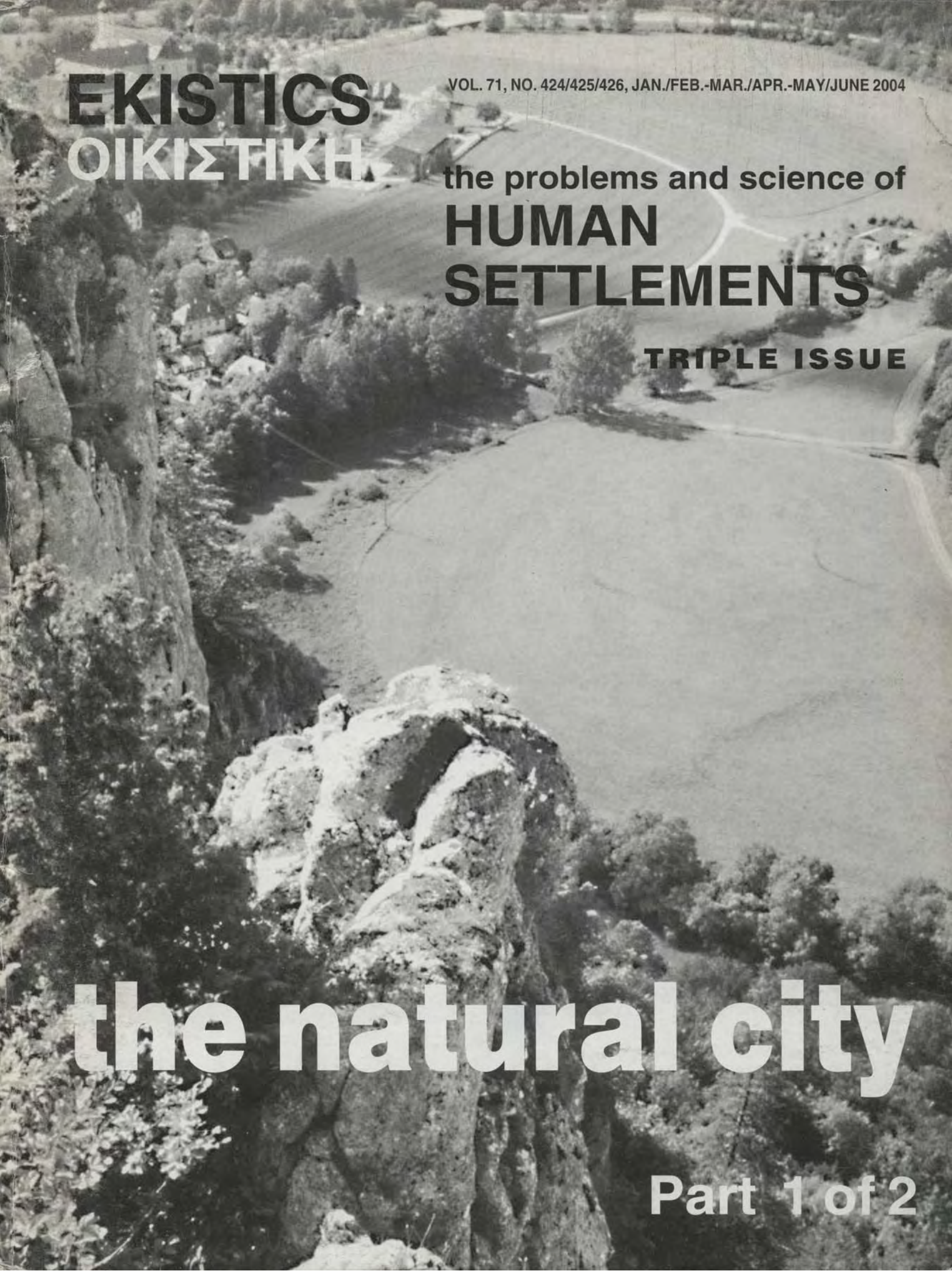
EKISTICS
ΟΙΚΙΣΤΙΚΗ

VOL. 71, NO. 424/425/426, JAN./FEB.-MAR./APR.-MAY/JUNE 2004

the problems and science of
HUMAN
SETTLEMENTS

TRIPLE ISSUE



the natural city

Part 1 of 2

EKISTICS: the problems and science of HUMAN SETTLEMENTS

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The Athens Technological Organization (ATO)

The Athens Technological Organization (ATO) is a non-profit organization established in 1958 to further technology and scientific research on any subject which can contribute to the improvement of human living conditions, technical and economic development and the training of people capable of pursuing these purposes.

Athens Center of Ekistics (ACE)

Upon its establishment in 1958, ATO started ekistic research and educational programs and later on in 1963 established the Athens Center of Ekistics (ACE) to foster a concerted program of research, education, documentation, and international cooperation related to the art and science concerned with the development of human settlements. In the domain of documentation in addition to its library, ACE publishes the following two journals:

- Ekistics, the Problems and Science of Human Settlements, and
- The Ekistic Index of Periodicals, as well as
- A series of research reports and monographs documenting its following four major research projects:

– "The City of the Future"
– "The Capital of Greece"
– "The Human Community"
– "The Ancient Greek Cities"

Since 1965 ATO-ACE have hosted on their premises the Headquarters and Secretariat of the World Society for Ekistics (WSE), an independent organization, whose goals and objectives are compatible with those of ACE.

●

World Society for Ekistics (WSE)

The Society – an international nongovernmental organization (NGO) in consultative status with the United Nations (ECOSOC) – is a nonpolitical and nonreligious body with limited membership, formed to study man's patterns of living and their physical expression in the past, present, and future. The aims and objectives of the Society are:

- To promote the development of knowledge and ideas concerning human settlements by research and through publications, conferences, etc.;
- To encourage the development and expansion of education in ekistics;
- To educate public opinion concerning ekistics, thus stimulating worldwide interest and cooperation;
- To recognize the benefits and the necessity of an interdisciplinary approach to the needs of human settlements, and to promote and emphasize such an approach.

WSE Executive Council (1 April, 2002 to 31 December, 2004)*

President: Alexander B. Leman (Canada)

Vice-Presidents *(in alphabetical order):* Christopher C. Benninger (India), William Doebele (USA), Thomas W. Fookes (New Zealand), Mit Mitropoulos (Greece).

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*The President and all other members of the Executive Council are elected by the General Assembly of members for a two-year term.

For further information on WSE, consult www.Ekistics.org

VOL. 71, NO. 424/425/426, JAN./FEB.-MAR./APR.-MAY/JUNE 2004

EKISTICS

the problems and science of HUMAN SETTLEMENTS

TRIPLE ISSUE

The natural city

- **Part 1: Canadian issues of international relevance**
  (vol. 71, no. 424/425/426, Jan./Feb./Mar.-Apr./May/June 2004)
- **Part 2: International issues of relevance to Canada**
  (vol. 71, no. 427/428/429, July/Aug./Sept.-Oct./Nov./Dec. 2004)

Guest-editor: Ingrid Leman Stefanovic

Part 1: Canadian issues of international relevance

EKISTICS/ΟΙΚΙΣΤΙΚΗ: the problems and science of HUMAN SETTLEMENTS

Volume 71, Number 424-429, January-December 2004

The natural city (two parts)

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20 Evolving cities into a sustaining and sustainable habitat — *Willem H. Vanderburg*
26 Urban sustainability and public awareness: The role of the National Round Table on the Environment and the Economy in Canada — *Edwin Charles Aquilina*
30 Toward the green city through revitalizing major obsolescent urban lands — *Ken Greenberg*
35 The growing role of citizen engagement in urban naturalization: The case of Canada — *Stewart Chisholm*
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63 Financial incentives for behavioral change in the ecological city — *Rodney R. White*
68 The environmental costs of femininity — *Carly Bowman*
76 The Urban Cliff Hypothesis and its relevance to ekistics — *Doug W. Larson, Uta Matthes, Peter E. Kelly, Jeremy Lundholm and John A. Gerrath*
84 Ecology in the natural city: Testing and applying the Urban Cliff Hypothesis — *Jeremy Lundholm*
90 Green Buildings Policy: An analysis of three market-oriented innovations — *Jesse Zuker*
102 The use of wood for construction and energy in the natural city – The case of Canada — *Gundolf Kohlmaier*
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203 Through the (not so) Green Door: University campus greening and curriculum change — *James Gray-Donald and David Selby*
213 The "Greening the Ivory Towers" Project: The University of Auckland case study — *T.W. Fookes, Alison Hall and Logan Whitelaw*
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236 Sustainable housing design and the natural environment — *Meltem Yilmaz and Ruşen Keleş*
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255 Metropolitan regions: New challenges for an urbanizing China — *Edward Leman*
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EKISTICS/ΟΙΚΙΣΤΙΚΗ: the problems and science of HUMAN SETTLEMENTS
Volume 71, Number 424/425/426, January/February-March/April-May/June 2004

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The contents of this volume "is only the beginning of a conversation that, we hope, will continue as we jointly seek to better understand the full breadth and depth of how to transform our human settlements into spaces that respect the moral laws of nature in all their complexity."

11 A contract with our future: A keynote address *Robert F. Kennedy, Jr.*
"Environmentalists are injecting the long view, the trustee obligation, into the political process."

15 Cities are successful because they are civic: The 2004 C.A. Doxiadis Lecture: *David Crombie*
The public realm, place and community, the value of a marketplace and economic opportunity, and relationship with nature – The four organizing components of civic culture: The case of Toronto.

20 Evolving cities into a sustaining and sustainable habitat *Willem H. Vanderburg*
"To create a knowledge infrastructure capable of guiding the evolution of the urban habitat toward livable and sustainable cities requires the introduction of a preventive orientation into each and every relevant area of specialization [which], in turn, will lead to beneficial synergistic effects between" them.

26 Urban sustainability and public awareness: The role of the National Round Table on the Environment and the Economy in Canada *Edwin Charles Aquilina*
Working closely "with the full range of partners and stakeholders [in] building public engagement with the sustainable future of which the natural city is one important part."

30 Toward the green city through revitalizing major obsolescent urban lands *Ken Greenberg*
Five projects of urban regeneration centers near water sites made available by the long, slow, and inevitable process of industrial retreat.

35 The growing role of citizen engagement in urban naturalization: The case of Canada *Stewart Chisholm*
Recording activity since 1991, assessing results and suggesting principles for future action by "Evergreen" – a national, non-profit environmental organization "that brings communities and nature together for the benefit of both."

45 Downsview Park, Toronto: A part of the natural city of the 21st century *Tony Genco*
The early stages in the process of implementing "a winning formula for the creation of an urban park … and a leading edge sustainable community to realize the potential and opportunity of building a natural city."

52 The price of sprawl in Ontario, Canada *Ray Rivers*
Adding "a positive tax to land converted from farm use to urban sprawl [and/or] promoting inner city development by requiring the purchase of sprawl offsets … might … assist in re-balancing the market place for development land."

57 Is Smart Growth a smart adaptation strategy? Examining Ontario's proposed growth under climate change *Brad Bass*
"A strategy to increase urban vegetation will confer many benefits that are currently inadequately addressed" and will also reinforce those elements "that reduce … vulnerability to climate change": A critical assessment of current regional planning initiatives.

63 Financial incentives for behavioral change in the ecological city *Rodney R. White*
Assessing "the implications of climate change for water availability and the potential for the application of urban environmental finance … to the three main physical throughputs of water, energy and solid waste."

68 The environmental costs of femininity *Carly Bowman*
A review of health and environmental risks deriving from cosmetics and related industry – and a call for women citizens to "to lobby government for a more inclusive regulatory regime."

76 The Urban Cliff Hypothesis and its relevance to ekistics
Doug W. Larson, Uta Matthes, Peter E. Kelly, Jeremy Lundholm and John A. Gerrath
If "our attitudes and feelings about the built environment have ancient evolutionary roots" and the flora and fauna of our landscapes are "largely rock outcrop species …, then it becomes possible to … create both efficient and comforting environments."

84 Ecology in the natural city: Testing and applying the Urban Cliff Hypothesis *Jeremy Lundholm*
"The acknowledgment that cities may be functionally 'natural' to non-human organisms may yield tangible benefits as well as provide a strong foundation for revitalizing our conceptions of urban places."

90 Green Buildings Policy: An analysis of three market-oriented innovations *Jesse Zuker*
The assessment of the quantitative and qualitative impacts of each of "three innovative applications that address the barriers to sustainability in the design, construction and real estate sector … developed in the USA [if coupled with] a review of European, Japanese and Australian initiatives, … [could] provide an in-depth understanding of the best instruments that could be applied in Ontario."

102 The use of wood for construction and energy in the natural city – The case of Canada
Gundolf Kohlmaier
As part of Canada's commitment to contribute through its cities to climate protection, its "forest … industry could expand its wooden home exports considerably by designing low energy and high-tech houses, while providing their wastes for heating systems."

113 Housing in the natural city: The role of prefabrication *M.T. Gorgolewski*
The huge potential towards a more sustainable supply of houses through "providing products appropriate to local culture and climate, yet based on industrial efficiency, and the latest technology."

118 The Oak Ridges Moraine: A story of nature in the Greater Toronto Urban Region
David Lewis Stein
"… the conflicts that come with trying to preserve green space in an expanding metropolis."

123 Lake Ontario's Waterfront : Realizing a decade of regeneration *Suzanne Barrett*
Assessment of multiple initiatives by the Toronto Waterfront Regeneration Trust and Identification of essential ingredients for continuous successful regeneration in the decade 2000-2010.

126 Lake Ontario Waterfront: Update since "A Decade of Regeneration …" *Marlaine Koehler*
Recording the successful efforts of a private local partnership initiative to complete, enhance and promote the implementation of an originally provincial environment program.

133 Organizing political support for the natural city *Preston Manning*
Five concrete policy proposals in an Agenda for Change and three concrete strategic suggestions for effective action towards the realization of the natural city.

135 Building on success in Mississauga, Ontario *Hazel McCallion*
A City "needs the support of the entire community to make ideas and initiatives possible": The long success story of Canada's sixth largest city.

138 Federal-provincial governance and the future status of Canadian cities *Frank Smallwood*
To counteract federal and provincial governments restricting policies, local governments should launch advocacy campaigns to strengthen their decisions and fiscal capacity through the Federation of Canadian Municipalities and forge alliances with urban businesses, the media and environmental groups.

145 Ekistic grid index

Cover: Early human occupation sites along the upper reaches of the Danube River and its tributaries in southern Germany (*Source*: Larson et al., "The Urban Cliff Hypothesis and its relevance to ekistics," p. 79).

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To the Reader

As is stated in the tables of contents (pages 5 and 6), the papers solicited by Ingrid Leman Stefanovic, guest-editor, for the special volume of Ekistics (vol. 71) entitled "The Natural City," are organized in two parts, in two corresponding triple issues of the journal, as follows:

Part 1: Canadian issues of international relevance
(Vol. 71, no. 424/425/426, January/February-March/April-May/June 2004)

Part 2: International issues of relevance to Canada
(Vol. 71, no. 427/428/429, July/August-September/October-November/December 2004)

The present issue is Part 1.

The reader interested in the contents of the entire volume should also refer to Part 2 of which the detailed table of contents is given on the pages that follow (pp. 143 and 144).

EKISTICS/ΟΙΚΙΣΤΙΚΗ: the problems and science of HUMAN SETTLEMENTS
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An initiative towards dismantling the broad concept of ekistics of balanced relations between nature and the other four elements of human settlements, i.e. Anthropos, Society, Shells and Networks.

168 Envisioning the natural city: The guest-editor's foreword *Ingrid Leman Stefanovic*
The contents of this volume "is only the beginning of a conversation that, we hope, will continue as we jointly seek to better understand the full breadth and depth of how to transform our human settlements into spaces that respect the moral laws of nature in all their complexity."

170 Mitigating natural disasters: The role of eco-ethics *David Etkin and Ingrid Leman Stefanovic*
The need for "a process that results in a greater emphasis on our interactions with and reliance upon the natural world, and the development of community resilience."

181 Resettlement of development-induced displacees: Emerging issues *C. Emdad Haque*
A critical review of global experience leads to the need for establishing a participatory decision-making process and, through evaluation of alternative choices concerning major development, largely aims at mitigating to the maximum the usual negative impacts on displacees.

187 The city at the end of the cheap-oil era *Klaus Illum*
The need for "adapting the economy to a decline in oil consumption … [through] the dismantling of the oil-technological complex so as to ensure that oil demand peaks before oil production capacity peaks."

192 The role of the university in city planning: Cleveland's Lakefront Redevelopment Plan
Wendy Kellogg and Kathryn Wertheim Hexter
Challenges faced and lessons learned from a first two-year program initiated by an urban university aiming at bringing together public and private stakeholders in decision making.

203 Through the (not so) Green Door: University campus greening and curriculum change
James Gray-Donald and David Selby
"The campus does not have to look green to be sustainable or to promote commitment to sustainable lifestyles among staff and graduates." The importance of "working with holistic understandings of sustainability; … employing a participatory pedagogy; utilizing campus assets to interpret … [its] environment through sustainability lenses; and giving immediate feedback to the campus community on its sustainability performance."

213 The "Greening the Ivory Towers" Project: The University of Auckland case study
T.W. Fookes, Alison Hall and Logan Whitelaw
Results of Planning students' research based on a "Campus Sustainability Assessment Framework initiated by the Sierra Youth Coalition to "actively promote the inclusion of faculty, staff and students."

223 Non-motorized mobility in cities of the future: College and university campuses as a pilot project *Spenser Havlick*
"The time is at hand to determine whether [university and college] campuses, which are unique microcosms of our larger towns and cities, can demonstrate that neighborhoods, towns and cities of the future can become less dependent on the single occupant vehicle."

228 Tethered vehicle systems for sustainable cities *Richard Gilbert*
Arguing in favor of future land transportation systems to "be dominated by … vehicles that receive their motive energy via a rail, wire or magnetic effect."

233 "Localization": A means to reduce negative transportation impacts in the "natural city" *Natalie Helferty*
"With the decline in global fossil fuel reserves and the ever-increasing … climate change, … air pollution and degradation of nature, localization will not only be desirable, but absolutely necessary."

236 Sustainable housing design and the natural environment *Meltem Yilmaz and Ruşen Keleş*
"… housing design must be based on the participation of users and principles of [sustainable development – reduce, recycle, reuse and recover – combining] new technology and inherited architectural vernacular."

245 Planning the emergent Basque megalopolis as a natural multi-metropolitan complex *Lawrence D. Mann*
The evolution of the meaning attributed to the notion of "natural city" by planners and landscape architects from 1896 to the present, "leading to the idea of an urban natural-artificial trade-off matrix": The case of the Basque urban system.

255 Metropolitan regions: New challenges for an urbanizing China *Edward Leman*
"Focused, policy-oriented, and comparative research on metropolitan regions could help to inform China's policymakers on actions that could lead to… optimal outcomes" of governance and management.

282 Conditions for effective management of a river basin in the European Union *Barbara Zanou*
Methods, data and cooperation among all stakeholders in the process of planning and implementing water management according to the EU Water Framework Directive "in order to promote social, economic and environmental benefits from water uses and services on a sustainable horizon."

289 Global urbanization, is it sustainable? The challenge to the UN World Urban Forum in Vancouver, 2006 *H. Peter Oberlander*
"… the time has come to reverse the inevitable and enlist global societies and their human and economic resources to maintain the city's historic civilizing impact."

295 Ekistic grid index

298 The anthropocosmos model

301 The Program of WSE Meetings in Toronto, 22-26 June, 2004

306 Cumulative Index of Contents of EKISTICS, January-December 2004 (Vol. 71)

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"The Natural City" International Symposion

The University of Toronto's Centre for Environment and the World Society for Ekistics

Toronto, 23-25 June, 2004

Summary of Daily Program

WEDNESDAY, 23 JUNE, 2004

- **Plenary Session**
  - Welcome and Introduction
  - Panel Discussion: The Natural City (dedicated to Jane Jacobs, author and activist in the City of Toronto)
  - The Natural City: Providing the Context

  Part I
  - Session I: The Toronto Setting
  - Session II: Restoring the Brownfields: The case of Toronto's Distillery District: Panel Discussion
  - Session III: The Federal Government and the Natural City

  Part II
  - Session I: Re-Discovering Toronto's Roots
  - Session II: Community Engagement in the Natural City
  - Session III: Contested Images of the Natural City
- **Plenary Session: Keynote Address by Robert F. Kennedy, Jr.**

THURSDAY, 24 JUNE, 2004

Part I
- Session I: The Text of the Natural City
- Session II: Respecting Natural Limits
- Session III: The Architecture of the Natural City

Part II
- Session I: Coping with the Hazards of Nature
- Session II: Building the Natural City
- Session III: The Social and Economic Impacts of Climate Change on the Health of Communities: A Web of Interrelationships: Panel Presentation

Part III
- Session I: The Humanity and Culture of the Natural City
- Session II: Designing the Natural City
- Session III: The Natural Ground of Cities

Part IV
- Session I: Rethinking the Philosophy of Nature
- Session II: Economic opportunities in the Natural City
- Session III: Lessons from India, Japan and Cuba

- **Plenary Session: The 2004 C.A. Doxiadis Lecture by the Hon. David Crombie**

FRIDAY, 25 JUNE, 2004

Part I
- Session I: Promoting Awareness of the Natural City
- Session IIA: Campus Sustainability and Student-Run Initiatives
- Session IIB: Campus Sustainability and Student-Run Initiatives
- Session III: Engineering the Natural City

Part II
- Session I: Greening the City
- Session II: Transportation and the Natural City
- Session III: The Natural Polis

Part III
- Session I: Planning the Natural City
- Session II: International Perspectives
- Session III: Future Challenges for the Natural City

- **Plenary Session: Synthesis – Next Steps**

Opening Plenary Session

Fig. 1: Dr Ingrid Leman Stefanovic, Chair of the Symposion, delivering her introductory statement on behalf of the University of Toronto and the World Society for Ekistics.

Fig. 2: Left on stage: Participants of the Panel Discussion on the Natural City dedicated to Jane Jacobs, author and activist in the City of Toronto.

Fig. 3: Participants in the Medical Sciences Auditorium, University of Toronto.

The editor's page

● For a long time I have considered any opportunity to collaborate with Dr Ingrid Leman Stefanovic a privilege. This time the opportunity was offered by the international Symposion on "The Natural City" sponsored by the University of Toronto and the World Society for Ekistics which took place on the campus of the university and was organized and chaired by her on behalf of both sponsors.

I wish to thank her for having accepted to act as guest editor for this volume of *Ekistics* in spite of her very heavy commitments due to her role as Professor of Philosophy and Director of the Centre for Environment, University of Toronto.

I also wish to express my admiration for her inspired and inspiring introductory statement on the concept of the natural city (see pp. 8 and 9).

● In this Symposion, an international and interdisciplinary group of approx. 100 experts and a fairly large number of other participants and students held a very intensive three-day program – 4 plenary and 28 special sessions, with several papers and discussions in each (see p. 2) – determined

- to challenge the erroneous but still prevailing perception of "human settlements" and "nature" as independent of each other; and,
- to stress the need for the general adoption of the integration of these two notions – which is inherent in the approach of both convenors of the Symposion.

● The 38 papers contained in this volume, most of which were made available at the Symposion and a few of them at a later date, are organized in two parts, i.e.

- Part 1: Canadian issues of international relevance (vol. 71, no. 424/425/426, January/February-March/April-May/June 2004)
- Part 2: International issues of relevance to Canada (vol. 71, no. 427/428/429, July/August-September/October-November/December 2004).

The papers focus chiefly on the relation of nature and its basic components – from vegetation and all other resources to climate – with the other elements of human settlements, i.e. Anthropos, Society, Shells and Networks. Emphasis is on the desirability for a conscious effort towards maintaining a constant balance between all five elements of human settlements, taking into consideration the dynamic changes identified at present and/or anticipated for the future. On the other hand, the feasibility of such an effort is supported by encouraging cases of success in high-income and technologically advanced communities, particularly at scales from "house group" to "metropolis" – and much less on larger scale human settlements.

For more specific information, in addition to the table of contents, the reader may also refer to the Ekistic Grid (pp. 145-148) for each individual paper and to p. 298 for the entire volume.

● I wish to thank all contributors to this volume of *Ekistics* and Mrs Noriko Doi who provided all the photographic material from the meetings.

● However, I must also express my apologies for the very long time it has taken for these issues to be printed for a variety of reasons – most of them beyond our control.

In addition, I personally wish to ask the guest-editor and the following authors – David Etkin, James Gray-Donald, Natalie Helferty, Hazel McCallion and David Selby – to forgive us for using their papers in this pre-dated volume. These papers were written and made available to us much later than the time of the 2004 Symposion – in fact three of them were presented at the second Symposion on "The Natural City" in 2006 focusing on "Success Stories." Their attractive topics represented essential contributions with new dimensions to the Natural City concept and I could not resist the temptation to make them part of the present volume.

P. Psomopoulos

Envisioning the natural city

The guest-editor's foreword

Ingrid Leman Stefanovic

The author is Guest Editor for the present volume of Ekistics (vol. 71, nos. 424-426 and 427-429, 2004) on The Natural City. Dr Stefanovic agreed to serve as the Director for the new Centre for Environment, University of Toronto, commencing July I, 2005, for a five-year term. She is the former Director of the Division of the Environment, one of the three units now integrated into the new Centre, and former Associate Chair for the Department of Philosophy at the University of Toronto. Dr Stefanovic is a Professor of Philosophy, whose teaching and research focus on values and perceptions of environmental decision making. She has a 30-year teaching and research career in interdisciplinary fields, ranging from environmental ethics to urban planning and environmental policy development. Her most recent book is entitled Safeguarding Our Common Future: Rethinking Sustainable Development *(SUNY, 2000). Dr Stefanovic, one of the earliest members of the World Society for Ekistics, having served on various occasions as member of the Executive Council and officer of the Society, was the organizer and acted as Chair of the international symposion on "The Natural City," 23-25 June, 2004, sponsored by the University of Toronto's Division of the Environment, Institute for Environmental Studies, and the World Society for Ekistics.*

The move to embrace nature today is not a rejection of capitalism, consumerism and the city, as was perhaps the case in the 1960s and 1970s. It does not promote finding freedom on 50 acres in the wilderness or country. Instead, it is a movement to embrace nature in our lives in the city.

V. Schaefer, H. Rudd and J. Vala, *Urban Biodiversity*[1]

My 80-year old father and I took a favorite walk together the other day. Crossing a busy Toronto intersection, we meandered into the University of Toronto campus – a world of stone buildings, wandering walkways, groves of stately elms and maples, and flower gardens with colors that dazzle. Moving through the quiet olfactory embrace of rose bushes and marigolds, our conversation moved effortlessly, agelessly. Passerbys included children, students and the elderly, moving in and out of our universe, never intruding upon the special space that the walk preserved between us. Looking upwards, my father remarked at the grey-blue ceiling of light cloud cover – and how much he preferred that to the picturesque cumulous images of picture postcards. A cheeky squirrel made us stop and remember fondly a walk along this same path 40 years ago when, as a child, I had fed an acorn with my father to one of this squirrel's ancestors: memories of years past wound themselves into an otherwise timeless moment.

In very many ways, our walk was through what I would call a "natural city." Certainly, the experience was defined by greenery and wildlife, from birds to dogs, raccoons and squirrels, from flies to the extraordinary spider, weaving its exquisite web along the bench where we sat.

Four million residents inhabit Toronto, a city that is embedded in an ecologically rich landscape that hugs the shores of Lake Ontario, and is nestled within a pattern of ravines and a floodplain of three large rivers. The water that we drink from those rivers and the lake today has passed, for generations, through the soils, through other beings. We are joined, ecologically speaking, to others both in space and through time.

A natural city certainly demands a level of biological diversity to ensure good health, both of the ecosystems and the humans who inhabit them. However, the vision of a natural city invites us to think more broadly still. The walk that my father and I enjoyed was made more meaningful by virtue of the social and cultural milieu as well. Our own conversation was as peaceful, as meandering, as the landscape itself. Others who passed us – people of different racial and cultural traditions – implicitly reminded us that respect of difference, acceptance of difference, happens in this city more than in almost any other in the world.

The science of Ekistics teaches that, additionally, cities support technological, economic and regulatory functions as well. Significantly, my father and I were surrounded by the technological symbol of urban form – cars – but, because of the courtyard design of the spaces through which we moved, the evening rush hour buzz was dimmed by thoughtful campus design.

While North American society is defined by consumerism, our walk was also special because financial considerations could be set aside for the moment – and yet, it must be admitted that the beautifully tended landscape was only made possible by a strong University, city and national economy.

Even the regulatory function can be seen to have impacted upon our walk. Living in a free, democratic Canadian society, my father and I could move within a city of 4 million people, feeling safe, feeling at liberty to speak about anything that came to mind. Others around us could do the same.

In this regard, I am moved to admit that – in addition to the biological, social, cultural, technological, economic and regulatory functions – a natural city must also be understood as a *moral* phenomenon. It is more than merely an ecological inventory of species, no matter the number and diversity. The concept of "nature" has been studied by philosophers at many different levels and, clearly, to explore this concept in depth is beyond the parameters of this Foreword. Nevertheless, I am reminded that the Latin *natura* is derived from the verb "to grow," and "to be born." For the Ancient Greeks, nature emerges and abides as *physis* – which gathers together notions of origin, of the grace of the unspoiled and of goodness.

Fig. 1: Professor Ingrid Leman Stefanovic (middle), Chair of the international symposion on The Natural City in Toronto (23-25 June, 2004) at the inaugural plenary session with her father (right) Alexander B. Leman, President of the World Society for Ekistics, and P. Psomopoulos, Secretary General of the Society (left), presenting her with a marble copy of an ancient Cycladic statuette from Greece on behalf of all participants in recognition of and admiration for her overall effort in organizing the symposion.

When we speak of the natural city, the intent is to point towards such notions as well – of the authentic and the true, and of a grace and source of creation of a world that will always exceed the parameters of narrow human manipulations. Certainly, there is a hermeneutic element to this as well: the interpretation of what constitutes a "natural city" will always be partial, finite, and never universal.

Ecologically speaking, our walk was hardly in a *wilderness* environment and for some biologists, defining a university campus as "natural" is, at best, naïve. Equally, one can say more about the social, cultural, economic, technological, regulatory and moral elements of our walk.

Nevertheless, to describe the experience of a "natural city" is not to aim to present a universal prescription. Life and lived experience are far too complex for neat, compartmentalized manuals. For this reason, we must come at the concept of the natural city from many different angles.

This volume of *Ekistics* presents a broad collection of perspectives on this issue. It is only the beginning of a conversation that, we hope, will continue as we jointly seek to better understand the full breadth and depth of how to transform our human settlements into spaces that respect the moral laws of nature in all their complexity.

As a final point of indulgence, I ask the readers to allow me to dedicate the work that I have personally put into this journal, to my father, Alexander B. Leman, the 17th President[2] of the World Society for Ekistics, in the hope that our walks together will continue for many years to come.

Editor's notes

1. Valentin Schaefer, Hillary Rudd and Jamie Vala, *Urban Diversity: Exploring Natural Habitat and its Value in Cities* (Ontario, Canada, Captus Press Inc., 2004), p. 14.
2. Presidents of the World Society for Ekistics:
   Richard Llewelyn-Davies, 1967-1969
   Margaret Mead, 1969-1971
   Jean Gottmann, 1971-1973
   Eiichi Isomura, 1973-1974
   Robert Matthew, 1974-1975
   R. Buckminster Fuller, 1975-1977
   Felipe Herrera, 1977-1979
   Thomas Lambo, 1979-1981
   Earl Finbar Murphy, 1982-1984
   Charles M. Haar, 1984-1987
   Gerald B. Dix, 1987-1990
   John G. Papaioannou, 1991-1993
   Wu Liangyong, 1993-1995
   Charles M. Correa, 1996-1997
   Wesley W. Posvar, 1998-2000
   Udo E. Simonis, 2000-2001
   Alexander B. Leman, 2002-2004

"The Natural City" Symposion: Keynote speech

Fig. 1: Dinner held at Hart House Great Hall, University of Toronto, on 23 June, 2004, preceding the keynote address by Robert F. Kennedy Jr. From left to right: Carolyn Tuohy (former Vice President at the University of Toronto); with Ingrid Leman Stefanovic to her left; then Robert F. Kennedy Jr.; then Pekka Sinervo, Dean, Faculty of Arts and Science; Don Cormack, Vice-Dean, School of Graduate Studies; Michael Marrus, Dean, School of Graduate Studies; and Alexander B. Leman, President, World Society for Ekistics. (*Source:* Tina Singal).

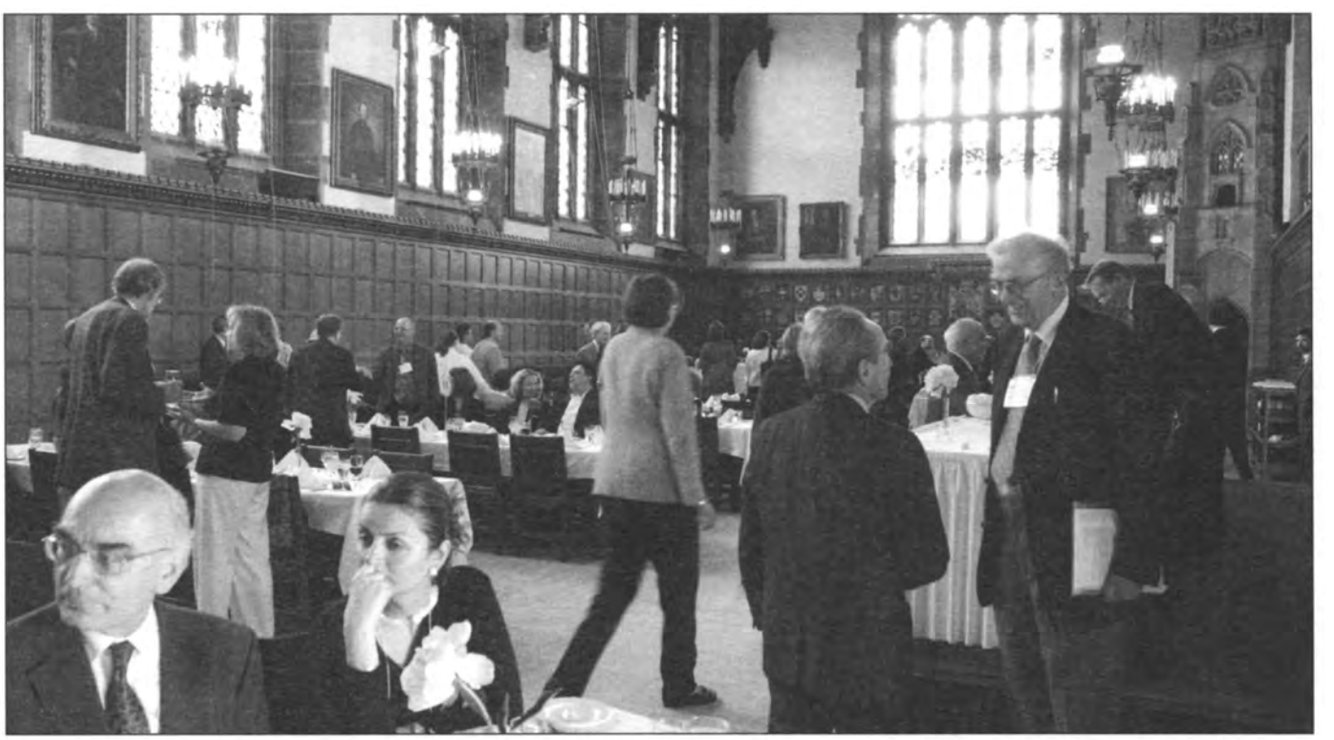

Fig. 2: View of the participants at the dinner at Hart House Great Hall, University of Toronto.

A contract with our future

Keynote Speaker: Robert F. Kennedy Jr.

Recently lauded by Successful Meetings *magazine as a man whose message supersedes his golden name, Robert F. Kennedy Jr. maintains a reputation as a resolute defender of the environment. His litany of successful legal actions includes: prosecuting governments and companies for polluting the Hudson River and Long Island sound; winning settlements for the Hudson Riverkeeper; arguing cases to expand citizen access to the shoreline; and suing sewage treatment plants to force compliance with the Clean Water Act. Mr Kennedy serves as chief prosecuting attorney for the Hudson Riverkeeper, senior attorney for the Natural Resources Defense Council, all while serving as the President of the Waterkeeper Alliance. He is also a clinical professor and supervising attorney at the Environmental Litigation Clinic at Pace University School of Law in New York. He has worked on environmental issues across the Americas and has assisted several indigenous tribes in Latin America and Canada in successfully negotiating treaties protecting traditional homelands. He is credited with leading the fight to protect New York City's water supply. The New York City watershed agreement, which he negotiated on behalf of environmentalists and New York City watershed consumers, is regarded as an international model in stakeholder consensus negotiations and sustainable development. The following are excerpts from the Keynote Address by Robert F. Kennedy Jr. at Convocation Hall, University of Toronto at the international symposion on "The Natural City," Toronto, 23-25 June, 2004, sponsored by the University of Toronto's Division of the Environment, Institute for Environmental Studies, and the World Society for Ekistics, and are reprinted with kind permission from* Idea&s: the Arts and Science Review, *of the University of Toronto, Autumn 2004, vol. 1, no. 1, pp. 10-12.*

Fig. 3: Robert F. Kennedy Jr. (*Source:* Rebecca Pinkus).

• I remember a time when my father was campaigning for president – when Oakland was burning, when Watts was burning – intellects across the country were saying it was the end of the era of cities. Cities were no longer viable places in our country. They were places people were fleeing from. They were going bankrupt.

• Asthma rates have doubled over the last five years. Fifty percent of asthma attacks are prompted by ozone and particulates, two components of air pollution. Over 50 percent of those components on the eastern seacoast of America are coming from a tiny handful of coal-burning power plants, most of them in the Ohio Valley, which are burning coal illegally. The Clinton administration was prosecuting 75 of the worst companies for failing to upgrade and for lying to the federal government. This is the industry that gave $48 million to the Bush campaign during the election, and has given $58 million since. And one of the first things the Bush administration did when it came to power was to order the justice department to drop all of those lawsuits and it rewrote *The Clean Air Act.*

• I live three-and-a-half hours from the Adirondack Mountains, the oldest [declared] wilderness area on the planet. We had a right to believe that generations of Americans would be able to enjoy its pristine lakes and forests. One-fifth of the lakes are sterilized – no life – because of acid rain, which has also destroyed the forest cover on the high peaks of the Appalachians from Georgia all the way up into Canada. That acid rain is coming from those same coal-burning power plants, and the Bush administration has put the brakes on statutory requirements that they clean it up.

• This is the battle we're fighting. Environmental advocacy is not about protecting fishes and birds for their own sake. It is about recognizing that nature is the infrastructure of our communities and that if we want to meet our obligation as a nation, as a civilization, as a generation, which is to create communities for our children that provide them with the same opportunities for dignity, for enrichment as the communities our parents gave us, we've got to start by protecting our environmental infrastructure.

• We have the Hudson River, one of the oldest commercial fisheries in North America. Many of the people I represent come from families who have been fishing the river since Dutch colonial times, using the traditional gear fishery, the small boats, the ash poles and gill nets – the same methods that were taught by the Algonquin to the original Dutch settlers of New Amsterdam and passed on down through the generations. One of the enclaves is a village called Croton, 30 miles north of New York City. The residents are not the prototypical environmentalists. They are factory workers, carpenters, electricians, lathers; half the people make their living crabbing or fishing. For them the environment was their back yard: the bathing beaches and the swimming and fishing holes of the Hudson.

In 1966, Penn Central Railroad began vomiting oil from a four-and-a-half foot pipe in the Croton rail yard. It blackened the beaches, poisoned the fish. Three hundred people got together that night at the legion hall. These are people whose patriotism is rooted in the bedrock of our country. That night they started talking about violence because they saw that something they thought they owned, that their parents had been exploiting for generations – the purity of the Hudson waters – was being robbed from them by large corporate entities and the government agencies that were supposed to protect them. Bob Boyle – the outdoor editor for *Sports Illustrated* who was a marine and Korean vet, a great fly fisherman – stood up. He had come across an ancient navigational statute called the *1888 Rivers and Harbors Act* that declared it illegal to pollute any waterway in the US. There was a bounty provision that stated anyone who turned in a polluter got to keep half the fine that was to be paid. The law had never been enforced, but it was still on the books. He stood up and said we shouldn't be talking about breaking the law; we should be talking about enforcing the law. They resolved to start a group that later became the Hudson Riverkeeper. Eighteen months later they collected the first bounty under this statute. They shut down the Penn Central pipe for good. In 1973 they collected the highest penalty in US history against a corporate polluter, and used the money to construct a boat, the Riverkeeper, and in 1983 to hire a riverkeeper, John Cronin. He hired me a year later as prosecuting attorney with bounty money.

We have brought hundreds of lawsuits against Hudson polluters and forced them to spend billions of dollars remediating the Hudson.

• Today the Hudson River is an international model for ecosystem protection. In 1966, it was dead water for 20 mile stretches north of New York City, south of Albany. It turned color; it caught fire. Today it is the richest body of water in the North Atlantic. It produces more pounds of fresh fish per acre, more biomass per gallon than any waterway in the Atlantic north of the equator. It has strong spawning stocks of all its historical migratory species. It is a Noah's ark, a species warehouse. The miraculous resurrection of the river has inspired riverkeepers across North America, among them the Lake Ontario Keeper.

• They say we have to choose between environmental protection and economic prosperity. This is a false choice. In 100 percent of situations, good environmental policy is identical to good economic policy, if we measure economy based on how it produces jobs, the dignity of jobs over the generations and how it preserves the value of the assets of our community. But if we treat the planet, as they say we should in Capitol Hill and in Ottawa, as if it were a business in liquidation... in order to enjoy a few years of pollution-based prosperity, we could generate an instantaneous cash flow and the illusion of a prosperous economy, but our children are going to pay for our joyride. They are going to pay for it with denuded landscapes and huge health and cleanup costs that will amplify over time and that they'll never pay. Environmental injury is deficit spending; it is a way of loading the costs of our generation's prosperity onto the backs of our children, and if you don't believe that, look at the nations who didn't invest in their environment like we did in the 1970s. All our environmental investments began on Earth Day 1970.

• In 1970, that accumulation of insults drove 20 million Americans into the street – the largest public demonstration in American history – demanding that our political leaders return the ancient environmental rights that had been stolen from our citizens over the previous 80 years. And the political system responded. Democrats, republicans got together and passed over the next 10 years 28 major environmental laws to protect our air, water, endangered species, wetlands, food. And those laws became the model for 120 nations around the world who had their own versions of Earth Day, and they began making their own investments in their environmental infrastructure.

But there are a lot of nations who do not and invariably those were the nations which did not have strong democracies. Because democracy and the environment are intertwined. You cannot get sustained environmental protection under any system except locally based democracy. And the main reason for that is the fishes and birds and future generations do not participate in the political process. Their interests are not represented. The future whispers, the present shouts. The constituencies today are the ones getting fed. Politicians have short horizons as do industrial officials. The easiest thing is to liquidate the trust assets that belong to the next generation. The environment is always on the auction block.

• Environmentalists are injecting the long view, the trustee obligation, into the political process.

• If you look around the world there is a direct correlation between the level of environmental injury and level of tyranny of their governments, regardless of whether they're right-wing tyrannies, like Brazil during the 1970s and Saddam Hussein's Iraq in the 1980s and 1990s, or left-wing tyrannies in Eastern Europe and China and Russia who are facing economic catastrophes because of their failures to invest in their environmental infrastructure. They did not have NEPA [*National Environmental Policy Act* – Ed.], which the Bush administration is now eviscerating.

• There is no stronger advocate for free market capitalism than myself. In a true free market you get efficiencies, you eliminate waste -- and that is pollution. ... You show me a polluter, I will show you a subsidy. I will show you a fat cat who escaped the discipline of the free market by forcing the public to pay for his production costs. In every instance of pollution it is the same thing.

Environmental advocates do law enforcement. We go out into the marketplace and catch the cheaters, force them to internalize the costs like they internalize the profits.

• Teddy Roosevelt said that America would never be destroyed by a foreign enemy. We are too powerful. But our democracy would be subverted by malefactors of great wealth who erode our institutions. And from the beginning of time, our greatest political leaders have warned our people about domination by large corporations. At the height of the Civil War, in 1863, Abe Lincoln said, "I have the South in front of me and the corporations behind me, and for my country I fear the corporations more."

• From the beginning of our colonial period, our great cultural and spiritual and literary leaders have been telling our people, "You don't have to be embarrassed because you don't have the 1,500 years of culture that they have in Europe, because you have this relationship to the land, and particularly to wilderness, which is the undiluted work of the Creator, and that will be the source of your values, your virtues, your characters, throughout time." ...Nature is the defining element of our culture. That is why we preserve it.

● I am fighting for the Hudson River because I believe my life will be richer and the lives of my children and my community will be richer if we live in a world where there are shad and sturgeon and striped bass. And where my children and I can watch the fishers out in the tiny boats using the same methods they were taught by the Indians, and my children can touch them when they come to shore as they wait out the tides and repair their nets, and in doing so connect themselves to 350 years of New York State history and understand that they are part of something larger than themselves. They are part of a continuum. They are part of a community.

● When we destroy our relationship with nature it is a moral issue. It is like tearing the last pages out of the Bible, the Torah, the Talmud, the Upanishads, the Koran. It is a cost I do not think we ought to invoke, or that it is prudent to impose upon ourselves or our children. That is what environmental advocacy is about. It is about recognizing that we have an obligation to the next generation and that obligation is expressed by the term "sustainability." And all that word means is that God wants us to use the things that we have been given, the bounties of the earth, to enrich ourselves, to improve the quality of our life, to serve others – and we cannot use them up. We cannot sell the farm piece by piece in order to pay for the groceries. We cannot drain the pond to catch the fish. We cannot cut off the tops of mountains to get at the coal. We cannot cut off our waterfront to make the highway go faster. We can live off the interest; we cannot go into the principal. That belongs to our children. ... All our environmental laws that we are fighting to protect have just restated the ancient law that protects the public trust assets.

● We force our way [into the courtrooms and back hallways of Capitol Hill], and we say we are emissaries for the future. And we demand an accounting. We want to know what you are doing with things that do not belong to you, the things that belong to our children.

I will close with a proverb from the Lakota people that says, "We didn't inherit this planet from our ancestors. We borrow it from our children." I would add, if we do not return to them something which is roughly the equivalent of what we receive, they will have the right to ask us some really tough questions.

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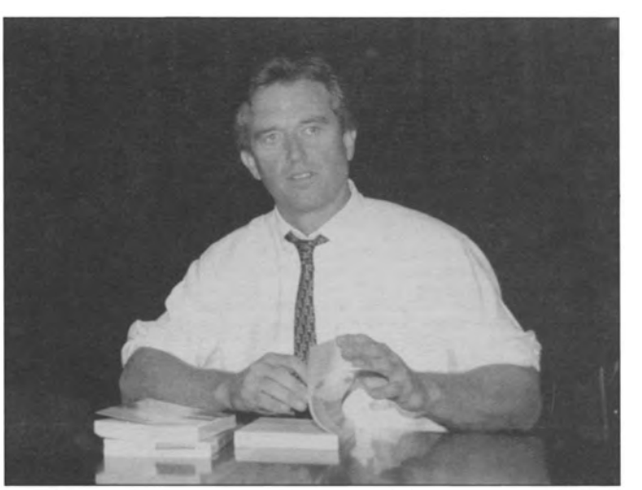

Figs. 4, 5 and 6: Participants at the dinner held at Hart House Great Hall, University of Toronto, prior to the lecture by Robert F. Kannedy Jr.

Fig. 7: Robert F. Kennedy Jr. in Convocation Hall after his lecture, signing his book entitled The Riverkeepers, co-authored with John Cronin and published by Simon and Schuster in 1997

The 2004 C.A. Doxiadis Lecture

Fig. 1: The Hon. David Crombie.

Guest Speaker, Hon. David Crombie

The decision for the organization annually of a C.A. Doxiadis Lecture to honor the memory of the founder of Ekistics, was taken at the WSE meetings in _el_kovice, Czech Republic, in 2000. The series is meant to invite distinguished experts in any professional field which may be considered as directly or indirectly contributing to ekistics, to expose their ideas on any theme of their preference. Reference to C.A. Doxiadis or ekistics is not required, although any such reference is not excluded.

The program for this year's lecture scheduled to take place at 19.30 hrs on 24 June was as follows:

Chairman : Alexander B. Leman
Introduction : Ingrid Leman Stefanovic
Lecturer : Hon. David Crombie
Theme : "Avoiding the 'dark age ahead' "*

The lecture was delivered in the Medical Sciences Auditorium and was followed by a lively discussion.

*An edited version of Mr Crombie's presentation is produced on the opposite page entitled "Cities are successful because they are civic."

The WSE President, Alexander B. Leman, offered the speaker the four books by C.A. Doxiadis which were presented in 1976, one year after his death, by the then President of WSE, Professor R. Buckminster Fuller, at the Assembly of the United Nations Conference on Human Settlements – Habitat I in Vancouver.

Fig. 2: Alexander B. Leman, President of the WSE and Chair of this meeting, invites Dr Ingrid Leman Stefanovic, Chair of the Symposion on The Natural City, to introduce the speaker.

Cities are successful because they are civic

The 2004 C.A. Doxiadis Lecture

Guest speaker: Hon. David Crombie

The author is President and Chief Executive Officer of the Canadian Urban Institute. A former Mayor of Toronto and Member of Parliament, he is the Founding Chair of the Waterfront Regeneration Trust, Chair of the Toronto Heritage & Culture Foundation, First Chancellor of Ryerson Polytechnic University and President of David Crombie & Associates Inc. In July 2006, he was named Chair of the Ontario Place Board of Directors.

The text that follows is a slightly edited version of the 2004 C.A. Doxiadis Lecture delivered on 24 June at the international symposion on "The Natural City," Toronto, 23-25 June, 2004, sponsored by the University of Toronto's Division of the Environment, Institute of Environmental Studies, and the World Society for Ekistics.

Foreword

Good evening ladies and gentlemen.

I will do my best to honor the name of Constantinos Doxiadis and his views of human settlements. I was not sure what I should be talking about, because I was not certain what Professor Doxiadis would have wanted. And also it seemed to me that to try and figure out what Doxiadis was talking about and then try to explain it all to you was far more than my ability to do so. So what I thought I would try and do was talk a little bit about what I know or think I know and hope that matches the standard that Doxiadis would likely have had.

Introduction

I have been working on a review of a book and I was participating in some public discussion about a new book called *Dark Age Ahead* by Jane Jacobs. The title should lead you to think that it is not a cheery book. On the other hand, her opening sentence is: "this is both a gloomy and a hopeful book" (JACOBS, 2004, p. 1). There are very few people I know who could actually have a sentence like that because if it is gloomy it is not hopeful, but she thinks that these are not contradictions in terms.

I would commend it to you. Recently, I attended a gathering here at the Great Hall of the University of Toronto with about six people from around the world, economists in the main, to talk about her book, and they all have different views on what her book means. Like many of Jane Jacob's books, it is like a jewel: turn it to this light and something refracts this way; turn it that way and something else comes out of it.

If it is anything at all, it is for her, from her, an intense wake up call. In all of her books, in whatever she is talking about, there is usually something at the end that says: please get it right. She is now 88 years old and she despairs that some of her previous thoughts have not dawned on us as much as they should. So the book is very much about revisiting some of her concerns and about the future. It is about the erosion, in her view, of values and the moral decay in the important pillars of our culture.

The five pillars that she chooses include "leadership": she says that, in our culture, the leadership is increasingly self-deceiving, and drunk with hubris and pride. She talks about education as a pillar and worries about the subversion of education. She talks about families, and the inability of families to get the resources that they need to do something with the new generation. She talks about science, but mainly about its abuses. And finally her fifth pillar is about the professions, interestingly enough, which she says have lost the art of self-policing and, therefore, have begun to lose their moral authority.

This is probably the gloomy part. She does, however, have a fundamental message. And that is really what I want to talk about tonight. She says that, "what is really important is the cherishing and nurturing of our own cultural characteristics. The important habits of mind and heart are what are important. And here is the quote to remember: "Any culture that jettisons the values that have given it competence, adaptability and identity, becomes weak and hollow. A culture can avoid that hazard only by tenaciously retaining the underlying values responsible for the culture's nature and success" (JACOBS, 2004, p. 176).

As soon as I read it, I remembered where I read something almost exactly like it. Some of you may have read Robert Fulford's wonderful book called *The Accidental City*, and, in his introduction, he says this: "A successful city fulfills itself not by master plans but through attentiveness to the processes that have created it and an awareness of its possibilities. It achieves heightened identity by giving form to memory and providing new space for life" (FULFORD, 1995, p. 14).

And I heard these ideas in another place. I heard them from a man by the name of Robert Putnam who has written a number of books. I remember when he came out with his first book about six or seven years ago. I had happened to be invited down to Santa Fe, New Mexico, to participate in a dialogue with some Americans and Mexicans on what they regarded as the possible fruits of the North American Free Trade Agreement (NAFTA). And we were to talk about what we might find in common between the three countries. My job was, at the end of it, to come back and write about what they regarded as the secrets of Toronto – a city that they regarded as a success. So I returned to Canada, wrote out some ideas and sent them down to the University of California, to the editor of the book, and he sent it back, saying "no, that's not it."

Now, I was writing this without being paid. So I only did it twice more. And finally I phoned him and said "what's bothering you, because you're only getting one more shot." He said "You know some secrets about Toronto, and we want to find those. And here is a copy of a book that's just coming out." It was called *Making Democracy Work*. It was about regional government in

Italy. It was a book that was quite impressive, because when you got to the end of it, the author discovered the answers to the question he was looking for, but he got an answer he was not expecting. And that answer was what Jane Jacobs and my friend Bob Fulford were talking about. He asked that when you look at the 17 regional governments in Italy, what is it that makes some of them flourish and some of them not? Why are some successful and others not? He addresses all the categories that you might expect: wealth, education, etc. The one he clings to at the end of his book, what really is the crucial thing to make a regional government and therefore a city successful, in his judgment, is the understanding of its own civic culture, and being able to employ it and send it into battle as you deal with the changes that come at you. Cities are not civic, he said, because they are successful. They are successful, he says, because they are civic. And it is attention and attentiveness to its own civic culture that is important in terms of a city's own future.

So I thought that what I might do is spend my time tonight with you to talk about Toronto because it is the place I know best. From whatever cities you may know or frequent or understand; you may find similar characteristics there as well.

Toronto: Its civic culture

If I had to pick four basic organizing ideas that are important about the civic culture of Toronto, I would pick the following:

- the first one is the importance of the public realm to Toronto;
- the second one is the importance of place and community in Toronto;
- the third is the value of a marketplace and economic opportunity; and,
- the fourth, is our relationship with nature.

Public realm

Let me begin with the public realm. When Lieutenant Governor Simcoe dropped anchor in Toronto Bay in 1793,[1] he did not come for private adventure. He did not come because he was seeking some commercial advantage. He did not come because he was looking for religious sanctity, religious freedom. In a book published about 35 years ago, the Toronto historian Glazebrook said that "Toronto was "dropped by the hand of government into the virgin forest" (GLAZEBROOK, 1971, p. 3). From the beginning, we had government around us and about us. Simcoe's mission was, of course, to try and organize a colony that would defend the British Empire against the ravages of the American Revolution.

He established that colony using two basic tools. One was out of a colonial handbook – all the British Empire colonial rulers in those days had a handbook. In the handbook, it said that his job was to establish the peace, order and good government of the colony. Later on, we elevated that to constitutional status. His job was to establish the peace, order and good government of a new colony and to extend the application of a common law to everybody. Those two things gave us, in Toronto, our first civic code. It stressed three factors: the importance of order, inclusiveness, and the idea that government has a direct and clear responsibility to shape community.

From that beginning, Toronto evolved a public realm which has been extraordinary. Public education, municipal institutions, public health, libraries, parks, recreation facilities, roads, transit, public places and spaces, even quasi-public structures like bookstores, restaurants, hotels, theaters, halls – all have been regulated in the public interest. All of those things have become so much a part of our direct everyday existence that we take them for granted.

What are they, all of those things? What is that public realm? They are the connecting tissues of our civic culture. They are the things that link all of our private worlds and link generations to generations. That is how powerful and important they are to us. And because in each one of those: public education, libraries, spaces, public health, all of them, we stress both equity and inclusiveness, they became the basis for our social peace.

People talk about Toronto's ability to bring cultures and languages from all over the world and sustain a social peace. How does it get there? It is not a mystery. It comes from the hard work that is done in building and maintaining and enhancing the public realm of this place. That is what gives us the social peace. Because of inclusiveness and equity, it also has allowed us over many decades to develop what has been called the "power of diversity." We have been able to liberate the power of diversity through the building, maintaining, and utilizing of the public realm.

Now, it does not come free and one of the things that come from taking it for granted is that from time to time, we have to reinvest, we have to rebuild, we have to reinvent, we have to repair. And we are doing that again right now, because we took it for granted. We forgot we had to reinvest. Schools are crumbling, roads are crumbling, libraries need fixing. If we do not bother investing in public transit, for example, then slowly we will not have it or people will not want to use it.

So we find ourselves today having to look at our public realm upon which we depend for both our economic prosperity and our social peace; we actually have to go back and reinvent it in the 21st century, and reinvest in it. That is why you will find that there is quite a debate these days about: how do we go about reinvesting in it, and rebuilding it? Should it be public or private? The great tradition in Toronto, of course, has been that we need both.

It is worth remembering that one of the values that we have depended on has been the ability to have both the private sector and the public sector, and the community, figure out, sort out, how much of which one we want at a particular time. There should be no ideology that says "no private," or "no public."

There is also a debate in connection with the rebuilding of our public realm that says that we need to have a "new deal" for cities, we need more from the federal government. But let's consider our constitution for a second. I know we don't like to talk about it, but the constitution has value. The constitution says that responsibility for cities and municipalities goes to the province. Every time we talk about "why can't the federal government fix it," we take the hook off the province. We need the province to have a continuing responsibility.

Let me stress the fundamental importance and power of the public realm that has been built in this city over two centuries, and our need to make sure that we are rebuilding it for the 21st century. We should not let ideology get in the way; we should look for the best ways to achieve success, apart from dogma.

Place and community

A second basic element with respect to the public realm is the idea of the importance of place and community. When David Miller ran for Mayor of Toronto, he discovered what every person who runs for mayor, whether they win or lose, recognizes: the importance to Torontonians of neighborhoods, because they are the most important expression of community and place. In 1972, when I ran for Mayor, I had a long list of important policies I thought people wanted to hear about. But mostly they wanted to know what I would do to maintain the health and safety and security of the neighborhoods that people lived in. And if you ask our current Mayor, David Miller, he will tell you he found out the same thing.

Why? Very important. It's because communities and places are what give people a sense of roots and a sense of identity. It is the place, these communities, these neighborhoods, where people answer the basic human cosmic questions that they have to ask their whole lives and find answers to: Who am I? How do

I behave? Where do I belong? Those are the fundamental questions, and they are best dealt with in small places and small spaces. The questions you ask yourself are not the same when you are 10 as when you are 30 and certainly not the same ones you do when you are 70. There are different answers to those questions as you get older. The quality of the public realm enhances your ability to answer those questions to your satisfaction. You will find out more who you are and how to behave and where you belong.

Those places and neighborhoods and communities also allow us to deal in a "Toronto way," with what I will call the "immigrant experience." Since aboriginal times, we have been an immigrant city, a city of waves and waves of immigrants. Not just after the Second World War, but long before. Torontonians have understood the immigrant experience probably better than most in the world, certainly as well as any.

I don't know whether you have read a book called *Gathering Place* by Bob Hamey. You can get it out of the pubic library, free. It is about Toronto, and how the city deals with the immigrant experience. The conventional wisdom is that most people who come into the city are simply in a holding tank, waiting to become Canadian, waiting to become Torontonian. Many see this as more of a static kind of process.

But anyone who has actually ever been an immigrant knows that it is a much more dynamic and interactive process, because all things are changing all the time. The immigrant who came from China, Belgium, or wherever, knows that three things are happening. The place they left is not the same one ten years later. So that the one that they left has already changed. The one they came to, this country, this city, it is changing too. And thirdly, they are changing. So trying to figure all of that out requires a public realm that gives people the tools to do that in a productive way.

All immigrants have a biographic map of the city. As soon as you get here, your biographic map is a very narrow one. Where do I sleep? Where do I get employment? What places do I avoid? Then, of course, as you are here awhile, you use your base camp, your neighborhood, where you have some safety, and you stretch out and your map changes as you change.

I can remember the first time that concept occurred to me; it had nothing to do with the city. It was a human thing, not a city thing necessarily. One of the jobs that I had in my life was a great job actually and one of the most interesting. I was the Minister of Indian and Northern Affairs of Canada. Since I knew nothing about the job, my wife Shirley and I got on the plane and traveled, lived with Aboriginal people for two and a half years, read everything I could, talked to as many people as I could, and learned an enormous amount. I have always been grateful because I got a perspective on this country that one would not ordinarily get. If you ever really want to understand more about the country, spend a little time with Aboriginal history, and philosophy and the people.

At any rate, one of the books I picked up at that time was a book called *Maps and Dreams,* written by a man by the name of Hugh Brody – he's an Englishman. He normally writes on the Arctic, but this book is about the Beaver people who live in North Central British Columbia. The Beaver people have been there for about 3,000 years. An interesting thing about the book (which you could also get at the library, it's a thin little book) is that on about every 15 pages, there are these squiggly lines. Brody explains on the pages between the squiggly lines what those lines mean. They are a rendition of the biographic maps of the Beaver people.

It tells them individually and collectively where the game can be found, where they might get rest, where water can be found, where the enemy might be. And it also tells them not only those things, but it builds in the dreams that they have about where they would like to be.

Of course, those biographical maps, both the actual physical maps and the dreams, change. They change with the seasons, they change with the times, they change with the forces that come upon them. Those biographic maps are exactly the same maps that immigrants bring to the city. So places and spaces, neighborhoods and communities, are the vehicles by which the public realm, all those things that we need for life, are found or where they ought to be found.

Marketplace and economic opportunity

The third out of the four basic organizing ideas for the future of a city is, of course, the marketplace. People come here for freedom, and economic opportunity. If they do not have economic opportunity or economic freedom, the ability to make things better for themselves and their families, they will not stay. Toronto has always been able to reorganize itself in order to maintain its ability to carry out a successful marketplace where people can make a living and make things better for themselves and their family, and move forward.

We are currently undergoing an historic reorganization, reinvention, a radical transformation of our economic base, of our ability to create wealth, of the way in which we make a living.

My father died in 1971. When he lived, if he was over at the Princess Gates, at the Exhibition site, and he turned his back to the lake and looked north, he would have seen a place of incredible industrial vitality.[2] It was farm machinery being produced for the world by Inglis, with 40,000 jobs approximately in that area, just north of the Exhibition. And today, all of that industrial activity is gone. Not a trace. You cannot even see the buildings anymore. Now that story can be told in many cities around North America and around the world. It happens on a daily basis, a monthly basis, a yearly basis – you do not notice the change. But we are undergoing a change in our economic life because of new technology, patterns of competition, patterns of trade, etc., that is transforming not only our economy, but everything else with it.

This is not new. We have been doing it throughout our history. We have had to reinvent the economy in order to have people want to stay and be able to contribute to the public realm. In 1853, there was the Toronto Waterfront that had a really beautiful area known as Walks and Parks. There was a walk where Torontonians on Sunday, in the afternoon because they went to church before that, would walk along the waterfront and be happy that they belonged to the British Empire.

And then, along came the railroads. And Torontonians were asked: would you like progress? Would you like industry? You like jobs? You want something for you and your family so you can move? "Yes," we said, "we're from Toronto. Of course, what do we need to do?" They said, "Well it really requires that we put this railroad down along the waterfront and then all the good things will come." And they did. Of course, we never saw the waterfront for the next six generations because the railways separated the city from the lake. But they transformed a colonial city of 1850 into an industrial powerhouse by the time we got into the new 20th century and beyond.

This transformation brought generations of Torontonians jobs, and opportunity, and schools, and all the things that they needed for their families. And the place progressed. It happened again after the Second World War; we wanted to be part of the new consumer society that was being built. So we broke out of the old perimeter into the new suburbs, created a metropolitan form of government. That metropolitan form of government allowed us to have a private and public investment, the likes of which we had never seen. We created a metropolitan city.

Again in the late1960s and 1970s, a new generation said that the economy is changing, and our attitudes toward the cities need to change. We asked new questions: How do we achieve a bal-

anced growth? How do we green the city? How do we make people live downtown? Torontonians of that generation went at it, actively transforming the city. We are now going through exactly the same thing. We will do whatever we can do, whatever is necessary to do, to maintain the freedom and opportunity of the marketplace in Toronto because that is the vehicle by which the people are able to get those things that they need for themselves and their families.

Relationship with nature

The fourth and final organizing principle is our relationship with nature. We have always understood that nature is crucial to our existence, to our economy, to our social being, even to our imaginations. In the 18th, 19th and early 20th centuries, that meant that we had to control it; we had to beat it back; we had to burn it, bury it, bag it. We had to do whatever was required because nature was so abundant that our job was to clear it out, and make sure that we could create what was called "civilization" in that change.

That began to change, of course, as we moved into the middle part of the 20th century, and certainly as we moved into the latter part of the 20th century. This moming, I was at a meeting organized by the Canadian Urban Institute looking at the Greenbelt. The new provincial government is organizing a public discussion to develop a greenbelt around not just Toronto, not just the Greater Toronto Area, but around the whole of the Golden Horseshoe, which is about two thirds the population of this province.

It is going to be a "growth management tool," as they call it. It is going to be a tool for planning and investment. It is going to determine agricultural policy, urban policy, and some economic policies. It is a powerful, extraordinary thing. What was striking to me is that everybody who was there this morning talked about it as if the idea were mainstream, that is was not unusual. It is interesting because many people there had either forgotten or did not know that as we move into the 21st century trying to implement this greenbelt, we are standing on the shoulders of a heritage and a tradition that is quite powerful.

We are standing on the shoulders of the people in the 1980s and early 1990s who said "what about the ecosystem approach to the building of cities?" I can remember us talking about the ecosystem approach like a mantra. Everything is connected to everything else. Human beings are part of nature; we are not separate from it. Therefore it follows that you cannot and ought not move in, use up, throw away, and move on. That became a way in which people began to look at how we go about cities 15 years ago. Michael Hough's book *Out of Place*, and *Cities and Natural Process* were way ahead of their time. Wonderful books, and he himself worked on the rehabilitation of the Don River.

There were people who began, not just to write and think, but to do. And there were organizations like "Save the Oak Ridges Moraine."[3] Most people did not even know where it was, let alone that it ought to be saved. I used to go around with a map. People would say, "where is the Oak Ridges Moraine?" They said "when you're going up to the cottage, it's the bump you go over, right?" Then we would try to explain what its function was. There began as well at the same time "Save the Don," "Save the Humber," "Save the Rouge,"[4] save anything that moved! People were getting on to the idea that nature had to be something we worked with, and that we could no longer survive by controlling it – we had to work with it in order to deal with it.

Even the people in the 1980s knew that they were standing on the shoulders of the people in the 1960s and 1970s. I remember like a light in 1961 when Jane Jacobs' book came out. It came along with another book, do you remember? It was Rachel Carson's book, *Silent Spring*. And it was followed quickly by William H. Whyte's *The Last Landscape* and later on Anne Spirn's the *Granite Garden,* and so on.

There was action. Pollution Probe began in 1969. Even those people were standing on the shoulders of the people in the 1930s, almost all forgotten now. Bill McLean, who was for many years the head of the Toronto Conservation Authority, has a new book on the history of the Toronto Area Conservation Authority, and so you do not have to read a lot of other histories, you can read this to get a sense of the changes in the Toronto region.

The Conservation movement of the 1930s had an idea that they could build conservation areas that would not only bring employment to people, because they worried about that in the 1930s, but it would make an enormous contribution to the planning of areas. So, as a central part of the Planning and Development Act of 1946, they brought in the idea of "Conservation Authorities." What was important about them? What was interesting about them? They were to be funded by the province in the main, appointed by the municipalities, and they were to plan on a watershed basis. We are talking 1930s and early 1940s – revolutionary literature here.

These people themselves stood on the shoulders of the Naturalist movement of the late 19th and early 20th centuries. That is the generation that brought in the provincial and national parks that we now enjoy. When I was a kid going to a very old fashioned public school, we had to read our Archibald Lampman,[5] our Bliss Carman, *Joys of the Road,*[6] we had to become acquainted with the artworks developed by the renowned Canadian wilderness artists, the "Group of Seven". All that literature and art was a reflection of the Naturalist movement of the early part of the last century. The movement had an enormous impact on our behavior, our attitudes and even our psyches to this day.

In 1914, Canadians had to explain to people that they were not Americans and they were not British. When Prime Minister Lester Pearson was looking for a symbol for a new Canadian flag in 1967, he chose the maple leaf. Now think about it. If you go down to the United Nations and look at all the flags, they are all about either the history or philosophy of the country that they represent. Our symbol is a leaf. The power of nature – not only in our physical existence but in our imaginations – is absolutely a strong, strong part of the values and heritage of this place. And the image still informs us to this day.

Finally, on the role of nature, do not ever underestimate its power because it has already, in a very short space of time, changed government policies, corporate strategies, personal and community behavior. And it doesn't take a theologian to say that the more you understand and think about the role of nature in your life, the closer you are to considering more ultimate questions – it has an enormous spiritual value to it.

Conclusion

To sum up I would say that you move your challenges forward and succeed by understanding who you are and the culture that you are from. It does not mean you do not take ideas from everywhere, but you have got to understand who you are and, therefore, you can understand other people's thoughts better.

Let me conclude with some remarks about Jane Jacobs, which is where I began. I was asked, about two years ago, to go to Washington because Jane Jacobs was being honored, which was an unusual event because by someone's count, she has refused to accept honorary degrees from somewhere in the order of 42 universities, or some large number. In fact, the man who was chairing the Washington event was from Yale, and he had found out that she had refused an honorary degree from Harvard and referred to her for the rest of the evening as the "Harvard refusenik!"

At any rate, they asked me if I would explain what was the value of Jane Jacobs to the Toronto that I understood. I said that I had first met her in 1969. The Toronto that we were involved with

in those days was watching with alarm at what was happening to fine old American cities. There were race riots at the core; they were being ploughed over by expressways and urban renewal schemes, both of them funded by the federal government. We younger folks at that time felt that we had to find another way to build the city in our time. That was when we began to look at the history of this place, Toronto, and try and understand some of the things I mentioned tonight.

When Jane Jacobs came along, she legitimized our own sense of the ideas that mattered to us. She said that it is the ideas that matter to you drawn from your own culture that are really important. That is the very first thing that Jane Jacob gave us. Secondly, she was not just a thinker, she was a doer. She went out of her way to be actively involved in stopping the development of the Spadina expressway that many felt would destroy old urban neighborhoods and to stop the destruction of the old City Hall. She participated in all of those movements and more. She was an activist, just as much as she loved ideas.

But finally and most important, she was also an ethicist. For her, city building was about doing the right thing. City building is spiritual work. City building is not just about bricks and mortar and streets and parks. It is about building the human spirit. That is why it is worth reading her book. That is why, as all of you people who are going to be here longer than I am going to be here, you have an opportunity to move the city forward in the 21st century and you will really do a good job if you understand all of the values and the processes that made it work up to now. History may be boring but it's sure worth it. Thanks very much.

Notes

1. John Graves Simcoe was the Province of Ontario's first Lieutenant-Governor, and Toronto is Ontario's capital city. Simcoe had a profound effect on the shaping of Ontario. For more information, visit http://www.heritagefdn.on.ca/userfiles/HTML/nts_1_2724_1.html (Accessed on September 1, 2006).
2. The Canadian National Exhibition (CNE) was founded in 1879 on a community need to encourage the development of agriculture, manufacturing, industry, commerce and the arts. Over the past 128 years the CNE has grown to be the largest annual fair in Canada and the fifth largest in North American with an average attendance of 1.3 million visitors annually. Exhibition Place houses the fair, and its historic, beautiful entryway is referred to as the "Princess Gates." http://www.theex.com/site.php?menu=06:01 (Accessed on September 1, 2006).
3. The Oak Ridges Moraine is a landform unique to southern Ontario. One of Ontario's largest moraines, the Oak Ridges Moraine extends 160 kilometers from the Niagara Escarpment in the west to the Trent River system in the east, and is on average 13 kilometers wide. One-hundred-and-fifty meters deep, the moraine stands out as a distinct landscape and is the "rain barrel of southern Ontario." Save the Oak Ridges Moraine (STORM) is a movement focused on protecting the ecological integrity of the Oak Ridges Moraine. Since 1989, STORM has been working at the local and regional levels to ensure that municipalities make good planning decisions that respect the environmental significance of the moraine and that take into account its ecological and hydrological functions. http://www.stormcoalition.org/ (Accessed on September 1, 2006).
4. The Don, the Humber and the Rouge are three rivers in the Greater Toronto Area that were the focus of grassroots restoration efforts.
5. Archibald Lampman (1861-1899) was a member of the so-called "Confederation" group of poets, and his reputation as the finest of Canada's late 19th-century English poets stands to this day. He was a master of the sonnet, and his nature poems abound in vivid pictures of the Canadian landscape. http://www.collectionscanada.ca/canvers/t16-202-e.html (Accessed on September 1, 2006).
6. Bliss Carman (1861-1929) was born in Fredericton, New Brunswick. After attending universities in Canada, the USA and Scotland, he became the literary editor of the New York Independent introducing Canadian poetry to its readers. His works include *Joys of the Road* and *The Kinship of Nature*. Like Lampman, he was a member of the "Confederation" group of poets. http://collections.ic.gc.ca/confederation/poets.html (Accessed on September 1, 2006).

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Evolving cities into a sustaining and sustainable habitat

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Creating a new habitat for humanity

Cities have become the habitat of a rapidly growing majority of humanity. Since cities can neither create nor destroy the matter and energy required for their maintenance and evolution and for the lives of their inhabitants, an ever more important reciprocal interaction with the biosphere has been created. Between cities and their inhabitants, we encounter another reciprocal interaction: as people change cities, cities simultaneously change people. The latter interaction stems from the influence cities have on human activities, human lives and the societies of which they are a part. Insofar as this urban habitat permeates human experiences, this influence can reach the organization of the brain-mind through synaptic and neural changes (VANDERBURG, 2005). Since cities help to constitute a new habitat for humanity, the historical record implies that these changes could be decisive.

Humanity has lived in two previous habitats:

- During what is commonly called prehistory, it was the biosphere, when human beings lived in groups whose ways of life were mostly based on food-gathering and hunting.
- When societies began to be formed during the epoch generally referred to as history, they interposed themselves between the group and the biosphere, thereby making societies the primary habitat and the local ecosystems the secondary habitat.

These habitats were internalized through daily-life experiences and symbolized by means of cultures. As a result, they contributed to a diversity of human consciousness and cultures that were very different during history than their precursors in prehistory. All this is well known and widely accepted.

What is not well recognized is that with industrialization and urbanization, people began to change their habitat once again. To put it in another way: as people changed their technology, their technology simultaneously changed people (VANDERBURG, 2005).

Today, it is not only cities that interpose themselves between portions of many societies and the biosphere, but also the many technologies on which contemporary ways of life depend. For example, telephones, fax machines, the Internet, and the mass media interpose themselves between people, between people and groups, and between people, groups and societies. Such technological mediations are not neutral, since they filter out certain things and not others, as is obvious in a telephone conversation, where eye etiquette and body language are not transmitted. The high density of these technologies, together with the rapidly-growing cities constitute a new habitat that mediates between people and their previous habitats. It is reasonable to expect that the accompanying changes in human consciousness and cultures may well be as great as those that accompanied the transition from human beings living in groups to their living in societies. There is considerable evidence to suggest that this is the case since industrialization created first *homo economicus*, and later, *homo informaticus*. Similarly, traditional cultures have been transformed into those of a mass society, to take on entirely different characteristics (VANDERBURG, 2005). In sum, as we re-engineer our habitat, we simultaneously recreate ourselves and our cultures.

The "cities changing people" component of our interactions with our new habitat has significant negative aspects. Although cities bring people into closer geographical proximity, these aspects make it more difficult for people to live together. I will briefly refer to four of these aspects.

- First, in bringing together people from different cultures, a process of cultural desymbolization and relativization sets in. During the early days of western civilization, Socrates and Plato sought to combat this effect on Greek culture by discovering the underlying rules – a project that in our time has been taken up by artificial intelligence. Weakening the culture of a community undermines its common unity and, hence, its survival.
- Second, contemporary cities contribute significantly to the effect crowds have on individuals, and hence to what is commonly referred to as a mass society.
- Third, conventional city planning separates people into socio-economic groups housed in different neighborhoods. It also separates the places where people work, shop, relax and live. This spatial separation contributes to a situation in which all these activities are carried out with different groups of people, in effect segmenting individual lives and thereby greatly weakening the social image people have of themselves and others, further contributing to the mass society.
- Finally, cities expose people to a variety of stressors such as sensory or social overload, crowding, noise, pollution and tall

buildings. Such stressors make it more difficult for human beings to carry out a variety of activities, including making and sustaining meaningful social contacts (VANDERBURG, 2000).

It would appear, therefore, that the effects cities have on human life and society will have a significant negative component. As is now widely recognized, contemporary civilization has not done a very good job in creating a habitat that socially sustains individual and collective human life. In sum, humanity may well be facing a social crisis as profound as the environmental crisis. The biosphere cannot sustain contemporary ways of life, including their dependence on the urban habitat. We should also recognize that unless we succeed in making our cities a great deal more livable, that is, capable of sustaining individual and collective human life, we may well be plunging ourselves into an equally profound social crisis.

The economic soundness, social viability and environmental sustainability of contemporary ways of life, as well as the possibility of justice, peace and security, will substantially depend on our ability to evolve our urban habitat in ways that will make it progressively easier for the biosphere to sustain its reciprocal relations with humanity, and for this habitat to sustain individual and collective human life. At least to Westem thought, the importance of the city for this leg of the human journey ought to come as no surprise, given its fundamental role in Jewish and Christian thought (ELLUL, 1970).

The present paper argues that a substantial change in the direction in which we evolve cities is virtually impossible if we maintain the current intellectual and professional division of labor between groups of specialists, such as civil engineers (involved in infrastructure, structures, building materials, water and sewage treatment, and transportation), architects, urban planners, urban managers, social service administrators and politicians. The bodies of knowledge built up by these groups of specialists jointly constitute the knowledge infrastructure that supports the countless decisions that evolve contemporary cities The weaknesses of such an infrastructure with respect to achieving livable and sustainable cities must be carefully examined.

The knowledge infrastructures of societies

The knowledge infrastructure of a society supports the decisions of countless specialists, which contribute to the evolution of its way of life. In the following paragraphs, I will briefly consider three characteristics of the knowledge infrastructures of contemporary societies (VANDERBURG, 2005).

- First, on the macro-level they institutionalize an end-of-pipe approach to dealing with the undesired effects that flow from any decision.
- Second, as I will show shortly, on the micro-level, they trap individual specialists in a triple abstraction. This has led to an ongoing decline in the ratio of desired to undesired effects flowing from their decisions.
- Third, on an intermediate level, they bar the road towards genuine solutions to many difficulties faced by contemporary societies because they lie outside of the domains of specialization of the practitioners who would normally deal with them.

As noted, the evolution of contemporary ways of life depends on the decisions of countless specialists. Most of the consequences of these decisions fall beyond their domains of expertise where they cannot "see" them. As a result, the undesired or extraneous issues must be dealt with by other specialists in whose domains they fall. Consequently, the "system" institutionalizes an end-of-pipe approach to undesired effects. Instead of getting to the root of any problem, the "system" adds technologies or services. There is a great deal of evidence to suggest that the system now produces undesired results at a greater rate than desired results. The costs incurred in the production of wealth are growing more rapidly than the increases in gross wealth production; and a number of economists have calculated that, as a result, net wealth has been declining for decades (DALY and COBB, 1989). Similarly, we are now producing pollutants (products that we produce but cannot sell) at a far greater rate than desired goods and services. A study from the American Academy of Engineering estimates that, of what we extract from the biosphere, 93 percent is turned into undesired products (pollutants) and only 7 percent into goods and services (ALLENBY and RICHARDS, 1994). Our materials and production systems may well turn out to be among the most uneconomic and environmentally destructive ones ever created by humanity. Some time ago, Blue Cross was the largest supplier to the largest corporation in the world. Apparently, physically and mentally ill workers were the company's most valuable undesired output (KARASEK and THEORELL, 1990). To deal with these and other health problems, we have expanded our "disease care" system. Rapidly growing health care budgets would suggest that the rate at which contemporary ways of life produce illnesses outstrips their ability to deal with them. It is easy to multiply these kinds of examples, but the deep structural crisis is obvious. We have created a "system" whose "signal-to-noise" ratio of desired to undesired effects is steadily declining as a result of our increasingly global knowledge infrastructure.

This knowledge infrastructure traps specialists in a triple abstraction that makes them almost impotent to do anything about the present situation.

- In separating a domain of expertise from the remainder of the world, the latter is represented in any specialty by the desired outputs it hopes to contribute to that world and the requisite inputs received from that world to produce these outputs.
- In a second abstraction, only those aspects of the process that convert requisite inputs into desired outputs that are coterminous with a specialist's domain of expertise are retained.
- A third abstraction flows from the way a domain of specialization seeks to make improvements. It begins by creating a model of the process that converts requisite inputs into desired outputs, followed by varying its form and correlating such variations to performance in order to select the "best" one.

Since no specialist has the knowledge of which form is best for human life, society and the biosphere, the "best" one is reduced to the one that obtains the highest desired outputs from the requisite inputs, as measured by output/input ratios including efficiency, productivity, profitability, cost-benefit comparisons and GDP (obtained from a society interacting with the biosphere). As a result, a specialist has no idea of whether any gains in desired outputs are realized in part or in whole at the expense of human life, society and the biosphere. There is, therefore, a significant tendency for such decisions to obtain the desired results but at the same time to undermine the integrality and context compatibility of what has been "improved." As a civilization, we succeed brilliantly in the domain of improving performance, and fail equally spectacularly to prevent performance from undermining human life, society and the biosphere.

The third characteristic of the knowledge infrastructures of contemporary societies follows directly from the second. What if a genuine solution to a particular set of difficulties cannot be achieved by optimizing one or more aspects of the process of obtaining the desired results from requisite inputs? In such cases, practitioners may be unable to arrive at genuine solutions, trapped as they are in the triple abstraction. For example, is it reasonable to expect that the solution to the traffic congestion of modern cities lies in optimizing the present transportation system? It may well be that the real solution lies in reducing the need for mobility. In that case, the urban form would have to be rethought; and this is clearly well beyond the traditional domain of traffic engineering. Similarly, it is highly unlikely that, in the

long term, the energy crisis can be dealt with by improving the efficiency of power generation and distribution and building more power stations. The exponential growth in energy demands will have to be reshaped; and this is clearly beyond the domain of power engineering. Hence, the present intellectual and professional division of labor and the knowledge infrastructure built on it together prevent genuine solutions from emerging when these represent a non-cumulative development.

These three characteristics of contemporary knowledge infrastructures give rise to the technical approach to life, which represents a shift from asking: How can this or that improve human life? to: How can this be made to yield its greatest power by converting requisite inputs into desired outputs? To sum up: the technical approach to life begins by abstracting whatever is to be made "better" and representing the remainder of the world only in terms of the inputs it must provide and the desired outputs it will receive. Next, whatever has been abstracted in this way is studied by further abstracting those features that are directly relevant to the goal of transforming the inputs into outputs, as well as being coterminous with the expert's domain of competence. These aspects are included in some kind of model, while the remaining features are excluded from it. The model is then manipulated to determine which of its forms functions best in terms of contextless output-input ratios. The previously excluded contexts continue to be left out of the picture. Finally, the results are used as the basis for reorganizing the portion of reality originally abstracted. It is a strategy for reorganizing human life and the world, piece by piece, with minimal consideration being given to the context in which they occur.

What a technical specialist does when he or she examines a portion of reality in order to make it "better" is to behave as if the world is unmanageably complex. Instead, whatever is to be made "better" is placed in the simpler and more manageable intellectual context of a technical specialty, supplemented by the limited physical context of a laboratory experiment designed to examine a few variables, preferably one at a time. Parceling out the task of knowing ourselves and the world in this way has turned out to be so manageable and efficient that technical knowledge has grown exponentially. However, it is not a growth of knowledge of things in their real-world context but in a context delimited by the triple abstraction. Hence, the exponential growth of technical knowledge of things out of their usual context is accompanied by an exponential growth of ignorance of what things are like in their real-world context. The technical approach takes whatever is made "better" out of the fabric of human life, society and the biosphere in order to reorganize it, which creates a tension between what has been made "better" and this fabric. Improving performance as measured by output-input ratios is rarely compatible with the maintenance of its integrality and context compatibility, and hence with evolving the natural and human order (VANDERBURG, 2005).

The following case study illustrates how the technical approach makes it next to impossible to get to the root of any problem to arrive at a genuine solution. A group of experts examining a hunger problem in a Colombian valley, under the auspices of the United Nations, ran into the following problems (VANDERBURG, 2000 and 2005). The nutritionist made an inventory of all the foodstuffs grown in the valley in order to determine the most nutritious diet possible, supplemented it as required, and made the appropriate recommendations. The specialist in community health suggested that these recommendations would not solve the problem because the inhabitants of the valley suffered from intestinal parasites, resulting in diarrhea and their inability to absorb a nutritious diet. Instead, this specialist recommended that the water supply be improved, sewage treatment be started, and basic health care provided. The economist smiled politely, suggesting that the inhabitants did not have these things because they lacked the resources; and these could only be created by economic development based on cottage industries and some inhabitants working outside of the valley to send money to their families. The agronomist on the team recommended instead that the inhabitants be taught modern agricultural methods to enable them to grow enough food for themselves and to sell the surplus to generate income, thus enabling them to procure the above necessities of life. The political scientist firmly disagreed. All these things were not happening because the hungry people in the valley had no political voice, and this would not change until they were empowered by forming a political party.

I could go on with the diagnoses and recommendations of the sociologist, the demographer and an expert in systems. However, the point is obvious. Each expert "paints" a picture of the situation by putting those aspects that correspond to his or her specialty in the foreground and everything else in the background, thereby creating incommensurate diagnoses and recommendations. Each and every expert has the answer but really does not know what the question is. It is impossible to scientifically integrate the findings of different specialties to arrive at a comprehensive interpretation of the situation. We would encounter a similar confusion of technical tongues if we had asked specialists what it is that socially and environmentally ails our cities, and what we should do about it.

Knowledge infrastructures for cities

The implications for creating and evolving contemporary cities are obvious. If we continue to do architecture, urban planning, civil engineering, urban management and politics based on the present knowledge infrastructure, it is almost guaranteed that undesired effects will be created at a greater rate than the desired ones and that the urban crisis will continue. For this reason, conventional approaches need to be gradually supplanted by preventive ones. These make use of the knowledge we have of how the urban habitat affects human life, society and the biosphere in a negative feedback mode, to adjust design and decision making to accomplish the desired results but, at the same time, prevent or greatly minimize undesired effects. In this way, preventive approaches can overcome some of the limitations of our present knowledge infrastructure. Fortunately, this is not merely an idea. A conceptual framework for preventive approaches has been created (VANDERBURG, 2000), which was recognized by the Canada Foundation for Innovation as one of 25 recent leading Canadian innovations. This framework is able to integrate the many embryonic and piecemeal attempts reported in the literature, which have been documented in four annotated bibliographies (VANDERBURG et al., 2001, 2001a, 2001b, 2004).

Introducing a preventive orientation into a particular area of specialization

- begins with determining the typical undesired consequences that flow from the design and decision making of its practitioners;
- next, the areas of specialization in which these undesired consequences "land" are consulted to discover what they know about the effects these have on human life, society and the biosphere;
- finally, this knowledge is internalized into the original area of specialization to provide its practitioners with the capability of adjusting their design and decision making to achieve the desired results while simultaneously preventing or greatly minimizing undesired effects.

To create a knowledge infrastructure capable of guiding the evolution of the urban habitat toward livable and sustainable cities requires the introduction of a preventive orientation into each and every relevant area of specialization. This, in turn, will lead to beneficial, synergistic effects between these areas of specialization. Not the least of these is a gradual transformation of the

intellectual and professional division of labor, which builds the portion of the knowledge infrastructure of a society related to the urban habitat.

Fitting together the many available preventive approaches can best be accomplished by starting with what we know about how urban form affects the livability of cities. After all, there is no point in creating cities that can be metabolically sustained by the biosphere but that are not good places to live. From a sociological perspective, the principles set out many decades ago by Jane Jacobs (1961) are, to the best of my knowledge, still the most fruitful point of departure. These principles are based on extensive, overall assessments of whether a certain street or neighborhood "works" for people. Such judgments can only be made on the level of experience and culture (VANDERBURG, 2000 and 2005) and not within the boundaries of any discipline or professional specialty. Once made, these assessments can be analyzed by abstracting various aspects to examine how they contribute to the livability (or the lack of it) of the street or neighborhood. Livable and sustainable cities depend on livable neighborhoods which, in turn, depend on streets that are safe and feel comfortable. This depends on a constant flow of people using the street for a wide range of functions that remain active all day and much of the evening. These people help to maintain a kind of shared public order that supports those who intervene, when necessary. There is little doubt that the further evolution of mass society has made this much more difficult since Jane Jacobs formulated her original principles, but they remain generally applicable.

According to Jacobs, four principles can guide us toward more livable urban habitats.

- First, to ensure people's presence on the streets for most of the day and evening, it is essential not to separate places where people live, work, play and shop. City blocks should mix these functions through an appropriate diversity of buildings that each serve as many of these functions as possible. For example, on a main street, buildings might accommodate shops, restaurants and theatres on ground level, and offices and apartments on the higher floors.
- The second principle aims to bring such diversity within easy walking distance of as many people as possible by arranging buildings on short city blocks. This will reduce the demand for mobility. A better balance may thus be struck between building cities for people or for private automobiles.
- The third principle aims to ensure a variety of accommodations for different functions. For example, the buildings on a city block should be somewhat diverse in age and quality, with the result that a startup business can find something affordable and, if things work well, can move into a better and more expensive location later.
- The fourth principle aims at ensuring a reasonable density of dwellings per hectare to have enough people on the street engaged in various functions for as long a time as possible during each day.

Intensifying cities through smart growth, traditional neighborhoods, pedestrian pockets or transit-oriented development must not be confused with slums, which occur when the density of people per room or per dwelling becomes too high.

It is immediately apparent that making the urban habitat more socially sustaining converges with making it more sustainable metabolically. This is confirmed by a growing body of evidence. For example, mixing functions should reduce the way urban form shapes the demand for mobility, both qualitatively and quantitatively. Trips could become shorter and could thus make walking and cycling possible and attractive. In turn, reducing dependence on the private automobile could substantially change the way urban form shapes the demand for energy, since transportation now consumes a very large portion of overall energy requirements. It may also positively change the way urban form shapes the demand for materials. For example, infrastructure requirements per functional unit (apartment, store, restaurant, etc.) are likely to be smaller. Alternative forms of transportation may also substantially reduce the throughput of materials in a community. Functional diversity creates a potential for more aesthetic and diverse streets and neighborhoods, moving away from the equivalent of monoculture in construction. In addition, these and other synergies may help to make cities more financially affordable by improving their "signal-to-noise" ratio of desired to undesired effects.

The above kinds of synergies may be further enhanced by preventive approaches in other domains. For example, the problem of municipal waste needs to be addressed by preventively restructuring our materials and production systems (VANDERBURG et al., 2001). Linear throughput patterns of materials in the network of flows of matter should be made circular as much as possible by businesses adding value to end-of-life products as an alternative engineering and business strategy to producing materials, components or entire products from virgin resources. Closing materials loops will require a decentralization of production and a reduced dependence on transportation, which will become significantly more expensive as fossil fuels run out. Converting markets for products to markets for the services these products render, as well as product take-back, design for environment, and industrial ecology are some of the preventive approaches capable of restructuring our materials and production systems, to the benefit of urban habitats (VANDERBURG, 2000). Such changes could make a substantial contribution to solving the increasingly difficult problems associated with the running out of, and having to create, new landfill sites.

We also know how to preventively restructure our **energy** systems. The engineering, operation and evolution of these systems have always focused on "production" and distribution, and have all but ignored energy end-use. The result has been systems that perform rather well in terms of production and distribution but are incredibly inefficient in their energy end-use. Furthermore, these systems were designed with little consideration of their human, social and environmental contexts, yielding a very poor "signal-to-noise" ratio of desired to undesired effects. We know how this imbalance can be redressed by integrated resource planning, distributed production and, most importantly, demand-side management. It is here that urban form can make an enormous contribution toward reshaping our energy systems. The lessons we have learned from designing energy systems to include energy end-use have not yet spread to the design of other urban systems related to water, sewage, natural gas and transportation. These systems must also be redesigned by integrating end-use. For example, buildings and what goes on inside and around them shape the demand-side of these systems and, hence, should be considered as system elements.

As noted, industrialization has produced spectacular improvements in labor productivity and an equally spectacular increase in workplace-related physical and mental illness (VANDERBURG et al., 2004). Healthy workplaces that are well integrated into the urban habitat to reduce stress from commuting and the need for mobility can make a substantial contribution to improving the social viability of urban communities (VANDERBURG, 2000). They can also contribute to reducing the rate at which the urban habitat "manufactures" disease, thereby reducing the need for end-of-pipe social and health services.

In order to realize the above kinds of synergies between preventive approaches, the intellectual and professional specialties that design, build and evolve the urban habitat must address the fact that this habitat is more than the sum of its constituent elements. A new nexus will have to be created between the university, the knowledge infrastructure and the city.

The previous nexus produced ways of designing and evolving the urban habitat by dealing with its constituent elements as

though they primarily contribute to one or two larger entities, which in turn contribute to still larger ones: neighborhoods, electricity and gas supply systems, water and sewage systems, transportation systems, communication and information systems, to mention only some of the more prominent ones. The city was regarded as a relatively loose aggregation of all such systems.

The creation of a more livable urban habitat requires that each constituent element becomes a local manifestation of that larger whole by providing as many of its functions as possible. For example, a building may be constructed from materials participating in an industrial ecology system, collect rainwater and reuse grey water, contribute positively to power generation through solar collectors and negatively by means of a passive solar shell, participate in urban agriculture by its roof-garden, provide "eyes on the street" for security, support a variety of neighborhood functions by means of shops, offices and dwellings, provide a sufficient population density to help make public transportation feasible, and aesthetically enhance the livability and appeal of the neighborhood. In sum, good design incorporates as many of the functions of the urban habitat as possible to each and every constituent element, so as to make the whole as economically affordable, socially viable and environmentally sustainable as possible. We must move from megacities that present a highly *unfolded* complexity to a genuine habitat with a highly *enfolded* complexity.

For a building to contribute a diversity of functions to an urban habitat, a blurring of the boundaries must occur between many areas of specialization. Once again, this may be accomplished by internalizing a knowledge of these diverse functions into every appropriate area of specialization. This task is greatly facilitated when every specialty begins to think about its contributions to particular urban forms. In other words, urban form thus becomes an over-arching concept capable of integrating the many decisions made by the practitioners of various areas of specialization.

To date, several urban forms have emerged that are moving in the direction of more livable and sustainable cities. They include: traditional neighborhood design, pedestrian pockets, transit-oriented design and smart growth. Each one embodies the principles set out by Jane Jacobs many years ago. Once areas of specialization begin to identify with these and other urban forms, they will have begun to re-interpret their mission: helping to make these urban forms as sustaining as possible of human and social activities, and as easily sustainable as possible by the biosphere. Such a development will move them away from concentrating on particular urban elements and aspects as if they were relatively independent and distinct "building blocks" of the urban habitat. Identifying these particular urban forms also links knowing and doing *separated* from experience and culture with knowing and doing *embedded* in experience and culture (which results from the way people experience these urban forms and the extent to which these urban forms satisfy their aspirations and values) (VANDERBURG, 2005). When this occurs, each area of specialization is no longer limited to optimizing whatever is contained within its triple abstraction. Each area of specialization now takes charge of particular aspects of these more livable and sustainable urban forms, and as such, contributes to a larger whole, which challenges the triple abstraction.

The use of urban form as an over-arching concept can thus fundamentally transform each and every area of specialization concerned with some of its elements or aspects. For example, the design of a water system for this habitat no longer needs to stop at the supply line to each building. The building itself can be incorporated into the water system as not only shaping the demand for water, but also as an active contributor by collecting water from its roof to be held in a tank from which toilets draw water for flushing; or alternatively, grey water may be used for this task. Roof water may also be used for the irrigation of gardens. There is a parallel here with what we learned from electricity systems. Integrating energy end-use into them opened up entirely new approaches for the design and evolution of these systems, such as integrated resource planning, energy end-use efficiency improvements, and demand-side management. These negatively produce electricity by saving it. In other words, the energy system no longer stops at the fuse-panel of a building. It now includes the building as an energy transducer. In the same way, water and sewage systems can be re-thought to better serve particular urban forms and integrate as many of their functions as possible. The result will be that each and every element of new urban forms will no longer be designed and evolved by separate areas of specialization. Instead, each area of specialization will attempt to enfold as many functions as possible of an urban form to make it more economically sound, socially viable and environmentally sustainable.

Toward a genuine habitat

The initiatives outlined in previous parts of this paper would lead to the urban habitat more closely resembling humanity's previous two habitats, nature and society, in the way that their elements relate to each other and to the whole. In Western thinking, as well as in scientific knowing and technical doing, the fact that everything appears to be related to everything else is depicted in mechanistic terms. The first generation of mechanistic world views was based on the clock and the second on the computer, but neither of these encompasses the kinds of relationships found in a social and natural habitat. In these living wholes, the whole is enfolded in each of the "parts," and the "parts" come into being within the whole by progressive differentiation. For example, each and every cell in our bodies and hence each tissue and organ has enfolded into it the blueprint of the whole in the form of the DNA. Similarly, by growing up in a particular society, the organization of the brain-mind progressively differentiates and expands as a result of symbolizing the experiences of our lives, to the point that this organization symbolically maps our lives as lived in a particular society and ecosystem. There is no separate society "out there." Others help to make up our society, as we help to make up theirs. We are both society and individual because something of our way of life and culture is enfolded into our brain-minds. In the same vein, there is no separate environment "out there," as was first depicted in the painting of the Mona Lisa. We help to make up the biosphere of all other life forms, as they do for us.

Although the urban habitat can never be a living whole, nevertheless its internal structure can be made to resemble more closely those of nature and society by the previously-suggested changes to the intellectual and professional division of labor and the knowledge infrastructure built up by it. The more each aspect and element of an urban habitat is a local manifestation of this whole, and the more their functions contribute to those of that whole, the more these aspects and elements enfold something of it. It may be expected that moving in the direction of structuring the urban habitat in this way will improve its economic soundness by virtue of the fact that as many aspects and elements as possible contribute to as many functions as possible. It may also be expected that this urban habitat will become more livable, for reasons discovered by Jane Jacobs. It will certainly reduce the ecological footprint of this urban habit, although it remains an open question whether an evolution based on the potential of preventive approaches and their synergistic effects can, over the decades, make cities fully sustainable. Nevertheless, reshaping the intellectual and professional division of labor and the knowledge infrastructure by means of which we evolve cities can make a substantial contribution to our common good.

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Urban sustainability and public awareness:
The role of the National Round Table on the Environment and the Economy in Canada

Edwin Charles Aquilina

The author, Co-Chair, Urban Sustainability Task Force of the National Round Table on the Environment and the Economy, and Special Advisor to the Mayor of the City of Ottawa, is a former senior public servant and international consultant with extensive experience in public administration, policy formulation and program management relating to economic and regional growth, infrastructure development, social development as well as urban planning and conservation. With degrees in International Affairs from Carleton College in Minnesota and Political Science and Economics from Columbia University, he also holds Certificates in Russian Studies from Columbia University and in Military and Strategic Studies from the National Defense College in Kingston, Ontario. Mr Aquilina had a long career in the federal public service which included appointments to the Civil Service Commission, the Prime Minister's Office and the Privy Council Office. He served as Assistant-Deputy Minister in the Departments of Regional Economic Expansion, Secretary of State and Finance. He also occupied the positions of Deputy Secretary of the Treasury Board, General Manager of the National Capital Commission and Chair of the Task Force on Decentralization of Government Operations. As a consultant, he provided senior advice to the govemment of Lebanon on public service reform and headed a task force in Ethiopia on public finance reform. He was also a senior member of two missions from Canada to the governments of Benin and Haiti. Mr Aquilina has been very active at the municipal level in Ottawa in the last few years as president of his neighborhood association and also president of the Federation of Citizens' Associations of Ottawa-Carleton. The text that follows is an edited version of a paper presented at the international symposion on "The Natural City," Toronto, 23-25 June, 2004, sponsored by the University of Toronto's Division of the Environment, Institute for Environmental Studies, and the World Society for Ekistics.

Introduction

The challenge of raising awareness and building momentum in support of the natural city will be a key factor in the development of truly sustainable communities. If we fail to harness public demand for the economic and quality of life benefits that go along with a natural city, we will find ourselves winning most of the arguments and losing most of the decisions that will be needed to make the potential a reality. And that is not the future that any of us would prefer to see.

The National Round Table

The National Round Table on the Environment and Economy has been in the business of public awareness for many years, and still is. As part of this commitment, we have provided and continue to provide support for classroom and other forms of education, as well as general public awareness on sustainability.

Let me give you a few examples of our activities in this field:

- In the late 1990s, we developed a catalogue of sustainable development education programming in centers of higher learning across Canada.[1] We published a community-based social marketing workbook that set out some of the tried and true techniques for building awareness and buy-in at the grassroots.[2]
- We served as an incubator for the sustainable cities initiative, a multi-million-dollar partnership program that has since been taken over by Industry Canada. The federal government's strategies website now describes sustainable cities as a program, "... aimed at enhancing the sustainability of economic development in cities, and helping its citizens in improving their quality of life without compromising their future."
- On the ground, the program supports sustainable development expertise and infrastructure in more than a dozen cities in Africa, Asia, South and Central America, the Caribbean, and Eastern Europe. Its methods are based on a multi-sector, multi-stakeholder approach to water, waste, energy, transportation, and other key urban issues.
- Closer to home, our usage statistics tell us that our web site and virtual library are in constant use as a resource for secondary and post-secondary students and instructors across Canada. Classrooms rank among our 10 audiences for electronic information, and we serve as a reference for several hundred school groups each year.

These activities are a very important part of our ongoing contribution to public awareness. But I know that other panelists will be discussing school environments in more depth, so I will devote my time to some of the other elements of our public awareness mandate.

We each have a part to play on the road to sustainable development, and long experience has taught us that the National Round Table's unique contribution is a convening power that enables us to act as a catalyst in identifying, explaining, and promoting the principles and practices of sustainable development.

We exist to create a neutral forum where stakeholders and senior decision makers can set aside fixed agendas, hammer out their issues, and seek common ground. In this way, we promote a form of self-directed learning and exploration with

participants who are in a position to make or influence policy decisions at the local, provincial, and federal levels.

This approach has led to some significant and measurable results:

- Within Canada's federal system, our annual greening of the budget submission has had a consistent impact on fiscal policy, and many of our major initiatives have been reflected in recent budgets and Speeches from the Throne.
- Most recently, the 2004 Speech from the Throne acknowledged the three years of concentrated effort that we put into an initial set of environment and sustainable development indicators. The indicators take us down the road toward a conceptual model that places environmental quality and quality of life on a par with more traditional measure of economic progress. The Speech from the Throne affirmed the federal government's commitment to "start incorporating key indicators on clean water, clear air, and emission reduction into its decision-making," and the government has already committed $15 million to the next stage of work on indicators.
- In Ontario, we see some of the key issues raised by National Round Table Task Forces reflected in provincial policy. When the Ministry of Municipal Affairs and Housing invited public comment on the province's land use planning process, the announcement referred to issues like protection of green spaces, redevelopment of urban brownfields,[3] reduced gridlock and traffic congestion, urban greening, and the need to locate housing and jobs in closer proximity ... all of which were major themes in our recent reports on brownfields[4] and sustainable cities.[5]
- And in a wonderful example of collaboration and partnership across sectors, we were delighted last March to hear about the formation of a Canadian Brownfields Network. We were particularly gratified that the network will explicitly pursue our recommendation on brownfields development.

All of this activity is consistent with our role within the Canadian federal structure. The National Round Table is a multi-stakeholder group, appointed by the Prime Minister to reflect the interest of business, labor, environmental organizations, academia, and aboriginal groups. As you can see by my presence here today, we also have representatives from municipal governments.

Our mandate is to explore the balance between economic progress and environmental improvement ... from the perspective that the economy is a wholly owned subsidiary of the environment, not the other way around. Our experience with a wide variety of policy issues has taught us that the most important word in our name is the "and": the value we bring to public policy is our ability to situate and characterize the debate at the junction between the environment and the economy, and to work with a variety of stakeholders to generate positive, creative results.

Beyond the specific issues we address, we believe we have made a substantial contribution to the *process* of public policy making in Canada. Over the past 10 years, we have developed a well-defined multi-stakeholder process for engaging a wide range of voices and interests in meaningful, effective discussion. We examine issues with the assistance of Task Forces, each of which is a microcosm of the Round Table itself.

As I have already suggested, some of our best work over the past decade has addressed the profound environmental and economic challenges facing our cities. Our early work on water and wastewater services in Canada resulted in "State of the Debate" analysis that was ahead of its time.[6] It addressed crucial issues related to water and wastewater pricing, financing, regulation, and infrastructure. And it raised an early alarm about the potential for human tragedy that was later played out in the water quality crises that struck Walkerton, Ontario and North Battleford, Saskatchewan.[7]

Several years ago, the National Round Table launched its program on urban environmental quality with the knowledge that more Canadians than ever before are choosing to make their homes in urban centers. Four out of five of us already live in cities and that proportion is expect to increase over the next two decades.

If urban concentration is a growing concern in Canada, the situation is already dire in the wider world that is becoming smaller with each passing day. Over the next 25 years, nearly two-thirds of the world's population will live in urban communities, and 2.4 billion people will be born there. The sheer pace and scope of urbanization worldwide raises fundamental questions about our capacity to meet the demand for sustainable transportation, water and wastewater systems, energy supplies and services, and housing.

Canadians do expect that our communities will continue to be safe, comfortable places to live, work, and play. But we see evidence that our urban centers are already suffering from environmental decline. At the National Round Table, we are convinced that environmental quality is a key factor in attracting and retaining the talent and brain power that will drive the knowledge-based industries of the future, which means that quality of life in Canada's cities will be one of the defining challenges of this century, with implications for both the environmental and economic sustainability of our country.

The Urban Task Force

These were some of our concerns when our Urban Task Force began its work. By the time the process was complete, we had coalesced around three over-arching themes.

- Our first theme was the understanding that the federal government is already a major player in the everyday life of our cities. With $55 billion in annual spending in urban settings, not including the Goods and Service Tax Rebate, there is ample opportunity for the government to lead by example. A very solid first step would be to realign federal investment and program initiatives to be more consistent with the drive toward urban environmental quality.
- The second theme was the need to "spend smart," to ensure that we derive the greatest environmental and economic impact from every dollar we invest in our cities. The National Round Table sees this as a perfect objective to tackle with fiscal policy tools, since so many of the decisions that can make or break the urban environment are influenced by price. A major challenge is to fashion federal fiscal policies that will unilaterally improve urban environmental quality with stable, long-term funding, without intruding on the provinces' constitutional jurisdiction over municipalities.
- Third, we recognized the importance of new relationships among the order of government. We argued for stronger synergies among federal policies and programs. And we asserted that the government's single most powerful policy instrument – fiscal policy – should be its most articulate spokesperson.

If Canadians genuinely value the environmental quality of their cities and communities, our fiscal policy should speak out loudly and clearly on behalf of urban sustainability. If we know that Canadians will choose to live in communities with clean air, safe drinking water, efficient transit, and adequate green space, federal fiscal policy is a powerful tool that can help make those choices possible.

If we have evidence that the entrepreneurs and specialists who drive the knowledge economy will decide where to live based on local quality of life – at that point, our economic prosperity depends in large part on fiscal policies that will help those knowledge workers choose Ottawa, Toronto, Vancouver,

or Montreal over San José, Boston or Redmond.

The urban report

The urban report identified three interrelated areas – urban form, transportation, and energy use – where the federal government could best deploy its taxation and spending powers in the interest of urban environmental quality. The National Round Table's Brownfields Redevelopment Strategy emphasized the seven billion dollar development opportunity embodied in Canada's 30,000 brownfield sites. It demonstrated that brownfields redevelopment can be the key to building desirable urban neighborhoods, locating new commercial or residential development near existing transit services, and increasing the value of surrounding properties.

Our report recommended a package of incentives, regulatory changes, and partnerships to stimulate Canada's brownfield redevelopment sector. We stressed the need for strategic public investment to address up-front costs, an effective public policy regime for environmental liability and risk management, and better capacity and awareness around brownfield redevelopment.

Since its release last year, the strategy has generated tangible results. The 2004 Speech from the Throne committed $3.5 billion over 10 years to clean up contaminated sites. The Canadian Brownfields Network is a reality. Given my own background in municipal politics, I am particularly proud of the National Round Table's role in helping to move this issue closer to the top of the federal agenda.

Seven-city tour

These messages were at the forefront when the National Round Table organized **a seven-city tour on urban environmental quality and brownfield redevelopment** that concluded earlier in the year. The tour was a great example of the targeted public awareness that has become our stock in trade: it was designed to broaden awareness and understanding of the recommendations of the two Task Forces, to help generate momentum for coherent policy response to the needs of urban centers across Canada.

The tour consisted of a series of half-day information sessions in seven large municipalities – Calgary, Vancouver, Winnipeg, Montreal, Halifax, Ottawa, and Toronto. At each session, we sought to focus the discussion by inviting local municipal leaders and officials, and key decision makers from business and other sectors. To bring the discussion home to the local level, we invited panels of experts to respond to our recommendations and link them back to priorities in each community.

Like many of our recent conferences and public events, community response to the urban tour exceeded our expectations – quantitatively and qualitatively. In many of the sessions, local attendance threatened to exceed the capacity of the meeting halls we had booked – the kind of problem that policy and public awareness people love to have.

But the quality of participation in the urban tour went far beyond the numbers, and was ultimately far more important. In each city, mayors and senior municipal officials joined with local business leaders, policy makers, and professionals from every sector and order of government to tell us that the time had come to put our cities on a more sustainable footing.

The urban tour was a good example of public awareness at its best – not only because the subject matter linked directly to the natural city, but because the process had everything to do with multi-stakeholder contact and awareness.

Whenever the National Round Table convenes a Task Force or issues a "State of the Debate" report, it is important to us to get our message out to the broadest possible audience. But our impact on policy also has a great deal to do with the specific audiences that we touch. Consistent with our approach to awareness and engagement, many of the stakeholders who took part in the urban tour were in a position to influence or take part in the policy decision that will shape our cities for years to come. We have seen the same dynamic at our recent conferences in subject areas as diverse as environment and sustainable development indicators, and the conservation of Canada's natural heritage.

All in all, my experience with the National Round Table tells me that we are bringing about a substantial evolution in policy, which should be gratifying for anyone with an interest in the Natural City. At the same time, we know there are still a number of challenges to be addressed on the road to sustainability, and that many of them will benefit from the National Round Table's contribution as a convener and a catalyst for policy development.

New initiatives

In May, our members began laying the groundwork for a new series of multi-stakeholder initiatives that will likely be launched in the next year. As the discussion proceeded, it was clear that many of us were concerned about the pace at which the broad objective of sustainable development has been advanced in the two decades since the report of the World Commission on Environment and Development.

The city where I work as special advisor to the mayor was recently identified by the firm of William Mercer International Consultants as one of the five best cities in the world in which to live. And from that vantage point, I brought some specific observations to the table.

- The first was the urgent need to **make the transition from a waste society to a reduce-and-reuse society.**

For some time, we have built our communities and our wider society on the implied assumption that we can continue to harvest resources from the planet and discard them when they are used up. As a direct result, we now face a decline in our natural capital and a dramatic increase in landfilling, air and water pollution, and other forms of waste.

I doubt that anyone ever assumed these practices were sustainable – I think it far more likely that no one asked the question until fairly recently. But none of us can imagine today that we can continue to waste scarce resources in a way that fouls the cities and communities we call home.

There is a growing body of research and practice which suggests that zero discharge is an attainable goal, that any waste at all represents a resource that has been squandered or an industrial process that has been inadequately planned or thought out. We will not get there overnight, but it is obvious that our quality of life and our progress toward the natural city depend in large part on our approach to resource utilization and waste.

- Much of the same can be said about **energy**. The recent history of human civilization has been characterized by a dependency on fossil fuel resources that are, by definition, finite. With energy consumption on the rise, global populations increasing, and developing countries quite rightly striving for a better life and higher lever of prosperity, a collision is inevitable. It is clear to me that the efficiency of our energy systems must increase exponentially, and that the future of energy is almost certainly renewable.

The National Round Table has dealt with the link between energy, the economy, and the environment in a number of recent initiatives, most recently through a Task Force on climate change and energy which held two multi-stakeholder

meetings earlier this month. The basic ground rule for a Task Force is that every energy option is open to consideration, because that is the way we work – over a period of months, the Task Force will consult key stakeholders, assess the State of the Debate, and recommend practical measures for addressing a contentious, multi-faceted issue.

- My third observation is that this entire discussion has **important parallels in the assumption that underlie our economic system.** Here, again, we have accepted an automatic link between prosperity and continued economic growth, even as we look back at ancient civilizations that collapsed under the weight of similarly faulty logic.

Conclusion

The reality is that nature will always win ... and we know that we can win along with it. But I think it must be obvious that we are in for yet another collision if we fail to anticipate the combined impacts of some of the trends we have been discussing: I am referring, of course, to rapid urbanization, growing population, the erosion of natural capital, declining environmental quality, and higher standards of living and the expectations they generate. The Round Table has addressed this issue from a number of vantage points, including the sustainable cities initiative and environment and sustainable development indicators. But it is safe to predict that the issues and the challenges will be with us for some time.

So, exactly where does this leave us? We can readily agree that our success in building the natural city will depend in large part on awareness and engagement at all levels of society. I believe that groundwork is in place for a major, lasting shift in the treatment that cities receive as the country's leading economic engine and as a sector where a transition to sustainability is both possible and necessary. The momentum has been building in Canada, and my hope is that the picture will get steadily brighter over time.

At the National Round Table, we look forward to working closely with the full range of partners and stakeholders, to continue building public engagement with the sustainable future of which the natural city is one important part.

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2. J. Kassirer and D. McKenzie-Mohr (1998), *Tools of Change: Proven Methods for Promoting Environmental Citizenship* (Ottawa, National Round Table on the Environment and the Economy).
3. "While there is no single, legal definition of a "brownfield" in Canada, it is generally considered to be an abandoned, vacant, derelict, or underutilized commercial or industrial property where past actions have resulted in actual or perceived contamination and where there is an active potential for redevelopment." National Round Table on the Environment and the Economy (1998), *Greening Canada's Brownfield Sites* (Ottawa).
4. National Round Table on the Environment and the Economy (1998), *Greening Canada's Brownfield Sites* (Ottawa).
5. National Round Table on the Environment and the Economy (2003), *Environmental Quality in Canadian Cities: The Federal Role* (Ottawa).
6. National Round Table on the Environment and the Economy (1996), *Water and Wastewater Services in Canada* (Ottawa).
7. In Walkerton, Ontario, drinking water contaminated with *e.coli* and *campylobacter* bacteria killed seven people and made over 2,300 ill in May of 2000. In March 2001-April 2001, nearly 6,000 people in North Battleford, Saskatchewan became ill after drinking water contaminated with the *Cryptosporidium parvum protozoan.*

Toward the green city through revitalizing major obsolescent urban lands

Ken Greenberg

The author, an architect and urban designer, has played a leading role on a broad range of assignments in highly diverse urban settings in North America and Europe. Much of his work focuses on the rejuvenation of downtowns, waterfronts, neighborhoods, and campus master planning. His projects include the award-winning Saint Paul on the Mississippi Development Framework, the Brooklyn Bridge Park on the East River in New York, the East River waterfront in Lower Manhattan, the Fan Pier in Boston, the Southwest and Southeast Waterfronts in Washington, DC, the Vision Plan for Washington DC, Kendall Square and North Point/Lechmere Square in Cambridge, the Downtown Hartford Economic and Urban Design Action Strategy and the Downtown Master Plan for Fort Lauderdale. Current efforts include the "Big Picture for the Big Dig": the Rose Kennedy Greenway in Boston, the renewal of Regent Park, a major public housing project in Toronto; the implementation of the Convention District Master Plan in San Juan, P.R., and Urban Design advice for the Cincinnati Center City Development Corp (3CDC). In each city, with each project, his strategic, consensus-building approach has led to coordinated planning and a renewed focus on urban design. The text that follows is an edited and revised version of a paper presented at the international symposion on "The Natural City," Toronto, 23-25 June, 2004, sponsored by the University of Toronto's Division of the Environment, Institute for Environmental Studies, and the World Society for Ekistics.

Introduction

Obsolescent lands including urban waterfronts – seafronts, lakefronts, and riverfronts – and vast tracts of obsolescent port, industrial, railway, and warehousing lands have become the new frontier for cities with the potential for re-use. Typically these are underutilized or abandoned places from which the cities derived their prosperity and vitality, and notwithstanding their past degraded condition they have now become a locus of renewed vitality and potential.

In the mid 1990s, I first used the phrase "retreat of the industrial glacier" as a metaphor to describe two key concepts of urban regeneration – firstly, it is a long, slow process and secondly, it exhibits a certain inevitability. As the industrial glacier recedes, it reveals an extraordinary terrain of availability and a host of new possibilities. While there are enormous differences from place to place, there appear to be a number of common characteristics. There is an almost universal psychological desire to be near water and ravines, valleys and protected woodlands. The powerful allure of these great natural features draws people to them, wanting to live, work and recreate there. They offer respite from the pressures of city life, often in settings with a boundless or expanded horizon. Because of the centrality of these places, relating to the reasons the cities were founded there in the first place, they offer a great possibility for compact and more "sustainable" development, putting housing closer to workplaces with reduced travel times. For many city dwellers, the new frontiers and in particular waterfronts become the "resort" *in situ* for leisure in close proximity.

There are many examples that illustrate some of the dimensions of this process of cyclical transformation. Many of the obsolescent areas of cities that I am referring to were actually formed or occupied in the middle of the 19th century when the railways established themselves connecting to ports around the world in low-lying areas near bodies of water. A particular aspect that warrants recognition is the dissolution of the false dichotomy, both professional and conceptual, that divided the city from the natural world. Like many powerful and timely impulses, this reconciliation has had many sources: scientific, cultural, aesthetic. It is significant as an example of simultaneous discovery that was also necessitated by a sense of crisis as the environmental movement called attention to appalling degradation and its impact on people. Powerful symbols, such as the Cuyahoga River fire, created further awareness of the need for urgent action at all levels.

The change in consciousness has also been fostered by inspired practitioners and writers including Ian McHarg, *Design with Nature,* Ann Spirn, *The Granite Garden,* and Michael Hough, *City Form and Natural Process.* These three landscape architects devoted much of their work to the presence of nature in city form. Their ideas have opened possibilities for a new way of thinking beyond conventional mitigation and management of impacts to one based on new possibilities for creative synthesis. It is also based on the acknowledgment that humans are part of nature. Two relatively recent anthologies *Uncommon Ground*, edited by William Cronan, *Reinventing Nature*, edited by Michael Soule and Gary Lease, raise the question – what is nature and wilderness when it exists without influence or control by human society? To an extent nature everywhere on the planet has become a built environment which has been deeply altered by human interaction with it. In order to develop a vision of the future, it is necessary to understand the nature of the city, and how it functions as a home for the vast majority of people who live as urban dwellers.

Two quotes from Ann Spirn illustrate the need for understanding the relationship between the natural and built environments: "We need to move away from the persistent, common perception of the city as a degraded environment and wilderness as a pristine place untainted by human presence ... We have to deal with cities as systems in which cultural processes create an environment that's decidedly different from undisturbed nature, yet united to it through the common flow of natural process." These ideas are also reflected in Jane Jacobs' most recent book and great synthesis of natural systems and economics, *The Nature of Economies.*

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The enhanced recognition of natural systems and great natural features is integral to a renewed understanding of the urban setting. While this renewal is still in its inception, it is already producing forms of development which are inherently more environmentally friendly. It is also producing a cultural predisposition to a new form of co-existence, the intertwining of city and nature and an altered sense of place. As Betsy Barlow Rogers, the former Executive Director of the Central Park Conservancy, states: "As the city becomes more park-like, the park becomes more city-like." An interesting contrast is Frederick Law Olmstead describing his own work in 1870: "We want a ground to which people may go easily after their day's work is done ... where they may stroll for an hour, seeing, hearing, and feeling nothing of the bustle and jar of the streets, where they shall find the greatest possible contrast with the restraining and confining conditions of the town, those conditions which compel us to walk circumspectly, watchfully, jealously, which compel us to look upon others without sympathy."

The environmental theme has developed a broad popular appeal, establishing new common ground which often cuts across class, cultural and political lines. This appeal is often out ahead of political perceptions and existing policies. It also encourages interesting new ethical questions, challenges and opportunities, such as the emergence of "Green Principles" and evaluation systems such as the LEED (Leadership in Energy and Environmental Design) rating system developed by the American Institute of Architects which deals with impacts on ground, water, air, use of energy, materials, and the treatment of waste (U.S. GREEN BUILDING COUNCIL). There are also efforts underway to create a similar kind of rating system for landscape architecture.

How is the practice of urban design, architecture and landscape architecture on re-cycled urban lands affected in a world where this new perception of nature is emerging? Several examples illustrate the current state of the art, including many of the urban places where significant remediation and renewal efforts are currently underway. These cities and their unique relationship to their settings offer a source of great promise and potential. To quote Jane Jacobs (2001), "Cities are the 'crucible' where solutions are found to problems that are otherwise quite intractable."

Five projects illustrating different aspects of the potential for re-use

• Saint Paul on the Mississippi – Development Framework

Beginning in the 19th century, the City of St. Paul exploited the advantages of the Mississippi River (fig. 1) while securing and developing its urban area by displacing the natural landscape.

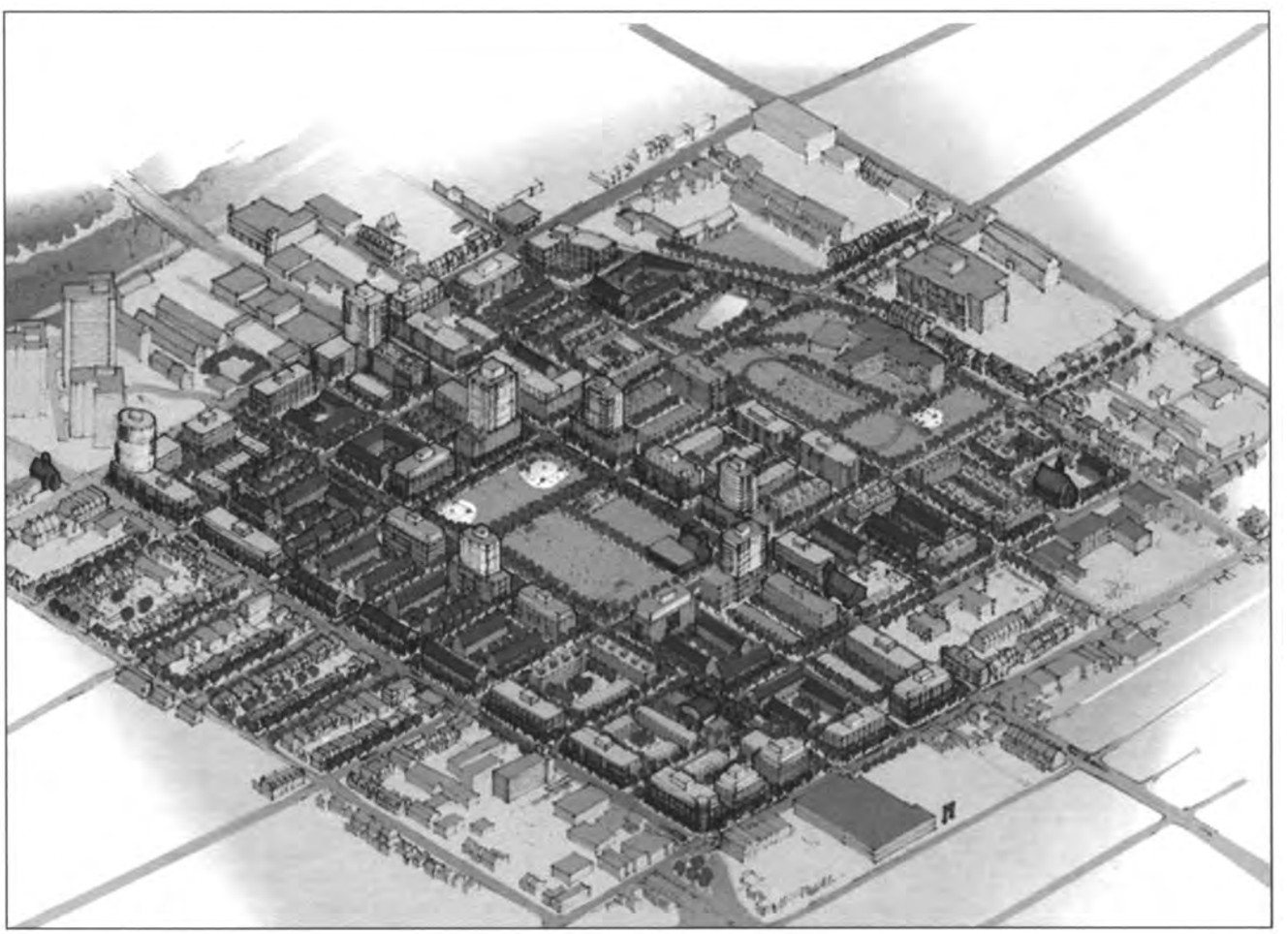

Fig. 1: St. Paul on the Mississippi. (*Source:* Cover of the "Development Framework" report).

However, in the early 1990s, a new appreciation of the river emerged, based on "Great River Park" and ecosystem concepts designed to re-establish the relationship of the river and the city. This led to a development framework in 1994-95 to incorporate a new vision of the community through urban design elements and, most importantly, the reconnection of the city with the river by restoring the historic landscape and creating, ultimately, an urban forest within the city (fig. 1).

• Brooklyn Bridge Park Master Plan

Initiated by the Brooklyn Park Local Development Corporation, this project demonstrates the opportunity created by revival of an historic waterfront. It is one element of restoration within a larger pattern of parks, green spaces and redevelopment of New York Harbor, which includes the creation of selected areas of natural shoreline and new green edges (fig. 2).

• Boston Harbor

Two new private developments, Fan Pier, Boston and Kendall Square, Cambridge illustrate the commercial opportunities for green development, especially in collaboration with a public realm plan based on small scale green spaces within the urban area. The series of new public places: Courthouse Park, Tidal Park, Fishing Pier, the Cove, the Public Green and the Institute for Contemporary Art provided a larger context involving six new city blocks and two new squares. One project, the Behnisch and Behnisch building, received a platinum rating under LEED certification, one of the highest achieved in the U.S. (fig. 3).

• Regent Park, Toronto

The Toronto Community Housing Corporation has prepared a comprehensive redevelopment plan and recommendations for the public/private renewal of Regent Park, one of Canada's oldest and largest public housing projects in downtown Toronto (fig. 4). The plan shows that it is possible to re-integrate this neighborhood with the rest of the City by introducing streets, creating generous new park spaces, aligning buildings along the streets and providing opportunities for employment, education, culture, and community facilities. It proposes that a mixed income, mixed use neighborhood with a diversity of built form and activities replace the current Regent Park. The plan is based on a pattern of urban blocks framing a major new central park and greenways, linking a series of smaller neighborhood squares and parks and schools.

• Glen Cove, Long Island

This 50-acre, Superfund site along the Glen Cove Creek, connected to the historic downtown, will be redeveloped as a new waterfront neighborhood incorporating a mix of new uses

Fig. 2: The Brooklyn Bridge and port lands.

Fig. 3: Boston Harbor during a sailing display.

Fig. 4: Artist's aerial concept of Regent Park, Toronto.

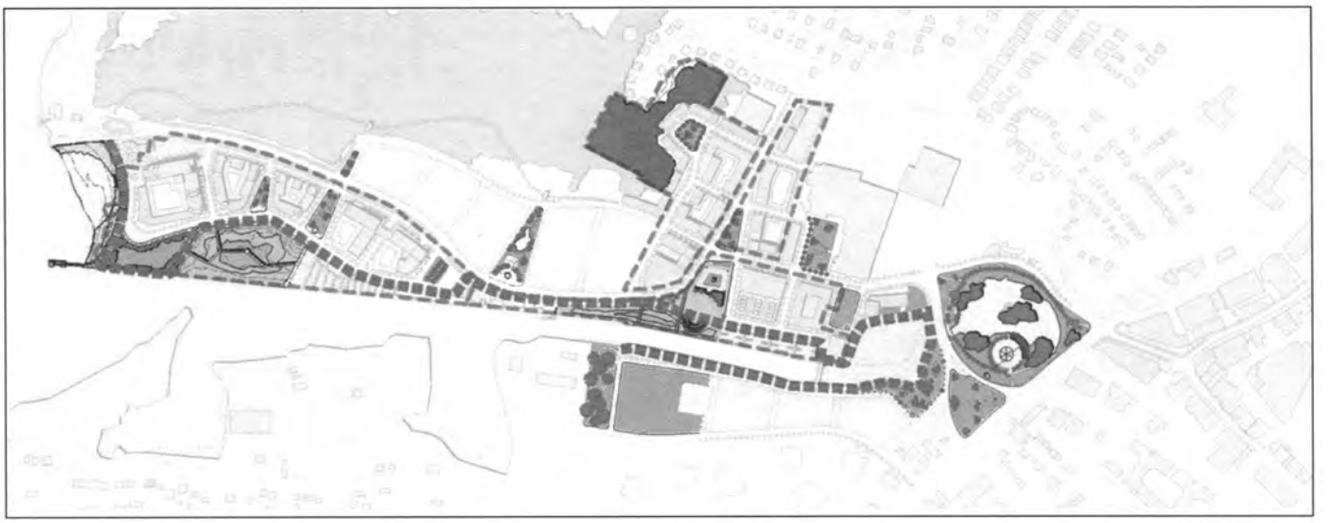

Fig. 5: Developers' proposal for Glen Cove.

including hotel, marina, conference center and a variety of commercial, retail, residential, cultural and entertainment facilities. The plan envisages a series of neighborhood clusters stretching along the Creek from Pratt Park and the existing downtown area to the open water of the Sound. The whole grouping is linked by a continuous water's edge promenade and a trail system tied to an existing County preserve which offers a variety of experiences, from a restored tidal wetland to active boating and recreation, a ferry connection to Manhattan and a beachfront (fig. 5).

Conclusion

Without exaggerating the importance of these examples, they give rise to some cautious optimism. They reflect a new shared vision which suggests a profoundly different sense of opportunity as well as aesthetic appreciation. On the basis of this new vision, one can look forward to a change in the image and use of urban places, a greater integration with natural settings and in built environments where a greater mix and complexity of uses contributes to an improved urban lifestyle and culture. As this new urban growth and succession occurs, there is also evolving a more mature aesthetic sense that appreciates that development, as in nature, is a messy process which is perpetually unfinished.

The perception of new "green" characteristics is also leading to changes in design approaches at the level of city plans and of individual buildings and landscapes. New places reflecting these approaches will become more rooted and specific, with the underlying layers of the natural setting revealed and better understood. To work in this way, clearly new kinds of professional alliances will be needed including Urban Designers, Planners, Architects, Landscape Architects, Engineers and Environmentalists.

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The growing role of citizen engagement in urban naturalization: The case of Canada

Stewart Chisholm

The author (MA, MCIP, RPP) co-manages Evergreen's Common Grounds program[1] which focuses on the protection and restoration of public lands in urban areas. He has a Master's degree in urban planning from the University of Waterloo, a Bachelor's Degree in resource geography from the University of Victoria, and he is a full member of the Canadian Institute of Planners. Over the past five years, he has developed urban greening resources for land use professionals and community groups including a national grant program, guidebooks, research reports, municipal policy guidelines and case studies. He has also developed and led professional training workshops for public land managers and other municipal officials on partnership approaches for protecting and stewarding urban green spaces. Prior to joining Evergreen, Stewart worked in the private and public sectors leading a variety of land-use planning, environmental assessment and resource conservation projects. Mr Chisholm has written journal articles and presented papers at national and international conferences including the Canadian Institute of Planners (2002) and the Society for Ecological Restoration (2001). The paper that follows is based on a presentation that he gave at the international symposion on "The Natural City," Toronto, 23-25 June, 2004, sponsored by the University of Toronto's Division of the Environment, Institute for Environmental Studies, and the World Society for Ekistics.

Introduction

Across Canada, an increasing number of volunteer-based community organizations are taking direct action to restore degraded urban habitats and transform barren open spaces into dynamic, natural areas. This movement, referred to as *community naturalization*, is about people taking collective action to achieve the shared goal of improving the quality of life and liveability of their communities by literally getting their hands in the dirt. It focuses on the act of planting trees, shrubs and wildflowers that are indigenous to the local bioregion and taking responsibility for their ongoing care and stewardship.

The benefits of this work extend far beyond the environment. Community naturalization can strengthen community ties, empower marginalized individuals and be a driving force behind renewed local economic development.

This paper discusses the key challenges that municipalities face in terms of protecting and caring for sufficient supplies of urban natural green space to meet ecological and social needs. It also profiles innovative examples of partnership-based approaches that are being undertaken to overcome these challenges. It concludes with a few observations on the principles that underlie successful partnerships and lessons learned that can be adapted by readers to their communities.

The ideas expressed are based on the observations and experiences of Evergreen, a Canadian Environmental organization that for over 14 years has supported the efforts of grass-roots organizations and decision makers across the country to create and sustain healthy, natural outdoor spaces in our cities and towns.

Cities without nature – Current context

The process of city building in North America has generally occurred with little or no regard for the ecological features and functions that support the natural world upon which we depend. To make way for streets, buildings and bridges, forests have been cleared, wetlands drained and waterways polluted or buried altogether. Compared to the rich habitats that once existed, the urban green spaces that remain are often fragmented natural features with little or no ecological value or monocultural turfgrass landscapes that offer minimal biodiversity. As a result, it is not surprising that urban dwellers often feel a sense of disconnection from the natural world and have developed the perception that cities and nature are distinct, separate entities.

This matter is of critical importance in light of the rapid urbanization trends that are occurring in Canada and other parts of the world. For example, over 80 percent of the current Canadian population is considered to be urban. In the past 30 years, the number of urban dwellers increased from 16 million to 24 million, a jump of about 50 percent (STATISTICS CANADA, 2005). As more and more people move to cities and towns, increased pressures are placed on remaining natural green spaces, both within existing built-up areas and beyond, in the urban fringe. Much of this new development is low-density sprawl that has been attributed to extensive displacement of natural features in highly populated areas, such as southern Ontario and the British Columbia's lower mainland (ONTARIO NATURE, 2005; SMART GROWTH BC, 2001).

Ensuring that the remaining significant natural green spaces are protected and stewarded, presents a growing challenge to municipal governments in Canada. Two major constraints that have been identified are

- limited financial resources; and
- lack of effective policy tools (EVERGREEN, 2004).

With regards to funding, this constraint has increased over recent years as senior levels of governments have downloaded responsibilities to local municipalities. This limits the ability of municipalities to purchase important green spaces when the opportunity arises, to ensure that they are protected in perpetuity. The lack of sufficient funds also challenges the ability of local governments to adequately maintain their existing inventories of parkland and other natural areas.

In terms of the policy constraint, municipalities from across the county indicated that planning tools such as provincial parkland dedication standards do not allow them to set aside enough green space during the development process to meet the needs of their growing communities (EVERGREEN, 2004; ALBERTA RECREATION AND PARKS ASSOCIATION, 2005). One study that focused on municipalities in Western Canada pointed out that there is a lack of appreciation of the importance of urban nature among municipal policy makers and elected officials. As a result, our natural capital is often sacrificed for short-term economic gain and current policies to protect it are largely insufficient (CANADA WEST FOUNDATION, 2004).

Responding to the challenge

In response to these challenges, citizens and community organizations are taking direct action to ensure that important natural green spaces in their communities are protected and restored. For example, Canada has seen an increased number of local land trusts and conservancies that are working with local partners to protect threatened green spaces. Land trusts are community based, non-profit organizations established for the purpose of protecting land for its natural, recreational, scenic or historical value. They may exist solely to protect one particular property or, more commonly, they may have a broader focus. The involvement of land trusts varies, depending on its goals. Some raise funds and purchase properties; others accept donations of land; others simply act as the organization that holds conservation easements without actually owning any land. Although the land trust movement is well established in other countries such as the USA, it is relatively new in Canada. Traditionally, land trusts have operated in rural or wilderness areas, but an increasing number are becoming active in urban and urbanizing areas (fig. 1).

Equally important, local organizations are also taking on an increased role in the care and stewardship of protected urban natural green spaces, through community naturalization – the focus of this paper. The term naturalization refers to a process of ecological restoration that involves returning an altered or degraded site to a more natural condition through the use of plants that are native to the local bioregion. Although definitions of native plants vary, for the purpose of this paper they are defined as species that existed in an ecological area prior to European settlement. The Society for Ecological Restoration (SER) defines ecological restoration as an intentional activity that initiates or accelerates the recovery of an ecosystem with respect to its health, integrity and sustainability (SER, 2004).

Community naturalization is more than planting trees to restore ecological health. When all stages of a project – from visioning and goal setting to implementation and ongoing care – involve citizens and organizations that represent the diversity of the local community, the resulting, social, health, economic and ecological benefits of a project can be considerable.

Traditionally, when these projects were undertaken, it was by local community stewardship groups such as "Friends of" organizations and occurred primarily within parks or other public open space in partnership with the landowner (usually the municipality or other public agency). However, as the urban community naturalization movement has evolved over the last decade, the scope, complexity and diversity of these projects, including the landscapes upon which they are occurring and the groups driving them has grown dramatically. For example, community groups are partnering with:

- teachers, parents and students to transform asphalt school grounds into dynamic, outdoor classrooms (the focus of Evergreen's Learning Grounds Program) (fig. 2);
- municipalities and business improvement associations to naturalize boulevards, street planters and other streetscapes (figs. 3 and 4);
- corporations to green utility corridors and rights-of-way that expand the local networks of greenways and connect fragmented urban ecosystems; and,
- hospitals, universities and social service agencies to increase biodiversity on barren institution grounds.

Fig. 1: Community planting in Toronto. (*Source:* Evergreen).

The benefits of urban nature when reviewing the leading literature

Transforming degraded urban green spaces through community naturalization is an important way to restore some of the natural features that have been lost through urbanization. These projects can enhance plant and wildlife biodiversity, improve habitat and connect fragmented green spaces through the creation of linkages. They can also increase the ability of the landscape to absorb water and recharge water tables. However, beyond the environmental benefits, there is a growing body of research that demonstrates the important contributions that the process of community naturalization and the actual presence of natural green spaces themselves, make towards the health, quality of life and liveability of cities and towns:

- **Social benefits:** The presence of nature in the urban landscape has been shown to contribute to creating a sense of community and is one of the strongest factors at predicting levels of satisfaction and pride among residents towards their neighborhood (KUO and SULLIVAN, 1998; LEWIS, 1992; FRIED, 1982). The act of participating in an urban greening project can also yield important benefits. For example, it has been shown

Fig. 2: School ground naturalization in Edmonton, Alberta. (*Source:* Evergreen).

to increase a community's sense of social identity and enhance the self-esteem of participants by providing them with the opportunity to improve the condition of the local environment (DWYER, 1995; HOUGH, 1990). There also appears to be a link between urban greenery and levels of crime. Comparative studies of inner-city apartment buildings with varying amounts of vegetation found that the greener the surroundings, the fewer crimes occurred against people and property (KUO and SULLIVAN, 2001). This relationship is attributed to the fact that green spaces bring people together outdoors which increases surveillance and discourages criminal activity. It may also be due to the fact that urban nature has a calming effect which lessens impulsivity and irritability – states of mind that psychologists recognize as precursors to violence (*ibid.*). Participation in community naturalization projects is an important way to reconnect urban residents to the natural world by providing them with opportunities to experience it, without having to leave the city. It also provides them with a first-hand opportunity to

Figs. 3 and 4: Naturalized streetscapes in North Vancouver, B.C. *(Source: City of North Vancouver).*

Fig. 5: Youth and seniors greening local street planters in Toronto. *(Source:* Evergreen).

learn about native plants and the natural and cultural heritage of their communities, by getting their hands in the dirt.

- **Health benefits:** Participation in community naturalization and gardening projects involves a measure of physical exercise with proven health benefits, such as the reduced risk of heart disease (CASPERSEN et al., 1991). The presence of green space in the urban environment can also have a profound positive impact on people's mental health by reducing stress, lowering blood pressure and increasing their capacity to concentrate on tasks (FRUMKIN, 2001; HONEYMAN, 1992; KAPLAN and KAPLAN, 1989; KUO and SULLIVAN, 2001; SCHROEDER and LEWIS, 1991). Studies also show that hospital patients with a view of trees through their windows had faster recovery rates and required fewer painkillers, compared to those without (ULRICH, 1984). From a planning and urban design perspective, the availability and accessibility of healthy urban green space positively influences the amount and type of physical activity that people engage in (FRUMKIN, 2001; EWING et al., 2003). Naturalized urban green spaces can also reduce and filter stormwater runoff, improve air quality, moderate air temperature extremes and reduce the need for chemical pesticides (KLINENBERG, 2002; MacDONALD 1996; DWYER et al., 1992; BOULAND and HUNHAMMAR, 1999; BRADSHAW and HUNT, 1995; HOUGH, 1995). A report released by the Ontario College of Family Physicians (OCFP) on the health effects of urban sprawl and the resulting loss of green space noted that green space is an essential part of human health and that serious public health problems will continue to escalate unless decisive and immediate action is taken to control urban sprawl and preserve sufficient green space (OCFP, 2005) (fig. 5).

- **Economic benefits:** According to studies by the Trust for Public Land, a national non-profit organization in the U.S., access to parks and open space has become a new measure of community wealth – an important way to attract business, visitors and residents by guaranteeing both quality of life and economic wealth (LERNER and POOL, 1999). A study of owners of small businesses found that recreation, parks and open spaces ranked as the highest priority in choosing a new location for their business (CROMPTON and LOVE, 1997). Proximity to green space can also increase property values and thereby enhance the municipal tax base. For example, a Windsor Ontario study showed that homes approximately 10 meters from a green space are worth about US$5,900 (CAD7,000) more than identical homes that are approximately 300 meters away (ZEGARAC and MUIR, 1996). In British Columbia, a study of four urban communities found that 10 to 15 percent increase in property values can be attributed to the land's proximity to a riparian greenway system (QUAYLE and HAMILTON, 1999).

Making it happen – Putting ideas into action

The benefits of urban greening can be widespread. However, projects do not occur on their own. In order for the benefits to be realized, community naturalization projects require considerable upfront planning, leadership and ongoing support from municipalities and other public agencies. Although there are many examples of successful projects undertaken by diverse, multi-sectoral partnerships, those engaged in this work still

face a number of challenges. A survey undertaken by Evergreen of 25 large and small municipalities across Canada found that, although nearly all municipalities offer some type of support to community stewardship groups on an *ad hoc* basis, few offer extensive, fully integrated coordination and support programs (EVERGREEN, 2004). Examples of individual support that municipalities and other public agencies currently provide include: materials (such as plants and mulch), equipment, technical expertise, administrative support and, in some cases, direct grants. More comprehensive approaches are needed to better leverage the efforts of community organizations and to make the most of the time, energy and expertise that they bring to the table. Examples of typical comments made by the professional land managers surveyed (*ibid.*) include:

- "There are a number of stewardship groups active in our watershed but we do not have the resources to coordinate their activities and ensure that they are working in areas that are in most need of restoration."
- "A full-time staff person such as a Community Stewardship Coordinator is needed to recruit volunteers and support local groups but unfortunately our [City] Council does not recognize the importance of this role and will not make the funds available."
- "The value of community volunteers is recognized but often they are perceived as a burden because staff do not have the time to provide them with the support and guidance that they need."

These comments are supported by academic research into citizen engagement and participatory environmental management that shows the current capacity of local organizations and municipal governments to collaborate is limited (LUKASIK, 2003; PARSON, 2000). From the perspective of local governments, this represents a real loss of potential, given that many local groups have the skills and capacity to undertake successful projects. They can also be a tremendous source of knowledge about the community's natural and cultural heritage. Many community organizations are also very resourceful in terms of raising dollars and stretching limited resources. Therefore, a dollar invested by a municipality into a collaborative greening project can potentially be leveraged several times over by its community partners.

An example of a municipality that recognizes the value of supporting community volunteers is the City of Calgary, which launched its *Natural Environment Adopt-A-Park* program in 2000. This initiative encourages volunteers to work collaboratively with the Parks Department to enhance the City's extensive network of natural environment parks. The program involved hiring a Natural Area Park Coordinator to work with local groups. The City also produced a comprehensive training manual for staff on working effectively with volunteers, plus a code of volunteer rights and responsibilities, safety guidelines and screening criteria. According to the City, when the program started, there were 110 volunteers in seven Natural Environment Parks. In 2002 the program expanded by 700 percent and now there are over 1,900 volunteers working in 60 natural environment parks (CITY OF CALGARY PARKS, 2005).

From the community's perspective, research shows there is a need for better collaborative approaches and tools to effectively take on and sustain urban greening projects (EVERGREEN, 2001). Some of the specific areas that groups commonly identified as those where greater support and capacity are needed included:

- fundraising;
- volunteer management;
- technical expertise on landscape design, plant selection and ecological planning; and,
- outreach and communications.

Evergreen is working with municipalities and community organization across the country to help them overcome these challenges. Our program strategy is based on inspiring action and giving people the tools to make change possible. Evergreen places great emphasis on fostering a culture of ecological stewardship, ensuring that citizens have the knowledge to sustain restoration projects. We work both locally, leading hands-on community gardening and restoration projects, and nationally, facilitating capacity building workshops and conferences and providing grants for community-driven restoration projects (fig. 6). Information about the programs and services that we offer is available from our web site.[1]

Fig. 6: Rooftop garden, Toronto, Ontario. (*Source:* Evergreen).

Measuring success

Based on Evergreen's experience supporting diverse urban greening initiatives, six characteristics that are inherent in a successful project are:

- **The project is planned and implemented on the principles of responsive design.** A responsive design process is inspired and guided by nature. It also recognizes the needs and aspirations of the people involved, as well as the broader community. A responsive design is flexible and adapts to the many unexpected changes related to the site's ecological and social context. Responsive ecological design means understanding how the site has been shaped by nature and the features that define it such as:
  - the types and diversity of plants present;
  - how it is used by birds and wildlife;
  - whether it is physically connected to other natural areas or is an isolated fragment; and,
  - other physical characteristics such as the composition of the soil, the direction and intensity of the prevailing winds, the amount of sunlight received.

  Of equal importance, responsive social design takes into account the different ways that the community engages with the site to ensure that the project is compatible and complements current uses.
- **The community takes ownership of the project and shares responsibility for its ongoing care and stewardship.** A successful project is not the domain of a single group or agency but a collective undertaking with a shared sense of commitment.
- **The naturalized site becomes a sustainable system requiring minimal maintenance.** Because native plants

Fig. 7: Briar Nine Park and Reserve. *(Source:* Elfi Berndl).

have evolved and adapted to local conditions over thousands of years, once they are established, they require minimal intervention compared to turf grass landscapes. However, a successful project is a continuing process with no real end, that continues to engage the community in ongoing educational activities (such as site tours and workshops) and stewardship events involving weeding, mulching and wildlife monitoring.

- **The naturalized site is used for a variety of uses by diverse members of the community.** For the most part, a successful community naturalization project is not one that is fenced off and out of bounds to residents. In order to be successful, the site must be integrated into the community and used by a diversity of people for a range of activities. For example, in Sarnia, Ontario the naturalized edge of a new stormwater management pond includes reintroduced native plant communities, interpretive signage and seating nodes which are used by local schools as an outdoor classroom. Naturalized areas can also be great venues for small-scale festivals and cultural celebrations. Naturally, the use must be appropriate for the site and exceptions made to avoid disturbances, such as restricting access to important habitat areas during the breeding season.
- **The landscape continues to educate and inspire.** A successful project provides urban dwellers with an important link to the natural world. By interacting with the site and observing its evolution and adaptation, people learn first-hand about ecological processes and the cycles of nature upon which all species, including ourselves, depend.
- **Partners continue to contribute time and resources.** As mentioned, a successful project is an ongoing process. As the site develops, and becomes an integral part of the community fabric, each partner remains committed to it and continues to support it in a variety of ways including hands-on, volunteer labor or by providing in-kind or financial support.

Working together – Two examples of Evergreen community partnerships

Let us refer here to the following:

- Briar Nine Park and Nature Reserve, Richmond Hill Ontario (figs. 7 and 8); and,
- Woodland Park, Vancouver B.C. (fig. 9).

Briar Nine Park and Nature Reserve, Richmond Hill Ontario

In 2002, Evergreen and the Town or Richmond Hill initiated a partnership to restore an underutilized, 13 hectare former agricultural site, owned by the Town, into a dynamic community park consisting of native plant habitats, interpretive trails and signage. The Town of Richmond Hill is located north of Toronto and has a population of approximately 160,000. Briar Nine Park and Reserve is located on the Oak Ridges Moraine and is a stunning example of the undulating topography that characterizes this unique landform. The moraine contains the headwaters of 65 river systems and

Fig. 8: Planting at Brian Nine. *(Source:* Elfi Berndl).

has a wide diversity of streams, woodlands, wetlands, kettle lakes, kettle bogs and significant flora and fauna. It is one of the last remaining continuous green corridors in southern Ontario (fig. 7).

Located in an area surrounded by new residential development, Briar Nine Park provides residents with important passive recreational opportunities and, as one of the last remaining urban natural green spaces in the area, raises their awareness of the area's natural heritage. Throughout this project, Evergreen worked with staff to plan a series of community planting and stewardship events to restore its rich meadow and woodland habitats that are home to a variety of wildlife species. By working in partnership with this municipality, Evergreen's role is three-fold:

- **Developing a community participation and education strategy:** Key to the project's long-term success was engaging a variety of participants in the project during its early stages. This involved reaching out to a variety of groups that typically participate in this work including schools, Scouting organizations, field naturalists and others. However, to ensure broader community involvement, other organizations, such as faith-based groups, social service agencies, youth groups, seniors clubs and corporate employees were also engaged. To increase participants' awareness of the ecology of the site and surrounding bioregion, planting events are augmented by educational workshops on a variety of topics, including native plant identification, the natural and cultural history of the Oak Ridges Moraine, local birds, insects and wildlife.

- **Leveraging resources:** As a non-profit organization, Evergreen is able to tap into funds not typically available to public agencies, including private charitable foundations, provincial and federal government grants and corporate donations. These funders recognize that municipal/non-profit partnerships lead to projects with far greater social and environmental benefits compared to those undertaken by single entities. Through Evergreen's fundraising efforts, the Town's capital expenditure on the park was matched. When in-kind contributions (donations of goods, services and labor) were taken into account, the Town's financial contribution was leveraged by 2:1. As a result, the Town is able to stretch limited financial resources while the community has enhanced opportunities to participate in the restoration and care of their park (fig. 8).

- **Ongoing stewardship:** One of the key challenges of community naturalization is ensuring that the site is maintained and stewarded over the long term. To achieve this goal, our strategy is to develop ongoing partnerships with a variety of organizations that can participate. For example, one of the key partners is Home Base, a drop-in center for youth-at-risk. Home Base youth who are interested in the project are encouraged to participate, which helps build their self-esteem and gain valuable skills-training. For Home Base, this relationship has increased and diversified the type of programs that it offers its clients, at minimal additional costs. The relationship has been successful and has expanded to Home Base's own property, where staff from both organizations have collaborated to implement community habitat and veg-

etable gardens. Since the Briar Nine partnership was established, the Town of Richmond Hill and Evergreen have expanded the relationship to include other parks across the municipality.

Woodland Park, Vancouver B.C.

Woodland Park, a small neglected urban park in Vancouver's east side, is an example of the positive change that can occur when the community shares a vision of what is possible and is willing to take action. For years, this 1.5 hectare park was a place that residents avoided because of drug use and other illegal activities that occurred within it. This situation was made worse by the fact that this neighborhood has a deficiency of accessible parks, 0.4 hectares per 1,000 people, compared to the rest City's average of 1.12 hectares.

In 1997, local residents came together to discuss ways that the park could be reclaimed by the community and transformed into a more vibrant space. After a series of community meetings facilitated by Evergreen, the vision that emerged included native plant gardens, food gardens, a new playground and an art installation that would reflect the cultural diversity of the neighborhood. Given the large Aboriginal presence in the community, there was a keen interest to incorporate themes related to First Nations rituals and beliefs. The following year, the "Talking Poles Community Art Project" was initiated, which included a totem pole, sculptures designed by the community and a Circle Garden based on the principles of the medicine wheel. According to First Nations tradition, the medicine wheel symbolizes the interdependence and interconnectedness of all things in the natural world. The purpose of the Talking Poles project was to address diversity and cross-cultural awareness by encouraging collaboration between neighbors, children, artists, businesses, and community partners. Through the project, a local First Nations artist was commissioned to carve the "Eagle Bear" pole. Once it was completed, the community was invited to participate in ceremonial pole-raising ceremony which was based on traditional protocols and customs. Because there has not been a traditional pole raising ceremony in all of the region in recent history, the event attracted First Nations elders from across the province and the northwestern U.S. (fig. 9).

In the weeks following the pole raising ceremony, Evergreen worked with the community to plant the circle garden and other gardens within the park. Almost 500 plants, representing over 20 different species of plants native to the region, were planted by diverse members of the community – young and old; rich and poor; and people from many different cultures and ethnicities. To ensure that the project continues to provide ongoing learning and inspiration, Evergreen provided free workshops on the themes of nature, art and ecology to community members. Examples of topics include native plant creative container gardening, native plants, names and uses, nature photography and garden pebble mosaics.

Although the park continues to face challenges, this collaborative approach has resulted in a space where connections between peoples, cultures and nature have been achieved and are still occurring. The process of working together on the

Fig. 9: Woodland Park planting. *(Source:* Evergreen).

stewardship of the site has strengthened community bounds and established a solid foundation for future community initiatives. As one local resident reflected "I'd recently moved to the area and [the park] was a really good stepping stone for meeting people who live here. It was one way to feel comfortable in a new environment ... a place to share ideas, to chat with people who are interested in keeping some of the traditions of this land alive" (EVERGREEN, 2002) (fig. 10).

Parting key messages

This paper concludes with the following thoughts:

- **Much can be accomplished by working together:** The key underlying theme of this paper is the importance of working together with diverse partners. Effective partnerships are more than the sum of its parts. Working together enables each member to tap into the experiences, resources and networks of the other partners, and it provides the satisfaction of knowing that the project is being planned and undertaken in a true collaborative effort.
- **There are many opportunities to bring nature back to our communities:** As described earlier, opportunities to bring nature back to our cities extend well beyond parks and open spaces. Those leading projects are seizing new opportunities such as rooftops, boulevards, alleyways and more.
- **Design by nature:** Learning to read the ecological and social landscape upon which the planned project will be carried out, and observing and understanding nature, inspires creativity and enables those involved to see the site's full potential. This ensures that the project plan and design recognizes and takes into account the opportunities and limits set by nature.

Because each community naturalization project is a unique undertaking, there is no single formula for ensuring success. However, when the broad principles discussed in this paper are taken into account and adapted to meet the unique needs and circumstances of the community, the likelihood that a project will continue to provide long-term social and ecological benefits, will be maximized.

Note

1. Evergreen is a national, non-profit environmental organization that brings communities and nature together for the benefit of both. It has been active since 1991, and offers hands-on help, resources, training and grants to communities and local governments. For more information, the reader may visit www.evergreen.ca.

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Fig. 10: Pole raising ceremony. *(Source:* Saleem Dar).

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Downsview Park, Toronto: A part of the natural city of the 21st century

Tony Genco

The author has been with Parc Downsview Park Inc. for close to five years. After only two years he has risen to lead the company as Executive Vice-President, which he has done for nearly three years through an extremely challenging period that included the change in governance and reorganization of the company and hosting two very large international events. Mr Genco has an extensive breadth of experience and skills in all facets of public affairs, communications, government relations and management. He is active in many charitable and community activities, and currently serves on the Board of Directors of the Woodbridge Agricultural Society, the Community Home Assistance for Seniors (CHATS), the Columbus Centre, Heritage Vaughan and is a member of the Canadian Sustainability Indicators Network. The text that follows is an edited and revised version of a paper presented at the international symposion on "The Natural City," Toronto, 23-25 June, 2004, sponsored by the University of Toronto's Division of the Environment, Institute for Environmental Studies, and the World Society for Ekistics.

Overview

When the Government of Canada announced the closure of Canadian Forces Base (CFB) Toronto in 1994 it stipulated, "the existing DND-owned lands associated with the Downsview site will be held in perpetuity and in trust primarily as a unique urban recreational greenspace for the enjoyment of future generations" (GOVERNMENT OF CANADA, 1994).

Overall, the Downsview Lands consist of 260 hectares (644 acres) of land. These lands are currently divided between two federal agencies: 236 hectares (583 acres) to Parc Downsview Park (PDP) Inc. (583 acres) and 24 hectares (61 acres) to the Department of National Defence (DND).

PDP's dream is to create a sustainable community, with a national purpose and identity, of great magnitude and prestige for all Canadians and to grow Downsview Park into a model for the world. The sustainable community will include traditional parkland, recreational (indoor and outdoor), cultural, residential, commercial, institutional, sports and entertainment uses all as one integrated, complete package.

Downsview Park will be a leading edge sustainable community. It will set 21st-century standards for excellence in landscape architectural design, recreation, urban planning and sustainable development. The goal is to define the leading edge of green development, to anticipate the future and bring it to the present by implementing green technologies and promoting green business to offer the Greater Toronto Area (GTA) and, fundamentally, the people of Canada, a wonderful place to showcase environmental social and economic sustainability on a self-financing basis.

Sustainability

Sustainability is the one word – and a way of seeing – that best captures the essence of the vision of Downsview Park. Sustainability is implicit in the mandate given to PDP by the Government of Canada and is at the core of PDP's interpretation of the mandate. The vision states: "Downsview Park is a unique urban recreational greenspace, a safe and peaceful place, developed according to the principles of environmental, economic and social sustainability, for Canadians to enjoy in all seasons. The park reflects Canada's mosaic brilliance and celebrates its past present and future accomplishments" (PARC DOWNSVIEW PARK INC., BOARD OF DIRECTORS, 2002). The Board of Directors demands that all of our actions contribute to the ultimate success and achievement of these important statements.

Experts from many diverse disciplines recognize sustainability as the development strategy for the 21st century. A sustainable community fosters the interdependence of social, ecological, and economic well-being. A balance among the three components enables each component to achieve its maximum potential. PDP plans to create that balance through the integration of common elements among the various land uses across Downsview Park so that it will look and feel like one, complete place.

PDP's commitment to sustainability is evident in the current and planned operations and activities of Downsview Park.

Downsview Park history

The lands where Downsview Park is located have a very rich history and have experienced a number of land uses over time. These uses, which have included agricultural production as well as its most recent national purpose as a military base, have helped shape Toronto and Canada, and have made Downsview part of some of the most important moments in Canadian affairs.

Downsview is named after an 1830s farm that was called "Downs View." It was named because of its high elevation and its excellent view looking southward towards Lake Ontario. The Downsview lands were acquired from the Aboriginal peoples with the Toronto Purchase in 1787 and were not ever a settlement area for the Aboriginal Community of Toronto.

In 1851, construction of the Ontario, Simcoe and Huron Railway began and, by 1853, much of the railway had been completed, helping to unite and bind the beginnings of Canada. The railway ran north through Downsview to Lake Simcoe and Lake Huron, transporting passengers, freight and mail. It exists today as the Canadian National Railway, bisecting Downsview Park and providing suburban commuter train

access and national Via Rail access through the site.

Although Downsview was initially a small rural community considered to be very far away from the core business area of Toronto, it soon grew to become a suburban industrial center, well connected to the region by both commerce and culture. De Havilland Aircraft of Canada located to Downsview in 1929 and began assembling airframes at a small airfield in Downsview, adjacent to the railway. This caused many of the road alignments to be affected. Later, land was expropriated from the community to enlarge the airfield and permit its use by jet fighters of the Royal Canadian Air Force and buildings were expanded following the Second World War.

Figs. 1, 2, 3 and 4: Toronto – View and location of the Downsview Park site in its broader region.

After the war, the government recognized Downsview's strategic importance with its proximity to Toronto's industry, infrastructure and community development. Downsview was considered by the government to be well suited as an air station and logistical support base because of the existing airfield and hangar facilities.

The idea of transforming the Downsview Lands into an urban park was first advanced in 1994 as the closure of the military base was being contemplated. This was not an easy process. All the currents of change at the time were to sell these lands to the private sector to pay the debt. But in an interesting twist, the Government decided to keep the land and create an interesting social instrument through a sound economic model that was self-sustaining. It was, in effect, creating a Natural City out of a part of the community that had been hidden behind barbed-wire fences and "No Trespassing" signs for close to 50 years. The lands were seen as a large, underutilized tract of land in the City of Toronto, containing valuable old assets as well as some heritage buildings which could be renaturalized and developed as a national and international showcase for environmental, social and economic sustainability. How to create a Natural City out of this starting point was a formidable challenge (figs. 1, 2, 3 and 4).

Since 1996, the site has been incrementally transformed but mostly through the invitation of people to the site's special events. Any site that is being restored to a natural state depends upon the participation and celebration of its local citizens. Transforming the area from a military base to a park required both physical changes (characterized by the replacement of the barbed wire with open, welcoming entrances) as well as attitudinal shifts (characterized by the introduction of programs and events designed to attract visitors to the site.

PDP was created in 1999 to formally assume responsibility for managing and developing Downsview Park and to harness the opportunity presented with the closure of CFB Toronto. As a Downsview boy, I could not wait to become a part of the experience. The government recognized that it had an unparalleled opportunity to make a positive impact on the City of Toronto through the retention of the former base lands under federal administration and to transform approximately 236 hectares (600 acres) of land in an urban area to improve the quality of life for the community and to create a firm, federal footprint for the people of Canada in the country's largest urban metropolis.

Since that time, great strides have been made affirming the mandate and refining the vision of Downsview Park as a sustainable community. This type of change is rare. Downsview Park represents the largest sustainable urban development opportunity in Canada. Detailed, thoughtful plans are in place to achieve the vision.

On September 29, 2003 the Government officially dedicated Downsview Park to the people of Canada and launched the public design consultation phase of the project.

In February 2004, PDP received the final design for the park plan. The exciting and dynamic plan details the park design, budget and implementation process and was the culmination of a series of informal and formal stakeholder consultations held in the summer and fall of 2003. The park was to become the driving force for the development of the rest of the site. It is the sun that will warm and provide the energy to inspire and create the sustainable community. The process originated with the International Design Competition in May 2000 that chose *Tree City* as the winning concept for Downsview Park.

From the beginning, Downsview Park has been developed through public input and ideas. During the recent phase of consultation, a number of stakeholders representing various sectors of the local community were involved in the process.

Among the issues that were considered by stakeholders were:

- the overall guiding principles upon which everything in and about the park should be measured, as well as
- the various recreational, sports and cultural uses on the lands that will contribute positively to the overall transformation of the Downsview Park property.

The consultations confirmed that the design process should be driven by a set of five core values. The five core values are:

- sustainability: design the maintenance;
- stewardship: design the educational effect;
- play: redefine leisure;
- legacy: build a living database; and.
- beauty: design the icon.

These values have evolved from PDP's five core themes:

– heritage,
– technology,
– innovation,
– community and
– environment.

In April 2004, a panel of landscape architects, architects and planners examined the plan and encouraged the board to move forward. This peer review will be a valuable benchmark for PDP management as it directs its focus on implementation of financial and technical matters of the plan (fig. 5).

The park plan envisages a seven-phase design plan, implemented over ten years at a cost of $40 million. Each phase will have a distinct purpose, a desired effect and will yield a significant and lasting transformation to the former Canadian Forces Base Toronto.

The recreational greenspace is organized into three distinctive zones:

– The Action Zone,
– The Promenade, and
– The Cultivation Campus,

unified by a system of pathways for easy pedestrian access. While it will be a park in the city, it will be a different kind of park by the way in which we interact with the city and complement the values, vision and opportunities of the park.

- The **Action Zone,** designed with a distinctively urban feel, will include a mix of commercial and cultural facilities. People are what makes a park urban. Notably, this zone will accommodate the Downsview Park National Sports Institute for the training and mentoring of promising community athletes. The Zone will also feature a main street thoroughfare that will contain a mix of commercial and artistic opportunities.
- The **Promenade** represents a striking change of pace from the Action Zone. It will extend panoramic views, forests, meadows and wetlands. It will be a place of passive recreation and landscape regeneration. It will serve as a respite from the pressures of urban life. It will provide an urban oasis for peace and tranquility.
- The **Cultivation Campus** encompasses will extend the park beyond its borders through education and social connections with such amenities as a retail nursery, greenhouse and mosaic gardens. This will be the basis of training and educational opportunities for people to engage the landscape at a variety of levels.

Downsview Park today – Setting for the conditions for tomorrow

In its early stage of evolution, Downsview Park is a vibrant place where hundreds of thousands of Canadians are educated and entertained through a wide variety of community programs and seasonal events. These programs and events promote and broaden the awareness of the significant histori-

cal, environmental and cultural features that make Downsview Park unique. Downsview Park has already come to be established as a place for people of all ages to play, learn and enjoy in every season and ultimately to reflect the face of Canada in all that we do and all that we say (fig. 5).

In keeping with the vision of the site as a place "for Canadians to enjoy in all seasons," a year-round roster of school and community programs has been created to show the potential of the site as a legacy for future generations. Community programs are designed to reflect such values as: culture, heritage, community, technology, innovation, environment, legacy, sustainability, stewardship, beauty and play. A representative list of titles includes: The Park in Winter, Heritage Day, National Wildlife Week, Earth Day, Doors Open Toronto, Heritage Toronto Hike, and Summer Dayz. These programs are the heart of the future because they make Downsview a Natural Park today.

Educational programs designed to support the Ontario Ministry of Education Guidelines are offered to elementary schools across the Greater Toronto Area. This becomes an incentive for teachers to fulfill the demands of the curriculum and for Downsview Park to teach our future leaders. Consistent with our mandate as a national urban park, some projects have been designed to raise awareness of the park in communities across the country. Notable among these is the Millennium Quilt. Young Canadians across the country celebrated the dawn of the new millennium with Downsview Park's "Our Canada" Millennium Quilt Initiative. Five hundred children from every province contributed to it. The Quilt was dedicated on Canada Day 2000 and then sent back to each of the contributing communities so that participants could appreciate the completed work. We also hosted, at that same event, the largest Citizenship Court in Canadian History, with 2,103 new Canadians celebrating Canada's mosaic brilliance.

In addition, Downsview Park hosts a roster of four, large-scale seasonal events which help to define the character of the park as a venue for the entire family. The Springfest event celebrates the fine and cultural performing arts with visual displays and performances from a broad spectrum of locally available talent with national and international purpose. Canada Day, our largest annual event, attracts approximately 100,000 people and is widely recognized as the most spectacular Canada Day celebration in the Greater Toronto Area.

The Fall Fair celebrates the Canadian harvest/Thanksgiving tradition each year with a specially designed mix of sports, music and cultural activities. Themes have included "Celebrating Canada's rural roots" by bringing "a little bit of the Country in the Heart of the City." The Winter Festival provides opportunities for families to appreciate and enjoy the many opportunities for sports activities and pastimes that winter creates.

Over the years, Downsview Park has also become a venue for a variety of cultural festivals that reflect the ethnic diversity of the Greater Toronto Area. These include Festival de Verano (a Latin festival), Viva Goa (a celebration of Goan culture), the South Asian Trade Show and the Downsview Park Highland Games.

Sustainability in action

It is the policy of PDP to carry on its operations in accordance with the principles of environmental, economic and social responsibility and in line with its vision statement.

Economic sustainability

One of the key foundational elements of a sustainable community is the requirement for economic sustainability. We must also make our standard of living meet our quality of life. When the federal government created Downsview Park, it created the conditions whereby it became possible for Canada's first national urban park to become a sustainable community.

PDP is to be self-financing. Self-financing means that PDP will create a balance of expenditures and revenues to build the sustainable community. The sale and sublease of some of the lands will be used to provide sources of funds to finance construction and development of the park property.

The following are PDP's economic sustainability goals:

- Ensure that there is no erosion of the core land base of the Park;
- Maintain and improve those key buildings that will generate income for the future benefit of the Park;
- Establish a Foundation as a future endowment base for the Park and to help it survive and thrive;
- Develop a wide diversity of economic activities on the lands of the Park;
- Encourage reinvestment and the economic development of the surrounding community;
- Encourage excellence within the human resources of the organization at the Staff and Board level.

Social sustainability

Downsview Park focuses on people – the most important part of the Park experience. Implicit in the mandate to create a park as a legacy for future generations is the obligation to create a park that is of value to the current generation, the local community and the broader public.

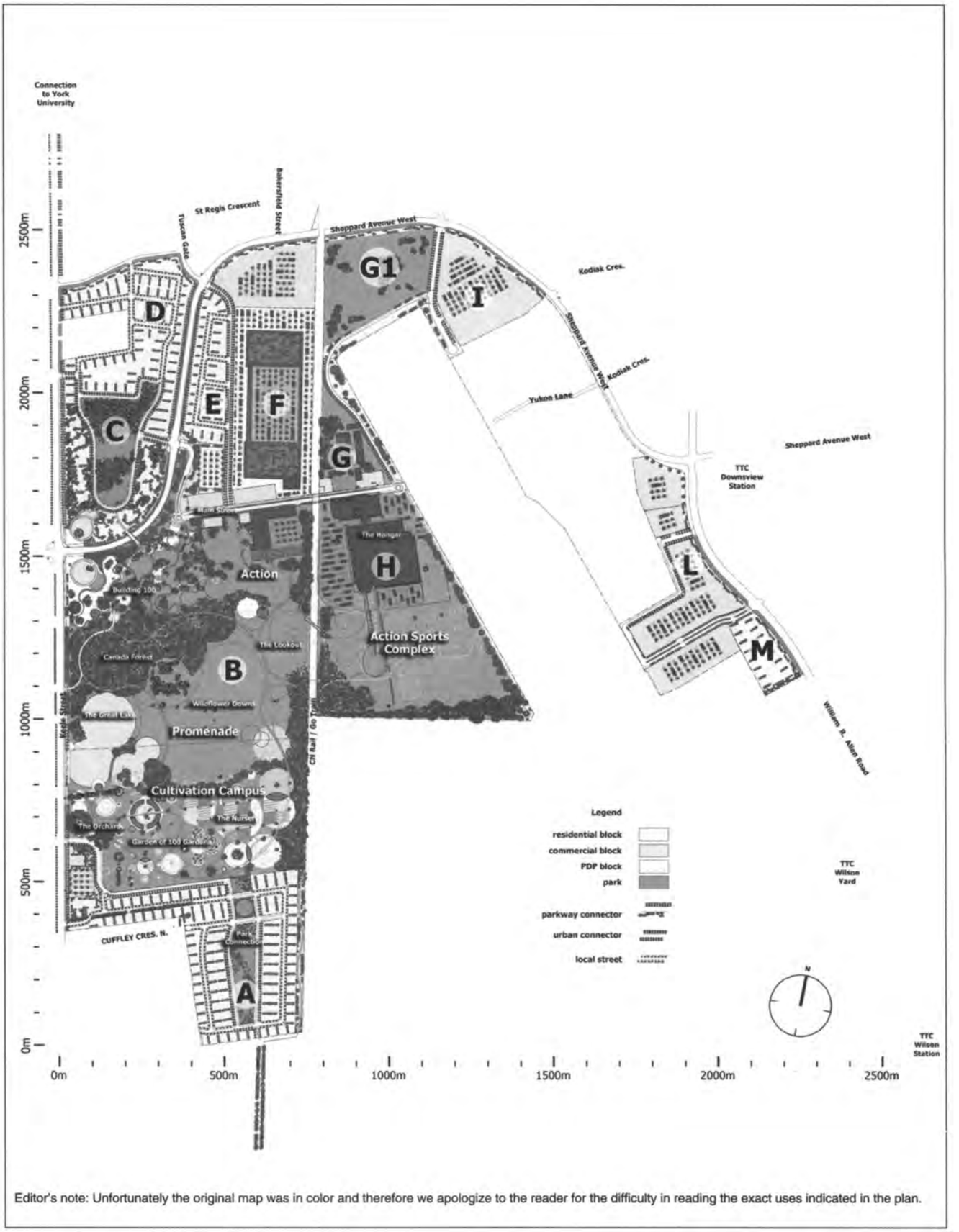
This is the key to increasing the social value of the Downsview Park now and in the future. PDP has committed itself to a strategy of on-going and transparent public consultation to ensure that as Downsview Park is developed, it remains relevant to the needs of the community. Similarly as communities evolve and their needs change, the park will aim to be responsive to those changes. This is the essence of social sustainability. We are building the Park for all and so everyone should feel that they are an important part of the process.

Through innovative programming, Downsview Park embodies the values of community, heritage, environment, innovation and technology. These values transcend the entire site, across all land uses. As Downsview Park evolves, the values of stewardship, beauty, play, legacy and sustainability will come into greater prominence. Like the evolution of anything, it becomes more beautiful over time.

The following are PDP's social sustainability goals:

- Encourage public/community participation as part of the planning and development of the Park;
- Encourage formal and informal educational opportunities geared to the Park's themes;
- Encourage activities in the Park that allow for creative development;
- Promote heritage preservation, commemoration, celebration, education and research at the Park;
- Promote educational opportunities with respect to present-day and future innovation and technology;
- Encourage respect for cultural diversity, equality of opportunity and people living together harmoniously and in mutual support of each other;
- Provide a social and economic impetus, raising the quality of life in the surrounding community;
- Meet human needs for "re-creation," relaxation, exercise and other aspects of healthy living.

All this means enjoying, celebrating and engaging the people naturally in every respect.



Editor's note: Unfortunately the original map was in color and therefore we apologize to the reader for the difficulty in reading the exact uses indicated in the plan.

Fig. 5: Toronto – Map showing the current design of the Downview Park site.

Environmental sustainability

The environmental sustainability potential of Downsview Park is almost limitless as we renaturalize the site for future generations. PDP has inherited much of the infrastructure required for the site to sustain itself "off grid" in terms of heat and electricity production and consumption and water safety. There is a steam plant on-site to generate heat and electricity as well as underground water reservoirs. District Energy is the key to our future to making sustainability a reality.

The buildings on site are structurally sound and amenable to development and refurbishment as "green buildings" and the park plan contains a well-considered strategy for water management across the site. These are the cornerstones of environmental sustainability and provide a solid foundation on which the Downsview Park sustainable community can be built.

Stewardship is the key to a successful rebuilding of the mandate for the site. PDP has successfully partnered with Earth Day Canada over the last seven years in promoting the values of environmental sustainability to the local community and the broader public. The company has also collaborated with such organizations as the Toronto and Region Conservation Authority, Evergreen Foundation, Toronto Wildlife Centre and the City of Toronto on environmental issues. Collaborative efforts will continue to be pursued and more can intensify as we continue to grow and prosper.

The following are PDP's goals for environmental sustainability:

- Provide environmental education opportunities, focusing on environmental renewal in an urban environment;
- Encourage partnerships with environmental organizations on best practices, co-operative projects and education;
- Evolve and enhance the existing urban ecosystem of the Park;
- Encourage and promote innovative environmental practices and leading-edge environmental technologies and encourage environmentally innovative business to locate at the Park;
- Promote the reduction, reuse and recycling of waste, and undertake a composting program so the compost can be used to improve the soil in the Park;
- Promote and encourage the use of public transportation as a model for all to follow and to encourage the use of bicycles and walking;
- Encourage energy conservation and the use of energy sources that will reduce greenhouse emissions, improve local air quality and encourage energy conservation;
- Manage storm water in an environmentally beneficial manner;
- Implement water and waste water conservation practices in buildings and on the lands;
- Utilize safe wastewater irrigation throughout the Park;
- Encourage the re-use and rehabilitation of viable building structures;
- Encourage the construction of buildings which are energy and water efficient;
- Encourage the use of recycled materials.

Sustainability metrics

Key to the success of PDP's sustainable community is the development of an empirical yardstick by which progress can be measured. It matters not what we say unless we can prove that we are making progress towards our key goals and priorities. PDP is challenging the conventional notion that sustainable parks in urban areas are just islands of nature. The natural city must acknowledge that there are challenges to meeting these important tests. PDP's view of sustainability requires a symbiotic relationship between business and park: the park as a business and PDP's business as a park. Downsview Park aims to be a demonstration of economic, social and environmental sustainability objectives working together to create a new harmony, a new definition of natural and balance in an urban context.

Sustainability Community Development Guidelines are being developed and will be implemented to create the demand base for the private sector to help us create Downsview Park. This will make the entire site (the greenspace, the cultural and recreational lands, the residential lands, and the business/commercial elements) one seamless and integrated community and a showcase of urban sustainability. Commercial development is an important dimension within the context of the greenspace and the promised legacy for future generations. Wherever one is on the site, one will feel and know that one is at Downsview Park. If you do not, then we have not created the new Natural City that we intended.

The Sustainable Community Development Guidelines will contain a land use plan and development policies; streets, blocks and community plans; an open space plan; sustainable urban criteria; sustainable building standards; an energy utilization plan; a sewer and water reduction plan; a sustainable housing plan; a public participation and marketing plan; a financial needs assessment for PDP; and new ideas for further investigation and innovation.

Success stories in sustainability and building the Natural City: The Hangar and Film Studios:

- **Downsview Park's Hangar Sports Complex** is a 400,000 sq.ft (37,160 sq.m) building divided into five bays, that echoes with the history of aviation in Canada. When the Canadian Forces military base closed in 1996, two of the bays in the Hangar were subsequently converted into a rudimentary sports facility – five indoor soccer fields, a set of changing rooms, a common space and a small administrative area run by a private sector operator.

Downsview Park inherited this promising, though initially unprofitable soccer operation and nurtured it back to financial health with the help of the Ontario Soccer Association. But its limited focus on soccer was only seasonal. Later, in partnership with another sports management partner, Downsview Park added five indoor beach volleyball courts which currently serve as a training ground for Canada's Olympic Beach Volleyball team and a modernizing sports venue. Today, the Hangar attracts more than 300,000 people per year to the park. In addition to this, BMW Canada leases the surrounding tarmac and one of the hangar bays to host their highly successful Advanced Driver Training Program where Downsview Park can be more than a landlord and those that invest in the space know that we expect them to be part of the sustainable community in every way possible.

The next phase in the development of the Hangar Sports Complex is its evolution into the Downsview Park National Sports Institute – a project undertaken in partnership with the Canadian Olympic Committee and the Canadian Sports Centre (Ontario) – in which the Hangar will expand to accommodate the needs of Canada's elite, high performance athletes.

- **Downsview Park Film Studios:** The Park also inherited from the armed forces a 1,000,000 sq.ft (92,900 sq.m) building, formerly a military Supply Depot complete with a million gallon (4.5 million liters) underground reservoir of water for fire safety and indoor bays for easy transportation. Part of this building has been converted into the Downsview Park Film Studios, which, over the years, has attracted a steady stream of some of the world's best-known producers, directors and actors. The world stops at Downsview Park in many ways and

this and other important examples all contribute to the Downsview Park experience at the highest levels.

Opportunities for collaboration with stakeholders in the GTA and beyond

Downsview Park presents a wealth of opportunities for imaginative partners to collaborate in the creation of our sustainable community. These opportunities include public education initiatives, the design and retrofitting of green buildings, district energy, sustainable energy demonstrations, sustainable industry development, community involvement in horticultural/cultivation initiatives, and collaboration with other sustainable communities. We continue to "talk the talk" of becoming a component of the Natural City. It is now time to "walk that talk" at a real level.

The aim at Downsview Park is to follow a course of strategic development that will produce strategic results well beyond the borders of the park. Located in the heart of the magnitude of the enterprise, Downsview Park is expected to attract a steady stream of tourism and create new employment opportunities in the area. In addition to showcasing Canada's heritage and cultural mosaic, Downsview Park is designed to evolve into a truly sustainable community.

Communications

One of the main challenges of building the sustainable community is simply communicating and effectively articulating the unique nature of this initiative to the public and to various potential stakeholder groups, who, once the idea is understood, could become effective champions for the cause. In all of its simplicity, it becomes very difficult to communicate what we are doing and how we are going to get there.

The idea of using a traditionally commercial instrument (a Crown Corporation) to fulfill a social policy objective (a regenerated green environment that promotes recreation and well-being in an urban environment) using a distinctively non-traditional strategy (sustainability principles and policies) is best explained to the public incrementally, and by example. But understandably, people want immediate results.

The communication challenge is to be met by having the public observe the process of actually building the park. The agenda for building the sustainable community is simple: PDP calls it the Park first philosophy. It is the Park that drives all of the development. It is the sine qua non of the mandate. Essentially this means: lead by building the recreational greenspace. Then create sustainable community development guidelines to ensure that the integrity of the values is preserved. The next step is to acquire stakeholder commitments, develop a broad understanding of the ambition, gain converts willing to support the fulfilment of the mandate. Finally implement the commitments related to the guidelines that add further credibility to the vision.

To date, PDP has been successful in adopting and implementing this strategy. Examples of our collaboration with stakeholders include: a tenant relationship with the Toronto and Region Conservation Authority which also offers PDP ongoing access to the expertise required to fulfill key aspects of the environmental agenda; collaboration with the Ontario Sports Alliance, Canadian Sports Centre (Ontario) and the Canadian Olympic Committee; memorandum of understanding in development with the City of Toronto regarding an operating protocol regarding how we will build Downsview Park together; improvements to surrounding streets and the possibility of a fire station in the park; discussions with the Province of Ontario regarding a GO Transit commuter train station in the park and tax incremental financing that helps the park prosper. These and other relationships are fundamental to PDP's duty to fuse the various institutions of Canada with its commitment to sustainability in all facets of urban environmental development.

Conclusion

The past successes of PDP have been considerable and the future potential of PDP is immeasurable. However, much of the promise has yet to be fulfilled and much of the progress cannot be seen with the naked eye. Like anything natural it takes time to evolve and time to make a real impact. A great deal of progress has been made by the company to fulfill its mandate and achieve its vision for Downsview Park. PDP has created a winning formula for the creation of an urban park for the 21st century and a leading edge sustainable community to realize the potential and opportunity of building a Natural City.

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The price of sprawl in Ontario, Canada

Ray Rivers

The author is an environmental economist who provides consulting services to a wide range of clients from private industry, environmental interest groups and the federal and provincial governments. He has worked with the federal departments of Environment, Agriculture and Fisheries and Oceans and the Ontario Ministry of the Environment; lectured at Concordia, the University of Ottawa and Wilfred Laurier University in Public Administration and Sustainable Development; and written widely on a range of environmental topics. Ray Rivers was the Canadian co-author of the Land Use sections in the 1996/1998 State of the Lake Ecosystem Conferences. The text that follows is an edited and revised version of a paper presented at the international symposion on "The Natural City," Toronto, 23-25 June, 2004, sponsored by the University of Toronto's Division of the Environment, Institute for Environmental Studies, and the World Society for Ekistics.

Introduction

Urban sprawl is a type of development characterized by relatively low population density and relatively high land utilization. Sprawl is less associated with, but equally responsible for, broader environmental degradation as well as societal dislocation. Dwellers in sprawling communities typically face long commute times on the way to work and back, affecting both individual leisure and family quality-time opportunities. The private automobile is the primary mode of commuting in sprawled communities since low population densities make the relative cost of public transit very high on a per capita basis. Municipal transit authorities respond to high transit per capita costs, low ridership, and the corresponding low fare box revenues by limiting transit service by time of day and geographic area and thus further making the automobile an even more preferred means of transportation for individuals in these communities. Further, recent studies indicate that the sprawl form promotes an unhealthy lifestyle as a result of inadequate exercise for residential dwellers. People who live in suburban sprawling communities tend to walk much less and less often than those in higher density urban centers.

The list of issues related to urban sprawl is extensive.

- For example (fig. 1), Ontario Ministry of the Environment documentation indicates that transportation accounts for the majority of smog related pollutants in Ontario cities, such as nitrogen oxide. Private automobiles and trucks are the most significant contributors of these pollutants.
- In addition, city budgets are constantly challenged by the need to provide, maintain and rebuild community roads at the expense of other services. The result is an increasing cost of living in these sprawling communities. For example, insurance companies pass on to consumers the ever increasing costs of auto insurance that is characteristic of areas of high traffic congestion and the consequent high accident rates from sprawling towns and cities.
- Finally, and not least of all, urban sprawl is a huge consumer of land, depriving that land from other non-urban uses, such as farming or natural habitat. A recent study by Statistics Canada highlights the degree to which prime agricultural land has been converted into houses, institutional buildings, factories and roads. *The Rural and Small Town Canada Analysis Bulletin* (vol. 6, no.1, Jan. 2005) highlights how, by 2001, about half of Canada's urbanized land was located on dependable agricultural land (all land in Classes 1, 2 and 3)[1] and that over the 1951 to 2001 period, the supply of agricultural land declined by 4 percent while the demand for cultivated land increased by 20 percent.[2] Towns and cities occupied over 11 percent of Ontario's Class 1 agricultural land by 2001.

More than 56 percent of Class 1 agricultural land in Canada is concentrated in Ontario. Of that, the proportion which is now covered by urbanization has virtually doubled from 1971 to 2001 (to 11 percent). This indicates that Ontario's urban planning systems, which involve a complex set of safeguards with provincial oversight and local/regional official plans and formal planning

Fig. 1: Ontario in Canada.

processes, have failed to protect agricultural land against urban sprawl.

In the course of their 1996 to 2000 State of the Lakes Ecosystem Conferences (SOLEC), the Canadian and US governments noted that land use is the biggest environmental problem facing the Great Lakes Ecosystem and that the urban sprawl land form is the primary component of this problem. The rates of sprawl in Ontario and US Great Lakes basin states were virtually indistinguishable. An interesting side observation of the SOLEC research was that urban sprawl occurred even in communities where the rate of population growth was very low or even negative (de-population). For example, Cuyahoga County in Ohio, USA, had declining population rates in the study period but still encountered urban sprawl at rates not dissimilar from that in Ontario. Clearly, population growth is not the sole or even the major driver of urban sprawl.

If population is not the key driver behind urban sprawl, then some other factor, such as economics, must be the driving factor. Since inner city land is typically more expensive to purchase and build on than open farm fields, one can conclude that economics plays a key role in this sprawl phenomenon. Quite simply, developers can make greater profits from building on these lower cost greenfields, than they can by re-development on higher priced land within existing cities. Of course, there are costs associated with the provision of new services and infrastructure for green field development, but these are often subsidized to a greater or lesser extent. It is the thesis of this paper that the economics associated with greater profitability of greenfield developments is a primary driver for continued urban sprawl.

Consequently, this paper examines economic solutions to what is essentially an economic problem – an imbalance in the market place for development land for new housing and industry. It is not that an economic solution might necessarily provide the entire answer to the problems identified above, or even the best answer to the ongoing problem of unabated sprawling urban development. However, economic incentives/disincentives for development that make communities more efficient would be a practical companion to better urban planning and greenbelt controls.

The natural city

Cities are the work of humans and not a part of nature, as we typically refer to that term. However, cities which are more liveable, efficient and environmentally supportive deserve to be called natural cities – if any do. The development of cities is guided by the controls that manage its growth, its overall urban form and its balance. By-laws typically serve to limit the activities of individuals within the city, while zoning restricts and guides where people may work, shop, sleep, drive and park and how the places in which they do these things must look and feel. Finally, subsidies, such as the funding of new development infrastructure and taxes and fees, both influence the final urban form.

The history of urban planning in Ontario is blighted by the fact that the very instruments intended to ensure rational development have hastened urban demise in the form of sprawl. Whether it be greenbelt (Parkway Belt) multi-level municipal official plans, the Provincial policy statement or policies of the Ontario Municipal Board, these planning instruments have failed to provide sustainable and liveable communities in spite of the prominence, expense and effort that have been placed on this very goal. In fact, the creation of city boundaries and official plans, which were intended to diminish inefficient urban sprawl, may have served to promote it.

As noted above, it is the thesis of this paper that imperfect land markets are a major distortion that have led to and continue to encourage urban sprawl. Some of this distortion is related to the differences in prices and preferences between long and short term markets for land. The ultimate responsibility lies with municipalities and the Province of Ontario which lack the will or ability to constrain the expansion of urban boundaries and thus hold the line on urban sprawl. This becomes a political issue in the end as municipal councils lack the tools by which they can simply say no to new sprawl.

Given the reality of politics, there is a need for new economic instruments in the municipal tool kit. The research coming out of the SOLEC process indicated that, despite Ontario's rigorous planning process, there was little difference in the degree to which urban sprawl has dominated development on both sides of the border. Thus, economic instruments could play a vital role for US as well as Canadian urban communities.

A natural city should be for humans what a natural forest is for wildlife. If the characteristics of successful ecological communities include diversity, complexity, efficiency and redundancy, then these should be present in the natural city. However, these characteristics are rarely present in typical urban sprawl communities. The thesis of this paper is that if economics is to blame for sprawl, then economic instruments could help to fix the problem.

Economic instruments

The term "economic instruments," as used in public policy, includes a wide range of tools that are available to governments for implementation to motivate human behavior and to pay the bills. Some instruments, such as property taxes, are not typically discretionary in application but are applied broadly to raise money to pay government bills. Other economic instruments, however, may be intended to promote changes to societal behavior. All of these economic tools can be assumed to result in some kind of effect in human behavior, whether intended or not. However, the incidence of any economic instrument and the relative elasticity of demand and supply for the services being taxed are important factors in determining the overall effect of any instrument.

Much as taxes and charges lead to changes in behavior, subsidies provide incentives for sustainable or unsustainable development. Subsidies may be direct or indirect and implicit. In some cases, they may not necessarily be seen as subsidies. For example, funding municipal infrastructure for a new development out of municipal general revenue is an implicit subsidy to the development, yet does not typically appear as a cash transfer to the developer as it likely would be spent directly by the Council on the project. This funding makes the development less expensive for the developer and encourages the project to proceed, since the result should improve demand and profitability for the developer.

The following two economic instruments are proposed for consideration to disincent urban sprawl type developments:

- a new tax to rebalance the huge economic advantage that exists for developers holding relatively inexpensive farm or natural lands, once that land is approved for development; and,
- a second instrument which would involve a sophisticated regulated land trading scheme, by which greenfield developments would proceed with their project, contingent on more efficient inner city development being undertaken.

The objective of these instruments is to increase the degree of density of Ontario's urban communities with the expectation that this will lead to economies of scale in the use of municipal resources and improved overall efficiency.

The sprawl tax

There is a significant price difference between downtown land and farm or natural greenfield land. In part, this is attributable

to the value that has been added to inner city land which has been fitted with sewers, roads and other infrastructure. However, the opportunity costs associated with agricultural and natural lands, as compared to residential/industrially developed lands, is the most significant part of the equation.

The economic return per hectare of agricultural land is considerably lower than what one would expect from developed lands. In most cases, there are no markets where transaction values can be established for the services provided by natural lands and, where there are usage charges, these values are typically poor proxies for what one is willing to pay (contingent value) for use of the natural resource. Speculators and developers purchase farms in the outskirts of urban boundaries and wait until the opportunity avails itself to convert this land into the urban form.

Urban sprawl is profitable, largely because the cost of land is so much less for new suburban development than it is for downtown in-fill or redevelopment projects. The Ontario Real Estate Association publishes real estate listings for land throughout Ontario. Industrial land prices ranged from CAD10,000 (approx. US$8,500) to CAD50,000 (approx. US$45,000) per hectare in smaller communities and ten times that amount in larger communities. This illustrates the potential profitability of building in rural and suburban locations as opposed to downtown locations.

However, it is the comparisons between the per hectare values of development land in cities like Toronto and agricultural land in rural, nearby communities like Milton that illustrate the magnitude of the profitability of urban sprawl. For example, an unserviced parcel of land that had been designated rural residential with future development potential was listed at CAD75,000 (approx. US$60,000) for 24.6 acres (approx. 12 hectares) while inner city development land was listed for CAD2.9 million (approx. US$ 2.4 million) for approximately half an acre (approx. quarter of a hectare).

The goal of the Sprawl Tax is to influence and re-balance the market for development land such that agricultural land being used for development bears a value closer to that of inner city lands. Raising the price of agricultural (or natural) lands to urban development price levels is justified, since these lands will no longer be used for farming or their original natural uses. This sprawl tax will provide a strong incentive for inner city and possibly, brownfield development.

The Sprawl Tax would need to be set so as to equalize the land cost differential between prices for agricultural land and the value of residential/urban use in inner city urban development. The fee would be collected from prospective greenfield developers, as a condition of development, based on the difference between average inner city prices and the likely greenfield price. Revenue collected could be earmarked and dedicated for specific uses such as to:

- redevelop brownfields;
- upgrade inner urban areas;
- contribute to urban infrastructure renewal; and,
- retrofit/green the city.

An example might be useful at this point. A developer applies for a new sprawl development on 100 hectares greenfield agricultural which is valued at US$10,000 per hectare (for its next best farm use, or based upon the recent purchase price). The equivalent land requirement for an inner city development would be US$1 million per hectare (ha). Allowance could be made for servicing the greenfield property and other infrastructure requirements which would bring the greenfield land costs closer to US$100,000 per ha. Building an equivalent number of residences in the inner city might require less land as a more compact urban form would be more appropriate for an inner city development, perhaps as little as 50 percent less in this hypothetical example.

The development land values are then: 100 ha @ $100,000 = $10 million for the greenfield urban sprawl development. Alternatively the equivalent number of residences could be developed in the inner city with 50 ha @ $1 million = $50 million. In this case, the difference in net land costs ($40 million) would be subject to the sprawl tax, which might be set at anywhere from 50 to 100 percent of the difference. Thus, in excess of $20 million would be available from that sprawl development for other purposes as suggested above, should the developer decide to proceed with the development.

If the development were based on 500 residential units and the land costs were fully passed on to the final purchasers, each house would cost $40,000 more than was the initial planned sale price in this example. The result would be to influence the demand for new sprawl development, since these residences are $40,000 more. This provides an additional incentive for inner city development and away from urban sprawl. As noted above, the sprawl tax revenues could be provided to cities to assist with low cost, inner city high density housing, urban transit system support, brownfield re-development and urban renewal or other worthy causes.

Sprawl offset trading

Rather than applying a tax or subsidy, there are a number of regulatory instruments, including the model provided by the highly successful British Columbia Agricultural Land Reserve, which has been of assistance in curtailing urban sprawl in that Province.[3] Alternatively, another option is the economic regulatory instrument inherent in offset trading.

Offset trading, typically applied to manage air emissions, is a process whereby regulated organizations which reduce their emissions beyond required limits may convert their surplus emission reductions into emissions credits or offsets. These offsets may be sold to other regulated organizations which are unable or unwilling to meet their emissions limits. Providing each regulated organization's emissions limits are met by undertaking emission reduction actions or by purchasing and retiring emissions offsets, the regulation will achieve its intended purpose. Since those organizations with high emission costs may purchase from those who can exceed their reductions at a lower cost, offset trading ensures that emissions limits are met in the most economically efficient way.

The following example applies the principles of offset trading to reducing urban sprawl (low density suburban development), given that reducing urban sprawl is an objective. This concept assumes that higher density residency developments (housing units per hectare) occur in the inner city and the outskirts are characterized by relatively lower density development. In order for this concept to work, a regulation would be required to restrict all new development to achieve a desirable level of high residential density (houses per ha). All new development would need to meet that density target or be required to purchase sprawl offsets sufficient to meet the density limits.

For example, let us assume that the density target was set at 100 residential units per hectare. A greenfield developer coming in with a plan for 5 units per ha would have to obtain another 95 units per ha to offset the low density impact of the development. This might motivate the developer to redesign the original development plan or to cancel it. Alternatively, the greenfield developer could purchase the necessary offsets from someone else who has developed with densities greater than 100.

Sprawl offsets would be valued in a market among buyers and sellers with a price contingent on available supplies of offsets and the demand for these. However, if an offset were valued at US$10,000, this regulatory program would increase the price of the development in the original design by another $950,000 per

ha. The developer in this example might want to reconsider the sprawl proposal, might increase density or might seek alternate development opportunities.

High density urban sprawl occurs when greenfield developments in outskirt locations are desiged to accommodate high residential rates of occupancy. In many ways, it could be argued that high density sprawl is worse than low density sprawl since the transportation and other issues associated with sprawl are magnified as the population is increased. Unless measures are taken to ensure adequate transportation and other amenities, it might be preferable to restrict this kind of high density sprawl entirely, particularly if a sprawl offset trading program is being considered.

A sprawl offset trading scheme, although complicated, is attractive and indeed could be very effective at re-balancing the distortions between the use of agricultural and agriculturally priced land with that of the inner city. To that end, this mechanism makes clear the signal for higher density (more efficient) developments and more efficient development as opposed to the continued exploitation of farm and natural lands. The key to making this tool successful lies in setting an appropriate density target and in ensuring that it serves the goal of increasing both inner and total city densities to make the delivery of mass transit and other urban amenities more cost effective.

Unlike a tax, a regulated offset program might be less susceptible to manipulation or political influence, since it would function automatically once the density rate had been set. Unlike taxes or subsidies, this tool would be independent of municipal budgetary decisions and all developers would have both clear signals and know the full costs facing them, should they decide to invest in greenfield developments.

Conclusion

Existing urban planning systems, such as that which is in practice in Ontario, were developed, in large part, to protect against continued "urban sprawl" and its impacts. History has shown that these planning systems by themselves have failed to stop urban sprawl and have, in fact, proved no better in this regard than practices in jurisdictions without such complex programs. The problems of urban sprawl are well known and include higher costs for residents, environmental degradation and social dislocation.

There is a need to find and implement new mechanisms to complement urban planning and to harvest the potential of market-based economic incentives for more sustainable and natural urban development. The fundamental causes for urban sprawl are economic, related to the imbalance in the marketplace for land valued for farming (or natural uses) and for urban development. Thus, in the absence of strict regulatory land-use controls which limit the use of farm land for urban purposes, economic instruments can play a vital role in market correction.

Two models, one that adds a positive tax to land converted from farm use to urban sprawl and one that promotes inner city development by requiring the purchase of sprawl offsets, have been proposed in this paper. Although there may be other economic instruments which might also assist in re-balancing the market place for development land, these two merit further consideration.

Notes

1. There are seven classes used to rate land capability. Class 1 lands have the highest and Class 7 lands the lowest capability to support land use activities of each sector (see also Note 3).
2. "The (British Columbia) Agricultural Land Reserve (ALR) is a provincial zone in which agriculture is recognized as the priority use. Farming is encouraged and non-agricultural uses are controlled. The ALR covers approximately 4.7 million hectares. It includes private and public lands that may be farmed, forested or vacant land. Some ALR blocks cover thousands of hectares while others are small pockets of only a few hectares. In total, the ALR comprises those lands within BC that have the potential for agricultural production. The Agricultural Land Reserve takes precedence over, but does not replace other legislation and bylaws that may apply to the land. Local and regional governments, as well as other provincial agencies, are expected to plan in accordance with the provincial policy of preserving agricultural land. The *Agricultural Land Commission Act* sets the legislative framework for the establishment and administration of the agricultural land preservation program." (*Source*: http://www.alc.gov.bc.ca/alr/alr_main.htm).
3. The Canada Land Inventory comprises four sectors - agriculture, forestry, recreation, and wildlife. For each of these sectors there are seven classes used to rate land capability. Class 1 lands have the highest and Class 7 lands the lowest capability to support land use activities of each sector. "The Government of Canada developed the Canada Land Inventory (CLI) under the auspices of the Department of Regional and Economic Expansion (1963-1971) and the Department of the Environment (renamed Environment Canada), (1971-1994). The program was officially discontinued in 1994. The process to transfer the data and intellectual property to the National Archives of Canada started in 1995. Since 1995 several Canadian federal departments have been instrumental in extracting the data from the old tapes to modern formats and media, including: National Archives of Canada, Agriculture and Agri-Food Canada, Statistics Canada, and Natural Resources Canada." (*Source*: http://geogratis.cgdi.gc.ca/CLI/right.html).

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"The Natural City" Symposion at the University of Toronto

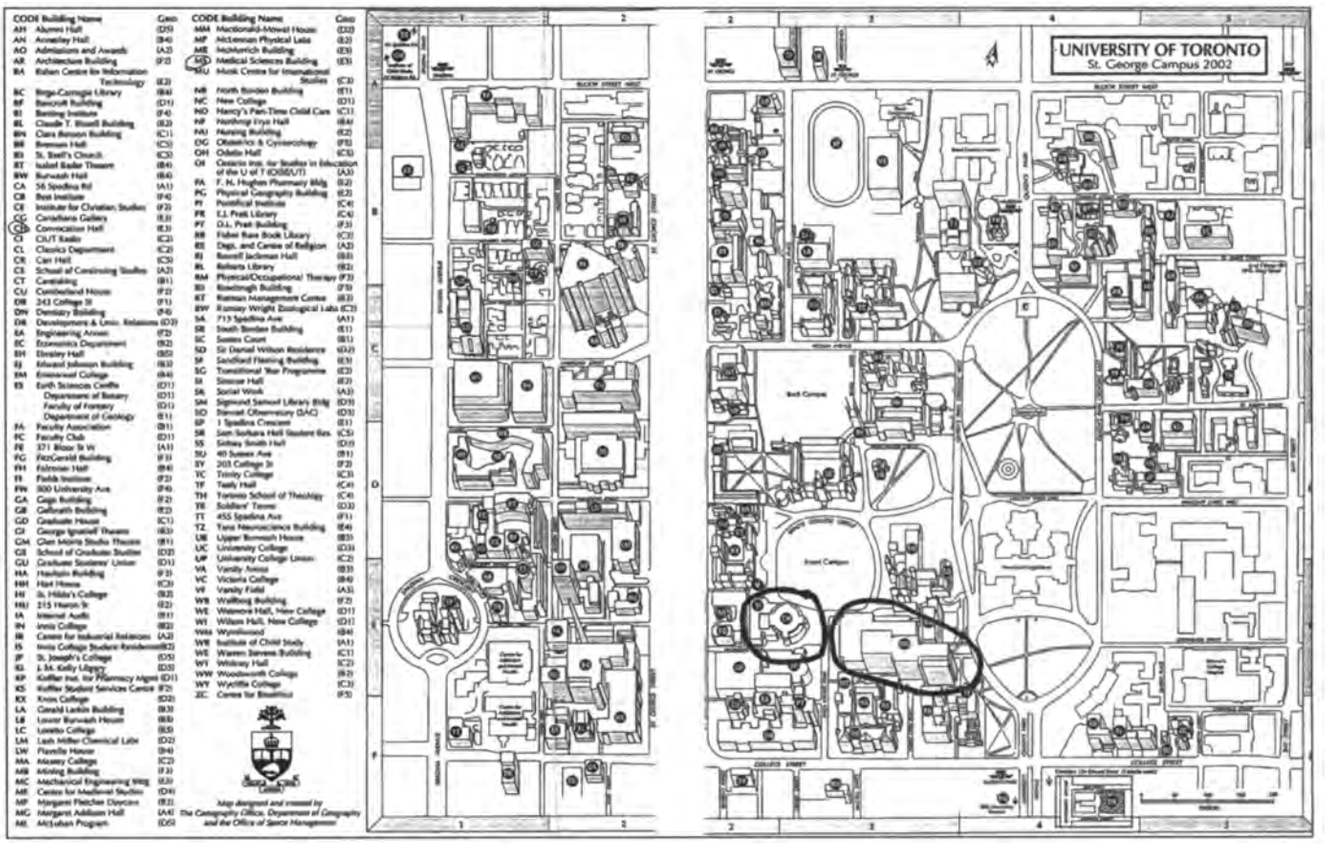

Fig. 1: Plan of the University of Toronto, St. George Campus, with the location of the buildings where the activities of the Symposion took place.

Fig. 2: Entrance of the Medical Sciences Centre building where the Symposion took place.

Is Smart Growth a smart adaptation strategy?

Examining Ontario's proposed growth under climate change

Brad Bass

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Introduction

Urban planners and other municipal officials throughout North America, Europe and Australia have been grappling with the costs of urban sprawl. Amongst this community of professionals and others, the realization has dawned that urban sprawl has led to increased traffic congestion, with its attendant economic and health costs, loss of green space and impingement on watersheds, increased infrastructure requirements and costs and a loss of a unique sense of place that is found in the downtown neighborhoods of most cities. There have been several responses such as fixed boundaries for urban areas and green spaces and new urbanism, but the 1990s witnessed the birth of a new movement in planning called Smart Growth. Smart Growth proposes a number of initiatives to reduce or stop urban sprawl, to reduce traffic congestion and to increase the economic viability of cities.

The most common element in Smart Growth plans is delimiting the areas where cities can expand and encouraging higher densities on commercial and residential land use. These measures are accompanied by mixed land use areas to put people closer to work and closer to commercial activities to reduce the reliance on the automobile and increase social capital; investments in public transit; development in proximity to public transit; and the protection of green space. It is hoped that these measures will lead to more vibrant, pedestrian friendly communities, reduce the cost of new infrastructure by concentrating growth in existing areas, reduce the number of private automobile trips and provide more affordable housing. To one degree or another, these elements are found in Portland, Oregon, USA; Sydney, Australia; and in the Canadian Province of Ontario's new growth management strategy (MINISTRY OF PUBLIC INFRASTRUCTURE RENEWAL, 2004).

Smart growth initiatives should not be viewed solely as an environmental strategy to preserve green space or a rural strategy to preserve farmland. The Province of Ontario considers it to be a crucial step in maintaining and increasing the competitiveness of the Golden Horseshoe Region, which is the economic engine of the province and the country. It is not only driven by the need to maintain competitiveness, but to accommodate the future projected growth in the region in a manner that protects the region's watersheds, valuable green space including two UNESCO Heritage sites, preserve farmland and reduce the growth in traffic congestion.

Smart Growth stands on an economic, environmental and social pillar, but the emphasis differs from region to region. Thus,

- in Northern Ontario, the major concern is declining population and recommendations to the Provincial Government focus on new ideas in regional development, such as industrial clusters, and community building to keep people in the North and to draw new migrants to the area (MINISTRY OF PUBLIC INFRASTRUCTURE RENEWAL, 2003);
- The Smart Growth Panels in Western and Eastern Ontario have had a decidedly more rural flavor, although with cities such as Ottawa and London, they also reflected the land use concerns found in Central Ontario (MINISTRY OF PUBLIC INFRASTRUCTURE RENEWAL, 2003).

The benefits of Smart Growth initiatives are not being questioned in this paper. The question posed is whether a planning strategy that is supposed to lead to more compact development increases or decreases the vulnerability to climate change, particularly in Central Ontario. It will be argued that, in some ways, it increases and, in other ways, decreases the vulnerability to climate change. If a Smart Growth policy does increase our vulnerability, it should not be dismissed, due to the potential benefits of curbing urban sprawl in Central Ontario. Those components of the growth management plan that decrease Central Ontario's vulnerability to climate change should be noted and addressed as necessary.

How Smart Growth reduces vulnerability to climate change

Two specific impacts – increased storm water runoff and warmer summers – will be used as the focal point from which to assess the extent to which a Smart Growth strategy will decrease vulnerability to climate change and enhance adaptability to climate change in Central Ontario. An increase in runoff is expected to result from an increase in extreme precipitation events. It is expected that warmer summers will not be characterized so much by an increase in average temperature, but an increase in the severity, frequency and/or length of heat waves.

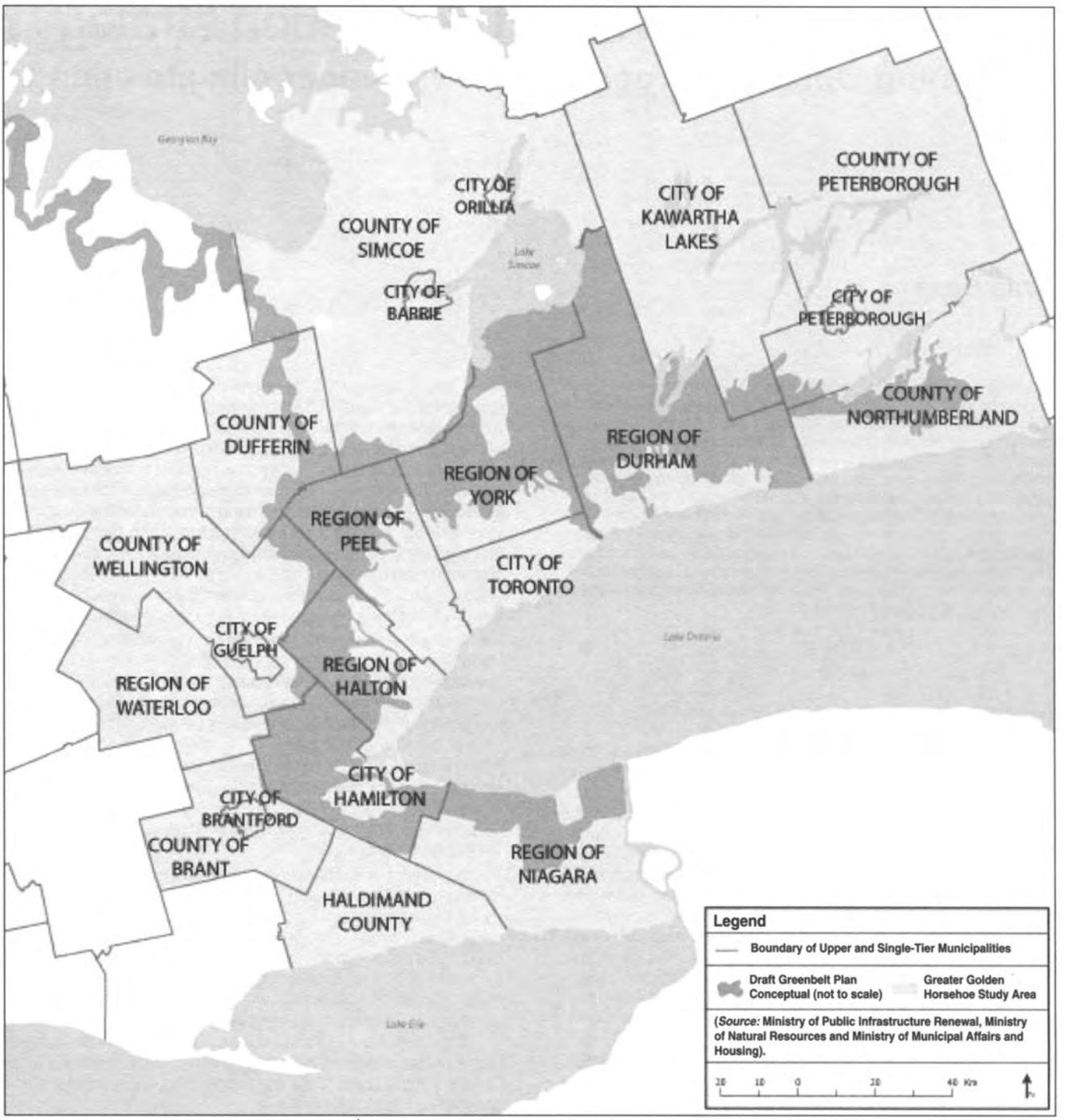

Fig. 1: The Greater Golden Horseshoe area, Ontario, Canada.

There are three objectives of Central Ontario's Smart Growth strategy, known as the Greater Golden Horseshoe Growth Plan (fig. 1) that would appear to reduce our vulnerability to both of these impacts:

- protecting green space;
- reducing congestion; and,
- compact development.

- **The designation of protected green spaces** and the restrictions on expanding urban boundaries suggest that the growth in impermeable surfaces, the root anthropogenic determinant of runoff, will be reduced or halted. Thus rain falling on these areas would not be expected to contribute to the total regional runoff and would not increase the risk of flooding due to higher spring stream flow, although this risk could be increased by other factors.

- **Reducing traffic congestion**, particularly within the urban core areas, and more compact development, would appear to be good adaptations to a warmer summer. All machinery contributes waste heat to the atmosphere, increasing the urban temperatures. Reducing traffic congestion would reduce the waste heat generated by idling automobiles and should have some impact on summer temperatures, although how large an impact is

not known. However, the severity of smog is also increased under warmer temperatures and traffic congestion. Reducing automobile emissions by reducing the use of automobiles would remove a source of pollutants for the formation of smog and is a logical adaptation to a warmer climate. Another benefit that might be expected from reducing the number of automobiles in the urban core is a decrease in traffic accidents, and their associated costs, due to inclement weather.

- **Compact development** would also appear to reduce our vulnerability to warmer summers as it allows for an optimization of infrastructure, particularly new infrastructure for delivering alternatives to electricity from Ontario's power grid. For example, providing air conditioning through a district approach, such as deep water cooling from a body of water, is more feasible with higher densities. This would reduce the dependency and the drain on the grid during periods of peak summer demand. Even without an alternative source for cooling, compact development should provide more opportunities for optimizing HVAC infrastructure, which should result in some energy savings during peak demand. Protecting green space would also reduce the geographic expansion of the urban heat island, an increase in urban temperatures as vegetation is replaced by hard, impermeable surfaces, typical of urban development. These surfaces absorb most of the incoming solar radiation, converting it to heat. On vegetation, a significant amount of incoming solar radiation is used for evapotranspiration and is bound up in the water molecules that are transported into the atmosphere. Hence, vegetated areas are cooler than non-vegetated areas.

Compact development also reduces the amount of new infrastructure required for drainage and sewage, thus freeing up additional funds that would otherwise have to be spent on maintenance and replacement of infrastructure. Although developers are responsible for installing the infrastructure for new developments, once the construction is complete, the responsibility for maintenance and replacement is turned over to the municipality. Low-density development on undeveloped green fields requires new infrastructure, which does not optimize the use of existing infrastructure, and requires more meters of pipe than higher density developments.

There are other ways in which the proposed regional growth management plan may decrease vulnerability to climate change. The designation and protection of greenbelts will provide corridors for biodiversity, which may be important as ecosystems adapt to a different climate. If this includes farmland as well (although only the tender fruit lands receive specific notice) it could provide an additional measure of food security. The Greenbelt Discussion paper also proposes to protect at least part of the urban forest, which is critical to reducing both runoff and the urban heat island (MINISTRY OF MUNICIPAL AFFAIRS AND HOUSING, 2004). The proposed plan also includes protection of watersheds. Without knowing if water supplies will remain at the current levels over the next 30 years, these watersheds may become increasingly important for supplying water throughout the region (figs. 1 and 2) and in maintaining the greenbelt around the Golden Horseshoe (MINISTRY OF MUNICIPAL AFFAIRS AND HOUSING, 2004).

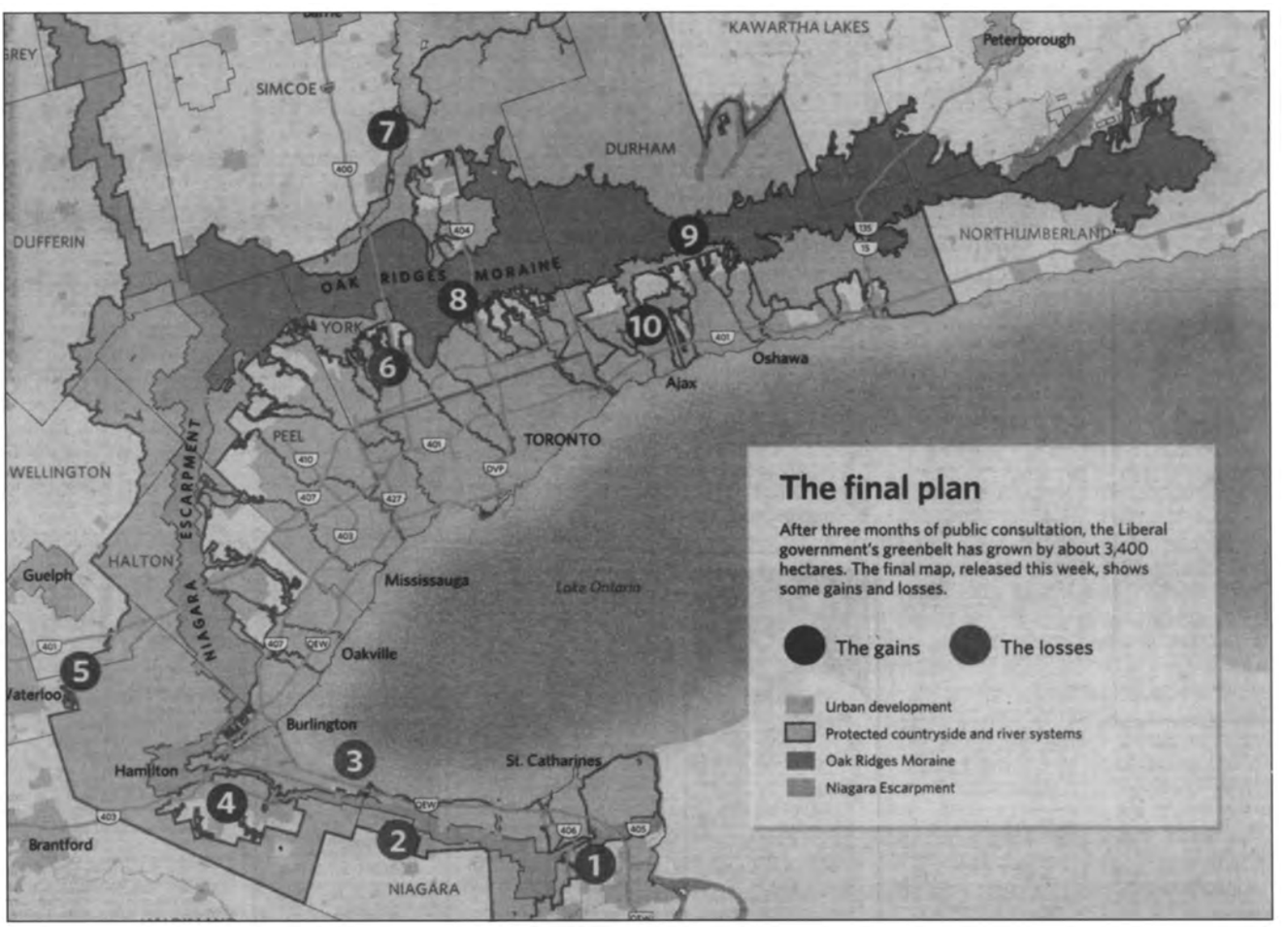

Fig. 2: Golden Horseshoe – The final plan.

How Smart Growth increases vulnerability to climate change

Just as Smart Growth may decrease the Golden Horseshoe's vulnerability to climate change, it may also increase its vulnerability. The discussion will be confined primarily to storm water runoff and warmer summer temperatures. In fact, many of the very features that were cited in the previous section are the very same features that have a deleterious effect on the region's ability to reduce the impacts of climate change.

Storm water runoff results from an inability of the surface to absorb the precipitation as it falls. Thus it runs overland, and in cities, into a drainage system. During a heavy precipitation event, the drainage system's capacity is often exceeded, which leads to other problems. In parts of the Golden Horseshoe region, the drainage and the sewage systems are combined. During a heavy rainfall event, the excess storm water is flushed through the sewage system, and without adequate storage, the sewage will be flushed out of the system before it can be treated, an event called combined sewer overflow (CSO). In other systems, and even in combined systems, the sheer amount of water leads to excess runoff and even floods.

In an urban environment, roads, sidewalks, driveways and parking lots generate a large amount of runoff, but a great deal is also generated by rooftops. One strategy for reducing storm water runoff is to reduce the amount of impermeable surface, and this is often done with vegetation. Typically, urban vegetation is reduced with higher commercial and residential densities. Thus higher densities will tend to increase storm water runoff, not only by squeezing out space for vegetation, but also by increasing the percentage of area in rooftops.

The argument that compacting urban growth reduces the impermeable surface on a regional level may not be relevant in the Golden Horseshoe. The region already features a large settlement area. The plan is to increase densities within this settlement envelope with no mention made about preserving a fixed amount of vegetation or reducing the impact of density on runoff. In fact, development will be allowed to proceed in areas within the settlement area that have already been designated, further reducing the amount of vegetation and replacing it with impermeable surfaces. In addition, the proposed growth plan does not prohibit future greenfield expansion. It will be allowed under certain conditions, and it will also be at higher densities, thus increasing the amount of impermeable surface, thus increasing the amount of storm water runoff. The protection of "municipal forests" is proposed solely in the context of recreation and culture (MINISTRY OF MUNICIPAL AFFAIRS AND HOUSING, 2004). Furthermore, it is not clear whether it applies to those urban forests that are only part of a network of green spaces or all trees.

The proposed growth management plan for the Golden Horseshoe region will also increase the vulnerability to warmer summers and heat waves. Typically, because of a reduction in vegetation, dense urban areas are warmer than their suburban and ex-urban counterparts – the phenomenon known as the urban heat island. The urban heat island has many ancillary costs, in addition to a decrease in thermal comfort. Every one degree Celsius rise in temperature increases electricity demand by at least 3.8 percent (LIU, 2003), which is a provincial average and may be higher within the Golden Horseshoe. This increase in demand places additional strain on Ontario's power grid leading to more pollution from Ontario's or US coal-fired generators (although this would be reduced upon the phase-out of coal-fired power in Ontario) and an increased risk of brown or blackouts. The higher temperature also increases the risk of morbidity and mortality for vulnerable populations, the severity of smog episodes and increased strain on the health care system (BASUR, 2000).

Increasing the density within the current settlement boundaries will increase the amount of surface area that creates waste heat. Further, high-density expansions beyond the envelope will only increase this surface area. Typically, an urban heat island may augment temperatures by 2-4 degrees Celsius, but in Toronto, urban heat islands of 6 and 10 degrees Celsius have been measured in transects from downtown Toronto through York Region (KOREN, 1997). If the proposed growth management plan creates higher densities within the existing settlement boundaries as well as additional higher density development outside the current boundaries, with no plan for preserving vegetation or mitigating the urban heat island, then cities in the Golden Horseshoe will experience even higher temperatures than expected under any scenario of future climate change.

There are other vulnerabilities related to climate change that have not been addressed in the Growth Management Plan at this stage, and are typically not addressed in Smart Growth. The plan for the Golden Horseshoe has identified priority nodes for infrastructure investment that will serve as "anchors" for high-density residential and commercial development. As these areas tend to be urban centers, there are opportunities to optimize the use of infrastructure and minimize the costs of new infrastructure. However, the plan provides no further discussion as to whether the existing infrastructure is adequate to cope with additional storm water runoff. Some of these nodes will also require additional infrastructure to meet the water and sewage needs of the projected growth. As this plan will take the region through the 2030s, it is surprisingly silent on future water supplies in the region under climate change; adaptations to cope with future uncertainties in the regional water supply; and potential conflicts between industrial, municipal, agricultural, recreational, shipping and energy stakeholders.

Discussions in the natural hazards area have also suggested that concentrating population in urban areas tends to increase societal vulnerability to extreme weather events, albeit with the recognition that cities tend to be better equipped to respond to emergencies (MILETI, 1999). This vulnerability has been highlighted with the 1998 ice storm in Montreal and Ottawa and the 2004 summer floods in Edmonton and Peterborough. There are also concerns about the construction standards for infrastructure under climate change. For example, it is expected that climatic design values will require updating, perhaps more frequently than in the past 50 years in order to ensure that the margins of safety are adequate. The climate variables that are the most important are winds, snow loads or snow packs, rainfall intensities, accumulated or antecedent rainfalls, cold and warm temperatures, wet bulb temperatures or other humidity variables, accumulated temperatures, and combinations of these variables with daily outputs as a minimum (AULD, 2004). The uncertainties of most of these elements in a climate change scenario are still high and the uncertainty of all elements increases at smaller time steps.

Modifying Smart Growth with green roofs

Smart Growth has emerged as a response to a real problem and its antecedent costs. The proposed Growth Management Plan for Central Ontario has the potential to both decrease and increase the region's vulnerability to climate change in different ways. The suggested modifications in this section provide the means to mitigate the increasing vulnerability by reducing the urban heat island and storm water runoff, without requiring major changes to the plan or the Government's policy directions. The simplest modification to deal with both storm water runoff and warmer summers is to add an urban vegetation component to the plan. The benefits of vegetation in an urban environment have been widely recognized and include reducing the urban heat island and storm water runoff, but extend to increasing biodiversity and improving mental well being (KAPLAN, 1995;

McPHERSON, 1994; McPHERSON et al., 1989; TERJUNG and O'ROURK, 1981).

One of the most important vegetative features in the urban environment is a tree. Being the largest piece of vegetation, trees magnify most of the benefits associated with vegetation as well as providing shade for people, animals and buildings. Being the largest also requires the most space. This requirement is under threat in many urban areas in the Golden Horseshoe, due to zoning restrictions in some areas and building densities in other areas. Although we tend to expect to minimize tree cover in a commercial high-density area, in some communities, the zoning restrictions have reduced the space in low-residential areas by two-thirds and even moderate zoning restrictions have reduced the available space by 25-30 percent (DUFFY, 1999: VRECANAK et al., 1989). Without any provisions for urban vegetation, we can reasonably expect that space for trees will be further reduced under a plan that will use a variety of incentives to encourage more compact development.

In addition to trees, parks are another important green space in urban environments. The demand at certain times of the day already taxes the existing supply in the GTA and exceeds it in the City of Toronto. For example, there are insufficient parks in downtown Toronto to support the enrolment in soccer leagues that is supported throughout the region. A recent survey of downtown residents in a University of Toronto married student residence highlighted the lack of recreational amenity space for families in the downtown core (SMIRNAKIS, 2003). It does not appear that parkland will increase in downtown Toronto under a Smart Growth policy.

There are several ways the plan could be modified, without sacrificing the requisite densities, to incorporate vegetation. The plan already ties future expansion beyond the existing settlement boundaries to several criteria, including the protection of natural heritage systems. The Greenbelt Taskforce Discussion Paper mentions the identification of existing and potential public parks and open spaces, and the task force is considering the protection of a network of public open spaces, including municipal parks and forests. These could be strengthened to provide for parkland, but it is important not to restrict urban vegetation solely to parks, but to incorporate it into all parts of the urban fabric to reap the full benefits. The City of Toronto's Wet Weather Flow Plan is also a model for incorporating storm water runoff reduction features into medium and higher density areas (WORKS AND EMERGENCY SERVICES, 2003).

Incorporating spaces for full-grown, mature trees is difficult in high-density areas, but this has been done in other cities such as Portland, Oregon, USA. It requires recognition of the importance of trees; planning for trees; and designing roads and walkways to allow the requisite space. In some urban areas, this is no longer possible, but there are other options. Shrubs provide many of the same benefits as trees and require less space. Rooftops and walls provide another option. Although they are similar to desert environments and contribute to the urban heat island, this effect can be mitigated through covering these surfaces with vegetation.

Green roofs are a thriving industry in Germany and other European countries, often backed up by legislation that requires the conservation or restoration of vegetation in urban areas. Green roofs in particular have been shown to reduce the urban heat island and to reduce storm water runoff. Green roofs and walls reduce the urban heat island by utilizing incoming solar energy for evapotranspiration, thereby cooling rooftop temperatures from 60 degrees Celsius or more to as low as 25 degrees Celsius. Green roofs also provide additional shade and insulation to a building, which, in combination with the evaporative cooling, reduces the requirements for air conditioning, more so in smaller buildings than large, multi-storey buildings. However, green walls can be designed to achieve significant reductions in summer electricity demand, even on multi-storey buildings. Green roofs store water in the growth medium, but include a drainage layer to store excess water, thus providing means to store rainfall or at least delay its entry into the drainage system during a storm. They can be designed to minimize runoff with deeper drainage layers, and increase depth of growing medium and broad, leafy plants that intercept most of the vegetation.

Green roofs can be designed to accommodate a variety of uses and building conditions and capacity for increased loading on the roof. For example, the residents of the aforementioned University of Toronto residence now have access to recreational green space on one of the roofs that is accessible from a Parent Drop-in Centre, a meeting room and the laundry room. It provides a safe and secure environment for children to play and ride tricycles. Green roofs can support a wide range of biodiversity or they can resemble other less-diverse landscapes, such as turf grass; they can support food production; and they can be designed to be used as parkland.

One element of the proposed growth management plan is the protection of employment lands in urban areas. Employment lands are often characterized by large, one-storey buildings on large lots of land as the design is adaptable to changing use and access is often required for trucks. Protecting employment lands is a difficult task for municipalities and not a popular political issue. Yet, these are the very buildings that could benefit the most from, and are the most amenable to, green roofs, and in some areas they have enough space to support substantial tree growth. Thus the employment lands – which are difficult to defend given the increased demand for housing, their apparent negative environmental connotations and the fact that they often sit vacant for long periods of time – can become the environmental heart of an urban area by providing green space to cool the city; reducing the impact on the drainage grid, perhaps using the roofs to recycle water; and providing an option for rooftop parkland.

There are other measures that can be used to cope with both increasing runoff and the urban heat island. The worst effects of runoff, flooding, could be dealt with reactively, using a series of low-cost barriers that can be wrapped around the lowest levels of buildings, preventing some of the damage associated with high water levels. The polluting effects of combined sewer overflow can also be mitigated by building large storage tanks to hold the overflow until it can be treated, or separate sewage and drainage systems, both of which represent significant infrastructure investments. Inlet control devices can be installed over sewer grates. These act to delay the flow of runoff into the drainage system, turning the street into a storage tank, although the local residents have to adapt to what appears to be a small flood during each rain event, and the risk of local floods may be increased during severe storms. Even roof runoff can be contained by using roofs as storage reservoirs or using holding tanks within buildings.

The urban heat island can be reduced through the use of reflective or white surfaces, and various demand management strategies or technologies can be used to reduce the demand for electricity from the grid during peak demand times. However, urban vegetation provides a range of benefits, some of which cannot be easily replicated by other approaches. It is also the simplest and least-cost strategy to reduce the vulnerability to runoff and the urban heat island in Central Ontario, while maintaining the benefits of Smart Growth. However, the other areas of climate change vulnerability, such as the uncertainty of future water supplies or the standards required for new infrastructure need to be addressed through other means.

Planning for urban expansion could also be conditioned on projected water supplies over the next 30 years. Although these future supplies cannot be predicted with certainty, the Growth Management Plan could be modified to include at least two climate scenarios in planning the expansion of any particular urban area in order to increase the certainty about future water sup-

plies. The model for this is Bill 160, The Emergency Management Act, in Ontario that mandates that each municipality develop a plan for emergencies. Environment Canada currently provides climate information for municipalities to assess the risks of meteorological hazards on a website devoted to supporting this bill (ENVIRONMENT CANADA, 2004). Environment Canada's Climate Impact Scenarios website could be used for the same purpose.

Conclusions

The Growth Management Plan for Central Ontario will increase and decrease vulnerability to climate change in different ways. At this point, it is not clear which trend is stronger. However, a strategy to increase urban vegetation will confer many benefits that are currently inadequately addressed in the Growth Management and Greenbelt Taskforce Discussion Papers. An urban vegetation strategy will also reinforce those elements of the Growth Management Plan that reduce the region's vulnerability to climate change. Reducing energy consumption due to the urban heat island will increase the effectiveness of energy infrastructure that can take advantage of compact development and will reinforce the benefits of reducing traffic congestion. Reducing the additional storm water runoff from increased roof area will reinforce the reductions of the potential regional runoff that would follow a business-as-usual development scenario.

The introduction of an urban vegetation strategy would complement the proposed Green Belt protection legislation and build on the specific proposal for protecting the municipal forests in the Green Belt Discussion paper. The Province of Ontario is currently reviewing the Planning Act, the Provincial Policy Statements and developing the Growth Management Strategy for the Greater Golden Horseshoe. These policy initiatives provide the vehicles for developing an urban vegetation strategy, and beyond. In addition, a policy that specified vegetation, including green roofs, could be used to increase the marketability of Growth Management Plan in Ontario, as demonstrated in several other case studies (LODER, 2004).

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Financial incentives for behavioral change in the ecological city

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Trends and issues

An Ecological City can be defined as "a city that provides an acceptable standard of living for its human occupants without depleting the ecosystems and bio-geochemical cycles on which it depends" (WHITE, 2002, pp. 3-4). Ideally, this means that an Ecological City discharges *no* unwanted residuals to the atmospheric, terrestrial and hydrological components of the surrounding biosphere. Specifically, this means that a city would emit *no* problematic gases, solids or liquids – no air pollution, no solid waste and no impure water. Clearly, the cities we inhabit are a very long way from this kind of ideal. Modern cities are *not* "ecological" in the sense defined above. In fairness to urban planners and urban managers, cities were never designed for zero ecological impact. Cities were designed to provide shelter and services, and to manufacture goods. Some had loftier aesthetic and spiritual purposes, but most were based on short-term, least-cost reasoning.

Not only are cities not physically designed to exist in harmony with the biosphere, but none of the key price signals have been set to encourage resource conservation or to minimize waste. Prices for services such as water and sewage treatment, transportation and solid waste management have evolved – at best – to meet some cost-recovery criteria. Even these criteria have not been pursued systematically.

This approach has produced cities that are extremely dysfunctional from an ecological standpoint. For example, traffic congestion is an almost universal feature of cities today. It is commonplace for "travellers" to spend more of their journey time immobile than mobile. Even 15 years ago, the engineers of the City of Toronto calculated that only 25 percent of the energy consumed by vehicles was used for motion – the rest is wasted (WHITE, 1994). The traffic situation in Toronto has greatly deteriorated since that time. For solid waste management, the situation has declined even further. The City's waste used to be taken to a landfill just north of the city boundary. When that landfill was closed in 1998, the "best solution" was identified as trucking the waste to a landfill in Michigan, some 450 km distant! Every day, between 120 and 140 trucks make the round trip, each carrying approximately 30 tonnes of solid waste. For air pollution, there have been some improvements for large particulates, carbon monoxide, lead and sulphates. However, for hydrocarbons and carbon dioxide, the situation has deteriorated further. Improvements in fuel and engine efficiency are far outweighed by increases in the number of vehicle-trips and the greater length of those trips. None of these trends is carrying us towards the goals of the Ecological City.

It might be assumed that a cleaner, healthier urban environment could be achieved only by restricting individual freedom, such as the freedom to pollute and to waste resources. That is not what is being proposed in this paper. On the contrary, the research question is: Are there changes that could be made to urban systems that would give the individual *more* choice, make the city less vulnerable, *and* provide the city with more revenue, from more diverse sources? More specifically, can we provide individuals and households with financial incentives to change their behavior?

This paper continues with a brief assessment of the implications of climate change for water availability and an introduction to the emerging field of urban environmental finance. It then assesses the potential for the application of the principles of urban environmental finance to the three main physical throughputs of water, energy and solid waste.

Water availability and climate change

Water quality is the single most important contributor to human health in both rural and urban areas. In urban areas, the greater density of settlement increases the risk of the spread of contagious diseases associated with poor water quality, as has been witnessed on a regular basis, especially with typhoid, cholera

and yellow fever. These diseases were largely checked in Western cities towards the close of the 19th century. They may still be a problem in poorer cities, along with other water-related diseases such as gastro-enteritis, hepatitis and malaria.

However, even in the richest cities we cannot afford to be complacent about water, either in quality or quantity. Cities like Los Angeles, located in a semi-arid region, are constantly looking for new sources of water. Even cities like Toronto and London face increasing costs for ensuring continuity of supply. For example, Thames Water in the UK has presented a proposal to build a desalination plant with a daily capacity to treat 150 million liters for the east London area, citing increasing demand per household, increasing population (800,000 people expected by 2016) and climate change (THAMES WATER, 2005). The proposal has been vetoed by the Mayor of London on the grounds that conservation is what is needed, rather than increasing supply, which is not a long-term solution.

Climate change will introduce a host of new challenges, including many related directly to water supply (WHITE, 2004). Although the global implications of climate change for average temperatures are quite well understood and quite predictable under the 'business as usual' scenario, little else is predictable (IPCC, 2001). Most fundamentally, business and government may not proceed "as usual" but may become very proactive toward the reduction of greenhouse gas emissions. Under the "business as usual" scenario, regional projections are subject to wide bands of uncertainty even for temperature, and more so for precipitation, wind and other atmospheric variables. What can be assumed is that the level of uncertainty for all these parameters will increase. It seems reasonable to further assume that, if we wish to maintain the same level of security under more uncertainty, then the costs of building and running urban infrastructure will increase.

The specific risks and uncertainties for the urban environment, under climate change, are:

- an increase in the probability of heavy precipitation events;
- these storms may affect water quality, through increased overland flow and disease transmission, such as *Giardia, E. Coli and Cryptosporidium;*
- these storms increase the probability of floods, including floods in urban areas;
- an increase in the probability of droughts;
- increased evapotranspiration, causing reservoir losses;
- a shift in disease vectors, especially malaria;
- more heat waves increasing the probability of deaths from heat stress, especially when added to the temperature increase due to the urban heat island effect; and,
- higher temperatures increasing the risk of wildfires in wooded areas adjacent to urban areas, as we have seen recently in southern France, south-east Australia, California and British Columbia.

Thus, climate change must be added to the main drivers that affect the future evolution of urban areas, along with population increase, an increasing percentage of the world's population living in urban areas, an increased level of material consumption and the disposal of residuals into the surrounding environment.

Urban environmental finance

Traditionally, urban services have been funded from revenue streams that might be completely unrelated to the use of the service or its impact on the environment (KITCHEN, 2000). Specifically, many urban governments rely heavily on residential and commercial property taxes. The tax is proportional to the value of the property and thus would be loosely correlated with the level of use of urban services. Transfers from senior levels of government are another important source of income. Urban governments also charge fees for a variety of services, such as parking fees and vending licences, as well as services such as the provision of water. Some urban governments have access to sales tax and some are able to tax company profits. None of these sources are linked closely enough to the environmental impacts of human behavior to act in a way that might modify that behavior (OPOKU-BOATENG, 2004).

Market-based instruments are now being applied to influence environmental outcomes directly in several countries and, internationally through the Kyoto Protocol, to the Framework Convention on Climate Change. The emerging field of environmental finance has been developed in order to address global environmental issues such as climate change and the extreme and unpredictable weather associated with it by using market-based instruments (LABATT and WHITE, 2002). Important products developed to date include trading credits for reducing emissions of pollutants (such as sulphur dioxide and carbon dioxide), weather derivatives (to hedge the risk of adverse weather), catastrophe bonds (to cover catastrophic risks such as hurricanes and earthquakes) and cost-cap-over-run insurance to cover unexpected costs for brownfield remediation. The field is expected to become an important force for improving environmental quality and reducing the financial impact of climate change.

With reference to principles for the successful trading of credits for emission reductions, Richard Sandor observed; "These core elements simultaneously assure environmental integrity, cost reduction, efficient trading and valid price discovery. They include: clear rules on emission monitoring and non-compliance penalties; unimpeded trading; fully fungible trading instruments; public-private partnerships to achieve transparent prices" (SANDOR, 2000, p. 11). Trading in emission reduction credits for sulphur dioxide and nitrogen oxides continues to evolve and now includes contracts for futures and derivatives (BIELLO, 2005). The European Union Emissions Trading Scheme (for carbon dioxide emission reduction credits) was launched on schedule in January 2005; finally we can identify "the price of carbon" (NICHOLLS, 2005).

In the urban context, local environmental issues are those associated with the basic elements of urban metabolism – inflows of water, energy and food, and outflows of solid waste, gaseous exhaust and wastewater (WHITE, 1994, Chapter Three). Can the market principles – identified by Sandor – be harnessed to provide more of what we need (goods and services) and less of what we do not need (wastes)? Finance is the key, *both to raise revenue, and to change behavior* (OPOKU-BOATENG, 2005). The reason we have so many avoidable problems in the urban environment is that we have sent the wrong price signals, and failed to internalize environmental externalities. The challenge is to understand the balance between these two facets – raising revenue and changing behavior – because a radical change in behavior may reduce the revenue stream, or fail to raise enough revenue to carry out the plan (OPOKU-BOATENG, 2005).

Given our lack of experience with this approach, it is difficult to predict accurately the impact on behavior. For example, the imposition of a traffic congestion charge in London in February 2003 has reduced peak congestion (by 30 percent) and increased bus ridership (by 14 percent) but "charge revenues have been lower and penalty revenues higher than anticipated" (LITMAN, 2005). The biggest surprise has been the rapid change in local opinion from (sometimes fierce) opposition to support for the scheme. The feared negative impacts on local businesses and the diversion of traffic to streets bordering the "charge zone" have proved to be insignificant (TRANSPORT FOR LONDON, 2005). The phrase "situated in the congestion charge zone" has even been used to advertise multi-million dollar townhouses, because being "in the zone" is an indicator of centrality and the residents of the zone are entitled to a 90 percent re-

bate on any charges that they pay. In the second year of operation of the congestion charge, net revenue amounted to US$ 175 million (£ 97 million), of which 80 percent will be spent on improving the bus network (TRANSPORT FOR LONDON, 2005).

Another recurrent concern is the welfare implication of user fees. For example, if water is to be priced for full cost recovery, how can the necessary minimum use be assured for low-income people? Similar examples can be found for solid waste management, energy for heating and cooling homes, transportation for the disabled, and so on. In addition to the welfare implications, there are direct health implications for all of these services, especially for water availability, air quality, climate change and waste management. All of these issues can be addressed on a case-by-case basis. A concern for the potential negative welfare implications of "true pricing" should not be used as an excuse for delaying reform forever. Indeed, in the water sector, under un-metered regimes, the poor (in apartments and smaller houses) subsidize those rich households which water large gardens.

Pricing that produces full-cost recovery may be implemented in either the public sector or the private sector. That is, pricing and ownership are separate issues. This fact is not always recognized in the arena of public debate where the issue often becomes emotionally charged to the detriment of analysis (BUDDS and McGRANAHAN, 2003). Because some privatization experiences have had very negative consequences (mostly in developing countries), there is widespread suspicion of privatization as a policy, especially in the water and sewage treatment sector. The fear is that companies will put profits and their shareholders before the public good.

A further objection to privatizing utilities and services is that the supposed competitive drive of the private sector does not come into play in these monopolistic situations. There is some validity to this observation, because it is true that the visible competition that is present between shopkeepers, people selling homes, or other recognized commodities does not exist for most urban infrastructure and related services. However, usually there are *elements* of competition. In the case of the English water supply, it is true that the consumers have only one supplier, but the economic regulator of the water industry – the Office of Water Services (OfWat) – has access to the pricing policies of several companies operating in similar markets. Thus – in the sense that prices must be approved by OfWat – these companies are in competition with one another to perform efficiently.

The other respect in which the competitive force can be brought into play is when the contract to design, build and operate a utility or service is put out to tender. Once awarded, the contract should be regularly reviewed for performance. This requires the regulatory bodies to operate in an effective and transparent manner, which cannot simply be assumed.

It is not easy to move from the traditional public sector supply system to one in which the private sector has an important role and in which prices are employed explicitly to move towards environmental targets, such as zero solid waste, zero harmful emissions to the air and 100 percent re-use of water. Pricing policy in a typical city today considers hardly any of these environmental quality issues, and none in a comprehensive manner. *Many pricing structures actually encourage wasteful behavior.* The situation is generally better in Europe than in North America but nowhere does it approach the goal of the Ecological City.

Water

Water is not only the most critical resource but is also the one that is most seriously mismanaged. The biggest waste of water occurs outside the city on the irrigated farm and is therefore outside the scope of this paper. However, some cities, such as Beijing and Los Angeles are now in direct competition with their rural hinterlands for water. In the worst urban cases, household water use is not even metered, but is simply made available in unlimited quantities for a fixed fee that is sometimes related to a property tax. This does *nothing* to encourage conservation. Indeed, it encourages a very inefficient peak use in the late afternoon in the summer as residents who have gardens water them profligately. In North America, this peak is several times larger than peak use in winter.

The overall environmental objective should be to approach 100 percent re-use of the water supply. Technically there is no reason why this could not be done. It would be much more efficient than the current systems in which cities (until recently) assumed that they could operate as a "free rider" on the natural hydrological cycle. As water becomes less freely available, we need to move towards a system based on 100 percent metered use with ascending block prices to encourage conservation. The price charged to users should be sufficient to cover both capital and recurrent costs of water use and treatment. The welfare and public health issues can be dealt with by making the lowest price block affordable to low-income people and sufficient to cover reasonable needs, such as 200 litres per person per day. Many cities are a very long way from this sort of target. In Toronto, even those households that are metered pay only US$1.12 (CAD1.37) per cubic meter for water, including sewage treatment.[1] Thus the daily charge for water use and sewage treatment, for a family of five people using 200 liters per person per day, is less than the price of a single cup of coffee.

Stormwater management is also being brought into the fee-for-service realm with the introduction of stormwater user fees based on the quantity and quality of runoff. Although more than 400 such schemes are operating in the United States, only three are operating in Canada (SMEH, 2003). The fees encourage the maintenance of porous surfaces and the control of contaminants discharged to the environment. Unfortunately, they do not curb the significant deposition of contaminants from motor vehicle exhaust.

Energy

Like water pricing policy, energy pricing policy has evolved without any regard for environmental consequences. The general objective within the framework of the Ecological City is to provide energy for a variety of purposes (the provision of manufacturing, administration and services; mobility, lighting, space heating and cooling, cooking, etc.) without damaging the environment or compromising human health. The transportation sector and its emissions to the air, which reduce air quality and change the climate, are major problems. Recently, attention has focused on the connection between the use of personal transportation and obesity. In North America, people in the suburbs, on average, weigh more than people living downtown who make more use of walking, cycling and public transport (FRANK et al., 2003). The final irony is that the automobile no longer delivers the service which people thought they had bought – an efficient means of personal mobility. As the suburbs sprawl and automobile use expands, more and more time on the road is spent in traffic jams.

There are various approaches to this conundrum. Many European cities have simply banned automobiles from the historic core, which was never designed for such traffic. Others have introduced congestion charges. The recent London example is not very sophisticated, being a set daily charge for entering the central part of the city. The price is fixed arbitrarily by the government. More ambitiously, Singapore has introduced a dynamic, market-based congestion charge that fluctuates with the degree of congestion. As congestion gets worse, the fee (which is deducted from an account) increases.

Electronic Road Pricing (ERP) ... uses a dedicated short-range radio communication system to deduct ERP charges from "smartcards" inserted in ... vehicles each time they pass a pricing point when the system is in operation. The pay-when-you-use principle helps make motorists more aware of the true cost of driving (GOVERNMENT OF SINGAPORE, 2004).

Some cities have tolls on ring roads and cross-town expressways. Others charge nothing for road use other than the vehicle tax and fuel tax. To improve the situation, we need to find financial instruments that will shift the transportation modal split from private automobiles to public transport, cycling and walking. This, in turn, will oblige energy-intensive travellers to pay for the environmental costs (as well as the congestion) which they generate.

Climate change has added a sense of urgency to the air quality and inefficiency implications of the transportation sector. Coupled with concerns about indoor air quality in the home and in the workplace, energy conservation has become a major focus for municipalities around the world, especially if they belong to the Cities for Climate Protection program established in 1993 by the International Council for Local Environmental Initiatives (BULLEID, 2005). As more data become available, it is easier to make the financial case for investing in environmental quality, for the household, the company, and the municipality.

Solid waste

As cities have become larger and more complex, their solid waste streams have become larger and more contaminated. In pre-industrial cities, most of the waste stream was organic and could be left to decompose, *in situ*. Today, the collection and disposal of solid waste – usually to a landfill outside the city – has become a significant municipal expenditure. Beyond the expense, a growing problem has evolved with resistance from local communities to accepting urban waste for various reasons, including odor, noise and dust, health fears, and impact on housing prices. As noted earlier, this problem has become so severe in the Toronto area that the city's waste is currently being shipped to Michigan.

It is not unreasonable to expect a city to take care of its own solid waste, rather than exporting it to an unwilling host community. Several means have been attempted to move in this direction. Much of household solid waste can be recycled, keeping the organics for compost (if a garden is available) and having reusable material – such as paper, plastic, glass, and metals – collected by the municipality or a private body. In most cities where these options exist, compliance is voluntary. These measures alone can reduce solid waste going to landfill by 80 percent per participating household.

It is more effective to tackle the problem of solid waste generation at source by making the manufacturers and retailers accept "producer responsibility." This was introduced in the European Union in 1994 with the Directive on Packaging and Packaging Waste (McCALLIN, 2003). Many municipalities have some form of take-back responsibility, if only for certain types of bottles, such as those for beer and soft drinks.

A more price-oriented approach can be developed in two ways – by paying the consumer for separating the recycled materials (as in the bottle-retum programs), and by charging the consumer for any waste that has to go to landfill. There is some fear that the latter approach will encourage people to abandon their waste illegally but the evidence on this is inconclusive. Where consumers do have to pay per bag for waste removal, there is more obvious political support for obliging the producers to reduce waste materials at source by providing appropriate packaging which can be returned, re-used or recycled. In scientific terms, this is not a profound problem and it should be within our capacity to reduce solid waste close to zero.

The role of market forces and the role of privatization

Without succumbing to a naïve belief that if "we get the prices right" all our urban environmental problems will be solved, it should be evident that we can do much better than most cities currently do in attempting to get some of the prices moving in the right direction. It should be possible to agree that prices (or lack of them) should not encourage individuals to squander resources that are then paid for by the community at large. Whereas there is little support for insisting that everyone pay for the necessities of life, there should be a great deal of support for the view that people should pay for the damage they choose to cause, the resources they choose to squander and the waste they choose to generate. Those choices could certainly be made subject to realistic (i.e. full cost recovery) charges.

The potential benefits from using prices to encourage more environmentally friendly behavior are huge. For example, a city may not need a new sewage treatment plant if it can reduce both the contaminants entering the wastewater stream and the quantity of stormwater running into that stream.

The goal of using prices to encourage environmentally friendly behavior is quite separate from the potential of privatization for encouraging this change in behavior to take place. After several years of recent experience, the approach to this issue has become more pragmatic and less ideological. For those in favor of privatization, the advantages are that the private sector, driven by competition and the search for profits, is more efficient than the public sector. Prices may rise in the short term as investment deficiencies (in deferred maintenance and modernization) are made good but, in the longer run, prices would fall. For those opposed to privatization, the risks are seen as loss of employment as workforces are downsized and soaring prices as the consumers are sacrificed to the company's shareholders.

In practice, the quality of the outcome depends on the quality of the public regulation of private companies delivering services to the general public. In England, where the water supply and treatment sector was privatized in the early 1990s, there have been negative experiences, such as lack of water supply and public health impacts, but also much has been learned (BAKKER, 2000). The process by which the system is monitored is much more transparent than it was when run by dozens of separate municipalities and public water boards. The government will continue to regulate price changes and supervise quality standards.

Conclusion

There is little reason to fear that a coherent, environmentally oriented pricing policy for urban services will have negative welfare implications. On the contrary it is the lack of any coherent approach to pricing that is unjust. Why should the relatively poor pay for the relatively rich to water their lawns? Yet that is what happens if a water system is un-metered. Why should those who walk, cycle or take public transit absorb the environmental burden from automobiles? Why should the frugal pay for the disposal of the solid waste of the profligate? No one would argue in favor of these effects of this kind of approach to pricing – yet, in many cities, this is exactly the way the system works.

Given that cities are very inefficient from a metabolic point of view, why is more not being done? The will to change seems to be there as is evidenced by statements such as the Nagoya Declaration (1997) and the Charter of European Cities and Towns Towards Sustainability (the Aalborg Charter, 1994). The Council for Local Environmental Initiatives was established in 1990 and is associated with the International Union of Local Authorities (WHITE, 2002, Chapter 11, Appendices 1 and 2). From the Rio Earth Summit in 1992, a notable outcome was "Local

Agenda 21" which established environmental goals for local authorities throughout the world.

It could be argued that in most cities, the situation is getting worse, despite some evidence of innovation. As poorer countries become richer, most of them seem determined to follow the "development path" of the richer countries, despite the obvious dangers. (Daily, we read of streets in China's big cities being closed to bicycles so that automobiles may have a freer passage). The barriers to improvement are the usual barriers to innovation. Decision makers and the public are preoccupied with seemingly more pressing matters. There is limited awareness of those cases where innovation has been successful. And, finally, the cost of implementation is often seen as a barrier. Yet, the financing of the Ecological City should be cost-effective if it is approached in an experimental fashion or if we can devise effective behavior modification pricing mechanisms such as a dynamic congestion charge for road use.

Some lessons from the general field of environmental finance are encouraging. The first, large-scale environmental market was established for credits for emission reductions for sulphur dioxide and nitrogen oxides in the north-eastern United States in 1995 through the Environmental Protection Agency (SANDOR, 2000). Despite widespread opposition on grounds of the expected cost of compliance, the credits traded, for several years, at less than one quarter the price predicted by the opponents of the scheme, and the reduction targets were achieved ahead of schedule.

Similar savings should be possible within the urban context from using water more efficiently, reducing the amount of solid waste we produce, and shifting the transportation modal split to less destructive modes of travel than the automobile. There is no technological obstacle to building an Ecological City. Perhaps there is no financial obstacle either.

In the globalized economy, cities are said to be in economic competition with one another. In the 19th century, when cities used to compete regionally for investment, employment, and hence sources of tax revenue, there was an incentive for municipalities and regional governments to offer cheap infrastructure in order to attract employment. To a large extent, we are still living with this mindset, expecting to provide cheap energy, cheap water and cheap transportation, subsidized by the taxpayer via public sector investment. However, there is a growing awareness that resources are becoming scarcer and that low environmental standards carry a measurable health penalty in the form of water-related disease, respiratory illness and automobile accidents. International terrorism has added to this sense of vulnerability. Perhaps this means that municipal governments should focus on environmental quality, resilience and efficiency as incentives for potential corporate investors – rather than the old strategy of cheap energy, cheap water and subsidized infrastructure for automobiles.

Note

1. This is the price for the first 80 cu.m in a four-month billing period. The next block is US$ 1.16 (CAD1.41).

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The environmental costs of femininity

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Introduction

Consumer goods transmit persuasive but stealthy political messages about the culture that created them (McCRACKEN, 1990, p. 133). Thus, clothing, furnishings, and other fashionable items have a significant role in a period's social ideology and identity. Cosmetics or skin care products help shape and simultaneously reinforce societal perceptions of women, their primary consumers. First, as visibly worn products, cosmetics act as evidence of imperfection and image-consciousness. Second, as an industry, cosmetic companies put forth massive expenditures on advertising to convince women to continue consuming, continue being "image conscious." Thus, cosmetics production and use is a self-reinforcing cycle, generally with corporations as the dominant power – and consumers, unless they consciously resist, as manipulated subjects (BARNUM, 2003).

Cosmetics contain chemicals, both synthetic and organic. Nevertheless, they have evaded the high public perception of personal health and environmental risk that other related industries such as petroleum, paints and coatings, and adherents and sealings bear (POWELL, 2004). This lower chemical risk perception is generally warranted, as it is estimated that only between 2 and 5 percent of adult users will report adverse reactions to cosmetic products (*Canada Gazette, Part I*, 2004, p. 853). Yet these reactions can be extremely serious, and debilitating to affected individuals. A recent *Gazette* highlighted some particularly shocking effects, such as:

- redness, swelling of the arms and legs as well as a general feeling of weakness and difficulty breathing, following a cream application to a person's body;
- within two days of applying hair spray to a child's head, the hair began falling out; a month later, 30 percent was gone, and it continues to fall out;
- after applying a product to her face, a woman's face became so swollen that she could barely see and her face was unrecognizable.

Hazardous chemicals are present in only small amounts in cosmetic products, a minority among over 10,000 ingredients (*Canada Gazette, Part I*, 2004, p. 853). Still, when the larger picture of manufacturing, packaging, and cumulative personal exposure is addressed, even these traces increase enormously in significance. Further, for those individuals who are impacted, harmful additives can have long-term consequences.

Legally, cosmetics are different than drugs. Cosmetics are intended to improve an individual's appearance with no therapeutic effects, while drugs actually affect the body's functions (*Canadian Food and Drugs Act C.R.C., C. 869*; POWELL, 2004; LYMAN, 2003). Thus, labelling requirements on cosmetic products in Canada are currently much less stringent than those applied to drugs. These minimal labelling requirements are currently under governmental review, and could become more aggressive.

The intensely intimate and value-charged relationship that consumers, especially women, have with skin care products, necessarily separates them from other chemical industries. Use of petroleum products is not a suggested man-catching strategy! And, although a new coat of paint in an old familiar room may perk up the average housewife, few would recommend, as Nancy Daggett did in her 1952 *Homemaker's Encyclopaedia: Personal Beauty and Charm*, that daily application, like cosmetics, regardless of one's position, "builds morale."

The mildly threatening, omnipresent nature of cosmetic advertising and pseudo-compulsory application of skin care products for many women make this industry a pressing area for feminist and environmentalist research. This paper explores some of the costs – environmental, social, physical, and cultural – associated with stereotypical feminine behavior, in particular through the lens of cosmetics.

A study of perceptions

The skin care industry constitutes an appropriate case study to demonstrate the link between women's appearance, corporate advertising, the women's movement and environmental degradation. Women dominate household consumption overall, and marketing for household products, from fridges to cleaners, reflects their consumer base both historically and at present (CAIN, 1996). Yet, the skin care industry is perhaps the most dramatic example of a feminized industry. Values Facilitator for The Body Shop, Rifka Khalilieh (2004) observes that 85 to 90 percent of its consumers are women. The skin care industry also spends "proportionately more on advertising than any other major industry group": generally 6 to 20 percent of sales are allocated to advertising expenses (CHAPKIS, 1986). As estimates of total cos-

metics sales in Canada total over $5.3 billion annually, this amounts to one colossal advertising budget (*Canada Gazette, Part I,* 2004, p. 852).

Yet this investment does not negatively impact the profitability of cosmetics. The industry frequently packages inexpensive products and sells them dearly, thus making its profit margins quite remarkable (CHAPKIS, 1986, p. 93). Indeed, Chapkis estimates that only seven cents of a consumer's dollar goes to actual cosmetic ingredients. Finally, as the skin care industry inherently sells beauty, youth and glamor, consumers are willing to splurge – indeed, will often choose a similar but more expensive product, in hopes of better results (CHAPKIS, 1986, p. 93).

The link between cosmetics and human and environmental health is counter-intuitive to most consumers, which is what makes this case a particularly interesting example. Since skin care products are comprised of chemicals, they should be included in a listing of "chemical industries" – an inclusion they vigorously resist, with the notable exception of the "Aveda" line which is ISO 14001 certified according to its *2001/2002 Ceres Report*. Even so-called "natural" products can include such harmful ingredients, in manufacture and packaging, as polyvinyl chloride (PVC) plastics, or use base ingredients such as sodium laurel sulphate and phthalates. This discrepancy between what consumers often understand "natural" to mean and what the products actually contain leads Mary McGrath (2004) and others to recommend a rigorous cosmetic labelling system with standardized, mandatory listed degrees of environmental and human toxicity.

As Rona Abramovitch (2004) noted, many individuals not directly involved in environmental work are unlikely to consider the chemical composition of their skin care products, instead trusting that authorities such as policy makers, cosmeticians, hair stylists, and pharmacists will ensure their safety. On a purely chemical level, if they are not pregnant and use skin care products in moderate amounts, this low level of risk perception seems justified. Yet, considering the skin care industry on a larger scale, with manufacturing, testing, production, distribution, eventual disposal, and corporate advertising power, a more troubling picture regarding environmental and human health appears.

Consequently, in 2003-2004, I conducted a study to further explore perceptions of the cosmetics industry. Comparative quantitative analysis of the chemical composition of cosmetics has already been undertaken by qualified groups. For instance, a 2002 report, *Not Too Pretty: Phthalates, Beauty Products & the FDA*, could be used by other researchers as a template for feminist research into beauty product composition and health impacts (HOULIHAN et al., 2002). Other industry literature proved inaccessible to the general public (i.e. advertising standards of the Cosmetic, Toiletry and Fragrance Association). A Freedom of Information inquiry into these standards, although time-consuming and expensive, could prove extremely valuable.

Nevertheless, much has been written about the relationship between advertised products and consumer desire (e.g. BARNUM, 2003; MYVESTA, 2002; BUDGEON and CURRIE, 1995; SESSIONS, 1990). The goal of my study was to explore, in more depth, the linkages between these advertised "needs," personal empowerment and satisfaction, and health. Supplementary information was provided through personal, face-to-face interviews.

Of the six adults contacted, four agreed to be personally interviewed for this project. Subjects were chosen for their differing perspectives on environmental and human health as they relate to the skin care industry: a female Masters student; the Executive Director of a small environmental non-governmental organization; a Facilitator for The Body Shop, a commercial enterprise specializing in environmentally friendly cosmetics; a female senior academic and Program Director, and a male MBA and program administrator of an environmentally-oriented College. Every half-hour interview was recorded on tape and supplemented by notes taken throughout the conversation. A summary of these recordings was e-mailed to each subject within a week for review, and their corrections to the text integrated into a final copy.

Questions were open-ended and used a funneling technique, going from general to successively more directed inquiries. The thread of questioning enquired into participants' ideas about femininity, consumerism, beauty and the skin care industry. Interviews were more conversational than strictly inquisitive, using feminist ideals of egalitarian exchange as outlined by Ted Palys in the 2003 publication of *Research Decisions: Quantitative and Qualitative Perspectives,* 3rd ed.

In attempting to link historical attitudes towards femininity and contemporary cosmetic composition and advertising, interview subjects provided valuable insights. Interviews in particular highlighted that there are no simple answers to the pervasive cosmetic use in society, nor are women exclusively impacted by image-consciousness.

Subjects noted that the cosmetics industry is, indeed, a chemical industry, yet one with relatively low risk perception associated to it (POWELL, 2004). This was contrasted with attitudes about food: although consumers will increasingly go out of their way to buy foods produced organically, this consciousness has not spread to cosmetics at the same rate (McGRATH, 2004). Considering the ingestible nature of many cosmetic products (for example, lip balm is often ingested, and nail polish by covering fingernails also comes into frequent contact with food), McGrath and Khalilieh considered this discrepancy surprising.

Ignorance of cosmetic options was a major theme in all interviews. Many consumers use the products that various experts (stylists, pharmacists, for example) recommend. Thus, these "experts" are an interesting target area for promotion of ethical and environmentally sound cosmetic options (ABRAMOVITCH, 2004). Also, the degrees of difference in "natural" cosmetics likely escapes many consumers. Clairol's "Herbal Essences," The Body Shop Ginger Shampoo and Aveda Rosemary Mint Shampoo may be viewed as equal in all areas but price, despite their respective increasing environmental and human health friendliness (McGRATH 2004; KHALILIEH, 2004). The important distinctions in manufacturing practices, animal testing methodology, distribution and ingredient composition are not effectively understood by many consumers. Public education and effective labeling were proposed as positive solutions by all subjects.

Cosmetic companies' consumer accountability was also emphasized. Interview subjects felt empowered, that as consumers they could vote with their dollar (McGRATH, 2004; KHALILIEH, 2004). Although consumerist strategies are not the primary recommendation of this work, they have a place in an overall conscious-raising effort to make cosmetics manufacturers more accountable. Powell noted, for example, that if an industry giant could be convinced to go organic, its action would have a positive ripple effect throughout the industry.

Finally, all subjects agreed that appearance, and, by extension, cosmetic appearance-improvement strategies, disproportionately impact women. Abramovitch wisely qualified this generalization by noting that these impacts differ depending on a woman's social and working status, and that appearance matters for *everyone*, although probably even more for women than for men. McGrath suggested that this could be observed through ads, as "the barometer of consumer consciousness." Khalilieh felt that ads, as well as being an indication of societal attitudes, were implicated in creating a "climate of fear" for women: fear of aging, gaining weight, getting wrinkles, or not being attractive enough.

Social costs of cosmetics

As reported in the September 2002 Marketing to Women report of Myvesta's 2002 Money Abuse Survey, shopping can be emotional for all consumers, but especially women. In his 1990 essay "Ecofeminism and Work," Robert Alan Sessions notes that women's historical "exclusion from male sources of meaning and power have left them especially vulnerable to compensatory consumption," namely purchases made to ease some emotional distress, loss, or conflict. According to Myvesta, 21 percent of women shop to feel better when they are lonely, and 18 percent do so for stress relief. Corporations and advertising agencies confirm that such behavior for women is natural, irrational, forgivable ... and exploitable (BARNUM, 2003).

Women's personal advocacy declined following the victory of Allied Forces, due to a strong North American resurgence of 18th-century ideals about domestic femininity. These ideals were emphasized through material and popular culture media. Considering consumer goods as "the visible parts of culture" (McCRACKEN, 1990, p. 131), the replacement of women's wartime utilitarian fashions with Christian Dior's "The New Look" in 1947 (ROYAL ONTARIO MUSEUM, 2002-2003) proved a significant change in women's role in society. Unlike earlier clothing designed with rationing and Home Front work-force requirements in mind, the New Look featured tiny corseted waistlines, full skirts, sloping shoulders and newly developed stiletto heels (WRIGHT, 1989). Thus, a delicate and sumptuous overall picture of womanhood was presented, reminiscent of feminine ladies of leisure from the Victorian era. Popular culture media outlets supported this shift enthusiastically, as an excerpt from the May 1955 *Housekeeping Monthly*, entitled "The Good Wife's Guide," demonstrates. Featuring many helpful suggestions for the average homemaker – on cleanliness, appearance, cooking, treatment of men, what to fill the days with and their subordinate place in the overall domestic arrangement – perhaps most important is the closing remark that "a good wife always knows her place."

Yet, for working- and middle-class North American women, a "lady of leisure" lifestyle was generally far removed from their reality. Dr Sharon Hartman Strom and Linda Wood (1995) emphasize that women's out-of-home employment was not a revolutionary post-war phenomenon. Women have worked since pre-modern times, and, despite the Victorian era of idealized middle-class domestic femininity (BRIDENTHAL et al., 1998), increased their participation in the capitalist economy steadily throughout the 20th century. During the Second World War, necessary Home Front industrial production led North American states to encourage more women than ever before to work as breadwinners and nation-builders, personified by such wholesome media characters as Norman Rockwell's 1943 illustration of Rosie the Riveter.

For former domestic servants, wartime factory work provided better wages, more opportunities for socialization, more regular hours and often better treatment than their positions in middle-class households. Thus, upon the Allied victory, many servants showed little interest in returning to their former stations (HUMBLE, 2002). Unfortunately, especially for middle class wives, the end of hostilities also signaled the end of women's perceived usefulness outside the home. Despite a continued rise of women's paid employment through the 1940s, 1950s and 1960s, hegemonic forces paradoxically glorified the traditional family. Thus, the nuclear suburban household anchored by a homemaking mother was presented favorably, and contrasted to those liberated women who were getting "out of hand" (HARTMAN STROM and WOOD, 1995). With fewer domestic servants, fewer societally condoned out-of-home work opportunities, and increasing distance between the home and economic centers due to increased suburban settlement, many middle-class women who were formerly household managers and part-time workers became housewives.

Societal trends further encouraged the nuclear family model. Marriage and childbirth, with their accompanying home-based responsibilities, were occurring at unusually young ages throughout the baby boom of the late 1940s and into the 1950s (STRONG-BOAG, 1997). These larger families needed safe, spacious accommodation, most easily obtained in suburban communities (STRONG-BOAG, 1997). They also required full-time caretakers, and women were overwhelmingly – even threateningly, through pseudo-scientific psychology manuals warning about maternal deprivation and its negative impacts on future citizens (SPOCK, 1946; BOWLBY, 1953) – encouraged to take on this role. The increased distance between women, children and family-based activities and the masculine economic means of production firmly re-enforced a traditional gendered division of labor, famously questioned by Betty Friedan's landmark feminist text *The Feminine Mystique* in 1963.

Finally, anxiety over the "Red Menace" created a stressful societal context. Baby boomers (BOWMAN, 2004) remember adults clustered around the radio listening to reports on the Cold War and Korean War, neighbors building bomb shelters in their backyards, and air raid drills. Suburban developments, emphasizing stable, middle-class families grounded by full-time homemaking moms, were perceived as an indicator of capitalism's success (STRONG-BOAG, 1997, p. 377).

These socially-imposed restraints on acceptable feminine activities following World War II were not the first incidence of a societal backlash against feminine progress towards equitable full active citizenry. For example, women's suffrage and, more recently, women's large-scale entry into professional arenas have been differentially protested by conservative elements. The overt heckling and booing that confronted suffragettes, described by June Purvis (2002) in "'Deeds, not words': daily life in the Women's Social and Political Union in Edwardian Britain," has evolved into a more covert contemporary strategy of "experts" such as Chemist Gordon Freeman (1990) presenting cautionary tales of links between increased numbers of professional career women and rising divorce and juvenile delinquency rates. Interestingly, these attacks often present the "deviant" women as unattractive or unfeminine (WRIGHT, 1993). Thus, the women are implied to be failures at the most attainable, universal feminine task: sexual attractiveness to men (BUDGEON and CURRIE, 1995, p. 184)

The post-war cultural barrage on sex role shifts, through printed or spoken materials and consumer goods, was of an unprecedented scale. Hegemonic messages on women's appropriate behavior was disseminated in a much more efficient, persuasive and dominating fashion through the spread of television ownership. According to Mary Bellis' 2004 *History of Television Timeline*, 1948 saw a 4,000 percent increase in television audience and over one million homes in the US owning televisions. Indeed, *A Timeline of Television History* (2004) reports that, by 1954, homemaking magazines routinely offered homemakers "tips on arranging living-room furniture for optimal television-viewing pleasure."

So indeed, what were women to do in their suburban isolation? In her 1993 doctoral thesis entitled *"The most prominent rendezvous of the Feminine Toronto": Eaton's College Street and the organization of shopping in Toronto,* Cynthia Jane Wright posited that "women's job is to be an attractive sexual object. Clothes and make-up are necessary tools of the trade. Man, as consumer of woman-as-sexual-object, is the commodifier" (WRIGHT, 1993, p. 26). Advertisers, quick to recognize women-as-sexual-object's ability to sell almost anything, participated in linking commodification of women's sexuality with overall consumerism (BOUCHIER, 1983). This commodification of women persists stubbornly, as noted by Kate Rossiter, in her

2001 article "Growing up Girl." Women's bodies are presented, through material culture goods and advertising pressure, as a commodity which requires fixing.

Although Lyman (2003) notes that cosmetic testing is not as rigorous as drug testing prior to entering the market, the level of research and analysis is still quite significant. In North America, once a product is approved in clinical trials, it moves to manufacturing, packaging and distribution. Importantly, testing of product additives for consideration of safe consumer exposure is conducted on a single-additive basis, i.e. daily burden of phthalates, in isolation from additional additives (COSMETIC, TOILETRY AND FRAGRANCE ASSOCIATION, 2004). This does not appropriately reflect users' common strategy of employing a myriad of products in tandem.

Entire theses, books and magazines have been written weighing the merits against moral costs of animal testing (FREITAG, 1995; FANO, 1997; *Scientific American,* 1997). As Freitag's 1995 Ph.D thesis notes, viable alternatives to investigate whether a product metabolizes safely can include tests on fungi, computer models, and – controversially – human tissue. Particularly when researching devastating diseases such as AIDS and cancer, animal testing of drugs is tolerated as worthwhile in many moral cost-benefit analyses. That animals should be, as Lynda Dickenson (1990) phrased it, "victims of vanity" is far less acceptable. Indeed, animal testing was a "hot button issue" (POWELL, 2004) that helped facilitate the increasing success of alternative, natural cosmetic companies such as the Body Shop, which does not test their manufactured products on animals and continues to work towards guaranteeing the same through their sources, and Aveda, entirely free of animal testing in sources and products. Products have historically been tested on animals primarily to establish levels of irritation caused by a harmful but useful additive. Chemicals that match this profile and have received particular attention of late include phthalates and sodium laurel sulphate.

Phthalates, in the forms of Dibutyl Phthalate (DBP), Diethyl Phthalate (DEP), and Dimethyl Phthalate (DMP) were reviewed and categorized as safe in a 1984 Food and Drug Association (FDA) assessment, a classification that has since been questioned by researchers of both industry and non-profit groups (HOULIHAN et al., 2002). Information available on the American Cosmetic, Toiletry and Fragrance Association (CTFA) site, supported also by the Canadian CTFA (CCTFA), states that phthalates "are used in cosmetics as plasticizers, solvents and fragrance ingredients in a wide variety of cosmetic product types" (CTFA, 2003). DEP is also used in nail care products at concentrations of up to 15 percent, hair goods at up to 0.1 percent, and fragrances at up to 11 percent. Finally, they are added to PVC plastic to increase the packaging agent's life-span. Phthalates are said not to accumulate in human tissues but pass quickly through urine, yet there is significant concern over their effect on developing male sex organs and other reproductive anomalies (CTFA, 2003; HOULIHAN et al., 2002).

Sodium Lauryl Sulphate (SLS) and the related Ammonium Lauryl Sulphate are detergents most often found in shampoos. They assist in emulsifying dirt and grease, but are skin irritants. There is concern that they are also carcinogens, refuted by a *Journal of the American College of Toxicology 2(7)* article highlighted on the CTFA site. Although perhaps not cancer-causing, in animal tests, they have been shown to significantly alter skin composition and accumulate in hair follicles with prolonged exposure. Thus, it is recommended that frequently-used products not have concentrations greater than 1 percent.

PVC plastic as packaging is a related concern. Manufacturing PVC produces such toxic by-products as dioxin, hydrochloric acid and vinyl chloride, priority pollutants that contribute to cancer, diabetes, neurological damage, and reproductive and birth defects. Dioxin alone is classified by the EPA as a carcinogen 300,000 times more potent than DDT; thus it is not surprising that areas supporting a PVC manufacturing facility have reported higher cancer rates than the general population, with plant workers at the greatest risk (WOMEN'S VOICES FOR THE EARTH, 2004). PVC's complex composition also makes it difficult to recycle. Greenpeace notes that less than 1 percent of PVC plastic is currently recycled, with the rest landfilled or incinerated.

The manufacture of these chemicals has been shown to have negative environmental and worker's health effects (BOENIGER and AHLERS, 2003). Although personal use in small concentrations is approved, testing organizations consider toxin exposure on a single-item basis, rather than recognizing the wider impact of the total accumulated burden of toxins that an assortment of cosmetic products place on the body. The Canadian government has launched the Environmental Impact Initiative (EII) to investigate the longer-term life of these and other personal care chemicals that accumulate once expelled or disposed into the natural environment. It is unclear whether they will study each compound in isolation, or take the wiser – though admittedly more challenging – route of considering the effects that cosmetic chemicals have jointly on the biosphere.

There are alternatives to both toxic cosmetic additives and unfavorable packaging, just as there are alternatives to animal testing. Houlihan et al. noted in their 2002 study of drug-store cosmetic items that many companies have similar products of differing composition, one containing phthalates and the other not, with seemingly no difference in performance or purpose. Aveda and others have developed viable emulsifying ingredients besides Sodium Lauryl Sulphate to use in shampoos and cleansers. Finally, even major corporations, such as Intimate Brands (parent company of Victoria's Secret and Bath and Body Works), have been persuaded to stop using PVC plastics in packaging in favor of other, more easily recyclable and more environmentally sustainable alternatives (WOMEN'S VOICES FOR THE EARTH, 2004).

Current cosmetic legislation

Despite the shortcomings in cosmetic chemical testing, approval and disposal, skin care products *are* a regulated industry. Federal legislation in both Canada and the United States outlines labeling requirements, banned ingredients, and a host of specific considerations for particular additives, and responds to concerns mainly on a complaints basis (DAVIS, 2004). Powerful trade associations represent industry interests in both North American countries.

Government and industry are not necessarily lacking in voluntary and regulatory responses to chemical and technological concerns. Indeed, the overall response is quite progressive. Yet, the focus is exclusively isolationist and technical. Actual chemical concerns surrounding human use of one individual skin care product is less of a dilemma than the joint effect that several will have on human and environmental health, including that of workers in manufacturing facilities. Also more problematic than simple chemical composition of cosmetics is the way people, especially women, are encouraged to use them. Thus, the promising technical regulatory outlook outlined below must be qualified by the fact that it fails to reflect the wider, generally negative influence of cosmetic products on human and environmental health.

In the United States, "cosmetics are legally defined as products not intended to affect the body's functions as drugs are." Thus "the FDA does not require any pre-market safety testing of cosmetics or fragrances to the extent that the agency would a drug" (LYMAN, 2003). Health Canada's *Food and Drugs Act C.R.C., C. 869* defines cosmetics as "any substance or mixture of substances, manufactured, sold or represented for use in cleansing, improving or altering the complexion, skin, hair or

teeth and includes deodorants and perfumes. This definition includes soap." Cosmetics are legally approached differently from drugs, and thus products must be slotted into one or the other category in the *Act*, despite much overlap between the two types.

Cosmetics are further distinguished from over-the-counter products that make therapeutic claims or contain ingredients not permitted in cosmetics, from products that contain natural therapeutic ingredients, from goods intended to be ingested but not have a therapeutic effect and from pesticides such as insect repellent.

Increasing awareness about environmental issues throughout the Canadian population has accompanied a greater concern about ingredients in various consumer products, particularly household cleaners, foods and cosmetics (CAIN, 1996; ADVERTISING STANDARDS CANADA et al., 1998/2003). In response, Health Canada's Environmental Impact Initiatives (EII) will focus on studying "the potential effect of personal care products and pharmaceuticals ... in the Canadian environment and on human health" (HEALTH CANADA, 2004). To assist with issue identification, in 2002 EII commissioned a survey to establish environmental assessment regulations and project benchmarks.[1] The 1,512 completed phone surveys presented some interesting findings on Canadians' ideas about health-related issues.

Although much of the survey is of interest to recycling and waste disposal specialists, particularly relevant to this work is that 52 to 55 percent of Canadians read labels on cosmetic products and similar consumer goods. Surveyed individuals were primarily interested in ingredient lists. This finding is supported by a smaller survey of women by Maria Cain for her 1996 Masters thesis, where 17 of 26 total participants regularly read product labels of household products (CAIN, 1996, p. 130). The vast majority of these individuals stated they read labels "to find out about ingredients." This attention to ingredients was justified in the EII survey by the observation that 52 percent of surveyed individuals feel that cosmetic products likely pose a threat to the environment, and 45 percent thought the same of soaps and shampoos.

Unfortunately for those conscientious citizens who wish to read cosmetics labels, ingredient information is not currently required by Canadian law to be expressly outlined (*Canada Gazette, Part I,* 2004, p. 853). These minimal requirements are currently under review, with the March 27, 2004 *Canada Gazette, Part I* outlining "proposed amendments to the *Cosmetic Regulations* [that] would require ... cosmetic manufacturers [to] declare ingredients on a label or exterior wrapping for all cosmetics" (*Canada Gazette, Part I,* p. 852). This amendment, which also includes an enforcement strategy, seems likely to be supported by Canadians, as their survey results demonstrate a general interest in stronger labeling requirements. Citizens will thus be able to make more informed choices about what they wish to use on their bodies.

Increased labeling requirements, accompanied by the EII's initiatives to better regulate products not well managed by current *Food and Drugs Act* legislation, are promising avenues of regulatory action. The additional EII and labeling amendment goal of raising public awareness about cosmetic additives is also positive. Yet, these initiatives seem to be the equivalent of "end of pipe" pollution prevention measures, focused on better management and disposal rather than on more environmentally sound manufacture or, more ambitiously, on the questioning of the overall product necessity.

Advertising guidelines

"The pressure of advertising and publicity is unceasing. If you use a certain lotion, the advertisements state, or imply, the next man you meet will fall in love with you. You know that isn't so. No man has ever fallen in love with a woman because she used a certain beauty product – in fact, millions of people managed to fall in love and marry before the cosmetic industry was born. Nevertheless, an otherwise sensible woman reading an advertisement like this, or seeing it on a billboard, or hearing it on the radio, will rush out to buy the lotion as though it were a magic formula that would transform her appearance, character, and future prospects."[2]

Khalilieh (2004) emphasized that, without cosmetic surgery, no product can reverse the aging process on skin and the best consumers can hope for is, through cleansing, polishing and moisturizing, a well-maintained visage. Yet Sheila Rogers noted on her November 5, 2003 edition of *Sounds Like Canada* "everybody wants something to make them look younger." Where 20 years ago there were face creams for normal and oily skin, now there are over 1,000 kinds of anti-wrinkle cream. Rogers' guest, Wanita Bates, emphasized that the claims of anti-aging creams are often outrageous. Yet, guidelines for cosmetic advertising are reasonably well established, with the *Guidelines for Cosmetic Advertising and Labeling Claims* (ADVERTISING STANDARDS CANADA et al., June 2003) revisited on a regular basis in response to the rapid evolution of the skin care industry. The Canadian Cosmetics, Toiletry and Fragrance Association also has a Code of Marketing Practices, access to which is limited to members only.

The *Guidelines* list acceptable versus unacceptable phrasing strategies for marketing campaigns, clearly indicating that these suggestions are "not exhaustive," and thus leaving some leeway for discretionary action by enforcement bodies. Yet who *does* enforce them? The efficacy of these guidelines is extremely questionable. A few forbidden product claims, according to the *Guidelines* (ADVERTISING STANDARDS CANADA et al., June 2003, pp. 8-20), include: product is deeply penetrating; product makes skin look younger; product can reduce, reverse, slow, or prevent aging; product will lift or tighten skin; product can repair damage; product will be "anti-wrinkle" or "anti-aging"; product is like a surgical lift.

If these "guidelines" could be upgraded to "standards," they would then be legally enforceable under Part I, item 17, of the *Food and Drugs Act*, which states that "where a standard has been prescribed for a cosmetic, no person shall label, package, sell or advertise any article in such a manner that is likely to be mistaken for that cosmetic, unless the article complies with the prescribed standard" (p. 12). This is an admittedly large legal jump, but the importance of corporate responsibility for advertising messages has been recently underlined through legal challenges against fast food companies such as McDonalds (McLIBEL SUPPORT CAMPAIGN, 2003), and federally-imposed stern restrictions on tobacco advertising (KERR, 1997). Legal challenges to social harms of fast food are quite relevant to possible cosmetics challenges: both wield enormous advertising power, both are omnipresent in North American society, and both demonstrably harm human health, especially if an individual is highly susceptible or a frequent "user."

Yet, advertising is an extremely persuasive and underlying societal force in North America. As Shelley Budgeon and Dawn Currie noted in their 1995 piece on the post-feminist subtext of *Seventeen Magazine* ads, "the failure to acknowledge the complexity of these types of processes which make meaning possible undermines efforts to regulate the types of images available to the consuming public" (BUDGEON and CURRIE, 1995, p. 185). Simple regulation of ad content will not effectively limit its hegemonic messages: careful arrangement of image and text can subtly present messages without overtly stating aging or appearance-oriented threats (BUDGEON and CURRIE, 1995, p. 181). Educational initiatives that foster the ability to recognize advertising tactics, must accompany regulatory reform to suc-

cessfully mediate the effect of cosmetic advertising on consumers' desires (BUDGEON and CURRIE, 1995, p. 185).

Conclusion: A plan for action

The Canadian regulatory formula for cosmetics currently follows an overly simplistic, technocratic understanding of the industry by externalizing all socio-political effects and ignoring the myriad of toxic substances citizens face daily *in combination*, continuing to consider thresholds on a per-item basis.

Certainly to compensate for negative societal and environmental impacts, large corporations often exhibit impressive corporate citizenship. McDonald's charities include Ronald McDonald house, and an endless assortment of neighborhood, professional sporting and cultural events. Tobacco industries were major supporters of the arts, culture, and sport. Cosmetic industries are no less active, although their charities of choice reflect their market demographics, and thus concentrate on areas such as violence against women and breast cancer.

Many would ask where the harm is in allowing large companies to give back to their consumers through charities. Perhaps the answer lies in a distinction made by Mark Sagoff in his 2001 article, where he notes that "not all of us think of ourselves simply as *consumers*. Many of us regard ourselves as *citizens* as well. We act as consumers to get what we want *for ourselves*. We act as citizens to achieve what we think is right or best *for the community*" (p. 468). Citizens will support a proposal that seems to serve a greater moral cause, or that lessens a significant societal risk. To combat the negative societal effects of cosmetic advertising, I insist that women should use their hard-gained rights as citizens, rather than their carefully cultivated consumer impulses, to lobby government for a more inclusive regulatory regime. Effective education campaigns about the social and health effects of cosmetics, as well as media literacy campaigns to combat both sly and overt advertising pressure, would support these regulatory changes (BUDGEON and CURRIE, 1995, p. 185). With the Federal EII still in fledgling phases and cosmetics regulations under review, now is an ideal time to proactively insist on better protection of human and environmental health in the cosmetics industry.

Notes

1. This survey, along with other Issue Identification documents for the EII, is available online at Health Canada's website: http://www.hc-sc.gc.ca/ear-ree/fda_report_e.html.
2. Nancy Daggett (1952), *Personal Beauty and Charm* (ed. Miriam B. Reichl), (New York, The Homemaker's Encyclopaedia Inc.), pp. 118-119.

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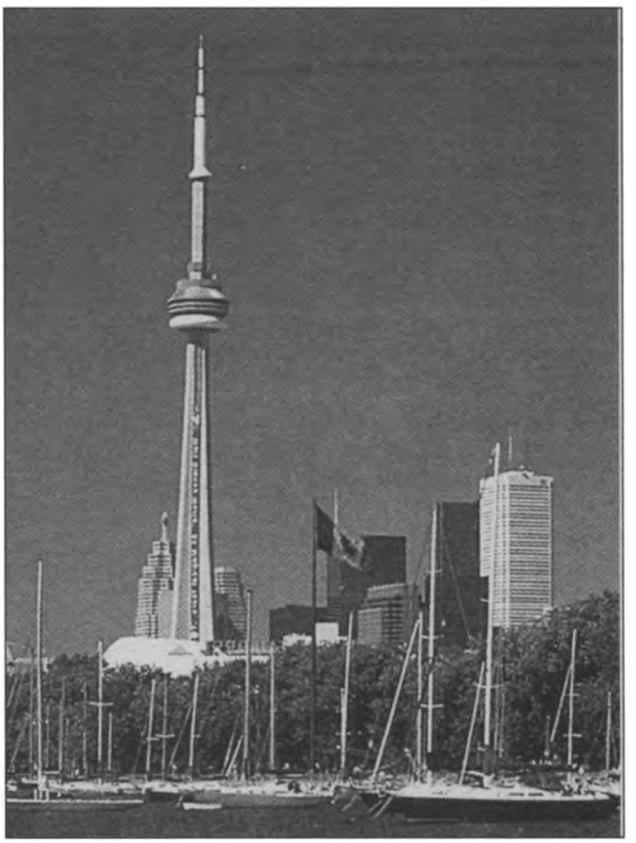
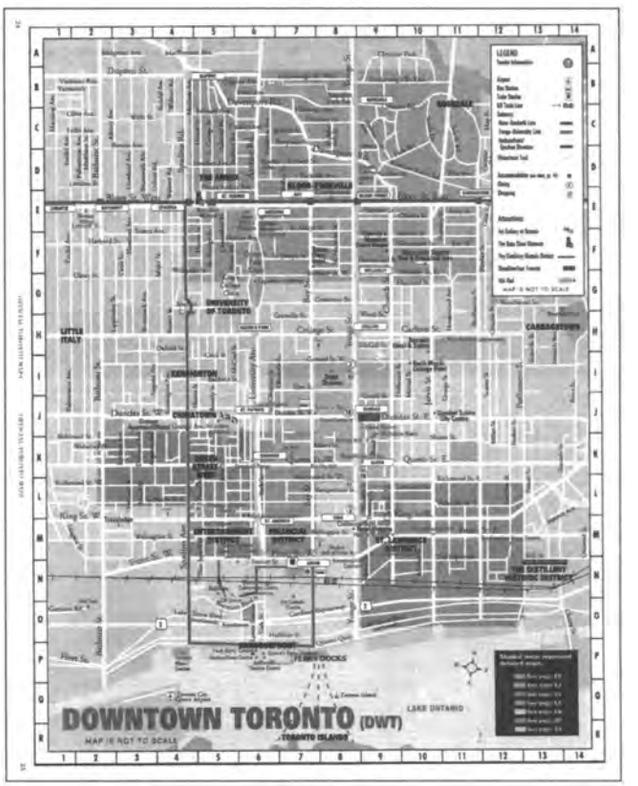
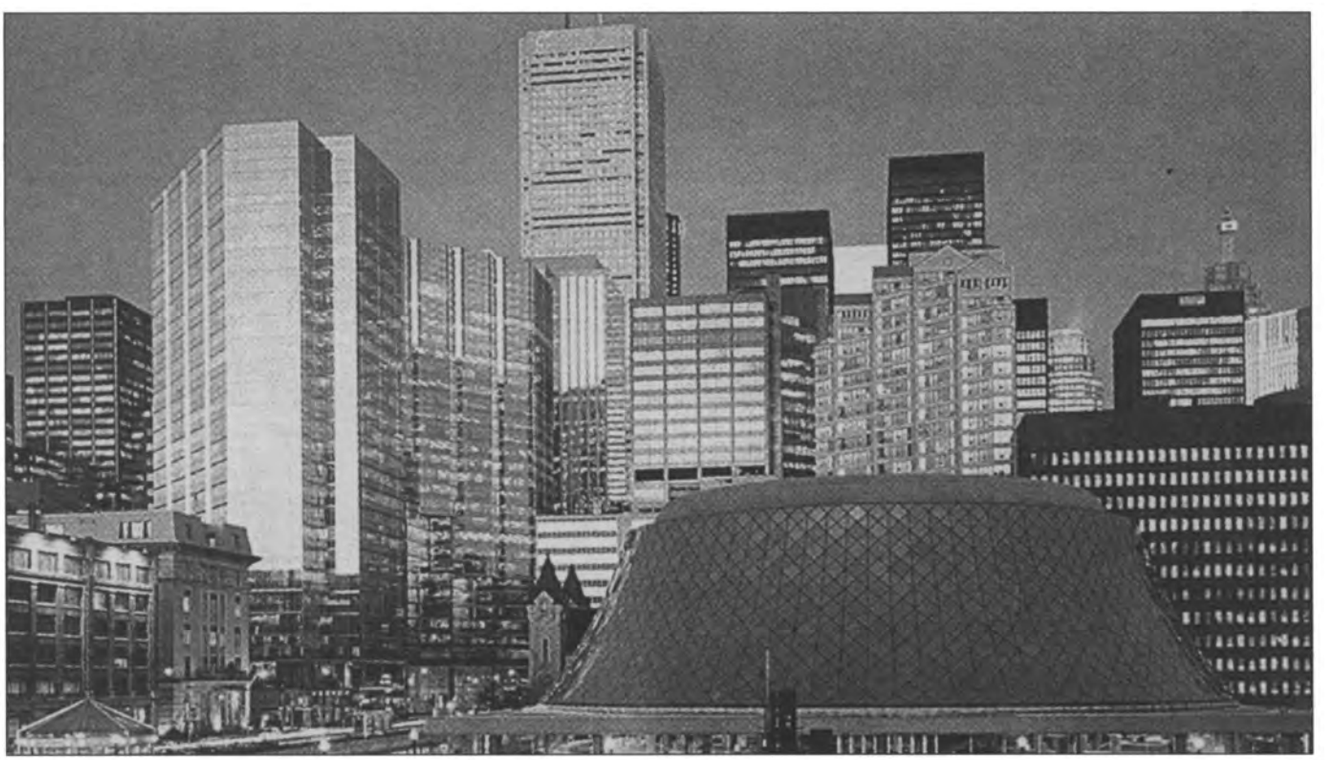
Toronto at the time of "The Natural City" Symposion





General plan of downtown Toronto



(*Sources:* Tourism Toronto, "Toronto, Visitor Guide," Spring/Summer 2004 – pamphlet; Tourism Toronto, Toronto Convention & Visitors Association, "Savings VISA Passport, Toronto" – pamphlet).

The Urban Cliff Hypothesis and its relevance to ekistics

Doug W. Larson, Uta Matthes, Peter E. Kelly, Jeremy Lundholm, John A. Gerrath

The Cliff Ecology Research Group (CERG), Department of Integrative Biology, University of Guelph, Guelph, Ontario, Canada, has been in existence since 1985 when its members began working on the ecology of the Niagara Escarpment (fig. 1). In 1988 they discovered a stand of ancient trees growing on the cliffs and in 1989 they discovered that in fact the escarpment cliffs support the oldest and least disturbed forest ecosystem in Canada. Individual living trees older than 1,300 years are still present and the forest appears to be in steady state. CERG's work on the ancient trees led to the idea that cliffs serve as refuges for many species including ancient humans. That observation led to the development of the Urban Cliff Hypothesis that is described in this paper and was presented at the international symposion on "The Natural City," Toronto, 23-25 June, 2004, sponsored by the University of Toronto's Division of the Environment, Institute for Environmental Studies, and the World Society for Ekistics, and also led to the recent book entitled The Urban Cliff Revolution.

• ***Dr Larson*** *is Professor of Botany in the Department of Botany at the University of Guelph and Director of CERG. He obtained his PhD in subarctic ecology from McMaster University and has been at Guelph ever since. He teaches courses in introductory ecology, laboratory and field work in ecology and ecological methodology. He also teaches a graduate course in the philosophy of biology. He has supervised numerous graduate students. His research on the ecology of cliffs and rock outcrops is supported by many public and private sector agencies and groups. The work done by CERG has appeared in over 100 peer reviewed papers as well as a book entitled* Cliff Ecology *(Cambridge). Dr Larson has also been active in interpreting science for the public using the mass media. He makes regular appearances on CBC and the Discovery Channel.*

• ***Dr Matthes*** *is a research associate in CERG. She obtained her PhD in ecology from Arizona State University. She studied the physiological ecology of lichens in that work. She is responsible for conducting field and laboratory work taken on by CERG. She also helps graduate students and senior undergraduates in project-based courses. She has taught several courses herself but her main activities support the research of the lab. She is author or co-author of over 50 peer-reviewed papers and is a co-author of the book* Cliff Ecology *(Cambridge).*

• ***Mr Kelly*** *is a research associate in CERG. He obtained his MSc. in geography from the University of Western Ontario in 1989. He studied soil development on high arctic tundras. His responsibilities in CERG include the execution of fieldwork related to the ancient forests of the Niagara Escarpment. His work has explored the potential to use tree rings from ancient trees to reconstruct past climatic patterns for eastern North America. He is currently working on another book for CERG to be entitled* Ancient Cedars of the Niagara Escarpment.

• ***Dr Lundholm*** *is a PhD. student in CERG and is studying the role of temporal and spatial heterogeneity in regulating plant community structure on limestone pavement communities. He has a MSc. degree from York University where he studied restoration ecology. He is the author or co-author of numerous publications in his field.*

• ***Mr Gerrath*** *is a MSc. student in the Department of Botany, University of Guelph and is working on the recovery of the American Chestnut tree. For many years he was a member of CERG and is the author or co-author of 8 peer-reviewed publications concerning the ecology of the cliffs. Prior to his years with CERG, he received a degree in radio and television production at Ryerson University.*

Introduction

Throughout human evolutionary history, there has been a continuous interaction between food supply, population size, and dwelling site characteristics. This interaction is driven by two forces:

- first, the underlying physiology, anatomy, and behavior of the human animal; and,
- second, the nature of the environment providing the resources that the humans were dependent on.

This interaction is *human ecology* in the broadest sense. While Ekistics[1] as a discipline is concerned mainly with the science and problems of modern human settlements, the Urban Cliff Hypothesis argues that these current problems and some of their solutions have ecological roots in the distant past (LARSON et al., 2004).

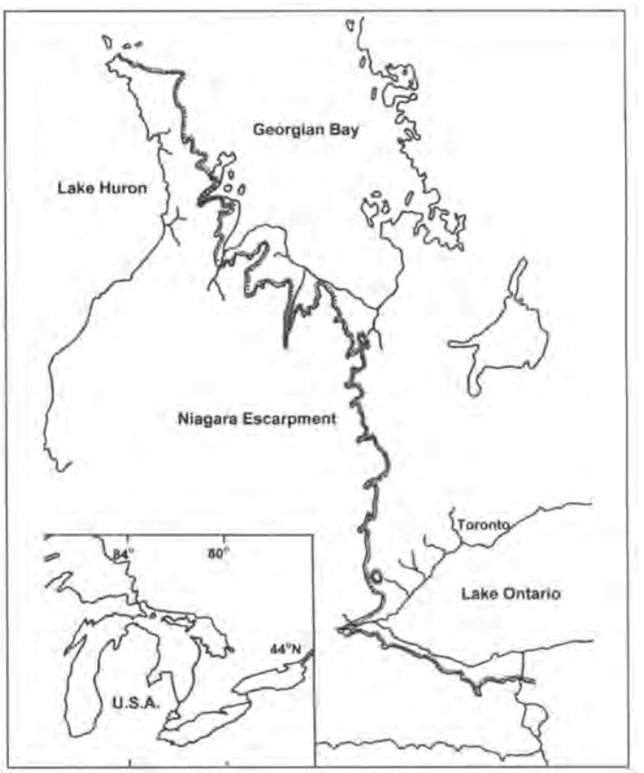


Fig. 1: Sketch map of the Niagara Escarpment in southern Ontario, Canada.

The objective of this paper is to summarize key aspects of the hypothesis and then to show points of relevance to current thinking as it relates to the design, function, location, and restoration of human dwellings. More specifically:

- we argue that the state of basic human ecology has not changed much since the Pleistocene and that many current problems in urban design and management can be solved using ideas generated by the hypothesis;
- we summarize those aspects of human biology that have defined us throughout our evolution;
- we show how these traits meshed with the changing environments in which humans found themselves over the last 1.5 million years;
- we trace the interaction between human animal and dwelling site to the modern era; and,
- we conclude by showing evolutionary connections between the modern condition and the distant past.

The human animal

Humans have not changed much in the past half million years, and even the forms of humans that lived one million years ago were much more like "us" than they were like any other animal living at the time. Body size, brain capacity, bone density, and dentition have all been subject to a long history of close scrutiny by palaeoanthropologists (GAMBLE, 1994; TATTERSALL, 1998). Debates over the names of human species, their evolutionary lineages, and their paths of colonization out of Africa all depend on exploring the smallest details of the differences in skeletons and tools that have been found (JOHANSON and EDGAR, 1996). While we value the huge literature that focuses on these small differences and their importance in reconstructing the pattern of human evolution, when we view humans coarsely we see an African bipedal primate that is a large-brained social omnivore weighing about 50 kg. For a long time humans have been nearly hairless, skin-sweating animals that were not very powerful for their size. These points are exceptionally important because fur is required for effective thermoregulation of mammals, and either strength or agility are needed in the harvesting of resources or in self-defense (SCHMIDT-NIELSON, 1975). Mammals that lack fur must display other mechanisms of thermoregulation if they are to survive climates that are outside of the zone of thermal neutrality (the range of ambient temperatures that produce minimum resting metabolic rates). Sweating through the skin achieves excellent thermoregulation and is more effective when the animal lacks a body covering of fur (MONTEITH and UNSWORTH, 1990). Mammals that lack physical strength or agility must depend on social structures or intelligence to deal with competitors, predators or other aspects of a changing environment.

Real human needs (as opposed to wants) are easily characterized. Food containing energy and nutrients is essential and the amounts needed to sustain basic metabolism are roughly 1,500 Kcal per day. Intense physical activity can increase this need by a factor of two or three. Water is also needed in amounts varying between 2 and 4 liters depending on physical activity. Shelter is needed because the better the shelter, the less food and water is required. Most other primates are social organisms of forested landscapes. Forest habitats provide not only food, but shelter from the sun, from wind, and from nighttime energy losses to the atmosphere. Open ground provides no such shelter.

When the cooling and drying of the planet took place at the end of the Pliocene between four and two million years ago, there was in Africa a pattern of forest contraction and savanna expansion. This ecological trend placed selection pressures on many species to change their habitat interactions, to change their interactions with each other and also to change their food supply. There is still an active debate about the precise timing of the evolution of bipedalism: none of which is ecologically relevant to understanding the opportunities it provided and the costs it imposed.

Bipedalism results in a vast reduction in the amount of direct beam solar radiation to which an organism is exposed. Plant biologists have studied the morphology of desert cacti and have found that erect leafless stems provide a mechanism that reduces heat loading during the day (GIBSON and NOBEL, 1986). Exactly the same kind of benefit accrues to an animal that emerges from the protection of forest cover and forages in open savanna with little protection from the sun. In addition to reducing solar radiation loads, an erect stature also allows for a more effective evaporation of sweat from the skin and therefore better thermoregulation (provided that water is available to drink). Bipedalism also increases the ability of an animal to gain greater distance views across habitats and thereby the trait provides some protection against competition and predation. In forested environments, escape into the canopy provides protection from competitors and predators. Lastly, bipedalism frees up one complete set of limbs for non-locomotory functions.

Despite the benefits of bipedalism, there are costs associated with it as well. Principal among these is that an erect stature causes rapid body cooling when the sun is not shining. Therefore energy balances made positive during daytime periods quickly become negative in the dark unless shelter of some form is sought.

The expansion of savanna environments in east Africa not only increased the opportunities to early humans, but to large numbers of other granivores and their predators as well. Gamble (1994) has argued, and we have shown (LARSON et al., 2004) quantitatively that savanna environments are vastly more productive for humans than any other kind of terrestrial habitat that we could exploit. The huge advantage of savanna is offset by the risks imposed by the high density of predators that live there as well and hence the problem of seeking appropriate shelter arises again.

The changing opportunities for shelter

For arboreal primates, shelter is virtually available everywhere. Despite the low productivity of arboreal environments for primates, protective cover existed everywhere and therefore environmentally, competitively, or predator mediated mortality was probably low. Exactly the opposite was likely true following the transition to savanna living 1.5 to 1.0 million years ago. Productivity for human ancestors increased by more than one order of magnitude, but so did the risks of mortality directly from heat, cold and drought, as well as mortality from competitors and/or predators. Shelter was therefore absolutely essential (PFEIFFER, 1972).

Available shelter sites for 50 kg bipedal mammals, however, were few on savannas. Trees were short, isolated and unsuitable for significant protection from anything. Soils on level terrain were derived from volcanism and subsequent weathering. Natural cavities that opened to the surface could easily be exploited by burrowing mammals such as hyena, jackal, and large rodents. Humans were too large and ill equipped for the digging of dens in soil. There is no evidence in the literature of den digging by human ancestors in the time period. The rapid weathering of large savanna landscapes exposed to volcanism did, however, lead to the development of erosion pathways, wadis, and river canyons. This erosion also formed the development of rocky shelves along the margins of the watercourses and these rocky shelves included large caves and

Fig. 2: Early human occupation sites along the upper reaches of the Danube River and its tributaries in southern Germany allowed people to have the protection provided by caves (a, above) while also providing them with a commanding prospect view of the landscape (b, on the opposite page). Fertile riparian zones supplied water and food in abundance. (*Source:* Photographs by D. Larson).

overhanging rock shelters (LARSON et al., 2000).

While rock shelters were certainly not perfect refuges from climatic and biological stressors, they were nonetheless relatively permanent and abundant relative to the numbers of humans who lived at the time. In addition, water and grazing animals (some of the other *needs*) were usually close by.

Human use of rock shelters

The evidence of the human exploitation of rock shelters as either permanent or temporary dwelling sites is overwhelming. There is evidence that all species and subspecies of humans used rock shelters during the time period from 1.4 million to roughly 40,000 years B.P. No evidence of tailored clothing exists before this time period either. In fact, no reliable evidence exists *anywhere* in the anthropological literature to suggest that humans had the capacity to create a "built" environment (either huts or clothing) until 40,000 years ago. An early claim by De Lumley (1969) that *Homo erectus* had built shelters out of rocks, poles and tree branches has largely been dismissed. From all the available evidence then, we can conclude that humans were forced to use naturally occurring shelter sites for most of their evolutionary history.

Rock shelters provided escape from solar radiation, high air temperatures, wind, rain, snow, dust/volcanic ash, competitors, and most predators. They usually existed on elevated parts of the landscape where they could be easily seen and readily accessed. They were easily defended against competitors and predators since gravity benefited the occupants of the cave when they were threatened. Rock shelters also provided raw materials for tools and simple niches for the storage of foodstuffs. We also know from an exhaustive review of the literature, that most of the plants and animals that are currently commensal with humans, or that have been exploited in agriculture, were organisms that were once endemic to rock outcrops, talus slopes, and cliffs. Lastly, the rock shelters that sat high above river courses would provide the occupants with both a sense of refuge and commanding views of the landscape at the same time.

We will return to the idea of refuge and prospect view below. For now, the important thing to realize is that rock shelters at the bases of cliffs allowed the occupants to look out onto a riparian landscape where food and water were both essentially "flowing" by the dwelling site (figs. 2a and 2b). This is the opposite of the current theme of drive-in fast food restaurants. It is also important to realize that this model of the human dwelling site persisted for what amounts to 97 percent of the time that "humans" have been on the earth. The importance of this

Fig. 2 (cont'd).

is huge within the context of Wilson's Biophilia Hypothesis (WILSON, 1984). In essence, Biophilia proposes that the many human psychological reactions to other species, as well as to landscape, beauty, odor, sound etc. have an evolutionary foundation. There is considerable remaining debate over the Biophilia Hypothesis because it presumes that a certain proportion of the human mind is driven by nature (i.e. by genetics) rather than by nurture (i.e. by learning and culture). We have recruited Wilson's idea to the Urban Cliff Hypothesis by arguing that human existence was cast within a rock outcrop environment for at least 97 percent of the time we have been evolving on the earth. Given this vast evolutionary experience, we think it at least *possible* that our current concept of the appropriate form of rooms, houses, villages, towns, and cities in the modern world has been sculpted by this evolutionary experience.

The built environment

For the bulk of this time, the habitable rock shelters and river canyons in which they occurred were more abundant than the humans that occupied them. Estimates of human population sizes in prehistory are very unreliable but some have estimated the total human population in France before the dawn of the last ice age was in the range of 30-50,000 people (GAMBLE et al., 2004). Only several hundreds of people are thought to have inhabited Great Britain at this time (SMITH, 1992). No one knows the events that resulted in the final exodus of modern humans from Africa between 100,000 and perhaps 60,000 years ago but, at some point in time, human population size was large enough to make it difficult to find unexploited rock shelters even in the south of France, Spain, Italy and other Mediterranean countries. Even if modern humans did not *invent* "architecture" to solve this problem about 40,000 years ago, when this capacity to *build* actually showed up on the scene, there was no longer any population size limitation imposed by the number of dwelling sites. Dwelling sites could be made anywhere, could be made quickly, and could even be transported. What is more, the capacity to *build* solved the real problems associated with cave living – the accumulation of waste and the distance between the resources and the dwellings. Buildings with good design allow all of these problems to be solved at once.

The earliest built dwellings such as those at Dolní Věstonice (40,000 years B.P., GLADKIHM et al.,1984) (fig. 3) all involved multiple dwelling units with functions that were partitioned between the units. Such built structures appear in increasing numbers from 40,000 to 9,000 years B.P. when the first cities were formed. Cooking, food storage, animal containment, and sleeping areas were all separated. This separation of activities is also observed in the grass huts found at Ohalo II (fig. 4) along the shores of the Sea of Galilee (23,000 years B.P., NADEL, 2003; BELMAKER, et al., 2001) and at Tabun Cave, Israel (fig. 4). All of these structures appear to have been built to allow the humans to position their dwellings as close to their essential resources as possible without giving up the advantages of prospect view and refuge provided by real rock shelters. These earliest dwellings may also have provided the vast array of commensal and mutualistic plants and animals with sites for their own proliferation. House mice, black rats, pigeons, hedgehogs, barn owls, and wildcats all proliferated in this environment. In addition, a large array of grasses and forbs flourished in the disturbed land around the first encampments. Many of these (as it was discovered by hunter-gatherers) were edible whether they grew wild in the hills or grew in the refuse and nutrient rich patches around the camps.

In the time period from 20,000 to 10,000 years B.P., agriculture as we know it did not exist, but many of the species that were eventually recruited into agriculture were present and exploited by people. The central importance of some of these species is only being realized now. A recent study by Vigne et al. (2004) has pushed back the association of the *Felis domesticus* (=*Felis silvestris*, the European wildcat) with humans from 3,500 years B.P. to 9,500 years B.P. Vigne argues that the housecat was revered by humans at this time since wild grains that were harvested but then stored in primitive dwellings would have been easy prey for the growing populations of rock doves, mice and rats that had already taken advantage of human encampments.

The full development of modern agriculture that started about 10,000 years B.P. in the old world and about 7,000 years B.P. in the new world provided enormous opportunities for human population growth. After this time, there was little increase in the use of natural rock shelters. The capacity to create artificial structures that had all of the benefits of natural rock shelters but none of the detriments made it possible for people to manufacture (using stone, mud bricks or wood) perfect sites that provided refuge and prospect views at the same time. Such structures are now universal in human societies.

Architecture

The goal of architecture at the small and large scale is to manufacture refuges for humans at a number of scales – the individual, family, and extended society (RUDOFSKY, 1977). Human existence has two basic phases – the collection of resources needed for living, followed by the consumption of those resources. Since we are omnivorous animals, the collection phase is governed by the behavior of plants and animals that live outside. If the foodstuffs are fully wild, architecture is not needed. If the foodstuffs are cultured or domesticated, some form of refuge is provided to them as well (a field, net, enclosure, barn, etc.). In the consumption phase, refuge is needed to keep competitors and predators at bay and to increase the comfort while the resources are being consumed. But neither the refuge nor the comfort can be absolute – "individuals" need their "family" groups, and "families" need their "societies." Hence, refuge for one can deny comfort for another. This brief summary suggests two quite independent components to architecture:

- The first is *efficiency* (usually defined in economic terms); and,
- the second is *comfort*.

- **Efficiency** in the form of massive high-rise apartment buildings might be measured as the persons/sq.km, or persons/tonne of concrete and steel. But the experience of architects and town planners in the world's largest cities has shown that maximum efficiency of construction does not produce maximum benefit to the residents (SAMUELS and PRASAD, 1994).
- In particular, **comfort** (especially psychological comfort) within one's own dwelling might include massive electronic security systems that *increase* the sense of peace within the dwelling while simultaneously *decreasing* the sense of peace outside of the dwelling space.

Optimum dwelling architecture must clearly deal with a tradeoff between these conflicting values.

Application of the Urban Cliff Hypothesis

The Urban Cliff Hypothesis argues that, in our evolutionary past, there was a configuration of dwelling spaces that provided this optimal tradeoff between efficient and comfortable use of space to small clusters of people. This configuration

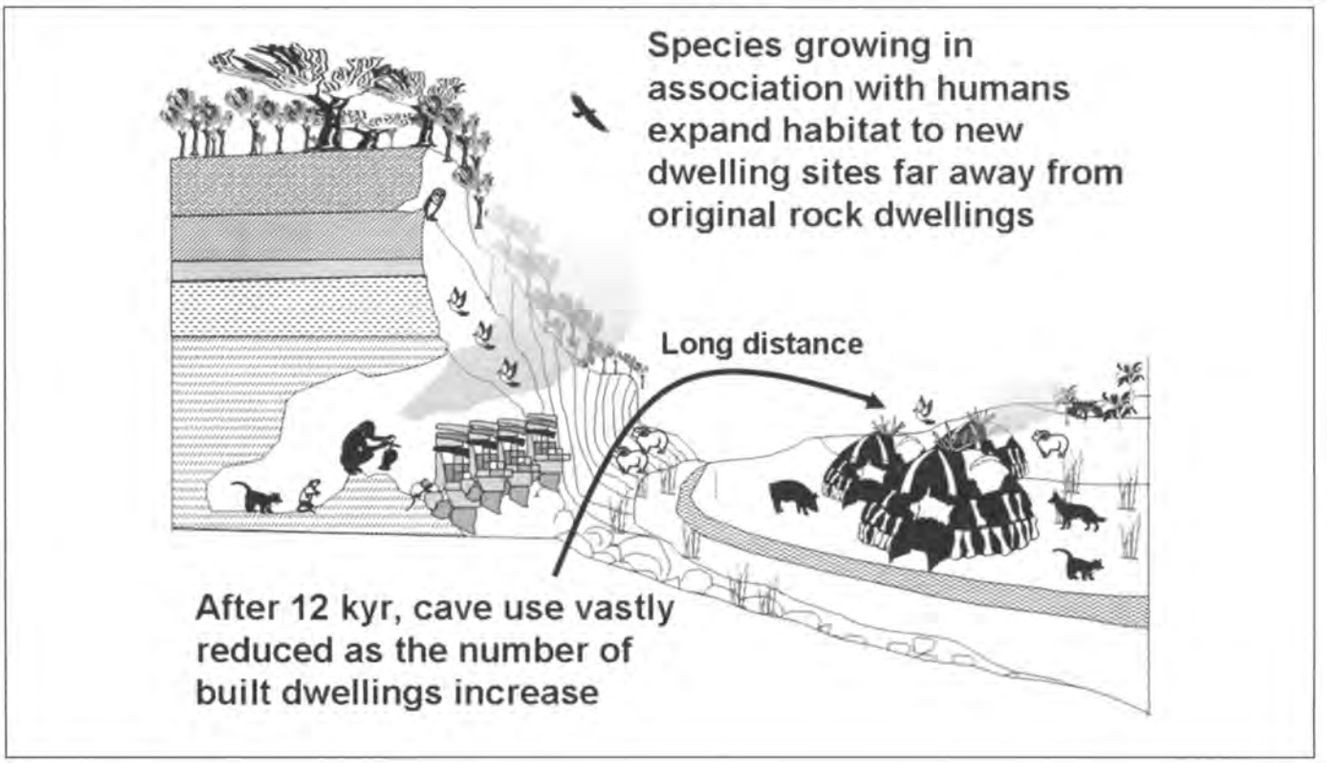


Fig. 3: Sketch of natural rock shelter with associated inhabitants, along with a sketch of the mammoth bone structures that represent some of the first built dwellings.

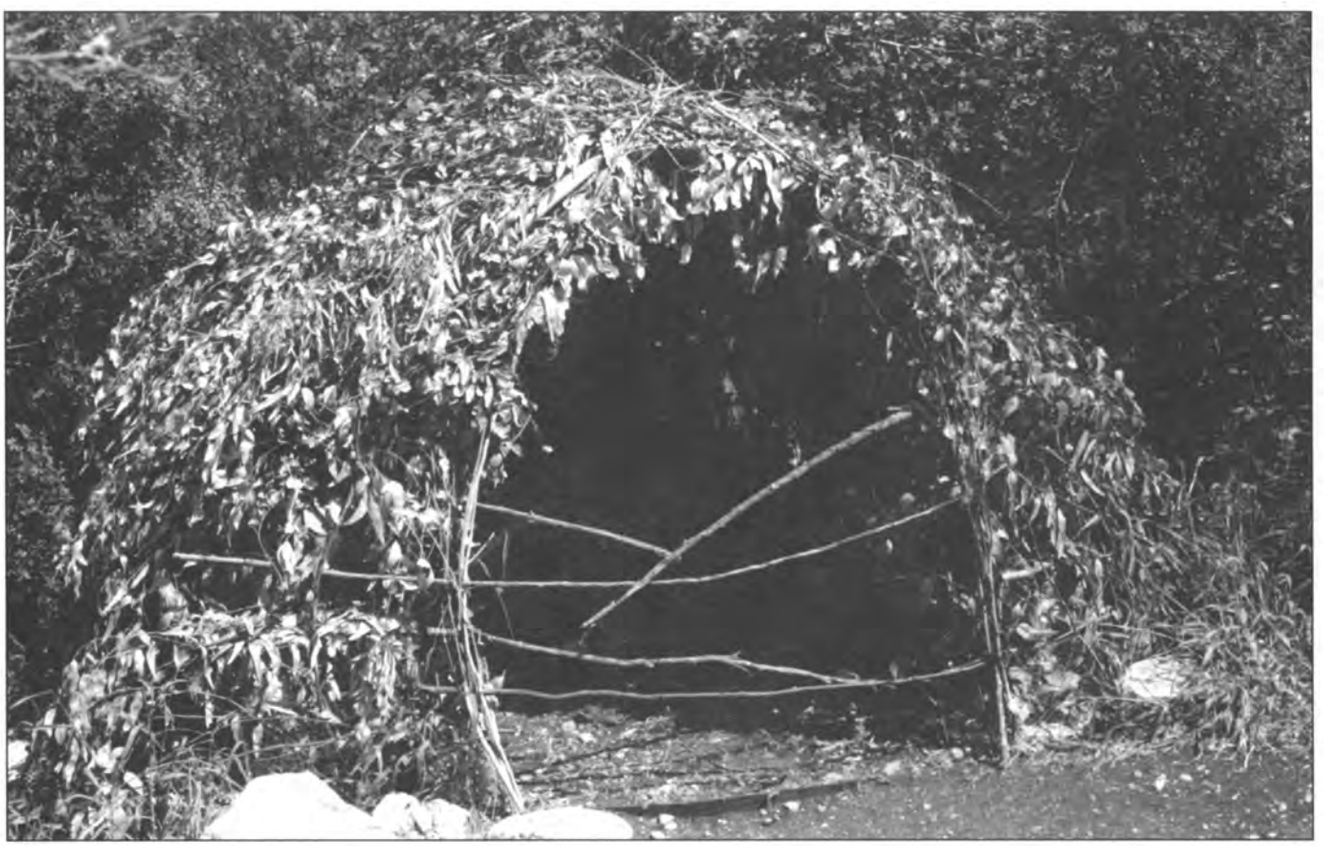


Fig. 4: A reconstruction of a Natufian dome-shaped grass and wooden hut at Tabun Cave, Israel. Such huts were also built at Ohola II on the shores of the Sea of Galilee about 20,000 years B.P. (*Source:* Photograph by D. Larson).

was in place for about a million years before the first wall was ever built or hut constructed (GAMBLE, 1994).

The Hypothesis then argues that, in the first phase of the built environment, this optimization of efficiency and comfort was copied over into many of the structural features of the first buildings. These copies included the following:

- **First,** the use of building materials that offered the greatest sense of "permanence" within the limits of cost and within the limits of the amount of time the occupants intended to reside in the structure. Stone huts were therefore not used by nomadic tribes unless their migration routes were repeated.
- **Second**, the division of the space into subunits that allowed for a division of function: cooking areas, food storage, sleeping, animal containment.
- **Third**, a connection of the individual family unit to other family units was provided in an open communal space that was nonetheless sheltered (at least in part) from the environment. In caves, this was provided by the space around the main hearth behind the dripline of the overhanging cliff, but in the built environment, the same functions were provided by foyers, plazas, cloisters, and courtyards.
- **Fourth**, this small group of family units had access to a flow of resources. In the natural rock shelter, this was represented most often by a riparian zone across which flowed water and associated plants and animals that were used for food. In the built environment, the "resource river" was often an array of merchants or vendors that would move across the communal space making their products available for residents.
- **Fifth**, the natural rock shelters were always rich in vegetation. In the built environment today there is no denying that the incorporation of microhabitat suitable for the growth of trees and other plants (both indoor and outdoor) is an essential feature of comfortable dwelling spaces for individuals, families and societies.

The Urban Cliff Hypothesis argues that the modern built environment should recognize its roots in its rock shelter past and do this by incorporating a sense of ancient landscape into building design. This does not mean that stone should be used for construction or that concrete should be poured to look like rock. Rather, it means that the division of the built space into functionally separate components should reflect both the need to use the space efficiently and comfortably at the same time. Part of this comfort is based on the need for people to feel protected from nature and from each other while at the same time feeling connected to them both. The automobile and the system of modern roadways that forms a menacing network around the world actually discourages people from making direct human contact at the local scale. Town planners that advocate the proliferation of big-box stores are unwittingly moving the "resource flow" areas outside of the places where people live. Landscape planning, from the point of view of the Urban Cliff Hypothesis, should reemphasize the value of foot traffic and the local provision of "resource flows" so that people are able to maximize their entire standard of living.

Conclusion

In conclusion, the Urban Cliff Hypothesis argues that we are a species that has evolved from rock outcrop exploiting ancestors and that our attitudes and feelings about the built environment have ancient evolutionary roots. In addition, the flora and fauna that form the bulk of the urban and suburban landscapes are themselves largely rock outcrop species that are simply exploiting the rock shelters that we have constructed of wood, brick, stone, glass and steel. If this evolutionary heritage can be accepted, and especially if it can be accepted that the human use and enjoyment of architectural space is something that is under our control, then it becomes possible to construct dwelling sites, workplaces, villages, towns, and cities that create both efficient and comforting environments at the same time. Such architectures may be more important than ever in the 21st century in view of predictions that another two billion persons will need to be accommodated in the next 25 years.

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Editor's Note

1. "We cannot acquire proper knowledge about our villages, towns, and cities unless we manage to see the whole range of the man-made systems within which we live, from the most primitive to the most developed ones – that is, the whole range of human settlements. This is as necessary as an understanding of animals in general is to an understanding of mammals – perhaps even more so." (*Source*: C.A. Doxiadis, "Ekistics: The Science of Human Settlements," *Science*, 23 October, 1970, vol. 170, no. 3956, p. 393).

Toronto at the time of "The Natural City" Symposion

Fig. 1: Financial district.

Fig. 2: Spadina Museum (Source: City of Toronto).

Fig. 3: The Distillery Historic District.

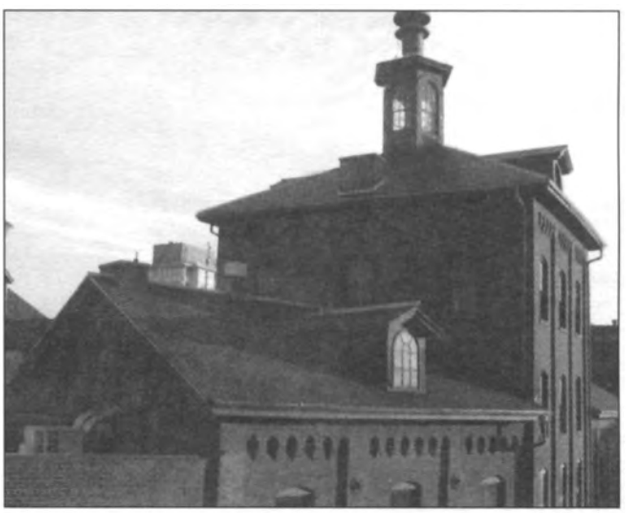

Fig. 4: The Distillery Historic District (Source: Hal Swann).

Fig. 5: Cabbagetown.

Fig. 6: Bustle of tourists around seafood restaurants.

(*Sources:* Tourism Toronto, "Toronto, Visitor Guide," Spring/Summer 2004 – pamphlet; Green Tourism Association, *The OTHER Map of Toronto,* 2003).

Ecology in the natural city: Testing and applying the Urban Cliff Hypothesis

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Introduction

Ecologists have been studying urban habitats for a couple of centuries and have largely concluded that, while biodiversity is often high in cities, the species that colonize cities and the habitat conditions they encounter are largely "unnatural." Cities are dominated by exotic or invasive species drawn from distant biogeographical provinces[1] and the action of human disturbance and technology has resulted in the creation of physical and chemical environments that do not occur in nature, such as heavy metal contamination and extremely high concentration of nutrients.[2] This lack of naturalness is typically invoked as further evidence of the production of ecological novelty by human beings and of our estrangement from natural processes. While it is literally true that many human settlements bring together concentrations of materials and energy that are often not seen in non-urban environments, and local, native species are often poorly represented in urban areas, the received view of the urban as epitomizing the unnatural should be thought of as only one of several possible perspectives.

Most currently recognized species of non-human life have existed for hundreds if not thousands of times longer than the first human-built structures at the edges of caves. Thus, each species has a unique evolutionary history largely prior to any large-scale human intervention in the landscape. This is not to suggest that some species have not rapidly adapted to novel conditions, in some cases caused by human interactions with their environments. In other cases, there is some evidence to suggest that many species, especially large mammals and birds, have not been able to successfully adapt to human activities. This seems to be the case for Pleistocene extinctions of large mammals and birds due to overhunting,[3] although there are several potential interlinked causal factors in most cases. Evolutionary biologists generally treat species as inhabiting or spending most of their time in one or more distinct types of habitat. Ecologists classify these habitats by dominant vegetation, the presence of water or other factors and so we have names for marshes, grasslands, alpine meadows, coniferous forest, dunes, and others. Many species can be classified by their preferences for these different habitats: there are forest interior birds, forest edge birds, marsh ducks, bay ducks, sea cliff birds and open ocean species.

While animals can typically move about from habitat to habitat, most have a preferred habitat for feeding with possibly others for nesting and reproduction.

Many plants have even tighter habitat preferences: the movement of plants is limited to relatively slow growth and to dispersal to other areas via seeds or spores. Ecologists can thus classify many plants by the habitats in which they grow, survive and compete best. While some plant species are highly plastic and tolerant of a range of conditions, the fact that no one plant species can grow everywhere lends credence to the idea that most plant species can only persist in a small subset of all available habitat conditions. With reference to urban ecosystems, the question then becomes: what kinds of habitats were exploited by these current urban species before we built cities?

The first attempts to find natural analogs for urban habitats were led by anthropologists and environmental psychologists who identified the suburban developments as copying features of ancestral human habitats on the African savannas: relatively open grassy areas with sparse trees which provide both prospect (the ability to scan the surroundings for food sources or enemies) and refuge from predators.[4] This research is important as it articulates the linkages between urban form and natural habitats, and argues for a biological basis, in part, for our preference for broad classes of landscapes. This "Suburban Savanna" hypothesis, however, omits key features of both current urban habitats and ancestral human landscapes. Urban settlements are characterized by hard surfaces, at least on the outsides of stone, brick and wooden buildings. Additionally, there is considerable

evidence that East African savanna environments would have been inhospitable to early hominids without the presence of rock outcrops to provide shelter.[5] Thus the "Suburban Savanna" hypothesis omits the actual buildings or shelters from the landscape template.

New research suggests that a large proportion of urban non-human inhabitants including vertebrates, invertebrates and plants, evolved in rocky, unproductive habitats such as cliffs, scree or talus slopes, and horizontal rock barrens. The "Urban Cliff Hypothesis," in brief, states that the urban denizens are stress-tolerant but opportunistic species with special adaptations to rocky habitats and that built forms represent ecological analogs of rock outcrop habitats.[6] Many urban species, such as pigeons (rock doves), mice, and dandelions, thrive in cities, because human beings have re-created their ancestral homes. When considering urban habitats, much past research has emphasized the classification of habitats based on the degree of human disturbance.[7] While this explicit recognition of humans as a component of urban ecosystems is important, it has had the effect of shifting the focus of urban ecologists to present day impacts of human disturbance and to an assumption that human effects on ecosystems are inevitably different both qualitatively and quantitatively from those of other organisms. When we consider the structure of cities from the perspectives of the other species that inhabit them, ignoring the design and intentionality of built form and focusing on the physical and chemical structures themselves, it becomes possible to acknowledge that humans can create habitats that are similar to natural habitats. While not all human-created habitats have natural analogs, cities in many parts of the world replicate some of the key features of natural landscapes dominated by cliffs and rock outcrops.[8] The implication of this view is simply that non-human species may perceive urban habitats, not as novel environments with challenging selective pressures, but as profoundly similar environments to their evolutionary habitats of origin. While initially bracketing out the human design of built forms to consider the life-worlds of non-humans, we can then return to examining the potential of conscious design to exploit the previously developed symmetries between built and natural habitat analogs.

Ecological restoration

Ecological restoration is a relatively new discipline that takes as its subject, the repair of damage to ecosystems caused by humans.[9] Some of the main tasks of restorationists include favoring native species often excluded by human disturbances or the influx of novel, "exotic" species. The premise of more ambitious forms of this field is that we can recreate habitats for many native species through both conscious manipulation of natural forces and natural recovery mechanisms. If it turns out to be true that much of the form of human settlements already functions as a recreated or newly replicated habitat, then this holds the promise that we might at least learn how to design urban features that not only take advantage of our perhaps subconscious manipulation of landscape elements and microhabitats to match certain habitat templates, but also to design better matches to allow greater colonization of settlements by native biodiversity.

While there is considerable evidence to support the Urban Cliff Hypothesis,[10] these data supports a "big-picture" view: many common species now dominant in urban areas derive from rock outcrop habitats, but quantitative tests in particular urban settings which examine complete sets of the biota are lacking. These will be essential in determining the practical relevance of the hypothesis.

In the following, I outline some of the key quantitative bases for the hypothesis and find some of the data that supports these. I will then show how future tests of the ideas might lead to practical applications in urban design.

The relevance of the Urban Cliff Hypothesis

The central premise underlying the idea that buildings and cities represent replicas of rock outcrop habitats is that the abiotic conditions made available by their construction match the conditions available in long-persisting rock outcrops that predate human artifice. Physical and chemical similarities between early found rock shelters and the first buildings may have been endemic to the development of buildings: some of the first dwellings outside of caves were constructed by piling rocks that had fallen from the cliff housing the cave, thus the new shelters were literal extensions of the cave walls.[11]

- Much of the evidence of the abiotic similarities between natural and built rock outcrops comes from an examination of biotic responses, i.e. patterns of spontaneously colonizing organisms on walls, roofs and other urban habitats and comparisons with natural systems.
- Another set of evidence takes the function of built environments for humans, and compares it to the early use of rock shelters and the exploitation of naturally occurring habitat features there.[12]

While functional similarities between urban settings and natural rock outcrops are easy to arrive at using qualitative descriptions, studies that explicitly compare urban ecosystems with other systems from the perspective of abiotic factors are needed.

One starting point is an examination of the current urban ecology literature that describes abiotic conditions in urban environments.

- Some of the key findings of these research programs outline potential similarities between built and natural outcrop habitats that may be useful in fields such as green building design and ecological restoration.
- One feature of human settlements that seems relatively universal at least in modern cities is the increase in hard or impermeable surfaces relative to adjacent rural areas. Some North American cities have had increases in impermeable surfaces from 3 percent to 33 percent from the 1940s to the 1990s.[13] This has resulted in an increase in peak streamflow volumes. Natural rock pavement habitats are characterized by similarly impermeable surfaces[14] and can also have greater magnitudes of fluctuations between flooding and drought compared with surrounding ecosystems.

This variable hydrology is widely thought to result in high levels of biodiversity.[15] Since more extreme hydrology is usually associated with problems downstream such as stream-bank erosion and the influx of nutrients into fresh water ecosystems,[16] the outcome of our inadvertent creation of habitats that function more like natural rocky habitats is considered to be largely negative from a hydrological perspective. On the other hand, if we can recognize that there are habitats in most regions of Earth that are naturally dominated by hard surface complete with biota adapted to these conditions, it becomes possible to conceive of revised urban forms that incorporate vegetation into hard surface environments. Technologies like planted pavements and green roofs lower the magnitude of urban hydrological fluctuations without reducing the amenity value of the surfaces.

Ann Winston Spirn[17] identifies several other abiotic parameters that differ between urban and rural areas:

- urban areas tend to be hotter overall (the urban heat island effect) than rural areas;
- urban soils also experience greater hydrological fluctuations between wet and dry conditions and tend to be more compacted than non-urban soils.

These features appear very similar to descriptions of natural cliff and rock outcrop habitats.[18] With reference to particular urban

microhabitats, it is easy to see similarities between natural flat pavements and abandoned or poorly maintained parking lots, gravelly "waste" areas and other unproductive urban settings where soil is shallow, stoney and often confined to cracks in the hard surface matrix (fig. 1). Walls have an obvious natural analog in cliff faces (fig. 2) and scree or talus slopes at the bases of cliffs have their counterparts in rough areas at the bases of walls where organic material accumulates, or planter boxes with deep soil surrounded by impermeable concrete (fig. 3).

Quantitative studies could directly compare microclimatic and other variables to determine how similar conditions are between urban habitats and their natural analogs. While it is expected that many similarities will be found, there will be differences as well. How do the differences in the arrangement of landscape elements and microhabitats between natural systems and built environments shape the function of the ecosystems and the patterns of biological organization within them?

While natural disturbances such as drought, flooding and fires may shape biotic responses in rural rock outcrops, how do human disturbances such as trampling affect urban biota? How do non-human species respond to urban sensory environments that differ from other environments where anthropogenic light and sound pollution are largely absent?

The answers to these questions should provide a basis for novel design solutions that maximize urban biodiversity and ecosystem function.

One of the main conundrums generated by the Urban Cliff Hypothesis is the overwhelming presence of "non-native" species in cities, whereas one would predict that if urban settings are such good analogs of natural cliffs, then species from local or regional cliff habitats should be abundant in cities.

Since rock outcrop habitats are known on all continents, why are regional rock outcrop species seemingly underrepresented in the cityscape? There are several further hypotheses that may explain this phenomenon:

- First, in many parts of the world, a large number of native species colonize urban or other built habitats.[19] For example, many native ferns easily colonize British stone walls (with their pre-urban habitats being rock cliffs, often of identical mineral composition to the built walls).[20] Clearly, the details of construction processes and materials may matter, especially where native species show strong substrate preferences. Thus the general finding that urban centers attract exotics is not always true.
- Another possibility is that urbanization, at least in the temperate zone of former European colonies,[21] brought with it such a huge influx of non-native propagules (seeds, spores and vegetative cuttings), that native species were simply swamped and remain much less abundant due to "propagule pressure" from newly established populations of non-natives both planted in gardens and farms, and spontaneously spreading in other urban habitats. In other words, there is a persistent horticultural bias toward "exotics" regardless of the region in question, and these preferred species reproduce in proportion to their abundance, leading to the domination of establishment sites by non-natives.[22] The history of agriculture in the last two hundred years also suggests that the availability of seeds is an important determinant of urban floras. Agricultural weeds depend on certain crops or cropping techniques developed in areas of the world. When agriculture began globalizing, weeds spread along with their host crops. In North America, a large number of crops derive from other bioregions where annuals are more common in regional floras, and where more weeds are annuals that can also easily colonize cities. With the early agricultural history of North America, it is not surprising that non-native plants dominate cities, with early cities being surrounded by farm fields.

The availability of propagule sources might also limit the spread of native species into cities because the appropriate habitat templates (cliffs and other rock outcrops) tend to be naturally rare in most landscapes. It is clear from recent research that cliff habitats represent refugia for many species, in part due to their relative inaccessibility and also due to their economic marginality.[23] Once global trade began in earnest, the exchange of plant materials among cities on different continents was likely orders of magnitude bigger and more ecologically important than the movement of plant materials from natural cliffs in the hinterland to cities.

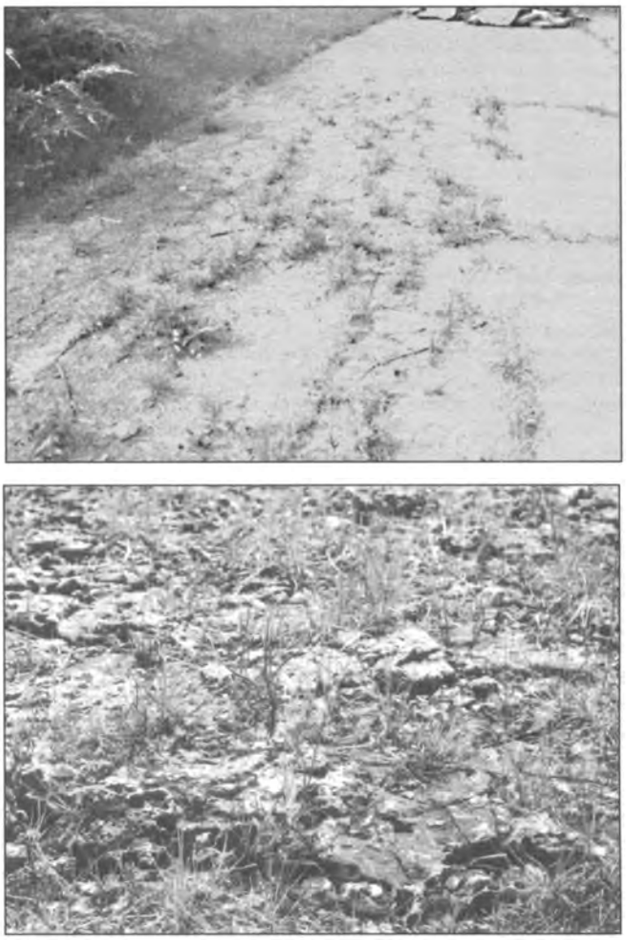


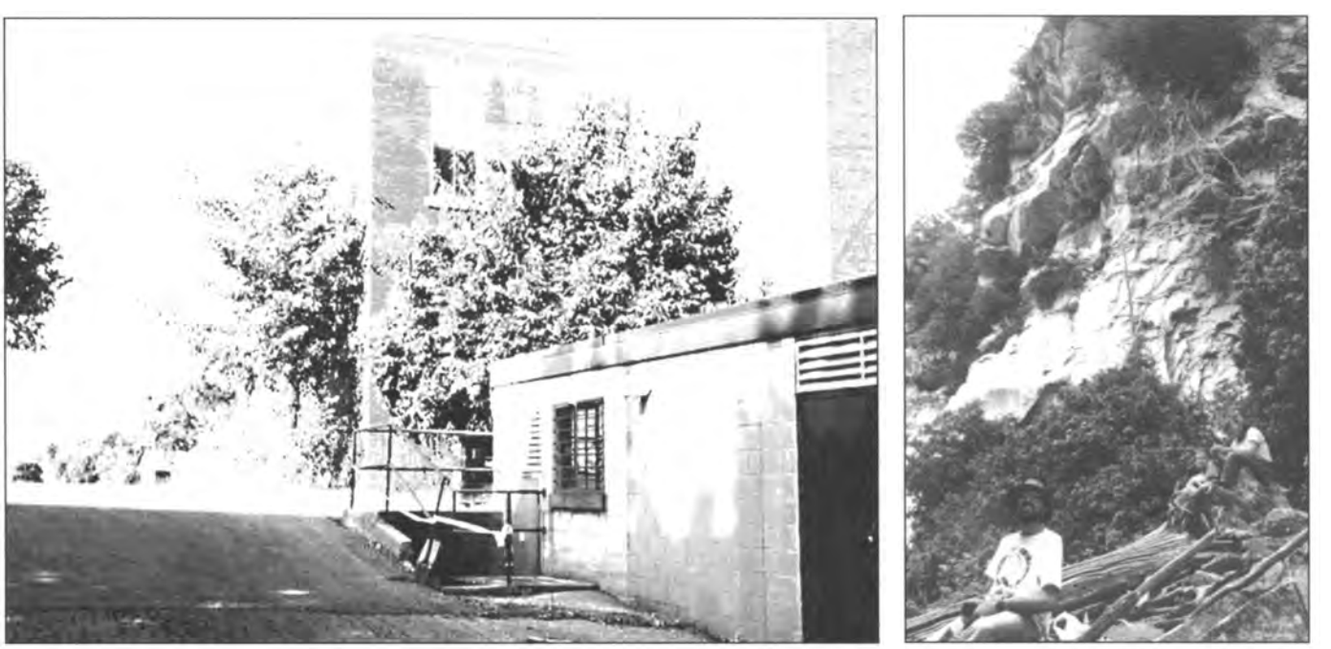
Fig. 1: Artificial (top) and natural (bottom) pavement habitats. (*Source*: The author).

The hypothesis that regions with longer histories of urbanization will be sources of well-adapted urban species that have undergone natural selection over thousands of years of urbanization, might have explained the high proportion of non-natives from Europe and Asia in North American cities, but European cities are also dominated by species that had most of their evolutionary history elsewhere. Thus, the propagule limitation hypothesis seems a likely explanation for the finding that many urban areas are dominated by species that originate in distant biogeographical regions. This hypothesis can be tested in urban areas by simply seeding various habitats with native rock outcrop species that are currently not present in the city, and tracking their survival, growth and reproduction.

Other quantitative tests could come from examining the genetic makeup of the populations themselves. While much of the Urban Cliff Hypothesis implicitly suggests that evolutionary change in species living in urban settings would not have been necessary because artificial rock shelters so well matched the

a b

Fig. 2: Artificial stone wall (a) and natural cliff face vegetation (b). (*Sources*: Jeremy Lundholm (a) and Peter E. Kelly (b)).



a b

Fig. 3: Organic deposits at wall edges (a) and natural talus slopes – foreground trees and rocks (b). (*Sources*: Jeremy Lundholm (a); Peter E. Kelly (b)).

conditions of natural rock outcrop habitats, it is likely as well that many developments in architecture and design have changed the basic habitat template. This is obvious when considering many modern buildings which feature sheer metal or glass facades, with the absence of colonizing life palpable: we have altered the template throughout the history of building. Thus genetic and phenotypic comparisons of urban and wildland populations (where they still exist!) of species could allow determination of the degree of evolutionary change that has occurred. The Urban Cliff Hypothesis would seem to suggest that genetic divergence between urban and wildland varieties of the same species would be minimal.

Why place so much emphasis on species native to regions, when the history of cities has much to celebrate in terms of the cosmopolitan cross-fertilization of cultures?

One of the key elements of ecological restoration can be the promotion of regional identity by restoring components, including biological entities, to vernacular landscapes.[24] The use of native plants in urban greening is one way to fight the creeping homogeneity of current cityscapes.[25]

Habitat preferences and human-nature relationships

It has been suggested that our construction of our own physical environment inevitably contains an "exhibitive" element that depicts our stance toward the rest of nature.[26] The prevailing view of urban habitats is that we design them exclusively for us, and for a select group of mutualistic species such as pets and garden plants. The ineradicable presence of pest species (many of which have their ultimate origins in cliff or other rocky habitats) seems to indicate that we are concomitantly and unwittingly designing for other species as well. The attempted species exclusivity of urban design projects an "us-them" attitude. The impact of such design may transcend the concrete forms of the buildings themselves. Some philosophers argue that we have largely underestimated the effect of our lived environments on culture, including values and behaviors with respect to the rest of nature.[27] Anthony Weston invokes a system of circular causation parallel to the notion of self-fulfilling prophesies whereby our engagement with our actual lived habitat shapes our actions, which in tum feed back to shape our habitat.[28] If built forms and settlement patterns reinforce cultural notions of separateness from the rest of nature or even an attitude of domination, then they provide a barrier to the cultural evolution of other possible relationships with nature, such as those characterized by reciprocity[29] or by an etiquette of respect.[30]

When we examine the findings of research into habitat templates of urban species from this philosophical perspective, we can see a signal from the rest of nature that cities are not as unnatural as we may have previously thought. We have tossed a ball into the wild and seen it thrown back: wild ferns, pigeons, and wild cats have colonized the places we built.

If we consciously design buildings and urban landscapes, we can depict different perspectives on nature than those that are currently coded. The idea of invitation as a basis for a new (or recovered) relationship between people and the rest of nature stems from philosophical investigations of disparate practices of the culture of nature.[31] By recognizing the inherent potential of built form (inherent because cities can be seen as an unconscious manipulation of resources to re-construct analogs of our optimal natural habitat) to welcome a diversity of other species, we can actually build for wild nature.

While clearly the most opportunistic of rock outcrop specialists have already joined our ranks in the cities, with many not welcome, it is possible to design for other elements of the rock outcrop biota which may not colonize spontaneously due to propagule limitations. It should be possible to design building surfaces with greater potential for colonization by plants. Some architects are already incorporating eyries for birds of prey, including nesting space for endangered bird species. While cities will continue to be built primarily as habitat for people, it is possible to engage with the rest of nature in a way that transcends dualistic, dominating approaches. The hope is that, given the potential for built environments to shape cultural relationships with nature, redesigning for invitation can actually promote a shift in values compatible with non-dualistic or less anthropocentric relationships with land and biota.

It must also be recognized that cities tend to be built on top of or in place of previously existing habitats which typically only included a small area of rock outcrop (with communities built within rock outcrop landscapes – e.g. Cappadocia or Petra – being obvious exceptions). Urbanization has thus been a process of habitat replacement: forests and wetlands being replaced by rock outcrop analogs, at least from the perspective of the Urban Cliff Hypothesis. It is essential that remnants of other habitat types be conserved within urban landscapes. Applications of the Urban Cliff Hypothesis are primarily useful for greening existing landscapes, not as justification for further erosion of natural, non-rock outcrop habitats.

Conclusion

The central precepts of this paper are that

- both biological and cultural factors determine built form; and that
- the biological basis of urban design has been marginalized up to now.

I suggest that the mutual causation of urban settings by our biological needs and cultural elaborations should be accepted and studied as a proper feature of urban design.

The view presented in this paper is admittedly biased toward the acceptance of hard-surfaced, urban environments as analogous to natural rock outcrops. Without stretching the analogy too far, the Urban Cliff Hypothesis at least provides the conceptual resources necessary to develop a perspective compatible with a "Natural City."

"The narrative that still needs to be articulated must reveal a direction for human action, self-understanding, and aspiration that points beyond the current practical and theoretical antagonism between the human and the nonhuman. By writing this narrative through our communal practice – including our architectural, design, and urban planning practices – we may be enabled eventually to discover a place for human beings that is neither a romantic return to the 'primitive' nor a glorification of 'shallow' management technocracy."[32]

A natural city need not be antithetical to notions of wilderness (or wildness) protection once we realize that we can project an invitational stance to the rest of nature and also to urban humans by inviting them to participate and encounter a nature that is both urban and wild. The acknowledgment that cities may be functionally "natural" to non-human organisms may yield tangible benefits as well as provide a strong foundation for revitalizing our conceptions of urban places.

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Green Buildings Policy: An analysis of three market-oriented innovations

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Introduction

"Green," "sustainable," "environmental," "smart" or "progressive" are terms used to refer to buildings that unconventionally apply techniques that affect the building and/or building process in a manner that minimizes the adverse effects on the environment. There are innumerable techniques considered to be "green" or "sustainable" and an inventory of them goes beyond the scope of this report. For the purpose of this inquiry, it should be important to note that anything that meaningfully reduces the amount of pollution that a building introduces into its environment is considered to be green. Increased awareness of the business case for sustainability has prompted interest among all stakeholders in the real estate industry. However, there are a number of barriers inhibiting the mainstream diffusion of these practices. Developing policies that address these barriers is the next step in achieving a more efficient industry and promoting public sector environmental objectives.

In the province of Ontario, the Smart Growth Panel was formed to report on and make a wide ranging set of recommendations (CENTRAL ONTARIO SMART GROWTH PANEL, 2003). This report discusses three innovative applications that address the barriers to sustainability in the design, construction and real estate sector. Each case proved difficult to research objectively because of the highly politicized stakeholder groups active in these industries. Most data related to these cases are from non-peer reviewed sources or directly from the organizations responsible for their implementation. Where available, academic literature has been reviewed. However, since these three specific examples are relatively recent, both forms of literature were important resources for the development of this report.

All three approaches originate from programs developed in the USA. Recent European policy advancements are not discussed here due to the abundance of unique market-oriented approaches found within the USA. Despite a huge number of effective programs being implemented in Europe at the time of writing, approaches developed in the USA tended to adequately reflect the market-oriented nature of this inquiry.

The criteria for analyzing these approaches have been adapted from two OECD reports (OECD, 1999; OECD, 2003). These criteria discuss the quantitative and qualitative impacts of each case. The criteria are:

- Environmental effectiveness;
- Economic efficiency;
- Administrative and compliance costs;
- Incentives for innovation;
- Competitiveness implication;
- Soft effects;
- Viability and feasibility.

The three case studies discussed are:

- Leadership in Energy and Environmental Design (LEED);
- Residential Energy Conservation Ordinance (RECO);
- Time-tranching.

Background

The total value of 2004 construction permits in Ontario was $23.9 billion (STATISTICS CANADA, 2005). Every new home or condominium generates 2.8 jobs. Nearly 250,000 person years of employment will be linked to the residential sector alone (VALELA, 2003). It is clear that the construction industry is an enormously important segment of Ontario's economy, providing livelihoods and homes to millions. Ontario is in the midst of a huge residential construction boom. The value of annual residential building permits in Ontario rose from $8 billion in 1998 to $15.2 billion in 2004.

Buildings in Canada represent approximately 38 percent of energy usage and 30 percent of total greenhouse gas (GHG) emissions. However there are a number of barriers preventing widespread uptake of green building techniques and the adoption of innovative construction, financing, and policy programs (MOORE, 1997; HABITAT DESIGN + CONSULTING & ARCHEMY CONSULTING, 1998; PECK AND ASSOCIATES, 2000; POMEROY, 1999). The impediments to achieving a more sustainable building policy mix can be broadly classified into five categories:

- Administrative – related to building code, official plans and the systemic barriers in large bureaucratic organizations.
- Financial – relating to the "green premiums," investment issues, and insurance liability.
- Psychological – relating to the inherent conservatism and risk aversion among building professionals.
- Experiential – problems associated with inexperience or lack of highly trained professionals capable of executing sustainable development.
- Market structure – relating to the large number of small firms that dominate the design and construction industries.

Administrative

Building codes and planning restrictions are geared to speedy approval of conventional buildings only and generally do not have

the capacity to address innovative designs in a timely manner. This additional time adds cost and frustrates many genuine attempts at green development. There is often little capacity for regional land use or transportation planning to support Smart Growth development. The fact that projects with innovative designs take considerably longer to gain approval makes it more difficult to convince investors of the project's financial viability, severely limiting the investment potential of sustainable development in Ontario and raising affordability concerns.

Financial

Until recently, the financial costs of green building were the critical deterrent to uptake in the industry. Recent evidence suggests that the 2 to 5 percent "green premium" associated with green building is now less costly than the future savings in energy and health associated with a 25-year life-cycle costing timeframe (KATS, 2003). Also, the variability in reported green premiums is high enough to discount many conservative investors from entering into green business ventures.

Green retrofitting has limited incentive for a lessor who generally transfers the operational costs on to the lessee. Furthermore, while a government institution should feel accountable for the future benefits that its building may have for society, private developers would be less likely to perceive environmental impacts as a financial incentive to building green. Also, higher capital costs and hurdle rates are discounted more heavily by businesses than government.

Developers often cite difficulty in acquiring investment backing for riskier projects (i.e. projects that involved innovative "unproven" technologies or took longer to gain approval) as being more difficult to finance (POMEROY, 1999). Investors are reluctant to finance a product that had not been proven in the marketplace. They want a clear demonstration that a project will earn money. There is also a perception among developers that there is an inherent lack of demand for compact development and that there is almost zero demand for environmentally responsible buildings (POMEROY, 1999).

Psychological

Risk aversion and a deep-seated conservatism in the building sector restrict the diffusion of green building.

Conservatism is inherent in the unwillingness of engineers to adopt new technologies to consumers who are conservative in their housing purchase decisions and financiers who want two thirds of the proposed project sold before advancing funds for construction. This conservatism is related to the fact that it is very difficult to "test the product," as is possible with other industry sectors, without significant up front investment risk (PECK AND ASSOCIATES, 2000).

There exists a stifling attitude toward sustainable building in the industry. A report by the U.K.-based Building Research Establishment (BRE) comments on how green buildings are branded by investors:

The image is of natural materials, green roofs, radical passive design, and technological gizmos. They are seen as a potentially short-term fashion trend with a narrow market place appeal that runs counter to longer-term appeal to long-term investment planners. There is a perception amongst building professionals that more sustainable solutions inevitably result in increased capital costs and/or reduced market/staff appeal. (YATES, 2001)

Experiential

The construction industry is characterized by a large number of small firms. Green buildings are characterized by a diverse array of techniques and require an integrative approach to their application. As a consequence, the diffusion of knowledge and first-hand experience is another obstacle for a more sustainable industry. Currently, the development community is unaware of the less radical options available and the benefits they can bring to a project.

Industry structure

The dominance of a large number of small firms in both the design and construction aspects of the building sector significantly slows the diffusion of technical and experiential knowledge. There are 3,691 firms in the Canadian Architectural industry and only 7,500 registered architects. Though the trend toward sustainable development has greatly influenced architecture, the profession is small in numbers and cannot influence decision makers as effectively as it should. Despite architects being recognized as leaders in the construction industry, the built environment and society in general, their impact on policy has traditionally been limited (INDUSTRY CANADA, 2002).

Green rating systems: Leadership in Energy and Environmental Design

Leadership in Energy and Environmental Design (LEED) is a green building rating system created by the United States Green Building Council (USGBC). The USGBC is a coalition of building industry participants across the United States. LEED defines the basic intent, requirements and documentation needed to qualify a building under LEED's four tier rating system. LEED qualifies green buildings with a classification based on the number of credits the building has satisfied out of a possible 69 (70 in Canada).

LEED operates on a voluntary basis by providing a project checklist to inform the design of a building and by awarding the finished building a rating. The ratings are: Platinum, Gold, Silver, and Certified. The rating is based on credits in six categories. The GBC charges a fee based on the size of the building and the number of audits required to qualify.

Analysis

- **Environmental effectiveness:** Energy efficiency is the largest category of credits under LEED v2.1 and the LEED-Canada system. It is also the most identifiable measure of a project's environmental effectiveness. LEED evaluates the quantity of improvements measured against a business-as-usual, built-to-code scenario. USGBC data on 33 LEED rated buildings reported average energy reductions of 28 percent (KATS, 2003). As to be expected, higher rated buildings were more energy efficient than those with a lower rating. The LEED rating system has other credits that indirectly affect environmental conditions although these criteria and their prerequisites are difficult to measure quantitatively.
- **Economic efficiency:** The additional costs of building green compared to conventional building was, on average, about 2 percent (KATS, 2003). The aforementioned reduction in energy consumption lowered operational costs and increased economic efficiency. This can provide a competitive market advantage to businesses and is a major selling point for the LEED rating system.

LEED has had a considerable impact on the building industry in the United States and Canada. Furthermore, many incentive programs in the U.S. now reference LEED. In effect, LEED has become the "image" of green building in the United States. Being the leader in green building makes LEED a significant player in raising awareness of environmental architecture. It has also put pressure on manufacturers to produce green building products to satisfy the new demand. A review of the trade literature (U.S. and Canada) has recovered an increasing frequency of references to LEED (BOAKE and PROCHAZKA, 2004).

From a policy perspective, LEED is a very cost-efficient means of effecting change in the building sector. Applicants are buying

an environmental label that can be used to improve operational expenditure and a building's marketability.

- **Incentives for innovation:** LEED has been credited with substantially increasing the industry's familiarity with environmental issues in the North American market (THOMSON, 2003). Awareness of LEED amongst building professionals is widespread – more so than competing green rating systems (GREEN BUILDING INDUSTRY AWARENESS STUDY, 2003). Recent building sector conferences in Toronto have included a CaGBC information booth and have featured specially highlighted environmental products or services. Increased environmental awareness has heightened the demand for more sustainably manufactured products and innovative building techniques. Though difficult to quantify, the momentum from LEED has contributed to awareness of green building, particularly in the United States. For example, a review of the trade literature shows a preponderance of environmentally minded product advertising, many with specific references to LEED.[1]

Of all the policy instruments available, a market-based voluntary information tool such as LEED is probably the most cost-effective way of promoting innovation.

- **Administration and compliance costs:** Administrative costs refer to the burden imposed on the public authorities responsible for applying the policy instrument. LEED is unique among the instruments discussed in this report because it is a product developed entirely by the private sector. It is a commercial product administered by a not-for-profit organization (USGBC or CaGBC). LEED does, however, demand payment to cover the costs of the USGBC. A typical commercial development may expect to pay less than 0.5 percent of total construction costs toward gaining the LEED label. Although certification may represent a small cost, more substantial overheads are usually incurred for the design in the form of increased professional person-hours. In the case of Natural Resource Canada's C-2000 program, this averaged an additional 30-45 person days.

Lack of experience and systemic barriers are partly responsible for these higher design phase costs of the development. However, considerable more work is required to integrate the myriad systems necessary to design an efficient building.[2]

- **Competitiveness implication:** Since LEED is a voluntary program it cannot depress the market. Evidence suggests that buildings with LEED certification have a higher market value than the business-as-usual scenario.

The financial benefits of green buildings include: lowered operational costs; reduced insurance premiums; and savings from increased productivity and health. Operational costs are predictable and can be accounted for in demonstrable tests. Productivity, however, is less quantifiable and its benefits remain uncertain. Increased productivity/health benefits, though proportionally smaller in relation to operational costs, represent a far larger potential gain because the direct and indirect costs of employees are the largest expense to a business. Figure 1 shows a breakdown of green building financial benefits. These benefits are estimated to be almost $50/sq.ft for Certified or Silver rated buildings and $75/sq.ft for Gold or Platinum buildings. This is over 10 times the average green premium of 2 percent or approximately $3-5/sq.ft for the 33 buildings analyzed (KATS, 2003).

- **Market impacts:** Although there is a lack of hard data on the market impact of LEED, anecdotal evidence suggests that LEED has played a significant role in popularizing the tenets of sustainable construction, particularly in the United States. LEED has been adopted by a number of regional and state governments and has influenced the building patterns of many other organizations.

Being a voluntary program, LEED cannot realize complete market transformation. As with any voluntary program, there must be a "want;" otherwise applicants can fall into the "LEED trap," where merely following the checklist will not guarantee the product. The problem does not lie with principles that LEED promotes, but with the method by which it is marketed. By promoting social responsibility as a market advantage only, LEED may also be producing a "loophole mentality," where builders start to look for shortcuts in the system. Of course, this sort of behavior is more common with regulatory instruments and atypical of voluntary systems. Still some designers are becoming disillusioned with LEED's "rigidity and bureaucracy" (SULLIVAN, 2004).

Once the first set of environmentally minded clients have signed onto LEED, the real challenge is convincing the mainstream to adopt LEED principles. An architect and environmental advocate commented that LEED has tremendous potential and has generated a lot of noise but has to be very persistent to pull the industry up the learning curve. Once the "low hanging fruit" has been picked, the real challenge lies in bringing conservative and risk averse builders on board.

Evidence suggests that green architecture has moved out of the "trend" phase of its development. High profile projects such as the reconstruction of the World Trade Center in New York City incorporates on-site wind generation. Another sign is that some of the most institutional, owner-occupied or build-to-suit projects are now incorporating green elements into their developments.

"Some REITs (Real Estate Investment Trust) and others in the industry are realizing the importance of getting beyond pure commoditization of space and pure rent. High performance green buildings can be seen as a measure of quality and a way to lead in the market" (SEAL and BROWNING, 2003).

Liberty Property Trust, one of the United States' largest Real Estate Investment Trusts, has four LEED projects under development. Furthermore, many of Canada's provincial or municipal governments have committed to large scale LEED projects.

- **Viability and feasibility:** LEED has become an industry leader in 10 years. Politics in North America is strongly supportive of market-based alternatives to government spending. In this atmosphere of fiscal restraint and government cutbacks, LEED manages to affect positive change without any development cost to governments. Although this may be LEED's greatest strength, it may also be its most profound weakness.
- **Barriers to LEED:** Barriers to the widespread adoption of LEED include investor awareness, lack of experienced practi-

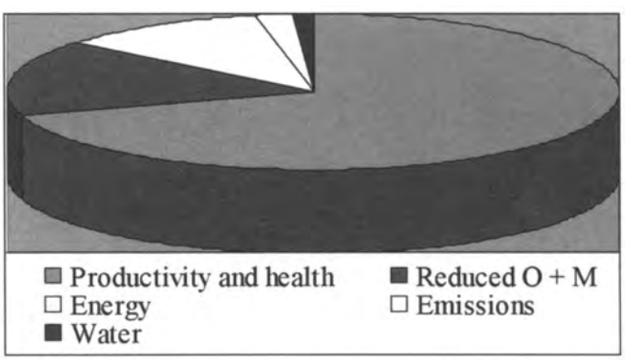

Fig. 1: Percentage breakdown of green building financial benefits (LEED certified and silver rated). (*Source*: G. Kats, 2003, p. 85).

tioners, and competition from other rating systems. Decisions to use LEED must be made by developers very early in the design process to be cost-effective. A poorly motivated investor decision to go ahead with a LEED project may impede the ability to achieve a green building. Above all else, the client must want an environmental building. LEED cannot be viewed as a checklist nor is it a surrogate for improved building codes.

Another potential barrier to the spread of LEED in Canada is the limited number of experienced practitioners. Though this number will probably increase over the next few years as LEED procurement increases in Canada, this may pose a problem at the more immediate stages.

LEED has some competition in Canada. BREEAM Green Leaf, Energuide, CBIP, BuiltGreen Alberta, and the C-2000 program have all enjoyed considerable success in Canada. This competition, coupled with LEED's narrow focus on large commercial development, may marginalize LEED in the Canadian marketplace. Furthermore, the costs associated with a LEED assessment may be prohibitory for smaller firms. It is unclear whether LEED will spread as quickly or with as much hubbub as in the United States.

• **Conclusions and recommendations:** LEED has enjoyed support and growth in the ten years since its inception. Whether or not LEED becomes the main player amongst the various green rating systems in Canada is yet to be seen. This may rest, in large part, on whether or not a residential version is developed for Canada's booming housing market and whether federal, provincial and regional governments move on sustainable building issues.

Being a market-based instrument, LEED has both strengths and weaknesses. It has zero administrative costs for govemment and does not require subsidy. However, this limits it to the whims of the market and it is unclear how much influence LEED can exert in an industry characterized by a large number of small firms. Being a voluntary program, LEED could provide an outlet for innovative building approaches and may produce a receptive environment that can ease the process of pioneering new standards (VINE, 1990).

An inherent conservatism and healthy skepticism among Canadian building professionals may reduce the impact that an "American-style" marketing system can have on the Canadian real estate industry. Nevertheless, empirical evidence on LEED-rated buildings shows promising results. A small green premium of about 2 percent can incur savings ten times the capital costs over a 25-year period. Though the data for these is somewhat unconventional, energy savings alone report to be a significant savings beyond federal or provincial baselines. Furthermore, NRCan's C-2000 program reports that energy savings of 35-50 percent can be achieved with zero or a very modest additional construction cost. This is achieved through an integrated design process (IDP).[3]

LEED has prompted a tremendous outpouring of support in the United States. Approximately 4 percent of all new commercial square footage in 2002 was LEED registered. A dramatic increase in the number of references to LEED in the trade literature is evidence of its momentum. Furthermore, a number of regional and state governments have adopted LEED as guidelines for building in both Canada and the United States.

The next few years will present a number of challenges to the LEED rating system. Once "easy" clients (i.e. those whose propensity to build green preceded LEED) have finished building, it is unclear if mainstream organizations will opt to use LEED or simply "greenwash" their buildings.

Residential Energy Conservation Ordinance (RECO): Retrofitting homes at the point-of-sale

The residential sector in Ontario represents a significant proportion of energy end-use. Ontario's 2.48 million dwellings used 512 petajoules of energy in 2001, almost three-fifths of which was used to heat homes (NATURAL RESOURCES CANADA, 2005). Ontario's cold winters are responsible for the disproportionately large energy expenditure on heating. New homes in Ontario are considerably more energy efficient than homes built a few decades ago. The fact that over 67 percent of Canada's homes are over 20 years old suggests that policies aimed at improving the energy efficiency of older housing stock should become a priority (CMHC, 2003).

With modem retrofitting, many older homes can be easily renovated. The improvements required to meet these standards generally include:

- attic, wall and basement insulation;
- furnace and appliance upgrade;
- draft-proofing and/or window improvement;
- ventilation upgrades; and,
- low energy lighting.

The capital costs associated with these renovations are considered to be the primary hindrance to further retrofits. Nevertheless, according to *Statistics Canada,* three quarters of homeowners reported at least one repair or renovation expenditure in 2001. The average amount spent by homeowners across Canada in 2001 was $2,065 (CMHC, 2003) with the largest proportion expended on repairs and maintenance followed by renovations and alterations. Strangely, homeowners spent, on average, more money on homes built in the 1980s than on homes built before 1946 (CMHC, 2003).

Canadians may need a further incentive to reduce their energy use at home. Traditional thinking suggests that increased energy costs are the single most effective method of reducing energy usage (OECD, 2003). Energy is a highly politicized issue in Ontario and the subject of endless debate. Based on the public uproar that de-regulation received when Ontarians were faced with energy prices actually reflecting its true market value, further taxation may not be the most fashionable solution for policymakers. Voters may be more open to a market linked regulatory mechanism that promotes modest conservation than they are to a fiscal mechanism such as increased taxation.

One such mechanism was designed and implemented in San Francisco in 1982. The Residential Energy Conservation Ordinance (RECO) requires owners to upgrade their buildings to a certain standard at the point-of-sale before a transfer of a deed can occur. This tool has been widely accepted into business-as-usual practices and has resulted in an estimated 15 percent decrease in residential energy use (VINE, 1990; SUOZZO, WANG and THORNE, 1997).

Policy triggers and requirements

RECO requires buildings to undergo energy conservation retrofits when the buildings are sold or have a substantial renovation. RECO is triggered at the point-of-sale and is designed to upgrade older housing stock. It is run by the Office of Building Inspection in San Francisco and the Energy Office in the Housing Department in Berkeley. Both programs use computer tracking to enforce compliance. In order to reduce administrative costs, San Francisco has private licensed inspectors who are responsible for carrying out some of the necessary inspections before and after the upgrades. Berkeley uses a non-profit organization, Community Energy Services Corporation (CESC), for all inspection work.

RECO is triggered by one of four factors:

- point-of-sale;
- metering conversion;
- major improvement; or
- condominium conversion.

RECO stipulates upgrades that include insulating attics, caulking around windows and doors, weather stripping and insulating piping. RECO also requires installation of low-flow taps and water efficient toilets. Certain limits have been placed on the amount of money that must be spent to comply with the ordinance. These costs typically cannot exceed 1 percent of the sale price. Since these upgrades have been incorporated into the newer building

codes, it is therefore unnecessary for buildings after 1978 to prove compliance.

Although the seller or buyer is responsible for enacting the upgrades with the ordinance, awareness is widespread and not a barrier to compliance. Non-compliance results in a fine of $300-400 in order to recoup the costs of enforcement and for an Order of Abatement (similar to a lien) to be placed on the property. Prior to the transfer of title, owners must arrange for a licensed inspector to visit the property to determine the necessary upgrades. After the conservation measures have been completed, a re-inspection ensures compliance and a certification form is issued. Certification is a requirement for transfer of title to occur unless an arrangement is made to transfer the responsibility to the buyer. An energy inspection must be filed with the city and an escrow account is established to hold 1 percent of the purchase price to implement the conservation upgrades. If the upgrades are not undertaken within 180 days of title transfer, then the city will proceed with non-compliance measures.

Analysis

- **Environmental effectiveness:** A lack of precise data limits an exact assessment of the environmental effectiveness of the RECO program, although one estimate suggests that since 1982, residential energy use has declined by 15 percent as a result of RECO upgrades (SUOZZO, WANG and THORNE, 1997). Similarly, RECO reduces water consumption and its associated environmental costs. By increasing the standards of existing buildings, this regulatory instrument probably also affects the likelihood of it being occupied for longer. Although it is difficult to quantitatively measure the environmental benefit of extending a building's service life compared to building a new environmentally efficient structure, it is important to note that a RECO program may be useful especially from a historical preservation perspective. More research on environmental impacts of renovation versus demolition/re-building should help clarify this gap in the literature.

- **Economic efficiency:** In the two municipalities where RECO is active, two approaches were identified as options for managing the administrative costs of enforcement: private-sector inspectors operating in a supply and demand market; and a not-for-profit inspection agency regulated by the city. San Francisco's Office of Building Inspection is responsible for about half of the inspections undertaken in that city. The other half is done by private inspectors trained and licensed by the city. Often, the private inspectors are also contractors or builders who perform the work after having identified what is necessary under the ordinance. This integration of inspector/contractor is considered an efficient altemative because it reduces the steps in achieving compliance. In San Francisco in 1997, approximately 70,000 properties had been inspected by the Department of Building Inspection, at least 65,000 of which were known to be in compliance. Private companies reported another 90,000 inspected properties. The compliance rate of these buildings was not exactly known, though the Department of Building Inspection classified the rate as comparable to that of the municipal inspectors.

Berkeley's approach has been to require that all inspections be undertaken by CESC, a non-profit arms length organization, and authorized inspector. CESC also provides a list of approved contractors to complete the work for RECO. Both in San Francisco and Berkeley, RECO was not considered to be a barrier to the housing market (MACKENZIE, 2003; SUOZZO, WANG and THORNE, 1997). These cities have undergone sustained housing booms and the addition of a small cost to doing business has not perceptively affected the market. However, no quantitative studies have been undertaken to support this statement.

RECO has created a specialized labor market in San Francisco where the integration of inspector/contractor allows for further efficiencies. It is likely that RECO also stimulated the local construction and retail hardware economy although no empirical data exists on this subject.

Seventy percent of San Francisco' population lives in rental units and principal agent problems historically reduced the market impact that energy conservation would have on renters.[4] This approach to enforcement has an uptake rate based on the turnover of properties. Figure 2 approximates the increase in compliance over time. Consequently, RECO achieves higher efficiency standards without large administrative investment in capital and training expenses typically equated with the outset of a program. Furthermore, because of the small staff requirement, only small costs are associated with the learning curve period of the project. The OECD's (2003) report entitled *Environmentally Sustainable Buildings* identified RECO as an important policy tool for addressing energy efficiency in old residential buildings:

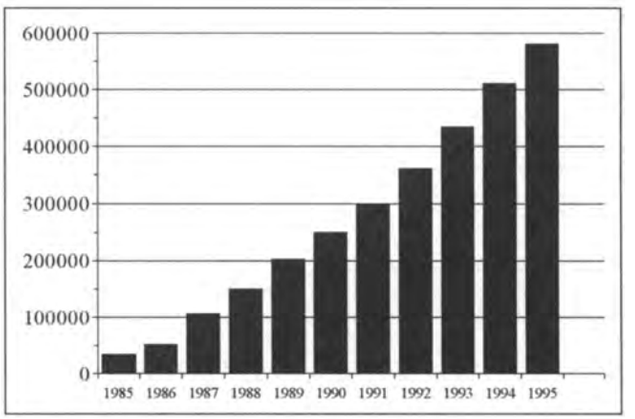

Fig. 2: Cumulative number of buildings in compliance over time. *(Source:* Suozzo, Wang and Thorne, 1997, p. 513).

"When considering the diminishing returns on investment in energy efficiency measures, relatively old and not very energy efficient building, which are RECO's main target, could potentially improve their energy efficiency in a very economical manner. It should be noted that there are not many options for upgrading the low level of energy efficiency of old buildings – in particular of old residential buildings – to the minimum standard" (pp. 83-84).

- **Incentives for innovation:** RECO's modest, uniform and specific minimum standards have made it palatable for stakeholders. However, the ordinance eliminates any stimulus for innovation (OECD, 2003). This is because RECO demands specific upgrades such as window caulking, extra insulation, etc. instead of performance-based requirements like an overall reduction in energy consumption. This severely reduces this policy's ability to promote new and innovative approaches to achieving energy conservation.

- **Administration and compliance costs:** The administration of RECO falls under the jurisdiction of the San Francisco Department of Building Inspection/Housing Inspection Services and the Berkeley Energy Office and Community Energy Services Corporation (CESC). San Francisco also authorizes private inspectors to perform inspections as well as retaining between 25-30 of their own staff inspectors. Every year the San Francisco Department of Building Inspection offers a training course for people to attain certification to complete a RECO inspection and the Department has developed a training manual and examination process. Private licensed inspectors can determine their own fees. However, the fees set by the Department's officers are designed to cover the administrative costs associated with RECO.

In Berkeley, inspections are undertaken by a non-profit corporation and inspection fees are also nominal. These costs cover a small administration staff and computerized tracking program for recording properties in compliance with the ordinance. For a single family dwelling, the CESC fee for initial inspection is $100 plus a $15 filing charge. In San Francisco, the inspection fee is similar. Non-compliance fees are between $300-400 which covers the cost of the issuance of delinquency statement, and, if necessary, a hearing and lien.

Inspection fees are considered to be a self-sustaining charge which eliminates the need for external funding. This was found to be true in both the San Francisco and Berkeley cases. In terms of the outlay that must be absorbed by the public, the compliance costs associated with RECO are never more than 1 percent of the value of the building.

• **Competitiveness implication:** In order to satisfy the interests of all the various stakeholders, the RECO standards had to be set to meet the requirements of the lowest common denominator (SUOZZO, WANG and THORNE, 1997). In this case, it is an example of "sacrificing breadth for depth" (VINE, 1990). Since RECO is so modest in scope, it does not have any discernable depressing effect on housing markets where it has been enacted.

Realtors and title companies, which do not want to be responsible for selling properties burdened by RECO liens, are relied upon to promote compliance (SUOZZO, WANG and THORNE, 1997). In effect, attaining RECO compliance is a competitive advantage in those housing markets and has been actively promoted by realtors.

In San Francisco, private inspectors can also perform the upgrades to buildings that they have inspected. This promotes integration and efficiency in that it reduces overlap and facilitates faster compliance. These private contractors are awarded a competitive advantage in the home renovation market from their investment in the certification course. This contributes to the local economy, stimulates continued education as well as market differentiation.

• **Soft effects:** After reaching its saturation point, the long-term effects of the RECO program could result in an eventual decline in building energy efficiency. The number of buildings reaching compliance will eventually decline (previously inspected buildings do not need to be reassessed) as the sale and resale of properties exhausts the finite number of "older" housing stock. Although, undoubtedly, building code amendments and social acceptance of energy conservation will demand more advances in efficiency, it may become necessary to update RECO by forcing post-1978 buildings to achieve re-compliance. Furthermore, as newer more energy efficient homes age, reinvestment may be necessary to bring them back up to an energy efficiency standard. Having an existing RECO in place already provides the technical and administrative infrastructure on which to build these future programs and to contribute to historical buildings' retention of market value.

It is unclear whether RECO will achieve higher energy efficiency in the long-term. RECO compliance offers no incentive to outperform the standard and may disincline further investment in conservation and energy efficiency once the minimum has been met (VINE, 1990).

• **Viability and feasibility:** Any sort of regulatory policy must be coupled with an intensive educational campaign. As the RECO experience attests, there is significant reluctance to accept a change in the status quo. Despite the best intentions of the policymakers and the obvious benefits to the common good, the reluctance to invest capital into energy conservation is a real barrier to conservation policy enactment.

Another issue is the difficulty in assessing RECO's impacts. Data for the programs is either based on estimates or cannot be readily accessible (MACKENZIE, 2003). This limits the ability of policymakers to assess the effectiveness of the program and document its benefits to the homeowner. Furthermore, this lack of formal data tracking makes it difficult to garner the support of stakeholders and proceed with defending the policy's effectiveness or applying modern requirements in the future.

• **Barriers to RECO:** RECO was conceived amidst the energy crisis during the 1970s oil embargo. Policymakers were faced with the growing realization that a fundamental mismatch existed between those people who were being targeted by conventional energy conservation policies and those who were actually paying to use the energy. RECO was subsequently developed to address energy conservation issues in San Francisco's existing housing stock.

The primary barriers that were encountered in the process of implementing RECO revolves around the aversion to further regulation and fears that it would depress the market. This would add an unnecessary additional cost to the already high transaction charges associated with the real estate business.

In order to get the ordinance passed, the municipal government was forced to tone down RECO. This resulted in a compromised version of the ordinance. The city initiated a targeted campaign to win over the gatekeepers of real estate transactions (i.e. realtors) with the assumption being that the information would filter down to the building owner. Although anecdotal reports suggest that these barriers were overcome by the eventual realization of the financial savings and social benefits of RECO, it was difficult to measure the temper of the times because few of the people involved in RECO's startup were available for comment.

A discussion with a city official revealed that the ordinance has since been normalized and even expanded to commercial buildings (MACKENZIE, 2003).

• **Conclusions and recommendations:** Despite the lack of precise data supporting RECO's achievements, the ordinance continues to be a widely accepted part of doing business in both San Francisco and Berkeley. RECO's innovative trigger mechanism has been successful in improving the energy efficiency of a substantial number of older buildings. Furthermore, it has done so without requiring additional funding and in a cost-effective, sustainable and socially acceptable manner.

RECO should not, however, be regarded as a panacea for energy efficiency in existing housing stock. The minimal standards delineated in California are not easily transferable to Canadian circumstances. In fact, the benefit of 1 percent of the value of a home for energy efficiency upgrades may not result in a proportionately similar decline in energy usage in the Canadian climate. Further inquiry is recommended before a decision to implement a RECO program is made. Specifically, data linking the quantity of capital investment in energy efficiency required to reduce a certain amount of energy use could provide a baseline for a future energy conservation ordinance.

Still, RECO is a good starting point for the design of a Canadian program for existing housing stock. If anything, the Californian experience demonstrates how successful the point-of-sale trigger is in enforcing regulatory measures. By adding a proportionately small amount to the already large real estate transaction charge, policymakers may be able to mitigate the traditional disdain for government mandated capital investment.

RECO produces further specialization in the trades and generates economic benefits in the form of long-term employment in the construction and the promotion of awareness and skills development.

RECO is particularly effective at addressing issues associated with principle agent problems and affordability in rental housing. There are 1.3 million rental dwellings in Ontario many of which are in older buildings. What economists refer to as "market failures" must be tackled by innovative policy measures. With a looming energy crisis in Ontario and a large number of renters, it is becoming increasingly evident that new policy must be developed to deal with rental housing and existing housing stock.

A regulatory measure such as RECO could be built upon the already existing Energuide for houses or Green$aver programs. These evaluators use HOT 2XP software and a blower door test to identify leakage points in the home. The assessment costs run between $102-192. By tying this system to a mandated point-of-sale trigger and enforcing it through realtors, private and not-for-profit sector, Ontarians could likely achieve similar results with minimal outlay.[5]

However, it is important to emphasize that the success or failure of a regulatory tool largely relies on the bureaucracy's ability to generate support for the policy. Industry stakeholders should be involved in the development of any point-of-sale triggered energy retrofit program right from the beginning. Bringing a fully developed regulation to the table will undoubtedly alienate the people who will ultimately be responsible for its success. This aspect of policy formation should be quintessential for the prospect of meaningful regulation to succeed.

A policy such as this should be timed to begin at an appropriate point in the real estate cycle. For instance, it is less likely to be accepted during a slump when the market is suffering from low sales. It also should not be initiated at a market peak because of the probability that it will be blamed for the inevitable future downtum. Again, a roundtable advisory panel should be responsible for informing all the terms of this kind of policy. In this manner, it is increasingly likely that a sustainable process of implementation will be realized.

Time tranching – Varying rates of risk and return over time as a method of financing environmental development

One of the most important barriers to the advancement of sustainable building is the inflexible accounting methods used to evaluate an investment. These methods tend to reward conventional development and penalize innovative projects (LEINBERGER and DAVIS, 1999; PECK AND ASSOCIATES, 2000). It is increasingly evident that a paucity of financing alternatives may be the limiting factor for progress toward greener developments. In many situations, imaginative methods of financing may be needed until the approach becomes commonplace (TAYLOR, 2000).

Typically, a developer will seek a mixture of debt and equity to cover the land, materials, labour and marketing that is required of a large scale residential development. A developer acts on a series of assumptions about the market before seeking investors to finance the project. A financier's decision to invest in a project revolves around a quantitative analytical procedure. A standard analysis technique, Discounted Cash Flow (DCF) is used to determine the risk involved in financing the proposal. If the analysis shows the project to be too risky, then conservative financiers will not invest. In many cases, DCF analysis automatically precludes certain types of projects.

Forty years ago, DCF analysis became the standard method of evaluating the potential of a specific investment (RUSSEL, 2003). Simply put, DCF can tell an investor what someone is willing to pay today in order to receive the anticipated cash flow in future years. It is the method most often used by large investment banks and consulting and accounting firms.

DCF and its derived valuation techniques, such as internal rate of return (IRR) and net present value (NPV), are means by which different projected cash flows can be easily compared over time. These valuation systems aim to assist investors in selecting the highest yield investment.

The assumption behind DCF is that a future dollar is worth less than a dollar today. The decline in value of a real estate investment is a factor of its "discount rate." The discount rate is determined by the cost of capital (the interest charged by a lender) and an investor's expected return on the investment. A typical discount rate is expressed as a percentage and, for real estate, is around 15 percent. This assumes an interest rate of 7 to 8 percent on the capital, and an expected profit of 7 to 8 percent. The discount rate is a measure of the risk of a particular investment; the higher the discount rate, the higher the risk.

IRR is a DCF methodology used to assess a specific percentage value of a projected cash flow. IRR is the discount rate where cash flow is equal to the initial investment in current dollars. A typical moderate-risk real estate development has an acceptable IRR of between 15 to 20 percent. A high-risk development will have an IRR of around 35 percent. Perceived risk will increase the IRR value for two reasons: first, lenders may choose to charge more interest for unproven developments; and second, innovative projects are, by their very nature, unique. Lenders attach a higher marketability to these projects because of their potential for higher return premiums. If the two components used to calculate IRR are examined (interest and expected profit), it is evident that IRR favors standardized low-risk development (LEINBERGER and DAVIS, 1999). Faced with two investments, one with an IRR of 35 percent and one with 15 percent, most investors will choose the lower IRR. In effect, the "catch-22" that arises from conventional financing has severely limited the opportunity for innovative projects to acquire financing.

Because DCF analysis' emphasis is on cash flow at the onset of the investment term, it is biased against any losses early in the development's life and tends to favor short-term conventional investments over all others. These projects tend to have a low IRR. As a consequence of DCF valuation, it naturally follows that the primary way of ensuring high short-term gains is by minimizing the costs of construction. This almost always translates into lower quality buildings (RUSSEL, 2003).

How time-tranches operate

Developed by real estate analysts Christopher Leinberger and Robert Davis, time-tranching divides real estate investment into tranches, which are different classes of risk/return that have a specified payback period (LEINBERGER and DAVIS, 1999). The concept of time-tranching is borrowed from the commercial mortgage backed securities industry. This technique distributes the cash flows to different classes of investor according to the levels of risk/return that appeal to each investor. Each "tranche," or investment class, will have a different level of risk associated with it related to the "piece" of the investment chosen.

Leinberger and Davis have particularized this system according to the assumption that a well-planned mixed-use development will continue to appreciate long after the conventional peak used in DCF analysis.

Each tranche is also assigned a time period where it receives a prescribed percentage of the cash flow for those years. For instance, the first tranche, 'A,' receives 90 percent of the cash flow for years one through five while 'B' receives the other 10 percent. Table 1 shows a breakdown of the cash flows for the three time-tranches.

Table 1
Time-tranche distribution

Tranche	Cash flow distribution		
	Year 1-5	Year 6-11	Year 12+
'A'	90%	20%	10%
'B'	10%	70%	45%
'C'	0%	10%	45%

(*Source: Arcadia Land Company* in Leinberger, 2001).

This scheme allows investors who use DCF methodologies to get their investment off the books quickly. This scheme also per-

mits patient investors, or those with vested interests in the project (i.e. municipalities, social institutions or regional governments), to eam a retum while, at the same time, enjoying the social benefits of compact, mixed-use development.

The percentages in table 1 are determined by the amount required to achieve an acceptable IRR of, for example, 20 percent on the investment. Unconventional developments tend to peak in value in a much longer timeframe than conventional sprawl. As can be seen in figure 3, the line going all the way up from left to right represents capitalization of a regularly maintained mixed-use development. The line going up and then down from left to right shows the value of a conventional development as peaking in years five through seven and then depreciating unless another capital infusion maintains the value.

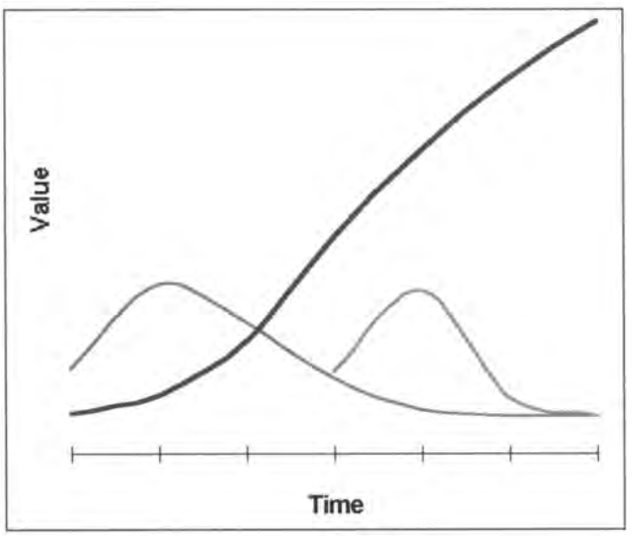

Fig. 3: Sustainable mixed-use development vs. Conventional reinvestment model. *(Source*: Leinberger, 2001, p. 6).

Analysis

- **Notes on the analysis:** Time-tranching is a financial instrument developed by Christopher Leinberger and Robert Davis, which is designed to diffuse the risks associated with high end residential New Urbanism (NU). At this point, it is primarily a theoretical scheme. Only a few situations exist in the United States where time-tranches have been used to finance developments. One such urban revitalization project in downtown Albuquerque, New Mexico, has piloted a time-tranched funding scheme. This scheme, because of its very nature, cannot be analyzed in the same manner as the previous case studies. New Urbanism is a highly contentious program and is criticized as being merely a representation of the complex web of social and economic networks that makes a diverse downtown neighborhood actually work (FOWLER and HARTMAN, 2002; EPPLI and TU, 1999). Furthermore, smart growth strategies, or alternative development strategies (ADS) are also widely debated and unresolved (CISCEL, 2001; CARUTHERS and ULFARSSON, 2003; JOHNSON, 2001). It is beyond the scope of this paper to discuss these issues in anything other than general terms. Although the primary analysis revolves around the financing tool developed to reestablish investment in mixed-use and walkable cities rather than ADS themselves, it is also important to look at why these ADS are more appropriate than conventional development.

Much of the literature on time-tranching is in popular or industry journals and offers a limited and often subjective analysis of its impact. At the time of writing, no peer-reviewed economic analysis exists on the potential impact of time-tranches as an alternative to conventional real estate financing and very little formal analysis of New Urbanism exists at all (SONG and KNAPP, 2003).

- **Environmental effectiveness:** The current DCF valuation model promotes short-lived, poor quality construction and is not a sustainable system. Aside from the inefficiency of resource use attributed to frequent demolitions, there is mounting evidence to suggest that urban sprawl has many diverse impacts on the environment (JOHNSON, 2001). These impacts are so numerous, varied and interrelated that a complete discussion is beyond the scope of this paper.
- **Economic efficiency:** The addition of more participants into a market translates into more liquidity and less risk (MIRON, 2000). A higher diversity of investor types may exhibit increased resilience in the event of a market downtum. This is reflected in the ability of a secondary market to spread risk among many smaller investors. The development of the secondary mortgage market is largely responsible for the increasing diffusion of risk in real estate and has made it accessible to more investors. Time-tranching is, in effect, another market innovation to further distribute the risk associated with real estate. However, time-tranching is best suited to certain types of investors.

Time-tranching operates using DCF analysis in order to improve the IRR of a specific investment. Gyourko and Rybcynski (2000) showed that financiers may have no inherent bias against a concept like NU or mixed-use development, though they must be shown to generate enough cash flow in the short-term. Similarly, Peck and Associates (2000) found that, among building professionals, the perception was that lending institutions looked for a certain set of criteria and are unwilling to give much leeway on programs that offer lower retum or more financial risk. This suggests that financiers would respond favorably to the introduction of a mechanism that made innovative real estate investment more palatable.

Using DCF analysis, green building is not an economically efficient alternative to conventional construction. This is because initial capital costs in the design and construction phase of the project only pay off over long periods of reduced energy consumption. However, time-tranching can offset this by reducing the risk associated with unconventional developments, especially when vested social interests are valued. This opens the door for higher capital cost construction (i.e. higher quality materials and techniques and more person-hours spent on the integrated design process) and diversifies the number of investors available to finance a project. In this sense, it is a low cost means of realizing an environmental objective.

- **Incentives for innovation:** Time-tranching has the potential to significantly alter the real estate investment market by creating opportunities for innovative capital-intensive developments. DCF methodologies, on the other hand, promote standardization and reduce the acceptability of unconventional urban forms.

In the real estate market, the move toward standardization has been a recognizable trend for the past half century.

"Risk mitigation has spurred standardization in design of buildings, planning approvals, the methods of financing of new construction, the quality and kinds of construction materials, and the fittings and equipment these buildings incorporate. Planned suburban communities and their individual components – from homes to shopping malls and business parks – reflect the importance of standardization in today's real estate market." (MIRON, 2000, p. 154)

One reason for this is the rise of Real Estate Investment Trusts (REITs). REITs are publicly traded and have a fiduciary duty to operate in the best interests of their shareholders; therefore, REITs tend to perpetuate this conservative bias toward low-risk standardized real estate development (LEINBERGER and KOZLOFF, 2003).

Investors are biased toward trading similar products because investment bankers have been trained to think of standardization as a way to minimize risk (LEINBERGER and KOZLOFF, 2003). As well,

"The lending industry is increasingly characterized by standardization and routinization. (These trends are most pronounced in single-family underwriting.) Making capital a commodity contributes to the efficiency of the current mortgage industry and explains such recent trends as automated underwriting with credit scoring" (BURCHELL and LISTOKIN, 2001).

Time-tranching may actually increase the capacity to produce innovative architecture. This is achieved through the division of the investment into the tranches. The first tranche represents the initial five years of the cash flows and covers about 65 percent of the costs of the total project. This 65 percent represents the costs of construction and is usually financed by a bank's short-term construction loan. Since the actual costs of the development are also financed by the investors in the second and third tranche in the form of equity, there is a larger amount of money available to spend on design and construction. This can result in more durable materials and construction techniques, higher quality labor, and/or the premiums associated with green building technology.

The reduced reliance on debt to finance a development increases the possibility of the construction loan being justified as non-recourse. Non-recourse lending means that the individual or corporation promoting the development will not be liable for debt if the project goes into default (LEINBERGER, 2001). Non-recourse lending further reduces the risk associated with a progressive venture.

- **Administration and compliance costs:** Because it is a new system, it is unclear what additional administration costs time-tranching might add. In the immediate context, it is likely that time-tranching will accrue unforeseen costs associated with the learning curve period of the scheme. It is also likely, however, that this extra complexity and the additional need for careful assessment and planning will increase the cost of profit in the long-term. This is due to the additional time and expertise required to evaluate and coordinate mixed-use development and the partnerships involved in the scheme. Furthermore, because it is untested and non-conventional, high administrative learning curve costs may be a barrier to widespread implementation in the immediate future.

Leinberger associates time-tranched developments as being characteristically unconventional. Deviating from the norm requires new approaches for equity, land acquisition, leasing and sale. He suggests that his approach may require what he calls "backward integration," which refers to the substantial amount of networking required to float this new system of financing.

Patient equity for the second and third tranche or even for the first tranche is not something found by a conventional equity or mortgage broker. Obtaining unique local tenants for an infill project is not something many retail brokers know much about (LEINBERGER, 2003).

- **Competitiveness implication:** From the few examples where time-tranching has been used to finance real estate developments, it is evident that these developments attract market premiums averaging between 4 to 25 percent (FRANKEL, 2001). This is due to the higher quality of construction and reflective of an unsatisfied demand in the market. This demand is probably fueled by a number of interacting issues (FLORIDA, 2002).
- **Soft effects:** The success of time-tranching largely depends on how the Albuquerque, New Mexico downtown revitalization project unfolds. Many Ontario cities have been experimenting with innovative financial techniques such as tax increment financing (TIF), reduced development charges, and/or grants (MINISTRY OF MUNICIPAL AFFAIRS AND HOUSING, 2000). Whether or not time-tranches become a normalized method of public/private development partnerships may be a function of its success in Albuquerque.

Time-tranching could reasonably contribute to the growing awareness of the problems associated with conventional financing. At the very least, Leinberger and Davis' scheme should stimulate more formal investigation into alternative financing methodologies and possibly lead to a re-evaluation of DCF analysis.

- **Viability and feasibility:** With the growing trend moving away from interventionist policies in favor of market-based approaches, time-tranching may be a viable alternative to conventional financing. Despite there being reasonable evidence to suggest that mixed-use and compact development is in demand, the market has failed to satisfy that demand in the United States. In Toronto, this demand has been at least partially supplied by developments funded, in part, by private companies. These types of investors could satisfy the requirements of patient, long-term investors for second tranche positions.

Overcoming DCF analysis' short-term bias using a non-interventionist approach could redefine how real estate financing influences the urban environment. This approach may be an acceptable alternative to regulatory intervention for the influential stakeholders in the financial and building professions. However, it is evident that long-term strategies to encourage or regulate compact urban development must eventually augment any market function to the extent that it places a disincentive on sprawl.

Evidence from Leinberger's experience as CEO of Albuquerque's revitalization suggests time-tranching is being accepted by the professional community. For instance, Phoenix Properties, the urban affiliate of Lincoln Properties (one of the largest and oldest apartment development companies in the United States) was happy to take a second tranche position on a 169-unit project in downtown Albuquerque.

Recent declines in inner-city manufacturing districts may represent an opportunity to experiment with time-tranche financing. There exists tremendous potential gain in supporting long-term sustainability strategies in the form of municipally-backed third tranche positions for Ontario's de-industrializing downtowns. This could also be developed as an alternative approach to subsidizing brownfield remediation.

- **Barriers:** Professional conservatism continues to be one of the most challenging barriers to the diffusion of time-tranching. Time-tranching may not be able to satisfy the investment community's need for standardized method because it is inherently a more integrated procedure than the conventional mortgage broker/client relationship. This may result in the rejection of time-tranching, especially since the trend toward standardized-thinking has been such an influential paradigm in this profession. In this scenario, time-tranching could continue as a marginal financing activity until standardized "alternative" development strategies become financially proven (i.e. less risky) and are more widely adopted. However, until that wall is breached, time-tranching might be a useful scheme to help reach that critical mass.
- **Conclusions and recommendations:** It is evident from this discussion that time-tranching should be viewed only as one option in a sequence of measures needed to affect the capital lending market. It is clear that the failure of markets to equip cities with a sustainable urban form is not easily remedied using a non-interventionist approach.

Time-tranching may be an important first step in developing a critical mass toward market transformation. Although a widespread adoption of this tool could have a far-reaching effect on the real estate industry, it is unlikely that time-tranching alone will transform the market. It may however, contribute, along with a host of other sustainably-minded innovations, to the increased quantity and quality of green or alternative development. As the

perceptual barriers are reduced by a larger stock of working green buildings and Smart Growth projects, a point should be reached where sustainability becomes a normative practice and is properly integrated within the entire building process.

As a result of the systemic disinclination to adopt more complicated and less standardizable procedures in an advanced market economy, it may be more appropriate to regulate ADS in order to achieve widespread compliance and reduce urban environmental impact. Still, this is not an acceptable option for the stakeholder community and it is recommended that a market-based alternative be explored alongside increasingly stringent and properly balanced regulatory mechanisms.

Current conventional valuation techniques actually discourage ADS on the grounds that they are unproven and therefore high-risk. Developers are pressured to achieve higher cash flows in the form of market premiums. This necessarily prices-out lower income households, further reducing affordability and choice in the market. Any future policy development must take these social issues into consideration; otherwise, a shortage of adequate housing and increased homelessness are likely outcomes.

Encouraging the market rather than regulating it may be the most appropriate means of building stakeholder acceptance in the largely private real estate development industry. However, since markets currently externalize most of the environmental costs associated with business-as-usual practice, it is apparent that market transformation must start by resolving this oversight. Until this time, however, developers inclined to Smart Growth, ADS or NU projects should be granted preferential financial treatment as an incentive. Municipalities can reward innovative development by assuming the third-tranche position in projects demonstrating balanced and detailed Smart Growth criteria. Special guidelines at the regional or provincial level must be delineated to ensure municipalities' proper involvement. Provincial participation should be limited to regulating the terms of general agreements, particularly in determination of an objective definition of Smart Growth, green building and brownfield or infill development. The terms that municipalities may enter into a public/private relationship with a land development firm should be designed to reward efforts toward sustainable development.

Municipalities should be responsible for the implementation of the specific proposals that ought to help diffuse risk. An arms-length, not-for-profit development corporation may be the most appropriate means of overseeing these projects. This body should represent all the provisions of good governance, transparency, etc. and should mediate a diversity of inputs from all stakeholder groups.

Tranched investments can be viewed as high-yield and long-term and are alternative sources of municipal income while developing an increased property tax-base. Time-tranching could be provided as an alternative to, or in conjunction with existing financial tools to promote sustainable practices.

Summary discussion

The intent of this paper was to identify a variety of policy options that can act alone or in collaboration with a voluntary rating system such as LEED. It is important to evaluate the efficacy of promoting a stand alone green rating system compared to a broader application of an integrated green building program that addresses a variety of barriers using a range of approaches. Any such program must consider the strengths and weaknesses of LEED. LEED only addresses large institutions and buildings designed to be occupied by the developer. LEED does not have an accessible residential component nor does it effectively address the entire built environment. RECO and time-tranching are two instruments capable of "filling in the gaps" that a voluntary green rating system would leave in a green building program. RECO's strategic use of the point-of-sale trigger mechanism allows for gradual compliance in the residential market. This approach slowly decreases energy consumption, particularly among segments of the population that the market cannot reach. This mild regulatory instrument can effectively augment LEED's inability to address the residential sector, especially related to issues of tenancy and marginal social groups.

Furthermore, RECO has been demonstrated to be a highly successful mechanism in reducing energy consumption without enormous public costs. Time-tranching's retooling of conventional valuation methods could allow municipalities to partner with innovative developers and more adequately direct growth into efficient urban forms. Again, LEED fails to address the financial barriers that inhibit green building. A green building program that encourages municipalities to experiment with time-tranched growth and development could complement an incentive program based on a set of green rating criteria.

It is the intent of this paper to address barriers to green building and promote integrative approaches to augment those already addressed by the Smart Growth Secretariat. The establishment of new networks and the development of creative and innovative solutions should be fostered in order to keep all the actors involved in the process.

Excluding RECO, the instruments discussed in this report favor non-interventionist policies. These may be effective means of establishing precedents for regulatory reform but do not represent a sustainable approach to long-term growth and should not be viewed as such. The intent of this report was to provide an in-depth understanding of the best instruments that could be applied in Ontario. These three tools do not represent the whole range of options (OECD, 2003). In fact, the three cases emerged from the United States and may represent inappropriate methods of affecting long-term and irreversible progress in the Canadian political system. Policymakers should include a review of European, Japanese and Australian initiatives into any thorough discussion of green building programs to complement those already undertaken.

Notes

1. For instance see: *Architecture, Azure, Construction, Architectural Record, Canadian Architect, The GTA Construction Report.*
2. According to the CANMET Energy Technology Centre of Natural Resources Canada, "the C-2000 Program for Advanced Commercial Buildings was a small demonstration program for high-performance buildings, developed and sponsored by the CANMET Energy Technology Centre (CETC) of Natural Resources Canada. The emphasis of the program was on energy performance and water conservation, but criteria was also developed for maintenance of site ecology and improved levels of indoor environmental quality" (http://www.buildingsgroup.nrcan.gc.ca/projects/c2000_e.html).
3. For more information on C-2000 and IDP see: http:// buildings-group.nrcan.gc.ca/projects/idp_e.html
4. "Principle agent problem" refers to the reluctance a landlord may have to upgrade his rental properties when it is the renter who benefits from the reduced energy costs. Renters rarely upgrade their units because, as renters, the perception is that they have nothing to gain from sinking capital into someone else's property as the renter probably does not gain the full benefit of their investment.
5. NRCan does not allow its Energuide evaluators to integrate these two services because of impartiality issues; however, non-profits like Green$aver, integrates these two services. Source: http://oee.nrcan.gc.ca/

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Toronto at the time of "The Natural City" Symposion

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Fig. 1: Glen Haffy Conservation Area – Caledon (Source: TRCA – R. Hasner).

Fig. 2: Heart Lake Conservation Area – Brampton (Source: TRCA – R. Hasner).

Fig. 3: Kortright Centre – Vaughan (Source: TRCA – R. Hasner).

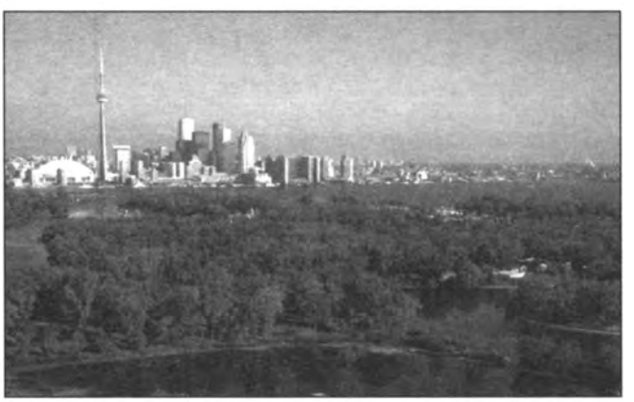
Fig. 4: Toronto Islands and skyline (Source: TRCA – R. Hasner).

Fig. 5: High Park.

Fig. 6: Toronto islands.

Fig. 7: Waterfront.

(*Sources:* Tourism Toronto, "Toronto, Visitor Guide," Spring/ Summer 2004 – pamphlet; Green Tourism Association, *The OTHER Map of Toronto,* 2003).



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The use of wood for construction and energy in the natural city: The case of Canada

Gundolf Hans Kohlmaier

The author received a Ph.D in physical chemistry from the University of Washington, Seattle, USA in 1962. At present he is Professor for Physical and Theoretical Chemistry at the Division Geo Sciences and Geography, Institute for the Atmosphere and the Environment, Goethe University of Frankfurt, Germany. His work ranges from the quantum mechanical description of molecules to the dynamics of global systems. In 1973 he introduced the first interdisciplinary course on "chemistry and environment; an ecological approach to chemical processes in nature and technology" at the University of Frankfurt. Later his emphasis focused on biogeochemical cycles, in particular, the "global carbon cycle, biosphere and climate." In cooperation with his co-workers he developed a world model for the CO_2 exchange between the biosphere and the atmosphere, the "Frankfurt Biosphere Model, FBM." He was visiting professor at the University of California, Berkeley, as well as Los Angeles and San Diego (Scripps Institution of Oceanography), University of Louvain-la-Neuve, Belgium, Tropical Science Center of Costa Rica, University of Paris, Orsay, the National Australian University, Canberra, and most recently Stanford University, USA. He was director of the Institute for Physical and Theoretical Chemistry and of the former Center for Environmental Studies (Zentrum für Umweltforschung ZUF) of the University of Frankfurt. In 1991 he was awarded the Philip Morris Research Prize "Challenge Future" for his work on the carbon cycle connected with the development of the Frankfurt Biosphere Model. In 1998, following a workshop in Freising, Germany, he, together with his colleagues M. Weber and R.A. Houghton, published the Springer Book: Carbon Dioxide Mitigation in Forestry and Wood Industry. *Professor Kohlmaier became a member of the World Society of Ekistics in 2001, returning to his roots as his father* was an architect. *The text that follows is an edited and revised version of a paper presented at the international symposion on "The Natural City," Toronto, 23-25 June, 2004, sponsored by the University of Toronto's Division of the Environment, Institute for Environmental Studies, and the World Society for Ekistics.*

Introduction

Within the discussion of "global climate change and cities," the issue of cause and of effect of climate change needs to be distinguished:

- Cause of climate change: the deforestation and in particular the burning of fossil fuels with a relatively large contribution of cities to greenhouse gas emissions and change in climate;
- Effect of climate change: the expected negative impact of climate change, climate variability and possibly increasing frequency of extreme events menacing life in the cities in many aspects.

This contribution focuses on the first factor and can be viewed as one aspect of the worldwide movement: Cities for Climate Protection with 662 cities participating worldwide including Toronto, Ontario, Canada (2004). At the world congress in Athens of the International Council for Local Environmental Initiatives (ICLEI) in November 2003, the eco-efficient large-scale application of renewable energies and of developing sustainable mobility was emphasized.

Sustainable forestry has the ability to assimilate CO_2 from the atmosphere and to transform it into the valuable and sustainable resource, wood. The use of wood for construction material of houses and other long-lived goods provides an intermediate carbon sink, while the burning of wood provides an energy source which is practically climate neutral (KOHLMAIER, WEBER and HOUGHTON, 1999).

Canada has a large potential to reduce its greenhouse gas emissions both by using wood in construction of private and public housing, and at the same time by replacing part of its fossil fuel use by fuelwood, often connected with residues of the forest industry. Canada ratified the Kyoto Protocol in December 2003 and promised to reduce its greenhouse gas emissions by 2010 by 6 percent relative to the base 1990. However up to now, secondary energy consumption and greenhouse gas emissions have risen by 18 percent relative to 1990 (NATURAL RESOURCES CANADA, 2004). Canada needs to focus all efforts to reach its goal by the commitment period from 2008 to 2012.

This paper is proposed by a physical chemist, whose interest has been focused on the global carbon cycle, energy consumption, CO_2 emissions, and stabilization of the carbon cycle and climate change. But I think that there are many useful interactions between chemistry and human settlements. As one example I should like to mention Buckminster Fuller whose dome-like structures with interesting networks have inspired chemists to name a whole class of molecules after him, the fullerenes.

Energy consumption and the greenhouse gases

At first the aggregated data are presented with respect to energy use and CO_2 emissions in both Europe (table 1) and the overseas OECD countries (table 2) with emphasis on the North American continent. Table 1 shows the mean primary energy use and mean CO_2 emission per capita. All CO_2 data are given in tons of carbon; the corresponding number in t CO_2 can be obtained by multiplication with the factor 44/12 = 3.667. There is no unique conversion between energy and CO_2 emission because different proportions of fossil energy and non-fossil energy are valid for different countries. Despite some efforts it is seen that the primary energy consumption has increased from 1990 to 1997. The base year for the Kyoto Proto-

Table 1
A reference view of the European Union with respect to energy consumption and CO_2 emission

Countries	Primary Energy Consumption (1990) [Quads BTU] 1 Quad = 1.0548 EJ	Primary Energy Consumption (1997) [Quads BTU]	CO2 emission 1990 [million tons carbon]	CO2 emission 1997 [million tons carbon]	Population 1996 [million]	1997 energy per capita [GJ/cap.]	1997 CO2 emission per capita [t C per capita]	Reduction or allowance goal [%]	emission reduction(-) or allowanc(+) [Mt C]
AU	1.16	1.29	17.2	16.7	8.1	168.0	2.1	-13	-2.2
B-L	2.16	2.58	35.91	38.64	10.6	256.7	3.6	-7.5	-2.7
DK	0.81	0.97	15.3	19.4	5.3	193.0	3.7	-21	-3.2
FI	1.14	1.19	14.7	15.3	5.1	246.1	3.0	0	0.0
FR	8.84	9.73	103.1	101.7	58.4	175.7	1.7	0	0.0
GE	14.76	14.18	267.2	234.4	81.9	182.6	2.9	-21	-56.1
GR	1.05	1.18	22.3	23.8	10.5	118.5	2.3	25	5.6
IR	0.37	0.48	7.1	9	3.6	140.6	2.5	13	0.9
IT	7.02	7.65	113.3	115.7	57.4	140.6	2.0	-6.5	-7.4
NL	3.26	3.88	59.9	64.3	15.5	264.0	4.1	-6	-3.6
PO	0.74	0.91	12.1	13.4	9.9	97.0	1.4	27	3.3
SP	3.93	4.48	62	67.8	39.3	120.2	1.7	15	9.3
SW	2.15	2.16	14.8	15	8.8	258.9	1.7	4	0.6
UK	9.44	10.08	167.4	156.9	58.8	180.8	2.7	-12.5	-20.9
EU-15	56.83	60.76	912.31	892.04	373.2	171.7	2.4	-8	-73.0

Table 2
A comparison view of five selected OECD countries: Australia, Canada, Japan, New Zealand and USA, with respect to energy consumption and CO_2 emission

Country	Primary Energy consumption (1990) [quadrillion Btu] 1.0 Quad =1.0548 EJ	Primary Energy consumption (1997) [quadrillion Btu]	CO2 emission 1990 [million tons of carbon]	CO2 emission 1997 [million tons of carbon]	Population 1996 [million]	1997 energy per capita [GJ/cap.]	1997 CO2 emission per capita [t C per capita]	reduction or allowance goal [%]	emission reductions(-) or allowances(+) [million t C]
AUS	3,7	4,5	74,4	88,8	18,3	259,4	4,9	8	6,0
CAN	10,9	12,2	127,8	143,4	30,0	429,0	4,8	-6	-7,7
JAP	18,1	21,3	273,6	296,7	125,8	178,6	2,4	-6	-16,4
N-Z	0,7	0,79	7,9	8,9	3,6	231,5	2,5	0	0,0
USA	84,1	94,2	1352,1	1488,4	265,3	374,5	5,6	-7	-94,6
Total	117,5	133,0	1835,8	2026,2	443,0	316,7	4,6	-6,1	-112,8

col is 1990, in which Canada pledged to decrease its greenhouse gases by 6 percent until the first commitment period between 2008 and 2012, corresponding to 7.7 million tons of carbon or 28.2 million tons of CO_2 equivalents. Only CO_2 out of the 6 Kyoto greenhouse gases (CO_2, methane, N_2O, HFCs, PFCs and SF_6) is considered here in detail as its share corresponds approximately to 70 percent of all greenhouse gases and also is, in most cases, the greenhouse gas which is most easily reduced.

It is seen from table 1 that the European Union of 15 member states pledges to reduce its greenhouse gases by 8 percent, with different shares for the individual countries, as for example Germany hoping to reduce by 21 percent or 56.1 Mt carbon corresponding to 205.7 Mt CO_2 equivalents.

The Kyoto Protocol has been signed by the European as well as by the Canadian Parliament. However, it is still waiting for ratification by the Russian and the United States Parliament in order to go into force (the Russian ratification would suffice for the Kyoto Protocol to become valid).

Secondary energy (end use energy) and primary energy are related approximately by the factor of 2/3, as is shown below.

The global carbon cycle: Circulation Models for climate change

Within the expected additional, manmade greenhouse effect, three different focus points should be distinguished:

- scenarios for future greenhouse gas emissions in relation to population and economic growth;
- CO_2 emissions from fossil energy use and land use changes and increase of atmospheric CO_2;
- the relation between atmospheric greenhouse gases and climate change according to three-dimensional coupled atmospheric and ocean circulation models.

Scenarios for future development

There are four Intergovernmental Panels on Climate Change (IPCC) scenario groups (IPCC, 2000a) that should be considered equally sound that span a wide range of uncertainty, as required by the Terms of Reference. These encompass four combinations of demographic change, social and economic development, and broad technological developments, corresponding to the following four scenarios: A1, A2, B1, B2.

- **The A1 storyline and scenario family** describes a future world of very rapid economic growth, global population that peaks in mid-century and declines thereafter, and the rapid introduction of new and more efficient technologies. Major underlying themes are convergence among regions, capacity building and increased cultural and social interactions, with a substantial reduction in regional differences in per capita income. The A1 scenario family develops into three groups that describe alternative directions of technological change in the energy system. The three A1 groups are distinguished by their technological emphasis:
  - fossil intensive (A1FI),
  - non-fossil energy sources (A1T), or
  - a balance across all sources (A1B).
- **The A2 storyline and scenario family** describes a very heterogeneous world. The underlying theme is self-reliance and preservation of local identities. Fertility patterns across regions converge very slowly, which results in continuously increasing global population. Economic development is primarily regionally oriented and per capita economic growth and technological change are more fragmented and slower than in other storylines.
- **The B1 storyline and scenario family** describes a convergent world with the same global population that peaks in mid-century and declines thereafter, as in the A1 storyline, but with rapid changes in economic structures toward a service and information economy, with reductions in material intensity, and the introduction of clean and resource-efficient technologies. The emphasis is on global solutions to economic, social, and environmental sustainability, including improved equity, but without additional climate initiatives.
- **The B2 storyline and scenario family** describes a world in which the emphasis is on local solutions to economic, social, and environmental sustainability. It is a world with continuously increasing global population at a rate lower than in A2, intermediate levels of economic development, and less rapid and more diverse technological change than in the B1 and A1 storylines. While the scenario is also oriented toward environmental protection and social equity, it focuses on local and regional levels.

Fossil fuel emissions and the global carbon cycle

The impact of fossil fuel CO_2 emissions in the past has been measured directly by C.D. Keeling et al. at the Mauna Loa Observatory, Hawaii since 1957. They show a clear correlation between consumption of fossil fuels and atmospheric CO_2 increase. To understand the CO_2 increase, knowledge of the global Carbon Cycle is required. For the time range of the order of 1 to 100 years, the carbon reservoirs' atmosphere, ocean and ocean biota and land biosphere with both living biota and soils need to be considered. Water vapor, CO_2 and methane are the most important components of the natural, unperturbed greenhouse effect of the earth, which increased the mean surface temperature from a shivery -18°C to an agreeable +15°C.

Perturbations of the carbon cycle by man are given in figure 1 for the last decade of the 20th century. The mean fossil fuel emission was 6.3 billion tons (Gt) of carbon, with a mean of approximately 1 t of carbon per capita. The industrial countries, as shown in tables 1 and 2, have a much higher contribution than the developing countries. Atmospheric measurements show that only 3.3 Gt C remain in the atmosphere, while the greater other part is absorbed by the oceans. There is still uncertainty about the ocean uptake indicated in figure 1 by the horizontal set of three numbers, a lower, an intermediate and an upper value. The total balance of input and output is usually achieved by the reservoir of the remaining land biosphere, which is a CO_2 source and sink at the same time in different regions and by differing mechanisms. Tropical deforestation still is a large source of CO_2, ranging between 0.6 and 2.0 Gt C/yr (with a mean of 1.6 Gt C/yr), indicated by the vertical arrangement of the two numbers. Carbon Balance is then only achieved if the land biosphere other than tropical deforestation is a large sink of between 1.3 and 2.7 Gt C/yr.

These sinks are due to different processes: regrowth of forest on lands which were formerly agriculture, regrowth of forest following perturbations during the first half of the 20th century including wars, CO_2 and nitrogen fertilization due to higher atmospheric CO_2 concentrations as well as nitrogen deposition. For many commercial forests, including most of the European forests and those of the United States, the growth increment has been larger than the annual cut in the past 30 years, which implies a building up of carbon.

With the fossil fuel emissions taken from the development scenarios A1, A2, B1 or B2 and the knowledge from the carbon cycle on the response to CO_2 emissions, the atmospheric CO_2 concentration can be extrapolated until the end of the 21st century, making intelligent guesses about the long-term ocean uptake and the behavior of the land biosphere.

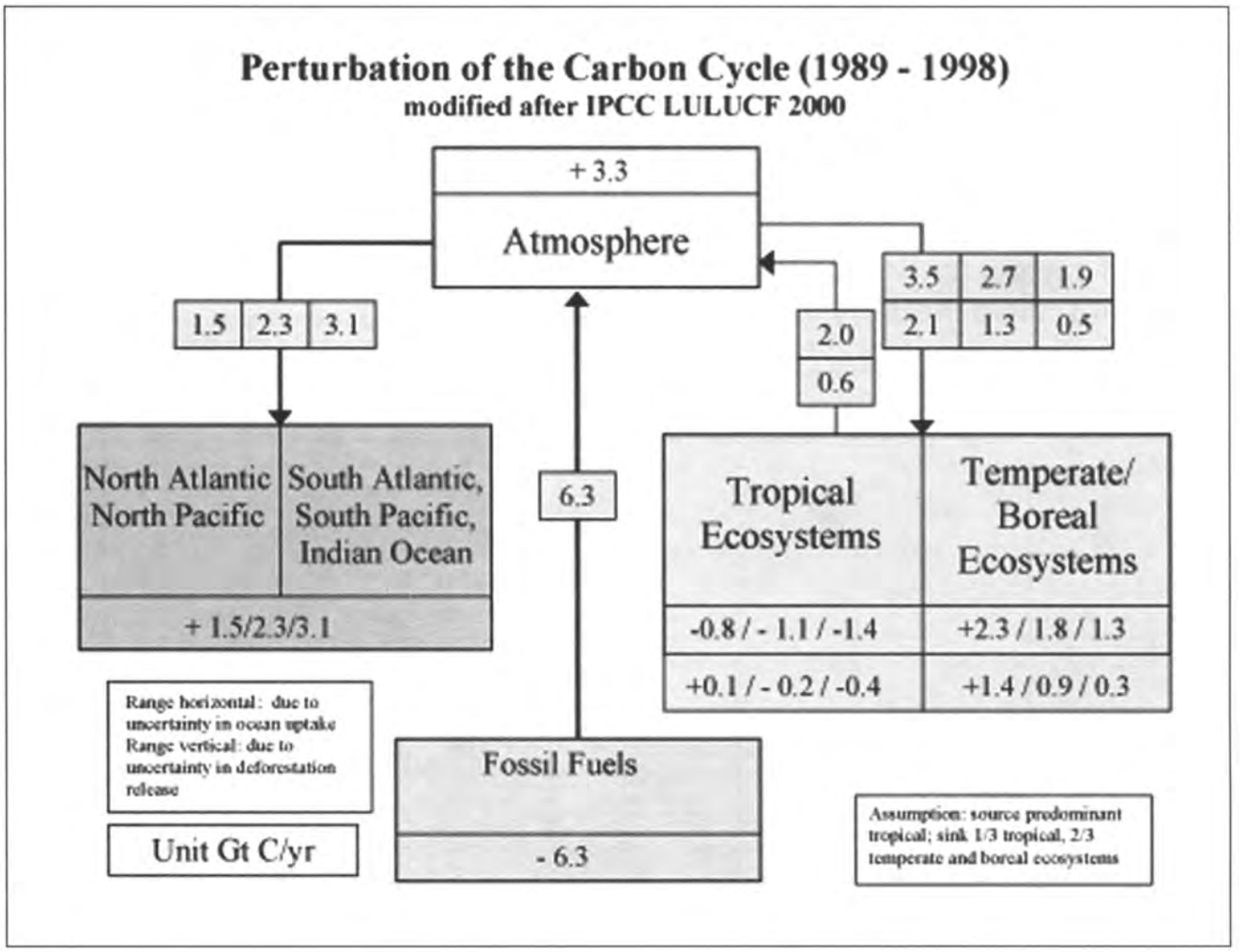

Fig 1: The Global Carbon Cycle (modified after IPCC 2000b).

General Circulation Models and their prediction of a future climate change

There are several well known General Circulation Models (GCMs) which translate CO_2 and the other greenhouse gas concentrations in combination with the change of the reflective properties of the earth surface and the atmosphere, the albedo, into the future temperature and precipitation changes in different parts of the world. The Dutch Institute RIVM (2001) has made a comparison of the following GCMs:

- HADCM2, model of the Hadley Centre for Climate Prediction, as part of the British MET Office, Great Britain;
- ECHAM4, model of the Climate Calculation Center in Hamburg, Max Planck Institute for Meteorology, Germany;
- CGCM1, model of the Canadian Center for Climate Modeling and Analysis, Canada;
- GFDL-LR15a, model of the Geophysical Fluid Dynamics Laboratory Princeton in cooperation with the National Oceanic and Atmospheric Administration (NOAA, USA);
- CSIRO-MK-2, model of the Commonwealth Scientific and Industrial Research Organization, Australia.

It is interesting to compare the predicted results for global warming for Canada. For instance, in 2080, the following warming is predicted for the business-as-usual A1F scenario and the ecologically oriented scenario B1 by the different models.

From tables 3a and 3b, it is clear that the choice of the B1

Table 3
Global Warming in °C for Canada, predicted by different GCMs in 2080 relative to 1990, Scenario A1F and Scenario B1

a. Scenario A1

City	HADCM2	ECHAM4	CGCM1	GFDL-LR15	CSIROMK-2
Toronto	2.5*	5.5	2.5	4.5	3.5
Churchill	4.5	5.5	4.5	6.5	6.0
Vancouver	2.5	2.5	2.5	2.5	2.5

*All numbers are read off a color map, and are therefore approximate.

b. Scenario B1

City	HADCM2	ECHAM4	CGCM1	GFDL-LR15	CSIROMK-2
Toronto	2.0*	2.5	2.0	2.5	2.5
Churchill	2.5	2.5	2.5	2.5	2.5
Vancouver	2.0	2.0	1.5	2.5	2.5

*All numbers are read off a color map, and are therefore approximate.

path is much sounder and connected with fewer risks than the choice of A1F, the business-as-usual path. Warming alone is insufficient to describe the expected man-made greenhouse effect. It is absolutely necessary to look at the precipitation changes as well, including extreme events like long hot-spells, cold-spells, storms, etc. Warming and precipitation changes determine soil moisture, which is most important for plant growth. Detailed analyses are needed here and will not be presented in this short summary.

CO_2 and carbon in the Northern forest and wood industry sector

Article 3.3 of the Kyoto Protocol specifies that the net changes in greenhouse gas emissions by sources and removals by sinks resulting from direct human-induced land-use change and forestry activities, limited to afforestation, reforestation and deforestation since 1990, shall be included in the national greenhouse budget. The Kyoto Protocol further states in article 3.4 that additional human-induced activities related to changes in greenhouse gas emissions by sources and removals by sinks in the agricultural soils and the land-use change and forestry categories shall be added to, or subtracted from, the assigned amounts for Parties included in Annex I of the UN Framework Convention on Climate Change UNFCCC (Annex I of the UNFCCC or equivalently Annex B of the Kyoto Protocol is an appendix in which the industrial countries are summarized). Figure 2 shows some first estimates of the sources and sinks of the activities related to forestry and wood industry. The study focused on the temperate and boreal

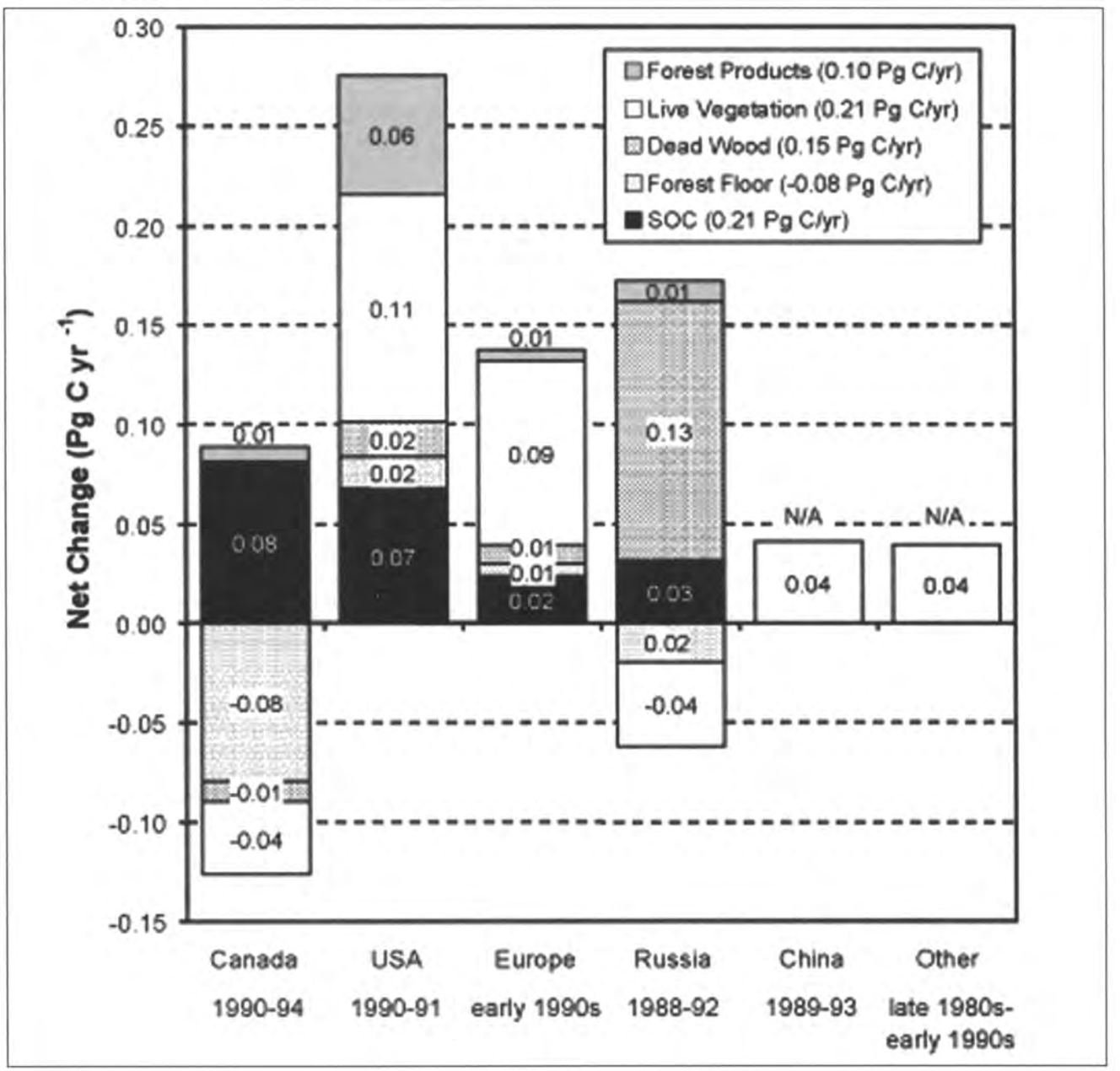

Fig. 2: Sources and sinks of the Northern hemisphere forests and wood industry.

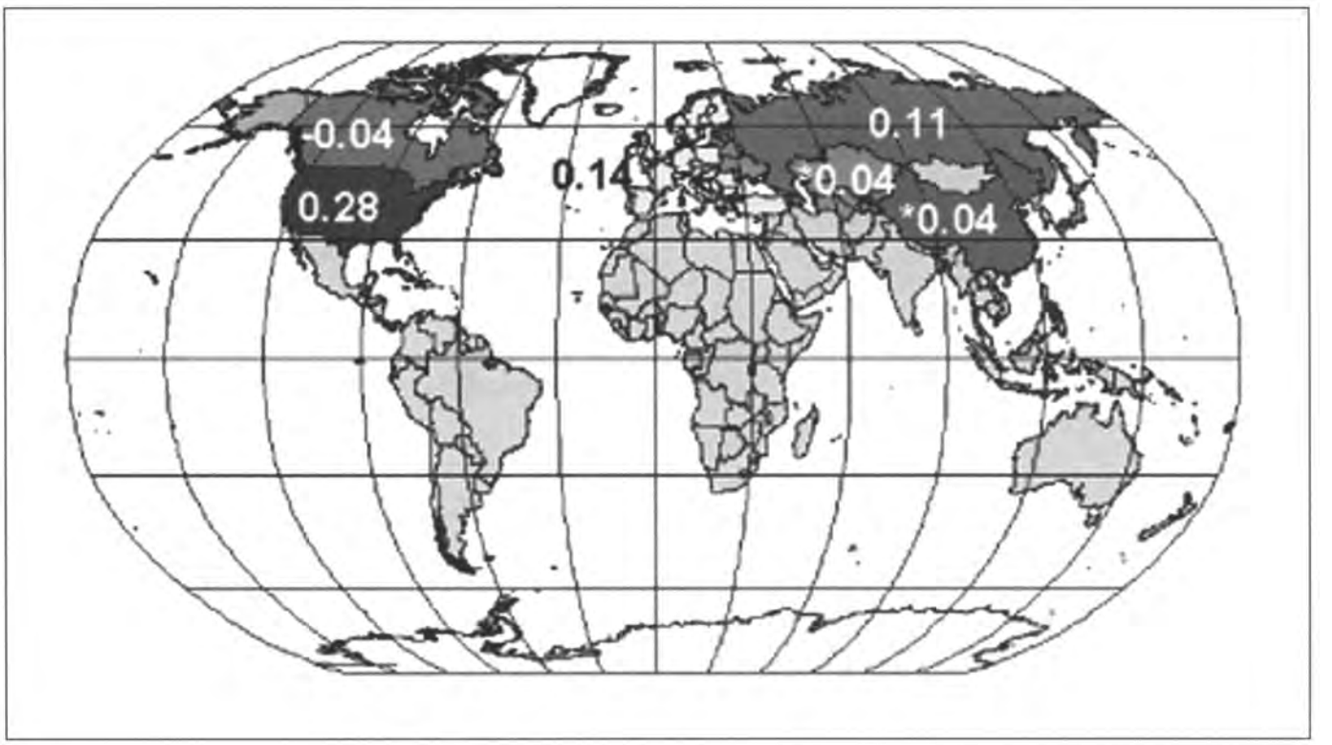

Fig. 3: Carbon balance of Northern forests (Gt C/yr). (*Source*: Christine L. Goodale, et al., "Forest carbon sinks in the Northern hemisphere," *Ecological Applications*, vol. 12, no. 3, pp. 891-899, 2002).

forests of the industrial countries, and distinguished Canada, USA, Europe, Russia, China and other developed northern hemisphere countries. The following categories were distinguished:

- live vegetation,
- forest floor,
- dead wood,
- soil organic matter, and
- forest products.

Within large error bars it showed that soil organic matter increased in all country groups studied, and the same was true for the forest products pool. The forest floor, however, decreased in Canada and Russia, while it increased in the USA and Europe.

There was a considerable increase also in live vegetation for the USA and Europe, while again a decrease was noted for Canada and Russia. Dead wood increase was noted in the USA and Europe and in particular in Russia, while there was a decrease in Canada. Summing up all components for each country group, shown in the bar graph of figure 2, the map of the Carbon Balance of the Northern Forests, shown in figure 3, has been obtained. All together, all categories added up to a carbon sink of 0.59 Pg or Gt of carbon, respectively.

Canada and its energy and CO_2 budget

In table 2 it is shown that 30 million Canadian citizens had an average primary energy consumption of 429 GJ/ (cap.*yr) and an average CO_2 emission of 4.8 t C/ (cap.*yr) equivalent to 17.6 t CO_2/ (cap.*yr) in 1997. The total primary energy consumption was then 12.9 EJ or 12,600 PJ (1 EJ = 1 ExaJoule = 10^{18}J, 1 PJ = 1 PetaJoule =10^{15}J) out of which 600 PJ or 5 percent were supplied by woodfuels. The total CO_2 emissions amounted to 127.8 Mt C (468.6 Mt CO_2) in 1990 which should be reduced according to Canada's Kyoto goal by 6 percent or 7.67 Mt C or 28.1 Mt CO_2 by the commitment period between 2008 and 2012.

The conversion factor between the burning gas CO_2 and black carbon C is just given by the ratio of the molecular weight of CO_2 to the atomic weight of C (44/12=3.667). The conversion of 1 cu.m of wood into carbon can be broken into two steps:

- The weight of dry wood to the volume of fresh wood is different for different woods grown in different regions of the world. A crude, but not always applicable conversion from volume dry matter (dm) is for softwood (0.4 t dm/cu.m) and for hardwood (0.6 t dm/cu.m);
- The carbon content of wood in the dry matter state is ~0.5. If the average density of wood is taken to be 0.55 t dm/cu.m, then a very simple relation is obtained:

1.0 cu.m of fresh wood = 0.55 t dry matter wood

= 0.275 t carbon = 1.0 t CO_2

Data from the *Energy Use Data Handbook* (NATURAL RESOURCES CANADA, 2004) show the time series of 6,950 EJ (1990), 7,737 EJ (1997) and 8,217 EJ (2002) for secondary energy (final energy) with a clear upwards trend. According to their statistics the greenhouse gas emissions rose by 18 percent from 1990 to 2002, in accordance with an energy increase of 18 percent, still far from the Kyoto goal to reduce its emissions by 6 percent. In 1997 (chosen here as the base year) the secondary energy use was divided up into the following categories (table 4):

The per capita use of secondary energy was in 1997 (7,738 PJ/30 million) 258 GJ or 71.6 MWh, out of which 18.1 percent was used in the residential sector, corresponding to 46.7 GJ or 13 MWh, with a use of over 80 percent for space heating

Table 4
Secondary energy consumption and CO_2 emission equivalents for different sectors of the Canadian economy. Reference year 1997

Category	PJ (1997)	Percentage [%] energy	Mt CO2 equiv. (1997)	Percentage [%] CO2
Residential	1,394	18.1	72.7	16.3
Commercial/Institutional	999	12.9	54.2	12.1
Industrial	2,998	38.7	152.4	34.1
Total transportation	2,117	27.3	152.1	34.0
*Passenger transportation	1,233	15,9	87.9	19.7
*Freight and off-road transportation	884	11.4	64.2	14.4
Agriculture	230	3.0	16.0	3.6
Total	7,738	100.0	447.2	100.0

and cooling, and hot water preparation. The corresponding per capita emission of CO_2 was in 1997 (447.2/30) 14.9 t CO_2 with 2.4 t CO_2 arising from energy use in the residential sector (table 4). Fossil energy use for heating and hot water per house per year: about 6 t CO_2/yr (13.4 percent of all emissions for space heating and cooling including hot water; 3 persons per house/apartment).

The majority of Canadian homes are single detached houses with one owner only, where changes can be done most easily. Table 5 shows the types of residential homes in Canada.

In table 6 details of the energy consumption in the residential sector are outlined.

Table 5
Types of residential houses in Canada in the base year 1997

Type of housing	Number of units (thousands)	Floor space (million sq.m)	Average size housing unit
Single detached	6,743	926	137
Single attached	1,235	141	114
Apartments	3,646	308	85
Mobile homes	245	22	92
Total	11,869	1,401	118

Table 6
Residential sector: Secondary energy in space heating, space cooling and hot water preparation, electric lighting and appliances (year 1997)

Space heating by source	PJ	Other energy uses	PJ	Total households (thousands)
Electricity	142.4	Total lighting	56.3	11,224
Natural gas	471.9	Total space cooling	9.4	Heating degree-days average base<18°C
Heating Oil	132.6	Total appliances	179.6	4,474
Wood	97.9	Total water heating	290.5	Cooling degree-days average base >18°C
Other	13.0	Total other energy uses	525.8	171
Total space heating	857.9	Total space heating + cooling + water heating	1,157.8	
Total residential energy use			1,393.0	

Average energy intensity per floor space 0.61 GJ/ (sq.m*yr) = 170 kWh/ (sq.m*yr)

To save on energy and to reduce the CO_2 emissions in the residential sector, the following could be done:

- Substitution of 15 percent fossil fuels by woodfuels would result in savings of 0.9 t CO_2/ (home*yr), or a total of 9 Mt CO_2 (10 million homes and apartments), out of 28.2 Mt CO_2 or 32 percent of the Kyoto goal.
- Energy savings by installing more efficient thermal insulation in the homes could also improve the situation significantly. The energy consumption per 3 person home or apartment is presently 140 GJ/yr or 39 MWh/yr corresponding to an emission of 9.2 t CO_2. Low energy houses, as described below, consume in the order of 50-100 GJ/yr and emit in the order of 2.5 to 5 t CO_2/yr. If energy savings could be achieved in the order of 15 percent this would result in a savings of 14 Mt CO_2 annually, about 50 percent of the Kyoto goal.

However, there are also opportunities of energy reduction on the part of the Canadian forest companies:

- The Canadian industrial roundwood production is presently 183 Mcu.m (corresponding approximately to 183 Mt CO_2 removed from the atmosphere), as given in the *State of the World's Forests,* 1999. Forest and wood industry operations produce a significant amount of wood residues. Four categories of wood residues are distinguished: forest residues, industrial residues, black liquor (an energy-rich by-product in pulp production) and recovered products (old wood), which have been examined in detail by M. Trossero, FAO. All residues can be used energetically and constitute a significant fraction of the entire category of woodfuels. The total of all fuelwood residues in relation to the annual roundwood production is an interesting indicator of the environmental concern for fossil fuel energy substitution.
- In Austria this ratio is highest with 76 percent, the average of the European Union is 54 percent, the United States of America has a ratio of 48 percent, but Canada has only a ratio of 16 percent. If only 15 percent of additional residues could be used for woodfuels, a savings of 27.5 Mt CO_2 could be achieved, just about the Kyoto goal of 28.2 Mt CO_2.

Mitigation of climate change through reduction of CO_2 emissions

To avoid a serious impact of a future climate change that is unpredictable in detail for the different regions of the world, global greenhouse gas emissions need to be reduced. The Kyoto Protocol of the United Nations Framework Convention on Climate Change (UNFCCC) is one international effort to mitigate climate change, by specifying six greenhouse gases:

- carbon dioxide (CO_2),
- methane (CH_4),
- nitrous oxide (N_2O),
- hydrofluorocarbons (HFCs),
- perfluorocarbons (PFCs), and
- sulfur hexafluoride (SF_6).

The most important greenhouse gas in the anthropogenic perturbation of the climate system is carbon dioxide, CO_2, responsible for about 70 percent of the greenhouse effect, which is predominantly due to the burning of fossil fuels.

How can CO_2 be reduced? Perhaps the most important component is the saving of energy through individual changes in lifestyle, which for most cases follow fashions, often supported by the manufacturing industry like, for instance, the use of the highly gas-consuming sports utility vehicles (SUVs). Transport is certainly one sector where savings can be achieved within urban life: public transportation with subways and commuter trains, electric or natural gas buses, and electric vehi-

cles to be rent for short-term distances, let alone bicycles, which can be position-checked electronically and collected to be transferred back to the points of rentals.

Lifestyle also determines the house you build, whether it is a stone or wooden house and the kind of heat insulation you are willing to install and pay for, and the energy you tap from the environment in the form of heat pumps and solar panels. Most older buildings have insufficient thermal insulation and, if energy prices increase continuously, it pays for the homeowner to install it. Energy savings can be influenced by the community or state by higher taxes on fossil fuels or by subsidies on modern energy savings equipment.

Lifestyle includes for instance also holidays in faraway countries, which add to the long distance fuel consumption of overseas air transport.

The energy industry and its task of conversion of primary energy to end energy still allows for substantial improvements in energy efficiency. The same is true for electrical appliances, as, for instance, electric lighting. The steel and aluminum industry consumes a high amount of energy; producing cement, by the same token, releases CO_2. The imbedded energy per unit weight or volume in building materials is often a lot higher than the energy needed to produce the equivalent materials made out of wood.

Carbon storage in forest products with emphasis on housing

The forest products sector is one of the important (yet modest, when compared to the carbon stocks of forests and soils) contributions of carbon storage in human society. The standing stock is determined by its annual input and output. In figure 2, section 4, it was shown that the stock increases in the Northern hemisphere countries by approximately 100 million tons of carbon per year. This estimate includes landfills with wood products in the United States of ~35 Mt C/yr, the product pool without landfills is ~65 Mt C/yr. About half of the annual addition to the product pool can be associated with the balance of wooden materials stored in houses.

Within the project BIOCLIMECO (Biosphere, Climate and Economy), Busch and Alcamo, members of our team, were able to show that the carbon pool in houses will increase over the next hundred years, due to both population growth and economic development of the less developed countries. Two limiting scenarios were studied: the first was a business-as-usual scenario with the present share of wooden homes continued, while the second scenario implied an increased use of wooden homes, wherever the construction statics allowed it. Figure 4 shows that the carbon stock increases from the base line in 1970 to 4,500 Mt C in the year 2100 for scenario 1, whereas a total of 13,500 Mt C is reached in scenario 2. The mean annual increase in carbon stocks for scenario 1 lies between 30 and 50 Mt C/yr, while that for scenario 2 lies between 65 and 150 Mt C/yr. When these figures are compared to the annual CO_2 emissions from fossil fuel energy use, and its possible reduction efforts, they appear relatively small. Present energy consumption already gives rise to 6,500 Mt C/yr and is supposed to increase up to 20,000 Mt C/yr in the global A1 scenario during the 21st century. The carbon storage in houses on a global level is, according to this analysis, only in the percentage range, or even below, in comparison to the CO_2 emissions from energy consumption.

However, the global picture neglects any efforts on the individual, community or country level, where the proportions of the potential savings may be quite different. Avoidance of CO_2 emissions of any individual, community or state is composed of a portfolio of many efforts, in which the contribution of any

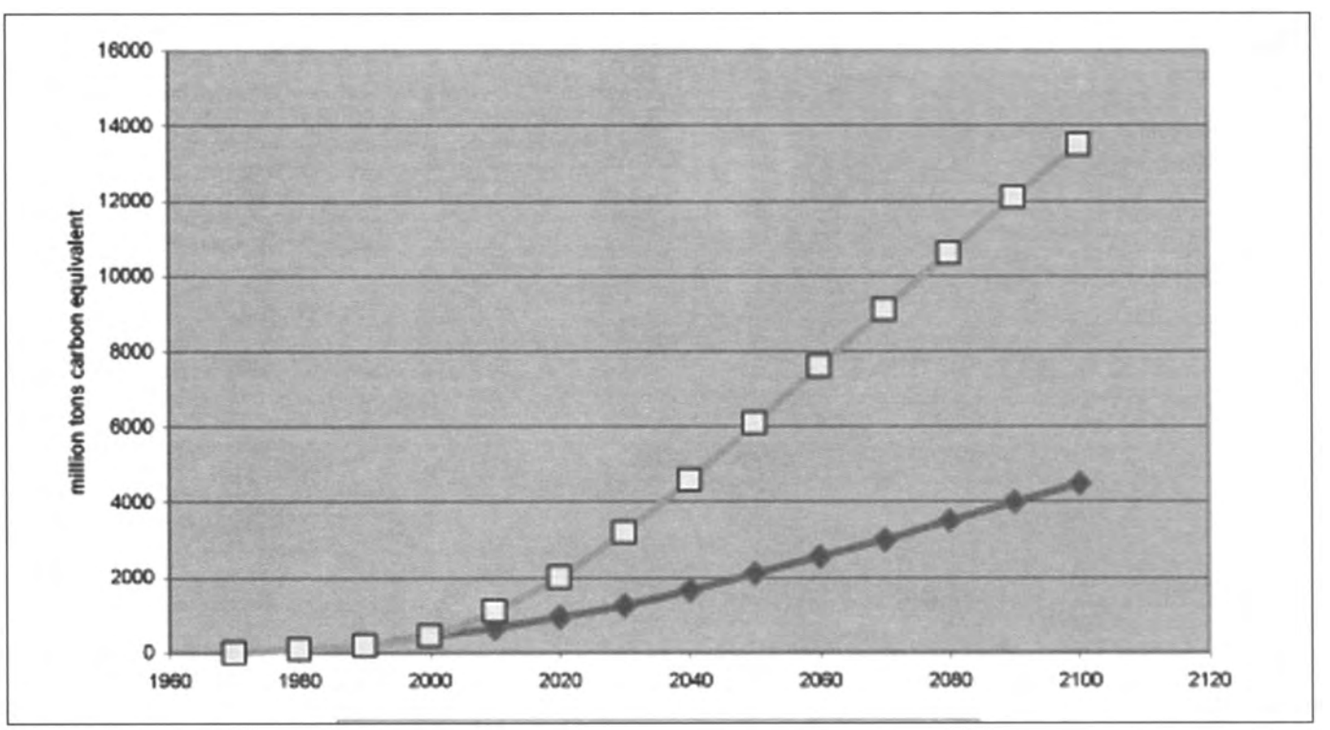

Fig. 4: Carbon accumulated in residential housing in model 1 (continuing trend) and model 2 (preference wooden houses) – A1 scenario for population growth. Base year 1970. (*Source*: G.H. Kohlmaier, et al., *Project BIOCLIMECO: Biosphere, Climate and Economy*, 1998-2001).

specific component may vary substantially. Not unlike investments at the stock markets, the CO_2-savings portfolio must fit the individual or the individual family, community or state. In the next section, a detailed analysis of the "cradle to grave approach" will be given for two different energy-saving prototype homes in Germany.

A life-cycle assessment of two low energy houses in Germany

In his dissertation, Cevin M. Pohlmann examined the life-cycle (fig. 5) assessment of two prototypes of low energy wooden houses in Germany, called House Bremen (to be built in the City of Bremen) and House Würzburg (to be built in the City of Würzburg). Both energy and CO_2 fluxes were studied in detail from the cradle: the crude materials, followed by the building materials, the manufacturing of materials, house construction, house use, to the grave, the deconstruction of the house, the waste disposal including energy use, and finally the material recycling.

With transport of materials being a separate category, the manufacturing of the building materials for the two prototype houses (House Würzburg 250 sq.m living area, House Bremen 210 sq.m living area), was 777 GJ for House Würzburg and 827 GJ for House Bremen.

The bar graph in figure 6 shows the individual components of energy consumption and CO_2 release. The units in figure 6 are 10 GJ, to make the bars comparable in the same graph with the unit of CO_2 emissions, in tons of carbon. These numbers can be viewed with respect to the average per capita secondary energy consumption of 112 PJ in Germany and 258 PJ in Canada, out of which are used in the residential sector about 25 percent (28 GJ) in Germany and about 18 percent (46.4 GJ) in Canada.

The energy needed for the construction of the houses was in both cases rather low, 15 and 13 GJ respectively; the same is true for the transport of materials, being 21 and 19 GJ. The maintenance, extrapolated over a lifespan of 60 years was estimated at 152 GJ for House Würzburg and 156 GJ for House Bremen. Operating expenditures for heating and hot water preparation, again over a lifespan of 60 years, were calculated at 2,500 GJ for House Würzburg and 1,500 GJ for House Bremen. The per annum consumption in this case is 41.7 GJ and 25.0 GJ, or 11.9 MWh and 6.9 MWh, as compared to the average 3-person Canadian family home of approximately 40 MWh. The numbers for the disposal of the two house types are 46 GJ and 49 GJ. Wooden houses are useful carbon stores, which in part can be recycled or used for energy. The total energy embedded in House Würzburg is estimated at 734 GJ, that in House Bremen at 1,200 GJ.

The CO_2 emission is proportional to the energy use; however there is no unique conversion factor for the different categories. Manufacturing, construction, maintenance, transport, and disposal totaled here 131 t CO_2 for House Würzburg and 107 t CO_2 for House Bremen. Operating expenditures released in House Würzburg totaled 157 t CO_2 and in House Bremen 105 t CO_2 over the time of 60 years. Useful carbon stored in House Würzburg is given at 92 t CO_2 (25 t C), while that for House Bremen is given at 150 t CO_2 (41 t C).

The houses can be optimized with respect to energy consumption and CO_2 emission by installing additional solar thermal and photovoltaic equipment, or alternatively, by using wood furnaces. The savings in energy are then an additional

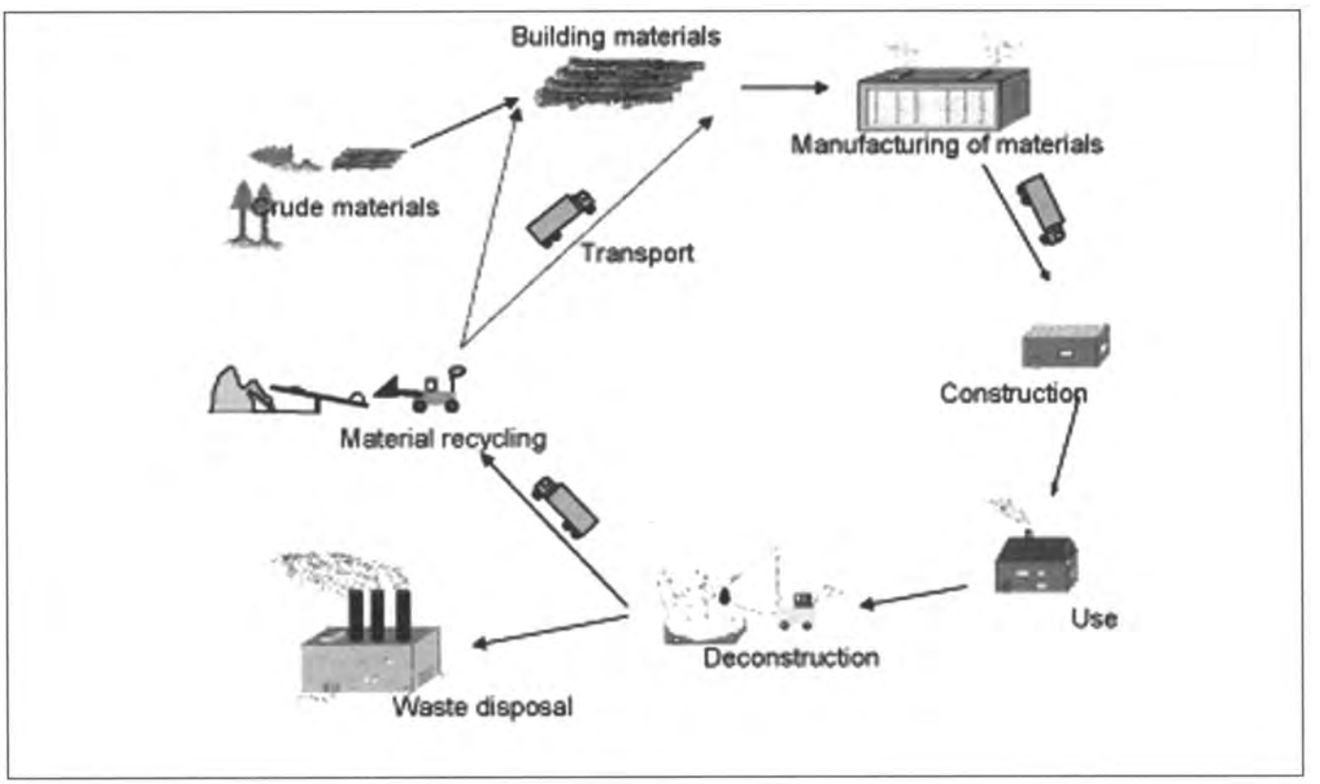

Fig. 5: Life cycle of a wooden house. (After C. Pohlmann, University of Hamburg and Bundesforschungsanstalt BFH).

465 GJ for House Würzburg and 364 GJ for House Bremen. The reductions in CO_2 emissions are 39 t CO_2 for House Würzburg and 29 t CO_2 for House Bremen.

Conclusions

In the review of the data presented above and the data of the *Energy Use Handbook* of June 2004, presented by Natural Resources Canada, it becomes clear that there was a 12.5 percent increase in CO_2 between 1990 and 1997, an 11.9 percent increase in primary energy consumption, and an 11.3 percent increase in secondary energy use until the year 1997, while an even more staggering 18.2 percent increase in secondary energy, and an 18.3 percent increase in CO_2 emissions in the time between 1990 and 2002 has been observed.

If Canada wants to fulfill the ratified Kyoto Protocol, it should reduce its greenhouse gas emissions by 6 percent up to the 5-year commitment period 2008-2012; the same is approximately true for its primary and secondary energy consumption. It is seen that Canada is far behind its plans; instead of decreasing its emission by approximately 4 percent it increased it by 18 percent in 2002. There are many possible sectors to save on energy and greenhouse gas emission: already a 1 percent decrease in a particular sector counts. In this sense the efforts of the forest industry should be viewed.

The commercial forests can be regarded as a big factory for wood, absorbing CO_2 from the atmosphere and transforming it into wood, a carbohydrate carbon compound. Wood is needed for many purposes, and if wood is used in construction for housing, this carbon will stay bound for a lifetime of at least 60 years. Thus carbon is removed from the atmosphere for a long time in which the energy industry can make a transition from a fossil fuel world to a non-fossil fuel world, using then mostly direct and indirect solar energy. Today's world energy budget is about 400 EJ (10^{18}J), the solar energy arriving at the earth's land surface is approximately 1,000,000 EJ, a factor 2,500 larger than the present energy consumption. With new technologies in storing and transporting energy, it should be possible to build a solar internet system, which can serve most countries of the world with enough energy.

Returning to the individual wooden home with good thermal insulation and additional solar panels, and perhaps a wood chip stove, it should be possible to obtain a CO_2 budget over the lifetime of the house, in which the CO_2 emissions from manufacturing of the building materials, the construction and the maintenance of the house, the operating expenditures (heating and hot water preparation, etc.) and the disposal of the house are lower in total than the carbon and its CO_2 equivalent stored in the house in the form of wood. This would indeed be a CO_2 positive house in which more carbon was removed through the forest manufacture than was released into the atmosphere in the lifetime of the house. If, at the end of the lifetime, the greater part of the material is used for energy, this will release CO_2 60 years later than today and at the same time avoids the use of fossil fuels, which are then a precious resource.

Rising energy consumption is the main factor of the expected man-made greenhouse warming. With respect to housing, the improvement of thermal insulation both in new houses and in older houses can help to reduce the greenhouse gas emissions considerably. Cost-benefit analyses show that the additional energy consumption and CO_2 release for better insulated houses are compensated within 10 to 15 years by the reduced energy needs of the house; similarly the additional economic investments do pay back within the same time frame. Additional tax reductions for thermal insulation improvements could help to accelerate this change.

The use of wood, in particular residual fuelwood from logging and forest industry operations, is a third factor to reduce CO_2 emissions. Here, ..., Canada with 16 percent has the lowest ratio of residual fuel wood to annual roundwood production. An increase in the energetic use of residual fuelwoods

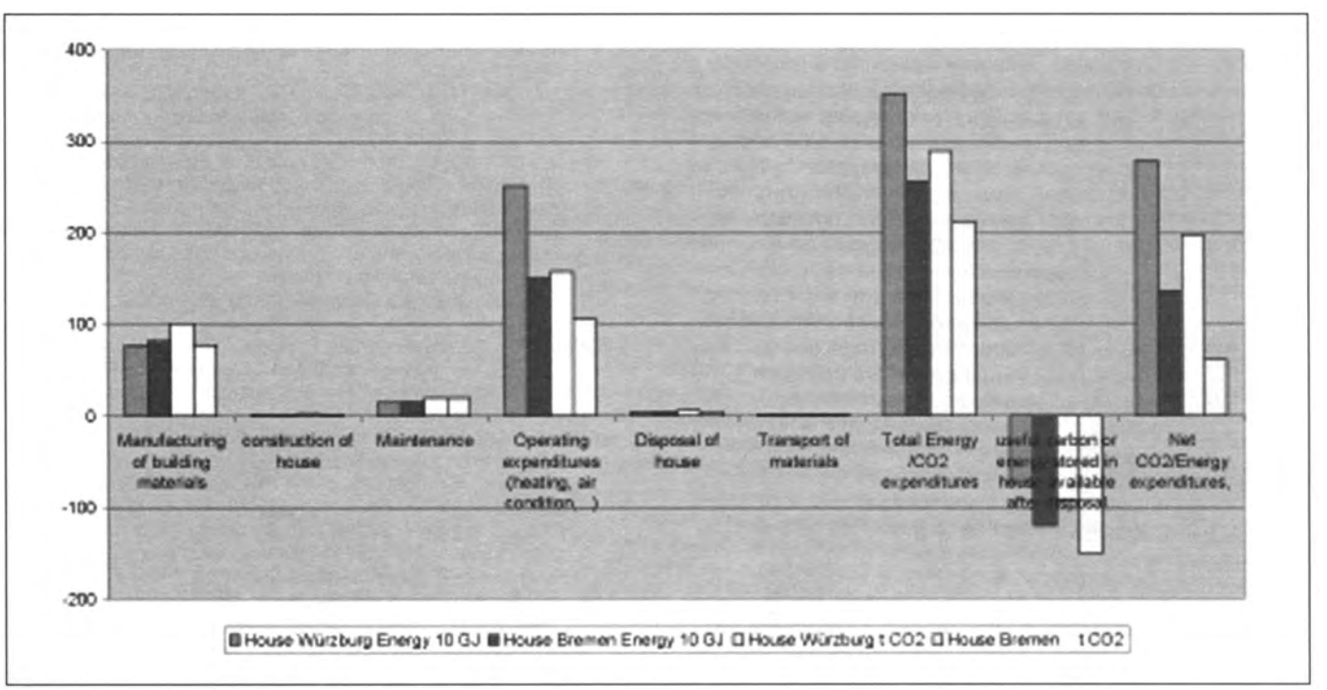

Fig. 6: CO_2 and energy expenditures in Low Energy Houses, Würzburg and Bremen. (After C. Pohlmann, University of Hamburg and Bundesforschungsanstalt BFH).

could improve Canada's CO_2 budget. Centralized heat and power plants, as well as individual stoves with automatic wood chip firing, are convenient means to use this renewable energy source.

The new restrictions with respect to a climate change could present a challenge and an opportunity at the same time to the Canadian forest and wood industry. The development of well insulated wooden houses, both in a standard edition, and in a special edition, which provides an even better insulation combined with heat pumps, solar thermal panels, and perhaps photovoltaic solar cell systems, could help to expand its market shares in its country and its export market. It perhaps would be going a bit too far to ask for commercially available houses with a rotating base, as were presented at a recent Austrian fair, which make use of the best meteorological position of the house during the day or the season of the year.

In summing up, it was shown above that the use of wood in construction and energy in Canada's cities could improve the greenhouse budget, which at present is 22 percent above Canada's Kyoto goal for the end of this decade.

Summary and afterthoughts

- Among the most serious global problems of the 21st century is the expected climate change. Climate change will be affected both by the increasing use of fossil fuels and by land-use transformations, in which forests are converted into grasslands, agricultural land and land needed for the infrastructure of cities and industries. Planning future housing should certainly include the aspects of climate mitigation. Many of the building materials like steel and concrete require in their production a large input of fossil fuels, while wood, a renewable resource, could replace at least part of these materials which have imbedded within them a large energy input. The construction of the future natural city should consider these material aspects as well as the energy needed for heating and cooling of the houses. Again woodfuels, often available as residuals from the wood industry, can replace oil, coal and natural gas as an energy source. Central heating is often more efficient than individual heating in private homes.
- Canada and the United States, as well as the Scandinavian countries in Europe, have a long tradition in wooden homes. Part of the Canadian wood industry is dependent on the home and export market of wooden houses. Knowing the additional benefits of climate stabilization should make them even more valuable and sought after. However, the green spirit alone may not be enough to make a breakthrough in this sector. It must become a fashion, as well. To give an example: about 10 years ago the sports utility vehicles (SUVs) became enormously popular despite the fact that they were consuming large amounts of fuels. For a certain fraction of the population, the opinion leaders, wooden homes must become very desirable. Perhaps these would not be the standard farmhouses, but houses which include many high tech features like solar thermal and photovoltaic energy systems. The spirit: It is great and fashionable to live in a house made from natural materials focusing on valuable and sought-after Canadian timber, and which includes many high tech features at the same time, both from the standpoint of energy as well as communication.
- Wooden homes stabilize the carbon cycle, in as much as the CO_2 absorbed by the photosynthesis of trees stays locked in the buildings during their lifetimes, and can be used for energy purposes when being torn down. Starting with the concept of the tree house, both the concept of house and tree should be followed up in the natural city when thinking about new ideas about living. The tree house obtains natural cooling through the green branches of the tree in the summer time by evapotranspiration of the leaves while in winter the snow-loaded branches of evergreen trees provide additional protection from the winter frost. Tree houses resting on a single stem provide protection from flooding, termites or other unwanted guests. As an extension of the house on one stem, the single stem could be made to turn easily into the direction of the best climate as encountered in the different seasons of the year as well as during the different insolations during the day.
- It makes sense to use woodfuels for heating, supported by solar thermal and solar electric energy. It saves considerable fossil fuels; 20 percent of Canada's primary energy budget is used for heating. Savings of only some additional percentage in this sector could provide the energy reductions needed to satisfy the Kyoto Protocol. In summary, the Canadian forest and wood industry could expand its wooden home exports considerably by designing low energy and high-tech houses, while providing their wastes for heating systems.

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Housing in the natural city: The role of prefabrication

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The author is a graduate of University College, London, Cranfield University and Oxford Brookes University in the UK where he completed his Ph.D thesis about Energy Efficient Housing. He is a registered architect in the UK and has worked for many years as an environmental consultant to the construction industry. In 2003, Dr Gorgolewski moved to Canada to take up a position as Associate Professor at the School of Architectural Science at Ryerson University where he lectures on issues of sustainability, environmental design and building science. Dr Gorgolewski has published several books and many articles and papers on issues of sustainable construction. His past positions include chair of the committee of the Association for Environment Conscious Building, in the UK, secretary to the Steel Sector Committee for Sustainable Construction and member of the Building Research Establishment Certification Technical Board. He has received many grants from public and private institutions to investigate issues of sustainable construction. Currently he is pursuing research in the areas of office building design in the 21st century and the benefits of thermal mass. The text that follows is an edited and revised version of a paper presented at the international symposion on "The Natural City," Toronto, 23-25 June, 2004, sponsored by the University of Toronto's Division of the Environment, Institute for Environmental Studies, and the World Society for Ekistics.

Introduction

There is increasing concern about site-based methods of construction and their ability to meet the needs of modern, 21st-century cities. Issues of quality, the availability of trained labor, high energy performance, and other sustainability issues such as efficient materials use, health and safety on site, disruption to the community, and increasingly demanding performance and quality standards, are leading to a rethinking about how to build in the future. Although site-based construction can be efficient and achieve high quality, there are inherent difficulties in management, quality control and efficiency, particularly on large sites, due to the number of unpredictable factors such as weather, management of subcontractors, waste, disruption and scheduling issues.

Off-site manufacturing processes, with industrialized production techniques more akin to automotive or shipbuilding, have the potential to lead to benefits in efficiency, speed, quality and control in construction. Such technology offers considerable potential to improve the way buildings are designed, use resources and create healthy, stimulating, and comfortable spaces. Potential social and economic benefits include improvements in health and safety, more stable employment and investment into machinery and development of skills. Environmental factors such as transport of materials and labor to site, processes used on site, materials used, waste created, resource efficiency, pollution emissions and local disruption may all benefit from this technology.

But can prefabrication lead to regional responses, where standardized components and processes lead to a variety of solutions appropriate to the region and individual site? This may be the true test of how well off-site manufacturing technology can contribute to sustainability. Can the technology of mass customization lead to appropriate solutions that respond to site conditions and regional climatic and cultural requirements?

Sustainability

Environmental degradation in cities is not new, as can be seen from this description of London by Evelyn in 1661: "... her Inhabitants breathe nothing but an impure and thick Mist, accompanied with a fuliginous and filthy vapour, which renders them obnoxious to a thousand inconveniences, corrupting the Lungs, and disordering the entire habit of their Bodies; so that Catharrs, Phthisicks, Coughs and Consumptions, rage more in this one City, than in the whole Earth besides" (EVELYN, 1661).

But the global scale of development presents major challenges, as this quote from Gro Harlem Brundtland, on the issue of sustainable production and consumption patterns at the Symposium: Sustainable Consumption in Oslo in January 1994, suggests: "... it is simply impossible for the world as a whole to sustain a Western level of consumption for all. In fact, if 7 billion people were to consume as much energy and resources as we do in the West today we would need 10 worlds, not one, to satisfy all our needs" (BRUNDTLAND, 1994).

In reality, the sustainability debate is very much about the old truth that *the poison is the dose.* The earth can sustain small numbers of human population consuming and polluting to western levels, or larger numbers but with a far more ecologically appropriate lifestyle. But it cannot absorb 7 or 8 billion people all wishing to have a western lifestyle. Thus, sustainability is about balancing population numbers with the level of resource use and pollution, and if we do not recognize this fact, then the truth is likely to be forced on us by the very real limits of the earth to provide resources and absorb pollution.

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Thus, in recent years, sustainability has emerged as a major international issue for the 21st century. The search is for balance between the social, economic and environmental impacts of human activities. Sustainability in construction offers the prospect of a holistic response to the present environmental and social crises and makes much needed connections between nature, culture, economics, politics and technology. This recognition is just beginning to induce construction clients to consider the sustainability impacts of how we build, operate and maintain our buildings, as indicated by the growing use of environmental rating systems for buildings such as BREEAM (BRE, 1998), LEED (USGBC, 2001) and Ecohomes (BRE, 2000). For example, the Housing Corporation which funds much social housing in the UK now requires an Ecohomes environmental rating for all housing schemes they finance and 50 percent should achieve a rating of "Good."

UK Housing

Housing is a central feature of cities and the provision of adequate dwellings for the population is a basic goal of cities. However, in many western cities, the mass provision of housing to huge populations is increasingly leading to questions about the most appropriate and sustainable way to supply the demand for larger, higher quality housing. The technology used in housing has not developed very much over the last century, particularly when compared to changes in the automotive or electronics industries. Housing is still predominantly supplied by labor-intensive, on-site construction methods using small components, and involving little off-site manufacture.

"A family house at the beginning of the 20th century cost approximately the same as a family car. By the beginning of the 21st century, the ratio between the two was approximately 5:1" (ASHWORTH and HOGG, 2000).

One of the reasons for this is that, to date, prefabrication in housing in the UK has not been a commercial success. It has often been associated with a reduction in flexibility and choice for the designer, client and end user, and with higher costs. Until recently, perceived market resistance prevented significant uptake of such technology in the UK, despite examples here and from abroad illustrating its technical feasibility. In the UK, following 1945, and sponsored by successive governments, there was an organized drive for the mass provision of (mainly social) housing, using various industrial building methods such as large, panel concrete construction. Many of these projects subsequently suffered technical and social problems and in the last quarter of the 20th century, there developed considerable mistrust and a perceived market resistance towards innovative construction methods, particularly in residential construction, influenced by past errors in design and construction. The problems included inappropriate technologies which led to moisture penetration, condensation and mould growth and, sometimes, even structural problems such as at the Ronan Point disaster, where a minor gas explosion led to a major structural collapse of one corner of a 23-storey block of apartments. However, many of the problems were social in nature, caused by inappropriate forms such as tower blocks for young families, and broken lifts denying access to the elderly. All this created a distrust for new technology, despite examples from home and from abroad illustrating its technical feasibility.

As a result, the UK housing stock is now ageing, renewal rates are slow, and supply is insufficient. Government predictions of household growth suggest that 3 million new dwellings will be required by 2016, in addition to renewal of existing stock. A construction program of between 225,000 and 250,000 homes annually is required, just to achieve housing renewal on a 100-year cycle. Yet, house building completions in recent years have fallen to their lowest level for many years with just 166,000 new homes completed in Britain in the year 2000. Completions are at their lowest since the 1920s, so current replacement rates are minimal, with most new housing adding to the stock rather than replacing old, outdated housing.

This demand for new housing presents a significant challenge to the UK housing industry. How can housing needs be met while minimizing environmental impact? The diminishing labor force, increased business performance demands, client requirements for higher building standards, health and safety issues and the industry's increasing regulatory improvements, particularly in thermal and acoustic performance, are leading the industry to reconsider off-site methods of construction and to investigate other ways of building homes. The need to use resources more efficiently through the application of research and development in new housing technologies is vital if the industry is to meet society's demand for new and sustainable housing.

A further factor leading to change in the industry is the government's construction policy, which is now dominated by the report of the Construction Task Force *Rethinking Construction* (EGAN, 1998) and the subsequent report *Accelerating Change* (EGAN, 2002). These documents encourage the industry to address market demands for improved efficiency, better quality, faster construction and better cost control. This development has led to a greater interest in off-site manufacturing technologies and many house builders are currently investigating a variety of innovative ways of building dwellings. The trend began with the hotel sector, where quality and repeatability of units lend themselves to volumetric buildings. This technology is now being increasingly applied to apartments, houses and sheltered accommodation. Recent reports (CRISP, 1999) have identified considerable areas of overlap between the agenda of improved industry efficiency through prefabrication and partnering and the sustainability agenda.

Off-site manufacturing systems

In the UK, there are three principal approaches to the off-site manufacture of residential buildings (KEITH, MILNER and GORGOLEWSKI, 2001):

- Volumetric systems;
- Panellized systems; and,
- Hybrid (semi-volumetric) systems.

These are discussed below:

Volumetric systems

Three-dimensional units are manufactured in the factory with a high degree of services, internal finishes and fit-out installed in controlled, factory conditions prior to transportation to site. This process has many benefits, including improved quality, reduced defects and snagging on site, increased speed of construction on site, better working conditions, increased predictability and efficiency in the production process. This approach is particularly suited to highly serviced areas such as kitchens and bathrooms, which have a high added value, and cause disruption and delays on site, but may be less appropriate for other rooms which have less internal fit-out.

Volumetric systems (fig. 1) have the disadvantage that each unit has to be transported separately, and the maximum size of the unit is determined by the practical problems associated with transportation by road. The factories operate most efficiently when a large number of similar units are

Fig. 1: A volumetric housing scheme under construction in London.

made to the same dimensions. Both of these factors work to reduce flexibility in layout and design. For these reasons, most volumetric construction in the UK to-date has been in the hotel, hospital and fast food chain sectors, where repetition of units is possible. Increasingly, they are also being used for student accommodation.

Panellized systems

Flat panel units are manufactured in a factory, and fixed together on site to produce the three-dimensional structure. Services, windows and doors, internal wall finishes, and external claddings can potentially be installed in the factory but, in most current systems in the UK, the services installation, external cladding and internal finishing occurs on site.

Panellized systems (fig. 2) are more flexible and can more easily accommodate variations in unit plan and detail design than volumetric systems. Spaces such as bedrooms and living spaces lend themselves to panel construction systems, providing greater choice to the client and designer, with few restrictions on room size and layout. Furthermore, the advantage of panellized systems is that they can be stacked flat, so more of the structure can be transported in one journey, reducing transport impacts. However, the levels of finish, and services, which it is practical to install into panels prior to shipping to site are reduced compared to the volumetric alternative. This leads to more work on site and requires further deliveries of other materials, components and labor to site. This may not be much of a problem for plain walling but would be a disadvantage for highly serviced areas, such as kitchens and bathrooms. Also, there is a greater likelihood of damage to the finishes applied to the panel during transportation or on site.

Fig. 2: Light steel frame panellized construction.

Hybrid (semi-volumetric) systems

A third option is to use volumetric units for the highly serviced areas such as kitchens and bathrooms, and construct the remainder of the building using panels or by another means. This method provides the opportunity to remove the highly serviced areas from the critical path of the project, and potentially bring together the benefits of different construction systems. It can also address the issue of providing flexibility and consumer choice.

Some schemes have used volumetric modules for bathrooms and kitchens in hot rolled steel frame or concrete frame buildings. Alternatively, volumetric units are used in combination with panels for the less serviced areas. Also, volumetric units have been used to extend buildings and provide additional accommodation with minimal disruption.

Such an approach may combine the benefits of economies of scale and the economies of scope, utilizing mass production, factory production and standardization to provide flexibility of options offering customization. A kit of parts can be used to provide flexibility yet maintain the benefits of standardization.

Sustainability benefits

How can the move towards off-site manufacture lead to sustainability benefits, and reduce the negative impacts of the additional three million homes? Below is a discussion of the potential areas of overlap.

Reduced local impacts

One of the key features of prefabrication is that much of the process is removed from the site to controlled factory conditions. This strategy reduces the amount of time spent on site, which leads to reduced impacts on the locality. Experience in the UK shows that prefabricated hotel buildings can be constructed on site in half the time (or less) of a traditionally built hotel of a similar size. In the catering industry, clients have claimed a factor of ten improvements in installation and commissioning timescales for a typical fast food restaurant when using volumetric construction. For example, McDonalds burger bars are now regularly prefabricated offsite and assembled with only about 1 week of site work before opening. One example was completed with only 24 hours of work on site. This means that the locality around the site is disrupted for a shorter period reducing noise, pollution emissions and local traffic disruption. Furthermore, the lightweight nature of the buildings can often result in smaller foundations and therefore less ground work, also reducing local disruption as well as reducing the volume of materials used in the ground work. For example, steel piled foundations, and substructures can lead to considerably less re-

moval of spoil from the site (GORGOLEWSKI, 2001).

From a financial point of view, the shorter construction period allows for a quicker return on investment by the client, and reduced overhead costs.

Reduced levels of defects

A building site does not provide an ideal environment for achieving quality construction or safety. Achieving quality construction is often very difficult in exposed site conditions. Factory-based activities allow for better quality management, and testing and checking procedures can be more easily implemented. For example, volumetric units can have electrical and water installations fully tested prior to leaving the factory. General experience in the UK suggests that far less call backs are necessary to make good defects after completion for buildings, using prefabrication. There is a significant cost and efficiency benefit to the builder and leads to satisfied customers. It also improves efficiency and reduces wastage of resources.

Less waste in manufacture

Waste from construction is one of the principal waste streams in many developed countries, in the UK leading to about 70 million tonnes of waste per annum. Manufacture in a factory allows far better management of the waste stream, with more efficient use and ordering of exact amounts of material, more careful storage, and the possibility of design to suit standard sizes. In addition, any waste that occurs can be more easily collected and reused or recycled. Many manufacturers of components have recycling facilities installed, as this reduces the costs of disposal of waste. There is further potential for reducing waste when using prefabrication if the designer is prepared to co-ordinate sizes so that materials such as timber and gypsum sheets are used in their standard sizes without generating many off-cuts. Assembly of prefabricated components on site should generate little waste as the components come to site pre-engineered for easy assembly.

Health and safety benefits

Construction work on site can be a dangerous activity and leads to significant numbers of casualties and fatalities. More demanding health and safety requirements are pushing many builders to consider off-site manufacturing techniques. In this way, much of the process is carried out in more controlled and comfortable factory conditions where safety requirements can be more easily met and policed, and healthy and comfortable working conditions are more readily maintained. This approach also helps with attracting and retaining a high quality workforce, who are increasingly hesitant to work on inhospitable and often dangerous building sites. The use of scaffolding is of particular concern, and some schemes in the UK have tried to eliminate the need for scaffolding completely by integrating claddings in the factory. Conversely, the use of heavy lifting equipment to locate the prefabricated components on site requires careful management.

Improved environmental performance of the final product

Thermal and acoustic performance is dependent on the quality of workmanship and supervision. The correct installation of the elements of the fabric, in particular insulation materials and air barriers, are important to the performance of the building in use. Factory manufacture allows operatives to be better trained and supervised in these tasks, and allows regular checking and testing of performance. Problems such as omitted insulation and badly fitted air barriers are less likely to occur. Reports from North America suggest that direct comparisons show higher thermal performance standards for homes that use off-site manufacturing techniques (CORNER and STURGES, 1995).

Social benefits from improved working conditions

Employment at a factory that manufactures prefabricated building components is generally more stable and long term than site-based employment, which is intrinsically transient. As a result, factory-based employers are generally more willing to invest in training for their workforce. Furthermore, to function efficiently, prefabrication requires high levels of skill and flexibility in the workforce, which necessitates greater training by employers.

Building sites are temporary employment locations, so they generally offer little long-term amenities for the local community. Manufacturers in factories are often closely linked with the local community, with much of the workforce coming from the locality. They provide a long-term economic and often social service for the community. Many manufacturers of prefabricated modular or panel units in the UK are well established in particular locations and have developed a highly trained local workforce, and strong links with the local community.

Greater efficiency in the use of resources, both materials and labor

Building sites are notorious in poor efficiency in the use of labor and materials. Studies in the UK estimate that up to 30 percent of construction work is done to correct poor workmanship or design. Furthermore, site labor is being managed at 40-60 percent of potential productivity, given the level of technology employed (EGAN, 1998). It is estimated that 19 percent of materials delivered to UK construction sites is wasted and never used properly (HOUSE OF COMMONS (UK), 2005).

In addition, volumetric construction using prefabricated pods or modules allows buildings to be potentially dismantled and the modules reused at a different location. Modular hotels in the UK have been dismantled and removed to a different location when found to be uneconomical at their original site. Similarly, many volumetric buildings are used as temporary buildings and removed for reuse when no longer necessary. Thus, the technology for reuse is well established. Many of the materials used in this type of construction, such as steel framing, can also be extracted for recycling at the end of the life of the module. This is made easier by the lightweight, dry construction methods that are generally used. This is likely to become more significant in the future when European legislation about producer responsibility encompasses the construction industry.

Transport

Transport is a complex issue, and monitoring of transport patterns relating to construction sites is difficult. In general, prefabrication leads to reduced numbers of deliveries to site, compared to traditional construction methods. Some monitoring of a site in London suggested that deliveries to site were reduced by up to 60 percent for a volumetric building compared to a similar building nearby using traditional construction methods (STEEL CONSTRUCTION INSTITUTE, 2000).

The wider transport implications of prefabrication are difficult to measure. There is a need to carry out meaningful comparisons of alternative prefabrication systems, such as volumetric

and panellized methods, with traditional sites for transport impacts. Deliveries of large volumetric components often come from considerable distances from the factory. Location of the manufacturing facility may be critical. However, there are generally fewer deliveries than with traditional construction. In addition, the shorter period on site and the nature of the work means that less labor is required on site and for a shorter period. Panellized construction can be more efficient in delivery to site, but more subsequent work on site to finish the building off can lead to additional transport movements. In general, it is likely that a well managed site using prefabricated components can significantly reduce the impact of transport.

Moreover, the additional transport movements related to the factory should be considered. However, the workforce in a factory is more likely to be local, and thus will travel shorter distances, and is more likely to use public transport, where possible. Secondly, material deliveries to a factory can be planned so that full loads are always delivered, and local suppliers can be used.

Conclusion

There is an increasing interest in off-site manufacture in the UK house building industry. House builders are beginning to realize that there is a need to improve standards and that new regulatory requirements, such as the changes to the Planning Laws and Building Regulations dealing with energy efficiency and acoustics, will be satisfied more easily by increasing the amount of off-site manufacture. Sustainability issues are a significant driver for change.

The objectives of sustainability and the "Rethinking Construction" agenda of improving efficiency in construction overlap in several areas, notably waste minimization, process integration, a commitment to people and a quality driven agenda. Off-site manufacture offers an opportunity to address both these agendas, and improve both efficiency and sustainability. However, the industry has much to learn to fulfil the potential of this technology.

Perhaps the optimal solution requires a more locally integrated system of smaller scale manufacturing facilities that can respond to local material availability, local skills and local design requirements. Such plants could be integrated into industrial ecological systems, where wastes from one industrial process form the resources for the next. Wastes from other local industries, such as agriculture or demolition, could potentially be used in the manufacture of large-scale construction components. Such a vision, based on local need, local supplies of materials and labor, and providing products appropriate to local culture and climate, yet based on industrial efficiency, and the latest technology, has huge potential to support a move towards the more sustainable supply of housing.

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The Oak Ridges Moraine:
A story of nature in the Greater Toronto Urban Region

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Introduction

When the council of Richmond Hill, a small city immediately north of Toronto, decided in the winter of 2000 to consider opening a sector of the Oak Ridges Moraine to developers, so many people came out to protest that the politicians had to move the meeting from their Council Chamber to the grand ballroom of a nearby hotel. It was a bitterly cold February night but the ballroom was packed and latecomers had to stand at the rear. People took turns stepping up to microphones to offer emotional recollections of times past when they had hiked and swam and farmed in the fields that the politicians were considering turning into subdivisions. They warned Richmond Hill Council members they would face electoral defeat – or worse – if they meddled with the moraine. At the crowded press table, reporters noted the rising fervor of the speakers and called new leading paragraphs into copy editors facing early deadlines. Television camera crews roamed the hall. The deputations went on until after midnight. The campaign to save the Oak Ridges Moraine had, a little to the surprise of people who had been involved with it for years, suddenly become a matter of passionate public concern.

In this paper, I will discuss why people began to care about the moraine and why, sadly, their efforts to preserve it fell far short of what they had hoped to achieve.

The Toronto story of nature

At the opening session of the Natural City conference in Toronto, Jack Diamond, a local architect, argued that there is nothing natural at all about cities. Cities are a built environment. Diamond has gained an international reputation in Toronto, his home city, but he first began to be celebrated 30 years ago for his skill in fitting new buildings into existing neighborhoods, most notably in the "Hydro Block" where he linked three storey apartments that preserve the existing streetscape to older houses and created a charming inner courtyard.

Diamond was determined to preserve inner city neighborhoods and many of his ideas have been incorporated into New Urbanism, the movement that attempts to replicate early 20th century inner city housing styles on the outer reaches of 21st century edge cities.

Followers of Jane Jacobs hold that inner city neighborhoods, with their small-scale housing, diversity of stores and other enterprises, help build up relationships of trust among people. These networks of trust, in turn, make city life civilized. Jacobs herself came from Greenwich Village to live in the Annex, an inner city Toronto neighborhood, shortly after her seminal work on the importance of streets and neighborhoods, *The Death and Life of Great American Cities,* was published.

The idea of the city as a federation of neighborhoods that Diamond and Jacobs helped to advance came to dominate city politics and urban planning in Toronto in the 1970s. Soon after settling in Toronto, Jacobs became part of the "Stop Spadina" movement, a campaign to prevent the Spadina Expressway from plowing through inner city neighborhoods. In 1971, the Ontario provincial government stopped work on the Spadina Expressway and then cancelled a whole grid of expressways that had been planned for Toronto. The anti-Spadina campaigners partied and danced on the main streets of Toronto and then went on to add their strength to a growing urban reform movement. The reformers, although never a majority on City Council, managed to push Toronto into making a new Central Area Plan in 1976. The plan was as thick as a small town telephone book but it had three objectives and these were met:

- It limited the size of new downtown office buildings.
- It hedged inner city neighborhoods with protective zoning regulations.
- It encouraged the construction of apartment blocks in the central area.

New condominium towers grew up just a few blocks away from the financial center at the corner of King and Bay, Toronto's Wall Street. Tourists were delighted to discover the people and activity they found on Toronto streets. Visitors from Detroit, New York and Chicago marveled that they could walk around downtown at night. In the late 1970s, Toronto promoted itself as "the city that works." But there was a price to be paid for making Toronto the city that works. The bills came due when developers threatened to spread across the Oak Ridges Moraine.

- **The moraine** is a glacial ridge that runs across the Greater Toronto Area. Geologists estimate that 13,000 years ago, two glaciers ran into each other and either exploded releasing unimaginable tons of water imprisoned under the ice or gradually melted away. Whatever the case, when the ice and water were finally gone, there remained behind a winding, 160-km ribbon of silt, sand and gravel. The moraine acts like a sponge, ab-

sorbing snow and rain. The water seeps down to underground aquifers that provide drinking water to two cities and feed the headwaters of 30 rivers flowing south into Lake Ontario and north to Lake Simcoe. The Oak Ridges Moraine is one of the most important physical features of the whole urban region.

As a journalist, I became involved with the moraine in the spring of 1998. I had written a City Hall column in the Toronto Star for 20 years but had recently given it up in order to begin work on a book about the evolution of Toronto as a global city and to write feature articles about the rapidly growing urban region around Toronto. A friend in government (a "contact," as we say in the journalism trade) told me over a quiet lunch that I should really look into Richmond Hill. What was going on out there, my friend warned me somberly, could endanger the three rivers that flow through the city of Toronto and endanger the city's whole park system.

• **Richmond Hill** is one of nine cities making up York, an urban region that spreads over 1,776 sq.km from the northern border of Toronto to the edge of Lake Simcoe, about 100 miles to the north. In earlier days, the farms of York were a buffer zone between the city and the chain of northern lakes known as "cottage country." But in the 1990s, York became the fastest growing urban region in Canada. By the turn of the century, it had almost 1 million residents.

Richmond Hill had two urban centers. The large one, at the south end of the city, was simply an extension of the growth spreading north from Toronto. The smaller urban center, a collection of pleasant looking subdivisions, was on the town's northern border. The two urban centers were separated by a 35-km wide belt of farmland. Most of this farmland lies right on top of the Oak Ridges Moraine. The land was designated "agricultural" in official plans but, in the late 1990s, developers who had bought up most of the farms began pressing to be allowed to build there. Their projects were close to the headwaters of the Don, the Rouge and the Humber, the three rivers that wind south through Toronto creating valleys and much of the city's parkland. If the moraine were covered up with asphalt and cement, very little water would be able to seep down to the underground aquifers and these headwaters would be endangered. It was clear that the swath of open land between those two sectors of Richmond Hill was a crucial section of the Oak Ridges Moraine.

I wrote a series of features on proposed developments in Richmond Hill and other cities that were threatening the Oak Ridges moraine. These features were well illustrated and my editors at *The Star* (a major Toronto newspaper) gave them a good display. But except for some grateful phone calls from environmental activists, I got little response. I moved on to writing about other issues. A year later, I began to write about the politics of the outer cities for *The Star*'s opinion page. I did a couple of columns on the moraine and suddenly I was getting telephone calls from all over the region. My callers were excited and angry. They realized that the moraine was in danger and they wanted to do something about it.

What had taken them so long to become aroused? Activists had been working for 10 years to try to establish development controls on the moraine but they had received little public attention. Then, it seemed as though overnight, people were demanding that developers be kept away and the Oak Ridges Moraine be preserved as part of the natural world.

The moraine was a sad looking expression of the natural world. On the surface most of it is just low, scruffy hills. The magnificent original forests had been clear-cut early in the 19th century and intensive farming had subsequently exhausted the soil in many areas. By the 1930s, much of the moraine had become an arid plain. The principal public parks on the moraine, the Jefferson Forest and the Ganaraska Forest, were the result of extensive reforestation programs and local authorities tended them as carefully as suburban gardeners look after flowerbeds. So if "natural" means being free of human intervention, there was really nothing natural about the moraine. What's more, there were already 100,000 people living on the moraine, mostly in "estate homes," spacious houses on large lots. But much of the moraine was still open space and developers were pushing to build homes for another 150,000 people there. This push for even more housing on the moraine came, I think, to stand for the closing of the urban frontier.

People were beginning to feel imprisoned by the pace of urban growth around them. They would buy a house in a new suburb and there were green fields just a few blocks away. They could feel they were living close to the countryside. Then, in the spring, they would see bulldozers lumbering on to the open fields and whole new subdivisions would spring up, it seemed, overnight. They were no longer living in semi-rural seclusion. Their homes were becoming part of a densely packed urban mass. The campaign for the Oak Ridges Moraine became a fight to preserve a belt of open space within this urban mass.

High densities are a necessary component for the kind of cities that Jack Diamond helps build and the followers of Jane Jacobs promote. Certainly, people living inside densely populated cities can benefit from the diversity of opportunities and the networks of trust that crowded cities can create. But people also long for a bit of greenery and open space. This yearning for open space may come from the belief that people can breathe more freely when they are in open fields. It may be a nostalgic longing for a more rural past and a simpler way of life. But whatever the source, the desire for greenery and open space became a powerful force in Greater Toronto and people focused on the Oak Ridges Moraine.

There was an ironic touch to all this for people like myself who had witnessed the urban reform movement of the 1970s. In order to preserve the inner city neighborhoods and limit the size of downtown office buildings, growth had to be directed away from the central area. The planners promoted the building of office towers and high-density apartment blocks away from the central area. There would be "downtowns" spread across the whole region. This spread-the-growth policy was known as "deconcentration," and it was hailed as a progressive step. Deconcentration worked in that it deflected growth away from the downtown core and helped keep Toronto a city of neighborhoods. But by the 1990s, the cities around Toronto were spreading out so rapidly that planners became alarmed. Deconcentration became "urban sprawl," a phenomenon to be feared and even loathed. The Oak Ridges Moraine, once an interesting geologic feature on the edge of the city, was squarely in the path of urban development.

In addition to the possibility of over 12,000 new houses on the Richmond Hill stretch of the moraine, a developer wanted to build 2,500 houses in the town of Uxbridge, a few miles to the east. He wanted to bring in a large sewer pipe to accommodate his development which he called "Gan Eden," Hebrew for "Garden of Eden." There were other smaller developments being promoted in other towns and cities and on the western flank of Greater Toronto, in the little town of Caledon, known mostly for the lush green farms of the horsey set, there was a struggle to control the spread of gravel pits. Sand and gravel extracted from under the moraine farmland made excellent building materials. The mayor of Caledon warned that pit operators were gouging so many holes down below the water level that the town would soon become known as "the land of square lakes."

The Oak Ridges Moraine runs across three urban regions bordering the city of Toronto, Peel, York and Durham and, in each region, there were plans to exploit the moraine. Saving the moraine became a cause that drew people together from right across the Greater Toronto Area.

One can see the moraine campaign as a case of conflicting desires, a piece of the unresolvable, unending urban dialectic. On the one side, there was the desire for all the varieties of ex-

perience that a compact, diversified inner city can offer. On the other side, there is a longing for the simplicity of the countryside, the fresh air and open space. As long as people living in the inner city feel that they can reach the open countryside quickly and easily, they feel they can balance these conflicting needs and desires. But when developers began to advance on the Oak Ridges Moraine, I think that people felt that all the open spaces in the Greater Toronto region would be filled up with city. The countryside would be pushed so far into the hinterland that it would be unreachable. It was this sense of urban claustrophobia that I think motivated people who came out to the Richmond Hill ballroom in the bitter cold.

They won a victory that night. The Richmond Hill politicians did back down from declaring all the open space between the city's two urban centers open for development. But there was still the possibility that individual developments might be allowed to proceed. Moraine campaigners quickly discovered that the complexities of government in Greater Toronto made controlling development across the moraine maddeningly difficult.

Greater Toronto covers 7,000 square kilometers. Politically, Greater Toronto is part of the province of Ontario. Under the Canadian constitution, Canadian cities are "creatures of the provinces." That is, cities have no inherent powers; city governments can only do as much as provincial governments allow them to do. The Ontario government had surrounded the city of Toronto with four urban regions. Grouped within these four urban regions are 24 cities and towns. This lower tier of municipalities sends members to regional councils and they are, in turn, subject to the decisions of the regional councils.

But off to one side of this complicated governmental pyramid – province at the top, regional councils at the next level and at the bottom, cities and towns – there was the Ontario Municipal Board. The OMB, as it is popularly known, is an "administrative tribunal." The members, mostly lawyers and former city politicians, are appointed by the provincial government and they function as a court of appeal. Private citizens – and developers – who are unhappy about an urban planning decision made by a municipal council can go to the OMB. The board operates with an adversarial system; witnesses are sworn in and subjected to cross-examination by lawyers for opposing sides. The board became the main arena for the fight to save the moraine.

In earlier times, people had to wait until a municipal council had made a decision before going to the OMB. But in 1995, the Conservative party won the provincial election. They were really neo conservatives in the tradition of Ronald Reagan, Margaret Thatcher and the first George Bush. They saw themselves as liberating citizens from stultifying government regulations. They made changes in the way that the OMB operated that seemed small at the time but which proved deadly when applied to the Oak Ridges Moraine.

Developers no longer had to wait for municipal councils to come to a decision. If a municipal council had not ruled on a subdivision application within 90 days, the developers could go directly to the OMB. Developers had long complained that the red tape involved in getting subdivisions approved by three levels of government, local, regional and provincial, kept them from getting housing on to the market and added to their costs. They produced charts of the approval process with arrows going to all the different bodies from whom they had to win approval and claimed that this process could take five long years and add substantially to the price of houses they brought to market.

However, the 90-day rule did more than cut away some of the complications of the subdivision approval process. It pushed elected municipal politicians to the sidelines. It was impossible for a local and regional council to deal with the complexities of a large subdivision application such as roads, sewers, water pipes, impact on transportation, education and the environment, all within 90 days. Developers quickly began to make end runs around municipal and local councils. Lawyers representing the developer promoting Gan Eden, the 2,500 unit project in Uxbridge, slapped their appeal into the OMB just 91 days after applying to the local council for approval. Moraine campaigners came to realize why the developers had not bothered to put on a big show at the meeting in the Richmond Hill hotel ballroom. The developers had already begun their appeals to the OMB. They did not need the approval or Richmond Hill Council or the approval of York Region Council. The Ontario Municipal Board had the power to give everything they wanted and they went directly to the Board.

Then, too, the Conservative government did away with a new planning act that would have required the OMB to conform to provincial guidelines when coming to a decision. Provincial governments over the years had built up a series of guidelines for dealing with environmental concerns such as wetlands and woodlots and farmland. Had these guidelines been strictly adhered to, they would have severely restricted urbanization on the moraine. But the new Conservative provincial government ruled that in future, the OMB need only "have regard" for provincial guidelines. Nobody knew what "have regard" would turn out to mean in practice. To some, it appeared to allow members of the OMB to simply say, "Yes, we looked at the guidelines and now the developer can go ahead and do what he wants."

Professor Robert McDermott of York University has done extensive research into political contributions. He has found that between the years 1995 and 1998, the real estate industry gave over $800,000 to the Conservative government. They were not, McDermott argues, trying to do anything so crude as buy support for a particular project. They were simply "investing" in government. If McDermott is right, and I certainly believe he is, the real estate industry received a handsome return on its investment. The development approval process had been removed from the uncertainty of local councils and turned over to an administrative tribunal appointed by the provincial government. People complained bitterly that crucial environmental decisions that would have an impact on many lives had been handed over to an "unelected" body. But the outcry had no effect on the Conservative government.

Two subdivision proposals in Richmond Hill involving almost 10,000 houses were the first projects to come before the Board. They were seen as the test of how the OMB would approach the moraine. The hearings began in June of 2000 and they did not open well for environmentalists. The two board members considering the Richmond Hill projects refused to fly over the area so they could see how Richmond Hill fit into the larger issue of protecting the moraine. They decided that they would consider only the merits of the projects that had been put directly in front of them. Then, they refused to give the City of Toronto status at the hearing. The City's lawyers argued that since the City's three great rivers had headwaters on the moraine, Toronto had an interest in protecting the moraine. But the Board ruled that Toronto's interests were being represented by environmental groups at the hearing and there was no need for Toronto to participate. So Toronto was reduced to contributing to the legal costs of the environmental groups instead of being able to send in its own team of highly experienced lawyers.

The Richmond Hill hearings settled into a slow, steady grind of experts contradicting each other. It quickly became apparent that the underground aquifers had been only partially mapped. No one could say with certainty how much water there actually was under the moraine, where it was coming from, where it was ultimately going. So the hearing became one group of experts declaring that it was safe to build on the moraine and other groups disagreeing. One developer spent over $500,000 hiring expert witnesses. The hearings droned on and on. But outside the sleepy hearing room in the Richmond Hill municipal building, public concern was growing.

The proceedings were often tedious but they were still well covered by the press, particularly *The Star*. The paper had a reporter there almost every day. In the summer of 2000 Mike Colle, a Liberal Member of Parliament set out on a walk across the moraine to dramatize the need for protection.

Colle was the embodiment of inner city concern with open space in the edge cities. The son of Italian immigrants, Colle had sold newspapers on the street comers of Toronto, become a high school teacher and been a highly regarded municipal councilor before entering provincial politics. Colle was the quintessential city politician but he took up the cause of the moraine and helped keep it before the public.

The Richmond Hill hearings were about to go into a second year when a provincial cabinet minister suddenly died and the government was compelled to hold a by-election to replace him. The riding of Vaughan-King-Aurora included much of the moraine in York Region. The Conservatives supported a local councilor, Joyce Frustaglio, and the Premier, Mike Harris himself, came to the riding to campaign for her. But she faced a formidable Liberal veteran, Greg Sorbara, and it was clear that anger over the moraine could cause the Conservatives to lose a seat in their heartland, the suburban belt surrounding the city of Toronto.

On May 18, 2001, with the Richmond Hill OMB hearing about to enter its second year, Chris Hodgson, the Provincial Minister of Municipal Affairs, sent out an urgent alert that he was about to make an important announcement up in Richmond Hill. He had chosen a pleasant looking suburban park as the setting. His government, he solemnly told the crowd of reporters and environmentalist who had followed him to the little park, was imposing a freeze on all moraine developments. The Richmond Hill hearings would end immediately and all applications to the OMB were suspended. The freeze was temporary, for only a six month period, but the govemment would set to work immediately on a plan for permanently protecting the moraine. It seemed that, despite the way that earlier developments had favored the real estate industry, the Conservatives were now going to favor the environmental advocates over the developers. The freeze cheered moraine campaigners but it did not help the Conservatives at the polls. Their candidate lost to the Liberal Sorbara by almost 10,000 votes.

Hodgson set up a task force of 13 moraine "stakeholders" that included environmentalists, citizen groups and developers. But Hodgson had, significantly, left out Glenn De Baeremaeker, the fiery young president of "Save the Rouge Valley," one of the groups representing environmental concerns at the Richmond Hill hearing. Still, hopes were high that the advisory panel would come up with a good plan for the moraine. But when the panel revealed their plan, they had somehow agreed to actually enlarge the sections that would be open to developers. Hodgson held three informational meetings that summer to try to sell the plan. People with objections were asked to put them in writing and hand them to civil servants who would be standing by. But so many people demanded the right to speak that Hodgson had to open the sessions up and people openly attacked him and his plan. De Baeremaeker denounced it as a gift to developers.

Finally, in November 2001, the Conservative government passed a moraine conservation act that did look impressive. It designated 38 percent of the moraine as "natural core area" and another 24 percent as "natural linkage area." Very tough restrictions were placed on both areas. It meant that two thirds of the moraine were protected. Another 30 percent of the moraine was designated as countryside and restricted essentially to agricultural uses. Only 8 percent of the moraine was designated "settlement area," and open to development. The act did say that these designations would be reviewed in ten years but moraine campaigners were still pleased. It looked as though for a decade at least, developers would be kept away from 90 percent of the moraine land. Even deBaeremaeker, who had been such a noisy critic of the Conservative government, praised the plan.

Then suddenly in April 2002, Hodgson issued a zoning order allowing 6,600 houses to go up in the Richmond Hill sector of the moraine. Moreover, 4,300 of those houses would be grouped around Bond Lake, one of the most ecologically sensitive points. It was not just housing that Hodgson's zoning order appeared to allow. Subdivision plans that I obtained showed a "gas bar," an apartment complex of 379 units and 6.5 hectares of "major commercial development," which most likely meant a shopping mall. A zoning order is like a royal decree. There is no appeal. When a provincial government issues a zoning order, it instantly becomes law. DeBaeremaeker denounced Hodgson's Richmond Hill zoning order as a betrayal. It did not seem too strong a word.

Except among environmentalists, there was little public reaction to this betrayal. Most of the moraine had been protected from exploitation for at least the coming decade. What is more, in a subsequent bit of negotiation, the provincial govemment created a public park of 1,000 acres on the Richmond Hill sector of the moraine and set up a foundation to purchase more land for more public use. Most people felt the moraine campaign had been a success.

But the fight over the Richmond Hill sector of the moraine had, in many ways, been lost. The cluster of subdivisions allowed by the ministerial zoning order accomplished something that environmentalists had said should never be allowed to happen. Those 4,300 houses did split the moraine into two lobes. Wildlife would now be confined to two islands isolated within the urban mass.

Still, if the moraine campaign had failed to create permanent protection for the moraine, it did succeed in making the natural environment a permanent feature of the local political landscape. In the spring of 2005, the McGuinty government established a Greenbelt that it said would protect 1 million acres of environmental sensitive land around the northern edge of the Greater Toronto Area and extend all the way around Lake Ontario to Niagara Falls. The Greenbelt sounded very promising but some of us recall an earlier greenbelt on the lower tier of the Greater Toronto Area. It was established by a Conservative govemment in the early 1970s. That earlier greenbelt is now an eight-lane toll road, Highway 407. We will see what happens to this new Greenbelt initiative.

It is tempting to attribute the failures of the Oak Ridges Moraine campaign to cynical manipulations by successive provincial governments more intent on accommodating special interests in the real estate industry than protecting open space. But those real estate interests represent a wider public interest, people seeking places to live. In the early 1990s, when Ontario was govemed by the left wing New Democratic Party, the government commissioned demographers who predicted that the region's population would grow from 5.2 million people in 1991 to 6.9 million by 2021. The New Democrats instructed the regions of Greater Toronto to prepare enough serviced land so that housing could be built to accommodate all of these new people. The New Democrats were defeated in 1995 but it could be said that the new Conservative govemment was simply finishing what the New Democrats had started.

In reality, left and right wing parties behaved in much the same way, despite their supposedly conflicting ideological positions on the role of government. There was no political party that defended the moraine except the ineffectual Green Party and a few scattered environmental groups. There was no ideology that could provide guidance for incorporating large natural features and open land being used for agriculture into a rapidly expanding urban region.

Meeting the desire for fresh air and a bit of greenery within older cities is a fairly straightforward business. Private backyards and garden and public parks can pretty well do the jobs. It is true there is often a demand for more parkland within cities but satis-

fying this demand is part of a well understood political process. However, when large cities are linked with smaller cities and towns and rural villages to make up vast urban regions, creating open space becomes more difficult.

Some moraine campaigners who had been co-opted by the Conservative government's bewildering array of committees and advisory panels and foundations claimed that the 1,000-acre park in Richmond Hill was a very significant gain. That may be a good size for a city park but, in an urban region of 7,000 sq.km, it will not mean very much. There was no ideology, no vision, no mental picture that people could carry with them that showed how green open space should co-exist within a rapidly expanding urban region.

Conclusion

Greater Toronto contains Toronto's largest and most dynamic city and 24 small cities but it is also one of Canada's most productive agricultural regions. Joyce Savoline, the chair of Halton region, told a recent conference on agricultural strategy that the Greater Toronto Area (GTA) has 3,800 farmers and agricultural sales totaling $1.3 billion.

Agriculture is still an important part of the region's economy but it does not co-exist comfortably with urban expansion. Farmers complain that the buildup of traffic on rural roads make it difficult to move equipment from field to field and take crops to market. Homeowners living next to farms complain about the smells and dirt wafting their way. Deep inside the city many people may still think of farmers as sturdy yeomen out on land that has been in their families for generations but many of them are simply tenants. A Greater Toronto Area Profile released in 2003 showed that half the farmland in the region is being rented to the farmers who work it. The owners of this farmland are developers and speculators waiting for the right time to plant new subdivisions on it.

The urban frontier is closing faster than I think most city dwellers realize. The campaign to save the Oak Ridges Moraine exposed the conflicts that come with trying to preserve green space in an expanding metropolis. After the natural city, the next step must be figuring out how to allow expanding cities and large tracts of farmland and open space to exist peacefully side by side in vast, rapidly growing urban regions.

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Lake Ontario's Waterfront: Realizing a decade of regeneration

Suzanne Barrett

The author was the principal author of A Decade of Regeneration: Realizing a Vision for Lake Ontario's Waterfront, *in collaboration with editor Ron Reid of Bobolink. She was Director of the Lake Ontario Program Waterfront Regeneration Trust from 1992-2002, leading its work on the Waterfront Trail, Greenway Strategy and Toronto and Region Remedial Action Plan. She is currently a free-lance consultant specializing in environmental planning, waterfront revitalization and public engagement. The text that follows was originally published in the* Ontario Planning Journal, *March/April 2002.*

Introduction

In November 2000, ten years after the publication of the groundbreaking report *Watershed* by the Royal Commission on the Future of the Toronto Waterfront, its successor – the Waterfront Regeneration Trust – published a retrospective on the achievements and lessons of the past decade. This paper summarizes the key findings and looks ahead to the challenges of the current decade.

Watershed brought a new way of thinking to the Greater Toronto Area at the beginning of the 1990s. In this report, Commissioner David Crombie introduced the concepts of bioregion and ecosystem approach, challenged old ways of planning and managing city regions, and showed how our economic, community and environmental health are inextricably linked.

The philosophy and methods espoused in Watershed have been incorporated into many plans, projects and policies along the Lake Ontario waterfront and elsewhere.

For example, the 32 communities along the Canadian shore of Lake Ontario now share a vision of a regenerated and connected waterfront, expressed in the Lake Ontario Greenway Strategy published in 1995. Over 100 projects along the waterfront greenway – ranging from parks to housing, restaurants, beaches, wetlands, historic buildings, and marinas – have demonstrated the power of partnerships and the benefits of integrating economic revitalization, community renewal and environmental regeneration in the context of a strong vision and good planning. New developments increasingly show a commitment to design excellence, public access, and respect for waterfront heritage.

The Waterfront Trail has been embraced as a symbol of regeneration and a valuable asset in each community. Some 350 km of Waterfront Trail are in place, with a strong commitment to complete the full 650 km from Niagara-on-the-Lake to Gananoque.

What have we learned?

Through a series of community workshops, surveys and interviews, the Trust identified nine essential ingredients for successful waterfront regeneration. They are:

- make the waterfront a community priority;
- look beyond your boundaries;
- set the stage with good planning;
- use milestone projects to build momentum;
- design with heritage in mind;
- add value with connections;
- make it happen with creative partnerships;
- secure strategic public investment; and,
- attract private resources.

Regeneration in action

A selection of case studies from *A Decade of Regeneration* is summarized below to illustrate these themes. The case studies also show how waterfront revitalization contributes to the most recent trend in growth management and urban development in southern Ontario – smart growth. The Greenway provides a framework for urban restoration and redevelopment that respects and restores natural and cultural heritage, improves quality of life and encourages economic development that is compatible with local needs and resources. The Lake Ontario Waterfront Trail expands transportation choices by providing a safe, attractive cycling route for commuting. In addition, with a potential domestic market in excess of 4.2 million people, the Trail and Greenway also represent an important resource for local tourism development.

- Port Dalhousie in St. Catharines illustrates what can be achieved with a shared vision and partnerships among local businesses, homeowners, service clubs and municipal governments. Recent initiatives include a waterfront promenade, new shops and restaurants, an on-road bicycle lane, and a renewed beachfront park, all in the context of a designated heritage district.
- In Burlington, the renovation and expansion of parklands, coupled with the development of the Waterfront Trail, have contributed to a boom in local restaurants and residential units on the downtown waterfront—an excellent demonstration of the value of public investments in quality of life as a stimulus for private-sector investment.

Fig. 1: Humber Bridge. *(Source:* Gera Dillon for the City of Toronto).

- The pedestrian and cycle bridge over the Humber River (fig. 1) in Toronto is an inspiring milestone in the greenway movement, illustrating the integration of waterfront access with sustainable transportation, magnificent design, and the interpretation of cultural and natural history.
- An integrated shoreline management plan was prepared for the former Scarborough waterfront by the Toronto and Region Conservation Authority with assistance from the Trust and other partners. It is the first of a new generation of ecosystem-based shoreline plans integrating physical, biological and cultural factors, as well as a range of needs including public use, natural heritage, public and property safety, and shoreline regeneration.
- Pickering's Mayor Wayne Arthurs established a citizen-led task force to develop a strategy for the waterfront. Early in the process, task force members visited a number of other Lake Ontario communities to gain inspiration and benefit from the experience of others. Recent projects demonstrate the close collaboration between the municipal government and the community, ranging from Home Place – a series of wood sculptures by artist Dorsey James – to the Millennium Square and Trail.
- Strong leadership from the Town of Ajax Council and staff in collaboration with Tribute Homes/Runnymede Development Corporation resulted in the protection of Carruthers Creek Marsh as a prerequisite for an environment-first housing development that takes advantage of the natural setting of the waterfront as a key marketing tool.
- In Whitby, Brookfield Homes developed a homeowner stewardship kit for new residents in their development east of the provincially significant Lynde Shores wetland, earning an award from OPPI for outstanding planning in the communications/public outreach category.
- In Clarington, new waterfront nature reserves, trails and parks are providing essential amenities for thousands of people who are moving into new waterfront communities.
- Cobourg's waterfront has experienced a major transformation from a focus on industry and transportation to a creative and highly successful integration of brownfield remediation, new housing, heritage retention, parkland renewal, cultural festivals and recreational boating. The annual three-day waterfront festival now attracts over 80,000 people and generates $3.6 million in local economic spin-offs.

Looking ahead to the next decade

The progress of the past decade inspires optimism for the future, and provides a rich fund of ideas, information and experience. But *A Decade of Regeneration* also highlights further action that must be taken to ensure a healthy, sustainable future for both human and natural communities of the bioregion.

The challenges are clear:

- population growth in the GTA alone is expected to rise from 5 million today to 6.7 million by 2021;
- land use changes will continue to affect the Lake Ontario waterfront through the conversion of former industrial or transportation lands to new uses such as light industry, commercial or mixed-use developments;
- the development of new housing, either as infill in existing urban areas, or in previously rural areas, will further change the waterfront landscape.

These changes provide opportunities for community economic revitalization and for the restoration of environmentally degraded areas. They also pose challenges in meeting the housing,

transportation and recreation needs of the growing population without destroying the natural resources and heritage values of the waterfront and its watersheds.

A Decade of Regeneration meets these challenges and opportunities with some clear directions for the next decade.

- First, it is crucial to share the vision with a new generation of local leaders. This is happening in many places through collaboration on projects, through changing membership on committees and action groups, and through public involvement in developing waterfront plans. For example, the Trust is hosting a series of workshops in waterfront communities, including Hamilton (Windermere Basin), Toronto, Kingston and Oakville that are bringing together diverse stakeholders to develop local waterfront visions and action plans, based on the lessons learned over the past decade.
- Second, the Waterfront Trail must be completed and enhanced. Although it is substantially complete from Hamilton to Trenton, there are some significant gaps. The Trail is close to 50 percent complete in the Niagara Peninsula and is in the early stages of development in Quinte Country, Prince Edward County and the Greater Kingston area. In addition to providing much needed public access and waterfront recreation, the Trail has proven to be an important symbol of a new attitude to the waterfront and a catalyst for waterfront improvements and tourism development. It is proving its value as the signature project that ties all the others together.
- Third, water quality and watershed stewardship require more attention. In the Great Lakes Areas of Concern around Lake Ontario, remedial action plans (RAPs) have been developed to address serious degradation, and progress is being made towards restoration, often with the leadership of watershed-based action groups. However, many of the watersheds between the RAP areas are vulnerable to similar land use pressures and environmental degradation, but have not had the benefit of the focused attention that accompanies designation as a Great Lakes Area of Concern. As more people are discovering the Lake Ontario waterfront through the Trail and greenway, there is increasing awareness of the environmental degradation that often devalues the waterfront experience. The Trust is currently developing a water campaign that will reach out to the waterfront constituency to encourage behavior change by providing information about pollution prevention, water conservation and stormwater management.
- Fourth, we need innovative new partnerships to continue implementation of waterfront regeneration. The 1990s was a time of transition from significant participation by upper levels of government (federal and provincial) to greater reliance on local communities to finance waterfront projects. While the upper levels of government will continue to be important partners in a variety of ways, the next decade will see a broader range of participation by foundations, corporations, local groups and individuals. For example, in Belleville the business community has raised $450,000 to complete the trail infrastructure that they see as critical to local economic vitality. In Clarington, the community group Valleys 2000 has raised $68,000 to create trails and recreational amenities. The Oakville Community Foundation is setting a new course for community foundation activities with its work to develop a heritage trails network that integrates heritage interpretation with healthy recreation opportunities. And the Rotary Club of St. Catharines is working to raise $340,000 to create the Charles Ansell Gateway Park at the northern end of the Welland Canal.

The Trust continues as communities face up to their waterfronts

The Lake Ontario waterfront was not degraded in one fell swoop; rather, its quality and health declined gradually, one small insult at a time. The past decade has seen a reversal of that slow process of decline. But regeneration will not happen overnight – it will be an ongoing process of gradual renewal, one project at a time.

Until the 1990s, people and communities had tended to turn their back on the Lake Ontario waterfront. Now that they have begun to face the water's edge again, they see the possibilities there, and expectations are rising steadily. Those expectations are not complex – clean water, clean air, no more beach closings, access to the shore, more green spaces, fewer large buildings and excellent design quality. Much progress has been made already, but continuing to realize this vision will require ongoing dedication, enthusiasm, hard work and leadership.

The Trust continues its work with waterfront communities. It has developed a cooperative communications program to promote the Waterfront Trail in collaboration with the municipalities and conservation authorities around the Lake. A coordinated application to the Provincial Superbuild Fund requests participation in the next wave of waterfront investment. Projects include new cultural facilities and natural heritage projects as well as trail-building, reflecting the evolution of the Trail from a significant public recreational amenity to a regional tourism resource.

The past decade has created a new generation of community leaders who understand the potential of waterfront regeneration to increase quality of life, bringing with it economic vigor and healthier communities. Many OPPI members have played an important role in developing this understanding, and no doubt will continue to do so over the next ten years. In time, that may be seen as our greatest collective achievement, and our greatest hope for a better future.

"There is no quick fix for waterfront challenges. The Waterfront Trail will continue to evolve and improve over many years to come. Progress on water quality, wildlife habitats, economic renewal, and community development will often seem frustratingly slow and uneven. But we will make progress. We will learn from the successes, and from the failures, of our own and other communities. We will persist in the face of inertia and ineptitude, and innovate in the face of obstacles. We will leave our children a healthier, more attractive waterfront than the one we inherited. So welcome to tomorrow's waterfront, full of bright promise." (David Crombie, *The Waterfront Trail Guidebook*, 1995).

Lake Ontario Waterfront: Update since *"A Decade of Regeneration ..."*

Marlaine Koehler

The author is the Director of the Lake Ontario Waterfront program at the Waterfront Regeneration Trust. She is responsible for the identifying innovative programs, projects and partnerships to complete, enhance and promote the Lake Ontario Waterfront Trail and Greenway. With the Trust's partners, she created the Lake Ontario Waterfront Investment Program, which attracted $23 million of local investment and $9.2 million from the Canada Ontario Infrastructure Program, to the waterfront. She also spearheaded the Collaborative Communications and Promotion Program for the Waterfront Trail, which pools resources to fund promotional and trail initiatives such as the website, signage, research and surveys, and events.

Introduction

In the six years since the publication of *A Decade of Regeneration*, the Waterfront Regeneration Trust has worked with its community partners to maintain the momentum for waterfront regeneration while undergoing a major organizational evolution.

This change has demanded that the Trust clearly focus its role in facilitating the vision and required its partnership of municipalities, conservation authorities and community groups to function collaboratively.

The result has been highly successful and as we approach the 15th Anniversary of the groundbreaking Royal Commission on the Future of the Toronto Waterfront Report, *Regeneration*, there is much to celebrate.

In this paper, I will outline the corporate changes that the Waterfront Regeneration Trust faced and how it continues to play a significant role leading the waterfront partnership.

From 1992 to 1999, the Trust was an agency of the Ontario's provincial government with a stable annual operating budget, a staff of 20 and a roster of about 20 excellent consultant experts and secondments. The agency began implementing the recommendations issued in *Regeneration*, chief among them the creation of a waterfront trail. As described in Suzanne Barrett's article, the Trail was part of the comprehensive Lake Ontario Greenway Strategy that addressed all aspects of waterfront regeneration including soil remediation, shoreline management, natural and cultural heritage. In 1998, a newly elected provincial government conducted a review of all provincial agencies, boards and commissions and concluded that while the Trust's work was important, it should find new sources of private funding and should cease to exist as a provincial agency.

In the next year, the Trust would be engaged in an extensive process around winding up the provincial agency and starting up the newly conceived registered charity with the same name and same mandate; i.e. to regenerate the Lake Ontario waterfront by completing, enhancing and promoting the Waterfront Trail, and to facilitate community regeneration projects.

The Trust launched an ambitious program in its inaugural year as a registered charity – it published *A Decade of Regeneration* and confirmed through research and community consultation the local partners' desire to see a strong new organization emerge from the agency – one that would continue to articulate the values of regeneration, attract new partners and coordinate efforts to achieve our common vision for the waterfront.

The new charity inherited a tremendous legacy of credibility, goodwill and ideas, but it would require creativity, ingenuity and focus in order to earn a leadership role with the communities. Some of the early tests would involve maintaining capital investment on the waterfront; creating a consistent identity for the Waterfront Trail; and promoting the Trail to the public.

Keeping investment on the Waterfront

The Trust's first innovation as a charity was a joint-application to the Canada-Ontario Infrastructure Program (COIP) to invest in the Lake Ontario Waterfront Trail and Greenway. COIP is a federal and provincial funding program aimed at investing in sport, tourism recreation infrastructure. The Trust's application, titled "Lake Ontario Waterfront Investment Program," detailed an exciting three-year plan to construct 50 projects along the Waterfront Trail involving 28 principal funding partners who together would invest over $22 million on the waterfront. Each partner (almost entirely from local or regional government) represented a network of community partners that were raising funds or volunteering expertise to the local projects.

Given the provincial scale of the project, the Lake Ontario Waterfront Investment Program was submitted under the provincial stream of the COIP. It is worth noting that had the Trust not presented the partners with this opportunity, there would not have been any capital investment either locally or from COIP on the waterfront. With the exception of the City of Burlington, no other municipality on the waterfront had submitted a waterfront project in the municipal stream of COIP.

In keeping with the broad definition of "trail and greenway," the Waterfront Trail projects of the COIP program would contribute greatly to the partnership's regeneration goals by creating:

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- 125 km of new trail, and regional and local trail connections
- 6 major waterfront promenades
- 2 bridges
- improvements to over 20 waterfront parks
- 5 new cultural facilities
- interpretation of over 20 waterfront habitats
- 4 major brownfield rehabilitation projects
- 6 significant waterfront habitat restoration projects; and
- 3 harbor/marina upgrades.

It took three years for COIP to finalize its review and negotiate the terms of their contribution to the Trust's application. Throughout the wait, local partners demonstrated their commitment to both the work and the partnership. All partners, even those not part of the application, participated in activities to promote the Trail and the application, such as the high profile end to end tour of the Waterfront Trail that showcased the gains and the potential for the waterfront. The tour became the subject of a six-part, full-page feature in Canada's largest daily newspaper, the Toronto Star. The concerted effort on the part of the partnership elevated the profile of the Lake Ontario Waterfront Investment Program and played a critical role in bringing senior levels of government to the negotiating table.

The COIP application demonstrated to the Trust and its partners that working together through this new partnership could achieve significant results.

Becoming market-focused – Creating a consistent identity for the Lake Ontario Waterfront Trail and Greenway

Where once the Trust and its partners focused exclusively on design and planning concepts, and trail-building, it was becoming clear that more attention was needed in developing a deeper understanding of how to market the Waterfront Trail and Greenway to the public. If successful, the marketing plan would build public support for continued public and private investment on the waterfront. Furthermore, by bringing people back to the waterfront, they would see the potential for regeneration and begin to exercise their influence in shaping policy and planning decisions consistent with regeneration.

Drawing on the talent of local marketing experts, a marketing plan was created that recommended a broad range of activities. This plan informed the Trust's Collaborative Communications and Promotion Program. Under this project, the partnership pooled promotional resources and funding to establish a strong, consistent identity for the Waterfront Trail and to publicize the Trail. The program has resulted in a number of projects, for example Surveys; the website redesign; a series of helpful resources for the public; trail tours to raise media profile; and an extensive signage program for the Trail.

To gain a better understanding of how people view and use the Waterfront Trail, the Trust conducted a *Trail User's Survey* in 2002, which is available in full-text from the www.waterfronttrail.org. The results demonstrated that user support for a continuous trail was overwhelming (95 percent) and that physical fitness and appreciating nature were the top two reasons that people used the Waterfront Trail. In addition, 88 percent of respondents highly rated the Trail's overall design. The Trail is a popular family destination, and receives consistently high ratings for the quality of its views, the environment it runs through, and for its maintenance, cleanliness, and safety.

The survey also confirmed the emergence of the Waterfront Trail as a tourism or holiday attraction. Seventy-seven percent of respondents indicated that they would consider spending part or all of their vacation exploring other areas of the Waterfront Trail. Among the cyclists surveyed, the number jumps to 85 percent. This finding is consistent with a study conducted by Travel Industry Association of America, which reported that 27 million North American travelers have taken a cycling vacation. Cycling has become the third most popular outdoor vacation with North Americans after camping and hiking.

Where there is a strong interest – there is a market. A study commissioned by Velo Quebec documented the impressive economic impact of La Route Verte – a 4,300 km provincial system of cycling routes in the Province of Quebec. In 2000, cycling contributed a total of $95.4 million CAD (US$64.6 million) to the provincial economy. This represented 2,000 jobs (person years) and revenues of $15.1 million for the Government of Québec (US$10.2 million) and $11.9 million (US$8.1 million) for the Government of Canada.

One of the key recommendations from the Marketing Plan was to redesign the Trust's website to better serve trail users. Informed by the User Survey and other studies, the Trust overhauled its website to create a quality resource that now describes the Trail's unique 650 km visitor experience and provides people with the excellent information and tools to plan their own trips. The new site is attractive, easy to use and features over 90 detailed color maps of the Waterfront Trail, along with suggested itineraries and community profiles and hundreds of relevant links. Each profile identifies where to stay, what to see and other valuable tourism resources for visitors. The website also contains the e-library for all of the major publications of the predecessor organizations – the Royal Commission and the Provincial Agency.

Brochures and advertising material that positioned the Trail as an ideal mini-vacation and promoted the website were created and used by our partners to promote the Trail and Greenway in the community, recreation and tourism publication. The advertisements and brochures reinforce the existence and scope of the Trail to the communities who live by it.

One of the Trail's strongest appeals – the sheer length of it from Niagara-on-the-Lake to the Quebec border can also be a barrier to people just learning about it. For many, the notion of an end-to-end trip is daunting and trying to figure out where and how to access the Trail may be too difficult. To respond to this challenge and to encourage active, healthy living, the Trust created the Lake Ontario Waterfront Trail and Greenway Starter's Kit. Launched at the Toronto Bike Show in 2006 with support from the Ontario Ministry of Health Promotion, the Kit is geared to families and focuses on sections of the Waterfront Trail that run on dedicated paths, have lots to see and do and are within a two-hour drive of Toronto. Each kit contains five mini-guides and detailed maps to a variety of trail experiences.

Trail itineraries featured on website and in printed material are based on tours organized by the Trust in collaborating with local partners. The practice began with the end-to-end tour in 2002, when the Trust invited a reporter from Canada's leading daily newspaper to travel the length of the Trail. The media coverage of that tour raised the Trail's profile to a new height and drove website visits to a record high. As a result, the Trust has instituted an annual tour in its work; each year featuring new sections or regional trail loops. The tours have also become a way to expand the partnership into Quebec with Velo Quebec and into the United States with Seaway Trail, which runs along the American shore of Lake Ontario.

A top-priority for the Trust is the installation of clear signage to mark the route and alert users to any gaps in the Trail. By 2007, over 60 trailhead signs will be installed at major access points on the waterfront. Highlighting inter-municipal connections, the signs depict a detail map of the regional route with parking, washrooms, hazards, landmarks and mileage markers. They are a key information resource for users on site and the artwork corresponds to the maps posted on the website.

Directional markers will complement the trailhead signage program and make it possible for someone to start in Niagara and follow the trail to the Quebec border.

Volunteers working with the Trust are performing an audit this spring to identify signage deficiencies. The results and recommendations will be provided to municipal partners to guide their efforts in achieving a fully signed route by 2007.

The Regeneration continues ...

The Waterfront Regeneration Trust is approaching a major milestone in 2007. Over 50 regeneration projects will be complete on the Trail, adding exciting enhancements to the waterfront. The extension of the Trail to the Quebec border will be accomplished, making the Trail a full 650 km from tip to tip along the Canadian Shores of Lake Ontario and the St. Lawrence River. At the Quebec border, a connection has now been developed to that province's 4,300 km system of cycling routes.

Without strong leaders among our partners, coordinating efforts along 650 km of waterfront would be impossible. Organizations such as the Cornwall and Seaway Valley Tourism Association recognize the benefits of connecting to the Trail and are providing valuable coordination at the regional level for our new partners east of the City of Brockville. Volunteer organizations, such as the Eastern Lake Ontario St. Lawrence River Waterfront Working Group and the Regional Niagara Bicycling Committee, have championed the Trail locally and paved the way for the Trail expansion into their communities. Corporations, such as the CIBC and The Trillium Foundation and MapArt, have provided generous funding, expertise and in-kind contributions. This year marks the 10th Anniversary of the Canadian Imperial Bank of Commerce's generous commitment to the Trail. During that time, they will have contributed $1.5 million to the Trust's work on the Trail and Greenway.

There remain 17 gaps in the Waterfront Trail that require the attention of all levels of government. There are reasons why these gaps are the last to be closed – generally speaking they represent major physical and financial challenges. However, they frustrate people's access to the waterfront, their enjoyment of the Trail and, in a few cases, pose safety hazards for people. The Trust will work with communities to develop a strategy to deal with the gaps and implement a plan to leverage federal and provincial investment to close them. The success of the Lake Ontario Waterfront Investment Program provides an excellent model for this work.

To keep the partnership active and inspired, the Trust will have to continue to seek fresh members to bring new perspective to the Trail. Our activities were focused on trail-building. However, we can see a growing need to develop resources aimed at promotions and marketing. At the same time, if the Trail is to live up to its reputation as a showcase of design innovation and excellence, the Trust will need to stay informed of new approaches and concepts and bring these to the partnership. Work on the Trail will continue to be opportunity-driven, but seizing those opportunities demands a strong, active partnership.

Perhaps the greatest success of the Waterfront Regeneration Trust and its successor organization, the Royal Commission on the Future of the Toronto Waterfront, is best measured in the ongoing commitment and enthusiasm of our partners and the community's adoption of and leadership in the implementation of the vision for a regenerated waterfront. The long-term goal is ambitious – a trail set in a greenway as close to the water's edge as is environmentally feasible. At this time, 30 percent of the trail runs on dedicated paths; the remaining 70 percent is routed on attractive residential streets, quiet country roads and scenic highways. The Waterfront Trail and Greenway is a legacy project that will draw inspiration from the community's aspirations for a regenerated waterfront. It is a collective accomplishment of a unique and dedicated partnership inspired by common vision and for a highly valued national natural asset – the Lake Ontario Waterfront.

Together, the Trust and its partners have attracted major public and private investment to making improvements to the waterfront. We have succeeded in building a stronger public awareness of the Trail in the public's mind. Waterfront projects currently underway and recently completed demonstrate the progress we are making toward achieving our vision of clean, green, open, affordable, diverse, usable, attractive, accessible and connected waterfront (fig. 1).

Fig. 1: The Lake Ontario Waterfront Trail and Greenway connects over 40 communities along the Canadian shores of Lake Ontario and the Ontario shores of the St. Lawrence River. From tip to tip it is 650 km long and connects to the Province of Quebec's extensive cycling route, La Route Verte and to the Seaway Trail which runs along the American shores of Lake Ontario.

The following photographs show some of the excellent projects that are regenerating the waterfront. Many are part of the Trust's Lake Ontario Waterfront Investment Program.

Fig. 2: The Waterfront Trail now extends 650 km from Niagara to the Quebec border along the Canadian shores of Lake Ontario and the St. Lawrence River. (*Source:* Ken Forgeron, The Regional Municipality of Niagara).

Fig. 3: Hamilton's new waterfront trail along Hamilton's Harbour. (*Source:* Marlaine Koehler, Waterfront Regeneration Trust).

- **Niagara Region** has added kilometers to its portion of the Waterfront Trail by paving shoulders of roadways. In addition they have completed major sections of the Greater Niagara Circle Route. The first complete regional loop using the Waterfront Trail, it connects Lake Ontario's waterfront to Lake Erie's. Along the way, people will find excellent interpretative panels that describe the region's fascinating shipping heritage. A major new gateway for the Waterfront Trail and Greater Niagara Circle Route is located at Charles Ansell Park. It pays homage to one of the area's local leaders and replaces a derelict, under-used site (fig. 2).
- **City of Hamilton** – For decades the city's waterfront was dominated by the steel industry with only 5 percent of the waterfront accessible to the public. Today the percentage of publicly accessible waterfront has increased to 35 percent with projects such as the one pictured in figure 2 that extended the Trail along Hamilton's Harbour. The beautification of Hamilton's Harbour has also set the stage for new residential development (fig. 3).
- **City of Burlington** – The city has embarked on an ambitious 10-year strategy to create a vibrant and connected downtown and waterfront for residents and visitors. A new interpretative center at the heart of the City's waterfront will be opened in May 2006. Year-round programming and events will ensure Burlington's waterfront becomes a destination offering entertainment, discovery, culture and play (fig. 4).

Fig. 4: Tourism Burlington-Blimpics. (*Source:* Tourism Burlington-Blimpics).

Fig. 5: Port Credit Memorial Mississauga. (*Source:* City of Mississauga).

- **City of Mississauga** – A major revitalization of the historic village of Port Credit is well under way with the City of Mississauga's redevelopment of Memorial Park East. By 2007 the City will have completed a major renovation by reconstructing the Credit River's shoreline protection and adding a water's edge walkway, installing naturalized planting buffers, viewing platforms, fishing areas, themed gardens, a village pavilion, terrace and playground (fig. 5).
- **Oshawa** – Friends of Second Marsh, a community group committed to protecting and restoring the largest remaining wetland in the Greater Toronto Area, is building a state-of-the-art education facility dedicated to great lakes ecosystem (fig. 6).
- **Port Hope** – Built almost entirely by volunteers in the early 1990s Port Hope's section of the Waterfront Trail now pays tribute to early trail leaders. The Keith Richan Walkway Bridge (fig. 7) is named after a leading waterfront advocate and trail champion.
- **Cobourg** – The Town has extended its Waterfront Trail west by remediating old industrial sites to make way for parkland. The changes have sparked beautiful new residential development in the area and breathed life into the heritage town center nearby (figs. 8, 9 and 10).

Fig. 6: Second Marsh, Oshawa. (*Source:* Friends of Second Marsh).

Fig. 7: Keith Richan Walkway, Port Hope – Built almost entirely by volunteers in the early 1990s, Port Hope's section of the Waterfront Trail now pays tribute to early trail leaders. The Keith Richan Walkway bridge is named after a leading waterfront advocate and trail champion. (*Source:* Municipality of Port Hope).

Fig. 8: The waterfront of Cobourg – Walktrail Hibernia.

Fig. 9: Newest extension of the Cobourg Trail, Fullerton, along the natural beach. This section of Trail was created on private land with the support of landowners and connects the western communities to the vibrant Cobourg waterfront. (*Source:* Town of Cobourg).

Fig. 10: Flowers, Cobourg.

Fig. 11: Toronto Music Garden. (*Source:* Marlaine Koehler, Waterfront Regeneration Trust).

● **Toronto** – The Toronto Waterfront Revitalization Corporation, the agency in charge of developing Toronto's downtown waterfront, has announced the winner of an international design competition to create a bold new concept for Toronto's Waterfront. The Waterfront Regeneration Trust participated in the competition as Chair of the Community Stakeholder Committee advising the jury. The winning team was led by Rotterdam's West 8 Urban Design and Landscape Architecture. Their design is defined by two major moves – creating a continuous water's edge public promenade the length of the downtown Waterfront and transforming the major road along the waterfront into an iconic boulevard where the "city kisses the lake." The Toronto Music Garden is an example of a beautiful integration of landscape and culture. It was one of the first major changes to the City's 40-acre Harbourfront Park system (fig. 11).

Organizing political support for the natural city

Preston Manning

The author served as a Member of the Canadian Parliament from 1993 to 2001. He founded two political parties – the Reform Party of Canada and the Canadian Reform Conservative Alliance. He served as Leader of the Opposition from 1997 to 2000 and was also his party's critic for Science and Technology. Since retirement from Parliament in 2001, Mr Manning has become a Senior Fellow of two major Canadian research bodies, the Fraser Institute and the Canada West Foundation. He is also a Distinguished Visitor and lecturer at the University of Calgary and the University of Toronto. In 2002 he released a book entitled Think Big *(published by McClelland & Stewart). He continues to write, speak, and teach on various subjects. The text that follows is an edited and revised version of a paper presented at the international symposion on "The Natural City," Toronto, 23-25 June, 2004, sponsored by the University of Toronto's Division of the Environment, Institute for Environmental Studies, and the World Society for Ekistics.*

Introduction

My background is in Canadian federal politics. My experience has been in taking the tools which democracy gives to us all – freedom of association, freedom of speech, freedom to vote, freedom to influence the votes of others – and using those tools to attempt to change the national agenda, including the agendas of traditional parties, the media, the public, and the federal government.

In the 1990s, my colleagues and I had some success in organizing a new political party based in Western Canada, becoming the Official Opposition in the Canadian Parliament within ten years, changing the national agenda in some important respects, and forcing a realignment of conservative forces on the national stage.

Question to be answered

Suppose that this Natural City conference comes up with an "Agenda for Change" – a list of five concrete policy proposals which, if pursued by senior levels of government, would move us much closer to the natural city of the future.

These proposals could include:

- instituting full-cost pricing of land and services;
- conscientiously greening schoolyards and other public places;
- reclaiming the waterfronts and river fronts of communities built around water;
- establishing watershed/air-shed based regulatory systems;
- redefining the service responsibilities and financial resources of civic administrations in relation to building and maintaining the Natural City, and much more.

How might one generate the level of public support – political support – required to secure adoption of those policies?

Suggestions for action

Because my time is short, I am only going to make two or three suggestions which I hope will be helpful, or will at least provoke discussion.

Suggestion One: Organize an issue campaign

At the federal and provincial levels in this country, the political parties no longer conduct serious issue campaigns, the parties having become strictly marketing machines for fighting election campaigns. But there is still a place for issue campaigns, and if political parties will not conduct them, then somebody else should.

An issue campaign is organized like an election campaign with:

- A beginning and an end (so that you are not asking people to sign up for life, only for a specified amount of time);
- A Campaign Team that includes a Campaign Manager, a Fund Raising Team, a Communications Team, and a strong grassroots component; and,
- Simple but carefully researched messages and mobilization of the means to communicate them (including competent spokespersons, special events, brochures, print and electronic advertisements, door-to-door canvassing, and a good website).

While an issue campaign may be organized like an election campaign, its object is not to get someone elected (although that may follow) but to get some issue – the need to establish environmentally sustainable cities – or some policies that would facilitate that, higher on the political agenda of the country and the politicians, than that issue and those solutions would otherwise be.

In other words, you run your issue campaign so that when the government or the political parties send out their pollsters, they begin to find that two out of three or three out of four people surveyed are responding to questions about their top-of-mind issue by saying:

- Why don't you do something about improving the urban environment? Or,
- Why don't you implement that Natural City Agenda?

It can be done! And if you want a few stories about federal issue campaigns, I wrote them up in a book called *Think Big* (McClelland & Stewart, 2002) – including the Charlottetown Referendum Campaign, the Balance the Federal Budget Campaign, and an Axe Your Tax Bill Campaign – all of which

are instructive. These may not be your favorite issues, but it is the issue campaign techniques that I commend to you as applicable to raising Natural City issues and policies higher on the national agenda in Canada than they are at present.

Suggestion Two: Build principled coalitions to get things done

The author is personally convinced that the most effective way to get things done politically in the 21st century will be to build principled coalitions to pursue particular policy objectives.

The days are gone (if they ever existed) when any one party or interest group can assemble all the right people with all the best ideas all at the right time all under one roof with all the necessary public support to advance a major public policy objective like eco-friendly, sustainable cities.

The alternative is to put together a coalition of individuals and organizations who may not agree on everything or even 50 percent of everything but who can agree on five or six very important positions – the Natural City Agenda for Change, for example – and are willing to work together politically at least for a time to get those five or six things done. Note that I use the term "principled coalitions" as distinct from coalitions of expediency or coalitions built solely on opposition to something or coalitions that rest solely on some temporary coincidence of interests. I believe that the most credible and effective coalitions are those in which the various players share a core set of principles or values from which their policy commitments and collective actions flow. This makes securing agreement in principle one of the first key steps in assembling such coalitions.

The building and management of principled coalitions, of course, is an art and a science. And, sadly, in Canada, our political system at the federal and provincial levels, with its division of legislators into watertight partisan compartments reinforced by rigid party discipline, fails to teach or facilitate – indeed obstructs and discourages – coalition-building activity. There is far more coalition building incentive, capacity, and experience, for example, in the US Congress and the British House of Commons, than there is in the Canadian House of Commons.

In Canada, there is currently much more potential for principled coalition building at the municipal level or among NGOs and interest groups in the civil society sector – particularly if one's purpose is to build a coalition for running an issue campaign to advance a Natural City Agenda for Change.

Suggestion Three: Frame key policy positions in their communicable form

This may seem self-evident but its importance is frequently underestimated, particularly by academics and idealistic interest groups endeavoring to get politicians to adopt new or different policy positions.

More specifically, if the caucuses of federal Members of Parliament, regardless of party, cannot see within about 30 seconds how to effectively communicate the position you are trying to get them to adopt, that position is in deep trouble, regardless of any of its other merits.

It is regrettable, but in this age when politics is increasingly dominated by communications, especially electronic communications, the communicability of a policy position is now more persuasive with most caucuses than its rationality, constitutionality, economic costs and benefits, ethicality, or administrative feasibility.

When we are presenting the highlights of our Natural City Agenda for Change to that political decision maker at Queen's Park or Ottawa, that legislator is most likely sitting there asking, "But if I adopt this position, how will I explain it at the town hall meeting in my riding next Saturday? How will I articulate it effectively to the TV reporter lurking outside this caucus room when she sticks her mike and camera in my face? How will I respond to their questions if I champion this position?"

If our presentation of the Natural City Agenda for Change to politicians fully addresses these questions – by presenting our key policy recommendations in their most communicable form – then our chances for getting a thoughtful hearing and a good reception are immeasurably enhanced.

Building on success in Mississauga, Ontario

Hazel McCallion

Currently in her tenth term as Mayor, Hazel McCallion is the longest serving mayor in the City of Mississauga's history with over 25 years in office. Presently, she sits on many boards, panels and committees. She was also Chair of the Central Ontario Smart Growth Panel, a panel which advised the Provincial Government on how to plan for growth in Central Ontario. She has been honored with numerous awards and distinctions including World Mayor 2004 finalist. The University of Toronto at Mississauga has also named the Hazel McCallion Academic Learning Centre in her honor. In 2005, she was appointed Member of the Order of Canada and was runner-up for World Mayor 2005. In 2006, Mayor McCallion was recognized as the CNW Group Communicator of the Year by the Toronto Chapter of the International Association of Business Communicators (IABC). The text that follows is an edited version of a paper presented by the author at the Natural City conference – "Success Stories" – organized by the Centre for Environment, University of Toronto from 31 May to 2 June, 2006.

Introduction

Communities are an organic entity, constantly changing and evolving. It is important that this change is positive and increases the overall health of the community. In Mississauga (fig. 1) we are working hard to make our city healthy, active and vibrant. To do this takes looking at the issues and challenges from a different perspective and making innovative choices.

The Healthy Cities Stewardship Centre

In 2002, Mississauga, along with public and private partners, established the Healthy Cities Stewardship Centre. While Mississauga is overall a healthy city, there are growing trends such as obesity, poverty, etc., that cause concern for the future well-being of our city. The Healthy Cities Stewardship Centre's unique partnership will help to focus both public and private action to address these concerns and ultimately benefit the entire city.

The City of Mississauga has partnered with the following organizations (in alphabetical order):

- AstraZeneca;
- Credit Valley Hospital;
- Dixie-Bloor Neighbourhood Centre;
- Dufferin-Peel Catholic District School Board;
- Mayor's Youth Advisory Committee;
- Peel District School Board;
- Peel Regional Police;
- Peter Fonseca, MPP Mississauga East and Parliamentary Assistant to the Minister of Health Promotion;
- Region of Peel, Trillium Health Centre;
- United Way of Peel Region; and,
- University of Toronto at Mississauga.

Fig. 1: The city of Mississauga within North America.

The Healthy Mississauga 2010 Plan

These 13 organizations have agreed to work together on local health issues and together have developed the *Healthy Mississauga 2010 Plan.* In developing this plan, the member organizations established a vision: "Mississauga will be a Healthy City of people with optimal physical, mental and spiritual health." Five goals of the 2010 Plan were established as follows:

- All people in Mississauga will value and strive for optimal health;
- All people in Mississauga will feel safe in their communities;
- All people in Mississauga will have equal access to information and services;
- All people in Mississauga will live in and contribute to a clean and sustainable environment;
- All people in Mississauga will feel part of a larger community and will know that they will be cared for in times of need.

All of the work undertaken in the future, no matter how small, is

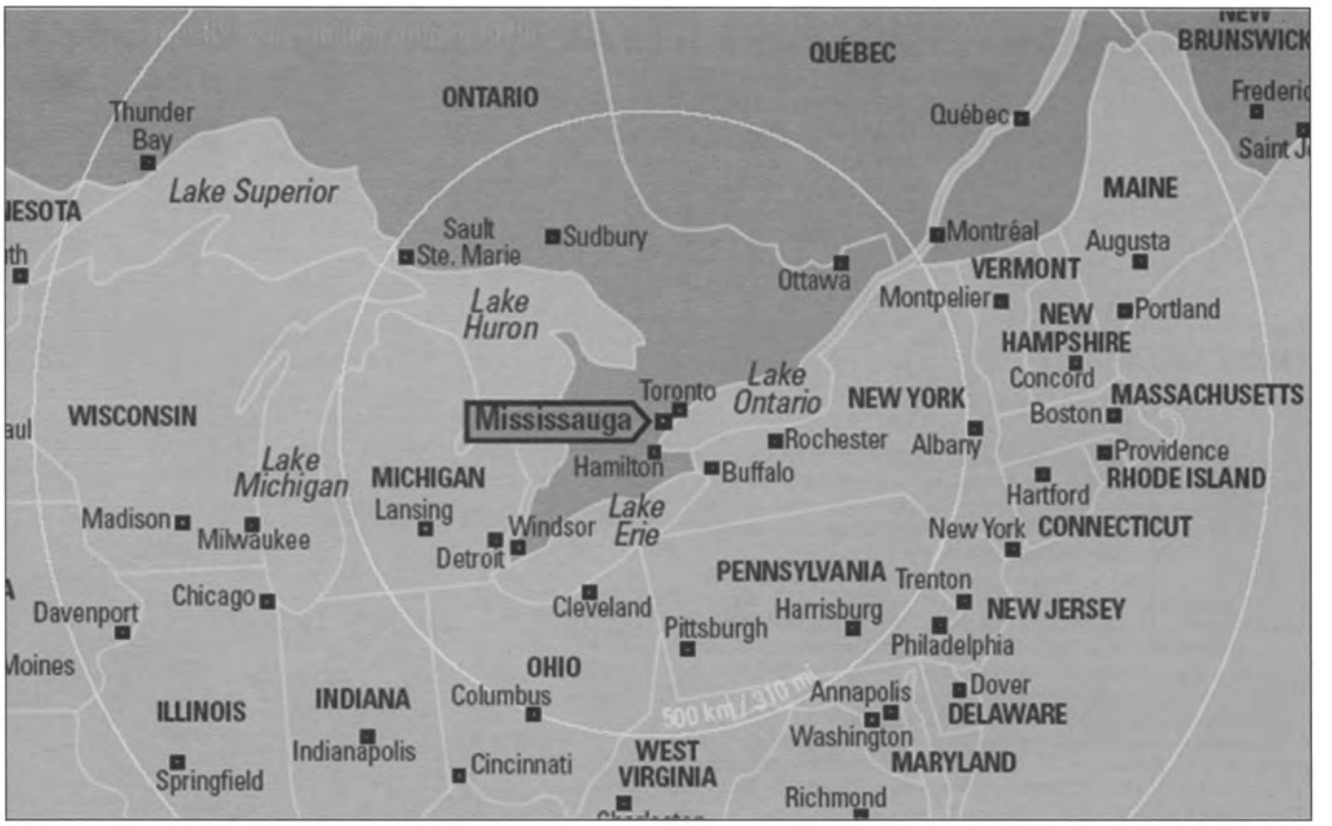


Fig. 2: The city of Mississauga within the Great Lakes Region bordering Canada and America.

important as it supports the collective efforts of the vision. At the operational level, we work hard to keep our great City healthy on a daily basis, particularly in the area of fiscal responsibility. Mississauga is a city with no debt and a Triple A credit rating. We realize that without having our financial house in order, it would be very difficult to accomplish the many other projects that help make our City a great place to live, work and play.

Some of the major issues surrounding healthy communities include maintaining natural areas, and managing urban growth and transportation (figs. 2 and 3).

- **Natural areas:** In total, 6 percent of Mississauga's land consists of natural areas, which are one of the City's greatest treasures. Careful management is needed for these fragile areas, as they affect the quality of life of residents and visitors alike. Through partnerships and community stewardship, these natural areas can be preserved for future generations. Every year we update our Natural Areas Survey, which helps to define and protect our natural areas within the Official Plan.

Each year approximately 2,300 volunteers commit over 7,000 hours in maintaining Mississauga's natural areas. The City facilitates 40-45 community events involving naturalization each year. Annually, over 3,000 trees are planted. We have also begun to partner with private properties to assist them in naturalization. As well, the opening of Riverwood Park in the heart of Mississauga is an excellent example of stewardship and preservation. These initiatives and the important relationships established with companies, communities, service clubs and stewardship groups have allowed Mississauga to protect and enhance our natural environment.

- **Urban growth and development:** While Mississauga is traditionally known as a suburb, it has recently been identified as an Urban Growth Centre in the Province of Ontario's Growth Plan. As a result, we have identified the City Centre as a place of redevelopment and infill. In fact, in the past three years the City Centre has seen the largest share of residential development in the City.

In the next five years, 9,000 apartments, 15,000 jobs, and more than 20,000 residents will call City Centre home. Indeed the City will meet and exceed the provincial targets as an Urban Centre.

In light of this urban growth, we recognize that our downtown needs to be more than buildings. In response to this challenge, we took the time and consulted with residents, community groups and professionals on what could make our downtown area a vibrant one. We called this exercise "Placemaking."

Our inaugural season created out of our Placemaking exercise will be very exciting. Community activities have been incorporated into the fabric of everyday life in our downtown areas. We have moved the Lion's Club Farmers Market closer to the City Centre. We are planning outdoor concerts featuring bands that appeal to today's youth as well as Carassauga Marketplace, which features crafts and foods from the many cultural groups that make up Mississauga. Family activities include storytime, children's entertainment, children's crafts. In our Civic Square we will be hosting live entertainers, the Rotary Club's 4th Annual Ribfest along with sports activities, a concert series and much more. Our goal is to have a vibrant downtown and to grow upon these exciting initiatives. Once again our partners and local communities groups make this all possible. We cannot do it alone.

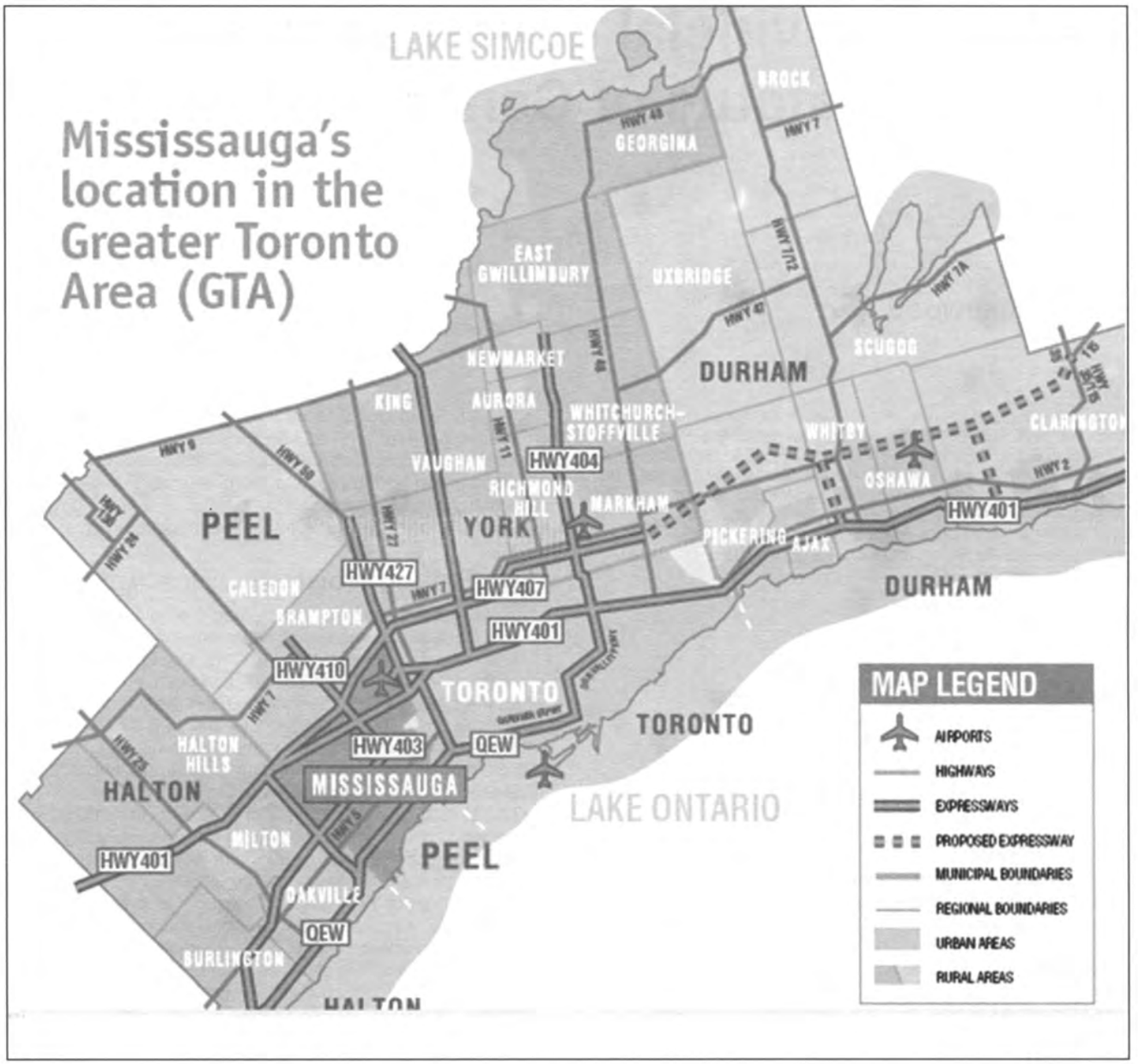


Fig. 3: The city of Mississauga within the Greater Toronto Area.

● **Transportation:** In conjunction with our intensification strategy, we also have to plan transportation throughout the City. We have been working for many years to establish the Bus Rapid Transit (BRT) system in Mississauga; however money and support have been long in coming. In 2006, the Province announced $62.8 million (CDN) in funding for the BRT. Another $2.2 CDN million has been allocated for a feasibility study for the Hurontario Transit Corridor, one of the City's busiest routes, to investigate the potential for higher order transit along this corridor. We still require the federal government to support this initiative with federal funds. Pursuing alternatives such as commuting, increasing transit ridership and active transit options such as bicycling is important in keeping the city moving forward.

Conclusion

The employees of the City of Mississauga work hard for the residents and the results are evident, but a City cannot act on its own; it needs the support of the entire community to make ideas and initiatives possible. Mississauga may be Canada's sixth largest city and home to more than 700,000 residents, yet despite the numbers and dispersion, if we work together we can achieve our goals, as shown by the Healthy City Stewardship Centre, which set out a vision that the City believes in and takes to heart everyday. I am confident that communities across Canada can do the same.

Federal-provincial governance and the future status of Canadian cities

Frank Smallwood

The author is the Nelson A. Rockefeller Professor of Government Emeritus and the past Chair of the Urban Studies Program at Dartmouth College, Hanover, New Hampshire, USA. He received his Masters and Ph.D degrees from Harvard University. In 1968 he worked with Constantinos A. Doxiadis and Panayis Psomopoulos in Athens, and he joined the World Society for Ekistics at that time. His publications include books on metropolitan government, as well as many studies of the Politics of Policy Implementation. He retired to Shelburne, Vermont, USA, in 2002.

Introduction

In 1953 the government of Ontario took an innovative step when it created the first major metropolitan federation in North America to govern the city of Toronto and its 12 surrounding communities.

Ten years later, in 1963, I spent six months in the Toronto area analyzing this new governmental entity. At that time I concluded that the Metro Toronto government had realized a number of major achievements:

- first, it had secured its political base by gaining widespread public support;
- second, it had completed a massive construction agenda including new water supply and sewage disposal systems, major highways and freeways, 175 new school buildings and a 4,800 acre parks system;
- finally, Metro had managed to reduce the cost of much of this construction by amalgamating the credit ratings of its member communities when it borrowed money to finance these projects.[1]

Today Toronto represents a startlingly different place than the one I studied 40 years ago. In 1997, a new Ontario provincial government abolished the earlier Metro in favor of a new Megacity organization. The province took this action despite the fact that 76 percent of the local residents who voted on this action opposed the new plan.[2]

A major argument Ontario's Conservative Party Premier, Mike Harris, had used to justify the new Megacity concept was that hundreds of millions of dollars would be saved by reducing governmental overlap and duplication at the local level. However, when David Miller was elected as Toronto's new mayor in November 2003, he faced an estimated budget deficit that had reached more than 340 million dollars. In order to understand and appreciate the problems facing Toronto, and many other Canadian cities, it is first necessary to review the constitutional status of Canada's local governments.

The British North America Act

The original legislation which created the governmental system of Canada was the British North America Act of 1867. At this time the first four provinces of Canada – Quebec, Ontario, New Brunswick, and Nova Scotia – had been amalgamated to form the Canadian confederation. Over the years additional provinces joined, but it was not until 1982 that the Constitution Act was passed which formally transferred full legal authority from Great Britain to the Canadian government and added a Charter of Rights and Freedoms to Canada's Constitution.[3]

The British North America Act provided for national and provincial levels of government, but it did not specify any direct powers for local levels of government which are totally under the jurisdiction of their respective provinces.

As creatures of the provinces, most of Canada's local governments do not possess any inherent legal authority. There are a limited number of exceptions. Four cities in Canada, for example, enjoy a unique status as "charter cities" which are governed by independent charters. These cities are Saint John, Montreal, Winnipeg, and Vancouver.

In addition, some provincial governments have recently granted their municipalities limited powers. The province of Alberta, for example, passed "natural person" legislation in 1995 which permits its local governments to exercise the powers of a natural person to own property, make contracts, and the like. In 1998, British Columbia took a different approach when it broadened municipal powers to facilitate public-private partnerships and provide more flexible revenue-raising authority.[4]

One of the most restrictive provinces, however, is Ontario which maintains very tight control over its local governments. Basically, the province relies upon "laundry list" legislation which limits the powers municipalities can exercise to only those that are specifically delegated by the provincial government. In addition, Ontario's localities are limited to local property taxes and direct license and user fees for their revenues (plus any grants they may receive).

As urban consultant Joe Barridge has pointed out, the major problem that Toronto and many other Canadian cities face today stems from the fact that modern Canada is an urban nation, but "its governance structures, political culture, and

sense of self still reflect earlier rural and small town traditions. Modern Canadian municipalities are not able to seize the initiative to improve their economic, social, and physical environment in ways increasingly characteristic of other great cities in the world."[5]

Canada's urban population explosion

The argument that Barridge makes is verified by the latest 2001 census figures which reveal that 80 percent of all Canadians now live in urban centers. Between 1996 and 2001, virtually all of the nation's new population growth took place in the four largest urban regions. The population of greater Montreal, plus the extended "Golden Horseshoe" area outside of Toronto, and the Calgary-Edmonton corridor increased by 7.6 percent. By comparison there was virtually no growth (0.5 percent) in the rest of the country.[6]

On the national level the problems facing Canada's cities are truly staggering. The Federation of Canadian Municipalities has estimated that the nation's cities have an "infrastructure backlog of more than $50 billion dollars and counting."[7] While the environmental and ecological dangers of the current deterioration are already alarming, the social services challenge is equally grim.

Since the end of World War II, Canadian cities have hosted increasing numbers of immigrants. In the 2001 census, immigrants made up over 18 percent of Canada's total population. The same census revealed that 48 percent of Canada's newest immigrants and refugees have settled in Toronto, 15 percent in Vancouver, and 12 percent in Montreal. By 2001, the proportion of immigrants of European origin had fallen to 17 percent while the number of immigrants from Asia constituted 63 percent.[8]

The influx of new population has placed heavy pressures on the cities. Unemployment and poverty have constituted a major problem: "Poverty has become more concentrated in urban Canada. Between 1990 and 1995 the poor population in Canada's Census Metropolitan Areas grew by 33.8 percent." As a result, the mayors of Canada's largest cities have declared homelessness a "national disaster," and it is currently estimated that over 30,000 people in Toronto alone rely on shelters for the homeless.[9]

Faced with burgeoning populations and mounting operating and infrastructure deficits, Canada's cities have struggled to meet their needs. Their fiscal distress has resulted from poor revenue growth due to lack of diversity in tax options and cuts in operating grants.

On January 24, 2004, the mayors of nine major Canadian cities met in Toronto to petition the federal government for specific tax relief and new financial assistance. Among their major demands was a 100 percent rebate on the federal GST taxes paid by municipalities and their agencies, an acceleration of a $2 billion federal grant for urban infrastructure expenses, and a new revenue source of 5 cents per liter from the federal fuel tax.[10]

In the February 2 throne speech, Prime Minister Paul Martin indicated the federal government would support the GST rebate proposal, and he called for speeding up the delivery of $2 billion in infrastructure funds. However, since the Federation of Canadian Municipalities estimated that the infrastructure deficit was already $50 billion, this would only provide a small fraction of support in terms of their financial needs, and it would still leave the cities "at the bottom of the governmental food chain."[11]

In addition, during their most recent January summit, the mayors did not emphasize the need to strengthen their legal powers. The omission was strange since this had been an important issue at previous urban summits. In 2001, the Federation of Canadian Municipalities had launched a campaign to give Canada's cities "21st century" powers.

In June 2002, a meeting of Canada's major hub cities in Montreal had called for major changes in the way Canada's largest regions were empowered and financed. In April 2003, the Toronto City Summit Alliance proposed major initiatives to secure the area's social and economic future including enhanced powers.[12] However, these previous efforts had failed to generate widespread support. Hence a key question still remains. What future actions, if any, can Canada's cities take in an effort to change the current situation?

The United States experience

Surprisingly, one of the important models Canadians would be wise to study is that of the United States. The United States Constitution of 1787, like the British North America Act of 1867, does not provide any inherent powers or authority to local units of government. Instead, these units are totally subservient to the American states just as Canada's localities are subservient to their respective provinces. Yet, unlike the case in Canada, many American cities can exercise substantial local powers which the states have granted directly to them or codified in their charter provisions. What explains this significant difference between the American and Canadian experience?

The most direct answer is the application of political pressure during the American reform era which began in the 1870s and still continues today. In order to understand this development, it is important to appreciate the origins of this political pressure.

The key point is that the pressure was not initiated by the general public. Participation in local elections is generally quite low in both Canada and the United States. Voter turn-out in the Toronto election of 1966 was 36 percent, and it only reached 40 percent in the most recent 2003 election. One analyst of Ontario's politics has noted "debates over limited funds does not seem to stimulate strong electoral interest. Overall voter turn-out averages only 30 percent in city elections, versus about 70 percent in provincial elections and an astounding 74 percent in the 1984 federal elections."[13]

In the United States, the situation is even more dismal. Voter turn-out is well below Canada in federal elections, and it is equally weak at the local level.

Since electoral turn-outs have been so minimal in the United States, it is fair to question how America's cities were able to gain significant reforms. The key factor was action by interest group lobbies, and the most important of these groups were the local business interests.

Alarmed by the growing power of the 19th century urban political machines, business groups realized that it was in their own self-interest to launch a variety of reforms that would enable them to regain political control of their cities. The business community realized that such reforms were designed to enhance their own power, but in a clever public relations move the businessmen labeled them "good government" initiatives.

Most of the reforms emphasized an "efficiency and economy" approach to local government. Some of them challenged the power of local ward leaders and city bosses by calling for non-partisan, at-large, city-wide elections. Other reforms focused on increasing professionalism through the use of municipal research bureaus and the eventual rise of the city manager movement. One of the most important items on the reform agenda called for General Act charters which provided more flexible powers to local governments. This led to the development of even more lenient "Home Rule" charters which

permitted cities to propose their own charter amendments. Over time, business leaders developed their economic power to a point where they convinced many of the American state legislatures to amend their own state constitutions to guarantee various Home Rule protections for their cities. As a result, many American cities greatly enhanced their political power.[14]

Forging alliances

There are many important political differences today between Canada and the United States. One of the most significant is the fact that the Canadian provinces are much more powerful than the American states, and there is little indication that most provinces would be willing to give up any of their existing controls over Canada's cities. Despite this fact, there is no reason the cities should abandon any attempts to improve their lot. If Canada's mayors continue to press for future reforms, there are at least three political groups they may want to cultivate.

- The first group is the same one that has played such an influential role in the United States. This is the urban business community. Data compiled by the City of Toronto highlights the major role cities currently play in powering Canada's economy:
  - Toronto accounts for 44 percent of Ontario's GDP;
  - Montreal for 49 percent of Quebec's GDP;
  - Vancouver for 53 percent of British Columbia's GDP;
  - Calgary/Edmonton for 64 percent of Alberta's GDP;
  - Winnipeg for 67 percent of Manitoba's GDP.[15]

  During recent years the Toronto Board of Trade has joined with the Federation of Canadian Municipalities to launch advocacy campaigns to strengthen Canada's cities. All the major metropolitan areas in Canada should join Toronto in enlisting the business sector as potential allies.
- A second major group that can make a strong case for promoting Canada's cities is the media. The major newspapers in all cities are aware of the revenue shortfalls and other political problems their cities face. The *Toronto Star,* as one example, provides excellent coverage and commentary on local affairs. Another promising development is the use of the internet web pages by cities to advocate their cases. Canada's major radio and television stations represent an important part of this group. Canada's cities should make their case known through all media sources – newspapers, journals, television and radio stations, plus the internet.
- A third key constituency which has a major stake in advocating the case for strong, healthy cities consists of Canada's environmental groups. The estimated multi-billion dollar strategic infrastructure deficit represents a potential catastrophe of staggering proportions. Major projects, such as sewer lines and water supply systems, are deteriorating because of lack of funding for maintenance and repairs. Other efforts, such as "Brownsfield" projects designed to revitalize contaminated urban sites, are also being deferred.

Conclusion

Today it is clear that Canada's cities face many major problems. The Canadian Round Table on the Environment and the Economy has pointed out that "the provinces have downloaded responsibilities for urban transit, housing, and welfare onto municipal governments without providing them with new fiscal tools ... Cities have been unable to meet the challenges needed to sustain urban environmental quality."[16] Additional shortfalls have resulted from the fact that the federal government withdrew all of its support for new social housing in 1993. Today Canada's federal government does not support either federal housing or national transit investment programs.

In the long run, Canada may well require a major restructuring of its intergovernmental system to provide more resources and powers to its urban areas. In the interim, the cities should seek to expand their base of support by enlisting more allies. This certainly will not be easy, in large part because of strong resistance from provincial governments which want to retain their existing powers.

Way back in 1971, Prime Minister Pierre Trudeau attempted to create more direct links between the federal government and local municipalities by proposing a Minister of State for Urban Affairs, but this plan was blocked by the provinces.[17] Three decades later, in 2001, MP Judy Sgro from Toronto, chaired a new Prime Minister's Caucus Task Force on Urban Issues which recommended a broad federal urban strategy to include a National Affordable Housing Program, a National Transportation Program, and extension of the Infrastructure Canada Program with a special focus on improving municipal water systems.[18]

In its report, the Sgro Task Force underlined the need for cooperative action. Canada's Urban Strategy should provide "a strategic framework for a collective approach ... an opportunity to establish a foundation for sustainable growth in collaboration with provincial, municipal and community partners."[19] Thus far, however, there has been very little evidence to indicate that provincial authorities will embrace any new federal incursions into their existing areas of jurisdiction.

In his landmark book, *Ekistics*, Constantinos Doxiadis observes "in order to reach our goals we must first define our policies ... From the moment we start speaking about policies instead of theory, we are speaking about the possible and the potential ... Once we become policy-makers, we are limited only to what can really be implemented at that time."[20]

Like many other nations, Canada may be running out of time. Hopefully, not many more years will pass before its leaders at all levels will be able to agree on a nationwide urban policy to confront the problems its cities face.

Notes

1. Frank Smallwood, *Metro Toronto: A Decade Later* (Toronto, Bureau of Municipal Research, 1963).
2. *Canadian News Facts*, vol. 30, no. 23, p. 5417 (Dec. 1996). Vol. 31, no. 14, p. 5532 (July 1997).
3. Will Ferguson, *Canadian History* (Toronto, Wiley, 2000), pp. 234 and 383.
4. City Solicitor, City of Toronto, *Powers of Canadian Cities – The Legal Framework* (October 2001). Saint John, New Brunswick, is the oldest charter city in Canada having been established by Royal Charter in 1785. The other three charter cities were created later by their respective provincial governments.
5. Joe Barridge, *Cities in the New Canada* (Toronto, Ontario, Urban Strategies Inc., undated).
6. Statistics Canada, *A Profile of the Canadian Population: Where We Live*, 2001 Census Analysis Series. F. Leslie Seidle, *The Federal Role in Canada's Cities* (Canadian Policy Research Network, December 2002), p. 3.
7. Royson James, "This time Toronto can't settle too cheaply," *Toronto Star* (November 27, 2003).
8. Seidle, *op. cit.*, p. 7.
9. Leilani Farha and Ruth Goba, *Access Denied: Canada's Housing Crisis,* UN-Habitat, Human Settlements Program, vol. 6, no. 3. (September 2002). Seidle, *ibid.*, p. 8.
10. City of Toronto, "Mayors to Federal and Provincial Governments: Fulfill Commitment to Canada's Cities Now." (Internet: http// wx. toronto.ca.), January 23, 2004.
11. Barridge, *op. cit.*, p. 1.
12. Canada's Cities News, "Unleash Our Potential" (Internet: www.canadascities.ca), January 23, 2004.
13. Wayne Thompson, "Ontario," *Canada 2002* (Harper's Ferry, West Virginia, Striker Post, 2002), p. 84.
14. Frank Smallwood, Government 31, Class Lectures, Dartmouth

College, Hanover, New Hampshire.
15. Canada's Cities, "Building stronger cities." (Internet: www.canadas-cities.ca), February 16, 2004.
16. National Round Table on the Environment and Economy, "Urban sustainability: Environmental quality in Canadian cities." (Internet: www.nrtee.ca), May 30, 2003.
17. William R. Young, *Municipalities, the Constitution and the Canadian Federal System* (Library of Parliament, October 1991).
18. Seidle, *op. cit.*, p. 5. Prime Minister's Task Force on Urban Issues, *Canada's Urban Strategy: Blueprint for Action* (Sgro Report), November, 2002.
19. Sgro Report, *ibid.*, v.
20. Constantinos A. Doxiadis, *Ekistics: An Introduction to the Science of Human Settlements* (New York, Oxford University Press, 1968), p. 417.

Ekistic grid index

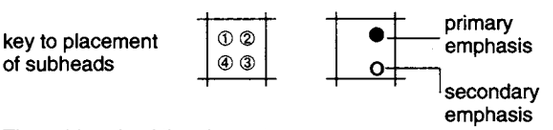
The articles in this issue are coded by the scale of settlements and an aspect of an element indicated in the ekistic grid.

The content of each article is classified within an ekistic grid as follows:

- The scale of the settlement(s) with which the article deals is selected from among the 15 ekistic units:

No.	Name	Population
1	Anthropos	1
2	Room	2
3	House	5
4	House group	40
5	Small neighborhood	250
6	Neighborhood	1,500
7	Small polis	10,000
8	Polis	75,000
9	Small metropolis	500,000
10	Metropolis	4 million
11	Small megalopolis	25 million
12	Megalopolis	150 million
13	Small eperopolis	1,000 million
14	Eperopolis	7,500 million
15	Ecumenopolis	50,000 million

- The subjects dealt with in each article are selected from among the subheads of the five ekistic elements. The position of a dot in any square of the grid indicates which of the four subheads is being referred to. If the article arrives at a synthesis of these elements, either in a physical plan or in ekistic theory, the dot is at the top or bottom of the square.



The subheads of the elements are:

NATURE
1. Environmental Analysis
2. Resources Utilization
3. Land Use, Landscape
4. Recreation Areas

ANTHROPOS
1. Physiological Needs
2. Safety and Security
3. Affection, Belonging, Esteem
4. Self-actualization, Knowledge and Aesthetics

SOCIETY
1. Public Administration, Participation and Law
2. Social Relations, Population Trends, Cultural Patterns
3. Urban Systems and Urban Change
4. Economics

SHELLS
1. Housing
2. Service Facilities
3. Shops, Offices, Factories
4. Cultural and Educational Units

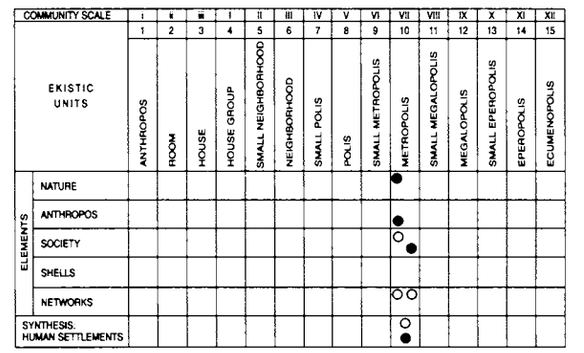
NETWORKS
1. Public Utility Systems
2. Transportation Systems
3. Personal and Mass Communication Systems
4. Computer and Information Technology

SYNTHESIS
1. Physical Planning
2. Ekistic Theory

Each article is described by keywords, which are also used in the *Ekistic Index,* and by abbreviations referring to their illustrative content.

Keyword letter code

D = Diagrams
I = Illustrations
M = Maps
R = References
S = Statistics, Tables, Graphs
X = Simulation, Mathematical Models, etc.



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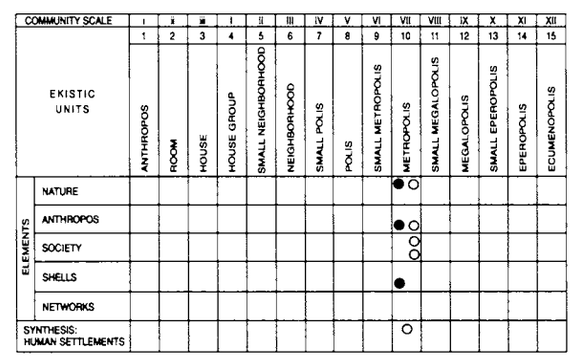
General; Past, Present, Future



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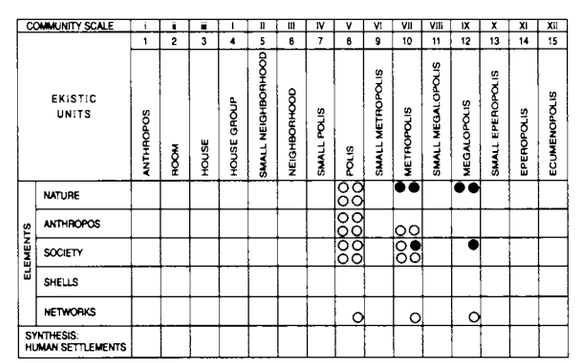

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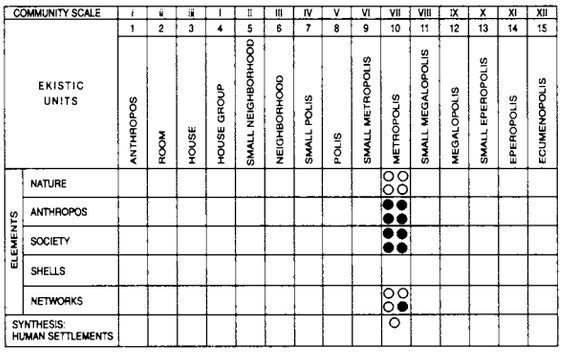

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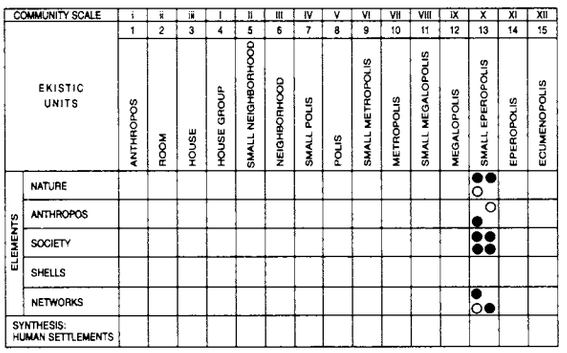

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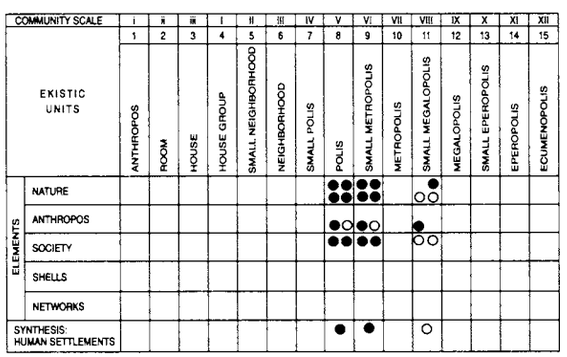

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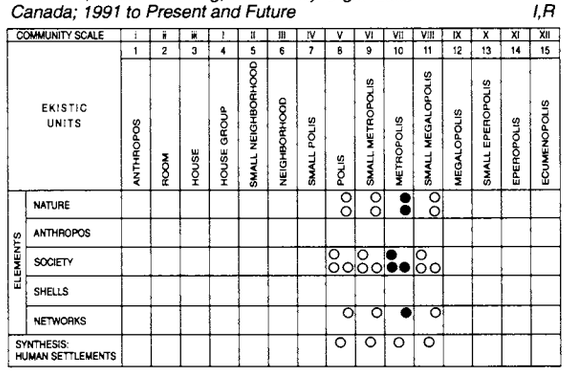

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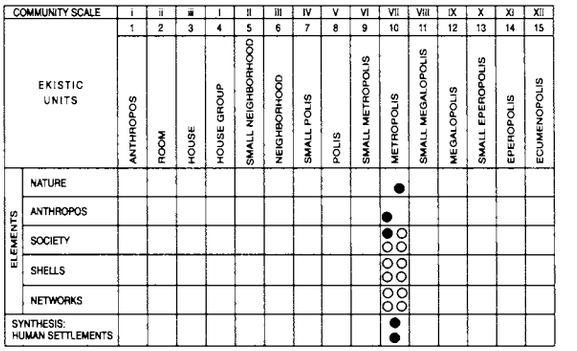

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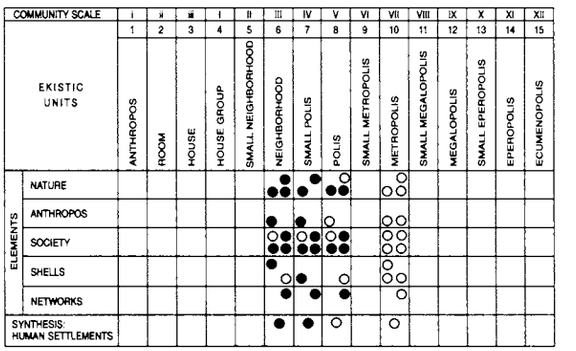

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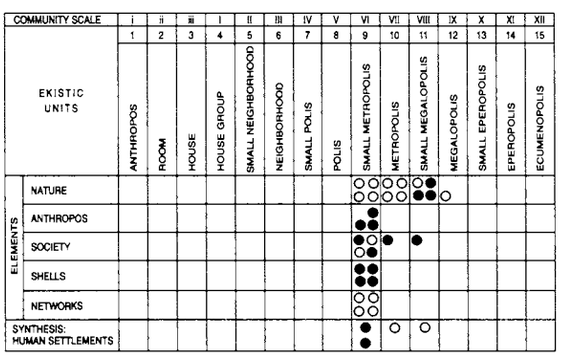

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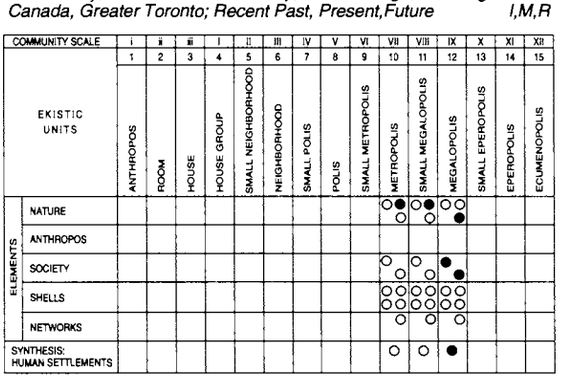

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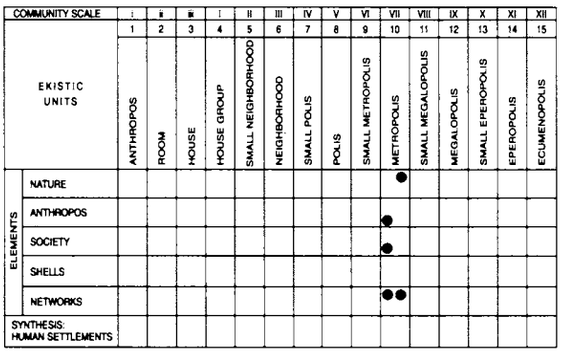

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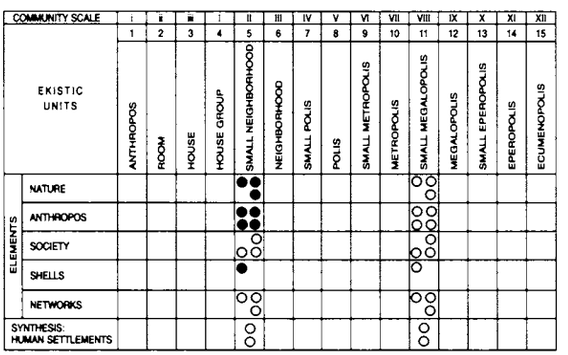

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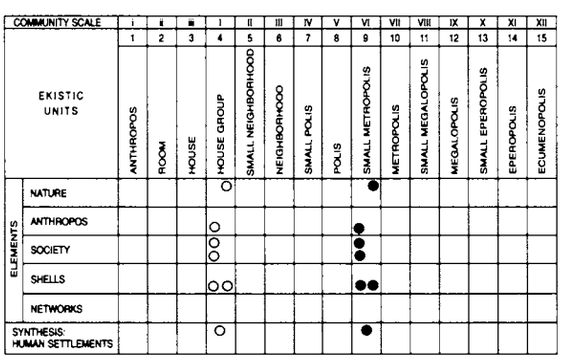

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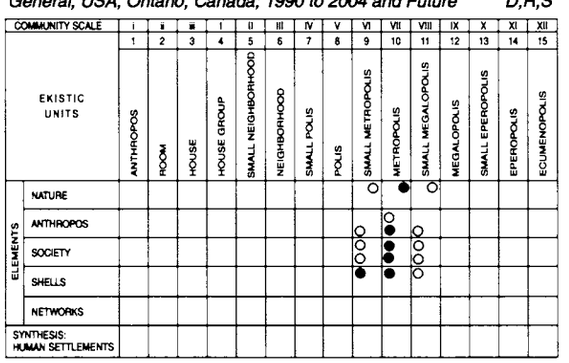

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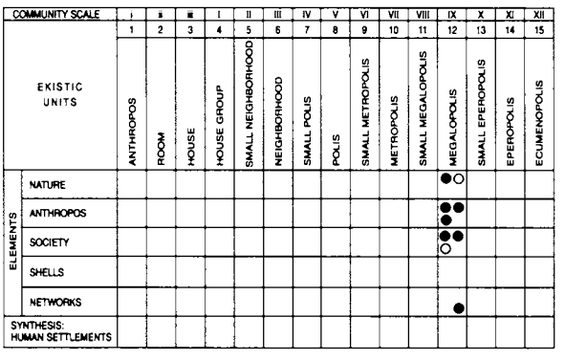

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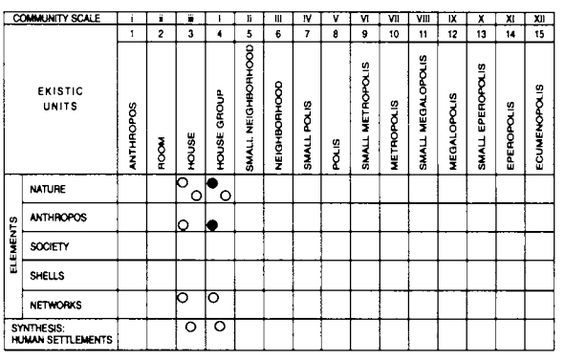

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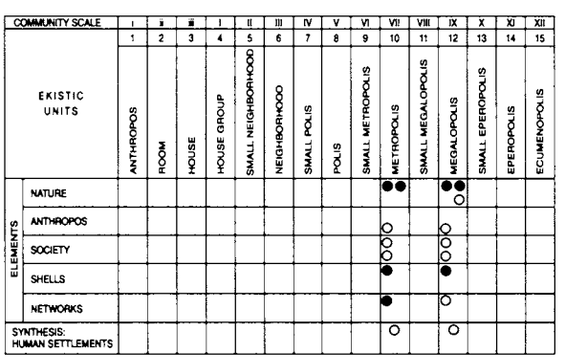

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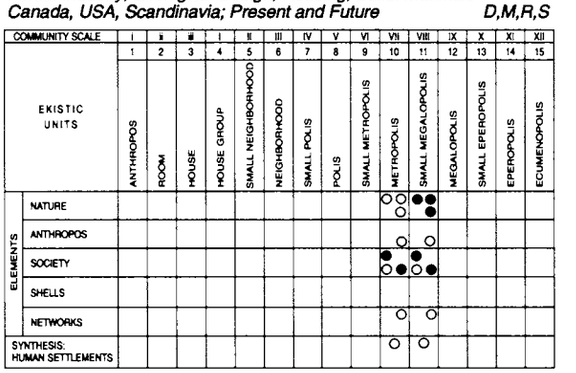

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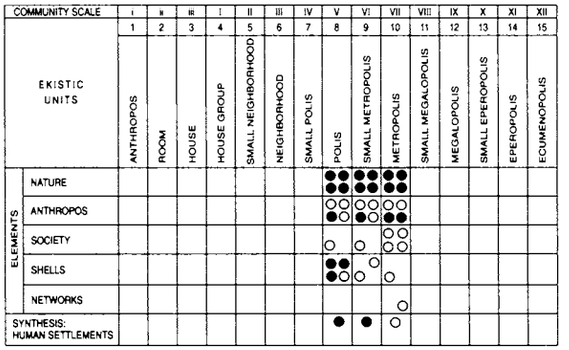

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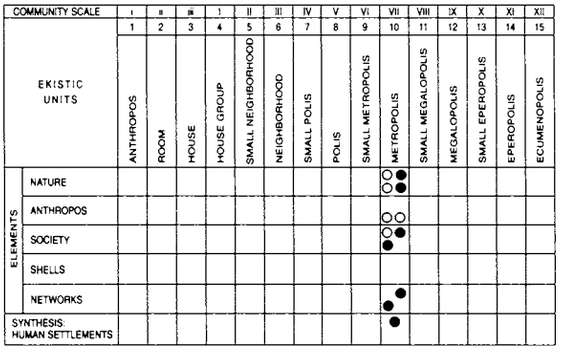

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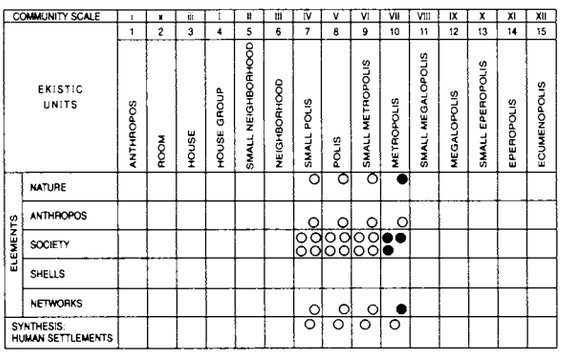

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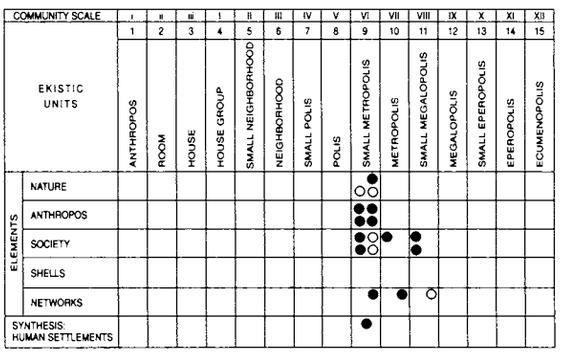

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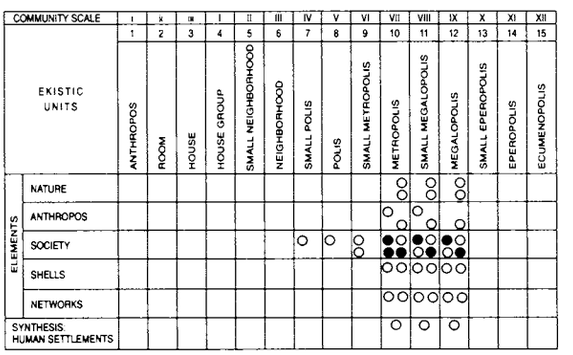

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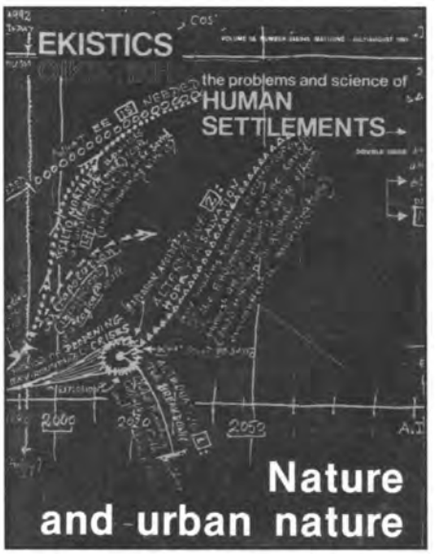

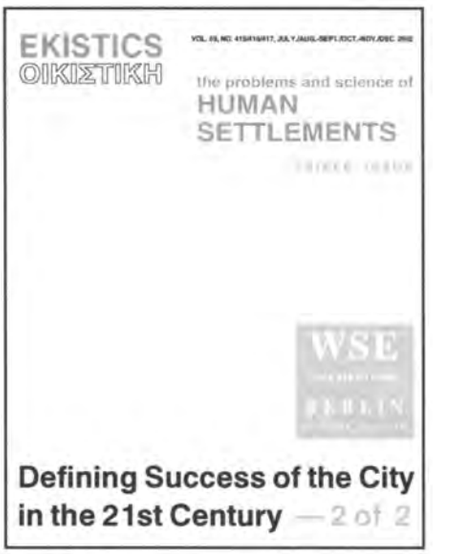

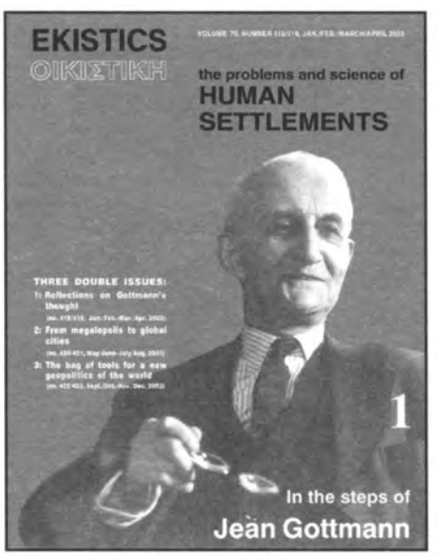

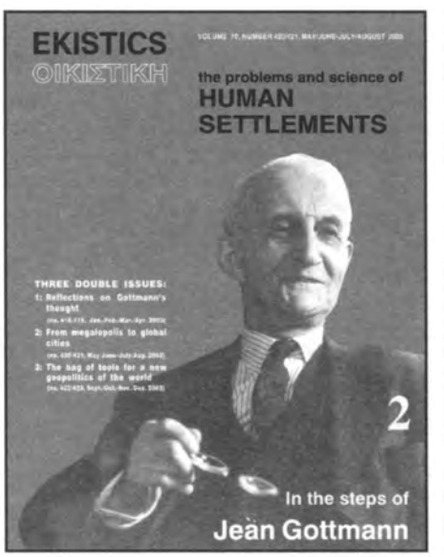

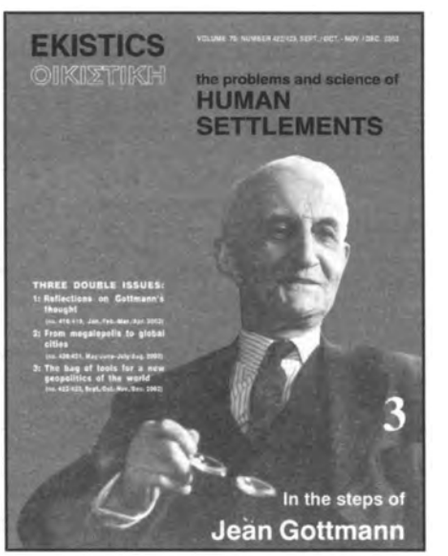

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164 Air pollution in Athens: Similarities of findings with remote sensing methods in 1967 and 1987 *Nicolas I. Sifakis*
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167 Environmental labelling on services: The case of tourism *Andreas Y. Troumbis*
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174 Solar greenhouse: The lure of primitive methodology speaks to a pioneer mentality *James Bischoff*
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179 The bicycle: Vehicle for a small planet *Marcia D. Lowe*
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195 Sustainable development — The urban challenge *Jim MacNeill, John E. Cox and Ian Jackson*
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199 Ecological urban restructuring *Ekhart Hahn and Udo E. Simonis*
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210 Permaculture and the sustainable city *Declan Kennedy*
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216 Sustainable urban development: Strategic considerations for urbanizing nations *Edward Leman and John E. Cox*
Policies and operations through institutional changes with priority on conservation of non-renewable resources, resource substitutes, resource rehabilitation, recycling, control and treatment of waste emissions, management of non-recyclable waste, resource distribution — based on an urban typology of nations.

226 Sustainable development in the Caribbean *John E. Cox and C. (Sid) Embree*
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232 Towards sustainable building: Growing structures in sea water to mitigate global warming *Wolf H. Hilbertz*
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247 "New Ethics" and the environment *John G. Papaioannou*
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Cover: Magnitude of the environmental effort needed — activities, cost, extent, etc. (See John Papaioannou, "'New Ethics' and the environment," p. 247).

The contents of this issue were compiled and edited by P. Psomopoulos. R.J. Rooke provided editorial assistance, Alex Freme-Sklirou proofread the texts, Mary Mavraki was responsible for typesetting, Angela Iliadi Moschona for graphics, Natassa Antoniadou and Eleni Panagiotopoulou for the photography, and Soula Nicolaraki with Zoe Tsiftsi for the final dummy from a maquette by the editor.

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The papers in the three double issues of vol. 70 were solicited, compiled and edited by Calogero Muscarà, guest-editor for this volume. P. Psomopoulos undertook the final editing of the whole in consultation with the guest-editor and the authors. R.J. Rooke provided editorial assistance, Alex Freme-Sklirou proofread the texts, Niki Choleva was responsible for typesetting and graphics, and Despina Moutsatsou for the final dummy from a maquette by the editor.

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6 From the global network of megalopolises to the political partitioning of the world – The guest editor's introductory statement *Calogero Muscarà*

Part 1: Reflections on Gottmann's thought

10 Reflections on Gottmann's thought – Introduction by the guest-editor *Calogero Muscarà*

13 Geographer, historian and classic French regionalist: The evolution of the writings of Jean Gottmann *Robert A. Harper*
"What began as the study of a spatial, regional complex, increasingly turned to concerns even predictions emphasizing social and economic developments."

19 From megalopolis to global city-region? The political-geographical context of urban development *John Agnew*
[Gottmann's] "urban geography was an outgrowth of a political geography that emphasized historical oscillation between closed and open territorial systems."

23 The long road to Megalopolis *Luca Muscarà*
Megalopolis was certainly not a simple reflection of Jean Gottmann's biography, but rather a natural evolution of his theoretical work on political geography.

36 City and culture *Paul Claval*
"The substitution of cultural approaches to morphological and functional ones was mainly achieved from the 1970s. Some authors had, however, understood earlier the interest of combining these different perspectives: it explains the interest of Jean Gottmann's contributions to the study of big modern cities (...)."

42 Geography, geopolitics and history: Considerations and conclusions *Pavlos Tzermias*
In "The intellectual environment in which Gottmann studied ... political science and philosophy were a pervasive part of the atmosphere; the frontiers between geography and history ... were practically non-existent in French universities."

47 Iconography: its historical, theological and philosophical background *Nicolas Prevelakis*
"... the significance of the Iconoography concept for the Social Sciences has to be studied according to the complex issues related to the Icons in the Christian Orthodox tradition."

52 Minorities in the trap of iconography *Christian Lagarde*
"... manifestations of the Imaginary, based often on myths which are variously understood outside, and conserved to a greater or lesser degree inside, the geographical entities to which they apply. Thus the situation lends itself to an analysis in terms of images, which may become icons when they are invested with the intangible values associated with the sacred, and may thus form iconographies."

60 From Gottmann to Gottmann: Testing a geographical theory *Calogero Muscarà*
"... If the use of iconographies has its fullest expression at the level of national States, what happens when an iconography can no longer count on the strength of national States to nurture it?

64 Territory and territoriality in a globalizing world *Ron Johnston*
"... I build on Gottmann's ideas, 30 years after they were presented, to suggest how that fluidity has developed and how different scales have become important in the use of territoriality strategies."

71 The identity of modern Chinese migrants from Hong Kong to Vancouver, Canada *Thomas Fournel*
"... regarding the apparent exile of the Hong Kong elite, it would seem today to correspond more to a reinforcing of a global presence, all the colonies forming that way a Hanse of modern times revolving around this Asian major pole. At the same time, these migrants, approaching the planet from a supra-national way and according to their habits no matter their country of residence, could foreshadow a globalizing and multi-residential trend which will more and more characterize behavior of a fortunate ubiquist elite in a close future."

79 Changing sovereignty and changing borders: vox dei or vox populi? *Jean Laponce*
"... Distance – physical and perceptual – as well as boundaries that protect and divert communication remain major factors in international relations. ... Will the 21st century reverse the process of fragmentation of the world system of states? ... We should thus anticipate that new nations will appear. ... How will these new states be created, how will their boundaries be determined?"

84 Expansion of the frontier and city of freedom *Yasuo Miyakawa*
"... the development of central regions and the evolution of frontier regions in Japan have been closely interrelated with each other as Japan became incorporated into the modern world system ... at five historical stages ... and the changing role of iconography ... in relation with the expansion or contraction of Japan's orbit on the global scene."

101 Jean Gottmann's theoretical writings: The art of reinventing geography *Jean-Paul Hubert*
"... Gottmann re-oriented geography by placing it in the realm of the sciences of organization and structures."

111 The complete bibliography of Jean Gottmann *Luca Muscarà*

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Cover: Jean Gottmann, 1983. (*Source*: Photograph by Hazel Rossetti, Fellow of St. Anne's College, Oxford).

The papers in this double issue – the first of three double issues of vol. 70 on the general subject "In the steps of Jean Gottmann" – were solicited, compiled and edited by Calogero Muscarà, guest-editor for this volume. P. Psomopoulos undertook the final editing of the whole in consultation with the guest-editor and the authors. R.J. Rooke provided editorial assistance, Alex Freme-Sklirou proofread the texts, Niki Choleva was responsible for typesetting and graphics, and Despina Moutsatsou for the final dummy from a maquette by the editor.

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138 From megalopolis to global cities – Introduction by the guest-editor *Calogero Muscarà*

140 An interview with Jean Gottmann on urban geography *Miloš Perović*
"An ancient philosopher said that Megalopolis was the 'city of ideas that determines the material city we really build.' In practice we know that material forms and processes inherited from the past restrict our thinking. This is in interplay between the spirit and the material world with which we have to live, but we can live better with it once we accept the evidence of change and the imperative need to use the power of imagination."

147 Sustainable development in the frontiers of the American Megalopolis *Mami Futagami*
"This study examines the issue of sustainable development in the frontiers of the American Megalopolis through an analysis of the Appalachian region, the first western frontier of the United States, to which the Atlantic Megalopolis expanded its markets and export capital.."

162 Marche region, a "marginal" area in Italy: Participation in and exclusion from the Mediterranean megalopolis *Rita Colantonio Venturelli and Andrea Galli*
Phenomena such as an overall process of growth or urban concentration "can be interpreted as events within a more general urbanization process, although at the same time they may serve as indicators of the specific modalities of the process itself."

170 In the footsteps of Jean Gottmann: From Le Havre to harbors between globalization and the quest for identity *François Gay*
"The case is clear: geographers need to rehabilitate the notion of territory and more precisely the notion of infra-national territory as a counterpoint to globalization. Man wants to be someone but come from somewhere."

180 Iconography and circulation on the Atlantic seaboards: Europe and North America *Michel Phlipponneau*
"How to explain then, that on the European shoreline, the starting point of Megalopolis' founding fathers, a demographic and economic stagnation, a scattering of men and activities and a limited urbanization, contrast with the extraordinary dynamism of the North American shoreline?"

183 Political aspects of planning the Basque coastal megalopolis *Lawrence D. Mann*
"Jean Gottmann's concept of the megalopolis has proved to be very useful in conceptual-level planning for the Basque coastal megalopolis. This is especially clear if a modicum of functional theory is added to the concept, as we have done."

196 City image and major international events: A new tool for urban strategy and planning *Jacqueline Lieutaud*
"... the place of the city is growing more and more in a worldwide life where borders are waning. The image of the city is even becoming a target representative of culture and ideology as a whole ..."

211 The periphery in the center: Some political features of Turkish urbanization *Ruşen Keleş*
"... realities of social and economic structure, including the characteristics and patterns of urbanization, deeply affect political development. ... As a result, social, economic and political factors tend to nourish the growth of extremist or fundamentalist movements in society."

218 Love and hatred: Changing relations between the city governments of Budapest and the national governments *György Enyedi and Krisztina Keresztély*
"Over the past 130 years ... Governments marked by 'openness' policies have always sustained the economic and urban development of Budapest. Governments following 'closedness' policies tend t o bestow privileges on rural and small town areas."

228 Towards a megalopolitan world? *I.B.F. Kormoss*
"The title of the present essay calls to mind its triple raison d'être: a homage paid to the person and to the paramount contribution of the late Professor Jean Gottmann and especially to the study of the North East corridor of the United States of America coined by him as 'Megalopolis' ... [and] The ... two 'megalopolitan' areas ... studied on a comparative approach in my paper 'Vers une Mégalopolis européenne?' Thirty years later it seemed to be appropriate to paraphrase the same issue in a larger context, still keeping the question mark in the title."

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Cover: Jean Gottmann, 1983. (*Source*: Photograph by Hazel Rossetti, Fellow of St. Anne's College, Oxford).

The papers in this double issue – the second of three double issues of vol. 70 on the general subject "In the steps of Jean Gottmann" – were solicited, compiled and edited by Calogero Muscarà, guest-editor for this volume. P. Psomopoulos undertook the final editing of the whole in consultation with the guest-editor and the authors. R.J. Rooke provided editorial assistance, Alex Freme-Sklirou proofread the texts, Niki Choleva was responsible for typesetting and graphics, and Despina Moutsatsou for the final dummy from a maquette by the editor.

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266 The bag of tools for a new geopolitics of the world – Introduction by the guest-editor *Calogero Muscarà*

270 The iconography and circulation of the Atlantic community *Alan K. Henrikson*
"... To look only to the explicit bonds of obligation or the official consultative arrangements between the United States, in particular, and the countries and organizations of Europe as the source of the cohesion that does, at most times, exist between the continents of America and Europe would, surely, be to miss much of the substance of the connection."

295 The relevance of Jean Gottmann in today's world *George Prevelakis*
"The question is if there can be a European iconography strong enough to overcome the influence of national iconographies in times of crisis and economic difficulty."

305 Gottmann and Mediterranean Iconographies *Giuseppe Campione*
"It is not the geography of matter which shapes the true compartmentalization of space. Nowadays in this field problems can be solved technologically and economically. It is in the hearts and minds that true blockages occur."

315 A "quantitative" analysis of the geopolitical situation in Russia *Vladimir Kolossov*
"National iconography is a result of a long historical development of the perception by state leaders, public opinion and the intellectual elite of the place of a country in the world, its geopolitical situation, national interests, and external threats to national security."

321 The Asia-Pacific region and the new world order *Dennis Rumley*
"... with the current global security configuration consequent upon the new internationalist agenda and the spread of nuclear weapons, Western states need to sufficiently recognize Asia-Pacific regional interests and to more effectively accommodate these in new regional and global economic and security structures."

327 "Indian" geopolitics: Unity in diversity or diversity of unity? *Sanjay Chaturvedi*
"... Indian geopolitics is best understood in its historical and discursive context of theorizing and practices."

341 The geopolitical role of China: Crouching tiger, hidden dragon *Fabrizio Eva*
"With the notion of iconography, Jean Gottmann demonstrates that spatial identity, nationalism, and the resistance of places can develop a power comparable to that of material forces."

352 "One Southeast Asia": Emerging iconographies in the making of a region *Elena dell'Agnese*
"... regional labeling is a ... conceptual formation generally presuming some form of correspondence in space between physical landmasses and human cultural features. ... it is also a very adaptable form of geographical representation ... over time."

358 Influence of Jean Gottmann's thought on national development plans in Japan *Jun Yamashita*
The influence of Gottmann's thought on national land plans includes megalopolis in Japan, the importance of the natural environment in a metropolis, decentralization of business functions to sub-centers in metropolitan areas, and so on.

366 Africa and globalization: What perspectives for the future of the continent? *Alessia Turco*
"Jean Gottmann said: '... National politics is built not only upon what exists or doesn't exist inside the border of a country, but upon what is found or not found in other countries whom the former has relationships with ...' In the context, Africa ... is trying to rebuild these relationships on a new basis, in order to get out of its geopolitical and economicisolation and identify its role in the international scene."

373 Latin American countries and their iconographies *Monica Gangas-Geisse and Hernán Santis-Arenas*
"The iconographic expressions of the political societies – the political 'territory' – at least in the case of Latin American countries, clarify the value of the notions of Jean Gottmann."

389 Ekistic grid index

391 The anthropocosmos model

392 Cumulative Index of Contents of EKISTICS, January-December 2003 (Vol. 70)

Cover: Jean Gottmann, 1983. (*Source*: Photograph by Hazel Rossetti, Fellow of St. Anne's College, Oxford).

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*85	December	Reviews on the Problems and Science of Human Settlements — Index, July-December 1962
	1963	
*86	January	Reviews on the Problems and Science of Human Settlements
*87	February	Reviews on the Problems and Science of Human Settlements
*88	March	Reviews on the Problems and Science of Human Settlements
*89	April	Reviews on the Problems and Science of Human Settlements
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*98	January	Reviews on the Problems and Science of Human Settlements
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*108	November	Reviews on the Problems and Science of Human Settlements — New Towns
*109	December	Reviews on the Problems and Science of Human Settlements — Index, July-December 1964
	1965	
*110	January	Order in the field of Ekistics
*111	February	Problems of water
*112	March	The human habitat
113	April	Technological aspects of research
114	May	Metropolitan development counter magnets
115	June	Time for leisure
116	July	The City of the Future
117	August	Research work of the Athens Center of Ekistics
*118	September	Technology and regional development
119	October	The third Delos Symposion
*120	November	Urban design
121	December	Work of the United Nations in housing, building and planning
	1966	
*122	January	Urbanization and metropolitan planning
123	February	International Seminar on Ekistics and the future of human settlements
124	March	Housing and community facilities
*125	April	Transportation in metropolitan areas
*126	May	Economic development: Immediate costs and long-term goals
127	June	Research techniques in Ekistics
*128	July	General research program of the Athens Center of Ekistics
129	August	28th IFHP Congress in Japan on urban transportation and housing
*130	September	Man is the measure
*131	October	Transportation, communications and the preservation of quality — Delos Four
132	November	Man's biological environment
133	December	Metropolitan problems
	1967	
*134	January	Progress from poverty
*135	February	Human settlements: Challenge and response
136	March	The built environment
137	April	Developments outside megalopolis
138	May	Strategy for development
139	June	Systems of urban form
140	July	ACE research
141	August	Rural housing
142	September	Technology and social goals
143	October	Delos: Strategy for settlements
144	November	Anthropocosmos: The world of man
145	December	The Second Athens Ekistics Month
	1968	
*146	January	The transport fit: Needs and facilities
147	February	Housing policies and public acceptance
148	March	Industry: Appropriate scales
149	April	Population dynamics
150	May	Urban systems and urban form
151	June	Anthropics: Man and his settlement
152	July	ACE research
153	August	Techniques of communication
154	September	Cumulative Index 1961-1967
155	October	Athens Ekistics Month: Man and settlements
156	November	The rational use of resources
157	December	Education and environment
	1969	
158	January	Housing by the people for the people
159	February	The transport fit
160	March	Ecosystems: Man and nature
161	April	Patterns of urbanization
162	May	Social actions and human resources
163	June	ACE research
164	July	Computers in the service of ekistics
165	August	Urban systems and urban form
166	September	Home life and leisure in the megalopolis
167	October	Society and human settlements
168	November	Balancing urban development and economic development
169	December	Prospects for human settlements in the seventies
	1970	
*170	January	The transport fit
171	February	Housing an urbanized world
172	March	Recognition of human dignity in the war against poverty
173	April	Ecosystems: Man and nature
174	May	From man's movement to his communications
175	June	City of the Future
176	July	The metropolitan scale
177	August	The human community
178	September	Anthropics: The human environment
179	October	Networks and human settlements
180	November	Balanced urban development vs. economic development
181	December	Cumulative index 1968-1970
	1971	
182	January	Cities of the past
183	February	Housing an urbanizing world
184	March	Travelling by road for pleasure
185	April	Man and nature

186	May	The built environment
187	June	The human community
188	July	The metropolitan scale
189	August	City of the Future
190	September	Anthropics: Technology and the family
191	October	Our buildings (shells) and human settlements
192	November	From theory to policy: Economic development and urban planning
193	December	Education in ekistics

1972

194	January	Inter-town and in-town transportation
195	February	Cities of the past
196	March	Housing and houses: Policies and plans for better living
197	April	Summary of Athens Ekistics Months 1963-1971
198	May	Energy resources, human comfort and the environment
199	June	Research projects of the ACE
200	July	Ekistics 200: A look to the future and a review of the past
201	August	Anthropics: Public participation in decision making
202	September	Latin America
203	October	From knowledge of the past to action for the future
204	November	Urban design: The people's use of urban space
205	December	Planning for urbanization

1973

206	January	Cities of the past
207	February	The city of the future
208	March	Human settlements and the natural environment
209	April	A city for human development
*210	May	Lifetime learning environments
211	June	Networks: Information, communication, transportation
212	July	New towns
213	August	Ethnic communities in an urbanizing world
214	September	Equatorial Africa
215	October	Size and shape in the growth of human communities
216	November	Feedback on housing habitability
217	December	Feedback after the implementation of regional plans

1974

218	January	Judging environmental impacts
219	February	Revitalizing urban centers
220	March	Human health and human settlements
221	April	Population and human settlements
222	May	Using urban simulation models
223	June	Accessibillity in the anthropocosmos
224	July	Housing the poor in developing countries
225	August	Energy sources and uses
226	September	Japan and China
227	October	Housing the poor in human settlements
228	November	Cities of the past
229	December	Report of Delos Eleven and cumulative index 1970-1974

1975

*230	January	**EKISTICS: The Problems and Science of Human Settlements** — Food from one earth
231	February	Combatting urban crime
232	March	City symbols
233	April	Metropolis
234	May	Living cultural values
235	June	Community and home
236	July	Work and leisure
237	August	Employment and economic development
238	September	South and South-East Asia
239	October	Creating more with less
240	November	Providing human services
241	December	Action for human settlements

1976

242	January	Meeting world housing needs
243	February	Canada
244	March	Land development policies
245	April	Health
246	May	Education
*247	June	C.A. Doxiadis 1913-75: Pursuit of an attainable ideal
248	July	Transportation
249	August	Planning for growth
250	September	Futures
251	October	Modes of participation
252	November	Perspectives on Habitat, the UN Conference on Human Settlements
253	December	Historic attitudes towards urban life

1977

254	January	Water for human use
*255	February	Environments for growing up
256	March	Urban design
257	April	Planning for rural areas
*258	May	Living with the desert
259	June	Appropriate technologies
260	July	Learning from disasters
261	August	Meeting world housing needs
262	September	Governing urban environments
263	October	Community development
264	November	Urban systems
265	December	Cities as cultural artifacts

1978

266	January	Comparative planning policies
267	February	Rural development
268	March/April	Social communication: Spatial and technological
269	May	Energy conservation in human settlements
270	June	Housing environments
271	July/Aug.	A present for our past, a future for our present
272	Sept./Oct.	The child
273	Nov./Dec.	People-oriented urban streets

1979

274	Jan./Feb.	Offices and urban growth
275	March/April	Housing choices
276	May/June	Inadequacies of economic analyses
277	July/Aug.	Specialized settlements and urban networks
278	Sept./Oct.	Qualities of place
279	Nov./Dec.	Urbanization and development policies

1980

280	Jan./Feb.	Islamic human settlements
281	March/April	The child in the city
282	May/June	Report on Ecumenopolis, city of tomorrow
283	July/Aug.	Neighborhoods: Their physical and social attributes
284	Sept./Oct.	Regional planning today: Rural equity and project-scale activities
285	Nov./Dec.	Education for regional and urban planning

1981

286	Jan./Feb.	Housing policies, Part 1: Positive aspects of squatter settlements
287	March/April	Housing policies, Part 2: Tenants' reaction to government
288	May/June	The arts and human settlements
289	July/Aug.	Japan's organization of space
290	Sept./Oct.	Planning for the Mediterranean
291	Nov./Dec.	Improving rural life in the Third World

1982

292	Jan./Feb.	Policies to guide urbanization
293	March/April	Coastal management
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295	July/Aug.	Cultural values and historic urban cores
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1983

298	Jan./Feb.	Housing in neighborhoods
299	March/April	Capital cities
300	May/June	Urbanization and social change in the Arab world
301	July/Aug.	Great Expectations: The people, the experts and the governments
302	Sept./Oct.	Communications with and without technology
303	Nov./Dec.	Rural I: The changing rural part of human settlement systems

1984

304	Jan./Feb.	Rural II: Changing the rural part of human

		settlement systems
305	March/April	Transportation and Movement I: Planning and managing infrastructure and vehicles
306	May/June	Transportation and Movement II: Human dimensions and settlement patterns
307	July/Aug.	Home, House and Shelter: Qualities and quantities
308	Sept./Oct.	Natural Hazards and Human Settlements Disasters — I: Problems, prospects and impact assessment
309	Nov./Dec.	Natural Hazards and Human Settlements Disasters — II: Research, planning and management
	1985	
310	Jan./Feb.	Women and space in human settlements
311	March/April	New Developments — I: Theories on planning practice
312	May/June	New Developments — II: Assumptions and assessments
313	July/Aug.	New Developments — III: Politics, policies and the process of planning
314/315	Sept./Oct.-Nov./Dec.	Mary Jaqueline Tyrwhitt: In memoriam
	1986	
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318/319	May/June-July/Aug.	The Mediterranean — III and IV: Response to problems with the local cultural contexts
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	1987	
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	1988	
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331/332	July/Aug.-Sept./Oct.	Stress and urban stress
333	Nov./Dec.	Aesthetics
	1989	
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	1990	
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	1991	
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	1992	
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	1993	
358/359	Jan./Feb.-March/April	Waste
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362/363	Sept./Oct.-Nov./Dec.	Aesthetics and ekistics
	1994	
364/365	Jan./Feb.-March/April	The landscape: Design and planning 2
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368/369	Sept./Oct.-Nov./Dec.	Heritage
	1995	
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	1996	
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	1997	
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	1998	
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	2001	
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Notes

1. Issues are obtainable from EKISTICS, Athens Center of Ekistics, 24 Strat. Syndesmou Street, 10673 Athens, Greece (Telephone: 30 (210) 3623216 and 30 (210) 3623373; Fax: 30 (210) 3629337).
2. Issues as far back as 1959 can be purchased in microfilm by writing directly to:
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Note

ACE : Athens Center of Ekistics
COF : "City of the Future" Research Project
COG : "Capital of Greece" Research Project
HUCO : "Human Community" Research Project

These publications, though in very limited supply, can be obtained from the Athens Center of Ekistics, 24 Strat. Syndesmou Street, 106 73 Athens, Greece. Price in US$ includes mailing cost (surface mail).

EKISTICS (modern Greek: ΟΙΚΙΣΤΙΚΗ) is derived from the ancient Greek adjective *οἰκιστικός,* more particularly from the neuter plural *οἰκιστικά* (as "physics" is derived from *φυσικά,* Aristotle). The ancient Greek adjective *οἰκιστικός* meant: "concerning the foundation of a house, a habitation, a city or a colony; contributing to the settling." It was derived from the noun *οἰκιστής,* meaning "the person who installs settlers in a place." This may be regarded as deriving indirectly from another ancient Greek noun, *οἴκισις,* meaning "building," "housing," "habitation," and especially "establishment of a colony, a settlement or a town" (already in Plato), or "filling it with new settlers": "settling," "being settled." All these words grew from the verb *οἰκίζω,* "to settle," and were ultimately derived from the noun *οἶκος,* "house," "home" or "habitat."

The *Shorter Oxford English Dictionary* contains a reference to an *oecist, oekist* or *oikist,* defining him as: "the founder of an ancient Greek ... colony." The English equivalent of *οἰκιστική* is *ekistics* (a noun). In addition, the adjectives *ekistic* and *ekistical*, the adverb *ekistically,* and the noun *ekistician* are now also in current use. The French equivalent is *ékistique,* the German *ökistik,* the Italian *echistica* (all feminine).