

Planning in Cold Climates: A Critical Overview of Canadian Settlement Patterns and Policies

by **Norman Pressman & Xenia Zepic**
1986

The Institute of Urban Studies





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PLANNING IN COLD CLIMATES: A CRITICAL OVERVIEW OF CANADIAN SETTLEMENT PATTERNS AND POLICIES

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PREFACE

In each and every historical period, a legacy remains for posterity in the form and pattern of our cities and in the shape and function of our buildings and open spaces. This is the case for a broad hierarchy of settlement functions, locations and sizes--neighbourhood, village, town through to city, metropolis, and urban agglomeration. The manner in which land-uses are distributed in space reflects the ways in which we carry out everyday tasks and perform both necessary and optional activities. These can be achieved with great convenience or inconvenience, depending on the prevailing conditions both in the man-made environment and in the natural setting. For example, in the daily life of the urban (or even rural) inhabitant, it is imperative to be capable of making critical journeys to work, to schools, to shops with ease and within relatively economical means. A fundamental requirement, therefore, of a livable community is an appropriate arrangement, organization and management of housing, employment, services and recreation with effective access and connections among these components.

In the vast majority of instances, our modern northern environments turn the winter experience into anything from nuisance to nightmare, particularly in built-up, urban areas. The low angle of winter sun has great difficulty penetrating buildings and open spaces--with shadows frequently cast which are up to fifteen times the height of the buildings themselves. Snow melts into slush, sometimes freezing over, creating driving hazards and severely inconveniencing pedestrian movement. Wind chill has the effect of making one feel much colder than the actual air temperature, alone, might suggest. Lengthy exposure to the cold--for example, waiting for a bus in -20°C , for twenty minutes which can easily produce frostbite--is debilitating and extremely unpleasant, if not painful. Walking on icy sidewalks is dangerous, especially for the elderly and handicapped. Shovelling snow, is for many, a hazardous activity. Accident rates climb steeply in both rural and urban areas on roads and

expressways during heavy snowfalls and blizzard-like conditions, when visibility is drastically reduced and road surfaces are slippery.

Despite these numerous inconveniences and the concomitant social risks, architects, planners and policy analysts still continue to persist in formulating development policies which are orientated toward the brief summer season.

The organization of functions and activities in both space and time is all the more essential under conditions of severe, extreme climate. It is of the utmost importance to encourage and apply development policies and microclimatic principles in order to moderate the severity of climate on outdoor patterns as well as to create "indoor" and "protected" spaces for human activities.

The maxim that "people follow jobs" is slowly and gradually being transformed to that of "jobs follow people". Specialized workforce populations, particularly in newly emerging, technology-based industries, are deciding that they desire to locate in amenity rich places--those with favourable climatic settings, good cultural facilities, excellent institutions such as schools and hospitals, locations where a high level of public safety is the norm and where access to high quality recreational space can be had--areas which are perceived as "livable environments".

In fact,

An assumption underlying many redevelopment efforts today is that economic revitalization of inner urban areas cannot be achieved unless the city's livability itself is improved, for the success of firms operating in urban centers is directly related to work force satisfaction with living and working conditions in the community. The economic viability and fiscal condition of a city are, in the long run, directly related to

its livability. Destruction of livability in cities, or failure to ensure it in the first place, has been directly related to economic and financial deterioration in many mature cities. This is even truer in an age of increased affluence, when the majority of householders have some choice as to where they live and work.*

If towns and communities in cold regions are to retain their inhabitants, and if the flow of people from colder to warmer regions, either within a given country or across international borders, is to be reduced, livability factors will have to be enhanced--and this will have to include climate-responsive decisions. One aspect of the problem can be resolved by making public and semi-public space climate-controlled, that is, by placing it indoors, however,

A livable winter city must deal with a great range of livability factors which have nothing to do with winter. It is not enough to solve conditions peculiar to winter in order to make a livable winter city. And further, the very act of solving the temperature problem by means of enclosure makes it more difficult to solve other problems of urban livability. If the concept of winter livability is to grow and evolve with any credibility, as we all hope it will, it must move very strongly in the direction of integrating considerations. It is counter-productive to accept a climate controlled town centre, for example, as a step forward if all it contributes to livability is relief from the cold. . .While the provision of interior public places has an important role to play, I think the amelioration of the outdoor climate is the greater challenge--and, indeed, the approach in greatest need of incorporation into Canadian cities. . .My intention is to encourage city designers to place winter livability in context with other aspects of livability, and, to develop all these aspects in parallel, so that the gain in one does not mean the sacrifice of another.**

* J. Barnett, J. Riley, J. Robin, R. Widner, Making Cities Livable. Academy for Contemporary Problems, Columbus, Ohio, April 1980, 2-3.

** Roger du Toit, "Livable Winter Cities: Potential Conflicts between Comfortable Temperature and other Aspects of Livability", Livable Winter Newsletter (Livable Winter City Association), Toronto, December 1985, Vol. 3, No. 6, 8-11.

Winter cities must be made amenity rich. They must serve as magnets which are attractive to all segments of society. They must celebrate human dignity and be places which are lively, diverse, festive and creative. If civic loyalty and trust are to evolve, then they must be provided an opportunity to fully develop. All sorts of positive gestures must, therefore, be initiated by government, at the local level, as well as by the business community and other voluntary associations.

The humanization of the urban environment frequently requires attention to details rather than creation of imposing buildings and plazas that may dwarf the human scale in the monumental . . . European efforts to reintroduce the human scale into the city are based upon a shift from large-scale demolition and redevelopment to smaller scale human details of renovation; rehabilitation; pedestrianization; and enhancement of the physical, social and recreational quality of the environment.***

The purpose of this paper is to attempt to outline the spectrum of winter-related problems, to set the context within which some realistic goals can be formulated--in cold climate regions--and to develop strategic approaches which, if implemented, will ultimately minimize the harsh effects of the winter season on man and his urban environment. The major intent of the authors has been to develop a fundamental understanding for and appreciation of winter-induced issues in such a manner that they can be dealt with in a rational fashion. The broad host of dilemmas encountered in rural, regional and urban environments has been viewed within a climatic perspective, thus adopting a rather unique position, since very few studies or documents have ever looked at urban problems from this stance.

While some basic aspects--such as a return to vernacular planning and building traditions, and fundamental physiological human requirements--have

*** J. Barnett, J. Riley, J. Robin, R. Widner, op. cit., 3.

been developed in the initial sections of the paper, it was our desire also to undertake a more general overview of the evolution of Canadian urban form and to evaluate this pattern within a framework which would permit corrective measures to be applied to the existing built-up fabric as well as to vacant, undeveloped land situated on the urban periphery.

In attempting to delineate the broad range of winter-induced dilemmas which require attention, a hierarchy of planning levels can be used within which various specific problem areas can be addressed. Cities in the cold need to consider development densities from a unique vantage point. They need to address the nature and use of "year round" urban spaces and facilities as well as the transformation into winter use of essentially summer oriented ones. Energy conservation concerns must be carefully analyzed as must human behaviour patterns. In fact, virtually all of the major planning, development, architectural and policy-related considerations that must be entertained in the design and management of urban places have to be attacked with an especially rigorous approach when applied to the problems of winter cities. The main reason is that, in the past, no systematic analysis has even been attempted on a broad scale of concern for urban development under severe climatic conditions.

It is the hope of the authors that this paper will provoke intensive dialogue and debate among those concerned with and responsible for the development of policies, programmes and projects in harsh climatic settings. Clearly, if our communities are to become more acceptable during the period of most intense cold, thorough and extensive research and pilot projects will have to be undertaken. Above all, climate will have to play a much more critical role than it has ever done in the past, if Canadian settlements are to successfully confront the unique circumstances under which future decisions will have to be taken.

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1.0 INTRODUCTION: MAN, PLACE AND MEANING

When confronted with conditions of extreme climate resulting in environmental discomfort--at virtually any geographic location or latitude--man has almost always exercised ingenuity in the struggle against nature and in the attempt to defend and protect himself from extremes of drought, poverty, wind, heat and cold. Often, such ingenious response, exhibited within the fabric of the built environment, has created a highly respected vernacular building tradition which is sensitive and responsive to the elements of climate, site, materials and cultural imperatives. Such collective form is indicative of a total "man-place" relationship and despite the fact that such great examples of urbanism developed under so-called primitive conditions of history, they are held up and being rediscovered today for the fundamental concepts and principles which are seen as quintessential to the process inherent in generating humanistic designs and urban developments.

The most critical component of vernacular building is the ability to instill the psychological functions of orientation and identification with the immediate environment--to know where one is and to understand how one is in a certain place or space in time. Familiarity with one's surroundings, or being "friends" with the environment can be taken as synonymous with the term "identification".

Nordic man has to be a friend of fog, ice and cold winds; he has to enjoy the creaking sound of snow under the feet when he walks around, he has to experience the poetical value of being immersed in fog, as Hermann Hesse did when he wrote the lines: 'Strange to walk in fog! Lonely is every bush and stone, no tree sees the other, everything is alone . . .' The Arab, instead, has to be a friend of the infinitely extended, sandy desert and the burning sun. This does not mean that his

settlements should not protect him against the natural 'forces'; a desert settlement in fact primarily aims at the exclusion of sand and sun and therefore complements the natural situation. But it implies that the environment is experienced as meaningful.¹

Where one can feel "at one" with the surroundings, especially when climatic determinants have been carefully taken into account, we can assume the environment to be "responsive". The buildings, villages, towns and cities of the past which have grown slowly and evolved gradually in response to social, political, cultural, economic and climatic forces tend to be more responsive to human needs than the cities which were "planned" and built in a short period of time and were not given the opportunity to develop mechanisms of sensitive adaptation to the requirements of their users. Such "non-pedigreed" building known today as the vernacular has also been labelled anonymous, spontaneous, indigenous, traditional or rural.

There is much to learn from architecture before it became an expert's art. The untutored builders in space and time-- . . . demonstrate an admirable talent for fitting their buildings into the natural surroundings. Instead of trying to "conquer" nature, as we do, they welcome the vagaries of climate and the challenge of topography . . . the beauty of this architecture has long been dismissed as accidental, but today we should be able to recognize it as the result of rare good sense in the handling of practical problems.²

Norberg-Schulz has suggested that man's merits do not count much if he is unable to dwell poetically.

Only poetry in all its forms (also the 'art of living') makes human existence meaningful, and meaning is the fundamental human need . . . To make practical towns and buildings is not enough. Architecture comes into being when a 'total environment is made visible', to

quote the definition of Suzanne Langer. In general, this means to concretise the genius loci . . . by means of buildings which gather the properties of the place and bring them close to man.³

2.0 VERNACULAR FORM, CLIMATE AND COMMUNITY DEVELOPMENT

Vernacular building has received so much attention of late that it is seriously considered by many prominent architects and urban planners as the genesis of new theories influencing urban development, architectural ideas, and built forms. So powerful is the systematic study of these forms of the past that:

what is undeniable to the eyes of architects, builders, sociologists and ethnologists is that it stays a source of analysis, of reflection, inspiration and aspiration and, as a reference for ethnic and aesthetic models and forms, particularly for didactic reasons.⁴

While much of this tradition appears arbitrary, what is important is that, without exception, the forms have always been a direct expression of life's realities embodying specific functions and activities while satisfying local needs from a culture-specific viewpoint and social perspective. The social requirements are almost perfectly integrated within the built form in a manner which makes it difficult to differentiate one from the other, to know which element is to be viewed as 'stimulus' and which one as 'response'. Social values, building materials, orientation, climate and site have been uniquely woven together, developing simultaneously an inventiveness, responsiveness, human scale, unity within diversity, and plastic qualities which never cease to stimulate the senses and the imagination. While these examples serve the functions of the societies which have built them, the spatial experiences reign supreme.

Regarding the climatic variable,

We note that it is rare for all the climatic data to have the same importance in architectural design, but vernacular architecture certainly does not know of any constructions which have not been adapted to climatic conditions.⁵

The majority of the vernacular examples to which homage is regularly attributed tends to be found in earlier civilizations of the warm and temperate climatic zones. A few name places should suffice to communicate some of the well known landmarks embodying these collective treasures of urban culture: Machu Picchu in Peru; the Italian Hill Towns such as Anticoli Corrado, Positano or San Gimignano; the Cliff Dwellings of the Dogon tribes; the archetypical Islamic towns such as Marrakesh or Fez; desert fortresses of Southern Morocco; Greek villages; domestic forms of Iran and the Middle East; tree-houses of New Guinea; roof details of Hyderabad Sind in West Pakistan; and many others of which the mud vernacular architecture of the desert is particularly noteworthy, especially in the countries of Mauritania, Senegal, Niger, Mali, Morocco and Iran. This desert vernacular demonstrates an almost unheard of diversity in volumes and shapes.

Nomads have developed tents of extraordinary lightness and durability. Palaces of stone and mosques of fired brick and tile rank among the world's great monuments. Between fabric and pole on the one hand and chisel and kiln on the other lies that most forgiving of materials, sun-dried mud, a constituent of the shelter, in varying climates, of some 1.5 billion people.⁶

Clearly, this vast array of case studies is located in Africa, South and East Asia, South-Central Europe and the Mediterranean regions--those

locations in which early civilizations first flourished; where limited technological know-how was available and where change occurred very slowly and gradually. Time, therefore, allowed for adaptation of urban form to climatic and lifestyle parameters. However, where do the colder climatic zones enter this perspective of "building with nature?" Are there examples of "cold-climate" responsive environments?

There are actual examples of what might be referred to as "nordic vernacular". Built forms such as the igloo which insulates occupants against temperature extremes--a veritable thermal fortress or thermally-sheltered cocoon--a sort of artificial, man-made cave serves to illustrate the case. This dwelling shape or 'snow house' responds in an admirable manner to a sense of far northern place. The adaptation has incorporated an understanding of the climatic imperatives and local materials which typically embody:

- 1) small spaces
- 2) a sense of enclosure
- 3) minimal openings
- 4) massive materials

The classic example of the Inuit sensitivity to and understanding of climatic place is their more than a dozen and a half words for different varieties and textures of snow. There are local dialect words denoting such concepts as snow that collects on trees, snow on the ground, wind-beaten snow, fluffy taiga snow, drifting snow, smooth snow surfaces of fine particles, rough snow surfaces of large particles, bowl-shaped depressions in the snow, very deep snow, spots blown bare of snow, areas of deep snow persisting all year round, and other similar examples. Clearly such ideas are indicative of the complex and intricate weave of language, culture, and climate.

In Iceland, where severe winds and driving rain are more common than heavy snowfall, a typical farm cluster is compact and half buried for protection from the violent winds. Main frontages face south and possess apertures such as doors and windows. Roofs must insulate thermally and have substantial wind resistance while the use of dark colours on the south-facing frontages increase passive solar energy gain.⁷ Scandinavian farm buildings usually group small-roomed buildings around a central courtyard with an open fireplace in the central dwelling space which radiates warmth to the surrounding living spaces. The courtyard enclosure acts as a device creating a favorable micro-climate protected from exterior winds, with people and animals living together either on a side-by-side basis or with animals below and people above thereby benefitting from the released heat. Swiss farms situated in the Jura mountains are formed of continuous dwellings under one large roof with western frontages carefully screened from strong rain-bearing winds. Those located in the Bernese Oberland have extremely large roof overhangs sheltering the working areas beneath the barns.

The infatuation with the urban forms derivative of folk cultures in Southern Europe and the Mediterranean basin can easily be explained since the history of civilization had its birth and development in the fertile regions close to the 21 degree C annual isotherm, a temperature range of 15 C - 25 C degrees and a relative humidity of 40%-70%. Such townsites can still be visited and experienced and, in fact, many are in the midst of being rehabilitated and preserved through architectural preservation activities sponsored by various national governments in conjunction with United Nations help and emergency programmes such as those in operation at Split, Yugoslavia. What is critical in attempting to develop climatically and socially responsive policies and built forms is to recall the spirit of the builders of gone-by epochs, their approach to the problems of urban living, and their sensitivity to the forces which directly and indirectly influence the shape of man-made environments.

When planning and designing under extreme climatic circumstances, for both hot and cold conditions, the principles have often been similar--the evolution of a balance between protection from the negative aspects of climate and exposure to the beneficial aspects.

It is necessary to be exposed to the natural environment and to the outdoor environment even if it is unpleasant at times.⁸

The vast, enclosed public and semi-public spaces (galleries, shopping centres, mixed-use urban complexes, etc.) over-react to one specific element of climate--that of temperature. They perpetuate the notion that a stable thermal environment is the only desirable goal responding to man's physiological needs. Such a position, while resulting in thermal protectiveness, nevertheless, creates "an environment that does not exist naturally on earth and which consequently has nothing to do with man's evolution".⁹

While the spirit of vernacular forms of the warmer climes continues to invade our collective memories, cold-climate extremes pose different problems from those encountered in the more southerly latitudes. In fact,

it is more difficult to accommodate to the extremes of cold than to the extremes of heat. Shade can be created and the breezes caught with relatively simple means...Drought can kill over a period of time, but extreme cold can kill within minutes. Even the Inuit, masters of the art of survival, have frozen to death.¹⁰

Frederick Gutheim has argued that in our infatuation with Italy and Greece,

we have built broad piazzas and boulevards which have no place in northern climes, and that the design of northern cities should be rooted in the forms of the north, not the

Mediterranean--for cities which have been well designed for the cold are often surpassingly lovely.¹¹

In adopting and importing urban forms from the south--axial vistas, public squares, open spaces, treed allées and boulevards--we are surely using an architectonic grammar which is unsuitable for cities which, for a large part of the year, must contend with conditions of severe wind chill, frost, ice, snow and bitter cold temperatures. The geometric and compositional properties of late-Renaissance Europe and the Beaux-Arts tradition seem most inappropriate for cold, snow-ridden towns and cities. Policy analysts, urban planners, developers and designers would therefore be wise to re-evaluate their policies and positions when working in such extreme settings.

Such a vocabulary of form could hardly be less relevant to the concerns of citizens in these circumstances; not only does such pattern-making contribute little to their lives--it actually hinders them in the course of their movements through the city, and denies them the possibility of using and enjoying their urban environment to its full potential.¹²

3.0 TOWARDS A WINTER GRAMMAR AND RESPONSIVE URBANISM FOR HIGH LATITUDES

In attempting to resolve some of the dilemmas raised by extreme cold in the realm of architecture and urbanism, a voluminous number of buildings has recently emerged which make use of the concept of "atrium" and "galleria"--enclosed, glazed public and semi-public spaces which can be heated throughout the cold season. While in countries such as Canada, such development has been applied largely to huge commercial and shopping centre projects, in Sweden, housing projects have been built which have adopted this idea. For example, in Peter Broberg's successful residential scheme at Eslöv--the Gardsåkra development--two-three-storey residential dwellings flank an "enclosed public street" which

serves as a climate-protected living room for the inhabitants surrounding this public space. Additionally, community facilities such as day-care centres, kindergartens, schools, hobby rooms and senior citizen spaces have been incorporated. These schemes employ the use of "greenhouse technology", essentially for energy conservation reasons; to cut the heating costs for individual dwellings. In so doing, they also create a semblance of community-life which, under normal conditions, is drastically reduced due to the increased amount of time northern dwellers spend indoors during the harsh, winter period.

However, the elements of "atrium" and "galleria" are but two aspects of the new "winter-orientated grammar", which was initiated by architect-pioneer Ralph Erskine whose permanent move from England, during the Second World War, to Sweden brought him into contact, for the first time, with the violent Baltic winter climate and thus forced him to think systematically and rationally about the unique qualities which buildings and urban spaces must possess at truly northern latitudes. Not only was extreme temperature a basic component of Erskine's thoughts, but he also had to accommodate factors of intense wind chill, short hours of sunlight and the problems of drifting and blowing snow.

Erskine's special interest in the way buildings function in their particular climate is fed back into all his designs, and not only those in northern latitudes. Matters of orientation, protection from prevailing winds (or noise pollution), sun screening, ventilation, cold bridging of outside elements to the interior and rain-water disposal are all examined to determine their essential characteristics and how they can be expressed architecturally.¹³

By his own admission, Erskine has drawn much inspiration from vernacular sources and traditions such as one may find in Bantu villages. In the context of vernacular building, he looks forward to:

the development of an architecture which finds poetry in the economic use of resources and which could provide the many buildings needed in modern communities, and to an architecture of the people for the people made by those users who are prepared for the necessary degree of involvement. Thereby could some of the skill used in creating an economical, involved and appealing environment, such as we enjoy in visiting old European villages and townships, be regained.¹⁴

Erskine has always been keenly sensitive to the rigours of living in northern remote communities with the accompanying psychological pressures associated with such environments. In an article for The Polar Record of 1968 for the Scott Research Institute, he wrote:

Here houses and towns should open like flowers to the sun of spring and summer but, also like flowers, turn their backs on the shadows and the cold northern winds, offering sun-warmth and wind-protection to their terraces, gardens and streets. They should be most unlike the colonnaded buildings, the arcaded towns and matt-shadowed streets of the south Europeans and Arabs, but most similar in the basic function--of helping people to maintain their skin at a comfortable 35 degrees C. When studying the beautiful towns of the south, whether old or new, it is not the forms themselves which should interest us, but the inventiveness and artistry with which people solved the needs which were peculiar to their situation and time, the comfort and beauty which they created. Only by such methods can arise a personal and indigenous Alaskan, Canadian, Scandinavian or Northern Russian tradition.¹⁵

His philosophy embodies a deep and acute sense of social awareness coupled with climatic imperatives, especially under extreme conditions. His architecture and town design is, above all, adaptable for varied circumstances--a different approach, through the use of concepts of grammar and form, from the ubiquitous international style whereby buildings of similar volumes, materials and facade treatment are erected in varying cultural and climatic settings and adjusted to local needs by the use of expensive, energy-consuming resources.

Indeed, it has been most unfortunate that the influence of climate on human well-being has generally been ignored in the cold-climate regions, which, typically, also engender highly developed economies and technological prowess.¹⁶ These two features--money and technology--seem to have been the major means whereby inhospitable environments have been restrained or entirely overcome. However, the vast majority of examples of climatic control or modification occur at the micro-level, e.g. more effective forms of insulation, new roof panels and wall systems, double and triple-glazed fenestration and increasingly sophisticated hermetic seals. It is infrequent that the meso-level urban patterns (street, city block, housing cluster, neighborhood, precinct) and the macro-level systems (urban sector, district, town, metropolitan area) have been restructured or managed in seasonally-responsive ways. It is rare, too, that large scale urban patterns are even examined from the perspective of climatic concerns and thereby viewed with the aim of creating climate-responsive environments. Climate must be seen as a significant modifier of urban spatial form. Under certain critical conditions, it may even act as a determinant of spatial organization. And since we are no longer living in an era of truly inexpensive and plentiful land and energy, we shall be forced, increasingly, to plan and manage our cities by using a model of urban settlement which is highly integrated with the natural forces.

On the whole, our ways of thinking about human settlement problems in cold regions have been rather shallow from the point of view of developing designs and policies which make the rhythm of urban life somewhat easier and less burdensome in an attempt to relieve some of the stress brought on by winter's elements. Our architectural and urbanistic vocabulary has had more of a 'southern' orientation than a 'northern' one--tending, as it has, to import urban forms from warmer climates, notably those of the United States and Western Europe. There have been a few exceptions to this rule exemplified by noteworthy projects usually located in the central business districts of a few Canadian cities, e.g.

Rideau Mall in Ottawa, underground pedestrian-concourse systems in Winnipeg, Montreal and Toronto, "+15" bridges in Calgary and "roofed-over" public streets such as those found in Quebec City and Thunder Bay. But smaller, more remote settlements and the large number of medium-sized towns and cities have generally not implemented winter-related solutions expressed either in physical terms or management systems for urban services and facilities--such as scheduling of public transit.

The physical conditions under which life must be carried out in cold areas are severe and demand careful, systematic examination. The warmth associated with summer's light and sunshine--when life begins to move outdoors, especially in cities--contrasts vividly with the sterility and dull-cold of winter when our special defence mechanisms are activated and begin to condition the ways in which we respond to undesirable weather patterns. The human spirit and morale appear to adapt to the changing seasons. Why, therefore, should not the shifting experience of social life, as expressed in the towns and built spaces, also reflect these changing moods and physiological needs?

4.0 FUNDAMENTAL APPROACHES REGARDING ADAPTATION TO THE COLD

In some remote, far northern communities, the 'indoor-living' period has been estimated to be as high as 70% of total annual hours. In fact, some studies have indicated that during the long winter months, the majority of northern residents--especially in sub-arctic regions--spend as much as 95% of their time indoors. With so much time spent under climate-protected conditions, it is particularly important to maximize the positive aspects of contact with the outdoor environment by extending the outdoor season and by optimizing the beneficial climatic effects.

Socialization patterns in the urban north are different from those in the south, and, hence, plans, designs and policies should not anticipate equal intensity, either of provision or use of facilities for user groups, on a year-round basis. Some activities and forms of socialization even disappear during the very cold periods of January through April in the northern hemisphere when people tend to spend more time in the home than out and tend to engage in organized activities (work, cultural events, indoor sports and even increased television watching). The rhythm of urban life often varies with respect to climate and the changing seasons. The northern life-style is seasonally variable and is highly reflective of 'climatic reality'.

When the environment and the climate make the summer type of outdoor activities difficult, people tend to stay at home in the private domain, or spend more time in organized activities... In other words, there is a functioning pattern in the urban life of cold climate areas, with different types of activities having priority during different periods of the year. The northern people have developed this way of life partly because of the climatic reality, and it may be wrong to try to replace it with the "Italian" way of life.¹⁷

Although it may not be advisable to overprotect urban dwellers from the cold, since provision of too many "artificial" indoor spaces would prove economically unfeasible and perhaps even socially undesirable, it is, nonetheless, crucial to offer a modicum of protection from excessive negative stressors. A healthy exposure within the optimal range of comfort-stress scales will result in improved states of both physiological and mental health.

While chance conditions will always be responsible for making some winter cities more livable than others (e.g. location, micro-climatic advantages such as exposure, orientation, altitude, etc.), innovative,

universally applicable planning and policy development measures can be instituted and are beginning to be evaluated. The approaches adopted in one community can often be transferred to another. The common component is the adaptation of environments to extreme conditions of cold in the struggle to create living circumstances which are better than merely tolerable.

Regarding human adaptation to the cold, two fundamental approaches have evolved in northern latitude nations. These are:

1. DO NOT OVERPROTECT MAN FROM NATURE

This approach assumes that man must learn to co-exist with nature as satisfactorily as possible. If offered too much protection from the harsh elements, the human race living in cold regions will become too docile and sensitive instead of becoming adaptive, sturdy and able to endure nature's onslaught without undue reliance on technological means.

2. OFFER AS MUCH PROTECTION AS POSSIBLE

This proposition suggests that a wide range of man-made sheltering devices (tunnels, skywalks, atria, gallerias, arcades, roofs, etc.) should be incorporated within the existing urban structure so that minimal contact with undesirable weather systems becomes possible. It implies that humans prefer 'soft', protective environments as opposed to forced contact with harsh wind and temperature conditions.

These two extreme-opposite positions suggest that critical to planning for northern climates is the provision of choice. There is a unique beauty intrinsic to winter, but not all urban inhabitants will be capable of appreciating this beauty, e.g. the elderly, handicapped persons, those with medical problems, people who are extra-sensitive to the cold, etc. One, therefore, should have the choice of being

outdoors or withdrawing into warm, protected recesses either inside buildings themselves or in 'urban pockets' which trap the sun's rays. It is this range of choices which must be analyzed, as well as the strategies for their ultimate realization within the built environment.

Concerning broad strategic options which focus on northern developments and livable communities, these can be targeted in two clear directions:¹⁸

A. MODEL OF THE NUCLEAR SUBMARINE

This model emulates the submarine that stays submerged for months at a time, or the space craft which is totally separated from earth. In this fashion, they strive for a wholly independent, detached, self-contained environment, one that within itself satisfies every biological and psychological requirement, that disposes of all human wastes and pollution.

B. MODEL OF URBAN SETTLEMENT HIGHLY INTEGRATED WITH ITS SURROUNDING

The dimensions and feasibility of such development are suggested by a winter visit to popular parks: thermal clothing, snowmobiles, winter camping equipment are only a part of it. This approach is one of 'living with nature' rather than that of 'conquering nature'. It is necessarily concerned with the broader aspects of urban development and design, embracing urban ecology, metropolitan planning, human psycho-biology and fields of equal complexity.

Harsh and foreboding climate such as that embodied by northern winters, has worked its way into the national psyche of cold nations. Canadians have been imaged by others--and image themselves--as a product of climate, to a large extent. The northern bleakness, with its cover of ice and snow, has repeatedly been a central theme in both French-Canadian and Anglo-Canadian poetry, literature and other forms of cultural expression. On the whole, our culture works hard in attempting to deny this

hostile season, although, at times, we also delight in the snow-reflected light, the visual beauty and the outdoor sports, carnivals and festivities made possible by the snow-covered landscape. Although many of these carnivals--especially throughout Europe--have been rooted in pagan based religious rituals dating back to the Middle Ages, and today assume a more commercial and touristic nature, they have had distinct cultural derivations and meaning.

In view of the recent technical advances, especially with regard to energy conservation principles, we should probably keep a sufficient distance from the nostalgia of the past--from literal interpretations of urban form and architectonic solutions--as we confront future problems. But we should retain a sense of the spirit within which problem-solving was approached in the vernacular tradition. Perhaps we should keep ourselves equally remote from an inclination to exalt technological achievements and their newly emerging hardware and software. It is within a framework that will blend a mastery over nature and co-existence with nature that time-honored answers will be found.

The energy crisis today...has shattered the so-called "International Style", namely the pseudomodern classicism of the box, of small boxes and large boxes of steel and glass. Narrow-minded architects supposed it was only a technological problem. But those capable of thinking, of carrying out "patient research", have seized the opportunity to reconsider the grammar, the syntax and the decrepit lexicon...they have dived back into the past not to mimic its forms...but to dig up its contents. The historical interpretation, from a bioclimatic point of view, has brought back to the forefront innumerable episodes forgotten or hidden by the scholastic apparatus of symmetry and proportion.¹⁹

5.0 MICROCLIMATE AND HUMAN REQUIREMENTS

5.1 The Human Comfort Zone

The human comfort zone, as a whole, varies within a given geographical area as well as in different regions--usually due to cultural, or even inherited differences. For example, the Inuit people prefer cooler temperatures than do Africans; young adults prefer temperatures which are normally a few degrees colder than the elderly. These differences can be accounted for, in part, by varying metabolic rates and, in part, for psychological reasons. While most of the useful research has been done for indoor comfort zones or interior space, little has been definitive concerning outdoor comfort zones or exterior space. Some variations in indoor comfort levels can be seen in the following chart:²⁰

Interior Comfort Zone

United States	20-24 degrees C
England	17-20 " C
Inuit Igloo	5-16 " C
Tropical Habitat	22-30 " C

It is, however, possible--within limits--to define a generally acceptable comfort zone suitable for a majority of people. This zone is dictated by four major elements:

- 1) air temperature
- 2) solar radiation
- 3) relative humidity
- 4) air movement (wind speed)

Each of these either tends to offset or to multiply the effects of the others, the comfort zone being the result of a 'balance' of all four.

Although the comfort zone can be viewed essentially as a subjective assessment of the environmental factors, the limits of the zone actually have a physiological basis--that range of conditions under which the thermo-regulatory mechanisms of the body are in a state of minimal activity or equilibrium.

Within the context of 'cold', the immense land mass called Canada could, for practical purposes, be divided into three broad areas:

- i) the urbanized area which is a ribbon of land contiguous to the U.S. border.
- ii) the middle north which extends from the northern limits of urbanization up to the tree line.
- iii) the far north, which is that portion north of the tree line.

The degree of cold varies substantially in each of these three zones as do the concomitant social adjustments necessary in each of the areas.

In the urban areas across Canada, the variations of cold are enormous: mild complaints from residents in Victoria or Vancouver, for a few days of the year when a temporary halt occurs to the blooming of flowers, are the norm in our temperate regions. Severe complaints from the biting cold areas of the southern prairies to the constant whining of inhabitants in southern Ontario and Quebec when winter is damp, slushy and generally disagreeable. And a range of complaints from Atlantic provinces dwellers who experience high winds, torrential downpours and heavy snowfalls within a variety of moderately cold to very cold air temperatures. While southern British Columbia may be warmer than most other Canadian locations, the rain can really upset people. While Winnipeg may be less depressing, due to the large number of sunshine hours and dry atmosphere there, the smile on one's face could quickly and easily freeze. While St. John's does not have a

terribly bad winter, the summers in Newfoundland are not all that wonderful--with plenty of fog.

Knowledge about climatic variability and severity is crucial for designers and planners who are interested--and they certainly should be--in making responsible, climate-responsive decisions. This is especially important because:

There is scarcely one aspect of Canadian society and economy that is not in some way affected by climate and climate extremes. Climate plays a large part in our daily living--it influences our choice of what we wear, what we eat, when we do outside work, when and where we vacation, and how much we pay for energy. Climate can increase personal satisfaction, uplift us psychologically and instil great civic pride. It affects the way we feel and behave and is a useful and often essential factor in influencing our day-to-day decisions. Climate can destroy life suddenly or subtly, yet contribute to its quality.²¹

Climate severity, if established on a comparative scale, is a useful concept for classification purposes. Such a notion can actually indicate relative severity of a range of locations within a given country. The various components comprising 'severity' are individually weighted and then aggregated into a single discrete value. Some of the climate stressors which are normally taken into consideration in developing a climate severity index are the following: duration, frequency, extremes and variability with respect to hot or cold, wetness or dryness, windiness, poor air quality, continuous darkness or daylight, prolonged or intense precipitation, fog, restricted visibility, lightning and such severe weather as thunderstorms, blowing snow and freezing precipitation.²² In one of the most important Canadian studies entitled "Climate Severity Index for Canadians" by D. W. Phillips and R. B. Crowe (Environment Canada, 1984), the authors, in classifying climate in terms of human comfort and well-being, singled out four key factors considered to account for most of the direct environmental stress:²³

- 1) comfort of individuals (discomfort factor)
- 2) psychological state
- 3) safety (hazardousness)
- 4) mobility of travel (outdoor immobility)

Figure 1 portrays the relative importance of the various factors and subfactors which comprise the severity scale indicating specific weighting schemes. Table 1 defines the elements and provides the maximum points for each subfactor. The authors then offer a climate severity index (CSI) formula which is a summation of the four major factors weighted, so that:²⁴

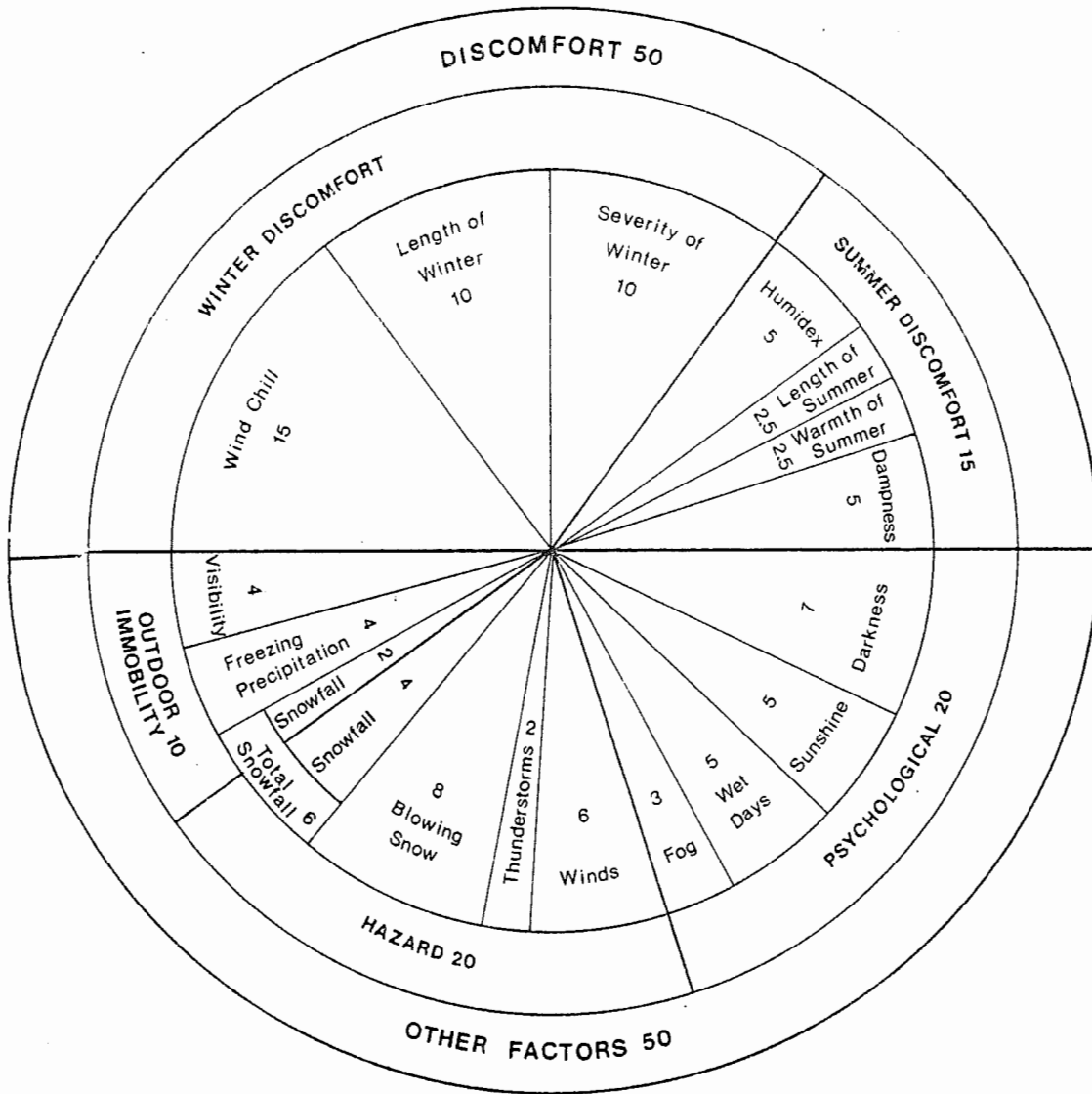
$$CSI = \frac{5A + 2B + 2C + D}{7.5}$$

where, A = discomfort
B = psychological state
C = hazardousness
D = outdoor immobility

The Climate Severity Index is an absolute numerical value on a 100 point scale, 100 indicating the highest or worst severity in Canada. Resolute, in the Northwest Territories, for example, rated the worst with a CSI of 95. It had the worst ranking on the winter discomfort scale as well as the worst on the summer discomfort scale, the most depressing weather and the most hazardous weather. Ten of Canada's major cities, in terms of their CSI look this way--from best (lowest index) to worst (highest index):²⁵

<u>City</u>	<u>CSI</u>
Vancouver	18
Calgary	34
Toronto/Hamilton	35
St. Catharines/Niagara	37
Edmonton	37
Ottawa	43
Montreal	44
Winnipeg	51
Quebec City	52

FIGURE 1
PERCENTAGE CONTRIBUTION OF EACH OF THE SEVERITY FACTORS
AND THEIR SUBFACTORS



Source: D.W. Phillips and R.B. Crowe, Climate Severity Index for Canadians, Environment Canada, Atmospheric Environment Service, Downsview, Ontario, 1984, 5.

TABLE 1
Weightings Assigned to the Factors and Subfactors Composing
the Climate Severity Index

A. <u>DISCOMFORT FACTOR (100 POINTS)</u>		<u>POINTS</u>
<u>Winter Discomfort (70 POINTS)</u>		
1.	<u>Wind Chill</u> Mean percentage of time in January that wind chill exceeds 1400 W/m ²	30
2.	<u>Length of Winter</u> Number of months with mean daily temperature less than 0°C	20
3.	<u>Severity of Winter</u> Mean daily temperature of coldest month	20
<u>Summer Discomfort (30 POINTS)</u>		
4.	<u>Humidex</u> Mean percentage of days with humidex greater than 30°C (some people uncomfortable) for 1 hour or more – highest 10-day value for summer	10
5.	<u>Length of Summer</u> Number of months with mean daily temperature of 10°C or greater	5
6.	<u>Warmth of Summer</u> Mean daily maximum temperature of warmest month	5
7.	<u>Dampness</u> Mean July wet-bulb depression	10
B. <u>PSYCHOLOGICAL FACTOR (100 POINTS)</u>		
8.	<u>Darkness</u> Increasing darkness factor with increasing latitude	35
9.	<u>Sunshine</u> Mean annual number of hours of bright sunshine	25
10.	<u>Wet Days</u> Annual number of days with measurable precipitation	25
11.	<u>Fog</u> Absolute frequency (in 10 years) of number of hours with fog	15
C. <u>HAZARDOUSNESS (100 POINTS)</u>		
12.	<u>Strong Winds</u> Mean percentage frequency of wind speed equal to or greater than 19 mph (30.6 km/h) – average of January and July	30
13.	<u>Thunderstorms</u> Absolute frequency in (10 years) of number of hours with thunder	10
14.	<u>Blowing Snow</u> Absolute frequency in (10 years) of number of hours with blowing snow	40
15.	<u>Snowfall</u> Mean winter snowfall (cm)	20
D. <u>OUTDOOR IMMOBILITY (100 POINTS)</u>		
16.	<u>Visibility</u> Absolute frequency (in 10 years) of number of hours with (a) fog, (b) snow, and (c) rain	40
17.	<u>Freezing Precipitation</u> Absolute frequency (in 10 years) of number of hours with freezing precipitation	40
18.	<u>Snowfall</u> Mean winter snowfall (cm)	20

Source: D.W. Phillips and R. B. Crowe, Climate Severity Index for Canadians, Environment Canada, Atmospheric Environment Service, Downsview, Ontario, 1984, 6.

The CSI can be used for a wide range of purposes, including remuneration allowances or compensation for working under severe climatic conditions, comparison of locations for retirement reasons, designation of locales by those suffering from weather-related illnesses, knowledge of the data germane to planners and designers dealing with projects related to workplaces, residences or recreational area plans.

It should be stressed that one major constraint in choosing the elements representing psychophysiological parameters was the availability of data in a suitable and economically obtainable format--from already published sources or from existing machine tabulations prepared on a Canada-wide basis by the Environment Canada Atmospheric Environment Service.

Clearly, the basic requirements of the human body must be taken into account when designing or restructuring buildings, public spaces and even entire neighbourhoods. The modification of severe conditions of temperature and wind is essential if some semblance of social life is to occur in public places--both indoors and out. Today, we seem out of balance with nature and its laws and we would do well to acknowledge, respect and apply natural processes, elements and factors which, if emphasized to a greater extent and more rigorously accepted in site planning and design, would result in a more socially-responsive built environment.

5.2 The Effect of Winter Climate on Human Behaviour

Scholars from Aristotle to Montesquieu have believed that climate has had a generally pronounced effect on human well-being and temperament. In fact, Montesquieu, in his treatise The Spirit of the Laws, in 1784, put it this way:

If it be true that the temper of the mind and the passions of the heart are extremely different in different climates, the laws ought to be in relation to the variety of those tempers.

His "climate doctrine", in which he claimed that national character was to an extent formed by and based on natural surroundings, sharply influenced social and political thinking during the latter part of the 18th century in France.

Authorities on historical evolution have suggested that proper climatic conditions have been among the main requirements and stimulus for the development of civilization. In fact, industrial analysts who have studied worker productivity at different times of the year, in varying countries, have demonstrated that such productivity tends to decline in times of excessive cold or heat. Whether or not one believes that climate is the determining element in the well-being of society, one thing seems to be generally indisputable:

No one can today deny that life in our cities is influenced by the climate. The city's culture and therefore the city's citizens are influenced by climatic factors. If we influence the climate of a city by steering and controlling the weather, then we open the door to a richer urban culture and to an urban citizen with a broader register of life-sustaining opportunities.²⁶

It can be reasonably stated that if a broad acceptance of winter, as a season with distinct characteristics, is to become a central issue in the life of urban Canadians, then an understanding of the effects of winter on human behaviour will be essential to the provision of a livable environment.

5.2.1 Seasonal Change

Winter offers a stark dramatic contrast to the other seasons. People begin to deny the arrival of autumn and then winter--as if such a denial will actually retard their coming. Winter 'doldrum' spirits are seen to be lifted in the spring when days become longer, and brighter, and melting snow slowly begins to disappear. However, the shifting seasons offer a diversity and variety often lacking in 'one-season' locations where monotony and boredom can result simply from this lack of change which is fundamental to physiological and psychological well-being.

To view things from a less negative perspective, we are told that:

a four-season city reduces family stress, according to Hamilton McCubbin, family social science professor at the University of Minnesota. The seasons allow families periods of greater togetherness in winter, then greater separation in summer, a kind of natural cycle that aids psychological adjustment.²⁷

In addition, winter oriented outdoor activities such as skiing (down-hill and cross-country), sledding, tobogganning, skating, hiking, snowshoeing, and snowmobiling, enhance the many joys of this cold season as those who inhabit nordic environments have experienced. Our generally negative disposition arises from the fact that we neither "think winter" nor "promote winter". At least, we have not done this actively in the past. However, we are beginning to re-evaluate this position. So negative have been our attitudes to winter that when asked what the four seasons are in Canada, one person has given expression to his sense of the bizarre by answering: pre-winter, winter, post-winter and next winter!

It is a well known fact that during winter, inhabitants of most "northern cultures" often spend more time indoors than out of doors. Their contact with the outdoors is thus minimized. Elements discouraging outdoor activity are severe wind chill, low air temperatures, limited visibility and an overall feeling of discomfort. Remaining in an indoor "artificial environment" one must necessarily be exposed to artificial heating, drier air, higher carbon dioxide concentrations and less fresh air.²⁸ Under such conditions, questions pertaining to human health must be raised.

Psychological effects of "sensory deprivation" are also known to have resulted from contact with the largely undifferentiated landscape associated with winter, especially in rural areas. Studies of such deprivation have revealed the deleterious effects of protracted stimulus starvation and an individual need for more or less constant stimulation, the lack of which can lead to boredom and depression. Proper lighting and use of colour has been found to act as an anti-depressant for urban dwellers for whom exposure to short, dull daylight hours is all too common in winter.

5.2.2. How Cold Affects Human Relations

Although the extent of scientific research dealing with human relations under very cold conditions has been neither conclusive nor voluminous, there are a number of speculations which have been 'proven' through limited experimentation, and observation under controlled conditions. They are as follows:

- a) During winter months, people of most cultures spend more time inside.²⁹
- b) During winter seasons, older populations repeat the same behaviours and are exposed to the same stimuli more frequently.³⁰

- c) Winter months reduce the stimulus variability to a monotonous minimum.³¹
- d) Old members of most cultures are the ones most affected by winter temperatures.³²
- e) Traffic accidents, bouts of aggression, sexual assaults, incidence of suicides, and general agitation are conditions known to increase statistically during temperature extremes.³³
- f) Human gestures designed to communicate "official" purposes of behaviour become exaggerated during winter. (e.g. people may engage in 'odd' ritualistic ways while waiting for a bus, exhibiting disdain with their public predicament).³⁴
- g) Even though people will be found out-of-doors during the most bitter weather, in general, significantly reduced numbers will appear in public places--well below summer averages.³⁵
- h) During or after a heavy snowfall, people in public often display a festive attitude--as if the weather, itself, were cause for celebration.³⁶
- i) Those who use public space or territories during winter seem to adapt well to them.³⁷
- j) People practice and are allowed many 'norm violations' during the winter season, e.g. relaxation of legal enforcement of drinking in public places when it is very cold outdoors, lenient practices by police with respect to parking in 'no parking' zones. The winter time order appears to operate on the basis of temporariness especially during severe weather conditions--people become more friendly, strangers more gregarious.³⁸

The above characteristics have some implications with respect to the behaviour of bureaucratic structures, law enforcement agencies, public behaviour and similar institutional norms. Winter utilization of cities might benefit from different approaches to policy-making than summer usage of the same cities. Time management perhaps ought to influence how a city is used in various seasons of the year.

5.2.3 Winter and its Impact on Human Activities

Northern climate may either inhibit or facilitate human activities. Two broad types of climatic influences are deemed to exist:³⁹

1. Direct influence

This is caused by the effect of climate outdoors, where little or no meteorological modifications have occurred as a result of the built environment. Climate, in this situation, will either encourage or prevent certain activity patterns. For example, extremely cold temperatures will tend to shorten the 'outdoor season' and its related social interactions by suggesting that people not move outdoors.

2. Indirect influence

This is the influence that architectural or urban solutions, created in response to climatic forces or pressures, exert on man's social interaction by virtue of their specific physical and symbolic characteristics. Examples are man-made "interiorized environments" such as large shopping complexes or "galleries" whereby the outside is kept out, thereby providing warmth and protection from the physical inconveniences such as rain, snow, wind or cold. These buildings or designs tend to attract large crowds, especially under poor weather conditions. Their major failing is the fact that they do not offer seasonal change or variety. The interior milieu remains constant (such that tropical and semi-tropical vegetation can survive), while the immediately contiguous environment outdoors is subjected to extreme seasonal variation.

There are also two generic types of activities which, according to Jan Gehl, take place under any circumstances. These are:⁴⁰

A. Necessary Activities

those which must take place under virtually any circumstances, such as work, travel, goal-oriented movement, etc.

B. Optional Activities

those which take place only if the external circumstances (e.g. the weather conditions) are favourable, such as leisure-oriented involvement.

Whenever it is possible to expose the northern dweller to the winter climate (even the coldest parts of the year contain positive elements), such exposure can be assumed as positive and would have as its objectives to increase time outdoors, to increase the number and range of outdoor activities and the related amount of provision of comfortable outdoor space.

The twofold objective of contact with the natural environment and meaningful contact with the social environment is essential if human activity patterns are to survive and carry on under the harsh conditions created by intense cold and high winds--particularly in urban regions. Since differing instances of social interactions between human beings require varying physical and spatial settings or contexts, these designs may either be facilitating or inhibiting with regard to the specific sets of activities for which they have been built.

Since outdoor 'social spaces' or 'public spaces' which are heavily used during summer tend to become deserted or infrequently used during winter, special attention must be placed on such uses, for a broad range of users.

Professor Jeffrey E. Nash in his winter studies in Minneapolis, found that even on "nice" winter days of relatively mild temperatures and a low wind chill factor, the peak numbers of people outdoors were far below the summer averages.⁴¹ Spontaneous activities such as play, walking or simply "hanging out", appear to be the first to be affected by the onset of cold winter temperatures. With the tendency to be either "inside" or "outside" in North America, we have "hard interfaces" as a result of

the abrupt separation of street (outdoors) and building interiors (indoors). There is little to choose by way of "transition zones" mediating between these two extremes--other than a solid wall of building. Perhaps some version or interpretation of a "soft interface" whereby undesirable weather systems can be lessened and public outdoor activities can be extended would be in order. Examples can be found in the covered street arcades of many old Swiss towns such as Bern, Fribourg or Murten. Alternatively, some form of overhead radiant heating could be employed to alleviate the direct effect of the cold but which would still permit outdoor activities to flourish.

The design and planning of micro-spaces and meso-spaces must be conceived in relation to human needs and climatic requirements. Human co-operation and interaction is important under extreme conditions. Regional differences must also be considered as they are bound to override attempts to develop universal solutions at either the conceptual or detailed levels of intervention.

6.0 EVOLUTION OF CANADIAN SETTLEMENT FORM WITH REFERENCE TO CLIMATIC FACTORS

Canadian native settlements prior to the colonization of the North American continent first demonstrated protection from the elements as a major factor influencing the form and siting of dwellings. Subsequently, climate as a design element, either at the individual building level or within the context of the broader urban pattern, was very seldom a major consideration when planning Canadian communities.

It was not prior to approximately the middle of the 20th century that climatic constraints became truly significant determinants in Canadian planning practice, with occasional exceptions. Such constraints mainly found their application in new resource communities in remote Canadian sub-arctic locations. Nevertheless, the majority of urban

settlements continued to be based on the principles of the "Garden City" and "Neighbourhood Unit" imported either from England or the U.S.A.

6.1 Native Communities

In the eyes of the first European colonizers, the dwellings and settlements of the Native Canadians were primitive and barely habitable. It is true that the natives did not have tools or the knowledge of the bricklayer, carpenter or stonemason to build structures similar to those constructed in Europe over the centuries. However, they did possess an instinct that allowed them to adapt to their environment quite successfully.

Today, it is hard to imagine that only 200 years ago, the vast expanse of pavement crossing our continent was once a dense primeval forest. It is equally difficult to imagine that the sewers and water pipes hidden beneath such pavements were once streams, creeks and rivers which, not long ago, were part of the beauty of this wilderness.

The homes of the native Canadians varied greatly from one another, in shape and size, in material, in their internal arrangements and in the number of families that occupied them.

Climatic, physiographic and biological conditions all played a part in producing these variations; but cultural and historical influences were equally active so that a type of dwelling that seems to be peculiarly the product of one environment occasionally extended beyond the bounds of that environment into another where it appeared less suitable.⁴²

6.1.1 The Indian Dwelling

In general terms, the Indian population in Canada can be divided into four major groups according to geographic location. The geography, the climate, the flora and fauna of the specific regions they occupied were determinants of their life style and their dwelling forms.

The first group, the Indians of the Eastern Woodlands, originally inhabited an area from the Atlantic Coast in the east to the prairies in the west; from the Subarctic in the north, to Ohio and Virginia in the south. This vast region had a gently rolling landform with great variations in climate. These climatic variables determined their life styles and activity patterns and this in turn, was reflected in the form of their dwellings.

The groups which depended on hunting and fishing did not have permanent villages and built shelters in forms of domed lodges or wigwams. These were constructed with a framework of poles covered with rolls of bark, rushes or skins. For winter, most tribes preferred a conical form that could be erected in approximately two hours. To increase the warmth of such a dwelling, the Indians often cleared away the snow on the floor and hollowed out the soil to a depth of six inches to a foot, so that the dwelling was partly underground.⁴³

The southern groups, the Iroquoian people and the Algonquins of the Atlantic seaboard lived mainly in settled villages. The area they inhabited had fairly long and hot summers and cold, snowy winters. These conditions were ideally suited for a society that was based on agriculture. The basic dwelling type was the "long house," which was used all year round. It was often more than 65 feet long and nearly 20 feet high. The wooden framework consisted of poles bent to form the

shape of a long barrel. The covering of the dwelling was made of sheets of bark--cedar, elm, ash or spruce. The space inside was partitioned so that several families could live together. On either side of the long house, low platforms provided sleeping space, and within the common aisle, down the centre, a row of fires served the heating needs of the families.⁴⁴ These were the prototypes of apartment houses that were to appear 150 years later on the same location. When Jacques Cartier first discovered Hochelaga (today's Montreal) in 1534, he was surprised to find a town which contained twenty apartment houses (long houses) which was run by a well organized municipal government.⁴⁵

The second group, the Indians of the Plains, inhabited the general area of the flatlands extending eastward from the foothills of the Rocky Mountains to the valley of the Mississippi River. This area extended from Central Alberta, Saskatchewan and Western Manitoba southward almost to the Gulf of Mexico. In the northern regions, winters were long and cold with snow, blizzards and never ending winds. The southern region also experienced severe but shorter winters. Geographically, this area was characterized by the absence of mountain ranges and large bodies of water.

The plains area was the home of the "tipi" or tent of buffalo hide stretched around a conical framework formed by 12-18 foot long poles. An average tipi of the Blackfoot Indians had a floor diameter of 12 feet. This design afforded excellent protection against the fierce winds and could easily be dismantled and transported as these tribes followed the migration of the buffalo herds.

The third group, the Indians of the Subarctic inhabited much of northern Canada in the lands of the boreal forest, where muskeg, lakes, streams and bare rocks covered the landscape. Spruce, pine, cedar and birch, native to the region, provided building materials for the frame-

work of their shelters. Caribou hides, birch bark or spruceboughs covered this framework and an insulating layer of snow and earth completed the structure.

Since Indian families often moved, following game animals and in search of better fishing grounds, the predominant form of dwelling was the conical lodge, similar to the "tipi." Permanent settlements were established within rich hunting and fishing grounds, where a secure livelihood could be found. Such settlements contained more substantial dwellings, which were adapted to the cold conditions by utilizing the earth-sheltered technique of construction.

The dome-shaped log cabins were built partly underground and covered with layers of packed earth and snow. They could be entered only by ladders leading down through a rectangular smoke-hole. These dwellings were so warm that they were only occupied in winter.

The fourth group, the Indians of the North Pacific Coast, differed from all other tribes in Canada, in many ways, specifically with regard to their dwellings. They built oblong houses of amazing size, several hundred feet long by fifty to sixty feet wide. Because of the mild Pacific climate, their settlements were permanent. These dwellings, similar to the "long houses" of the Iroquois, could be considered as the first apartment buildings on the Pacific coast.⁴⁶ In a typical village (kwakiutl), all homes were built on one side of a narrow street facing the sea with the mountains behind sheltering them from the cold winds of the interior.⁴⁷

6.1.2 The Indian Village

All village sites were very carefully selected. They had to be close to a good supply of fish, hunting grounds and fresh water. Other

determining factors were the proximity of a hill or dominant point, protection from the prevailing winds, fertile soil and accessibility to trade and travel routes. The village, either a temporary encampment or a permanent settlement, was organized according to an established pattern.

The Huronia region, first encountered by Europeans in the mid-16th century, encompassed numerous villages situated on the lands bordered by Georgian Bay, Lake Simcoe and Lake Ontario. Each village contained between 300 and 400 families living in several long houses.

Excavations undertaken by the Royal Ontario Museum in the Toronto area (Dr. W. Kenyon--The Miller site in Pickering and J. V. Wright--the Nodwell site near Port Elgin, Ontario) in the late 1950s, indicate that these Iroquois settlements were circular in shape surrounded by palisades, and occupied up to 10 acres of land.⁴⁸ There is also evidence that the long houses within the village were not erected at random but that they followed a pattern. All of the dwelling structures are aligned, more or less, in a northwest to southeast direction and parallel to each other.⁴⁹ Norcliffe and Heidenreich suggest that a reason for such alignment was in order to achieve maximum protection from the prevailing winds.⁵⁰ This village pattern remained unchanged until the French suggested some modifications in 1636.⁵¹

It is still unknown whether the open spaces in the village played a role in the social life of the Huron community. The entire purpose of the palisade is also open to speculation. Was the palisade only a defence element or did it perform some other function as well--as a climate modifier or as a delineator of the urban space within the forest? Similar enclosures are found in Japan where they are used as a wind screen. In Western Japan (Shimane Prefecture), pine trees are shaped into thick hedges fifty feet high protecting the home, while in Northern Japan,

straw screens of comparable height are erected during the winter months around both individual houses and even entire villages.⁵² Can one assume that a parallel function was served by the palisades in the Indian Villages?

6.1.3 The Arctic and its Inhabitants

Throughout the ages, the inhabitants of the Arctic have selected their habitation sites based on the availability of good fishing and hunting grounds. Villages were always constructed on raised land in order to avoid annual flooding from ice-clogged rivers or from high sea levels during storms.

The Arctic developed its own intrinsic village pattern with a strong emphasis on community life.⁵³ The Village of Rasboinsky on the bank of the Yukon River contained twenty five dwellings, both winter and summer houses, two community structures called "Qasgiq", a graveyard, and variety of utilitarian structures such as meat caches, and boat and sled racks. The Qasgit were semi-subterranean structures, similar in construction to a family dwelling, but much larger in size and served as both a men's house and, on special occasions, as places for community gatherings.

Every man, and consequently each family of the village belonged to one of the several qasgit. Within the qasgiq, men made gear for hunting and fishing, took sweat baths, told stories and played games. The typical dwelling in the village was a rectangular, semi-subterranean log structure approximately nine feet high and covered with earth and compacted snow. During the summer, it was entered through an at-grade doorway, while during the winter, an underground passage was used in order to conserve heat. This type of dwelling is very similar in form to that used by the Indians of the sub-Arctic. Such subterranean types developed due to the availability of driftwood along the Pacific coast--a feature

not to be found east of the Mackenzie Delta. Driftwood was used as a primary building material for the framework of the structure. North of the treeline and east of the Mackenzie River, where strong winds compact the snow into an easily carved surface, the igloo was the most practical form of shelter. The blocks of ice were mounted one on top of the other to form a dome-shaped structure extremely resistant to the wind and the snow.

Summary

In analyzing dwellings of the Canadian native population, it could be concluded that neither of them provided the comfort found in the homes of medieval Europe. Ventilation and lighting were inadequate. Privacy was an unknown commodity. Basically, most of the Canadian native dwellings were to protect man against the elements, and from this point of view, they showed an intrinsic adaptation to environmental, and social factors.

Winter dwellings needed little energy to remain warm. A small fire together with many warm bodies sufficed. Many were orientated in a northwest/southeast direction to minimize exposure to the prevailing winds and to conserve heat. Winds were deflected and tamed by the high banks and palisades, while the villages themselves were snuggled in natural windbreaks.

There was a fundamental difference in the type of settlement and approach to land exploitation between the natives and the European settlers. The Indian villages were compact: the territory used for agriculture was communal, whereas the scattered rural development of the European settlers was the product of land availability and distribution. These settlements were not the product of a slow evolution, but of rapid colonization which ruthlessly changed forests into agricultural lands, producing an urban pattern which responded neither to the topography nor to the climate.

6.2 Early Colonial Development

There is a tendency to identify the urbanization of Canada with the first colonial settlements, despite the evidence that a large portion of the country was already "urbanized" thousands of years before the arrival of the first European settlers. The re-urbanization process placed primary emphasis on the colonization and exploitation of the land and its natural resources. The assimilation and disappearance of the native populations, combined with the non-durable nature of their dwellings, contributed toward their demise as an urbanized group.

The period of early Canadian colonial development up to the 1750s was the work of the French, whose cultural heritage included the magnificent fortifications of Quebec and Louisbourg. After defeating the French, on the plains of Abraham in 1759, the British, with remarkable speed, colonized the rest of Canada and totally changed its landscape within barely a century.

6.2.1 The French Legacy

Colonization began on the Atlantic Seaboard and gradually spread across the continent along the fur trade routes of the St. Lawrence river, the Great Lakes and the Prairies. The inland part of the country was colonized much later due to its lack of accessibility to water routes.⁵⁴ Port Royal was founded in 1608, Quebec in 1608, Trois-Rivières in 1634, and Montreal in 1642. A few of the many trading posts and fortifications built during this period became cities, but most were abandoned and forgotten. Their success or failure was closely tied to the economic development of the time--i.e. the fur trade and the logging industry.

From the urban point of view, the significance of the first French settlements was in their permanency. The French decided to build cities

and habitations which would provide them with a feeling of belonging and a sense of achievement. Their habitations, were copies both of villages in France and French fortifications of the period. Quebec City resembled St. Malo in many respects.

The Port Royal Habitation built by Champlain in 1608 was an expanded transplant of the Norman manor house. The internal court surrounded by several connected buildings contained various functional spaces (kitchen, smithy, bakery, dining hall, dormitory, gentlemen's dwelling and governor's house). The continuous building facade and the palisade defined the site and protected its inner court and living quarters from both inclement weather and from outside intrusions.

The design and construction of Quebec City was entrusted to a group of prominent French architects, contractors and craftsmen.⁵⁵ Local materials such as stone, were used for the most significant buildings to provide an impression of permanence. As early as 1727, Quebec City undertook a series of civic design projects aimed at improving its appearance and quality of life. The projects included a fountain, "a holiday ground" and an artificial lake!⁵⁶ It is difficult to believe, viewed from today's perspective of mass urbanization, that such a small colony, isolated and with limited funds, had the ambition to pursue excellence in civic design for the sole benefit of its inhabitants.

Climate definitely played a significant role in the architectural expression of the individual structures. Once a successful formula for the orientation of a building, or the size of a window opening or a roof slope was established, there was no need to change it. As a result, these specifications were repeated regardless of the function of the building.⁵⁷ There existed a parallel consistency in the planning of urban centres. For example, the dense built-up form of Quebec City and Montreal facilitated social interaction among inhabitants during the

winter months. The public squares surrounded by important public edifices were enclosed or semi-enclosed spaces, where a variety of activities could take place even during cold weather. The walls of the fortification provided a barrier against the freezing winds and, to an extent, modified the climate within the city.

6.2.2 The English Presence

French supremacy in North America, ended in 1763. For about the next 20 years, the British ruled all of the North American continent. The American Revolution, (1776-1781) however, left England with Canada as its only major British possession in North America.

The reason for the colonization was to exploit the continent's natural resources. Up to the mid-19th century, economic activities were centred along the Great Lakes Basin where both the Americans and the British had important vested interests in fish, fur, timber and grain. After the American Revolution it was of paramount importance for the British to colonize and defend their lands within the Great Lakes Basin in order to counter-balance the power and influence of the newly created American nation to the south.

6.2.3 Upper & Lower Canada -- (Ontario & Quebec)

With the establishment of the American Republic and the arrival of large numbers of Loyalists and later other European immigrants to Canada, the urbanization process was rapid and in many cases, ruthless. Apart from some major urban centres, the predominant pattern of colonial development in Canada was rural in character. The origin of this rural, scattered development, can be traced to the land allocation policy following the arrival of the Loyalists from the United States. The generous land grants, beginning in 1792, promoted colonization, but at the

same time, created land shortages forcing the new settlers to disperse across the colony because of land speculation.

According to Lord Durham's Report on the Affairs of British North America in 1839, less than a tenth of the land granted by the government prior to 1825 had even been occupied by settlers, much less cultivated.⁵⁸ In many instances, land was granted to people who never intended to settle. Such practices did not encourage compact and efficient settlement. In order to speed up the process of urbanization, a rectangular system of road allowances was established on the British/Roman pattern. Consequently, the original pattern of settlements was determined by the survey of concession roads and by the lot size and not by their locational constraints, topography, or climate. There was a great demand for land adjacent to the roads which led to the main markets.

In the mid-1840s the three great thoroughfares were planned or macadamized for about 10 miles (out from Toronto); and for the same distance, nearly every last frontage on the roads is taken up, settled or under cultivation.⁵⁹

Such development led to the "ribbon" pattern of settlement which has survived in almost all our cities.

Summary

The French built their military forts in combination with permanent settlements. Their design was based on European precedents with the intent of being as permanent and as habitable as possible. They were enclaves of French civilization in the wilderness, but built to respect the climate and the needs of their inhabitants.

The British built blockhouses and outposts necessary for defence or trading purposes. Later settlements were scattered through the

forests on locations allocated through a system of land grants and surveys.

While the French created settlements which supported community life during the winter season, many British settlers lived in isolation, usually in dwellings built in the middle of their properties, miles from civilization.

In time, the French, learned how to cope with (and to enjoy) the cold season; their British counterparts suffered through it. The architecture of Quebec reflects the climate, and the building materials of the region. The architectural styles adopted by British Canadians were direct imports from Britain, very seldom modified to the new environment. Architectural form was used as a symbol representing the current political and social aspirations of the young Dominion- rather than being rooted in the native landscape and climate.

This period was also noted for deforestation which caused severe environmental damage and changes in regional climates. Massive wood clearings for agricultural and lumber exploitation purposes caused disruption of the soil allowing run-off and erosion. As a result many smaller water courses dried up during the summer months while flooding from melted snow was a regular event in the spring. Soil erosion became a serious problem, especially along steep river banks and on hilly farm lands. Devoid of their protective forest wall, houses and farms became exposed to the elements, roads became impassable due to snow drifts, and the farmers started to complain.⁶⁰

The 19th century agricultural settlements had produced an over-cleared landscape which had exhausted the economic capability of the soil, disrupted the ecological balance, and resulted in a visually unattractive countryside. By 1880, this problem was considered serious

enough to prompt the government to reassess agricultural practices. Reforestation was introduced. Programmes for planting of woodlots and buffers around dwellings and highways were promoted and financially assisted. In many cases, the forests we now enjoy are the legacy of that undertaking.

From a great number of viewpoints, the evolution of Canadian colonization and urban settlement (as well as rural development) can be interpreted and analyzed from the perspective of various stages in the struggle against winter: dwelling and construction methods of indigenous groups; heating techniques since the earliest periods of settlement; land development patterns in French and British Canada; clothing designs; food preservation methods and diet; spatial displacement (sleds, skis, snow-shoes); life styles, especially within French Canada which varied significantly according to the demands of the changing seasons; and other forms of adaptation.

Particularly in French Canada, winter was seen as a principal force--indeed, a determining element--of a deeply rooted, life-style tradition.

The Canadian winter was certainly a state of siege, but the besieged ultimately triumphed. Despite its abrasiveness, the season of cold became one which was well loved, perhaps in the sense that one appreciates a victory.⁶¹

Winter became a time of greater family intimacy, of longer periods spent indoors among friends and, in part, was responsible for a strong, active and faithful family-orientated life, in which the church also played a powerful role--it became the 'school of invention' requiring constant and demanding ingenuity.⁶² Without doubt, it can be said that winter, in all of its many-faceted dimensions, can be seen as the principal cause of successful human adaptation to rigorous extremes and of the improvements in both social and technological engineering of cold countries.

6.3 Urban Patterns in Canada: Mid 19th-Century to World War II

Within a one hundred year period, from 1840 to 1940, the Dominion of Canada achieved considerable economic growth which was reflected in the establishment of an extensive settlement and transportation network. The proliferation of the railway in the second half of the 19th century was largely responsible for the rapid urbanization of the country and the evolution of Canada from a rural, agriculturally-based economy into an urban, industrialized nation. The growth, in terms of population, labour force and business enterprises, was largely sought by almost every municipal corporation. As a result, many constraints which should have been placed on sites and building were waived in the attempt to attract development.

This attitude is well described by a contemporary Winnipeg observer:

The fact is that Winnipeg in her feverish desire to grow, only to grow, was not in the least concerned to grow properly and healthfully, to develop sanely. Her mad passion for evidences of her expansion . . . have blinded her to the fact that cities cannot live by growth alone.⁶³

To develop and build, in accordance with local topography and climate and in the best interests of the community, was certainly not one of the considerations deemed important by developers and city fathers of the day, with some exceptions across the nation.

Speedy expansion and urbanization had its consequences. The downtown areas were becoming predominantly industrial and old residential neighbourhoods became dilapidated and undesirable due to increased pollution, traffic and social problems.

6.3.1 The City Beautiful Movement

Slums, traffic congestion and visually chaotic streetscapes led to a need for improving the existing situation. The urge to beautify cities in the United States, as well as in Canada, following the success of the 1893 Chicago World's Fair resulted in the establishment of the "City Beautiful" movement which advocated comprehensive master planning and a return to the classical principles based on Beaux-Arts designs, as expressed in monumental public buildings, grand boulevards, squares and park systems. This movement lasted approximately twenty years, until the beginning of the World War I. In its wake, it left several master plans prepared for most of the major cities in Canada: Toronto in 1905 and 1909, Montreal in 1906, Winnipeg in 1913, Calgary in 1914, and Ottawa and Hull in 1915.

None of these master plans were executed in their entirety because of the magnitude and costs associated with such development. In almost all cases, the architects and engineers who prepared them came from outside Canada. Some of them created plans without ever visiting the actual cities. It is therefore understandable that the solutions they proposed very seldom reflected the specificity of these cities, their locations, climate, and social structures.

Among the more sensitive plans was that of Thomas Mawson for Calgary, completed in 1914. The need to protect pedestrians against the harsh Calgary winter was expressed in the provision of continuous arcades at the ground level of all buildings surrounding the central square of the civic centre. This centre was never completed as envisaged by Mawson and only the Hudson's Bay store, with its gracefully arcaded elevations, remains as a testimony in the attempt to make Calgary's centre more habitable.

6.3.2 The Modern Era - "Planning" Comes to Canada

By the time the great war and the depression had ended, the age of idealism and grandiose planning was over due to an urgent demand for better housing, higher sanitation standards and improved mobility.

From 1914 to the mid 1920s, "Garden City" and "New Town" concepts enjoyed great popularity through the efforts of the federal government's Commission of Conservation established in 1909. With the arrival of Thomas Adams from Britain to Ottawa in 1914, the direction of planning changed drastically. His appointment as the Town Planning Adviser to the Commission allowed him to promote "Garden City" and the "New Town" ideas, of which he himself, was a strong proponent. He advocated a "comprehensive" planning approach and dismissed, as unnecessary, "frills" and all architectural improvements which might add visual and aesthetic qualities to the built environment. His main concerns were for "scientific" and orderly planning which was primarily focused on "convenience in development of land and the reservation of the most suitable sites for industrial plants."⁶⁴

As a result of his interventions in Ottawa, several satellite and resource towns were built. In some cases, he was directly or indirectly involved in the planning of Temiscaming (Kipawa), Kapaskasing and Iroquois Falls. The original physical town and street pattern of Temiscaming and Iroquois Falls were influenced by the topographical features of the sites. The plan for Temiscaming, prepared by T. Adams, showed a great deal of sensitivity toward preservation and enhancement of the existing landscape. It also attempted to introduce the "block-layout plan" whereby multiple family units, mostly in the form of rowhouses, enclosed internal courts containing allotment gardens and a children's playground. Heavily treed boulevards lined every residential street and provided some barriers against winds. Indirectly, this spatial organization was responsible for providing some protection against the hostile climate.

In 1927, four years after Adams left Ottawa, Clarence Perry formulated the prototype of the "neighbourhood unit" which, among other applications, was perfected in the new community of Radburn, New Jersey. This type of planning immediately appealed to the developers and planning authorities because of its efficiency in land development and easy application of zoning regulations. By this time, the need to control the development of peripheral lands became apparent, due to rapid proliferation of the suburbs, far in excess of natural population increase which started prior to 1913.⁶⁵

With Perry's "neighbourhood unit" concept, the basic suburban residential form was launched. Planning standards, zoning bylaws, and later on, population and traffic projections became the basis for most planning practice in North America. If the prevailing conditions had been appropriate, "New Town" and "Garden City" ideas would most likely have evolved to reflect the uniqueness of the Canadian landscape, climate and society. However, Canada, at this time, was still predominantly a rural country, dependent on Great Britain for its political, economic and professional leadership. From the 1920s until the end of the World War II, national and provincial issues preoccupied Canadians and urban problems diminished in importance. In the words of Humphrey Carver:⁶⁶

. . . the economic depression of the thirties was a vacuum and a complete break with the past. . . So in 1946 we (planners) almost literally started from scratch with no plans or planners and we immediately hit a period of tremendous city growth.

6.4 Urbanization in the Post World War II Era

The post World War II period was marked by massive migration of rural population to existing cities and towns where employment opportunities became concentrated during the war and immediately after it. This migration tide flooded already crowded cities suffering from a lack of decent infrastructure and services.

There were two approaches to resolving the situation; either to build on the outskirts of the existing urban area or to redevelop within it. From 1945 to the late 60's both methods were used. "Urban renewal" of the older residential and industrial neighbourhoods provided smaller size dwelling units within high density, highrise apartment blocks while families were accommodated at the periphery of the city, in newly developed residential subdivisions.

6.4.1 The Suburban Pattern

Development patterns of low density were possible because of the availability of cheap energy and almost unlimited agricultural or vacant land which was swiftly reclassified as developable with an instant increase in value. Advancement in technology, especially in the field of communication and transportation facilitated outward growth into the countryside.

Suburban locations appealed to potential homeowners for several reasons. Firstly, they could buy more living space for less money (in comparison to what they could afford in the inner city neighbourhood), and secondly, they could save time on commuting since employment areas started to leave downtown for peripheral locations. Other factors, such as privacy, home ownership and a life style with emphasis on raising a family, also contributed towards the widespread popularity of the suburbs. The ownership of a car and a single family house became the prerogative of most Canadians.

The homeowners also expected a steady increase in property value of their suburban homes and for that reason demanded a guarantee that the character of the neighbourhood would not change over time. In response to those demands, public control over urban development was introduced at the municipal level. Subdivision plans and zoning bylaws became major regulatory instruments in developing urban areas.

Subdivision plans were based on a melange of garden city, neighbourhood principle, and Radburn layout concepts. This basic formula has been endlessly repeated throughout North America regardless of climate, regional topographic characteristics, availability of energy sources or social requirements. The visual monotony and uniformity of suburbia was directly related to development of large parcels of land by a single entrepreneur and to mass production of dwelling units for socially and economically compatible groups of homeowners.

Its physical layout and predominantly single family form requires high energy input and high capital costs for roads and services. This dwelling type is the most inefficient housing form with regard to energy consumption. Costs of servicing, road construction and maintenance of such low density spread-out development are much higher in comparison with more dense urban forms. Inherent in the design is an inflexibility in accommodating any changes in population composition or lifestyle of the homeowners which often results in bringing isolation and loneliness to the suburban dweller. Although suburbia has been heavily criticised, it still has an appeal to many prospective buyers because it is the only type of development where they can still buy a single family house.

6.4.2 Central Areas

It is within the central areas of many Canadian cities that many innovative, climate-responsive projects have been implemented. These include extensive underground pedestrian movement systems in Toronto and Montreal; elevated pedestrian bridges (skyways) in Calgary; enclosed heated sidewalks in Ottawa, and roofed-over portions of commercial streets, e.g., Quebec's Lower Town, Thunder Bay, Ontario. All are provided for the benefit of downtown shoppers and workers. They facilitate movement, in comfort, from one office building to another, from hotels to convention centres, encouraging shopping, business transactions and human communication.

Such comprehensive schemes were made possible because of existing compactness of the urban structure, mixed land-use development and economic incentives offered to developers. The major impetus for these climate-controlled areas has been the existence of rapid transit systems and the possibility of connecting the new developments to new and existing stations.

A concentration of high density residential uses, particularly in Montreal and Toronto (each having an efficient subway), has strengthened and encouraged development of extensive climate-protection pedestrian networks. Due to wind turbulence created by tall buildings inserted into the urban tissue, drastic changes have occurred to the micro-climates in proximity to such redevelopments. Public outdoor spaces have thus become quite uncomfortable, as a result, and now urgently require both greater attention and modification.

6.4.3 Planned Communities in Urban-Centred Regions

In contrast to suburban subdivisions which are primarily residential dormitories, "planned communities" were intended to provide a higher level of self-sufficiency including possibilities for entertainment, recreation, shopping, employment and dwelling.

The precedent of the post World War II "satellite" towns in Canada was Don Mills, built in the early 1950s on the outskirts of the City of Toronto. This new community, built on former farm land, was planned to be a self-contained entity for people who would both live and work there. Developed by a single entrepreneur and planned from the outset, Don Mills had the potential to become a prototype for a Canadian winter city. Instead, it became just another suburban community, but with a greater semblance of order than most other developments of its period. It was most unfortunate that the climatic component was given so little importance.

This was at the time when the Garden City of Tapiola was built in Finland. While designers of Tapiola were concerned with developing the most suitable housing form and building techniques for its specific site and climate, developers of Don Mills created a hybrid of a standard neighbourhood subdivision and a British "new town" with strong emphasis on the car. In Tapiola, buildings were located according to topography, sunlight, wind and view while Don Mills was planned to obtain a maximum return on the investment.

With Don Mills, which was, however, a financial success, a pattern for future development across Canada was set. Zoning bylaws and planning regulations became solidly entrenched in municipal legislation and any innovations in land use composition or building form were to require amendments. In many cases, the innovative aspects of the development were deleted because of the costly and lengthy process required to change existing regulations.

In the 1970s, with an energy crisis affecting all aspects of our lives, re-evaluation of planning principles and practices became necessary. Energy conservation, building insulation, and land use/transportation relationships became operative words of planners, architects and builders. That was also a time of economic recession and very few "new towns" were either planned or built. New communities which were planned at that time, such as Townsend, Ontario, incorporated some energy conservation measures and microclimatic guidelines in their conceptual plans.

Only within Townsend's proposed town centre, were pedestrians to be protected by a system of arcades, galleries and shelters. Testing on wind tunnel effects was suggested as a part of the implementation process. Although the plan dealt adequately with pedestrian protection in the centre, the form, location and density of residential areas were planned in a strictly conventional manner.

With localized exceptions, as a whole, it might be concluded that opportunities to truly address a severe climatic context for large scale development have not been realized, especially where occasions have existed to achieve even a minimum level of innovation. More recently, some of these "town centres" have been considerably modified by enclosing the open sections of the pedestrian malls and providing a more comfortable environment for shoppers.

6.4.4 The New Resource Towns

As Ira Robinson has pointed out, the new resource towns in Canada did not emerge as a result of urban growth pressures but were created to accommodate the needs of single industrial enterprises engaged in extraction and primary processing of nonagricultural resources. These natural resources are found in the remote areas of Canada's north far from the heavily populated belt which extends along the American border.⁶⁷

Development of these towns is based on resource exploitation. Their existence and prosperity depend upon outside market forces which, in turn, regulate product impact and employment levels. Because of their specialization, these communities easily become victims of failing economies.⁶⁸

The first permanent post war communities were established as "company towns" and reflected an interest in the most economic and efficient exploitation of resources rather than in the planning issues or the life styles of their employees. These communities were modelled on typical suburbs built in temperate regions with low densities and dispersed activities.

During the early and mid-50s, the Central Mortgage and Housing Corporation (CMHC), to a large extent, shaped the form of new Canadian

communities. Through the amendments to the National Housing Act in 1946, the CMHC was also in control of the physical design of resource communities. From 1956 to 1959, the community of Elliott Lake was developed as a joint federal-provincial project. In analysing the resultant urban form, R. Robson states:

The layout reflected the "traditional" CMHC design standards, regardless of the severe climate of Northern Ontario and economic and financial consequences of such design. The wide winding streets lined with single family houses provided little protection from the harsh winter weather.⁶⁹

It seems that until the 1970s, the main thrust in planning new communities was directed toward the fast production of housing and adequate infrastructure.

Energy conservation, extremes of climate and fragile environment were not considered important factors. In addition, social patterns based on the abnormal demographic profile and psychological stress caused by isolation and remoteness were also disregarded during the planning process. The approach to development of the next generation of resource communities, built from 1970 on, began to differ considerably from earlier ideas.

The advancement in technology requires a highly skilled and stable labour force, and companies are willing to pay well. Since the majority of skilled workers are recruited from the southern parts of the country, where temperate climate and a high level of amenities are taken for granted, employers are forced to compensate for such displacement by offering better wages and by making the new place of residence as attractive as possible.

Within the constraints of harsh climate and remote location, attempts are now being made to provide the most efficient urban form--from both

energy conservation and functional viewpoints--with the hope of engendering a higher quality of life by also incorporating significantly improved social services facilities and programmes. In addition, an effort has been made to enhance the roles of voluntary groups and citizens in defining collective goals and in actively participating in mechanisms to implement them over the short and medium time frames.

Some of the latest examples of planned resource communities encompassing innovative strategies are Tumbler Ridge, B.C. (1977); Leaf Rapids, Manitoba (1974); and Fermont, Quebec (1970).

Fermont, Quebec

Of all new resource communities Fermont is the only one which embodies the design principles for building in the north through:

- 1) Compact urban land use pattern
- 2) Windscreen building principle
- 3) Climate-controlled pedestrian access to community facilities
- 4) Mix of housing types and densities
- 5) Orientation for maximum solar access

Built in 1970 by the Quebec Cartier Mining Company, Fermont, with 5,000 population has proven that company towns could also be well planned, habitable environments.

Leaf Rapids, Manitoba

Between 1971 and 1974, Leaf Rapids in northern Manitoba, was developed to serve employees of Sherritt Gordon Mines Ltd. who work at extracting copper and zinc at Ruttan Lake. The government of Manitoba, through the Leaf Rapids Development Corporation, was responsible for the preparation

of the plans and the execution of the project. Many innovative ideas were applied in order to provide a high quality of life and environment:

- 1) Retention of large tracts of trees and vegetation
- 2) Pedestrian pathway system linking all residential units to the town centre
- 3) Multi-use town centre under a climate-controlled roof
- 4) Innovative approach in developing the town

The physical infrastructure is only one component of the new town. The quality of life and the level of urban amenities are other very important ingredients which are usually missing in northern communities. Design of the town centre with its integrated uses provided these amenities.

Tumbler Ridge, B.C.

One of the few Canadian "mega-projects" of the 80s, Tumbler Ridge has been planned and built from the ground up. It has the harsh climate, partial isolation and exceptional natural setting. Its advantages are in the availability of several energy sources, good transportation and a diverse resource base. Energy conservation was one of the primary objectives in the planning of Tumbler Ridge. The basic principles which were developed include:

- 1) Land efficiency - compact lots and housing clusters
- 2) Network efficiency - reducing the length of roads and services
- 3) Solar design - orienting and spacing houses to maximize passive solar gain
- 4) Wind protection - reducing wind velocities around the housing unit in order to cut infiltration-related heat losses
- 5) Retention of tree shelter belts protecting heavily used areas from severe wind chill

Since the innovative application of the "windscreen building" concept at Fermont, further utilization of this idea has not evolved in Canada--or elsewhere--except on a parcel of land in Malminkartano on the outskirts of Helsinki, where Ralph Erskine (who invented the idea) was chief designer of a portion of a large housing estate.

Canadians simply do not seem prepared to accept anything less than the single-family or row house, especially in towns of small size, sited in remote areas and close to nature.

It is improbable that we shall see many more newly planned communities based on resource exploitation due to the high costs and family disruption related to such type of development.

However, we are continuing to build huge, new residentially-oriented subdivisions (with shopping centres, schools, and, recreational facilities) on the urban fringes of our larger cities. It would be reasonable that, by this time--given the lessons we have learned about the urgent need to adapt settlement forms to climatic needs--we should be more attentive to these forces, both physical and social, in formulating new plans, policies and programmes.

7.0 CRITIQUE OF EXISTING URBAN FORM AND CURRENT POLICIES

In most instances, in Canada, an approach to design based on climate, and topography, scarcely exists. Furthermore, implementation of policies or projects, where realized, is carried out in fragmented fashion.

Shopping centres with attractive pedestrian-oriented internal spaces, below or above the street level, pedestrian precincts within the central area, and enclosed leisure facilities are some examples of attempts to introduce livability into the urban fabric. There has not been, however, a comprehensive approach towards the development of a totally climate-responsive community. The exceptions are a few of the new resource towns built by a single developer, private or public, and based on a detailed master plan, such as Fermont (Quebec), Leaf Rapids (Manitoba) and Tumbler Ridge (British Columbia).

The rest of urban Canada is evolving according to the accepted formula of low density sprawl. Canadian climate and its influence on life style, urban environmental quality, and the economies of management, in most urban areas, has received very little attention from planning or political authorities.

There are a number of factors which can be assumed to have played a major role in this general indifference--both in the development industry and in public policy initiatives--to winter concerns, especially as they affect the day-to-day functioning of routine human affairs. These are as follows:

1. Until the energy crisis of 1973, we have had access--both financial and physical--to almost unlimited energy sources.

2. Canada has been a high-technology, post-industrial nation with a reasonably high standard of living, with some exceptions in economically disadvantaged regions.
3. Our general architectural/urban vocabulary, as it has been influenced by theoretical premises, has been predicated upon formal, classical elements of composition and urban imagery--broad plazas and public squares, boulevards, axial vistas and civic open spaces. This tradition is still being pursued and, in many cases, revived by practitioners. The resultant urban form is, on the whole, quite inappropriate for cities and human settlements which must endure harsh, lengthy winter climates such as those experienced in most of Canada.
4. Much of the urban fabric of Canadian communities and their residential hinterlands, as they have been built up by the private development industry, has imported a vocabulary of community structure based on more southerly climates (notably those of the United States and Great Britain) and their more docile demands. This built form has been largely predicated on four key elements:
 - i) the single family detached dwelling (low density development).
 - ii) private ownership of land.
 - iii) mass ownership of the private motor car.
 - iv) access to mortgage finance for residential purposes.
5. Rapid urbanization has been a recent phenomenon, largely following World War II. Therefore, the issue of development typology was hardly a matter for serious concern prior to the last 30 years.
6. There has been a very limited awareness of the variety of means (and of the need) available to architects, town and regional planners,

and urban administrators for actually formulating policies directed toward reducing or eliminating winter's negative characteristics,

It seems that the greatest obstacle to the improvement of our northern settlements is planning practice. Through the development and perpetuation of policies which barely acknowledge regional differences in climate, topography or local energy sources, the urban form of our cities and communities has been energy inefficient, costly to manage, and visually unattractive for the better part of the year. This problem has been addressed in the "Interim Report - Northern Saskatchewan" for the Land Use Policy Committee in December 1980 which stated that:⁷⁰

Northern land use policy must be distinct from southern policy. Decisions governing activities in the north should not be made solely by people in the south.

The repetition of similar zoning regulations from the Yukon to Halifax is hard to justify and it can only be hypothesized that practicing planners have cared little about the principles of creating livable communities. Planning policies and regulations have been seen merely as tools for the protection of individual property values and they cannot encourage innovations which would contribute toward more humane settlements.

Efficient physical form is one of the components of urban livability but there are many other factors which are equally, if not more, important. The quality of the visual environment, architectural expression, the life style and well being of the inhabitants are some of the elements without which our cities would become dead. It seems that the dominant preoccupation of Canadian planners to strictly enforce utilitarian planning concepts and to ignore all other "frills" which make cities livable, has roots in the 1920s when Thomas Adams declared that "orderly development" through planning and proper zoning "will produce beauty without seeking beauty as an end in itself".⁷¹ Is it possible that planners practicing today still assume that the orderliness resulting from efficiency is the only part of their vision which taxpayers would support?

In order to appraise existing urban form and pattern in Canadian settlements with regard to climatic adaptation, it is necessary to establish criteria against which such an evaluation can be undertaken. Livability of an urban settlement is, to a large degree, a reflection of personal satisfaction with the life style, amenities, or services offered within a community. Economic, physical, and mental well being are essential requirements from the individual's point of view. The level of efficiency, safety, and beauty of the built and natural environment enhances those basic requirements.

In an economic sense, livability could be defined by job availability, the cost of living, and ease of mobility. Physical and mental well being is dependent on the availability of immediate medical care, educational, recreational and social services. When these requirements are imaginatively and adequately translated into built form, livability is given further expression.

Social and economic factors affecting individuals living in cold regions are very important and, in some instances, the most significant issues to be addressed. However, the discussion of livability of northern communities will be confined to criteria which, in general, are responsible for the physical form, such as economic factors, mobility, urban habitat, sociability and public space, visual environment and civic life.

7.1 Economic Factors

It is a well known fact that considerable savings can be realized if individual buildings are well designed, building materials carefully selected, and if the construction is effectively managed and completed within a set time frame. The same is true for the larger, planned environment, if all factors are carefully considered beforehand and if implementation is carried out according to stated objectives.

It was only during the mid-1970s that energy savings became important enough to warrant attention from the building industry and government agencies in charge of building standards. Prior to 1973, double glazing and thermal insulation were not part of the daily vocabulary. Energy was inexpensive and overheated apartment and office buildings were the accepted norm. To cool buildings down to bearable levels, the windows had to be left open (sometimes overnight). Almost inevitably, this action caused flooding from frozen radiators, and a "cold war" between tenants and management. Such occurrences are now events of the past. The energy crisis made us realize that consumption was unnecessarily high while environmentalists pointed out that energy sources were not limitless.

Newly constructed buildings, in general, have to comply with government regulations for energy efficiency measures. What we do not accept, as yet, is the need for improving the total physical environment in order to achieve more economical and manageable urban settlements. Adaptability to site, topography, and climate are major ingredients. Living in cold regions is, in itself, a costly proposition. Personal expenses related to clothing, food, house maintenance, transportation and recreation, tend to escalate as one travels northward. Costs associated with the construction, maintenance and servicing of urban settlements also increase with the harshness of climate.

7.1.1 Jobs and Employment

The highest possible price is paid when people are uprooted and forced to leave their community in search of jobs or a new house. Many of the Canadian resource towns, which were developed and settled for the purpose of exploiting non-renewable resources, have experienced successive economic booms and busts and even occasional demise. Because of their single specialized functions, they easily become victims of faltering world economies.

Seasonal unemployment during the winter months is regarded as a normal occurrence within the economic cycle and its victims are subsidized at a tremendous cost to the nation. Those employment sectors most affected are the construction industry, tourism, recreation, fishing, and to some extent transportation. The number of unemployed is not small. Even in Metro Toronto it is estimated that between 40,000 and 50,000 workers are unemployed between November and June every year. There is obviously a correlation between climate of the urban areas and the job market.

Winter can also be a stimulus for development of specific winter climate products and technology. Some examples include snowmobiles, cold stress meters, snowblowers, new building materials, etc. There is an untapped potential for developing and marketing products and ideas which are uniquely rooted in northern landscape, climate, and cultural frameworks.

Carnivals and winter pageants combined with displays, sale of crafts and food (based on the ethnic tradition) specifically developed for the winter season could not only become sources of enjoyment but also sources of revenue to the community. Some existing examples include the successful Carnaval du Quebec and Ottawa's Winterlude. Each region has its own micro-climate, its own ethnic character, its history and customs. Such diversity should be exploited in developing specific economic development strategies for winter activities in each region. If properly marketed, these activities will generate more employment which, in turn, will be reflected in local pride and satisfaction. It will also make northern communities economically more self-reliant.

7.1.2 Food

Sweden has set for itself the goal of self-sufficiency in energy and food production by the year 2000. For that reason, glass houses and allotment

gardens have become a popular feature of many housing projects. In Iceland, natural sources of hot water and steam are extensively used for heating and food growing. Hveragerdi, a village near Reykjavik, has numerous greenhouses heated by natural hot springs which supply all vegetable, fruit, and flowers for the market in Reykjavik. Many Reykjavik households utilize the low temperature water (25 - 30°C, which has previously been used for heating) offered free on a city-wide basis, to heat small greenhouses and swimming pools. The U.S.S.R. has adopted the principle of establishing agricultural hothouse operations adjacent to some of the major urban centres in Siberia to supplement local markets with food.

Canadians are rapidly urbanizing vast areas of the best agricultural land, primarily to accommodate low density development. The costs of servicing as well as the actual waste through unproductive use of land within residential areas has, as yet, not been seriously understood. In regions with severe cold climate, when open space (required by the existing bylaws) in front or back of dwellings can hardly be used for more than 4 months of the year, such passive use of the land appears unjustified. An alternative and potentially more productive idea might be to reduce lot sizes and create semi-private enclosed allotment gardens, which would not only provide recreation but also a measure of employment within the community.⁷² "Gardens under glass" could become a feature of the north.

7.1.3 Energy Efficiency

The amount of energy used for heating depends to a great extent on the climatic zone in which the community is located. It has been demonstrated that district heating, especially in remote areas, has a potential to be more economical for the community, as a whole, than presently used individual heating sources. However, such systems are very seldom employed in Canada. Considerable savings could be realized through the application

of various design measures based on microclimatic principles and energy-efficient planning exemplified in some new resource towns.

A series of energy planning studies have been undertaken in 1981-82 for Tumbler Ridge, a planned, new resource community in northern British Columbia.⁷³ These studies support the theory that compact community design, compared with conventional subdivision design, is capable of generating substantial savings to the individual as well as to the community. Capital cost savings, including road construction servicing and site development was \$8,250 and almost \$110 per year in operating costs per detached unit (transportation and municipal services).

The cost of one kilometer of arterial road (4 lanes) in Tumbler Ridge or in Metropolitan Toronto is approximately the same, 1 million dollars (including pavement, sewers, water supply lines, lighting, etc.). In Toronto, \$12.6 millions were spent in 1985 on winter maintenance of roads under the Metropolitan jurisdiction. Of the \$12.6 millions, \$7 million was spent on salting, plowing and snow removal, the rest being used toward salt purchases, road repairs and spring cleaning. Even a slight reduction in the length or width of roadways would significantly reduce the cost of winter maintenance.

The consistent application of energy-efficient planning principles to achieve compact development does not require front-end capital investment. On the contrary, with little investment, important savings can be achieved. Presently a very limited number of Canadian municipalities use energy-efficient planning criteria as a basis for physical development. While energy conservation measures have been well developed for individual dwellings, very few examples of residential subdivisions, based on the zero-lot line and passive solar access principles exist.

7.2 Mobility

Long distance commuting is necessitated by the present dispersed form and by the increasing range of job opportunities within the regional structure. Road, rail, water, and air transportation are all modes used to combat distances and to facilitate freight and passenger movement.

The remote northern communities depend heavily on air transport as the main mode of inter-city and inter-regional movement. Technological innovations such as snowmobiles have helped greatly to improve mobility within the community and its immediate hinterland during the winter season. Within the more urbanized part of the country, and especially within large metropolitan regions, road and rail transportation are still the most important means of achieving a high degree of movement.

The automobile is the major mode of personal transportation in urban and rural areas and our reliance on it has, to a great extent, shaped the settlement pattern in this country. Although it provides the greatest degree of personal mobility, it also creates numerous problems which, despite continuing efforts, have not yet been overcome. Road congestion, long commuting distances, parking, pollution, energy costs, high numbers of accidents, effects on the aesthetics, and the quality of life in our urban areas are all issues for which solutions are not easy to find.

The severe winter climate further aggravates these matters, when snow, ice, wind and darkness severely impede movement. However, accessibility is increased in the rural, sparsely populated areas when frozen rivers, lakes, and swamps are suddenly transformed into endless highways; where winter opens up the countryside by eliminating the natural and man-made barriers.

The problems related to mobility, specific to cold climate regions, affect motorists and public transit passengers as well as pedestrians. Since

all modes of transportation, including walking, are in constant interaction, influencing and interfering with each other, the problems arising from their operations are necessarily linked.

7.2.1 Road Transportation/Vehicular Traffic

The most common winter problems related to vehicular traffic are:

- lengthy commuting hours due to inclement weather.
- accidents related to road conditions, such as snow drifts and poor visibility.
- stress experienced while driving under harsh conditions.
- psychological depression related to darkness (short daylight hours) and/or sense of confinement (specifically related to remote northern communities).

Due to the lack of national settlement policies aimed at directing future urban growth in a more rational way, it can be expected that our urban areas will evolve following the past pattern of low density and scattered development. For this reason alone, the importance of the private automobile will not decrease and the demand for the expansion of road networks will continue.

The environmental impact of the automobile, energy and land consumption, and the required capital costs for construction and maintenance of roads and highways are all factors pointing against such a scenario. It seems that the only possible solution is therefore, to find a balance between both the optimum degree of mobility and affordability. To reduce the use of the car we must minimize the need for travel.

There are two possible alternatives for achieving this objective:

1. to concentrate development within defined urban growth areas and to provide greater integration of land uses and activities.
2. to provide opportunities for greater utilization of alternative modes of transportation.

Travel distances can be considerably shortened, resulting in the elimination or reduction of many problems associated with long distances through implementation of the following planning principles: controlled and concentrated urban growth, infilling of vacant and underutilized parcels of urban land, and provision of multi-use buildings. In addition, measures, specifically developed for better design of roads during the winter season, would contribute toward a reduction of accident rates and an improved vehicular/pedestrian relationship.

The basic design criteria for northern climate regions are:

- orientation: for maximum solar gain to reduce snow and ice accumulation, fog and flooding.
- alignment:
 - to follow natural contours.
 - to provide attractive vistas by exploiting natural features or by utilizing planting with an emphasis on winter vegetation.
- storage of snow: to make provision in the design for the storage of snow after removal.

Maintenance

The effectiveness of the road networks during the winter months depends heavily on their maintenance and management. In order to reduce

the number of accidents caused by icing and snowfalls, various techniques have been developed based on the specific climatic conditions and energy sources. While in Edmonton, because of its consistently low temperatures during the winter months, sand and gravel are used to increase tire friction on snow-covered roads, in Southern Ontario salt is used to combat ice conditions which are prevalent in the regions adjacent to Lake Ontario to the detriment of vehicles and rapid deterioration of road surfaces and buildings.

The extensive use of salt is justified by highway engineers on the basis that motorists require a high level of mobility and safety at all times and it is therefore essential for snow and ice to be removed as quickly as possible. However, there is a growing awareness of environmental problems associated with a high level of salting and research is currently being undertaken into different ways of dealing with snow and ice removal problems.

In some countries, such as Norway and Sweden, electrical heating/melting systems are built into the road surface in order to eliminate the need for snow removal and to reduce the overall costs of the maintenance. This system, although initially very costly, may yet be the most desirable from an environmental point of view. The scope of its application is very broad: one of the most obvious applications could be in the driveways of single family homes, which are (at least in the Southern Ontario region) the highest consumers of salt and therefore the worst environmental offenders. Specific systems, for snow and ice removal should be developed based on local energy sources. However, such systems will not be economically feasible if a community does not have sufficient density or compact form.

7.2.2 Parking

Provision of parking is an essential factor in achieving a desirable degree of accessibility in urban areas. During the winter season, the car becomes, for the majority of people, a protective device which is left only when one is ready to enter a sheltered space. Therefore, provision of convenient parking is of utmost importance in designing for winter comfort. Parking structures, directly linked to transit and/or protected pedestrian systems leading to high-use activity areas, seem to be the most appropriate form. An example of a successful parking concept is found in Calgary, where parking structures are directly connected to the +15 skyway system and the LRT (Light Rapid Transit) line. Minneapolis is developing a comprehensive system of peripheral multi-level parking structures which will direct vehicular access from distributor streets and pedestrian access via skyways into the core. Conveniently located parking is of particular importance in smaller communities where major facilities are scattered throughout and shopping is contained primarily within the "main street". A system of protected pedestrian walkways and mid-block arcades directly linked to parking areas would greatly enhance pedestrian comfort and increase commercial viability in the core.

Safety of the users of parking facilities is another factor which has to be addressed in the designing stage. During the winter months, daylight hours are considerably shortened and walls of snow piled at the edges of at-grade parking lots further reduce visual contact with the immediate surroundings. The risk of assaults, especially on women (which in any case, is great in parking lots), is increased under such conditions.

7.2.3 Public Transit

Use of the private automobile can be significantly reduced by restricting its access to selected areas. However, an alternative mode of

transportation has to be available in order to maintain a desirable level of mobility. Public transit, encompassing rapid transit systems, commuter rail service, streetcars, and buses are the most common modes. The larger the urban area, the more important is the service provided by public transit. This is especially true during the winter months when the number of passengers using public transit is increased.

Poor road conditions, traffic congestion, and the sudden increase in passenger load causes a slow-down of transit systems resulting in discomfort to and irritation of travellers. To alleviate such problems the following improvements are suggested:

- expansion of transit services and routes to serve large residential areas.
- development of "winter" scheduling which would include reduced headways throughout the day during the winter months, information on routing and timing.
- better passenger services including heated bus shelters, less draughty bus and subway stations, and integrated transit terminals.
- provision of parking facilities adjacent to rapid transit stops.
- provision of reserved lanes for transit vehicles within the existing road right-of-way.
- provision of walkways to minimize walking distances and access time to transit stops. Transit authorities should be involved in the approval process of all subdivisions and major redevelopment along transit routes.
- utilization of auxiliary systems such as dial-a-bus and car pooling.

7.2.4 Auxiliary Transit Services

The public transit system is feasible within highly urbanized areas. A circuitous, collector road system, a widely spaced arterial road system, dispersed development, and the nature of work trips have made it difficult and expensive to provide a high level of transit within existing suburban areas. There is a need for systems which can supplement the full fixed transit service and be cost-effective within the suburban domain. One of the systems developed and used in some Canadian communities is a dial-a-bus service, a form of conventional public transit service by which a passenger is picked-up and delivered either to the local destination or the major transit routes in response to a telephone request. Because of the personalized nature of this service, the cost in most cases is higher than that of the present transit services but lower than taxi service. This type of transit has the added advantage of being able to provide improved service for the young, handicapped, and elderly. For that reason, and having in mind the increase of elderly living in the suburban areas and their inability to cope with winter related transportation, dial-a-bus has an excellent potential of becoming the more widely used type of public transit, especially within smaller size communities.

Ridership is a crucial determinant in procuring transit facilities within selected areas. The present urban pattern does not provide sufficient ridership to warrant major expenditures on public transit improvements. Therefore, modification of the present physical layout of suburban communities, in conjunction with the implementation of innovative public transit services, will have to be undertaken if future populations living in low density areas are to be adequately served. Through a slight modification of the street pattern, the use of public transit can be improved even if densities are not significantly increased.

7.2.5 Pedestrians

During the winter season, pedestrians are the most adversely affected group. Their mobility is severely decreased due to the following:

- lack of pedestrian networks, due to the design principles used in subdivisions.
- poor maintenance of existing facilities such as sidewalks, transit stops and road-crossing clearing.
- lack of well designed protective devices such as canopied sidewalks, and mid-block arcades.

Discomfort of pedestrians along streets, which become "traffic corridors", has been addressed, to a certain degree, in the central cores of large urban areas. Separation of pedestrian from vehicular traffic was the primary reason for Montreal's Place Ville-Marie underground and Minneapolis' skyway system. The economic benefits of such enclosed, protected pedestrian spaces very soon became obvious to the business community which further expanded the initial idea. Therefore, the first responses to climatic conditions were within the commercial district and, in most cases, it is the sole extent to which the protection against adverse elements is offered to pedestrians.

Extensive pedestrian precincts within central areas have been developed in major Canadian cities, such as Montreal, Toronto, Edmonton and Calgary in conjunction with rapid transit lines. Some smaller communities, such as Thunder Bay and Hornepayne in Ontario, have improved the central areas by enclosing a portion of their main shopping streets in order to improve the commercial base as well as the quality of life.

While most municipalities have the practice of erecting bus shelters, very few have policies to develop a comprehensive climate protected pedestrian system, either within the central area or in residential neighbourhoods.

Pedestrian walkways need not always be enclosed structures to be climate responsive. Canopies, arcades, and awnings are some of the protective elements used in many commercial establishments along "main street". But their effectiveness is diminished through inconsistent and discontinuous application. A continuous, at-grade pedestrian arcade system with overhead radiant heating, lighting, and music could provide an improved "winter" environment at street level at much lower costs than any other type of totally climate controlled system.

The use of landscape principles for protection against winds and to "trap the sun" is another cost-effective way of providing protection to pedestrians. Recycled heating from adjacent buildings can also be used to melt snow and ice on sidewalks. To absorb radiation, the application of dark colours such as red or brown instead of grey can be used. There is a variety of means to improve pedestrian comfort during the winter months. Some are more costly and more appropriate for certain locations than others. The usefulness of various systems will depend on a comprehensive approach to the total winter environment.

In general, it will be a long and a costly process to improve mobility. However, better management of the existing transportation facilities is a feasible and urgent requirement. The current policies already encourage higher densities, as well as better relationships between place of work and residence. The implementation of such policies requires a strong centralized decision-making body whose responsibility would encompass all elements of the urban structure. As long as urban areas continue to be developed within our existing political structure, emphasis should be placed on incremental improvements which would ultimately be beneficial.

7.3 Urban Habitat

The North American continent has embraced the single family detached house as the most appropriate type of dwelling within which a quest for the "good" life is believed possible.

The dream house is a uniquely American form, because for first time in history, a civilization has created a utopian ideal based on the house rather than the city or the nation. For hundreds of years, when individuals thought about putting an end to social problems, they designed model towns to express these desires, not model homes.⁷⁴

This love of and need for the ownership of a free standing dwelling is also rooted in Canadian settlement policy, in the aspirations of immigrants, in the operations of the financial institutions and in development practices.

Although it is expected that every nine out of ten Canadians will be living in urban areas by the year 2000, the values of the population are still largely rural. The cores of cities are still often perceived as undesirable concentrations of strange people, and they are visited only for special occasions such as shopping, to see visiting dignitaries, to attend political rallies or sporting events of national significance. Such attitudes are very difficult to change. A comparison could be drawn with Finland, which is very similar to Canada in its landscape, climate and sparsity of settlements.

...Finnish people do not feel the urbanite as something deeply rooted with their tradition. The farmhouse, once it becomes part of the urban scene, sees the land around it shrink, but never disappear from any of its sides; it seems that rural people never quite accept the fact of becoming urban.⁷⁵

When efforts were made by various government bodies towards increasing residential densities, such attempts were met with resistance on the part of

existing owners as well as by the development industry. The reasons for rejecting different housing types, from the presently well known ones, can be attributed to the influence of policies which are supportive of perpetuating existing rather than new and innovative forms and to the reluctance of the building industry to produce high quality, medium-density housing in a form which is human in scale and functional in design.

Presently, there are three major issues with respect to accommodating change in the residential environment, which induce conflict in urban policy decisions:

- i) Low Density Residential Neighbourhoods and Shifting Social Structure
The need to restructure existing residential neighbourhoods to provide more varied housing accommodation and to increase densities in order to generate transit ridership is in opposition to the present owners' wishes to retain the "status quo" for fear that any change within the neighbourhood would affect their property values. (In many cases the house is their only asset.)
- ii) Single Family Detached Dwelling and New Housing Form
A deeply rooted preference for a house surrounded by unspoiled countryside is juxtaposed against the need for services, amenities and job opportunities close to home as required by new population groups entering the housing market. In addition, the high maintenance costs associated with services and utilities in low density developments are placing a substantial financial burden on local municipalities, reflected in continuous increases in the property tax.
- iii) Existing Zoning Regulations and the Need to Accommodate Change
Existing zoning regulations have been developed to protect property values by strictly regulating uses and usage within neighbourhoods.

Because of their rigidity, any changes in land use composition or in housing form are difficult to realize, creating an imbalance between housing demand and housing form.

7.3.1 Demographic Changes and New Housing Form

In Canada, the major change has arisen from a declining fertility rate. The total fertility rate that was 3.8 in 1961 declined to 2.2 in 1971 and 1.7 in 1981. By 2010 it is expected to be increased to 2.3. These factors dramatically alter the age composition of the population with significant social impacts.

Household size is continuing to decrease because of:

- a) smaller families;
- b) increasing economic independence of the young and elderly;
- c) increasing numbers of single parent families;
- d) fewer boarders, lodgers, and doubled-up families.

The population will consequently occupy more residential floor area per person and the number of households will grow faster than population.

These demographic changes will influence the restructuring of existing land use distributions and provision of different types of services. Older population groups will require various health care and associated services extended over longer periods of time. Recreational, cultural, and entertainment facilities will have to be easily accessible by this group, especially since the majority in the 65+ age group are single women with low incomes.

The availability of public transit as well as services and amenities within walking distance will become the most important locational criteria

in selection of a residence. The same is true for families in general, but even more so for single parent families who rely on daycare and other communal facilities.

Single persons and childless couples, especially when both partners are working in white collar jobs, are strongly attracted by the opportunities provided in the central areas. The other group which needs to live in close proximity to the centre is made up of low income blue collar workers which relies on job opportunities in the centre and at the peripheral locations which are accessible only from the centre by public transit. Ownership of a single family house has been constantly advertised as a necessary prerequisite for becoming a respectable citizen. This is a very commendable goal; however fewer citizens will be able to afford single family houses in future.

Condominium and co-operative apartment projects are becoming a more acceptable and desirable form of home ownership. Such housing types within the low rise, medium density structures, provide a sense of neighbourliness and a sense of belonging. These are, at the same time, less costly to maintain than the private detached home and climate responsive common social spaces, such as glass atria, could be more economically provided.

This all points toward the need for a housing form which is compact, well connected to transit facilities, located in proximity to essential services, affordable and easy to maintain.

7.3.2 Restructuring Suburban Neighbourhoods

As a result of these socio-economic shifts there is a great disparity in type and price of dwelling units within different residential areas. Suburbia is experiencing a significant transformation in its social and demographic makeup. Children of the "baby boom" generation have matured, schools are closing and social problems have emerged. Today's suburban areas are predominantly populated by empty nesters and the elderly. However, the

percentage of single parent families, working mothers, and unemployed youth still living at home is also steadily rising. The housing form is inadequate as much for the elderly as it is for single parent families. The elderly, who would prefer to remain in the old neighbourhood but cannot maintain large homes any longer are forced to sell. Even if they decide to remain, they cope with the remoteness of a suburban home, with few convenient shopping facilities or transit stops nearby. Single parent families cannot afford the luxury of living in houses for which taxes and maintenance costs are well beyond their means. They rely heavily on accessible commercial and institutional services. However, commercial enterprises are neither available nor easily accessible by public transit as a result of planning policies and design criteria. While residential neighbourhoods in large metropolitan areas, in general, are losing population because of the decrease in household sizes, new suburban areas, supported by outdated zoning regulations continue to obliterate the countryside.

Unless there is a drastic change in population projections with a new "baby boom" on the horizon, a reorganization of the existing suburbs will be inevitable. The pressure will be to allow for intensification and increase in densities, for inclusion of commercial and social facilities within neighbourhoods and even employment. In addition, public transit lines will be required to penetrate the neighbourhoods, instead of serving their edges. In order to enable such changes, major modifications will be required to the existing zoning regulations. Innovations will be possible only if regulations are flexible.

The Scandinavian countries are already responding to the needs of newly emerging population groups as well as to the demand to produce a better social environment within physical structures which are energy-efficient and climate-responsive. Recently built residential complexes in Sweden and Finland of medium densities, accommodate a cross-section of population, including elderly, handicapped, single parent families and singles. A

residential complex in Linköping, Sweden, "Stolplyckan" which contains dwelling units in 4 - 6 storey high apartment blocks has a protected space at grade, linking all buildings. This enclosed internal "street" with its indoor squares acts as a major gathering space in the winter time. It links various facilities, such as recreation rooms, pool, sauna, daycare centre, dining room, hobby rooms, and serves as a children's playground. Type of tenure includes condominiums, rentals, and subsidised apartment units. The project was built by combined public and private funds.

Another innovative complex which is already serving as a prototype for other residential, low density projects throughout Sweden is "Gardsåkra" in Eslöv, near Malmo in the south of Sweden. A 1,230 ft. long glass-enclosed street links 126 housing units in six buildings. Dwelling units are contained either in 2 storey apartment blocks or in 2 storey high townhouses. The enclosed street serves as an extension of the private living space, in more or less the same fashion as a Southern European village street. The basic objective of this project was to conserve both energy and land. Through more compact grouping of housing units, a saving in land was achieved, and through the application of greenhouse technology, considerable energy savings have been realized. The glass-covered street acts as a passive solar collector and no additional heating is used for the public spaces. Architecturally, the project unifies the elements of traditional rural living within a highly urban form. The initiative for this project came from the municipal council which utilized funds available for energy conservation projects. The townhouses are privately owned while apartment units are rented.

Suggestions for more compact residential development always raises the question of privacy and neighbourhood integrity. As Hans Blumenfeld noted:

...for the low income groups the street is an indispensable outdoor livingroom, and extension, indeed an integral part, of their homes. By contrast, the higher the economical, social and educational level of the group, the more it identifies the home with its own dwelling and yard, and the greater the value it attaches to privacy, the protection from sight and sound.⁷⁶

The design parameters for dwellings in northern climates should reflect the following requirements:

- privacy at desired times.
- spacious, sunny, and bright living areas.
- high-energy performance standards of the dwelling unit to minimize costs.
- indoor/outdoor space attached to the unit which can be used on a year-round basis, replacing open balconies or even front and back yards.
- smaller individual lots, compensated for by larger, climate-responsive common spaces.
- convenient parking facilities with easy access from the dwelling unit (long driveways serving individual single homes should be avoided).
- appropriate building form and materials, reflecting regional, topographic, and climatic conditions.

Any innovation in housing form, under present conditions, will be difficult to introduce to the Canadian housing market. The responsibility lies with various levels of government to develop, finance and produce experimental projects which would serve as prototypes demonstrating new technological, design and planning principles as well as potential economic benefits.

Most of the Scandinavian countries, including Finland, are introducing new concepts in neighbourhood design through housing exhibitions. The most recent one, B0 '85 near Stockholm, Sweden, demonstrated the imaginative re-use of the townhouse blocks built in the 1950s and 1960s to suit the needs of the newly emerging population groups in the 1980s. In addition, new apartment blocks and groupings of individual housing units around common enclosed spaces were designed to accommodate population groups with specific needs, such as the elderly, young singles, and the mentally retarded. The present trend in housing design is to create neighbourhoods where people can feel at ease and make social contacts so necessary in regions where harsh climate restricts outdoor activities and social interaction.

7.4 Sociability and Public Space

The imagery of the romantic, livable winter city, endlessly reproduced on greeting cards every year, is composed of well defined, public open space within which many different activities can take place. Skating, tobogganing, courting, singing, dancing, and strolling are juxtaposed against evergreen trees, white snow and charming, colourful and brightly lit clusters of houses. The rural scene is usually depicted by a sleighride through the forest, the gathering of neighbours in front of the church or with a highly artistic image of a farm fence.

Within the context of our communities, both types of spaces are retained. The public open spaces expressed in the form of a square, a plaza, or residual spaces around large development projects are intended to provide areas where active and passive activities can occur. The park system, in homage to our rural heritage, is primarily provided for "health" reasons, as "green lungs" to reduce pollution and traffic noise. The provision of recreation spaces and facilities within the park system was of a secondary order, although the increased remoteness of regional recreational areas

is now putting pressure for more facilities within the existing parks. In our planning practices, through the adoption of various urban design principles developed in countries with a temperate climate, the majority of our public open spaces have not been developed for year-round use. In addition, public policies have been developed in a piece-meal fashion, dealing with individual issues, rather than holistically looking at the purpose and use of lands constituting the public realm. The division of jurisdictions, for example, between local and metropolitan or regional governments with regard to the design and implementation of roads, pedestrian walkways, tree planting, utilities, etc., results in uncoordinated, sometimes useless and costly undertakings.

7.4.1 Indoor Spaces

A necessity to encourage social interaction and to reduce the feeling of isolation and loneliness, has created spaces and places, public and private, throughout history. Italians gossiped in the "piazzas", Germans shopped in the "markt" and "hof", and Scandinavians enjoyed the sun in their "torgs".

With the emphasis on the street as a thoroughfare for cars, as well as the proliferation of regional shopping centres, the importance of the traditional public square has been greatly diminished. Outdoor residual spaces at the grade level of towering office blocks were never conceived as a place for pedestrians, except on architectural drawings. The micro-climatic conditions, in most cases are such that any activities at grade level are discouraged for most of the year due to wind impact, icing and the general inhospitability of landscape treatment.

Today, the outdoor environment has become a hostile territory hurriedly traversed on the way to work. The need to protect ourselves from slush, from fumes and from accidents has resulted in enclosed

climate-controlled corridors leading from one office tower to another. Increasingly, we are being coaxed into accepting enclosed spaces as the only solution for living in cold climates. The available technology makes it possible to completely eliminate climate as an element of our environment.

The West Edmonton Mall, in Edmonton, Alberta, advertised as the "eighth wonder of the world" is a testimony to how modern technology, coupled with high capital investment, can totally change climate and environment. Although such enclosed spaces, if built to appropriate scale, location, and purpose, could enhance the urban fabric and foster social life, there are several issues to be addressed with regard to their economic feasibility as well as their impact on social and legislative order within our communities.

While enclosed, climate-controlled spaces provide a more pleasant environment in the winter months, there are new problems arising from their application which are physical, social, economic, legislative and administrative in nature.

Physical

The size and location of climate-controlled projects are frequently prime factors in their implementation. Public space is often incorporated within the private projects in order to make such an undertaking economically and politically viable. In many instances this includes public streets, lands or sidewalks. The result is a reduction of traditional public outdoor spaces and a depletion of street activities at grade level. The most needy citizens, the urban poor, are increasingly being deprived of their traditional and only "free" space. If the trend continues, to enclose more and more of our cities, what spaces are going to remain for them?

The recent trend in architecture, the so called "Post-Modern" movement, evolved as a reaction to the International Style, to glass-utilitarian boxes. The proliferation of glass domes and galleries has a tendency, again, to negate the regionalism of location and climate by transplanting built form as well as interior landscaping.

Social

Enclosed spaces engender a different behavioural pattern from those accepted as the norm at street level. Spontaneity of gesture or vocal expression is severely curtailed within such space; one enters as a guest, not as an owner, although in many instances, a large part of the project is publicly owned. Of the interaction between weather, behaviour and enclosed spaces, Prof. Jeffrey E. Nash observes:

Winter is normally a time when the police are less concerned with certain kinds of street crime like purse-snatching and mugging. The Skywalk system in downtown Saint Paul has created major surveillance problems and extended these types of crimes into winter.⁷⁷

There are many examples where underground pedestrian tunnels, publicly built and owned, had to be closed because of vandalism and crime. Formerly, outdoor spaces and streets became privatized in terms of winter use, especially under adverse weather conditions. There is also evidence that winter has traditionally provided increased freedom to the individual in using outdoor urban space,

Economic

Provision of climate-controlled spaces requires firm commitment and continuity in implementation on the part of public and private investors. The underground or the +15 skywalk systems, if

discontinuous, can do little to protect pedestrians. The large commercial or leisure facilities are capital intensive and their viability is closely linked to the markets they serve. Because of high construction and maintenance costs, as well as high energy input, their application is limited to large metropolitan areas. In smaller communities, such large scale projects may prove to be very costly and not as beneficial as initially perceived.

Legislative

The perception of pedestrian enclosed spaces included within shopping malls and gallerias, is that they are public. However, these are not public spaces; they are privately owned and the public is allowed to use them only at certain times, under certain conditions. In addition, only certain types of people are allowed to linger within these spaces. The conflict between public and private interests will escalate with demand for more enclosures and refinements in legislating the use of such projects will be necessary.

Administrative

The implementation of a comprehensive system of climate-protected pedestrian spaces is dependent on the willingness of a developer to entertain such projects as well as on the ability of local officials to negotiate appropriate solutions from the public point of view. Usually, it is a lengthy and a complicated process and costs to the taxpayers are considerable. Public safety plays an increasingly significant role and the quality of design and innovation in these projects is often sacrificed for its sake.

Our outdoor public realm is usually ignored as a living space. Cold climate drastically reduces the "outdoor season" and limits social inter-

action. While enclosed, climate-controlled spaces are beneficial in some locations, attention has to be focused toward improvements to the outdoor environment. While provision of enclosed spaces is costly, difficult to implement and maintain, and reduces public open space, modification through micro-climatic design of existing and proposed public open spaces does not require high, up-front, capital investment. It can be implemented incrementally throughout the central areas as well as within suburban residential developments. There is an enormous public realm waiting to be used on a year-round basis. What is required is a new approach to "open space" which will integrate our streets and sidewalks, laneways, lawns and leftover spaces between buildings into a comprehensive system carefully designed to deflect the wind, brighten the streets, and encourage pedestrian use. Within our present planning system of zoning regulations and divided jurisdictions it will be difficult to achieve such results.

7.5 Visual Environment

The ultimate purpose of the city should be to provide an environment conducive to creative living for each individual; an environment which is capable of changing with peoples needs but which is, at the same time, constantly enriched.⁷⁸

The urban form--with its built and open areas, the parks, and the streets--reflects the city's adaptation to nature and place. The composition and relationship of the multitude of elements comprising the city will determine the quality of visual environment.

The quality and the life of the city is primarily conveyed through its visual expression. The public spaces, indoor or outdoor, are reflections of the city's prosperity, and the affirmation of its citizen's pride. From the quality--not only physical but also functional--of the major public spaces, the first impression of the city is formed. Kevin Lynch states:⁷⁹

Looking at cities can give a special pleasure, however commonplace the sight may be. Like a piece of architecture, the city is a construction in space, but one of vast scale, a thing perceived only in the course of long spaces of time. City design is therefore a temporal art, but it can rarely use the controlled and limited sequence of other temporal arts like music. On different occasions and for different people, the sequences are reversed, interrupted, abandoned, cut across. It is seen in all lights and all weathers.

7.5.1 Urban Spaces

While public life, in countries with warm climates, is conducted in outdoor spaces, squares and streets, urbanites living in northern climates increasingly prefer to spend time in attractive, climate controlled places embodying qualities which outdoor spaces lack during winter months.

The Milan Galleria and other arcades of 19th century Europe, have been rediscovered and their design principles have been adapted to many northern communities.

Through the skillful application of art, vegetation and lighting, they have created environments which are exciting. It is from such examples that we can learn how to improve our outdoor spaces, to make them more attractive and more intensively used in winter. Our streets, parks, public squares and plazas are dull places during the winter months. They are designed to be used primarily in summer. -And yet, it is in the winter season--grey, cold, windy and too long--when outside spaces, more than ever, need to be animated, to provide visual delight and intimate, sheltered areas and nooks where one can catch a few moments of warm sun.

The relationship of positive and negative spaces, solids and voids, of vertical and horizontal dimensions of walls and pavements will provide the base or canvas, upon which colour, light, trees, and water can be applied to create the final painting. The functions and activities created by people within such a space, or at its perimeters, add the human dimension. The primary elements improving the visual environment are colour, light, water and ice, parks, lawns and green spaces, street furniture, floorscape and civic art combined so as to incorporate an approach sensitive to climate.

7.5.2 Colour

The cities in Iceland, Russia, Germany, and Finland are colourful. The gilded domes of Russian churches still grace the snow covered squares and parks. The pastel-tone frescoes on walls of buildings seen in the small towns of Switzerland and Bavaria are excellent examples of how to use colour and art for embellishment of major public spaces. The Gaspé Peninsula, in Quebec, is known for local contests held for the most brightly coloured houses in the village. Faced with the greyness and starkness of modern architecture, we have suddenly started to appreciate the texture and colour of the warm brick used in Victorian buildings.

The importance of colour and its psychological value has only recently started to seriously interest the scientific community. And yet, colour is necessary to physical and spiritual well being. It affects human reactions towards the surroundings and changes in the natural and built environments. Extensive studies of the effect of light and colour on the perception of environment were done by Faber Birren and, before him, by a number of Swiss scientists--Rorschach, Pfister, and Luscher. As early as 1947, Luscher developed a colour test for the use of "psychiatrists, psychologists, physicians and those who are professionally involved with the conscious and unconscious characteristics and motivations

of others".⁸⁰ Luscher's test indicated that bright yellow is a favourite colour--it promotes hope and expectation. Grey is "neither subject nor object, neither inner nor outer, neither tension nor relaxation... Grey is a Berlin Wall, an Iron Curtain".⁸¹ Rejection of grey may indicate boredom and a wish to participate in life rather than remain isolated. Is it any wonder that our grey communities are rejected in winter in favour of the bright tropical colours of southern places?

According to Birren, the level of illumination, in combination with colour hue, tends to influence body action and its direction. With a high level of illumination and surrounded by warm and luminous colours, such as yellow, peach and pink, the human body tends to direct its attention outward. Under such circumstances, there is an increased level of alertness and activity.⁸² This finding suggests that yellow and red tones might be considered as dominant colours to use on buildings and outdoor spaces in northern communities.

Red, pink, and gold have been favourite colours in winter cities for centuries. Did their inhabitants instinctively choose the right hues to counteract the climate conditions that had to be fought? Most of today's communities are starved for colour. We have eliminated forests around our houses, trees from our streets; we replaced graceful buildings with anonymous concrete towers; and we have succeeded in changing white snow into grey coloured slush. No wonder our urban environments are unappealing! This is why urban design elements are especially important in northern settings.

7.5.3 Light

Light, depending on the time of day or season, is constantly changing. Objects are seen under different light conditions, in different relationships and different degrees of clarity.⁸³ The details of lighting,

its intensity, spacing, height and shape have to be taken into consideration within the winter context. The level of use and safety of walking areas partly depends on weather conditions, the amount of precipitation and also on the degree and quality of illumination. Ice and slush cause serious injuries, especially among elderly, and appropriate lighting can considerably reduce such occurrences.

Long periods of darkness are associated with depression and mental disorder. The arrival of spring, with its longer daylight hours, was always celebrated as a victory over darkness and the cold grip of winter. When cities are devoid of colour, foliage and animal life, light becomes the sole element of animation. The activities and, accordingly, the rhythm of city life, change with the seasons. While during summer one can enjoy the great outdoors, winter is the time when cultural and social activities reach their peak. The arrival of summer, in our homes, is greeted by the replacement of "winter" with "summer" decor. Our private stage set is changed. Our cities, to some degree, do the same. However, the urban stage is usually designed only for the summer setting and very little conscious effort is directed toward creation of visually attractive winter settings.

The beads of lights, twinkling in the windows along the streets of small Norwegian villages and towns offer warmth and a sense of security for passersby on cold, snowy nights. At the larger scale, the exuberant, dazzling city lights on squares, streets or buildings, provide an excitement and a welcome sight to citizens and visitors alike. How festive and cheerful Christmas lights are in residential neighbourhoods! Theatrical lights hung from trees or strung across streets and buildings enhance the urban scene. Ideas drawn from holiday occasions should be more broadly applied throughout key parts of the city.

7.5.4 Water and Ice

While water, in fountains, waterfalls, jets or quiet ponds is associated with summer, ice, on lakes and rivers--as icicles and sculpture-- is associated with winter. Many great northern cities are built around water--Leningrad, Stockholm, Helsinki, Oslo--and water, as much as ice, forms part of their aesthetic appeal.

Water, more than any other element of the landscape has deeply-rooted symbolic and spiritual meaning, often reflecting cultural attitudes toward nature. Throughout history, water was channelled in hundreds of different ways: in Italy, to emerge in waterfalls, cascades and sprays from the great fountains; in France, to form reflective symmetrical basins; and in England, to form placid lakes within romantic man-made landscapes.

Replicas of these artistic creations are familiar features in many urban settings in countries with northern climates where their beauty and function cannot be fully appreciated. The kinetic energy of water disappears when frozen and the form is obscured by snow drifts.

The Niagara Falls are transformed into one of the most magnificent winter scenes. It is from such examples of nature, that designs of fountains and waterfalls should be conceived. They should be designed as "winter sculptures", heightening the drama of water and its many forms, and not merely as static artifacts.

Besides its purely decorative element, the role of water in the city also has to be examined from the point of view of re-establishing its identity with life processes. The approach toward water, as an element of urban design, has to be multi-faceted. Valid and imaginative solutions will be achieved if the design and management of water systems

are integrated with objectives directed toward climatic improvements, creation of wildlife habitats and fulfillment of social and aesthetic needs.⁸⁴

Since 1965, the City of Winnipeg has been building a comprehensive system of temporary and permanent basins to provide immediate storage areas for heavy rainfalls which cannot be immediately absorbed by the storm sewers. These retention ponds, some 37 in total, are located within new suburban areas and provide recreational amenities such as canoeing, fishing, sailing, skating, and curling on a year-round basis for residents.⁸⁵

The prototype of a park, developed within the city core area, which integrates water and its management with social and educational values, is the Lebreton Park in Ottawa. The design of this 1 1/4 acre neighbourhood park demonstrates the creative and practical alternative to traditional site development practice in storm drainage. It introduces a hydrological function in a park setting which was traditionally reserved for recreation only. The pond, designed as a stormwater retention basin provides recreation and creative play, which varies according to the season.⁸⁶ Urban ecology provides the conceptual vehicle for urban design. The regional characteristics ought to be given strong consideration in designing settings which are environmentally appropriate and visually pleasing.

7.5.5 Parks, Lawns and Green Spaces

Looking at the Canadian urban landscape one might conclude that Canadians do not have as great a love for nature as they claim. Even when they escape the city for the countryside, the sounds of lawnmowers and chainsaws attest to the constant attempts to subjugate nature. The suburban mentality, with its worship for lawns, is deeply entrenched in North American culture.

A suburbanite who fails to maintain a lawn violates an unwritten law by neighbours or at least is viewed with a mixture of suspicion and contempt.⁸⁷

The approach toward landscaping which is promoted by practicing professionals reflects man's control over nature.

Each tree, shrub and flower is a symbol of human ingenuity... We no longer see plants as interdependent, related parts of a total natural community, but as an individual specimen... There is an unending human struggle to maintain order and control constantly supported by the formidable array of machines, fertilizers, herbicides and manpower.⁸⁸

Such attitudes and design norms perpetuate the ever increasing need for new technology, rising maintenance costs and create a monotonous landscape without much diversity.

Ottawa's comprehensive open space network is one of Canada's finest examples of landscape design. However, the cost of maintenance and development is becoming almost prohibitive and the National Capital Commission (in charge of the implementation of the system) is presently working on the modification of its design. One of the first measures, undertaken in 1981, was the introduction of a naturalization programme, which encompassed reforestation and reduction of mowed areas and the creation of meadows. It is hoped that such an approach toward landscaping, carried out by a major government organization, will influence current design practice.

Some cities are graced with extensive open spaces in the form of natural ravines (Toronto), riverfronts (Saskatoon) and landscaped parks (Ottawa). The benefits of such open spaces are invaluable. They perform a physiological function in removing carbon dioxide from the air,

modifying climate and providing recreational facilities. Their size and distribution within an urban area are determinants of usefulness and serviceability. Linear open spaces traversing the city are more beneficial from the climatic point of view than a few large parks surrounded by built up areas. An even distribution of smaller parks, throughout an urban area, contributes toward a more efficient and faster exchange of air masses, achieving better atmospheric conditions and higher levels of comfort.

The design and management of green spaces within communities should be carried out in harmony with the size, use, topography, climate and related environmental factors. Their purpose should be to advance public education in the field of ecology and natural habitation, and simultaneously to provide recreational facilities.

The small urban parks and public gardens are primarily created to provide opportunities for relaxation, social interaction or public celebration. In most cases, their design is based on the standard landscape formula and their furnishing is selected from available "catalogue stock". In a majority of Canadian communities, urban parks are a cross between backyard gardens and picnic areas - repetitive in their layout and planting materials, limited in their use and ignorant of their regional and climatic contexts.

The surroundings of the National Gallery of Canada, in Ottawa, are an example of a unique approach to park design. The landscape architect, Cornelia Hahn Oberlander, has reached for a regional solution. The site is related to the Northern Canadian landscape through the use of indigenous plant materials.

The design focuses also on seasonal changes and a variety of textures to delight the eye of the visitors while walking through the spaces or viewing these outdoor livingrooms.⁸⁹

The private front lawns and backyards are considered essential elements of the single family home and an integral part of the life style of Canadians.

Instant wall-to-wall grass appears everywhere, in hot climates and cold, in prestige projects and run-of-the-mill ones, in large landscapes and small... As a high-cost, high-energy floor covering, it (the lawn) produces the least diversity for the most effort. As a product of a pervasive cultural aesthetic, it defies logic.⁹⁰

This is especially true in environments where such grassed areas can be enjoyed for a very short time of the year. Surely, there must be a viable substitute which is more economical and equally attractive. Ground-cover, evergreens, and bushes with winter berries could be an alternative for the present turf. Not only would they look more attractive under snow cover and cold skies, but they could also support some forms of wildlife habitat in the city.

Trees, with their endless variety of forms, foliage and colours, are among the most common and satisfying elements of urban design. They should be lavishly used to define outdoor spaces and to soften the edges between built and natural environments.

The urban trees survive in a totally hostile environment. Their roots are covered by asphalt, obstructing access of water, air, and plant food. Cold, strong winds dry their leaves and break their branches. Planted singly, they have slim chances of survival. Planting in rows, ten feet apart or in bosques, creates a handsome canopy, strong massing and a well defined street facade.⁹¹

In northern communities, where snow, ice and salt are major concerns, special precaution has to be exercised with regard to tree planting technique and selection of appropriate species.

Snow removal machines, as well as salt, cause extensive damage to trunks and roots. Therefore, their location and spacing have to be carefully considered. Concrete planters, advocated by the utility managers, provide little relief from the drabness and the clutter of streetscape. During winter months, they become serious obstacles to pedestrians, collecting snow, ice, and trash. (The famous Parisian cast iron grating is still the most decorative and sturdy protective device around tree trunks.)

Planting material should be native to the community, sturdy to withstand climatic variations and be decorative all year round.

Evergreen trees and bushes should be the natural symbol of winter cities. They should bloom and colour our yards, neighbourhoods and public places... They add colour to a stark winter world, and hold armfuls of snow for us on lovely winter mornings. They soften the appearance of concrete walls and brick houses and beautify the rims of parking lots... They grow faster than most deciduous trees, and there are as many kinds of them as there are celebrations of Christmas.⁹²

Selection of planting material, cost of maintenance and manpower are important design parameters for regions where the growing season is short and usefulness of open, landscaped areas is limited. The landscape design elements should be selected with the intention of climate modification as much as for the aesthetic purpose.

7.5.6 Street Furniture

During our daily routine, on the way to work, or shopping, we pass countless pieces of furniture gracing, or more often cluttering, our streets and sidewalks. There are hydro-poles strung with myriads of wires,

telephone booths, kiosks, and a variety of boxes selling newspapers, collecting trash or guarding electrical installations. Sometimes there is a bench, a planter or even a bus shelter.

Most of the street furniture has been predesigned and is often ordered from a catalogue. The danger with this approach is that the metal bench can be ordered for a place where the normal temperature is -20°C ; that the bus shelter might have an entrance facing north winds; and that a planter, instead of holding flowers, will hold snow, ice and trash for most of the year. Attractively designed furniture is not hard to find. It is the appropriateness of its application; choice of materials and form in relation to the local climate that are critical.

Benches

Seating is an essential element of our public outdoor spaces, parks, plazas, and promenades. It is provided for the public to rest, to sun, and to socialize. The most common type of bench, loved by architects, and despised by the public, is the flat, backless concrete slab used more as a sculptural element and much less as a piece of furniture to be sat on. Its only redeeming feature is that it is virtually vandalproof. To sit on a bench made of concrete, ceramic tile or pressed metal in temperatures well below freezing is neither practical nor desirable. It is time for designers and architects to realize that we have reached a point when costs have to be justified and it is difficult to justify the expenditure toward a bench that is used for a mere two months of the year.

Warm, sunny days during the winter are not numerous and therefore they are most precious to city dwellers in northern regions. By providing sheltered open spaces and appropriate seating, the usage of our public spaces can be greatly enhanced and the outdoor season prolonged.

Instead of fixed seating, very often exposed to northern winds and placed in the shadow of tall buildings, movable individual chairs should be used. This type of seating, widely used throughout Europe, provides mobility allowing for maximum sun exposure as well as arrangements conducive to social contact.

Bus Shelters, Kiosks, and Canopies

Amazingly, there are very few sensibly designed bus shelters, in Canada or in the Scandinavian countries, which are warm and safe and provide necessary transit information.

Ottawa's Rideau Mall bus shelters are an example of a conscious effort to offer maximum protection and a high level of comfort. They are heated and incorporated within a comprehensive canopy system on both sides of a transit mall. Beside the cost, fear of vandalism is often quoted as a factor in favour of not installing better amenities, such as heating and information systems. However, there are design solutions which would eliminate some of the concerns --such as the installation of floor heating rather than overhead radiant units.

The proper slope of the bus shelter's floor, allowing for slush and water to drain properly, would greatly improve the comfort of passengers. The installation of electronic information systems, flashing up-to-date bus schedules, graphic and plastic art, as well as music and light would make the usage of public transit systems more attractive. It is a pleasurable experience to walk along the Nicollet Mall in Minneapolis, listening to the classical music emanating from its decoratively lit bus shelters.

Simple canopies suspended over an entrance door or stairway offer some degree of protection and visual quality to the streetscape. They allow people to open umbrellas and to bundle up while emerging from an enclosed space into the wet, cold environment. They also serve as decorative elements, with splashes of colourful signs and symbols. Can one imagine the sidewalk cafés of Paris, Stockholm or Vienna without these features?

Unfortunately, their use in Canadian communities has been very limited thus far. And yet, they can be inexpensively and easily installed on existing or new buildings. Their usefulness for pedestrian protection is fully realized only if the system is continuous and comprehensive.

In addition to bus shelters there are other structures, fixed or mobile, placed along city streets or in public parks which are necessary to the functioning of a community. Telephone booths, information and flower kiosks, newspaper boxes and planters all serve a specific function and their designs and placement can either improve the overall visual quality of the street or render it unattractive. Overhead wiring--in the interest of safety and visual appeal--should be placed in underground conduits.

Removal and storage of snow are major problems and budget items to be faced by city managers every winter. Any unnecessary obstacles along the roadways and paths increase the cost of servicing. Therefore, grouping and strategic positioning of street furniture are important criteria in designing the urban landscape. Roof slopes, building materials and their insulation properties are equally important elements. Formation of icicles at the edges of roofs, fogging and icing of windows, low resistance of the building material to cold temperatures and high precipitation would make such structures unsightly, uncomfortable, and even dangerous.

7.5.7 The Floorscape

For pedestrians trying to negotiate windy corners, in temperatures well below freezing, and with icy rain or snow beating at one's face, it is important that at least our feet have a solid grip. Very often it is a matter of proper footwear. However, more than occasionally, it is a question of the floor texture and material used in paving of sidewalks, squares and streets. "The floor underfoot" in the words of L. Halprin, "is a very immediate and personal kind of experience for pedestrians, but unfortunately modern city builders have forgotten the visual and tactile qualities possible through the floor".⁹³ City builders have also forgotten that materials used should have such properties as to provide for durability, comfort and safety in all kinds of weather. In many instances, paving materials are not suited for the climate in which the community is located. These should be tested for slipperiness and resilience towards freezing and low temperatures.

The design of steps and ramps in public outdoor spaces requires different dimensions than indoors, largely because the manner of walking varies and because larger tread width is necessary due to accumulation of ice and snow. The relationship of step risers to treads is vital to ease and comfort.

Installation of electric heaters under the pavement and steep steps and ramps has been widely used throughout Scandinavia, even in smaller communities. The City of Toronto is one Canadian municipality which has a policy to install a heating system under the pedestrian crossing at Queen and Yonge Streets, one of the busiest intersections in the city. However, the implementation has been postponed pending the resolution on traffic movements along Yonge Street.

Pedestrian crossings and curb cuts designed to facilitate the movement of wheelchairs have to be reexamined within the context of climate. While performing their primary functions well during the summer months, they create dangerous situations for pedestrians as well as handicapped during the winter.

An exemplary design, introduced recently in Sweden, has resolved this problem by providing a crossing--over the roadway--at the same elevation as the existing sidewalks. This has created a slight "speed bump" which slows vehicles and also prevents splashing of pedestrians by moving traffic. This idea is particularly suitable for the elderly as well as for the handicapped, offering both a sense of security and comfortable movement.

7.5.8 Civic Art

A range of objects--such as, sculptures, murals, fountains, clocktowers, weather instruments, banners, advertising/information signs--forms part of the public scene and should be conceived so as to embellish urban life through its plastic qualities.

In imparting an artistic vision, these objects must be positioned--in both night and day, winter and summer--and conceived so as to reflect the local spirit of place, the urban matrix, the subtle nuances of climate as well as the cultural values and preferences of the inhabitants.

In the case of sculptures and fountains, it is desirable that the design be developed so as to incorporate the unique characteristics of winter's elements such as ice, snow, and rain. If these can add to the aesthetic by changing the shapes, volumes, and reflective light, thereby enriching the viewers' image, the value of such civic elements will be appreciated to a greater degree.

Murals and other graphic art forms should embody colour tones which enliven winter's generally bleak aspect. Neon signs should be used for advertising purposes in more creative and colourful ways than have previously been practiced. They are excellent means for brightening up winter nights if executed with an artistic flare.

Banners suspended from poles along streets or major buildings--or strung across streets creating a "gateway effect"--are the simplest and least expensive elements signifying gaiety and expressing "joie de vivre".

Buildings, open spaces and civic art must be conceived simultaneously if the environment is to be perceived as meaningful. What can be referred to as visual pollution is most definitely a problem in our communities even if its "levels" cannot be accurately or reliably measured.

The experiential realm constitutes an important element in our lives. It should not be dismissed or neglected, especially in a society which places relatively little value on visual environment. We must learn to look and see, and appreciate what is visible in a more sensitive way. Civic art is a vital means whereby aesthetic quality can be greatly enhanced.

Our winter season urgently demands more sensory stimulation. In addition to being effectively managed, our communities must be interpreted more poetically and with greater symbolic meaning. They must convey the natural conditions, the historic legacies, and the aspirations of a society which supports urban life.

In attempting to synthesize some of the major characteristics of existing dilemmas and possible solutions--to be dealt with at the policy level--the following charts have been developed. Their aim is to identify social, economic, physical and administrative strategies which correspond to livability criteria with the intention of improving winter living.

While some of the proposed strategies are directed to a longer term perspective, and may be difficult to implement, others are more specific and can be more easily executed, both within the short term and at relatively low cost.

These strategies are intended to apply to a more typical, broadly-based urban population. They do not specifically include native or indigenous groups, which exhibit their own unique circumstances reflecting cultural, historical and administrative characteristics. These should be treated as separate cases with special solutions.

Many Canadian communities now appear eager to improve urban life especially during the harshest season. It is therefore imperative that all levels of government, in partnership with the private sector and prospective users, develop explicit policies and strategies to achieve the enunciated goals.

I. CRITERION: ECONOMY

GOALS

STRATEGIES TO IMPROVE WINTER LIVING

	SOCIAL	ECONOMIC	PHYSICAL	ADMINISTRATIVE
- High degree of self-sufficiency with respect to:	- minimize family disruption created by seasonal unemployment	- stimulate winter climate products and technology through R & D.	- expand green-house technology	- Government incentive policies and programmes for:
- food production			- maximize local energy sources	- research
- energy	- grants to assist low income groups (heating, clothing, basic shelter)	- winter tourism promotion	- compact, mixed-use development	- innovation
- Utilize local resources to increase job opportunities			- balanced transportation systems	- development
- Preserve economic stability				
- Minimize maintenance and management costs				

II. CRITERION: MOBILITY

GOALS

STRATEGIES TO IMPROVE WINTER LIVING

	SOCIAL	ECONOMIC	PHYSICAL	ADMINISTRATIVE
- Minimize need for commuting	- improve transit service to low income areas	- subsidies where required	- better road and sidewalk maintenance and use through:	- revision of current policies regarding land-use distribution and movement patterns
- Reduce hazards of movement	- provide adequate transit systems to special needs groups (handicapped, elderly, etc.)	- incentives to private sector for more flexible transit (dial-a-bus, carpooling, etc.)	- sensitive road alignment, design and illumination	- require wind and snow impact statements
- Encourage use of public transit and walking			- provision of snow storage areas	- winter management/scheduling of public transit
			- parking structures at strategic locations	
			- provide for mid-block pedestrian movements	
			- microclimatic development concepts	
			- heated ramps, stairs and sidewalks	
			- sheltered passenger/pedestrian areas	

III. CRITERION: URBAN HABITAT

GOALS

STRATEGIES TO IMPROVE WINTER LIVING

	SOCIAL	ECONOMIC	PHYSICAL	ADMINISTRATIVE
- Create climate responsive residential development and related out-door space	- spaces for resident groups to promote greater social contact	- incentives for passive solar gain and innovation	- microclimatic principles for site development through: - compact form - mixed-land use - use of vegetation - district heating where appropriate	- revise zoning bylaws and building codes - promote innovative housing through demonstration projects
- Provide energy efficient housing	- provide basic facilities (shops, day-care) within the residential complex - extend public transit to serve major residential developments (medium density)		- promote enclosed spaces for use by residents	- public/private cooperation for efficient delivery systems

IV. CRITERION: SOCIABILITY & PUBLIC SPACE

GOALS

STRATEGIES TO IMPROVE WINTER LIVING

	SOCIAL	ECONOMIC	PHYSICAL	ADMINISTRATIVE
- Improve social contact	- recreational programmes	- incentives for provision of climate protected spaces	- indoor parks and public spaces	- bonus systems to private sector for publicly used spaces
- Induce positive images regarding winter	- winter festivals & carnivals		- micro-climatic landscape concepts	- agreement between local government and developers regarding use and access of enclosed spaces
- Provide more public spaces	- animate streets, sidewalks, and parks			- implementation of comprehensive systems of climate-protected spaces
	- education and winter season promotion			

V. CRITERION: VISUAL ENVIRONMENT

GOALS

STRATEGIES TO IMPROVE WINTER LIVING

	SOCIAL	ECONOMIC	PHYSICAL	ADMINISTRATIVE
- Ameliorate quality of the built environment in all seasons, with emphasis on winter	- instill sense of pride and belonging in the community	- reduce expenditures through approaches which maximize use of existing resources and also enhance visual character	- provide high quality urban amenities in order to retain and attract jobs	- revise current planning practice and policies to include urban design as a critical component of the planning process
- Improve use and visual appearance of publicly-owned land		- conserve and improve resources in which investments have already been made	- urban design elements reflecting regional character of the community: - use of colour - lighting - water & ice - greenery - civic art	- strengthen planning, programming and management - interdepartmental government cooperation

8.0 TOWARDS A MICROCLIMATIC PLANNING APPROACH

Urban development designs, policies and principles at the macro, meso and micro-levels have not been accorded their proper importance from the perspective of climatic determinants. The natural setting has not been given the attention it deserves and careless building projects have often contributed to deterioration in the quality of the living environment.

In view of the lengthy winters and brief summers,

all ways of using outdoor areas should be utilized. Children should be able to play, grown-ups to sit, talk, read, play games, etc. outdoors in a pleasant, green environment protected against undesirable climatic conditions. The creation of versatile facilities for outdoor life is especially important in areas with multi-storey buildings where people do not have their own private gardens . . . The climatic factors that have to be taken into account are temperature, sunlight, wind, rain and snow. The microclimate can to some extent be manipulated through the size, location and grouping of buildings.⁹⁴

Clearly, when the planning process commences--either for new development or for redevelopment of existing areas--qualitative goals should be kept in mind for various activities and collective amenities. In addition to the social requirements of the user groups and target populations, and their economic implications, the location and dimensioning elements of activity settings and the spaces between them must be heeded. Decisions must be taken on the primary factors vis-a-vis those which can be compromised. Choices must be viewed within the overall integrative frameworks and the stated objectives bearing in mind that accessibility and climatic constraints must be seen as essential features of designs and policies.

Creation of the best possible micro-climate in all parts of the urban area, but especially in its residential sections, is an important criterion for a physical environment conducive to health and happiness.⁹⁵

Our human settlements will have to attempt, where possible, to "wall out" inhospitable surroundings. But they will also have to be developed so that the beauty of the untouched landscape lying just beyond the urban periphery is brought within walking distance of the inhabitants. Social facilities should be grouped so as to offer the choice of climate-controlled access among clustered buildings at the neighbourhood level in such manner that the satisfaction of personal, family and collective needs is optimized.

In a universe where hardly any nation is today sufficiently wealthy to afford waste of any kind, an urban spatial pattern which is efficient in terms of both land use and energy conservation--as well as human convenience--will have to be sought. Compact urban development with little wasted open space (costly to maintain and frequently underutilized in suburban areas) would produce more reasonable walking distances to collective facilities and would assist in creating population densities more supportive of efficient public transit systems. The result would be more stable neighbourhoods with a closely knit identity, greater public safety and a stronger sense of civic pride--no mean achievement in today's unstable world.

The major advantages of compact development are the following:⁹⁶

1. CONSERVES LAND

Such conservation could free up land for potential use in agriculture and recreational open space with better access to user markets thus assisting in tax reduction.

2. PROTECTION OF THE ENVIRONMENT

Due to proximity of land uses, a lesser extent of destruction will occur to the environment--especially sensitive ecosystems which may exist in extreme climatic zones.

3. PERMITS EFFICIENT CONSOLIDATION OF URBAN SERVICES

Whereas dispersal and sprawl induce duplication of urban services and institutions such as schools, hospitals, etc., specialized services can be made available more economically in compact patterned cities because of time and distance factors.

4. SAVINGS IN URBAN INFRASTRUCTURE

Reduction in lengths of utility networks (streets, underground cables, lighting systems, trunk sewers, water mains, etc.) as well as in their planning, construction, maintenance and operation.

5. SAVINGS IN TIME

The closer spacing of activities and uses within the spatial configuration permits for time and energy savings in all types of displacement by a variety of modes--walking, vehicular movement, public transit, etc.

6. CONSUME LESS ENERGY

Since they are subject to lesser amounts of heat exchange than a dispersed urban pattern, they consume less energy for heating (and cooling).

7. ACCOMMODATES EXTREME CLIMATIC CONDITIONS

A 'heat island' effect is promoted and, in addition, more economical and accessible climate-controlled projects (shopping, housing, institutional, commercial) can be developed in strategic locations and connected to public transit systems.

A more compact urban form should be developed if an energy-efficient, as well as a climate responsive reorganization is to be achieved. Approaches should be imaged from the perspective of urban design concepts, policy development planning and implementation/action strategies. The following principles have been accepted as contributing toward the amelioration of communities from energy and climatic perspectives.

8.1 Principles for Energy-Efficient Planning

1. HIGHER DENSITIES

In the residential, retail and commercial sectors, increasing densities can result in significant reductions to space heating requirements and, in addition, will reduce transportation energy demand minimizing the need for spatial displacement throughout the urban region.

2. MULTI-USE BUILDINGS

Buildings containing a diversity of uses or functions, e.g. shops, offices, residences, public facilities (cinemas, restaurants, post office, schools), can potentially minimize the necessity for movement--especially under inclement conditions. Hypothetically, one may work, shop and dwell within a single building complex, although this infrequently turns out to be the actual case.

3. MIXED LAND USE

At the broader urban scale, mixing land uses in various neighbourhoods or districts within the urban configuration--as opposed to segregation of uses through traditional zoning practices (e.g. residential, retail, recreational, industrial, etc. uses have conventionally been dispersed throughout different zones of a city)--will also reduce the need for commuting. This approach creates greater self-sufficiency at the district and neighbourhood levels since a broader range of services can be made economically available with improved accessibility either by private or public modes of transportation--which also include walking and cycling.

4. INTENSIFICATION OF FUNCTIONS

This implies more intensive use of existing land which is vacant and awaiting development (as well as redevelopment), including urban infill. Services and housing are the usual fabric at the neighbourhood level although commercial and retail uses can be incorporated as can public transit installations. In such instances, it must be seen that existing infrastructure networks are adequate to support the additional functions. In some cases, where warranted by local market conditions, single-family houses can be converted to multiple-family use.

5. PUBLIC TRANSIT

This is the most energy-efficient form of movement but to be cost-effective it must serve relatively high density areas. Hence there is a great compatibility between higher density, mixed use development and the provision of improved public transit service serving transportation corridors and linking nodes of concentrated development. Judicious transportation management can assist in providing higher levels of comfort, reduced travel times and more economical benefits to users.

6. INTEGRATION OF USES

Complementary functions should be grouped according to relative compatibility, given existing local conditions. Places of work and areas of residence should be closer together and effectively linked by a variety of movement modes. Recreational areas should be accessible from both employment and dwelling zones. Overall functional relationships of uses should encourage non-vehicular movements both between buildings and sub-neighbourhoods as well as within the central business area and "mixed use nodal points" within the metropolitan built-up tissue.

It can be said that measures drawn from the following are likely to create the best balance of costs and benefits, in varying Canadian environments, from an energy-effectiveness point of view:⁹⁷

For Existing Areas

1. Encourage development in existing built-up areas.
2. Develop attractive and energy-efficient public transportation systems.
3. Increase densities to a level of about 67 du/ha through redevelopment, rehabilitation, conversion and infill projects.
4. Mix land uses through strategies and zoning by-laws.
5. Develop district heating systems in conjunction with garbage incineration and cogeneration of electricity in areas where population size and density make such systems viable.
6. Retrofit existing housing based on energy audits.

For New Development

1. Ensure development is contiguous with existing built-up areas.
2. Develop higher densities and mixed land uses to create pedestrian, bicycle, and public-transit oriented developments.

3. Use district heating where appropriate.
4. Apply environmental design principles taking the best advantage of site opportunities and minimizing the effects of site constraints.
5. Ensure that a maximum number of units are oriented for solar access through proper alignment of streets, lots and buildings.
6. Develop conservator houses with optimum levels of insulation, airtightness, and window glazing, oriented to take advantage of the sun's energy.
7. Use higher density, compact housing forms with internal layouts responsive to the external environment.
8. Use optimum combinations of heating systems and envelope thermal efficiency.
9. Where developing landscaping as an amenity, base decisions on conservation principles.

The above represent some of the basic prerequisites which will allow for energy efficient forms of urban development. These will contribute toward greater satisfaction and "livability"--both real and perceived--with the built environment. However, an energy-efficient policy alone will not specifically generate a climatically protected or responsive environment. It will assist toward obtaining such an objective but also required will be further "landscape planning" and "microclimatic strategies" acting in a concerted and carefully orchestrated fashion.

8.2 Principles for Climate-Responsive Development

While many of the basic principles for energy-efficient planning are more directly concerned with the macro-level and meso-level urban patterns, the tenets upon which landscape planning for climate-responsiveness are formulated tend to rely more heavily on micro-level considerations which deal with two prime issues:

1. Manipulation of the Natural Environment (e.g. through solar orientation, use of vegetation, site selection, siting of buildings, etc.).

2. Intervention by Built Form

Here, examples would be through 'wind gates', fences and walls to deflect wind and snow, "roofed-over" projects (atrium and galleria type development), integrated bus shelters, arcade systems above sidewalks, courtyard dwelling designs providing their own micro-climatic protection, linked buildings, etc.

Meaningful policies and urban design strategies for the cold must not only take into account the local conditions of topography and climatic constraints but must also be acutely aware of the societal values, attitudes and potential user requirements. Climate, therefore, should be seen as a modifying factor under normal design settings. However, under extremely severe conditions, it may turn out to be a determining element.

During the past several years, micro-climatic concerns have commenced, especially in the central areas of larger cities where redevelopment has been prevalent.

As cities became more dense and buildings taller, the resulting environmental conditions became more extreme and these conditions affect an increasing number of pedestrians who visit or work in the core. Pedestrians began to notice the lack of sunlight between tall buildings and the increasing wind turbulence that became more unpredictable and even dangerous at times. Noise and pollution from increasing numbers of vehicles have added to the irritants.⁹⁸

In 1979, the City of Ottawa approved planning policies intended to address such concerns as an outgrowth of micro-climatic problems. The studies dealing mainly with sunlight access, snow drifting and accumulation,

and wind turbulence control are breaking new ground and are destined to contribute significantly to a much more sophisticated urban design approach to development.

Consulting engineering firms in Canada have been among the pioneers to develop techniques related to the study of existing or potential wind, snow, pollution and sun/shade problems associated with a broad range of development projects--industrial, commercial, residential, through to university campus master plans and newly planned communities. They utilize open channel water flumes and a boundary layer wind tunnel for analysis of such projects as snow control studies for town sites; wind pressure and aeroelastic studies for high-rise structures; pedestrian level wind studies for open spaces and publicly exposed plazas; studies of pollution involving blowing smoke and exhaust fumes; studies of exterior shadowing and daylighting; and other research relying on hydraulic engineering techniques applied to urban development projects.⁹⁹

The most significant work tends to be applied to pedestrian level wind studies--conducted to help architects overcome dangerous, high velocity wind conditions which normally occur at the ground level and adjacent to the facades of tall buildings. The objective is to reduce the wind velocities and to deflect such wind directions away from areas which receive the most intensive use by pedestrians in the city.

In general, it can be stated categorically that:

Effective wind controls demand a site analysis, including the speed, frequency, and direction of prevailing winds, slopes and vegetation types and positions of neighboring buildings or structures which may influence the pattern of airflow.¹⁰⁰

Dense, tall coniferous trees carefully planted, often in rows, can act as "wind sponges" or windbreaks and can divert cold wind currents. The

detailed understanding of using "nature to fight nature"--through planting policies can go a long way toward reducing wind-induced discomfort under winter conditions. Tools and techniques are now readily available for evaluating the impact of adverse climate on urban inhabitants, especially pedestrians. Open spaces between buildings--used by the public--can be designed for improved micro-climates in cases where it is undesirable to totally enclose and climate-control them.

In addition, the following guidelines should be applied if climate-responsive development is to ensue:¹⁰¹

8.2.1 Regarding Site Plan Layout

a) Single Family Detached Dwellings

Highest density sited on preferred south-east slope below ridge-line for wind protection using clustering concept form for minimum wall exposure. Those units sited on cool north slopes, will require buffering to reduce air infiltration and heat loss. Compact lots should be oriented north-south along east-west or north-south streets.

b) High and Mid-Rise Apartments

The multiple-unit residential form for the northern regions should be:

- highest buildings sited at northern edge of site, lowest at southern edge.
- low to moderate height (to avoid wind)
- courtyard development - good accessibility
 - protected micro-climatic public space
 - summer and winter allotment gardens, if desired
- glass galleria linking clusters of housing units creating communal spaces
- unit loggias for southern exposure (enclosed balconies)
- cluster on south-facing slopes or directions to create sun pockets

c) Public Space

Major public open spaces exposed to the sun protected by buildings with green space partially shaded for summer use.

d) Open Space System

Throughout the development site to be used as wind buffer and define pedestrian circulation system also used to channel summer breezes.

In relation to the above, several complementary principles are desirable: ¹⁰²

- Buildings should be clustered to create sun pockets and take complete advantage of winter sun.
- Solid walls and single row hedge planting should be used on end units facing north westerly wind flows.
- Fences should be located on northside and evergreen wind breaks at 1 1/2 - 2 times the distance of the height of the unit. Vegetation equal to the height of the unit and spaced so that bottom boughs touch should also be used.
- Compacted layouts around interior courts combining end walls, fences and vegetation for wind protection should be seriously considered.

8.2.2 Regarding Micro-Climatic Control

Unfortunately, most architects and planners, almost without exception, tend to base their designs on the programmatic requirements of the brief summer season--that period at which peak use is made of outdoor space. However, during the colder periods, much is known that can moderate the severity of climate and which can extend the seasons of relatively comfortable outdoor activity through the use of wind shields protecting one from the wind and reducing the wind chill factor, orientation for maximum reception of solar radiation, prevention of shadowing by tall buildings or natural elements, use of heat absorbing or heat reflecting materials or even outdoor heating--such as overhead radiation heaters.

These general micro-climatic principles include:¹⁰³

- 1) wind protection for winter, spring, fall and most of the summer months.
- 2) orientation for maximum reception of spring, fall and winter solar radiation.
- 3) prevention of shadowing by buildings and natural elements.
- 4) use of heat absorbing and heat reflecting materials.
- 5) avoidance of cold micro-climatic pockets of air.
- 6) provision of built form or plant material shelter to the north and west.
- 7) architecture designed to create micro-climates which optimize available solar energy and provide protective buffers from the cold, windy northern exposures. The resulting sun pockets should be organized so as to function as comfortable outdoor gathering areas during the less desirable periods, e.g. cool spring and fall days.
- 8) use of deciduous trees for summer shade and winter sun penetration. Coniferous trees should be used for winter colour and year-round wind buffering.
- 9) canopies, arcades and other overhead shelter systems which should cover primary pedestrian circulation areas--in densely built up areas--providing weather protection and retarding outgoing radiation at night.
- 10) screening of north and west facing elements of all outdoor activity areas with vegetation and appropriate plant materials.
- 11) provision of paved areas and of rock or masonry surfaces on south facing slopes--or, in general, surfaces which maximize heat gain from solar radiation.
- 12) pruning and thinning of existing shade trees to allow maximum solar penetration.
- 13) minimization of single-season use of water features--all outdoor fountains should become "ice-sculpture" during the winter months or be integrated with skating rinks or other active winter-use activities.

Although the improvements, through the use of the above principles, can be significant, there is still much to learn through research programmes about climatically-sensitive design and site planning especially since most of the existing research, literature and application has been concentrated on the hot or arid zones of the world. This fact, alone, hampers policy analysts and urban planners working within cold-climate contexts.

While not all "summer" activities must be abandoned during the winter--especially where these are of an outdoor-type, climatic control of the environment is, nevertheless, essential if some human animation and life is to be retained outside.

The conclusion must be that the outdoor social space has to be located, designed, and equipped to extend the outdoor season and to support social activity during the cold part of the year, even if not necessarily with the same intensity or in the same way.¹⁰⁴

8.3 Applied Climatology and Human Settlement Planning

The integration of climatic factors into human settlement planning and building construction is not new. However the energy crisis--which attracted attention in 1973--brought a renewed focus to this field. The proliferation of new journals and professional magazines in "applied climatology" and "energy and building" throughout the 1970s was a phenomenon which did not go unnoticed in both developed and developing countries. Publications dealing with "climate, urbanization and society" were to be found almost everywhere, but especially in countries of northern latitudes where energy costs spiralled and efforts were made on a massive scale to address the matter through a more rational policy both at the building scale and at the urban planning level. The key factor in this problematique was the ability to predict and relate the effects of climate

on human settlements--individual buildings and agglomerations of buildings-- as well as on the inhabitants of these settlements and the forms which ultimate development would assume. The judicious application of this ability requires careful consideration of the following:

a) Definition of the Problems

- the physical/spatial mechanisms (building and urban design levels).
- significance of the climatic effects.
- ultimate goal or purpose of the applications.

b) Understanding of the Present Situation

- current practices in planning.
- current trends and developments in policy, design and planning.
- innovations on the horizon regarding administrative strategies, management thrusts, and policy development.
- current use of climatological information and data.
- available applied climatological know-how integrated within the framework of decision-making concerning the built and social realms.
- knowledge of methods used to predict climatic conditions in future settlements as a result of the disposition of buildings and open space on a designated site, e.g. snowdrifting and snow accumulation, wind speeds and directions, etc. around buildings, on their approaches and on major roads and recreational spaces.

c) Future Scope Within Policy Development Frameworks

- development of interdisciplinary research and development practice.
- development of appropriate networks (data-based) and observations.
- development of sunlight, wind and snow impact prediction methods.

In northern latitude, cold climate countries, protection from wind, extreme temperatures and blowing snow is imperative when dealing with the

exterior milieu. The achievement of significant reductions in heating requirements is essential. It is already known that energy savings in the area of 10-20%, and even higher, may be achieved by means of a dense urban site layout and by the use of heavy building materials, both of which can reduce cooling rates of the ambient urban air. Additionally, outdoor thermal comfort in urban areas can be improved if wind speeds are minimized and heat is added to the atmosphere through a 'heat island' effect operating in the urban field. Furthermore, it is desirable to utilize solar radiation as a source of passive heat in buildings even though this may dictate a policy of imposing restraints on the density in a designated urban location. In order to obtain optimal solutions--which may also include air quality control at street level--additional restrictions may be required in site planning and design of traffic systems. Both meso-climatic (regional) conditions and the local environment will have to be considered in greater detail than has hitherto been the case.

On the whole, applications of climatology, especially in cold climate zones, have been few and far apart as they have been directed to urban development.

It would be difficult to dispute the fact that weather and climatic forces are among the most influential elements in our daily lives. Furthermore, there appears to be insufficient attention paid to this fact, by the public-at-large and by development planners and analysts--especially concerning the constructive application of climatic parameters as they affect and dictate urban policy. Applied climatology, a relatively new field of study whose aim it is to integrate climatic considerations in the various stages of building, planning, and policy can make a powerful impact on urban development if taken seriously. Alternatively, disregard for such an approach may prove to have a harmful effect.

9.0 WINTER LIVING: OPTIONS AND RECOMMENDATIONS

9.1 Intervention Strategies

Prior to being capable of generating action strategies, we shall have to develop an acceptable set of goals and policies. These will have to be viewed both within the short and the long-term. As such, they will be subjected to one of the major dilemmas in urban planning and policy making--balancing the sectoral versus the comprehensive approaches amongst which there exists a constant tension. Furthermore, there is a complementary tension operative inside this larger frame--that of the individual's needs versus those of society.

What can northern human settlements do if they wish to make their environments more convenient, efficient, attractive and comfortable during the winter? At once, it becomes clear that if comprehensive solutions are desired, they must encompass the entire field of settlement patterns and the social, political and economic structures of communities. Four such scales can be determined:

1. The regional level, which has the overall settlement pattern, and movement systems, as central focal elements.
2. The macro-level, which has the total city as its field of attention. Here, one is concerned with distribution of uses and activities and provision of services and transportation facilities.
3. The neighbourhood level, which has the urban district or neighbourhood as its field of concern. Issues such as building types and orientation, land use, site planning, local climatological factors, floor area ratios, development profiles and urban design are crucial.
4. The individual building level, which is concerned with the specific design, layout, materials and technical installations.

Since most efforts, to date, have been directed at the individual building level, this paper has deliberately emphasized the regional, macro-level and neighbourhood scales of consideration.

The livable winter city will have to address a wide spectrum of issues. Amongst these the following will have to be considered: ¹⁰⁵

1. Think Winter

A radical readjustment will have to occur regarding our ingrained habit of thinking negatively about winter. More ways of inducing positive images shall have to be developed, e.g. attitude modification through education.

2. Do More With What We Have

Solutions will have to be energy efficient and cost effective. However, more can be done to reuse and retrofit our existing spaces and facilities. Through modifications, where appropriate, of many practices, ideas, policies and regulatory instruments which currently guide the ways in which the city is used and managed, much more can be done to incrementally improve what already exists. Innovative philosophies and approaches will have to be encouraged.

3. Attitudes and Lifestyle

A reallocation of time should perhaps be studied in order to make better utilization of short daylight hours during mid-winter. We must take advantage of the dramatic seasonal contrasts and even consider recreation (cross-country skiing or ice skating) as a mode of travel from place of residence to place of work.

4. Improvement of the Urban Infrastructure

Better management of the urban infrastructure is urgently required. Transportation must be rendered more comfortable, convenient and accessible (heated bus shelters and reduced headways between buses can go a long way toward achieving such objectives during the coldest part of the season). More enclosed and semi-enclosed public spaces are needed with protective elements linking shops to parking garages, transit stations and other institutional functions.

5. Provide Exterior Public Spaces Conducive to Winter Activities

Cities require more fountains, water, trees, and places for social communication; for sitting, chatting, daydreaming, thinking, relaxing--which must embody a high standard of aesthetic quality in the design of their urban furnishings and landscape features. Especially in chilly climates, the presence of sunlight is a significant factor in explaining why some public urban spaces attract people and others repel them.¹⁰⁶

6. Architecture and Design

Matters of colour, form, materials, textures, shapes and volumes will have to be more in keeping with the spirit of winter and its appreciation, in a physical sense. Multiple-use spaces will have to be provided within the framework of interrelating the indoors and outdoors.

7. Visual Environment

Four-season open spaces and especially, winter gardens incorporating colourful features such as banners, flags, sculpture and other art forms should enhance the northern setting and evolve from it.

8. Inject the City with More Lively Centres

The city must be imbued with constructive energy which enhances and promotes civic life, pleasure and ease in shopping, business, and movement on foot, and which offers a high level of sensory stimulation, delight and variety--while reducing stress induced by cold temperatures. It needs lively, informal meeting places--both indoors and out. The integration of a diverse range of urban functions must be so devised such that a richly woven tapestry of urbanity and urban identity will be the inevitable result.

9. Stimulation of Neighbourhood Action/Civic Activity

Carnivals, winter festivities and celebrations of various types should promote the winter image throughout various neighbourhoods and, as well, within the central business district.

10. More Research is Imperative

Post-occupancy evaluation of urban spaces, user analysis, participant observation together with interview and questionnaire techniques will be required if we are to find out just which elements of the winter season are sought by urban dwellers and which are viewed as nuisances.

There can be little doubt that our urban environments must serve not only as places for making a living but also as sources of inspiration-- where the "meaning of life" takes on an importance at least equal to the "means to life." If we are truly concerned with making our cities more habitable, our interventions shall have to work toward the creation of improved aesthetics in both built and non-built space, improvements in social and economic opportunities, and the genuine acceptance of management and organizational strategies which respond to the goal of accommodating human needs as well as climatic demands. The benefits of designing with nature are not only practical but also aesthetic and sensory. We must learn not only to accept seasonal change but also to appreciate its fundamental beauty, and to emphasize rather than minimize variation of season.

9.2 Further Action and Research

From existing applied research and policy development experiences, conducted to date both in Europe and North America, in almost every community one can find instances of ideas, policies, programmes and projects which address the issues of energy conservation and climatically-responsive planning. However, these responses are fragmented and normally deal with only one, or sometimes a few, aspects of the problem. In the majority of cases, solutions are focussed on one issue at a time, for this tends to be simpler from an administrative point of view vis-a-vis implementation strategies. Treatment of a highly multi-faceted problem, from a holistic view, is much more complicated and this would seem to be the reason for fragmented solutions.

Planning decisions and their actual implementation within the urban field normally fall under the jurisdiction of multiple agencies, authorities and departments (e.g. parks and recreation, transportation, housing, engineering services--road maintenance, sewerage, water supply, urban design, and social services provision), each of which is charged with specific

responsibilities and is answerable to elected officials, on the one hand, and to the public, on the other. The task of coordination in all these areas has infrequently been effectively managed--which is, perhaps, the most delicate and complex operation affecting the well-being of the urban population, as a whole.

Planning has been both restrictive and reactive in its nature and orientation within the Canadian context. It has been conservative in its outlook and has acted primarily in an advisory capacity. Generally speaking, planning is concerned with choices and policy options--and there are certain groups and individuals who will benefit at the expense of others, e.g. motorists versus pedestrians or public transit, air quality versus vehicular access, ecological welfare versus employment opportunity, private space versus municipal services. Planning has usually focussed on preservation of the status quo rather than on the testing of future possibilities and innovative ideas which tend to increase choice and to open up new directions for a better community life in social, economic and physical realms. Any more radical approach would be paramount to questioning the fundamental principles and practices upon which planning has been based for the past half century.

Insofar as environments can be considered--indeed, must be considered--to be complete, spatially integrated entities, effective "winter planning policies" can only be achieved if these are, conceptually and practically, made an integral component of the comprehensive planning, development and design process. Applications of the basic principles will have to be simultaneously applied to the micro-, meso-, and macro-levels of the urban pattern if "cities in the cold" are to be reshaped and reorganized in more humane ways. Coordination amongst all the disciplines involved in ameliorating urban living under harsh conditions will be absolutely essential. Boundaries which have traditionally isolated disciplines, e.g. architectural and industrial design, landscape architecture, applied

climatology, social policy development and urban planning, will have to be removed with more information exchange occurring if progress is to be made.

Design and policy decisions should be related to the behavioural sciences. Nourishment received from this source can make a noteworthy impact toward the improvement of winter living. Through inter-disciplinary collaboration, planners, policy analysts and designers have the possibility of becoming more socially responsible. Reciprocally, behavioural experts and environmental sociologists will have greater opportunity in the realm of applying their findings in more practical ways. With such joint activity, those working in the "gap" between social needs and environmental design responses--dealing with the interaction of man, society and the built environment--can more meaningfully contribute to development of the knowledge base affecting these two concerns. Higher standards of both urban planning and policy development can be attained and, as a result, more effective social planning can be undertaken.

In order to advance our knowledge and actions in the face of severe climate, we must understand how to harness the decisive forces behind most private and public decision-making within all fields of urban development. Problems will have to be viewed within a broad context of comprehensive, integrated urban and regional planning and management of existing urban systems from the spatial and temporal angles. Last but not least, the quality of urban living will have to be improved continuously, community and individual consciousness must be increased, and urban dwellers will have to be sufficiently well informed so that they may participate meaningfully in collective decisions which will influence how they live.

Climate variability (together with varying levels of energy consumption) will have to be recognized in a land mass as large as Canada's. There will be a range of concepts and principles which may have to be applied in differing ways, depending on the problems at hand.

Much of the work existing in the field of "winter livability" is still in the stage of infancy and must continue to evolve. Knowledge concerning landscape planning is not yet fully developed. There is a need for further research concerning the application of such concepts to particular climatic and physical proposals.

All the actors directly or indirectly involved in the building, planning and development industries will have to become experts in understanding which elements contribute, in the most useful way, to easing winter-induced discomfort and, as well, to enhancing the positive benefits and joys of the winter season.

Future research should assist in resolving the dilemmas inherent in "winter problems" so crucial in Canada. In addition to answering questions of a more theoretical nature regarding the effect of climate on behaviour, research should also contribute to the development of social and physical planning guidelines and interventions including both spatial and aspatial components dealing with human well-being.

Government, together with citizen's groups will have to be jointly involved in revising existing policies. Various levels of the public sector, which are responsible for managing and developing our communities, should undertake demonstration projects which would test new ideas in winter habitability. Large-scale home exhibitions, competitions and educational programmes are some of the vehicles which can be used to obtain visibility and greater comprehension.

We shall have to think and act more courageously. Innovative policies will have to be monitored in terms of cost effectiveness and level of user satisfaction. They will have to extend to a wide spectrum of spheres dealing with human life in cold climates--not only housing form, land use and transportation, but also clothing, home maintenance, community organization, family and friendship networks, leisure activities and time management.

The choices we make will ultimately determine what kinds of environments we shall have. The debate on what is "desirable" will have to broaden its base. Urban policies at provincial and municipal levels will have to reinforce these "desired" development patterns. We shall have to decide what types of cities and communities we want for what kind of a society and then harness policies so that the likelihood of attaining these goals becomes realistic and puts them within reach of the available means.

The organization of space is a product of the collective will of the participants...Living and working together in compact settlements may seem unnecessary once the technology to overcome distance is well developed. However, it does not necessarily mean that the compact city has been made obsolete and that settlements will disperse throughout the countryside. It all depends on what the people decide to do.¹⁰⁷

Winter and its problems tend to be perceived in various ways--a season to celebrate or, very often, a time to hibernate. It calls forth a host of conflicting emotions and contradictory viewpoints. Poets have traditionally equated this season with the passing of life; spring with its rebirth and awakening.

Solutions to these dilemmas are found in many forms. For some, it is merely a matter of dressing or eating properly--to fit the demands of the weather. We require better and more sophisticated knowledge about the role of clothing--and even diet, for that matter--if we are to minimize the unpleasantness of extreme cold. What has been referred to as "weather-sense" must obviously be a part and parcel of cold-culture know-how. We must also be capable of systematically addressing the physical, social and economic issues and be able to designate their priorities. We must accept and respect climate if communities in winter settings are to survive. Policies and urban design measures must be developed to suit a variety of human settlement sizes, functions and locations as these are

surely characteristic of a country as large and diverse as Canada. Whether the future is better than the present will depend on our making the correct decisions based on our values, attitudes and understanding of the variables acting on our urban systems.

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