

Ken Ogilvie



**Air, Water and
Soil Quality**

**Issue Paper
No. 2**

n e p t i s
THE ARCHITECTURE
OF URBAN REGIONS

This is the second in a series of nine issue papers commissioned by the Neptis Foundation for consideration by the Central Ontario Smart Growth Panel established by the Government of Ontario.

Ogilvie's paper argues for an approach to air, water, and soil conservation that goes beyond "no net loss" of quality or function to "net gain." That is, changes to the environment should, over time, bring about improvements in the quality and function of air, water, and soil in the Central Ontario Zone. The principle requires monitoring environmental indicators, and the paper suggests 10 potential indicators that could be used. Ogilvie also looks at major trends in air, water, and soil quality, their current and long-term effects, and proposes solutions for each area.

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- 1 Agriculture in the Central Ontario Zone, Margaret Walton
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Research for the series has been coordinated by Dr. Pamela Blais, of Metropole Consultants.

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The opinions and ideas expressed in this report are those of the authors, and do not necessarily reflect those of the Government of Ontario.

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THE ARCHITECTURE
OF URBAN REGIONS

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Introduction

In a 1997 Global State of the Environment Report, the United Nations Environment Programme (UNEP) made the following comments on environmental progress in North America:

Destructive consumer choices are slowing a generation's worth of environmental progress in North America. ... The two countries ... rank among the wealthiest in the world, not only in per capita income but also in richness of natural resources. With its high standard of living, North America is the leading producer and consumer of goods and services — and of waste — on the planet.¹

The UNEP report noted that per capita gasoline consumption in North America is nine times the world average, and the continent produces one-quarter of global carbon dioxide emissions, even though it houses only one-twentieth of the world's population. This was attributed to "the booming desire for a mobile lifestyle, increasingly propelled by heavy and inefficient vehicles, [which] has led to significant increases in total energy use." The report went on to note that Canadians and Americans are among the world's largest per capita consumers of water because prices are relatively low. Canadian households use twice as much water as European households, but pay half as much. The Great Lakes basin, in particular, was highlighted, given that it is home to more than one tenth of the population of the U.S. and one quarter of the population of Canada. The basin contains some of the world's largest concentrations of industrial capacity and accounts for nearly 25 per cent of total Canadian agricultural production.

The Central Ontario Zone contains Canada's largest concentration of population, industrial capacity, agricultural production, and possibly water use per capita. Its wealth is beyond the dreams of most regions of the world and of many parts of Canada. The Government of Ontario, and the people of Ontario, need to understand that our environmental problems are not just regional problems, they are also global problems, and our solutions are not just regional solutions, they are global solutions. We must find remedies that extend beyond the narrow confines of Ontario, or any particular region of Ontario. We have

North America is the leading producer and consumer of goods and services – and of waste – on the planet. Gasoline consumption is nine times the world average, and North Americans are the world's largest per capita consumers of water.

Our environmental problems are not just regional problems, they are global problems, requiring global solutions.

1. United Nations Environment Programme. 1997. Global State of the Environment Report 1997; Chapter 2: Regional Perspectives: North America: Major Environmental Concerns.

an obligation to be responsible global citizens and to contribute to solving problems that extend beyond Ontario and Canada's borders, which should be emphasized in the work of the Central Ontario Zone Smart Growth Panel. This argues for more far-reaching solutions than addressing immediate and even longer-term local and regional problems might sometimes suggest.

There is another compelling reason for adopting a global perspective -- the impact that global environmental problems have, and increasingly will have, on Ontario. To illustrate this, the following table shows some of the projected impacts and health effects in the Toronto-Niagara Region associated with climate change.²

Impacts of Climate Change in the Toronto-Niagara Region

- The number of days exceeding 30°C could double by the 2030s and surpass 50 days by the 2080s. The number of heat-related premature deaths among the elderly could reach 171 to 447 annually during an average summer by the mid-2020s.
- The frequency of extreme weather events is projected to increase, with associated increases in injuries, illnesses, and deaths caused by high winds, tornadoes, blizzards, and ice storms.
- Transmission vectors for West Nile Virus and Lyme Disease are already present. Increased exposure to these and other vector-borne and rodent-borne diseases, such as malaria, dengue fever, and hantavirus, is projected as they spread northward due, in part, to climate change.
- Background ambient levels of ground-level ozone are projected to double under climate change, while the frequency of occurrence of oppressive air masses could increase from 5% of summer days to 23-39% by 2080. This would result in a substantial increase in illness, hospital admissions, and death caused by air pollution, which is currently estimated to cause 1,900 deaths in Ontario and almost \$1 billion in health care costs annually.
- In areas dependent on groundwater, increased exposure to water-borne and food-borne illnesses are expected to occur, such as diseases caused by Giardia, E. coli, and Cryptosporidium, due to changes in the intensity and frequency of excessive rainfall events.
- o The stratospheric ozone layer may not begin to recover until 2020-2050, thus exacerbating the health risks caused by ultraviolet radiation. In Ontario, it is estimated that there will be 370 deaths due to melanoma in 2002.

2. Pollution Probe. 2002. Towards an Adaptation Action Plan: Climate Change and Health in the Toronto-Niagara Region (October 2002).

The Relationship Between Urban Form and Environmental Quality

It is not possible in a short paper such as this to describe in detail all the impacts that different urban forms have on the environment. However, a few examples illustrate some of the problems that arise with urban sprawl. The focus is on air pollution, adverse impacts on water quality and flow regimes, and soil quality related to brownfields in urban areas.

Air Pollution

Dramatic reductions have been made in several air pollutants in Ontario during the past three decades. Unfortunately, one major pollutant of concern, ground-level ozone, has increased steadily in the environment over the past 20 years. Significant human health effects are occurring at current concentrations.

The Ontario Medical Association stated in a June 2001 report that, "This review finds a worrying situation in recent trends in Ontario's air quality. We see:

- Increases in ozone levels
- No change in particulate levels
- A stalling of earlier progress in the reduction of the building blocks of smog: nitrogen oxides (NO_x), sulphur dioxide (SO₂) and volatile organic compounds (VOCs).³"

Nitrogen oxides (NO_x) and volatile organic compounds (VOCs) are the main pollutants that cause the formation of ground-level ozone. Ministry of the Environment data for the Toronto area show that emissions of NO_x from automobiles and heavy duty trucks account for approximately 50% of all local emissions (80% if off-road vehicles are included). Several other air pollutants of concern to human health are also increased by vehicle use related to urban sprawl, including fine particulates, volatile organic compounds, sulphur dioxide, and carbon monoxide, as well as carbon dioxide (which exacerbates the health effects of the other pollutants due to its role in causing global climate change).

The impact of urban sprawl on transportation and related air emissions, such as CO₂, is shown below⁴:

Ground-level ozone, caused by the build-up of nitrogen oxides and volatile organic compounds, has increased steadily in the environment over the past 20 years.

Urban sprawl is a major contributor to poor air quality, because it increases the number of vehicle kilometres travelled per person.

3. Ontario Medical Association. 2001. Ontario's Air: Years of Stagnation (p.3).

4. Asia Pacific Foundation of Canada. 1997. Reducing Urban Air Pollution in APEC Economies: Transportation and the Roles of Local Government. Issues for APEC Series No.4 (August 1997). p.25.

Table 1. Travel and Other Characteristics of Four Concentric Parts of the Toronto Region

	Core	Core ring	Inner suburbs	Outer suburbs
Residential density (urbanized portion, persons/sq. km.)	7,340	5,830	2,810	1,830
% of households owning one or more cars	49%	75%	87%	96%
Travel by car (km/person/day)	7.5	10.2	15.0	25.6
Travel by motorized transport (km/person/day)	11.1	14.2	18.7	27.0
Estimated CO2 emissions resulting from travel (grams/person/day)	1,710	2,280	3,222	5,200

In recent studies, the U.S. Environmental Protection Agency has found that infill development and re-development of older suburbs could reduce vehicle kilometres travelled per capita by 39 to 52 percent (depending on the metropolitan area studied) compared to urban sprawl ⁵. Thus, the relationship between urban form, transportation emissions and air quality is clear, with urban sprawl being a major factor related to air pollution.

Water Quality and Quantity

A recent report by the U.S. Natural Resources Defense Council (NRDC), Smart Growth America and American Rivers, notes that "impervious surfaces significantly change natural patterns of water movement, affecting river flows and the recharge of underground water supplies."⁶ Impervious surfaces are usually developed or compacted surfaces that do not allow water to be absorbed by soils. The U.S. Environmental Protection Agency has found that changes to the hydrology of rivers are second only to the effects of agriculture in the degradation of river systems.

A watershed becomes badly degraded after a mere 10% is covered by the various impervious surfaces (roads, parking lots) that come with development, because of run-off from those surfaces.

The NRDC report contains the following information on what happens to water supplies when natural areas are replaced with roads, parking lots and buildings:

- A one-acre parking lot produces 16 times more run-off than an undeveloped meadow [of the same size].

5. Environmental Protection Agency. 2001. Our Built and Natural Environments: A Technical Review of the Interactions between Land Use, Transportation and Environmental Quality, EPA 231-R-01-002.

6. Natural Resources Defense Council, Smart Growth America, and American Rivers. 2002. Paving Our Way to Water Shortages: How Sprawl Aggravates Drought, p. 7.

- Wide streets and excessive parking around single-family homes in sprawling developments also contribute to run-off.
- Low stream flows are exacerbated by low groundwater levels, which often occur later in the urbanization process. (One study found that groundwater-influenced stream flow fell to 10% of the regional average when the level of imperviousness in the stream watershed reaches 65%.)
- A review of the literature suggests that a watershed becomes badly degraded after a mere 10% is covered by the various impervious surfaces that come with development.
- The rise in vehicle kilometres travelled has been linked to higher polycyclic aromatic hydrocarbon (PAH) levels in some watersheds (due to tire wear, crankcase oil, roadway wear, and car soot and exhaust). In a study of lake soils at ten sites, six exceeded estimates of concentrations that would have adverse impacts on aquatic life.

The NRDC report notes that "low-density, automobile-dependent development is a leading cause of imperviousness. Transportation-related hard surfaces account for 60% of the total imperviousness in suburban areas."⁷ The creation of large areas planted with turf grass is also a problem associated with urban sprawl, since "soils beneath our developed turf areas are often as impervious as roads and parking lots. Development involves wholesale grading of the site, removal of topsoil, severe erosion during construction, compaction by heavy equipment, and filling of depressions. Indeed, some studies have shown that with these practices, the infiltration rate of urban soils actually approaches those of impervious surfaces."⁸ While at the local or neighbourhood scale, denser, more compact development may mean a higher percentage of impervious land, at the urban region scale, aggregate levels of imperviousness will be reduced.

In another NRDC study on "Environmental Characteristics of Smart Growth Neighbourhoods," the benefits of smart growth are explored and the conclusion is reached that, "successful new neighbourhoods can be designed and located to perform more efficiently than conventional suburban developments

Neighbourhoods can be designed to perform more efficiently than conventional suburban developments in terms of land consumption, water use, and energy use related to residents' travel patterns.

7. Ibid., p. 8.

8. Ibid

9. Natural Resources Defense Council. 2002. Environmental Characteristics of Smart Growth Neighbourhoods, executive summary.

on several environmental indicators, including land consumption, water use and pollution, and energy use and air pollution from residents' travel patterns."⁹

Soil Quality

According to a recent report by the National Round Table on the Environment and the Economy, "Brownfields are a legacy of a century of industrialization – they are abandoned, idle or underutilized commercial or industrial properties where past actions have caused known or suspected environmental contamination, but where there is an active potential for redevelopment.

There may be as many as 30,000 such sites in Canada. They include decommissioned refineries, former railway yard, old waterfronts and riverbanks, crumbling warehouses and other commercial properties where toxic substances may have been used or stored. Left idle and unmanaged, brownfields represent a significant loss of economic opportunity. They adversely affect a neighbourhood's image and quality of life, and in some cases pose risks to human health and the environment.

Brownfields also represent an untapped opportunity to revitalize older neighbourhoods and generate wealth for communities. With the right kind of incentives and partnerships, brownfields can have a bright future. Already, several thousand sites have been cleaned up in Canada, creating tens of thousand of jobs, millions of dollars in additional property taxes and thousands of new housing units. With the package of supportive measures outlined in this national strategy, Canada's nascent brownfield redevelopment industry could evolve rapidly into a business worth many billions of dollars a year.

In addition to direct commercial benefits realized by the developers and users of the land, brownfield redevelopment within cities (instead of the development of so-called "greenfield" land on the city's periphery) has the potential to generate up to seven billion dollars a year in public benefits in Canada. These public benefits arrive through the increased economic productivity of the surrounding and, increased tax revenues, lower municipal infrastructure costs, reduced health risks, preservation of agricultural land, less air pollution and improved neighbourhoods.

The case for redeveloping Canada's brownfields is strong. Experience with brownfield redevelopment in Canada, the United States and Europe suggests that, while specific circumstances may vary, significant benefits are consistently seen in the following areas:

Economic benefits:

- creation and retention of employment opportunities
- increased competitiveness for cities
- increased export potential for Canadian cleanup technologies
- increased tax base for all three levels of government

Social benefits:

- improved quality of life in neighbourhoods (people can live closer to work and recreational facilities)
- increased tax base for all three levels of government
- removal of threats to human health and safety
- access to affordable housing

Environmental benefits:

- reduced urban sprawl on Greenfield sites around community
- restoration of environmental quality in the community
- improved air quality and reduced greenhouse gas emissions in urban areas"¹⁰

It is clear that air, water and soil quality, as well as water quantity, are strongly linked to urban form.

Net Gain as an Overarching Principle

The Central Ontario Zone Smart Growth Panel is encouraged to adopt "net gain" as the overarching principle against which future urban form and growth management will be assessed. The basic concept is that growth cannot be "smart" unless it results in a net environmental benefit.

The Great Lakes basin ecosystem is overstressed — our "ecological footprint" in terms of total waste generation of all kinds already exceeds the carrying capacity of the basin, with resulting ecological feedback mechanisms delivering

Growth cannot be "smart" unless it results in a net environmental benefit.

¹⁰ National Round Table on the Environment and the Economy. 2003. *Cleaning up the Past, Building the Future: A National Brownfield Redevelopment Strategy for Canada*. (p. ix-x)

poor air, water, and soil quality.^{11 12} It is only with the net gain principle that we can stop depleting natural capital, such as forests, wildlife, agricultural land, and water, upon which life on this planet depends, and go beyond to undo some of the existing damage.

Furthermore, the Panel should strive to ensure significant net gain, not merely "no net loss." No net loss is an approach that can be applied in limited circumstances, but it exposes subsequent generations (and their expanded populations) to constant deterioration of the natural environment.

The Central Ontario Zone Smart Growth Panel should set an aggressive target of, for example, a 25% net gain (relative to established baselines) in specific environmental indicators, which might be applied at the provincial level for certain indicators and linked to regional/upper-tier municipal plans (and hence required to be implemented in lower-tier municipal plans). Flexibility would thus be allowed for specific developments, but the net gain principle would ensure that environmental quality indicators improve with urban and transportation developments in the Central Ontario Zone.

How Would Net Gain Work?

Net gain should measure total, not per capita, environmental improvements, including improvements to air, water and soil quality. For example, the province's targets for reduced total emissions of nitrogen oxides of 45% by 2010 under the Anti-Smog Action Plan, and reduced total emissions of sulphur dioxide of 50% by 2010 under the Canada-Wide Acid Rain Strategy Post 2000, are both good examples of the net gain principle in action. Both are achievable, even allowing for a growing population and economy. The targets, in and of themselves, do not prescribe the specific solutions; rather, they set the quantities of pollutant reductions that industry and governments must strive to achieve. The Kyoto Protocol is another application of the net gain principle that is under intense debate in Canada and other countries. The same thinking should be applied to a range of environmental indicators for urban development and regional transportation development.

A workable concept of net gain must be fair. It must apply to both public- and

The Smart Growth Panel could set a target of 25% net gain in specific environmental indicators for each new development, to ensure that overall environmental quality not only does not deteriorate further, but actually improves with each new urban or transportation development in Central Ontario.

11. For example, see Commissioner of the Environment and Sustainable Development. 2001. Annual Report of the Commissioner of the Environment and Sustainable Development: Great Lakes and St. Lawrence River Basin; Chapter 1 – A Legacy Worth Protecting: Charting a Sustainable Course in the Great Lakes and St. Lawrence River Basin.

12. Also, see Health Canada. Undated (based on data collected between 1986 and 1992). Great Lakes Health Effects Program: Mortality and Morbidity in the Metro Toronto and Region Area of Concern. Bioregional Health Effects Program Division, Health Canada (p.9).

private-sector developments. It must be transparent — understandably measured or estimated, clearly articulated, and objective. For some developments, net environmental losses in the immediate area may be inevitable, but there are many opportunities for offsetting environmental improvements at local or regional scales (or even at the provincial scale). Proponents of new developments should be required to explore and implement opportunities to offset the environmental impacts of their developments to achieve the net gain target. In essence, Ontario would be continually investing in, not depleting, its natural capital, with ever-improving environmental quality as a result. Natural capital and the health of future generations would be greater, not less, than what exists today.

Indicators of Net Environmental Impact

Provincial net gain targets should be set for a number of environmental indicators, with net gain targets and the use of indicators applied at the regional level. Every upper-tier municipal plan should be required to work with the net gain targets, but should retain flexibility in deciding how the targets will be met.

To implement the net gain principle, indicators will be needed that measure the net environmental impact of new developments. The following discussion identifies potential indicators. There must be some room for trade-offs among indicators, depending on the circumstances of each new development (or re-development). Overall, however, there be no net loss on any indicator, with lower-tier municipal plans held responsible for achieving an overall net gain among the indicators.

A fair and transparent process will need to be put in place to ensure that the environmental budget for each new development is appropriate and that pollution reductions and/or offsets are made. While indicators may not always be as precise as desired, they should convey a strong sense of direction and be quantifiable wherever possible.

A number of possible sources of advice for indicators exist, including:

- National Round Table on the Environment and the Economy;
- Global Reporting Initiative;
- Federation of Canadian Municipalities' Environmental Agenda;
- Canadian Council of Ministers of the Environment;
- Virginia McLaren, University of Toronto;

Opportunities exist for environmental improvements that offset environmental losses caused by new development. These improvements could work at the local, regional, or provincial scale.

The environmental indicators used to measure net gain must be appropriate, quantifiable, and able to convey a strong sense of direction.

- Centre for Sustainable Transportation.

The list of potential environmental indicators could be lengthy. Pollution Probe believes that the following output- and outcome-oriented indicators may be feasible, recognizing that the choice of indicators should be made using an open and transparent public consultation process. Policy choices will inevitably have to be made in the selection and development of indicators relevant to growth management and in the practical application of the indicators by proponents, developers and regulators.

Ten indicators that could potentially be linked to net gain targets and environmental sustainability are noted below:

Ten Potential Indicators for Net Environmental Gain

1. Emissions of nitrogen oxides and volatile organic compounds (which affect air quality and human health through ground-level ozone formation).
2. Emissions of fine particles (which create smog and harm human health).
3. Emissions of sulphur dioxide (which cause smog and acid rain, thus harming human health and natural capital).
4. Emissions of greenhouse gases (which cause global warming and widespread negative effects on human health and natural capital).
5. Total and per capita water consumption (which affects ecosystems and natural capital).
6. Regional percentage of impervious surfaces (which is linked to water quantity and quality).
7. Protection of significant woodlands and significant wildlife habitat (which contributes to increasing natural capital).
8. Brownfield clean-up and re-development (which contributes to urban intensification and to restoring natural capital).
9. Population density per hectare (which contributes to the viability and cost-effectiveness of urban transit and protects natural capital – greenfields – from unnecessary development).
10. Agricultural and natural land preservation (which enhances food security and contributes to maintaining natural capital).

The following sections discuss environmental trends and problems and propose various solutions related to air, water, and soil quality. Special emphasis is given to transportation issues, since transportation is a very large source of, and contributor to, air, water, and soil quality problems, and is highly influenced by

urban form. Each of the solutions discussed is relevant to net gain targets and indicators.

Problems and Solutions: Air Quality

Major Trends

The nature and extent of air pollution in the Central Ontario Zone have changed substantially during the past 30 years. In the late 1960s and early 1970s, levels of sulphur dioxide, particulates, and other critical pollutants were frequently outside acceptable bounds, especially during periods of temperature inversion. Sources contributing to the problem included factories using coal or oil to fire boilers, incinerators at sewage treatment plants, thermal electric generating stations burning coal and oil, and residential and commercial space heating based on fuel oil. Inadequate or non-existent emission controls were typical, with dispersion through high stacks being used to reduce local ground level pollution.

Dramatic reductions in ambient air pollution concentrations occurred in the mid-1970s and later through stricter regulatory controls on emissions (rather than dispersion through stacks), more efficient industrial processes, the reduced importance in the economy of primary industries such as mining and metallurgy, and the increased importance of secondary and service industries. The concentration of several of the most common air pollutants decreased significantly from 1971 to 2000, including sulphur dioxide (82% decrease), nitrogen oxides (49% decrease), and nitrogen dioxide (23% decrease). Consequently, Ontario's ambient air quality criteria for these pollutants are seldom exceeded today.

The most dramatic improvements in air quality occurred between 1970 and 1980. From 1995 to 2000, the trend was slightly reversed in the case of some pollutants (e.g., sulphur dioxide levels have increased to exceed those measured in 1990), while levels of other pollutants remained stable (e.g., nitrogen dioxide) or decreased further (e.g., carbon monoxide by a further 50%).

Health Effects

The Ontario Medical Association has expressed concern about ground-level ozone levels, which have increased steadily in Ontario for the past 20 years and which frequently occur at levels that are of concern for public health, especially for seniors, asthmatic children, and people of all ages who have problems

Levels of air pollution rose in the 1960s because of oil- and coal-fired boilers in factories, sewage incinerators, coal-burning electric generating stations, and oil heating in homes and workplaces. These levels decreased in the 1970s and 1980s because of stricter regulatory controls and more efficient industrial processes. The trend was slightly reversed between 1995 and 2000.

with their respiratory and cardiovascular systems.

Numerous health effects studies have been conducted on air pollutants and, in particular, on smog pollutants (e.g., ground-level ozone and fine particles). These studies are showing adverse health effects at much lower levels than were previously thought to be a problem. As a result, the Canadian Council of Ministers of the Environment has set new standards for ozone and fine particles, and the Ontario Ministry of the Environment has recently revised its air quality index to reflect new knowledge on the health effects of fine particulate matter. While people are still being significantly harmed by today's pollution levels, they are increasingly aware of this alarming fact due to frequent air quality advisories and extensive media coverage, especially during the late spring/early summer smog season.¹³

High levels of ground-level ozone can harm the health of children with asthma, the elderly, and those with respiratory or cardiovascular problems.

Major sources of air pollution today

- NOx emissions are predominantly from transportation sources (64% of total provincial NOx emissions, 1999 data).
- The electricity sector accounts for approximately 17% of NOx emissions, with another 16% coming from industrial sources.
- Provincial emissions of volatile organic compounds (VOCs), another ozone precursor along with NOx, come from four major sources — transportation (30%), residential (15%), general solvent use (23%), and industrial point sources (17%).
- Approximately 70% of Ontario's total sulphur dioxide (SO₂) emissions come from major point source industries, including nickel smelters (Inco and Falconbridge in Sudbury), power generation (Ontario Power Generation's six fossil-fuel generating stations), the iron and steel sector, and petroleum refineries.

It should also be noted that smog and other air pollution levels in Ontario are often much higher than they might otherwise be since the Midwestern States are generators of coal-fired electricity. During periods of widespread ground-level ozone pollution, it is estimated that more than 50% of Ontario's smog can be attributed to transboundary air pollution. Nevertheless, Ontario generates significant amounts of air pollution both for itself and for downstream jurisdictions in Canada and the U.S. To address transboundary air pollution con-

Coal-fired electric generators in the Midwestern states contribute to Ontario's air pollution, but Ontario generates considerable amounts of the air pollution that affect Ontario residents and those in other provinces and states.

¹³ For a more complete description of the harmful effects of smog, see The Smog Primer, Pollution Probe. June 2002. www.pollutionprobe.org/Publications/Air.htm

cerns, in December 2000, the federal government signed the Ozone Annex to the Canada-U.S. Air Quality Agreement, agreeing to smog reduction targets for the electricity sector, transportation and other sectors in southern Ontario.

Solutions

A number of air pollution control initiatives have been identified or are under way at both the federal and provincial levels. Since this report is oriented towards a smart growth strategy for the Central Ontario Zone, only major federal and provincial initiatives are highlighted. The reader is referred to the web sites of Environment Canada and the Ontario Ministry of the Environment to obtain more detailed information.

The Ontario government formally launched an Anti-Smog Action Plan (ASAP) in January 1998. The first progress report was published in August 2000 and a second progress report is soon to be released. The progress reports describe the initiatives taken by governments, industry and other non-governmental organizations to reduce emissions of NO_x, VOCs, SO₂, and particulate matter. ASAP also describes some of the initiatives under way in municipalities, although the municipal information is very sketchy. The progress reports show significant progress towards meeting the NO_x reduction target of 45% by 2010 (from the 1990 emission level), less (but still somewhat significant) progress on achieving the VOCs target (a 45% reduction from the 1990 emission level), and little progress to date in both understanding the sources of and hence reducing the emissions of particulate matter, which has a 10% interim reduction target until better source characterization is available.

Smart growth has not been included to date in the ASAP progress reports. However, smart growth and other measures that can be implemented in the Central Ontario Zone can cause major reductions in air pollution (and greenhouse gas emissions). Examples of such measures include:

- Intensifying urban development by infilling existing built areas, cleaning up and re-developing brownfields, and promoting compact, mixed-use communities, with appropriate green space access, to enable people to meet most of their needs and interests locally.
- Concentrating new developments in transit-oriented nodes, with supportive parking policies and other measures to encourage transit use, bicycling, and walking as modes of transportation.
- Increases in ozone levels

The Ontario government's Anti-Smog Action Plan (ASAP) is designed to reduce emissions of nitrogen oxides, volatile organic compounds, and sulphur dioxide. Progress reports show significant progress towards target levels of these pollutants.

- Modernizing and reinvesting in transit systems that implement the latest user-friendly technologies and information systems, and integrating transit systems into seamless webs in large urban centres, such as the Greater Toronto Area.
- Educating the public on the harmful effects of smog and climate change, the benefits of switching to transit and alternative transportation modes, and the contribution that inefficient vehicles and the overuse of such vehicles make to these problems.

In addition, there are some important supporting measures that are outside the authority of municipal and regional governments, but that are essential to reducing air pollution. Municipalities should be active advocates for the implementation of these measures, including:

- Converting coal-fired electric power stations to cleaner sources of electricity.
- Putting pressure on the federal government to implement a Corporate Average Fuel Economy (CAFE) standard to increase the fuel-efficiency of new vehicles.
- Lobbying the federal and provincial governments for funding to support smart growth and to provide incentives for areas under municipal control, such as a tax-exempt benefit for employer-provided transit passes and an urban gasoline tax to fund urban transit systems and other appropriate investments. The Greater Vancouver Transportation Authority receives 12¢ of the 15¢ provincial fuel tax to fund its work. These funds are sufficient to manage the transportation system, but are not sufficient to expand it. A re-direction of federal fuel tax revenues should also be implemented in major urban centres across Canada.

Some of these initiatives, and many more, were part of the Central Ontario Zone Smart Growth Panel's "Interim Advice on Unlocking Gridlock and Promoting Liveable Communities in Central Ontario." The Panel is to be commended for this excellent report and its progressive recommendations. The report focuses on short-term initiatives, but also identifies some medium- and longer-term actions related to expanding system capacity and integrating land use and transportation planning. Strong stakeholder and public support exist for these recommendations, as evident in the Summary of Consultations for the Five-Year Review of the Provincial Policy Statement. Smart growth wording should be included in any revisions to the Provincial Policy Statement.

Smart growth could contribute to the Anti-Smog Action Plan by promoting compact development and encouraging transit use.

Municipalities should advocate for important supporting measures to reduce air pollution, such as lobbying the federal and provincial governments to encourage transit use by treating employer-provided transit passes as a tax-exempt benefit and allowing municipalities to levy a fuel tax to support transit.

The Interim Advice given by the Panel also touches upon broader transportation issues and needs that must be addressed by, or in cooperation with, other levels of government if the goals of unlocking gridlock and promoting liveable communities are to be achieved. In particular, working with the Ministry of Transportation (MTO) as part of a long-term transportation network for highways and on a goods movement strategy are noted as areas of interest, but are not addressed in detail. The Panel is urged to include these issues as part of the smart growth strategy.

The June 2001 Review Panel report on the Canada Transportation Act (CTA) is an excellent resource for future large-scale transportation thinking, especially with respect to the need to preserve rail corridors and to reform transportation funding and management.¹⁴ It is worth noting that the loss of short-line railways in southern Ontario has already started to foreclose some options for future freight and passenger movement by this generally more energy-efficient mode. U.S. legislation exists to the effect that an existing rail line cannot be fully abandoned. Tracks can be lifted and rights-of-way given on an interim basis (for example, for recreational trails), but rights-of-way must be kept available for future reactivation. Similar legislation should exist for Canada. A large number of Ontario municipalities have called for an Ontario Rail Renewal Task Force. The Central Ontario Smart Growth Strategy Sub-Panel should support this recommendation since it too is integrally linked to smart growth.

The overriding goal of the Smart Growth Strategy should be to create a vision of sustainability for the Central Ontario Zone, engage political leaders in the vision, secure senior government policy and funding commitments to make it happen, build widespread cooperation among key stakeholders and opinion-leaders, then fully involve the public in the implementation of the vision. This means that public engagement initiatives, such as the City of Toronto's campaign 20/20: The Way to Clean Air, and other worthwhile efforts by a multitude of non-governmental organizations, should be fully supported both politically and financially. These initiatives are needed to reinforce the behavioural changes that people will have to make to do their part to improve air quality and reduce greenhouse gas emissions.

In summary, the main barriers to achieving environmental improvement are political leadership, adequate funding arrangements, multi-jurisdictional cooperation, and sustained stakeholder and public engagement. Smart growth principles are well-known and energy-efficient technologies are widely available. It

The loss of short-line railways in southern Ontario has foreclosed some options for future freight and passenger movement. Many municipalities have called for an Ontario Rail Renewal Task Force, a recommendation that is integrally linked to smart growth.

The public must be fully engaged in implementing a smart growth vision for Central Ontario.

14. Report of the Canada Transportation Act Review Panel. June 2001.

is entirely feasible to achieve much lower emissions of air pollutants and greenhouse gases while maintaining our high standard of living.

Problems and Solutions: Water Quality

Drinking Water Quality

The Walkerton Inquiry established a comprehensive set of research papers and stakeholder views on issues related to the safety of Ontario's drinking water. As a result of Walkerton and subsequent events, the Ontario public has a high sensitivity to water-related issues, and several new regulations and policy developments have been implemented. New funding has been committed by the province to municipalities to review the state of drinking water treatment plants throughout Ontario, and source protection studies are under way to ensure that potential problems are identified and addressed. The Ontario Government has also consulted the public on the introduction of a *Safe Drinking Water Act*.

Large municipal drinking water treatment systems in Ontario generally meet all applicable standards and guidelines, whereas smaller systems lack both the technological sophistication and the availability of highly trained personnel. It is these systems where the most immediate threats exist to human health. Larger systems, however, face serious funding problems as water and sewage treatment infrastructure ages and deteriorates. This deterioration was documented in a 1996 report by the National Round Table on the Environment and the Economy titled, *Water and Wastewater Services in Canada*, which noted that:

*Canada's water and wastewater system is under pressure: the infrastructure—water and wastewater treatment facilities, sewers, supply lines ... is severely deteriorating, primarily due to shortages of public funding. If the decline continues, the health of the country's water resources will suffer. At the same time, due to subsidized and below-cost pricing for water and wastewater services, innovative environmental technologies that conserve water resources are failing to find a market.*¹⁵

The National Round Table report noted that the root of the problem is that Canada has the lowest consumer prices for water and wastewater services in the industrialized world, but next to the highest rate of per capita use. The

As a result of the Walkerton Inquiry, the Ontario public has a high sensitivity to water-related issues.

Although large municipal drinking water treatment systems in Ontario generally meet all applicable standards, smaller systems are less technologically sophisticated and are operated by less highly trained personnel.

15. National Round Table on the Environment and the Economy. 1996. *Water and Wastewater Services in Canada* (A State of the Debate report), p. 3.

National Round Table concluded that Canada's water and wastewater system will have to move toward full-cost, user-pay principles, taking account of all externalities, just to meet basic infrastructure requirements. One benefit of this funding approach would be an increased demand for eco-efficient environmental technologies.

The cost of rehabilitating existing water and sewer infrastructure in the Toronto-Related Region under "Business-As-Usual" conditions will be immense. The total cost of such infrastructure has been estimated at \$33.5 billion over the period to 2031, of which about four-fifths (\$26.9 billion) would be required for system rehabilitation, renewal and upgrading, and the remainder (\$6.6 billion) for growth-related investments. These cost-estimates do take additional urban infill growth into account. Also, in some cases infill growth can be accommodated without placing additional demands on the system, because it occurs on lands that are already serviced and had previous (often industrial) water-using units on them, and/or are in areas where population levels have declined due to falling household sizes.¹⁶

In Pollution Probe's opinion, Ontario is well on its way to addressing the concerns related to ensuring the safety of drinking water, at least at the level of the treatment systems themselves.

The longer-term issue of funding the upgrading of drinking water treatment systems has not yet been resolved. Bill 155, *The Sustainable Water and Sewage Systems Act*, has been proposed to empower municipalities to raise the necessary funding based on user-pay principles. This Bill could be an important part of ensuring the ongoing integrity of drinking water systems. The Bill has recently gone through second reading, and offers the possibility of resolving the funding problem, which as noted by the National Round Table, is a root cause of deterioration of the existing infrastructure.

The Central Ontario Zone Smart Growth Strategy Sub-Panel should highlight the need for adequate funding for drinking water treatment and sewer systems and support the development of full-cost pricing and user-pay principles, at least for large municipalities. Equity adjustments will be needed to allow smaller municipalities to meet their system upgrading and maintenance needs.

Canada has the lowest consumer prices for water and wastewater services in the industrialized world. As a result, there is little money available to renew aging systems and implement innovative environmental technologies.

Passage of the Sustainable Water and Sewage Systems Act has gone for second reading, offering the possibility of resolving the problem of finding ongoing funding for water and wastewater infrastructure.

16. Neptis Foundation. 2002. Toronto-Related Region Futures Study – Draft Interim Report: Implications of Business-As-Usual Development. Prepared for the Neptis Foundation by IBI Group in association with Dillon Consulting Limited (June 2002). p.34.

Groundwater Quality and Availability

Source protection concerns about drinking water supplies tend to focus on groundwater and the lack of information on the quality of this resource in many parts of Ontario, as well as the future threats to groundwater quality. It turns out that there is a considerable amount of groundwater information in the Central Ontario Zone. At the regional scale, assessment of groundwater resources (i.e., available supply) has been mapped and documented.¹⁷ At the watershed level, studies of groundwater availability have been completed for a number of watersheds, such as the Grand, Credit, and Humber rivers, and Duffins, Bowmanville, Soper, and Wilmot creeks. The groundwater resources of the Oak Ridges Moraine have also been documented.

Groundwater susceptibility mapping (i.e., showing current clean sources of groundwater that are susceptible to contamination) has been completed at a regional scale for all of Central Ontario. In addition, more detailed maps have been prepared on a watershed basis for the Oak Ridges Moraine. However, additional mapping will be essential to help plan for the anticipated population and business growth in the Central Ontario Zone.

Surface Water Quality

Although there is a considerable amount of historical surface water quality information available for Ontario, a reduction of data acquisition by the provincial government over the past decade will be a constraint on planning for growth in Central Ontario. For example, from a historical peak of more than 900 stations, the Ministry of the Environment's Water Quality Monitoring Network had declined to less than 250 stations by the year 2000.¹⁸ A number of new stations are scheduled to be added to the network in 2002, but there is still a significant loss of capacity to provide the surface water quality information needed to plan for substantial population and business growth.

Another factor to consider when planning for growth is that the population density may increase, for example, from 31.7 to 37.7 people per acre in the City of Toronto.¹⁹ If so, the effects of this increased density of people will have to

The Ontario Ministry of the Environment used to monitor surface water quality at 900 stations. Today it monitors only 250 stations. This decline in information will hinder planning for population and business growth.

17. See Singer, S.N. and C.K. Cheng. 2001. *A Guide to the Assessment of Groundwater Resources in a Watershed*. Ontario Ministry of the Environment. Toronto, Ontario.

18. Environmental Commissioner of Ontario. 2002. *Annual Report – Developing Sustainability* (September 2002). p.47

19. Neptis Foundation. 2002. *Toronto-Related Region Futures Study – Draft Interim Report: Implications of Business-As-Usual Development*. Prepared for the Neptis Foundation by IBI Group in association with Dillon Consulting Limited (June 2002).

be taken into account in plans for water supply and sewage treatment in Toronto and other areas where infilling and re-development are expected to occur.

Solutions

Watershed-based management principles and practices should underpin the management of population and business growth in the Central Ontario Zone. Both the Walkerton Inquiry and the *Managing the Environment Report*, which has cabinet approval by the Government of Ontario, recommended that a comprehensive approach to managing all aspects of watersheds be adopted by the province. The following "strategic shift" was recommended in the *Managing the Environment Report*. The Central Ontario Zone Smart Growth Panel is urged to support the strategic shift in advising both municipal governments and the province:

A comprehensive approach to managing all aspects of watersheds should be adopted by the province.

Our research indicates a consensus that watersheds are an appropriate basic organizing principle for place-based environmental management. Watersheds are reasonably easy to define and remain relatively fixed over time. Also, non-point source pollution is closely associated with run-off patterns.

Adopting a place-based/watershed approach requires new and different structures and processes as well as significant changes in how governments, the regulated community, NGOs, and the public work together as part of:

- *Establishing ecological boundaries that are flexible in size and scope.*
- *Drawing heavily on local participation and in some cases, local agencies with delegated responsibilities.*
- *Working with local publics and the regulated community to establish goals for each place, in the form of agreed upon public uses/activities for the various resources within its boundaries.*
- *Establishing the maximum amounts (total cumulative load) of pollution from all sources (including point and non-point and naturally occurring) that can be allowed in that area over a specified period consistent with achieving the agreed-upon uses.*
- *Ensuring transparent public access to as comprehensive as possible a range of information and data.²⁰*

20. Executive Resources Group. 2001. *Managing the Environment: A Review of Best Practices*, p. 5.

The Walkerton Inquiry concluded that the best way to achieve a healthy public water supply is to put in place multiple barriers that keep contaminants from reaching people. The main types of barriers include source protection, treatment, a secure distribution system, monitoring programs (including drinking water standards) and pre-planned responses to adverse conditions.²¹

A smart growth strategy requires accurate identification of drinking water sources and should put measures in place to ensure that land uses do not affect source waters.

In addition, the following smart growth measures should be implemented:

- Protect headwater streams and riparian buffer areas.
- Ensure that water supply is considered in all land-use-related planning activities, including transportation, housing and all other types of construction.
- Minimize growth in greenfield areas by promoting infill development, brownfield re-development and transit-oriented development.
- Facilitate development that minimizes regional impervious cover and maximizes regional groundwater recharge and baseflows.
- Handle stormwater through on-site storage and infiltration through permeable native soils and bioengineering techniques that facilitate evaporation and transpiration, instead of conveyance through large structural systems.

The Walkerton Inquiry also made specific reference to the need to regulate the potential impacts of agricultural activities on drinking water sources. With population and industrial growth in the Central Ontario Zone, both point source discharges and non-point source pollution (e.g., bacterial and nutrient run-off from agricultural lands) can be expected to increase. The Summary of Consultations on the Five-Year Review of the Provincial Policy Statement also included the following comment:

Because of its potential environmental impact, especially on water, a number of stakeholders said that intensive agriculture, such as intensive livestock operations, should be treated differently than traditional agricultural uses. A range of suggestions included both defining and providing specific policy direction and detail for "intensive" agriculture, and linking to other

A smart growth strategy requires accurate identification of drinking water sources and should put measures in place to ensure that land uses do not affect source waters.

Agricultural activities need to be regulated to reduce impacts on drinking water sources.

21. O'Connor, The Hon. Justice Dennis R. 2001. Part 2 Report of the Walkerton Inquiry.

*agriculture legislation.*²²

Stronger policy and regulatory mechanisms need to be put in place for agricultural pollution than have been used in the past. Intensive livestock operations in the Central Ontario Zone, and elsewhere in Ontario, should be treated as industrial emissions and should be regulated by the Ministry of the Environment. Non-point sources of pollution, in general, should be fully considered in watershed planning and management as part of a smart growth strategy.

Intensive livestock operations should be treated as industrial emissions and regulated by the Ministry of the Environment.

The Need for Good Data on Water Quality and Quantity

As a final comment on water quality, the Central Ontario Zone Smart Growth Strategy Sub-Panel is reminded that the direct effects of climate change will very likely be experienced within the 30-year study period. The province of Ontario, including the central zone, will have to be prepared for potentially nasty surprises, the nature of which can only be speculated upon given the current level of research on this issue. The following information from recent studies gives an indication of the types of problems that may occur.

The results of climate change could include a shrinking of potable water supplies. Ontario already suffers from freshwater shortages.

A paper published by Natural Resources Canada in July 2002 indicates that the results of climate change could include a shrinking of potable water supplies, and points out that Ontario already suffers from freshwater shortages. The paper also notes that the quality of freshwater may also suffer from more extreme conditions brought on by climate change. For example, lower water levels tend to lead to higher pollution concentrations, whereas high-flow events and flooding increase turbidity and the flushing of contaminants into waterways.²³

A January 2002 discussion paper on groundwater and climate change by an Expert Committee on Freshwater predicted that warmer temperatures will lead to more precipitation falling as rain than snow, and that there will be less snow melt, which may come earlier in the year, and soil moisture levels will drop. As a result, groundwater recharge will decrease, groundwater levels will fall, and many wells will become unusable. As groundwater levels fall, less groundwater will be discharged to streams and wetlands. Stream flows will decrease and water chemistry and temperatures of streams will change. This will affect biological communities and the ability of streams to assimilate wastes, such as

If climate change leads to lower groundwater levels, many wells will become unusable.

22. Government of Ontario. 2002. Five-Year Review of the Provincial Policy Statement, Summary of Consultations, p. 11.

23. Natural Resources Canada. 2002. Climate Change Impacts and Adaptation: A Canadian Perspective — Water Resources.

agricultural run-off.²⁴

The results of these and similar studies suggest that it may not be possible to depend on the continued availability of water quality and quantity that historical monitoring data might suggest. This increases the urgency of ensuring that Ontario's Water Quality Monitoring Network is comprehensive and up-to-date with the newest technologies.²⁵ Clearly, a greater investment, or re-investment, in this network is needed, and the Central Ontario Zone Smart Growth Strategy Sub-Panel is urged to endorse this in its report. Smart growth cannot be managed without good information.

Ontario's Water Quality Monitoring Network should be kept up-to-date with the newest technologies.

Problems and Solutions: Soil Quality

Brownfields

In a 1998 State of the Debate Report, the National Round Table on the Environment and the Economy defined brownfields as follows:

*Brownfield sites are abandoned or under-used properties where past actions have caused real or suspected environmental contamination. Although they are classified as a subset of contaminated sites, these sites exhibit good potential for other uses and usually provide economically viable business opportunities. They are mainly located in established urban areas, where existing municipal services are readily available, or along transportation corridors. They may include, but are not limited to: decommissioned refineries, railway yards, dilapidated warehouses, abandoned gas stations, former dry cleaners, and other commercial properties where toxic substances may have been stored or used.*²⁶

Brownfields are not just an issue for old industrial areas. New brownfields are being created by leaking storage tanks and the use and disposal of domestic, industrial, and agricultural chemicals.

Brownfields are not just an issue for old industrial areas. New contamination is still being created, for example, by leaking petroleum product storage tanks, domestic uses of solvents, paint strippers and other chemicals, and farm disposal of fertilizers, lubricants, and pesticides. Conventional uses of agricultural chemicals such as pesticides, spreading of biosolids such as paper waste, and

24. University of Toronto. 2002. Groundwater: A North American Resource; A Discussion Paper resulting from an Expert Workshop on Freshwater in North America; hosted by the Munk Centre for International Studies, Trinity College, University of Toronto, January 4, 2002.

25. Environmental Commissioner of Ontario. 2002. Annual Report – Developing Sustainability (September 2002). P47-48

26. National Round Table on the Economy and the Environment. 1998. Greening Canada's Brownfield Sites (A State of the Debate Report), p.4.

spray irrigation of domestic or industrial sewage can all exceed Ministry of the Environment criteria. Roads also often have measurable impacts on nearby lands.

Current damaging, but legal, activities, such as soil conditioning and the use of pesticides, may create future brownfields as the detection limits for contaminants improve and evidence of harm increases. As an example, the developing science of endocrine disruptors could force regulatory tolerances for pesticides to be set at unprecedentedly low levels. Future regulatory criteria may also be set for other widely used chemicals that are not currently regulated in soil or groundwater, such as pharmaceuticals, plasticizers, and phthalates (a component of plastic).

Even supposed "greenfields" may contain undiscovered contamination from past or present deposition of air contaminants, from farm activities or from waste disposal. There are many cases in which contaminated fill, chemical agricultural wastes, and industrial wastes have been dumped on or buried in innocuous-looking rural lands.

Solutions

The solutions to brownfields and other contaminated soils problems are complicated. The province has made a start on the brownfields issue with the *Brownfields Statute Law Amendment Act, 2001*. The brownfields legislation may encourage the clean-up and re-development of some abandoned, underused or contaminated lands. To the extent that this happens, it can contribute to improving air quality by allowing for opportunities to develop around existing public transit, rather than development on greenfields that require additional road or transit infrastructure. While encouraging, the new legislation has not addressed key issues around the need for liability protection for developers, in part because such protection may shift the liability for some orphan sites to the provincial government. Moreover, the issue of civil liability, as opposed to regulatory liability, imposes huge constraints on how much certainty any developer or financier of brownfield developments can attain.

The issue of brownfields clean-up and re-development is under ongoing discussion by all levels of government in Canada, and it is likely that there will be new regulatory and incentive initiatives in the next few years. The Central Ontario Zone undoubtedly has a large number of brownfields in this region, and municipalities should therefore be active participants in the policy and regulatory work that is being done in this area. The barriers to achieving environmental improvement at brownfields are well known, as are some of the potential solutions.

Brownfields legislation may encourage the clean-up and re-development of some abandoned, underused or contaminated lands.

Current brownfield legislation has not adequately addressed the need for liability protection for developers.

Conclusions and Recommendations

In planning for future development in the Central Ontario Zone, the Ontario Smart Growth Panel must strive to create a vision of sustainability that extends beyond provincial or national borders. It must engage political leaders in this vision, secure senior government policy and funding commitments to make it happen, build widespread cooperation among key stakeholders and opinion-leaders, and fully involve the public in the implementation of the vision.

Such ambitious objectives require thoughtful planning and decisive actions on the part of all levels of government, as well as the strong support of Ontario's residents. The following is a summary of key recommendations to the Central Ontario Zone Smart Growth Strategy Sub-Panel to help achieve the goal of an effective smart growth strategy:

Net Gain

Net gain is the central concept being promoted in this report. There are many ways to achieve net gain targets and improve environmental sustainability. This report has identified and advocated a number of specific solutions to air, water and soil quality concerns, but it also emphasizes the need for building flexibility into smart growth management and related development processes. There are many valid social and economic goals that must also be achieved by smart growth.

The goal is to achieve environmental sustainability, not to direct or control all of the choices and decisions that governments, developers and private citizens make in pursuit of their various responsibilities and interests. Environmental sustainability can be compatible with a broad range of other goals and interests; however, as a largely un-priced "externality" in planning and decision-making, environmental sustainability must be explicitly added to the goals of a smart growth strategy for the Central Ontario Zone. If not, environmental deterioration will continue to occur.

The following recommendations are made to the Central Ontario Zone Smart Growth Strategy Sub-Panel:

- **"Net gain" should be adopted as an overarching principle to guide future growth management. Net gain should generally be measured in total, rather than per capita, improvements in air, water and soil quality indicators.**
- **The net gain principle should be interpreted to ensure an overall environ-**

Environmental sustainability can be compatible with other goals and interests. However, as a largely un-priced "externality" in planning and decision-making, environmental sustainability must be explicitly added to the goals of a smart growth strategy for Central Ontario.

mental quality improvement within each lower-tier municipal planning area. A target of 25% net gain relative to pre-established baselines is recommended.

- **Indicators should be developed to track the net environmental impact of new developments. To this end, an initial list of 10 potential environmental indicators is proposed in this report.**
- **A fair and transparent process should be developed to ensure that the environmental budget for each upper and lower-tier municipal plan is appropriate and that environmental improvements are implemented and effective in the long term.**

A number of specific solutions are recommended for the Central Ontario Zone Smart Growth Strategy Sub-Panel to consider in its report. Solutions that are reasonably under the control of regional and municipal governments are noted below.

Air Quality Solutions

- **Urban development should be intensified by infilling existing built areas, cleaning up and re-developing brownfields, and promoting compact, mixed-use communities, with appropriate green space access, to enable people to meet most of their needs and interests locally.**
- **New developments should be concentrated in transit-oriented nodes, with supportive parking policies and other measures to encourage transit use, bicycling, and walking as transportation alternatives.**
- **Investments should be made to modernize transit systems that implement the latest user-friendly technologies and information systems, and integrating transit systems into seamless webs in large urban centres, such as the Greater Toronto Area.**
- **The public should be educated on the harmful effects of smog and climate change, the benefits of switching to transit and alternative transportation modes, and the contribution that inefficient vehicles and overuse of such vehicles make to these problems.**

In addition, the Central Ontario Zone Smart Growth Strategy Sub-Panel should advocate the implementation by the province and the federal government of the following measures:

- **Coal-fired electric power stations should be converted to cleaner sources of**

electricity.

- A Corporate Average Fuel Economy (CAFE) standard should be implemented to increase the fuel-efficiency of new vehicles.
- Municipalities should be given the authority to raise funds to support smart growth and should actively encourage the federal government to enhance transit incentives, such as a tax-exempt benefit for employer-provided transit passes and an urban gasoline tax to fund urban transit systems.
- A sustainable transportation network for highways and a long-term goods movement strategy should be developed.
- An Ontario Rail Renewal Task Force should be established to ensure the preservation of Ontario's railway corridors.

Water Quality Solutions

- Headwater streams and riparian buffer areas should be protected.
- The water supply should be considered in all land-use-related planning activities, including transportation, housing and all other types of construction.
- Growth in greenfield areas should be minimized by promoting infill development, brownfield re-development and transit-oriented development.
- Development that minimizes urbanized area and aggregate regional cover and maximizes groundwater recharge and baseflows should be facilitated.
- Stormwater should be handled through on-site storage and infiltration through permeable native soils and bioengineering techniques that facilitate evaporation and transpiration, instead of conveyance through large structural systems.

In addition, the Central Ontario Zone Smart Growth Strategy Sub-Panel should advocate the implementation of the following measures:

- Adequate funding for upgrades and essential maintenance of drinking water and sewage treatment systems should be ensured. In particular, Bill 155, The Sustainable Water and Sewage Systems Act, should be supported in terms of full-cost accounting and user pay/full-cost pricing of drinking water and sewage treatment systems.

- **Ontario's Water Quality Monitoring Network should be expanded and equipped with the newest technologies to provide the surface water quality information required for future population and business growth.**
- **Watershed-based management practices should be implemented as recommended in the Managing the Environment Report.**
- **Stronger policy and regulatory mechanisms should be adopted to address agricultural pollution. Intensive livestock operations should be treated as industrial emissions and should be regulated by the Ministry of the Environment.**

Soil Quality Solutions

- **Municipalities should become active participants in the policy and regulatory work on brownfield clean-up and re-development in the Central Ontario Zone.**

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Selected References

Asia Pacific Foundation of Canada. 1997. Reducing Urban Air Pollution in APEC Economies: Transportation and the Roles of Local Government. Issues for APEC Series No.4 (August 1997).

Central Ontario Zone Smart Growth Panel. 2002. Interim Advice on Unlocking Gridlock and Promoting Liveable Communities in Central Ontario (August 14, 2002).

Commissioner of the Environment and Sustainable Development. 2001. Annual Report of the Commissioner of the Environment and Sustainable Development; Great Lakes and St. Lawrence River Basin; Chapter 1 – A Legacy Worth Protecting: Charting a Sustainable Course in the Great Lakes and St. Lawrence River Basin.

Environmental Commissioner of Ontario. 2002. Annual Report – Developing Sustainability (September 2002).

Environmental Protection Agency. 2001. Our Built and Natural Environments: A Technical Review of the Interactions between Land Use, Transportation and Environmental Quality, EPA 231-R-01-002 (January 2001).

Executive Resources Group. 2001. Managing the Environment: A Review of Best Practices; Executive Summary (January 2001).

Government of Ontario. 1996. Anti-Smog Action Plan (1996 and subsequent progress reports).

Government of Ontario. 2002. Five-Year Review of the Provincial Policy Statement, Summary of Consultations.

Health Canada. Undated (based on data collected between 1986 and 1992). Great Lakes Health Effects Program: Mortality and Morbidity in the Metro Toronto and Region Area of Concern. Bioregional Health Effects Program Division, Health Canada.

IBI Group. 2002. Toronto-Related Future Study: Draft Interim Report: Implications of Business-As-Usual Development (June 2002).

National Round Table on the Economy and the Environment. 1998. Greening Canada's Brownfield Sites (A State of the Debate Report).

National Round Table on the Environment and the Economy. 1996. Water and Wastewater Services in Canada (A State of the Debate report).

Natural Resources Canada. 2002. Climate Change Impacts and Adaptation: A Canadian Perspective — Water Resources.

Natural Resources Defense Council. 2002. Environmental Characteristics of Smart Growth Neighbourhoods.

Natural Resources Defense Council, Smart Growth America and American Rivers. 2002. Paving Our Way to Water Shortages: How Sprawl Aggravates Drought.

Neptis Foundation. 2002. Toronto-Related Region Futures Study – Draft Interim Report: Implications of Business-As-Usual Development. Prepared for the Neptis Foundation by IBI Group in association with Dillon Consulting

Limited (June 2002).

O'Connor, The Hon. Justice Dennis R. 2001. Part 2 Report of the Walkerton Inquiry.

Ontario Medical Association. 2001. Ontario's Air: Years of Stagnation.

Ontario Round Table on Environment and Economy. 1995. A Strategy for Sustainable Transportation in Ontario: Report of the Transportation and Climate Change Collaborative.

Pollution Probe. 2002. The Smog Primer. June 2002. www.pollutionprobe.org/Publications/Air.htm

Pollution Probe. 2002. Towards an Adaptation Action Plan: Climate Change and Health in the Toronto-Niagara Region (October 2002).

Pollution Probe and the Canadian Urban Transit Association. 2001. Trans-Action 2001: Towards Economic and Environmental Health.

Prime Minister's Caucus Task Force on Urban Issues. 2002. Canada's Urban Strategy: A Vision for the 21st Century; Interim Report.

Report of the Canada Transportation Act Review Panel. June 2001.

Singer, S.N. and C.K. Cheng. 2001. A Guide to the Assessment of Groundwater Resources in a Watershed. Ontario Ministry of the Environment. Toronto, Ontario.

United Nations Environment Programme. 1997. Global State of the Environment Report 1997; Chapter 2: Regional Perspectives: North America: Major Environmental Concerns.

University of Toronto. 2002. Groundwater: A North American Resource; A Discussion Paper resulting from an Expert Workshop on Freshwater in North America; hosted by the Munk Centre for International Studies, Trinity College, University of Toronto, January 4, 2002.