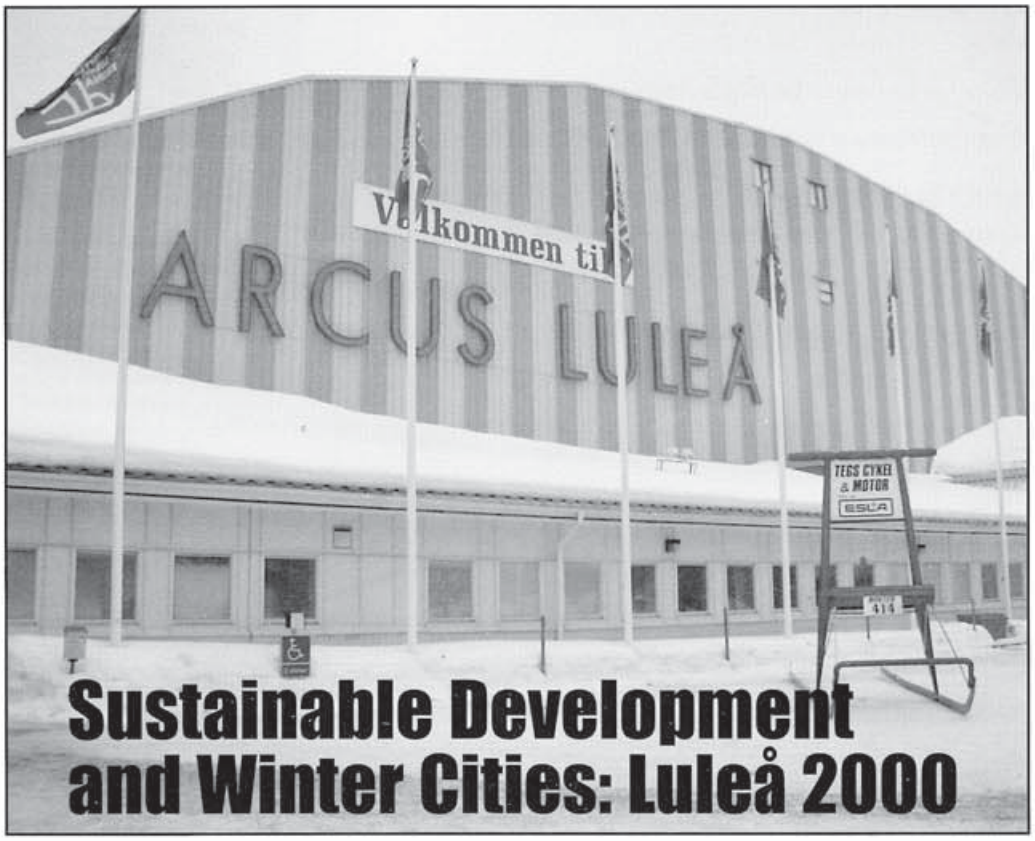
Winter Cities

VOLUME 19 • NUMBER 2 • SUMMER 2000



Sustainable Development and Winter Cities: Luleå 2000

Photograph courtesy of Michael Broadway

Winter Cities Association to Select City as Site for 2003 Forum

The Winter Cities Association will be selecting a host community for a 2003 conference at the upcoming Winter Cities Forum 2001 being held in historic Quebec City in late January. The Forum has been held in North America every two years since 1986.

Hosting the Winter Cities Forum provides the opportunity to attract international attention to your city, provide educational opportunities for the city and region on innovative solutions to winter challenges, and showcase local efforts to celebrate winter and improve quality of life.

The Winter Cities Forums in North America have historically attracted 300-400 delegates including participation from Japan, China, Sweden, Norway, Finland, the United States and Canada. Forums attract numerous exhibitors and include local activities that promote winter in the city in a positive manner.

Previous host cities have reported positive and long-lasting impacts from hosting this event, including community inspiration, economic spinoffs, business contacts, increased awareness, and new approaches to municipal planning and management.

See the WCA Web site for more information on winter cities: <http://wintercities.nmu.edu>

To receive information on this opportunity, please contact Patrick Coleman, President, Winter Cities Association: pcoleman@portup.com.

The Winter Cities Forum 2001 in Quebec City will be held January 30-February 2, 2001. The conference theme will be climate change and its impact on Northern communities. Conference attendees will have the opportunity to participate in Quebec's Winter Carnival, which will be held January 26-February 11.

For more information, e-mail wintercitiesquebec@videotron.ca, visit their Web site at www.nordicite.org, telephone 418-681-3114, fax 418-684-8815 or write to Winter Cities Conference and Showcase: Quebec 2001, 1327 Maguire Avenue B200, Sillery, Quebec, Canada G1T 1Z2.

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Editor: Michael J. Broadway
Assistant Editor: Julia C. Broadway
Layout Editor: Karen Wallingford

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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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Winter Cities

Volume 19 • Issue 2

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The Power of the Good Example

Four of the six articles in this issue of *Winter Cities* magazine are devoted to the issue of climate change and the response of northern communities. They were presented at the February 2000 Winter Cities Forum in Luleå, Sweden.

Patrick Coleman, President of the Winter Cities Association, notes in his article that U.S. communities have much to learn from their counterparts in Sweden in terms of how they respond to winter's challenges. Dr. Erland Källén of Stockholm University reports on the successful results of climate modeling in the Nordic region that indicate a milder climate for Luleå and other northern communities in Sweden. Eva Lindberg of the Swedish Society for Nature Conservation writes about her organization's involvement in promoting Agenda 21. Agenda 21 was established at the United Nations 1992 "Earth Summit" in Rio de Janeiro as a means for promoting sustainable development at the local level. Lena Bengtén of the City of Luleå details her community's efforts at establishing an Agenda 21. Mark Brostrom and Jessica Rytter describe the City of Edmonton's plans to reduce greenhouse gas emissions.

The articles dealing with Luleå and Edmonton emphasize the importance of encouraging local community involvement in developing sustainable development strategies. They also illustrate how far advanced communities in Sweden and Canada are in addressing the challenge of climate change. A quick Internet search of Agenda 21 and my adopted state of Michigan, for example, found no citations!

The final article provides a case study of downtown winter city design and urban revitalization. It concludes that in order for such efforts to be successful they have to be part of a broader strategy that promotes sustainable development.

Michael L. Broadway

Lessons from Lapland

By PATRICK COLEMAN

Many residents of Michigan's Upper Peninsula greet the end of the winter season with joy. Whether the warm conditions experienced this past season are a signal of global warming, or just an unusual event, it is probably safe to say that winter and snow will remain a dominant part of life in the Upper Peninsula.

Historically, winter has been viewed negatively by American culture. It is said that winter creates additional costs and inconvenience and reduces quality of life. Winter has been described as detrimental to efforts to stimulate the economy of the Upper Peninsula. Several years ago, a study for the conversion of the former K.I. Sawyer Air Force Base cited that "snow, cold, and isolation are against you from the get-go." I believe it is imperative that this perspective be rejected.

As a consulting urban and town planner working with many area communities, I have been concerned with winter's effects on urban and rural areas. This interest led me to study positive examples of winter response and design in areas with a northern climate, most recently at the 2000 Winter Cities Forum at Luleå and Kiruna, Sweden.

Although these cities are located near the Arctic Circle, the natural environment and winter climate are very comparable to that of the Upper Peninsula, due to the warming influence of the Gulf Stream. Luleå and Kiruna are very forward looking communities and offer both traditional and innovative examples of living in harmony with winter.

Photograph courtesy of Patrick Coleman

Luleå's Storgatan Street

New approaches are being used there for the design of residential areas to mitigate the effects of wind and snow drifting. Snowplow friendly, narrow roadways are aligned with the prevailing winds to prevent drifting of snow across the road and include separate pedestrian walkways and ample space for snow storage.

Individual home sites consider wind direction and snow drifting. Garages are placed close to the roadway at an angle to prevent drifting across the driveway. The house design also provides wind-sheltered outdoor space for use in all seasons. Elevated decks allow occupants to enjoy springtime sunshine when snow is still present in the yard.

Quality of life is very important to the people of northern Sweden. Although auto dependent like Americans, a great deal of attention is given to pedestrian walkways in neighborhoods and the city center. Traditional kicksleds, a lightweight chair mounted on long metal runners, are used extensively, especially by older citizens, on the walkways. Extensive lighted ski trail systems are located in and around the city and can be accessed from neighborhoods. Snow is used to create art works throughout the city, which are lighted and add interest to long winter nights.

Luleå and Kiruna are remote communities, yet have found ways to improve their economies through the development of high-tech business and industry. Iron ore mined in Kiruna is made into high quality steel in a micro-mill in Luleå, now used by the Ford Motor Company for side impact protection in cars. Kiruna attracts space and atmospheric scientists from Europe and the United States. Kiruna has developed a strategic plan to further its economy and reduce dependence on iron mining.

Both cities have discovered a new role for tourism. Distance and remoteness increases interest. And there is great interest in winter. Lars Tornman, Mayor of Kiruna says, "Winter used to be problematic here; now it is our main attraction." Outdoor adventures are promoted by a number of entrepreneurs.

An outstanding winter attraction is the world famous Ice Hotel at Jukkasjarvi, a small village near Kiruna. Constructed of snow and ice, the Ice Hotel attracts thousands of visitors from around the world who marvel at the structure's Absolut Ice Bar, art gallery, outdoor theater, and chapel. Many sleep overnight in the fifty stunning hotel rooms. Guests take part in various activities, such as dogsledding, snowmobiling and skiing.

Across the Finnish border, another large-scale snow construction, the Lumi Linna Snow Castle has attracted one million visitors in five years. The City of Kemi constructed the Snow Castle as a means of stimulating a troubled economy.

There are many lessons to be learned from successful winter cities, which can be applied to northern communities in the United States to improve their quality of life and economy. Winter must be viewed as an asset and opportunity rather than something to be endured. Here are some ideas:

- Focus on enhancing quality of life during winter, including pedestrian mobility, maintenance of public spaces, outdoor recreation, and community appearance so as to improve residents' attitudes toward winter.
- Encourage local colleges and universities to design products that respond to the winter climate. There is a worldwide demand for such products that could be produced locally.
- Develop entrepreneurial opportunities in areas such as winter clothing, tourism, winter product testing and e-business.
- Diversify winter tourism beyond snowmobiling.
- Encourage the use of creative town planning, architecture and building techniques suited to the winter climate.

Photograph courtesy of Patrick Coleman

Kiruna's Centrum District

The new millennium promises great things for northern communities. Remoteness and our climate should be viewed as assets. To reach this potential, we must overcome the prevailing anti-winter attitude in our culture in a positive and creative manner.

Patrick Coleman, AICP, is the President of U.P. Engineers & Architects, Inc., a multi-disciplinary design firm based in the Upper Peninsula of Michigan. He is also President of the Winter Cities Association, a non-profit organization that promotes solutions to the unique problems of northern communities. For more information on winter cities: www.upea.com or wintercities.nmu.edu.

The Human Influence on Global Climate: A Discernable Change

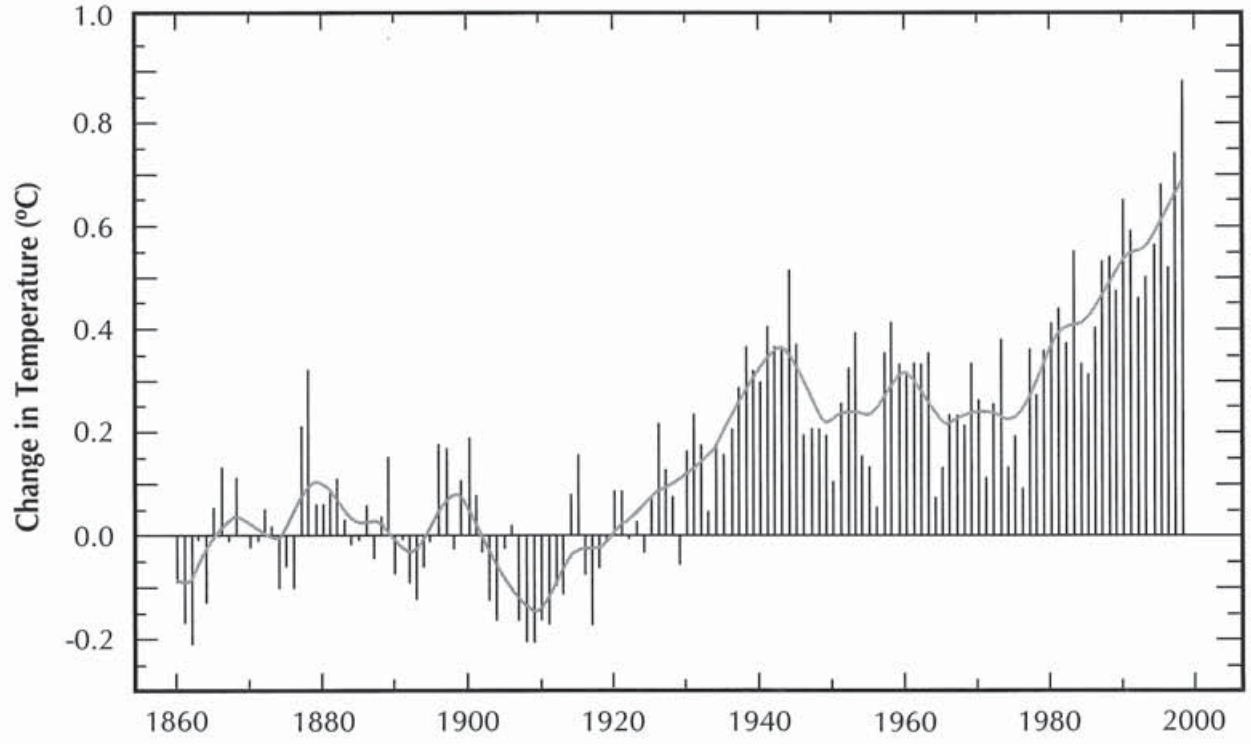
By ERLAND KÄLLÉN

The global climate is determined by a balance between energy received from the sun and energy lost by infrared radiation to space. Changes in the solar energy received by the earth may cause fluctuations in the global climate. Changes in the composition of the atmosphere can also cause climate change at the earth's surface. Since the start of industrialisation about 150 years ago the concentration of carbon dioxide in the atmosphere has increased by about 30 percent. This increase is due to man's activities of burning fossil fuels such as coal and oil. Through the effect of carbon dioxide on infrared radiation, this concentration change can influence the surface temperature. This influence is due to the so-called greenhouse effect — the fact that the atmosphere acts as a greenhouse for thermal radiation emitted from the surface. Due to the greenhouse effect the surface of the earth is heated by back radiation from the atmosphere. Increases in greenhouse gas concentration lead to a more effective shielding of infrared radiation and thus higher surface temperatures.

Past Climate Change

Surface temperature observations show that globally averaged temperature has increased by about 0.7 °C over the past 100 years (figure 1). Direct temperature observations with a global coverage are

Figure 1: Global Climate Change Over the Past 150 Years



Globally averaged surface temperature observations. Each vertical bar indicates an individual annual average; the solid line is a running mean annual average. Source: Hadley Centre for Climate Research, Bracknell, England.

only available for the last 150 years, but this warming can be compared to temperature variations in a longer time perspective if indirect temperature measurements from tree-rings, ice cores, etc. are used. A recent study shows that over the past 1000 years the warming during the last century stands out as exceptional. During the period 1000-1900 AD Northern Hemisphere average temperatures only varied by about ± 0.3 °C. To judge whether the temperature increase over the past century is a direct effect of the increase in carbon dioxide concentration, a physical model of the climate system is required. Such models are at the focus of climate research and are based on atmospheric models for weather prediction. Simulations with climate models show that global warming over the past century can to a large extent be explained by the increase in carbon dioxide concentration. The model calculations also take into account solar variability, volcanism, and particle concentration increases in the atmosphere, and the model produced temperature record matches the globally averaged observed record quite well.

Future Climate Change

Another use of climate models is to simulate future climate change given a prescribed increase of carbon dioxide. The models can thus be used to assess global climate change given a scenario of carbon dioxide emissions. The most commonly used carbon dioxide scenario is that emissions will increase at the same rate as they have done in the past and atmospheric concentrations will thus also continue to increase exponentially. This scenario is called "business as usual," and it will result in a doubling of the carbon dioxide content of the atmosphere by the middle of the 21st century. By the end of this century, around the year 2100, the concentration will have increased 150 percent compared to the pre-industrial level. The resulting climate change is appreciable — globally averaged surface temperatures will increase 2-3 °C according to a number of climate model simulations. The temperature increase is accompanied by changes in precipitation, ice-cover, and the length of the growing season. Of particular interest is to determine how global climate change will affect certain regions. The global model simulations are in general too coarse in their spatial resolution to accurately model the climate over a region such as the Nordic one, but it can clearly be seen that global warming is more pronounced in polar regions than near the equator.

Regional Climate Change

Climate scenario simulations with a regional climate model for the Nordic region have been made in the Swedish climate-modelling programme SWECLIM. The results from SWECLIM show that the regional climate characteristics of the Nordic area can be well captured. Furthermore, regional aspects of global climate change can be analysed in more detail and an assessment can be made of a number of different characteristics of a warmer climate. In figure 2 the centennial temperature change over the Nordic area as determined from regional climate change simulations is shown. The largest temperature increases of between 3 and 4 °C, are found in the northern parts of the region. This increase is larger than the corresponding globally averaged values quoted above. Seasonal changes in precipitation, evaporation, and river runoff can also be derived from model simulations. A number of impact studies have been made with the Nordic climate scenarios, such as river runoff calculations for hydropower production and forest growth. All impact studies clearly demonstrate the significance of the regional climate change signal: if the carbon dioxide content in the atmosphere continues to increase according to the "business as usual" scenario, we will experience a much warmer climate towards the end of this century. Luleå can become as warm as southern Baltic Sea cities are today while the snow season in the Scandinavian mountains will be considerably shorter than it is today.

Uncertainties

The example discussed above is just one possible climate scenario under "business as usual" conditions. If the global emissions of carbon dioxide are reduced, the warming will become less pronounced. By how much and when we may notice the change is still a research problem; only a few emissions scenarios have so far been analysed with global and regional climate models. Another very important aspect of climate change simulations is the uncertainty issue. A region's climate may vary considerably due to natural climate fluctuations, much more so than the globally

Figure 2: Temperature Climate Over the Nordic Region

The leftmost figure shows observed annually averaged temperatures for the period 1960-1990. The middle figure is temperature increase over a 100-year period, and the rightmost figure is the resulting 10-year averaged temperature climate around year 2100. Middle and rightmost figures from model simulations assuming a "business as usual" greenhouse gas scenario. Source of information: Swedish Regional Climate Modelling Programme, SWECLIM.

averaged climate. All climate change simulations should be put in the perspective of natural, regional climate fluctuations. Some simple statistical measures have been used to estimate the significance of a Nordic regional climate change over a 100-year period, and it is clear that the temperature change is significant while precipitation changes are almost within the natural range of variability. Results vary between different geographical regions and different model simulations. Future research aims at reducing these uncertainties and in particular identifying the part of the uncertainty that is related to natural fluctuations and the part that is related to model deficiencies. The first type of uncertainty will always be part of a climate change estimate, while the second part can be reduced if models improve. Climate model research aims at continuous improvement; the test, which every model has to undergo, is a check on how well the model simulates present day climate conditions. This is far from a trivial test — the present day climate is quite variable, and the goal is to show that models can reproduce this variability. To test how well the model scenarios actually depict global climate change we compare model results with observations of past climate. But this type of analysis is restricted by data availability. Ocean climate observations are scarce while we have a reasonably complete set of atmospheric observations for the period 1950-2000. Before 1950, upper air observations are lacking.

Implications of Climate Change

Simulations of future climate change cannot be checked against reality until it has occurred. The purpose of such simulations is, however, not to show how accurate they may be but rather to give an estimate of a possible climate change that may result from human activities. Such estimates may motivate the global society to limit the emission of carbon dioxide and other greenhouse gases. Another use of climate change simulations is to prepare society for a climate change that may be coming. The climate change that the model simulations are showing is considerably more rapid than would result from purely natural climate fluctuations. The magnitude of the change is less than what the earth has undergone in the past during ice ages, but a very important point is that the present change is much more rapid. In particular, the polar region may be about to experience a warming that will significantly alter the environmental characteristics of the region. Planning for the future in this area should take this possibility into account.

Erland Källén is Professor of Dynamic Meteorology and Chairman of the Department of Meteorology at Stockholm University. He can be contacted at the Department of Meteorology, Stockholm University, S-106 91 Stockholm, Sweden. Telephone: 46 8 16 23 95, e-mail: erland@misu.su.se.

Global Climate Change: Agenda 21 in Sweden

By EVA LINDBURG

The origins of the sustainable development movement can be traced back to the 1972 Stockholm Conference on the Human Environment. A decade later, the Brundtland Commission declared a sustainable development to be "development which meets the needs of the present without compromising the ability of future generations to meet their own needs." At the 1992 "Earth Summit" in Rio de Janerio, sustainable development was incorporated into local planning efforts by establishing Agenda 21. Agenda 21 can be looked upon as an action plan for the 21st century. According to the plan, by 1996 most local authorities should have undertaken a consultative process with their populations and achieved a consensus on a community-based Local Agenda 21. Each Local Agenda 21 should include environmental, social, cultural, and economic issues and have a long time perspective — over 100 years.

In Sweden, Agenda 21 has become a familiar concept that has worked as a catalyst for innumerable initiatives all over the country. Since fall 1993, the Swedish Society for Nature Conservation has been a driving force in realising the aims of Agenda 21. One of the Society's main objectives has been to supply municipal employees, politicians, and active members of the Nature Conservation Society with ideas and strategies on how to work with Agenda 21 at the local level. This work has been carried out by illustrating good examples through newsletters, education, and development guides. By the end of 1998, 56 percent of Sweden's municipalities had adopted a local Agenda 21 and 70 percent of municipalities employed a full-time or part-time Agenda 21 coordinator. Apart from specific programs aimed at new measures for handling waste, energy supply, communications, and agriculture, Agenda 21 has successfully contributed to integrating environmental considerations into other sectors of society.

Climate Change and Agenda 21

Since the Rio conference, climate change and global warming have emerged as major issues. In 1997 at the Kyoto summit on climate change, thirty-nine countries pledged to reduce their carbon dioxide emissions as a means of combating global warming. A year earlier the municipality of Växjö,

Figure 1: Challenge Communities

Location	Base Year	Target Year	CO2 Reduction
Lund	1995	2050	75%
	1995	2005	reduction of road traffic emissions by 25%
Säffle	1995	2025	50%
Växjö	1993	2010	50% per capita
Uppsala	1990	2010	reduction of road traffic emissions by 25%. Energy consumption shall be based on fuels that do not increase the greenhouse effect.
Övertorneå	1990	2020	50%
Sweden	1990	2000	Stabilisation at 1990 levels, thereafter reduce.

in working with the Nature Conservation Society on Agenda 21, took the decision "to stop using fossil fuels in the Växjö municipality." By 1998 the Society's work in this area was extended to four other municipalities that we call "Challenging Communities." They are Lund, Säffle, Uppsala, and Övertorneå. Each municipality has its own goal for reducing carbon dioxide emissions (figure 1).

The five municipalities are very different and each has a different set of strategies to reach its goals. Säffle (17,000 population) plans to expand the provision of district heating and promote the use of bikes. Lund (98,000 population), a university town, has decided to promote walking and biking to school. Uppsala (187,000 population), another university town, intends to increase the availability of public transport for commuters, while Växjö (73,000 population), will promote municipal car sharing. Övertorneå (6,100 population) plans to develop a program in "eco-driving." Clearly, it will be a challenging task for these communities to meet their goals. The challenge for other communities is to follow these examples by establishing their own goals for carbon dioxide reduction and becoming less dependent upon fossil fuels.

Luleå's Tourist Information Center

For further information about the Swedish Society for Nature Conservation's Challenging Communities program, please contact Eva Lindberg, Swedish Society for Nature Conservation (SSNC), Box 46 25, S-116 91 Stockholm, Sweden. Telephone: +46 8 702 65 15, e-mail: eva.lindberg@snf.se.

View of Stockholm's Old Town, Sweden

Photographs courtesy of Michael Broadway

Local Agenda 21 in Luleå

By LENA BENGTÉN

At the 1992 "Earth Summit" in Rio, delegates from around the world signed a 600-page action plan for sustainability called Agenda 21. The following year Luleå City Council unanimously agreed to establish a Local Agenda 21. Work with the Local Agenda started in 1994 when a co-coordinator and an EcoBoard were appointed. During the intensive working period (1995-1996), we started the Agenda office, and the staff expanded to two persons working full time who were in turn assisted by several (5-10) environmental guides who worked part time. The mission given from the Rio conference urged local governments to undertake a consultative process with the community so as to achieve a consensus on a local Agenda 21. This task posed the obvious questions of how do you have a consultative process with 70,000 inhabitants and how do you obtain a consensus? This article explains how the city of Luleå answered these questions in developing its Agenda 21.

Establishing the Agenda

Since the municipality is the biggest employer in Luleå, the city began with an education program for municipal employees and politicians. By the end of 1996, 4,200 persons had participated in one day of environmental education. The program was planned and executed by our own staff guided by the principle of "thinking globally and acting locally." A major goal of the sessions was the clarification of values, with every participant being encouraged to share his or her views with others. During the course of the program questions were asked about the future of Luleå and participant responses were recorded. Knowledge of the city's efforts spread and inspired similar programs in other sectors, and we provided a recorder for these sessions. Our environmental-program was evaluated by interviews with 300 employees. The results were overwhelmingly positive, with 66 percent highly praising the content and 68 percent claiming that changes had been made at work after the program. The overall effect was to put the issue of sustainable development high up on the local agenda.

Outreach Efforts

To increase household awareness, study groups were established and they were given free materials and support. Open evening-lectures about composting, sorting waste, green consuming, and using wood for heating were well attended and appreciated by the inhabitants. Articles in the local authority magazine, *Vårt Luleå*, spread information about the work. In addition, we visited companies, associations, and organizations to give them information about Agenda 21 (about 1,500 people were reached in this way). At each occasion participants' responses and concerns relating to the future of Luleå were recorded. To increase contacts with and between the companies, we arranged visits to firms to illustrate examples of "best practices" and invited those persons with responsibility for environmental issues. Over the course of two years, we made personal contact with a total of over 6,500 people and from all of them we collected "thoughts and notes" about Luleå's future sustainability.

Achieving a Consensus (1997)

After reviewing the notes that had been collected relating to Luleå's future, seven areas of concern were identified: housing, education, business, communications, nature, leisure, children, and care of the elderly. We then set out to build a consensus for dealing with these issues by broadening our education effort to include a local theatre company who toured the city and used music and comedy to raise people's level of consciousness with the topics. Children were also contacted. An author and local artist created a children's book. Music was later added to the book and was shared with children at day-care centers. The staff received written guidance for answering environmental questions together

with the children. The final stage in building a consensus was an appeal in the local newspaper for everyone interested in Luleå's sustainable future to attend a series of Roundtable discussions. About 200 persons answered the appeal. In preparing for the Roundtables we arranged for the participants to attend a series of lectures that provided background information on the different issues.

In February 1997 we devoted seven afternoons for Roundtable discussions on each of the topics. The surroundings were important; to avoid a "lecturing atmosphere" we met at a restaurant. Each Roundtable had its own subject and an image of the future as a starter. A maximum of 8 persons were assigned to each table and to ensure diversity, participants were selected according to age, gender, and socio-economic background. After each Roundtable discussion a summary of the deliberations was sent to each participant for his or her approval. These summary documents were used to form "A Local Agenda 21 for Luleå — a vision of being a sustainable society." It was formally accepted by the City Council in August 1997.

Establishing a Set of Indicators

After its acceptance we began identifying indicators that would tell us how the work toward a sustainable Luleå was progressing. New Roundtables were arranged to search for indicators to find the "Green Keys" for Luleå. This process identified about eighty Keys. The criteria used to select the indicators were that they be easy to understand, cheap to bring forward, and wanted by people living in Luleå. In spring 1998 we continued this process by searching for "owners" to the suggested Green Keys and attempting to reduce their number. We gave the city's residents a chance to choose the final Keys by allowing them to vote via the Internet and ordinary mail. A total of 700 people responded and this resulted in the selection of these eighteen Keys: non-smoking restaurants, good drinking water, young people with a positive future spirit, living near nature, living near a good store, eco schools, environmental studies at university, sorting waste, composting, going by bus, alone in the car, agriculture, nature care, district heating, and effective transportation. We also gave companies with more than 500 employees the chance to participate. If they wish they can provide one indicator that will evaluate their own contribution to a more sustainable Luleå. We now have indicators from three employers: Ferruform, the hospital, and the municipality.

Other Projects

To change people's transportation habits we started a project in 1998 called "People on the Move" (Folk i Rörelse), in cooperation with the Swedish Road Association, Luleå Medical District, and the municipality. We want more people to walk and cycle short distances instead of taking the car, as half of the journeys made by car are shorter than five km. Ten persons with car-habits were chosen. They signed a contract agreeing to bicycle or walk to work 80 percent of the work-time. A bicycle, helmet, clothes, studded tires and other necessary equipment were provided to the participants. At the end of one year the participants' health had improved while air pollution had been reduced and a new transportation habit had been established.

An old army store at Kronan is being restored to serve as a Center for Sustainable Development called the EcoArena. The restoration is being undertaken using energy-saving methods and materials. Visitors will be able to obtain energy-saving, flexible, and ecological solutions for ordinary life. The Arena will demonstrate a variety of solutions for issues relating to insulation, ventilation, energy, and sanitation. A greenhouse and cultivated areas around the Center will provide information about growing food. It is planned that the Center will become a place where unemployed persons will be able to obtain education and experience that will increase their opportunities to get future employment.

Conclusions

Luleå's experience with developing a Local Agenda 21 shows that it takes time to build a consensus but the effort is worth it. The town's most successful outreach efforts involved the use of the arts to increase resident's awareness of environmental issues. Communities that are beginning to plan their own local Agenda 21 should incorporate such methods from the outset of the planning process.

Lena Bengtén is the Eco-coordinator for the city of Luleå: She can be contacted at Lena Bengtén, Eco-Coordinator, Luleå Kommun, S-971 85 Luleå, Sweden. Telephone: 46 920 293230, e-mail: lena.bengten@miljo.lulea.se.

Edmonton's Greenhouse Gas Reduction Strategy

By MARK BROSTROM and JESSICA RYTTER

In 1995 the International Panel on Climate Change (IPCC), the United Nations body of leading climate scientists, concluded that there was enough evidence to indicate that climate change will occur due to human generated greenhouse gas emissions. They called for immediate action to reduce greenhouse gas emissions from human sources in order to minimize the risks of negative impacts of climate change. Two years later the Kyoto Protocol called for a 6 percent reduction in greenhouse gas (GHG) emissions by Canada and other developed countries.

Edmonton is one of more than 70 Canadian municipalities that have signed on to the Federation of Canadian Municipalities Partners for Climate Protection (FCM PCP) program of a 20 percent reduction in GHG emissions (i.e. 20 percent below 1990 levels). This program requires submitting an action plan detailing how specific greenhouse gas emission targets will be met and how progress will be measured. This article describes the process and results to date of Edmonton's efforts to develop a GHG Emission Reduction Strategy.

Municipal Activities: Impacts on Greenhouse Gas Emissions

Day-to-day municipal functions impact the level of greenhouse gas emissions through a host of activities that use fossil fuels including the provision and maintenance of local roads, recreational and cultural facilities, policing, solid-waste management, and snow removal. In addition they control methane gas emissions from landfills as well as carbon sequestration through greening activities and urban forestry on municipal properties. Municipalities can also affect community-wide greenhouse gas emissions indirectly through plans, policies, bylaws, and agreements as well as providing leadership and advice on reduction strategies.

There are multiple benefits to be obtained by reducing GHG emissions through improved energy efficiency, landfill gas recovery, waste management projects, community greening, and land use changes. The benefits include improved air quality and public health; lower infrastructure investment costs; reintegration of land uses; decreased automobile dependence and traffic congestion; enhanced economic development and job creation; improved urban forestry and rural land use policies; improved competitiveness; reduced fuel and electricity bills; potential revenue sources from participation in emissions trading; and landfill utilization projects.

Edmonton's Greenhouse Gas Emissions Reduction Strategy

Edmonton is the capital of Alberta, a western Canadian province, with a population of about 630,000 in the city proper and over 800,000 in the region. As a northern city, Edmonton has a number of challenges in reducing GHG emissions from it's own operations and the community. The energy intensity of the transportation, residential, commercial, and industrial sectors in a cold weather climate is typically high. In addition, Edmonton is supplied with electricity from the provincial grid, which is coal based and thus high carbon dioxide emitting per unit of energy.

Overall Strategic Approach

The City of Edmonton recently developed an Environmental Strategic Plan (ESP) in which 18 environmental topics are identified, of which Climate Change is one. The ESP fits under the umbrella 'Plan Edmonton' document, Edmonton's municipal develop-

Photograph courtesy of Michael Broadway

A view of downtown Edmonton from across the Saskatchewan River Valley

ment plan. The goal of the climate change component of the ESP is a community-wide reduction in greenhouse gas emissions. This will be accomplished by the following key strategies:

- Encourage reduction of overall energy use from current sources within the community.
- Develop strategies to deal with greenhouse gas emissions in planning future community growth.
- Increase community-wide awareness of the importance and means to reduce GHG emissions.
- Develop and maintain a community-wide greenhouse gas emissions inventory.

The plan consists of two distinct components, an action plan for reducing GHG emissions from City operations, and potential options for community-wide GHG emission reductions. The City operations plan addresses the components of buildings/facilities, fleets and processes. The community options component addresses Edmonton's residential, commercial, and industrial sectors.

Part 1: Greenhouse Gas Emissions Reduction from City Operations

Edmonton's city operations represent only a small proportion (approximately 3 percent) of GHG emissions from within the municipal boundaries, but they do provide a target over which the City has control and can demonstrate leadership by example. An action plan was developed for City operations as a test and refinement of the process that is being used to develop a community wide plan.

The GHG inventory for City operations has been broken into six main areas consisting of (1) City buildings (40%); (2) City Fleets (24%); (3) Street Lighting (20%); (4) Wastewater Treatment (8%); (5) Contracted-Out-Services (6%); and (6) Green Spaces & Sinks (2%). In 1990, City operations accounted for 354,000 tons of CO_2 equivalence emissions per annum; this increased to 363,000 tons in 1997.

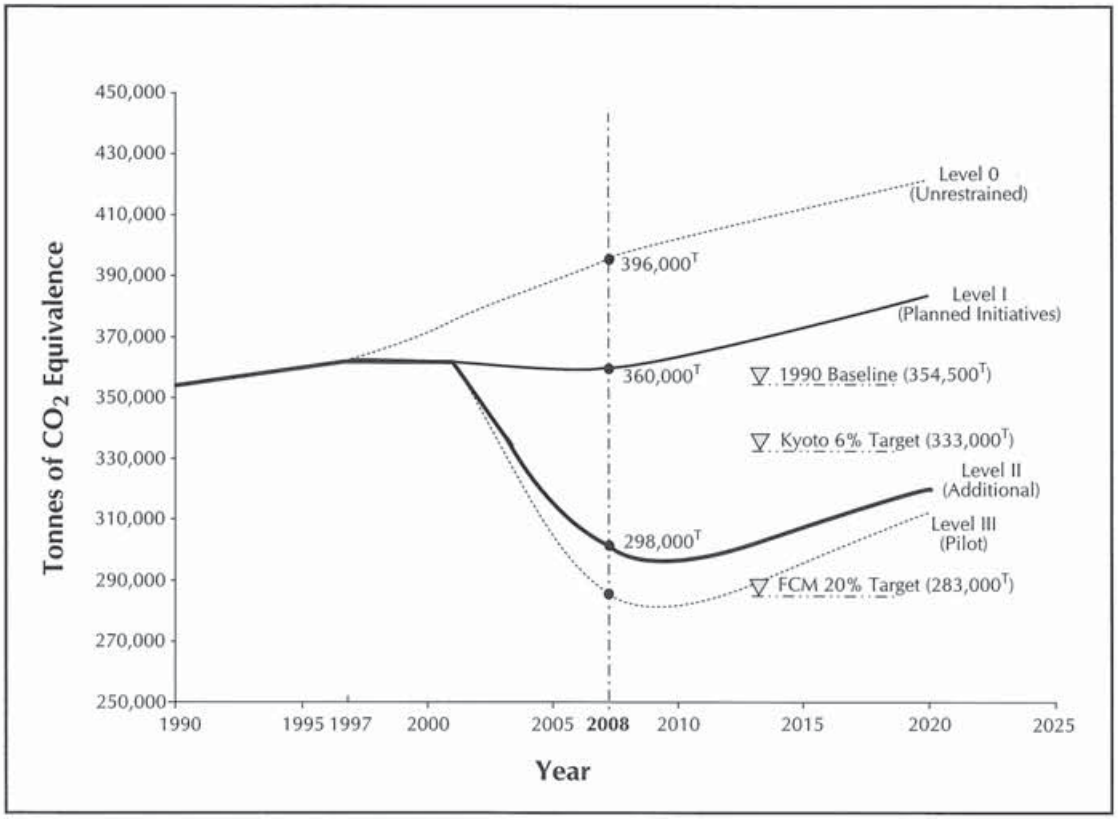
In 1998, a task force comprising representatives from key City departments, the local natural gas

Table 1: Summary of Edmonton City Operations Action Plan

Projects		Annual GHG Reduction at 2008 (Tons)
Level I: Already Planned Expenditure		
Buildings	• $5M Energy Management Revolving Fund for retrofits • En Vest supplement to EMRF (Boards/Authorities)	16,750 3,000
Transit Fleet	• Purchase new 40′ buses • Purchase articulated buses	8,500 500
Municipal Fleet	• Replace obsolete vehicles	1,250
Street Lighting	• Improve design through new Standards Manual	1,000
Wastewater Treatment	• Install fine bubble diffusers	6,000
	Total, Level I	**37,000**
Level II: Additional Projects		
Buildings	• Design new building to National Model Energy Code • Awareness and training • Monitoring and reporting	20,000 500 300
Municipal Fleet	• Driver training and awareness	700
Street Lighting	• Replace luminaire inventory • Install circuit reduction devices (based on preliminary evaluation)	39,000
Wastewater Treatment	• Winter shut-down of UV • Develop utilization of digester off-gas and final effluent	900 500
	Total, Level II	**61, 900**
Level III(a): Piloting to Enable Level III(b)		
Buildings	• Pilot test new building energy efficiency and alternative technologies	TBD*
Transit Fleet	• Pilot test alternative propulsion technologies (e.g. hybrid or fuel cell)	TBD*
Municipal Fleet	• Pilot test alternative propulsion technologies and special fleet design criteria	TBD*
Green Spaces and Sinks	• Review of urban forest (i.e. age, species, emissions potential, etc.)	TBD*
	Total, Level III(a)	**TBD***
Level III (b): Initiatives achieve 20% reduction	Level III(a) pilot testing will verify the technical suitability and evaluated likely costs and savings of the new and emerging technologies. Specific recommendations for implementation of Level III(b) would be brought forward as the results from Level III(a) are determined.	

**TBD: To be developed*

Figure 1: City of Edmonton Operations



supplier, and the City owned electrical supplier was established to develop a GHG emissions reduction plan for City operations. The task force determined a number of strategies and initiatives that would reduce greenhouse gas emissions. These were broken into:

Level I: Already Planned Expenditures

Level II: Additional Projects

Level III: Piloting of Emerging Technology/Processes

Table 1 provides a list of projects with the expected GHG reductions.

Level I (already planned expenditure) yields GHG reductions of 31,000 tons, but the net impact is reduced significantly due to emissions arising from projected growth in facilities and services.

Level II, recommending new initiatives of $20.7M, provides an additional 16 percent GHG emission reduction and a corresponding operational savings of $22.1M over eight years. Over twelve years, these savings increase significantly to $41.8M as the effect of the improvement measures become fully realized.

Level III provides an additional 4 percent reduction and will be required (in addition to Level I and II) to reach the full 20 percent target. Level III consists of (a) piloting and (b) implementing new technologies to reach the 20 percent reduction target and constraining GHG emission increases beyond 2008.

Figure 1 provides a graphical representation of the impact of the proposed actions in achieving various reduction targets. Edmonton City Council accepted this strategy in October 1999 with implementation currently under way.

Community-wide GHG Emissions Reductions

In addressing the issue of reducing community-wide greenhouse gas emissions, a consensus building process is under way. The project was initiated in fall 1999 with expected completion in mid-2000. The key element in this process is the creation of the CO_2 Reduction Edmonton (CO_2RE) project that is intended to identify viable strategies and develop consensus on a reduction plan to address Edmonton's greenhouse gas emissions. The project's specific objectives are as follows:

- Identify community-wide

options for GHG emissions reduction measures

- Determine extent to which measures will be cost-effective and attainable
- Determine likely acceptability of proposals to community stakeholders
- Obtain approval for implementation of key strategies for community-wide reduction of greenhouse gas emissions
- Initiate implementation and monitoring of community-wide initiatives for reduction of greenhouse gas emissions

In order that key stakeholder input was obtained, the CO_2RE process has citizen, commercial, institutional, industrial, residential, municipal, provincial, and federal government representation. The project began with a workshop that was designed to provide the various stakeholders with a common understanding of the key issues and options for resolution. The following draft vision statement was developed during the workshop:

VISION for EDMONTON'S APPROACH to CLIMATE PROTECTION

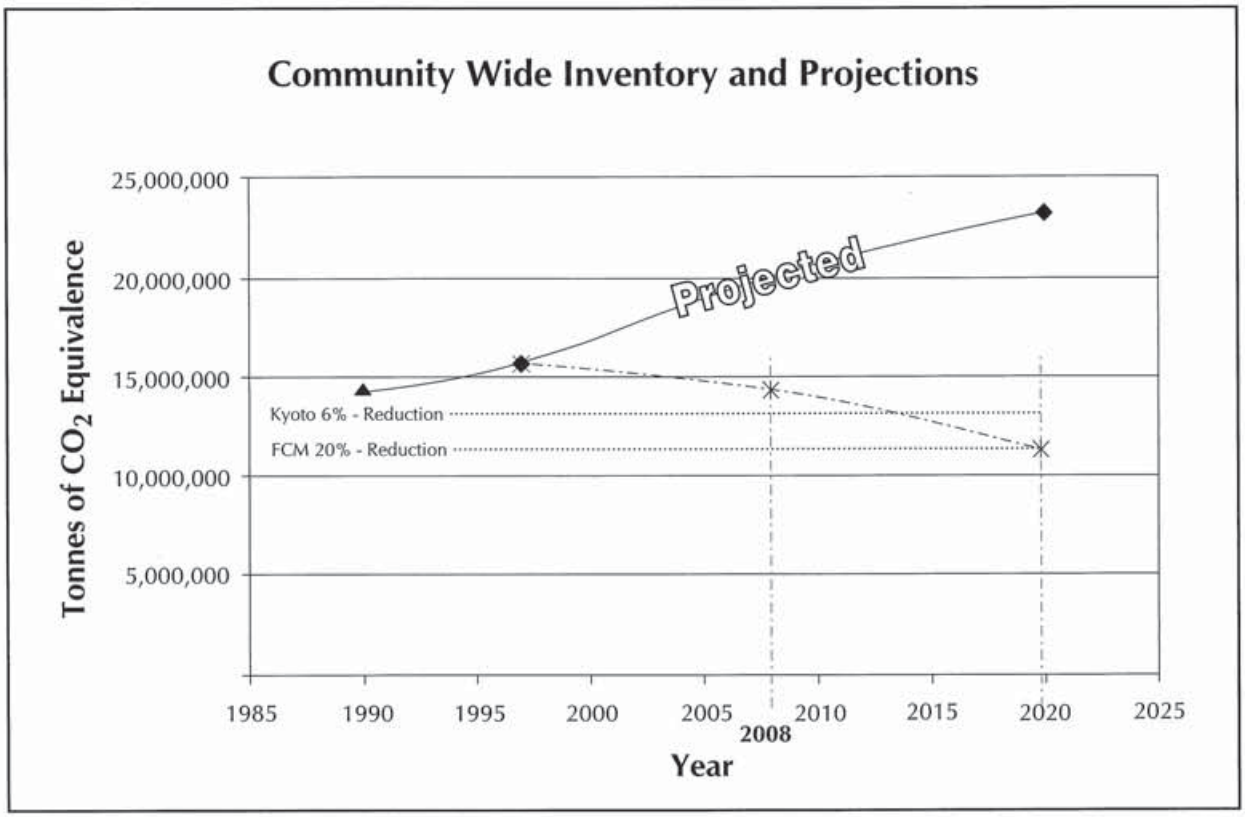
> Edmontonians accept the challenge of reducing GHG emissions and adopt measures and lifestyles that significantly reduce greenhouse gases beyond the Kyoto targets by 2010 and will complete the transition to sustainable energy forms by 2050.

Individual ideas and groups of related ideas were then classified into strategies or supporting initiatives and sorted into the following strategic action areas:

- Reduce overall energy use community wide
- Replace fossil fuel energy with alternates(s)
- Sequester carbon from the atmosphere
- Increase community stewardship regarding climate protection
- Develop and maintain a comprehensive GHG inventory

Initial targets for GHG emissions reduction were then assigned to the strategies. Estimates were then made for the reduction initia-

Figure 2: Trial Pass for Deriving GHG Emission Reduction Target



tives and related enabling actions. When totals for all of the strategies were combined, a reduction potential in the order of 20 percent by 2020 was indicated as being achievable as shown in figure 2. However, meeting the Kyoto 6 percent target reduction by the timeframe 2008-2012 appeared to be much more difficult. Preliminary indications were that significant GHG emissions reductions can be obtained in the institutional, commercial, and residential sectors, but emissions would continue to increase with growth in the industrial sector. Although 2050 was identified in the draft vision statement, the CO_2RE Team decided that determining potential reductions beyond the year 2020 to any degree of accuracy was not possible.

Photograph courtesy of Michael Broadway

Edmonton is encouraging people to live close to downtown by promoting the conversion of old warehouses into loft apartments and in the process reducing residents' journey to work.

A formal consultation process with a broader stakeholder group is currently under way which will refine the GHG emissions inventory and the various options for reduction. Approval of the project's recommendations will be sought in April/May 2000 from the various stakeholder organizations. Outline action and monitoring plans will be available to enable implementation to be initiated immediately afterward. The CO_2RE process and recommendations will be conducted with due regard for the findings of the ongoing Canadian Municipalities Partners for Climate Protection Program and the (Alberta) Provincial Climate Change initiative as it is important to remain cognizant of wider political ramifications and potential implications for the energy producing industries

The results that have been obtained so far are based on initial estimates only. These represent a tremendous first step in gaining an idea of what might be possible and the extent to which efforts will need to be made to gather information and develop community consensus on an agreed forward path.

Summary

The City of Edmonton has developed a plan for reducing greenhouse gas emissions from its own operations. The City is currently developing a local action plan to reduce community greenhouse gas emissions. This process involves key stakeholders in all phases of developing the plan. Previous planning experience indicates that this will result in a more effective implementation of the recommended strategies which in turn increases the likelihood of achieving the greenhouse gas emission reduction targets. Edmonton's experience illustrates that the development of 'Local Action Plans' by municipalities around the world can play an important role in addressing climate change.

For further information concerning Edmonton's Greenhouse Gas Reduction Strategy contact Mark Brostrom, P.Eng., Office of the Environment, City of Edmonton, 9803 - 102A Avenue, Edmonton, AB. Telephone: 780-496-5992, Fax: 780-496-5657, e-mail: mark.brostrom@gov.edmonton.ab.ca.

Photograph courtesy of Michael Broadway

Victoria Avenue in Thunder Bay's South Core

Downtown and Winter Cities: More Than Urban Design Part II

BY MICHAEL BROADWAY

Enclosed shopping malls and upper level pedestrian walkways have become common features in the downtowns of North America's winter cities. These designs are based upon the premise that by protecting office workers, downtown residents, and visitors from severe winter conditions the area will become more attractive to these groups and add to a city's livability. But as an article in the previous issue of *Winter Cities* illustrated, the incorporation of such designs does not guarantee sustaining a downtown's retail function. This article provides a case study of downtown winter city design in Thunder Bay, Ontario, and draws some lessons to be learned for winter cities concerned with downtown revitalization.

Developing Livable Winter Cities

Downtown planners in dealing with the challenges posed by severe and long winters have sought to improve the area's visual environment and provide protective structures. Strategies designed to improve the visual environment focus on adding color to street furniture, outlining buildings with lights, and constructing ice sculptures. Protective structures have taken the form of elevated pedestrian walkways and underground and enclosed shopping areas. Calgary, Minneapolis, and St. Paul have constructed extensive above-ground

pedestrian walkway systems linking offices, shopping malls, parking garages, hotels, and entertainment complexes within their downtown areas, while Toronto and Montreal have established extensive underground pedestrian malls that serve the same function.

Thunder Bay as a Winter City

Thunder Bay is located at the northwestern corner of Lake Superior. The city was formed in 1970 with the amalgamation of the cities of Fort William and Port Arthur and MacIntyre and Neebing townships. Winter is long and cold with average monthly temperatures falling below freezing from November to March. Measurable snowfall occurs from October to the end of April and amounts to approximately 78 inches. Thunder Bay's primary functions are to serve as a regional service center for northwestern Ontario, a transshipment point for grain from the Prairies, and a manufacturing center for the forest products industry. The metropolitan area has experienced very slow population growth since the late 1970s due to the city's relative isolation from major markets, the reduction in grain shipments through the port, and competitive pressures within the forest products industry to substitute capital for labor. Since 1970 suburbanization of retail activity adversely affected the city's two downtown districts — Port Arthur in the north and Fort William in the south. The city responded to these challenges with urban revitalization projects that incorporated elements of winter city design in each core area. It is these schemes that are evaluated.

Thunder Bay and Downtown Winter City Design

The south core (Fort William) consists of a six-block area of Victoria Avenue between Simpson and McKellar Streets. There is no evidence of any visual enhancements in the two blocks between Simpson and May Streets. Between May Street and the entrance to the Victoriaville Centre, the streetscape had been substantially modified with the addition of deciduous trees, hanging baskets from street lamps, colored garbage receptacles, and small lights in trees. To the west, between Archibald and McKellar Streets, a number of deciduous trees have been planted. The principal structure designed to protect shoppers from severe winter conditions is Victoriaville; outside the mall there are no shelters or other protective devices along Victoria Avenue.

The mall has its origins in the 1970s and was conceived as a means of revitalizing retail and commercial activities. In 1974 the enclosed Keskus Mall opened in the north core (Port Arthur), while during the same decade the Intercity Shopping Centre between the two core areas continued to expand. The net effect of these developments was to reduce the south's core retail sales. In response, the city developed Victoriaville — an enclosed climate controlled mall that was constructed over the intersection of Victoria Avenue and Syndicate Street. The mall extends southward from the intersection, and a parking garage for over 600 vehicles was attached to the structure. Victoriaville was considered a model of winter city design when it opened as it "enhanced" the image of the south core, "improved" pedestrian safety and comfort, "increased" social interaction, and "brought people back to the center of the town." By the late 1990s it was essentially empty of retail establishments with the mall's major tenants being the city of Thunder Bay, the province of Ontario, the Canadian government, and three banks.

A review of planning documents indicates that five years after the mall opened nearly 50 percent of the mall's retail space was still vacant, while over seven hectares of vacant land existed in the surrounding area. These conditions led a consultant to recommend that improvements be made to the area's traffic flow, parking availability and surrounding streetscape. Despite their implementation, the mall continued to have difficulty attracting tenants. A 1989 report attributed the "failure" of Victoriaville to its opening at the time of Canada's worst recession in fifty years, the absence of a national chain store to anchor the complex and help generate traffic for other stores, and the lack of any professional management to determine the appropriate mix of stores or market the area. These conditions were exacerbated by the south core's small trade area, a declining population, and the loss of over 1600 public and private sector jobs from the area. Finally at the same time Victoriaville opened, the Intercity Mall, a regional shopping mall was constructed three miles north of the south core that attracted shoppers with its convenience, variety of stores, and cleanliness.

Red River Road between Cumberland and Court Streets is the north core's downtown area. Its principal visual enhancements consist of banners hung from street lamps, a number of deciduous trees, and small lights outlining buildings. Opposite the entrance to the Keskus Mall are two small-protected seating areas and flowerbeds. Beyond these minor modifications, little attention has been given to the streetscape. Newspaper vending machines are chained to street light support structures in a haphazard manner, parking meters and street light supports are painted black, and garbage cans are constructed of wire mesh.

In the late 1960s several historic blocks south of Red River road between Cumberland and Court Streets were demolished as part of a federally-funded urban renewal project. In the wake of the demolition, the Keskus Mall was constructed, the north core's principal winter city structure. The mall has on-site parking and was anchored by Eatons, a large department store. In fall 1997, the store was closed as part of the company's nationwide corporate reorganization effort to avoid bankruptcy. The loss of this anchor and consumers overriding preference for suburban shopping centers meant that by the summer of 1998, two-thirds of the stores were vacant.

Photograph courtesy of Michael Broadway

Thunder Bay's Victoriaville Mall

Conclusions

Thunder Bay's two downtown areas contain evidence of winter city designs with minor visual enhancements to the streetscape and the construction of climate-controlled shopping centers. But 20-30 years after their implementation, these efforts have failed to revitalize or even sustain the downtown retail function. The demise of the north core as a retail center, as with the south core, has little to do with winter city design but instead a corporate reorganization and the overwhelming advantages of suburban shopping centers with their ease of access, variety of stores, and overall convenience. Moreover, after the city of Thunder Bay was amalgamated, the official council policy was to protect the old retail cores of Fort William and Port Arthur in defiance of much stronger market forces. This led to the construction of the Keskus and Victoriaville malls. Both malls were poorly conceived with minimal market research with the result that neither achieved their goals of renewal and revitalization. All that is left in each downtown shopping center are low-order services that cater to the local workforce such as restaurants and drug stores. Thunder Bay's experience with winter city design and downtown revitalization indicates that without a large residential population base to support a retail sector, shopping malls as a means of urban revitalization are doomed to failure. Instead public investments need to be directed toward enhancing the attractiveness of downtowns as residential locations. This can be accomplished by increasing accessibility to such amenities as waterfronts and parks and encouraging the transformation of old buildings into apartments and offices. Such a strategy can contribute to a city's overall sustainability by reducing the distances that people travel to work, shopping, and entertainment. In short, in order for downtown winter city designs to succeed they must be part of a broader strategy to build sustainable communities.

Michael Broadway is Professor of Geography and Head of the Department of Geography at Northern Michigan University. He can be contacted at the Department of Geography, Northern Michigan University, 1401 Presque Isle Avenue, Marquette, MI 49855. Telephone: 906-227-2636, e-mail: mbroadwa@nmu.edu.