one-way street system. This was designed to favor the traffic flowing uphill, resulting in a 30 percent decrease in auto emissions in the city. More importantly, the traffic improvements allowed the narrowing of major streets to provide more space for pedestrians in the centrum (central business district).

In both cities care is taken to provide the pedestrians with a consistent-walking surface. No salt or de-icers are used; rather, small diameter gravel is used for an abrasive to improve traction. Walkways are scraped clear of loose snow, leaving a packed snow surface, perfect for walking.

Traditional kicksleds, or sparks, are used by many persons

An inviting pedestrian walkway in Bratsk, Siberia.

in northern Scandinavia to assist with walking in winter. Consisting of a chair mounted on long steel runners, the kicksled has been used for more than 100 years and remains an important mode of travel that is especially favored by older persons and mothers with children. The kicksled provides stability and support on the winter walking surface. They can be ridden on downhill grades or propelled by standing on one runner and kicking the snow surface. Small parcels may be carried on them, and the chair provides a place to sit and rest.

Scandinavian communities consider the kicksled when maintaining walkways. When spreading the gravel abrasive, clear lanes are left for the sleds. There are even special parking places for kicksleds in Kiruna.

Some North American winter cities take special measures for the pedestrian. After hosting a winter cities conference in 1997 the City of Marquette has made winter livability a priority in many areas of public works and facilities. Key walkways through neighborhoods are plowed for pedestrians.

In Marquette's historic downtown district, winter conditions when combined with the area's steep grades, are major barriers to downtown's competitive advantage over outlying shopping areas. In response, the city's downtown development authority has promoted the development of linkages between parking and retail areas.

The downtown development authority clears snow from sidewalks using a small tractor with sweeper, rotary and blade attachments. Property owners may elect to scrape and do further maintenance if desired. Sand and/or de-icer is spread for icy conditions. The maintenance includes opening areas in the snow windrow along the curb left from street plowing. This provides more convenient access from on-street parking. While not entirely perfect, the attention to winter maintenance has improved attitudes among downtown office workers and retail patrons in Marquette. But constructing and maintaining these links is expensive.

Anchorage, Alaska, has developed a multi-use, non-motorized trail system linking various parts of the city. One can walk, run, ski, and ride a bicycle on this trail in the winter. Marquette, Michigan, is also considering maintaining a bike path in winter for multi-use. But cost is a potential constraint since special equipment must be purchased and used in order to pack and prepare the snow surface for multi-use.

The public cost of building and maintaining walkways for winter use must be compared to the value the community places on winter pedestrian mobility. Many will argue that pedestrian mobility in winter is not an achievable goal, or that the desire to walk in winter among citizens is not there. This view is shortsighted as multi-seasonal access and mobility will have a far greater value in the future, as more persons will choose to live near where they work, forsaking traffic congestion and long commutes associated with many large cities.

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Winter City Downtown Revitalization Plans

An Analysis of Edmonton, Calgary and Winnipeg

By MICHAEL J. BROADWAY

Plans for revitalizing downtowns have been a common feature of North American cities since the 1960s. In Winter Cities much of this effort has taken the form of infrastructure improvements such as constructing indoor shopping areas and protected walkways. The three major Canadian prairie cities of Edmonton, Calgary and Winnipeg have all utilized such strategies in their downtowns. This article reviews each city's major downtown plans and their success in improving the area's social and economic conditions.

Edmonton

Edmonton's 1981 Downtown Plan recognized that cheaper land and greater convenience had led to an expansion of retail and service activities in the suburbs and their decline downtown. At the same time, the area's high concentration of offices combined with the loss of affordable housing meant that it was largely deserted after normal working hours.

To deal with these issues the 1981 Plan proposed establishing high-density, mixed-commercial and residential areas and increasing public transit access to Downtown. But most of the plan's strategies dealt with improving physical structures such as the network of protected pedestrian walkways and providing more usable public spaces. Throughout the 1980s Downtown's infrastructure was enhanced by constructing cultural facilities, enhancing the appearance of public spaces and parking availability.

By the mid-1990s Downtown's contribution to the city's tax base began to decline, reflecting a fall in property values and an increase in vacancy rates. This loss of revenue had serious implications for the city's ability to deliver services and hence the 1997 revitalization plan's emphasis on "reinvestment." The 1997 Plan acknowledged that previous planning efforts had failed to arrest Downtown's decline and that "buildings do not revitalize a downtown. People do." Many of the plan's reinvestment strategies focused upon making Downtown more "livable" and restoring its primacy as a commercial center. Economic development would be fostered by creating an Enterprise Zone and building upon existing knowledge-based industries in the Downtown. Urban village centers were proposed for the Warehouse District and McKay Avenue residential area, and incentives would be provided for constructing new housing in the same areas. Parks and open space for recreation were to be expanded and pedestrian and bicycle links to the Saskatchewan River valley added, while an extensive tree planting program was proposed. Traffic calming measures would be introduced to slow traffic down, while through traffic was to be kept to the edge of Downtown.

It is too early to determine the success of the 1997 Plan in boosting the area's population and economy. But for it to succeed, it will have to reverse the area's sustained deterioration in social and economic conditions. Between 1981 and 1996, Downtown's population has declined, while the incidence of unemployment and poverty has nearly doubled (Table 1). An increasingly impoverished resident population suggests that any revitalization strategy that focuses solely upon physical improvements will have a limited impact.

Calgary

Since the 1960s, more than 30

Table 1: Downtown Edmonton Social and Economic Indicators

Indicator	1981	1991	1996
Population	4,659	4,810	4,476
Percent Unemployed	4.3	11.5	10.5
Percent of Families Below Poverty Level	11.8	21.9	28.0
Percent of Individuals Below Poverty Level	34.4	47.5	44.1

Source: Calculated by author from census data.

different plans related to Downtown have been produced by Calgary's planning department. The 1966 and 1979 Downtown Plans and the latest (1998) City Plan are reviewed. The 1966 Plan's goal was to maintain Downtown's status as the commercial center of the city by increasing automobile accessibility and improving the provision of parking. The Plan proposed consolidating office and retail development into a linear east-west core accessed by a complementary transit system, redeveloping residential neighborhoods, and establishing a pedestrian mall along 8th Avenue connected to the east-west core by a series of north-south walkways. These principles have effectively guided much of Downtown's subsequent development.

By the late 1970s, it was apparent that the overriding emphasis given to accommodating commercial development and the automobile in previous Plans was threatening Downtown's livability due to high levels of traffic intrusion, noise and air pollution, lack of amenities and the demolition of affordable housing. The 1979 Plan proposed improving Downtown's residential environment by protecting existing residential areas from commercial encroachment, developing large residential "pockets" adjacent to major amenities in areas free from through traffic, promoting residential development in existing commercial areas by providing incentives for developers, and establishing a clearly defined network of open spaces. The significance of the 1979 Downtown Plan was its recognition that the key to revitalizing the area lay in increasing the resident population and that in order to achieve this goal, the quality of the environment would have to be improved.

The section of the 1998 Calgary Plan devoted to downtown represents a continuation of earlier

Table 2: Downtown Calgary Social and Economic Indicators

Indicator	1981	1991	1996
Population	10,308	10,996	11,572
Percent Unemployed	4.5	11.3	10.8
Percent of Families Below Poverty Level	26.2	41.1	44.7
Percent of Individuals Below Poverty Level	39.7	50.4	59.9

Source: Calculated by author from census data.

Calgary's Eau Claire neighborhood.

policy objectives. Downtown housing will continue to be encouraged by improving the quality of the natural environment, reducing air and noise pollution, and reducing wind amplification and the loss of sunlight associated with the construction of high-rise buildings, while automobile access will be controlled by limiting the supply of long-term parking.

The earlier emphasis on attracting a residential population is reflected by small population gains, particularly in the Eau Claire neighborhood adjoining the Bow River. But despite these increases, Calgary, like its Edmonton counterpart, has experienced rising levels of impoverishment (Table 2).

Winnipeg

Winnipeg's Downtown and surrounding core area have been the object of numerous studies that document each area's social and economic decline and Plans to arrest the decline. The 1981 Plan Winnipeg and the 1994 CentrePlan are the focus of this study. The decline of Downtown Winnipeg has its origins in the 1960s with the familiar pattern of retail and commercial activities following people out to the suburbs leaving behind an increasingly impoverished inner city characterized by high levels of housing abandonment, poverty, unemployment and social problems

The 1981 Plan attempted to reverse Downtown's decline by promoting high-density residential development. To achieve this goal, the Plan acknowledged that public concerns over public safety and the safety of private property would have to be addressed along with improving the physical quality of the environment. The Plan proposed increasing the amount of open space, preserving heritage buildings, improving transportation and redeveloping the CN rail yards into a mixed land-use area. To encourage new residential development, the Plan also proposed providing developers with incentives such as freezing taxes at their existing levels for five years.

The severity of inner city Winnipeg's social and economic problems, including Downtown, led to the establishment of the Core Area Initiative (C.A.I.). The Initiative began in 1981, with the federal, provincial and city governments each providing $32 million to stimulate economic development, provide job training for inner city residents and revitalize inner city neighborhoods. The

accomplishments of the C.A.I. are a matter of controversy, but the Initiative did have a major impact on downtown development in promoting the establishment of the North of Portage Development Corporation and the Forks Renewal Corporation (both organizations merged in 1994 to create the Forks North Portage Partnership). The North Portage Corporation was responsible for the development of an eleven-acre, mixed land-use site on the north side of Downtown's main retail street. The Forks Renewal Corporation began the redevelopment of the rail yards with the development of a tourist and heritage complex at the confluence of the Red and Assiniboine Rivers.

The 1994 CentrePlan contains a host of strategies designed to fulfill five different visions of Downtown (Table 3). The Plan in pursuing these goals incorporates many of the same strategies utilized by Edmonton and Calgary in revitalizing their Downtowns, with proposals to improve public transit accessibility, expand the existing weather-protected pedestrian walkway system, enhance urban design and celebrate the city's heritage. CentrePlan, like its predecessors, recognized that Downtown had a poor image and proposed measures

Table 3: CentrePlan's Vision of Downtown Winnipeg

Vision	Key Components
Community and Belonging	Downtown exhibits a strong sense of community and belonging. People are safe, secure and welcome. Downtown is a place for everyone, where opportunities are shared.
Prosperity and Innovation	Downtown offers a range of opportunities for commerce, culture and living all integrated to form a rich and diverse environment. Downtown is the centre of employment, new technology, life-long learning and education.
Effectiveness and Efficiency	Downtown provides appropriate services to residents, workers and visitors and provides them in a way that demonstrates a commitment to excellence. All Downtown uses are well integrated to create a very livable, comfortable, clean and aesthetically pleasing environment.
Soul and Personality	Downtown has a soul and personality all its own, one that is vibrant and energetic yet warm and caring. It cherishes its ethnic and cultural diversity and its reputation for friendliness.
Direction and Commitment	Clear direction and commitment cultivate ongoing development of the downtown as a vibrant, welcome and secure place where people want to be and stay.

Table 4: Downtown Winnipeg Social and Economic Indicators

Indicator	1981	1991	1996
Population	9,800	12,350	12,480
Percent Unemployed	6.5	15.9	13.1
Percent of Families Below Poverty Level	33.1	37.4	43.2
Percent of Individuals Below Poverty Level	47.0	53.0	57.5

Source: Calculated by author from census data.

Winnipeg's Portage Place shopping mall.

to address public concerns over personal and property safety as well as the needs of new immigrants, the homeless and aboriginal residents of Downtown (Community and Belonging Vision). In promoting Downtown's traditional city center functions, it advocated the recruitment of new businesses and education facilities into existing vacant space in the historic Exchange district.

Downtown's population has risen since the 1980s, reflecting the influence of the North Portage development and Core Area Initiative, but unemployment and poverty levels have also increased (Table 4).

Conclusions

Downtown revitalization is a complex process; having a plan does not necessarily mean it will occur, or in the form originally intended by planners. The completion of Winnipeg's North Portage development had the unintended consequence of worsening retail conditions along other sections of Portage Avenue, while the completion of the Forks renewal project has had the effect of dispersing people to another area of Downtown.

Calgary's success in increasing its downtown population appears to be related to its booming economy and the expansion of Downtown commercial office space which has increased the demand for housing in the area. The population gains in the Eau Claire neighborhood also attest to the importance of amenity factors in attracting residential development. Conversely, Edmonton's much slower growing economy and the loss of jobs in the downtown as a result of cutbacks in provincial government employment has clearly weakened the demand for downtown housing despite the area's close proximity to the natural amenities of the Saskatchewan River Valley.

The experience of these three cities suggests that a city's success in revitalizing its downtown is related to the overall strength of its economy. Cities can enhance the quality of their downtowns by adding and improving the provision of cultural and physical amenities, but unless there is a demand for housing that is linked to an expanding commercial center, there is unlikely to be an increase in population. Moreover, population gains by themselves are not necessarily associated with improving economic conditions as all three downtowns have experienced rising levels of impoverishment. Traditional land-use planning can, at best, only have a limited impact on revitalization; a holistic approach that incorporates economic development strategies and land-use planning offers the best prospect for improving Downtown conditions.

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Official Launch of the University of the Arctic

By GREG POELZER

On June 12, 2001, more than two hundred dignitaries, politicians and educators from around the Circumpolar North formally launched the University of the Arctic at the University of Lapland, Rovaniemi, Finland. The University of the Arctic involved nearly four years of planning by post-secondary institutions from all eight Circumpolar countries — now it is a reality. As a result, residents in Northern communities will have unprecedented access to educational opportunities that meet the needs of Northerners. The University of the Arctic will be a university of the North, for the North, by the North.

The primary goals of the University of the Arctic are to provide educational programming that is accessible and relevant to Northerners and to facilitate research on the North.

"Our new university has an ambitious agenda," said Sally Adams Webber, incoming Chair of the Council of the University of the Arctic. "This fall, UArctic will offer our first undergraduate course, focussing specifically on northern topics and northern needs, through participating institutions in Russia, northern Europe and northern North America."

"We're very excited. This course will not only be available in traditional classrooms in many circumpolar states but also on the World Wide Web." The use of the Internet to facilitate learning, particularly for students in remote areas, is central to the University of the Arctic concept.

Supporting these educational objectives are three key pillars: the Bachelor of Circumpolar Studies (BCS), the Arctic Learning Environment (ALE), and the Circumpolar Mobility Program (CMP). The BCS is a program of study consisting of 120 credit hours. It has seven foundational courses and advanced emphases with more concentrated study in such areas as sustainable communities, northern governance, and community health and well being. This undergraduate program of study is supported by the ALE, which is the portal for program delivery. Students may take courses in conventional classrooms, but they will also be able to access courses through the Web and by other new information technologies. This is essential for students in more remote and smaller communities in the North. Along with ALE, the CMP provides the opportunity for students and faculty in the North to study and teach in other Circumpolar institutions and communities. The CMP allows the North to meet North.

The University of the Arctic is not only about teaching. Research is also important to its mandate. One of the venues for Northern research facilitated by the University of the Arctic is the Northern Research Forum (NRF). Last November, the NRF launched its first meetings in Akureyri, Iceland. These highly successful meetings brought researchers, young and old, together from around the Circumpolar North to exchange findings of direct relevance to Northern communities.

Preceding the official launch, University of the Arctic officials, including members of the newly appointed Board of Governors conducted three days of intensive planning meetings. Formal meetings have been taking place every six months over the past four years, with sub-committees in key areas, such as curriculum development, meeting in between. Oran Young became the newly appointed Chair of University of the Arctic Board of Governors.

Other new members of the Board of Governors include Ingmar Egede, Director of the International Training Centre of

Indigenous Peoples in Nuuk, Greenland; Shirley Adamson, General Manager of Northern Native Broadcasting in the Yukon, Canada; Audrey McLaughlin, long-time member of the Canadian Parliament; Oran R. Young, former vice president of the International Arctic Science Committee (IASC) and Professor of Environmental Studies at Dartmouth College in the United States; Jan Henry Keskitalo Founding President of Saami College, Norway; Lloyd Axworthy, former Minister of Foreign Affairs, Canada; and Dr. Polit. Erling Olsen, long-time member of the Danish parliament and founding President of Roskilde University.

One of the primary tasks of the new Board of Governors is to provide the University with much needed financial assistance if it is to carry out its mandate. In connection with the celebration of the Rovaniemi process, some of the members of the Board of Governors and Council had the opportunity to meet with Dr. Klaus Töpfer, Executive Director of the United Nations Environment Program (UNEP) and had the pleasure of receiving Dr. Töpfer's expressed commitment to the further development of the University of the Arctic. The University has received strong support from other well-respected members of the Arctic international community including Dr. Olafur Ragnar Grìmsson, the President of Iceland and Prime Minster Paavo Lipponen of Finland, who has been a key supporter of the University throughout its development.

For further information about the University of the Arctic, go the following Web site: http://www.urova.fi/home/uarctic/.

Greg Poelzer is the Secretary of the Bachelor of Circumpolar PDT, University of the Arctic and Chair, Political Science Program, University of Northern British Columbia.

University of the Arctic Programs

Teaching Programs	Description
Bachelor of Circumpolar Studies (BCS), development	A plan for the development and delivery of a baccalaureate degree in Circumpolar Studies, as a coordinated program between circumpolar education institutions.
Mobility Programs	
Circumpolar Mobility Programme	The overall structure under which all UArctic mobility programs are coordinated. Facilitates student and faculty mobility through financial support and developing exchange standards.
north2north	Proposed comprehensive student and faculty exchange system, supporting BCS and other UArctic teaching programs.
northTREX	Northern Teaching Resource EXchange, providing guest faculty for short-term teaching at UArctic partner institutions. (Under development)
Circumpolar Arctic Social Science (CASS) Network	An international network of PhD students in social sciences, focusing on Arctic issues, which meets for a series of seminars and presentations at a different location in the Arctic each year.
Circumpolar (CAES) PhD Network in Arctic Environmental Studies	An international network of PhD students in environmental studies, focusing on Arctic issues, which meets for a series of seminars and presentations at a different location in the Arctic each year.
Field Courses	
NABO International Field School	A cooperative international, interdisciplinary investigation of the early settlement of northern Iceland, organized by the North Atlantic Biocultural Organization.
IRISEN (Integrated Regional Impact in the European North)	An advanced study course in basic issues, methodologies and regional climate modelling, held at Abisko Research Station.