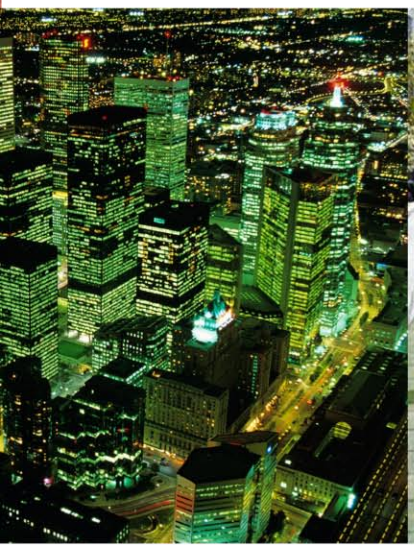
The Impact of Urban Areas on Great Lakes Water Quality

A REPORT OF THE GREAT LAKES SCIENCE ADVISORY BOARD, GREAT LAKES WATER QUALITY BOARD, INTERNATIONAL AIR QUALITY ADVISORY BOARD, AND HEALTH PROFESSIONALS TASK FORCE TO THE INTERNATIONAL JOINT COMMISSION **OCTOBER 2009**



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INTERNATIONAL JOINT COMMISSION
Canada and United States

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Table of Contents

The appendices are contained on the accompanying CD, and also located at:
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COMMISSIONERS' PREFACE

The Boundary Waters Treaty of 1909 has provided the foundation for Canada and the United States to cooperate on the management of transboundary waters and to prevent and resolve disputes. While the Treaty prohibits pollution of the waters that would cause injury to health or property in the other country, it did not specifically recognize the linkage between land, water and air that is understood today. A major advance in the scientific understanding of the significance of land use impacts to Great Lakes water quality began in 1972 when the federal governments of Canada and the United States gave the International Joint Commission a reference to investigate the pollution of the Great Lakes from various land-use activities.

The early focus of the Commission's work centered primarily on agricultural practices, but by the mid-1990s it was evident that the large, growing urban centers in the basin and their extensive suburbs had fundamentally changed the way land affected water quality in the Great Lakes basin. Vast, growing urban clusters surrounding major cities such as Chicago and Toronto were perceived as having a significant impact on Great Lakes water quality through increased discharges of sediments and contaminants from urban watersheds, runoff from impervious surfaces and direct discharges from storm and wastewater treatment. Sprawling, low-density development resulted in more paved roads, parking lots and other impervious surfaces such as rooftops that were found through scientific study to contribute significantly to water quality degradation.

From 1997 through 2005, the Commission's Great Lakes Science Advisory Board devoted part of the Commission's biennial Great Lakes priorities cycle to examining various aspects of urban land use and developed a total of 19 recommendations, which, for the convenience of the reader, are recalled on pages 8-12 of this report. These recommendations, in turn, were reflected in Commission's advice to governments submitted in its 10th and 12th Biennial Reports on Great Lakes Water Quality in 2000 and 2004, respectively.[1]

This work culminated in the 2005–2007 priority cycle when several of the Commission's other advisory bodies[2] collaborated with the Science Advisory

1 See http://www.ijc.org/en/publications/rpts_bi.htm

2 Great Lakes Water Quality Board, International Air Quality Advisory Board and Health Professionals Task Force.

Board to further the work on urban land use and produce this report, which includes four specialized annexes. Together, the groups identified three major findings and submitted 12 recommendations for the Commission's consideration.

As the report notes, the impact of urban areas on Great Lakes water quality occurs at a basinwide scale and thus requires regional solutions. For this reason, the report proposes specific recommendations to local governments as well as to the state, provincial and federal levels.

While every level of government is essential to successfully transitioning Great Lakes cities to sustainable-growth patterns, the Commission recognizes that the bulk of the responsibility for implementation lies with local governments, though funding may come from other levels. Through their ordinances, taxes and land-use planning, municipalities can directly reflect and advance their community's values. Local decisions influence where, what kind and what size of residential, commercial and industrial development will occur; where and how traffic will flow; how sewer systems will be used; and if or how brownfields will be redeveloped.

In the Commission's view, it is essential for communities to develop land-use plans that reflect first and foremost why Great Lakes residents live in the basin: the quality of life that the lakes and surrounding land provide. As each plan outlines the unique needs and goals of its community, it must also reflect how these goals meld with the broader urban area's goals and strategies to reach sustainable growth *and* protect the health of the lakes and land everyone depends on for their quality of life. The annexes to this report provide an inventory of the approaches that can be employed by local governments.

While land-use decisions have and will continue to rest with local governments in both Canada and the United States, coming to grips with even half of the issues that impact sustainable land-use planning can overwhelm the wealthiest of communities. The eight Great Lakes states and Ontario contribute oversight for infrastructure projects, enact building codes and provide regulatory frameworks and funding to local governments. By also taking on the responsibility to direct and coordinate watershed and land-use programs across urban and regional areas, state and provincial governments can significantly accelerate sustainable growth successes for the entire Great Lakes ecosystem.

If provincial and state governments take the lead to provide regional cooperation through a variety of incentives, and require watershed-based planning through codes, frameworks and laws, they can ensure that Great Lakes cities create and implement sustainable land-use plans. As this report notes, excellent examples already exist, including Wisconsin's 1999 requirements for comprehensive land use plans, Pennsylvania's "Growing Greener" initiative and Ontario's three growth plans for the Toronto metropolitan region. These

demonstrate that leadership from provincial and state levels is a critical factor in the success of sustainable land-use planning.

Of all three levels of government, the federal governments of Canada and the United States may have the greatest responsibility and opportunity to affect the health of the Great Lakes ecosystem. While local governments' actions may directly result in less pollution to the lakes or air, how the federal governments lead – through laws and their enforcement, their own daily operations, and creating opportunities for cooperation with all other levels of governments – can have just as great an impact on the ecosystem and the people who live in it.

First and foremost, the commitments both countries made in the Great Lakes Water Quality Agreement provide a mandate to advocate for successful stewardship of the lakes and their collective ecosystem. Countless studies and action plans have confirmed that urban areas have a great impact on ecosystem and human health. Thus, all actions that enhance energy and water efficiency, and reduce pollution, help to meet Agreement goals. As noted earlier, these actions will not happen without basinwide coordination, support and management from all levels of government. The Agreement and its Lakewide Management and Remedial Action Plans, as well as State of the Lakes Ecosystem Conference reporting, provide avenues where federal governments can enhance and secure their capacity to lead and coordinate responsibilities and actions.

Second, both governments have a powerful role in advancing sustainable development through the vast amounts of funding provided for infrastructure and other projects. Monies for water and wastewater treatment plants can be contingent on comprehensive regional water conservation plans or involve creative alternatives for sewage treatment or stormwater management. Priority funding can be allocated to those projects that advance Agreement goals for combined sewer overflow controls, sewer separation and improved sewage treatment in the Great Lakes basin.

Updating the Great Lakes Water Quality Agreement, as both countries committed to on June 13, 2009 at a ceremony in Niagara Falls to mark the 100th anniversary of the Boundary Waters Treaty, provides a unique opportunity to incorporate requirements for research and subsequent action on the most sustainable land-use options that reduce and even eliminate impacts on Great Lakes water quality. This research should focus on the 10 major urban areas in the basin, as defined in the Commission's *Twelfth Biennial Report on Great Lakes Water Quality*: Chicago, Cleveland, Detroit, Hamilton, London, Milwaukee, Rochester, Syracuse, Toledo, and Toronto, and include summit meetings to identify options for regional and binational cooperation.

U.S. Secretary of State Hillary Rodham Clinton and Canada's Minister of Foreign Affairs Lawrence Cannon announce the updating of the Great Lakes Water Quality Agreement, on June 13, 2009 at a ceremony in Niagara Falls to mark the 100th anniversary of the Boundary Waters Treaty

Finally, the Commission notes that several of the report's recommendations are directed at the Commission and is pleased to confirm that it will respond by taking the following actions during the 2009-2011 priority cycle: (1) Direct its Nuisance and Harmful Algae Work Group to focus on urban sources of nutrients, as well as agricultural sources, and to prioritize management actions; (2) Direct the Current Issues Work Group to convene a workshop to examine best practices and management activities to minimize urban impacts on Great Lakes water quality. This would be a major component of assessing progress toward meeting the goals of the Great Lakes Water Quality Agreement with a specific focus on the impact of the 10 major urban areas in the Great Lakes basin; (3) Ensure that the 2009-2011 priority activities that focus on the impact of urban areas on Great Lakes water quality draw upon expertise available from the United States Geological Survey and the Geological Survey of Canada. This approach will help ensure that impacts of urbanization on both surface water and groundwater resources are adequately considered; and (4) Examine how innovative approaches, such as the Leadership in Energy and Environmental Design (LEED) regional program for rural Michigan that provides credit for minimizing the impacts of stormwater on water quality, could be expanded into other ongoing activities in the Great Lakes basin.

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3 See http://www.ijc.org/php/publications/html/12br/english/report/index.html

INTRODUCTION

This summary report from the 2005 – 2007 IJC Priority cycle includes the activities sponsored by the multi-Board representatives on behalf of the Science Advisory Board (SAB), Water Quality Board (WQB), International Air Quality Advisory Board, and Health Professionals Task Force during the biennial cycle, as well as relevant advice offered on land use matters beginning with the IJC Pollution from Land Use Activities Reference of April 1972. The principal contributors to the 2005 – 2007 IJC priority included the following Board and Task Force members and outside experts: Dr. Isobel Heathcote, Mr. Jay Unwin, Dr. John Braden, Professor Marcia Valiante, Dr. Pierre Filion, Dr. Hugh Whitely, Ms. Judy Beck, Mr. David Ullrich, Mr. Craig Mather, Dr. Gary Foley, Dr. Ann McMillan, Mr. Harold Garabedian, Dr. Monica Campbell, Dr. Russell Lopez, Dr. Brian Gibson, Dr. Ray Tomalty, Dr. William Clune and Dr. Enid Slack. The specific activities undertaken during 2005 – 2007 are addressed elsewhere in this report, within the context of PLUARG, recent IJC Biennial Reports, previous IJC Priorities cycles and SOLEC. The impact of land use on Great Lakes water quality is significant, and the topic has consequently been a priority of the Commission and its Boards since 1972.

The notion of chemical, physical and biological integrity of the waters of the Great Lakes Basin Ecosystem contained in the purpose of the Agreement cannot be easily imagined as it existed at the time of discovery and during the earliest period of European colonization. Since that time, myriad human actions have converted a once vast store of ecological capital into a built environment that now supports millions of people concentrated in a relatively few urban centers. In the words of Great Lakes historian William Cronon, "Much of the capital that made the city was nature's own" (Cronon, 1991). By nature's standards, the built environment of the present day has degraded a once "Great" Lakes Basin Ecosystem through a process of incremental land use change and development over the last two centuries to its present state of diminished integrity.

Yet despite a general perception of development negatively and consistently impinging on water quality, most would agree that conditions today are much improved from their peak decline during the early to mid-20th century. Most also would agree that progress toward restoring the Great Lakes to a level approaching their former natural heritage remains as elusive as ever.

In the Visioning Session from the Science Advisory Board's "Expert Consultation on Emerging Issues in the Great Lakes in the 21st Century" held at Wingspread in 2003, the metaphor "retreat of the industrial glacier" was used to capture a contemporary urban philosophy and green design that is redefining the relationship of the city with nature. The Board concluded that an urban renaissance is underway based in part on the value of the water resource to impart the qualities of the natural environment within the developed area (IJC, 2003).

Participants at the meeting also identified that new research investments in aquatic science are necessary to ensure that costly restoration efforts are sustainable. In order to achieve success, they also concluded that, "If the prospects for greater coexistence for city and nature are to be beneficial in terms of maintaining and restoring the integrity of Great Lakes waters, it will be critical to include Great Lakes goals within an intergovernmental framework that encompasses the basin ecosystem in the decision-making process at all levels of government." This statement reaffirmed the need for greater cooperation between all levels of government previously identified by the International Joint Commission in Chapter 4 (land use) of its 10th Biennial Report. It also resonates with the emerging call for a "new deal" for cities that recognizes their important social and economic imperative within the federal systems of both countries. While this challenge remains an elusive shortcoming of the Great Lakes Water Quality Agreement, recent initiatives such as the Great Lakes Regional Collaboration have emerged to provide a framework for cooperation among all orders of government to implement a strategy for the restoration, protection and sustainable use of the Great Lakes. Under the 2005 "Strategy to Restore and Protect the Great Lakes," principles and practices for sustainable development of land have been adopted as a component of the Great Lakes Regional Collaboration (Great Lakes Regional Collaboration, 2005).

The current Great Lakes Water Quality Agreement review process also made recommendations about including other orders of government and the public in the successful implementation of the Agreement (Binational Executive Committee, 2007). A recent report in 2008 from Great Lakes United, "A Way Forward: Strengthening Decision Making and Accountability under the Great Lakes Water Quality Agreement," represents a first step in addressing governance challenges and their implications for Great Lakes water quality (Jackson and Sloan, 2008).

GREAT LAKES LAND USE

The Historic Role of the Commission and Great Lakes Advisory Boards

The Boundary Waters Treaty of 1909 concerned itself primarily with the management of binational waters along with the procedures for the prevention and resolution of disputes. It did not specifically recognize the linkage between land, water and air that is understood today. The scientific understanding of the significance of land use in Great Lakes water quality began with its 1964 reference into the extent of pollution in Lakes Erie, Ontario and the International Section of the St. Lawrence River. In its 1970 report, the Commission recommended that the governments enter into an agreement on programs and measures to implement water quality objectives, and that the 1964 reference be extended to include the Upper Great Lakes. Concurrently with the signing of the 1972 Great Lakes Water Quality Agreement, the governments gave two references: (1) for the study of water quality in Lakes Huron and Superior, and (2) to investigate the pollution of the Great Lakes from various land use activities.

The second reference (Appendix 6) resulted in the formation of the International Reference Group on Pollution of the Great Lakes from Land Use Activities (PLUARG), and initiated IJC scientific study and involvement in the role of land use and land use practices with respect to Great Lakes water quality. PLUARG activities from 1972 – 1980 resulted in 121 scientific reports and 18 IJC recommendations to the governments. With respect to urban areas the Commission concluded that urban areas, particularly those that are large and densely developed, contribute substantial non-point phosphorus loads to the Great Lakes; and that these loadings can to some degree be ameliorated by more environmentally sound urban planning, design and maintenance procedures (IJC, 1990).

PLUARG activities were essentially completed by the WQB with its post-PLUARG assessment report in 1983, until the SAB marked the 20th anniversary of PLUARG at a special session of a Great Lakes soil erosion and sediment control conference held in Toledo, Ohio, September 16-18, 1998. Of particular importance from the meeting was the recognition of the significant changes that occurred in the basin with reference to growth and development of urban areas, particularly in increased land surface imperviousness.

In order to provide a context for the 2005 – 2007 multi-Board Priority on the Impact of Urban Areas on Great Lakes Water Quality the following summary is provided beginning with the 1997 – 1999 Priority Report from the Toledo special session:

Summary of Recent SAB Findings and Recommendations on Urban Land Use

1997 – 1999 IJC Priority Cycle

Key Findings

- Non-point sources of pollution to the Great Lakes basin remain a serious issue, and phosphorus levels are far from under control. Phosphorus continues to be a major source of concern in the Great Lakes basin, both because of persistent eutrophication in some areas and because control strategies have been less effective than anticipated.
- The paucity of good data on non-point source loads and their impacts on environmental decisions has contributed to confusion about appropriate actions and endpoints and is a major obstacle to further progress on commitments under the Agreement.
- It is clear that obligations under Annex 13 of the Agreement cannot be met with the present level of effort. New technologies combined with improved land-use planning will be necessary to meet targets and continue the progress achieved to date.

Recommendations

The IJC identify to the Parties the need for continued action and vigilance in the control of pollution from non-point sources. Such action will be particularly urgent in Areas of Concern where non-point sources have been a major contributor to the impairment of beneficial water uses.

The IJC begin discussions with the Parties to review the adequacy of the phosphorus load reduction targets described in Annex 3 of the Agreement (Control of phosphorus), because phosphorus continues to be a concern in the lower lakes.

The IJC initiate discussions with its advisory boards and the Parties about the significance, sources, biology and pathways of microorganisms arising from non-point sources of pollution.

The IJC urge the Parties to ensure that there are adequate monitoring and surveillance programs for non-point sources of pollution, particularly for the evaluation of the effectiveness of specific management actions for the identification of cause-and-effect relationships and for informed decision making about the control of non-point sources.

The IJC request the Parties to increase funding for research and development of new technologies and techniques for the control of urban and rural non-point sources of pollution.

The IJC urge the Parties to place special emphasis on urbanizing areas in transition from rural to urban uses. Such land-use changes represent opportunities for implementation of watershed management plans as defined by Annex 13, 2(b), as a condition of their development.

The IJC request the Parties to report on their implementation of the recommendations for agricultural practices that were published in its Ninth Biennial Report on Great Lakes Water Quality.

1999-2001 IJC Priority Cycle

Key Findings

- Non-point sources remain a significant source of pollution to the Great Lakes basin.
- Pollution from land-based activities continues to impose substantial costs, particularly in the Great Lakes basin with its rapid urbanization and intensive water use.
- Because non-point source pollution arises over a large land area, its control demands an understanding of the physical, chemical and biological characteristics of the land surface. In some cases, this means tailoring control measures to conditions at the field level within a farm or in a particular residential lot.

Recommendations

That the Parties quantify pollutant loadings to receiving waters by individual non-point source control practices, the nature and magnitude of associated impacts, and the costs of control (and lack of control) of non-point source pollution.

That the Parties adopt systematic methods to evaluate non-point source pollution control programs.

That the Parties develop performance standards for non-point source pollution control technologies, including standards for the land surface.

That the Parties extend the use of economic incentives for the control of pollution from non-point sources.

That the Parties adopt full-cost pricing of water and sewerage services, incorporating a scarcity value of the water and including provisions for infrastructure maintenance, upgrading and replacement.

That the Parties review current institutional arrangements for water and watershed management, and explore the feasibility of collaborative, multi-stakeholder regional or watershed-based institutional structures.

2001 – 2003 IJC Priorities Cycle

Key Findings

- The population of the Great Lakes basin will continue to spread out faster than it increases over the next 20 years. This sprawling development trend will mean more sewage requiring treatment in urban and suburban areas, more paved and roofed surfaces over which precipitation will rapidly flow and airborne pollutant loadings from increased vehicle distance traveled.
- To ensure that costly restoration efforts in urban areas are sustainable, new investments of research in aquatic science need to be made to provide a greater understanding of ecosystem function. In terms of the impact of development, the effects of imperviousness, both in terms of habitat fragmentation and increased runoff, merit special research focus.

- Four elements of urban form can reduce the quantity and improve the quality of urban runoff: compact development, mixed uses, short blocks and respect for natural systems.
- There is a broad consensus that urban water quality impacts can be reduced with careful site planning to reduce impervious cover and increase water detention.
- Local efforts to manage urban growth do require support, assistance and leadership from senior levels of government, for example, in the area of transportation policy.
- There is a need to send a message and transmit the information needed to address the growing threat to Great Lakes water quality posed by urban and urbanizing development.
- Another PLUARG-style study will be needed to help ensure the information is heard and understood by those involved in urban land use in all jurisdictions throughout the Great Lakes.

Recommendation

That the Parties undertake a major binational investigation and research effort on the effects of urban and urbanizing development on Great Lakes water quality and develop a comprehensive response to these effects

2003 – 2005 IJC Priority Cycle

Key Findings

- The principal obstacles to effective stormwater management are lack of money and the lack of a regional infrastructure planning and coordination mechanism.
- Concern about urban stormwater is justified by the large loads of pollution that it can convey. Compared to runoff from forested land, it has been estimated that stormwater runoff from industrial and commercial development can carry ten times the amount of phosphorus, five to eight times the amount of nitrogen, four times the amount of suspended solids and sixty times the bacterial load.
- Automobiles, trucks and buses contribute additional pollutants to stormwater, including leaked fluids, by-products of combustion and high concentrations of zinc and copper from brake and tire wear.
- On both sides of the border, the day-to-day business of land use planning should and will continue to rest with local governments. However, this planning should be subject to regional or state/provincial regulatory frameworks that require consistency of practice and coordination across a planning region and consider impacts on water resources.

- State/provincial governments have a responsibility to ensure adequate oversight of local planning processes and decisions. For state/provincial and federal governments, a key lever for this oversight is available through funding mechanisms, which could incorporate requirements for watershed-level planning and a higher level of accountability for impacts to water resources than currently exists.
- Land use in urban and urbanizing areas has a significant impact on natural flow regimes and water quality. To some extent, those impacts can be reduced or reversed by careful land use planning coupled with site-appropriate stormwater management infrastructure.

Recommendations

The Commission, in cooperation with the Parties, state/provincial, municipal and other regional stakeholders, convene a binational conference to elucidate the extensive data and experience available on the causes of, and potential solutions for, water resource impacts of urbanization in the Great Lakes basin.

The Commission urge the Parties, in partnership with state/provincial and local governments, and as a principal outcome of the proposed binational conference, to develop detailed technical guidance for local governments on how to evaluate the suitability of a site for specific recharge-based stormwater management measures.

The Commission encourage the Parties to make infrastructure funding contingent on the existence of adequate watershed management and land-use planning processes, including an integrated, cost-effective plan for management of sewage treatment plant outflows, sanitary/combined sewer outflows and stormwater discharges.

The Commission urge the Parties, through state/provincial agencies as appropriate, to direct agencies that have local planning expertise and responsibility to initiate institutional coordination to limit urban/suburban/exurban development to shared watershed areas where stormwater best management practices can be successfully implemented.

The Commission initiate dialogue involving the Commission, Parties, developers and financial institutions to explore the environmental implications of urban land-use financing decisions.

Summary of Recent IJC Observations and Recommendations on Urban Land Use

10th Biennial Report

The Commission recommends that:

The Governments should provide for a binational study of the effects of changes in land use on Great Lakes water quality to determine the measures that should be taken to address these changes, including:

(i) the effects of urban and residential growth

(ii) the effectiveness of existing policies and programs in controlling pollution from land use in all sectors

(iii) the identification of measures that should be taken by provincial and state governments, with appropriate assistance from the Parties, to prevent adverse effects

The Governments should proceed with implementation of the SOLEC work on Biodiversity Investment Areas, emphasizing the preservation and rehabilitation of wetlands (IJC, 2000).

12th Biennial Report

- The overarching challenge in terms of Agreement goals is whether current approaches are sufficient from an overall, basin-wide perspective. A comprehensive and binational assessment of the effectiveness of (land use) policies and programs from a basin-wide perspective could provide a broader context for local decisions, and at the same time advance achievement toward an ecosystem approach as envisioned by the Agreement.
- In the United States and Canada, land use decisions are generally regarded as the exclusive domain of local government, yet decisions cannot simply be viewed in isolation of other responsibilities at the provincial, state and federal levels. Because wise land use decisions and effective land management are

fundamental to implementing and progressing toward the ecosystem approach envisioned by the Great Lakes Water Quality Agreement, governments need to improve their institutional capacity to coordinate and integrate roles, responsibilities and decisions between and among all orders of government (IJC, 2004).

Recommendations

The Parties take binational actions to address the impact of urban land use on Great Lakes water quality by:

- Evaluating under what circumstances best management practices are effective in managing urban runoff.
- Ensuring that information on urban best practices reaches local authorities and implementers.
- Assessing the cumulative effects of management actions to minimize the impacts of urbanization on the Great Lakes, using the Lake Erie basin as an example.

1996 State of the Great Lakes Ecosystem Conference — Year of the Nearshore — Land Use

The Impacts of Changing Land Use was a major study authored by Steve Thorp, Ray Rivers and Victoria Pebbles and presented at the conference. The report identified "urban sprawl" to be a major stressor for the Great Lakes ecosystem and concluded that sprawl was perhaps accelerating in the basin. In a conclusions section of the report, the authors called for greater use of planning instruments that promote sustainable development and protect the environment, along with education and the use of economic disincentives as the way forward in managing sprawl.

2005 — 2007 IJC Priority Cycle — Sustainable Cities and Smart Growth

The 2005 – 2007 IJC Great Lakes Priority description for the Urbanization priority is found in Appendix 1. This activity was undertaken as a multi-Board activity, involving the Water Quality Board, the International Air Quality Advisory Board and the Health Professionals Task Force. The activity was led by the Science Advisory Board's Work Group on Parties Implementation. At an initial meeting held in Toronto on November 9, 2005, key issues were discussed in order to determine the role for each of the Boards and the overall approach that would be followed. It was agreed that the assessment template to be used for the work would address sustainable development, and in particular the DPSIR framework developed by the United Nations and the European Environment Agency would be used, which consists of five main components of analysis based on Driving forces, Pressures, State, Impacts and Responses. The DPSIR framework is described in the first of the major reports appended in Appendix 2 authored by Dr. Isobel Heathcote. By using an integrated approach to assessment, the use of the DPSIR framework allows policy consideration within a wider societal context than the traditional assessment process of measuring impact alone.

Sustainable Cities

Following the November 2005 planning meeting, two major events were sponsored to assist the Boards in their work. The first of these events took place at a special meeting of the Science Advisory Board held in Chicago on December 1 - 2, 2005. The meeting was organized by its Work Group on Parties Implementation, and there were expert presentations on a variety of topics including:

- Urban Land Use Issues in the Great Lakes Basin
- Cities, Stormwater and Sustainability
- Regional Public Involvement and Smart Growth Initiatives
- Land Use Planning, Regional Planning and Transportation Systems
- Sustainable Development Principles as Adopted by Chicago Wilderness
- Linking Urban Ecological Design and Water Quality Management

- Downstream Economic Benefits of Low-Impact Development
- Sustainable Redevelopment of Brownfield and RCRA Sites
- Leadership in Energy and Environmental Design

The second event took place on September 25 - 26, 2006 in Chicago, Illinois, and was entitled "International Symposium on Urban Impacts: Global Lessons for the Great Lakes Basin." The symposium included international experts from Australia, Europe and North America and addressed the following major topics:

- Urban Impacts on Water Quality
- Urban Impacts on Air Quality
- Population Drivers
- Industrial Growth
- Mapping and Visualization
- Tools: Engineering and Others
- Healthy Cities
- Growth Plan for the Ontario Greater Golden Horseshoe
- Developers Panel
- Finance and Governance
- Case Studies: Europe, Japan and Australia

Two commissioned papers from this meeting "Implementing Sustainable Stormwater Management Strategies As Part of Green Urban Development: Economic and Institutional Challenges, Barriers and Opportunities" by Dr. William Clune, and "The Impact of Municipal Finance and Governance on Urban Sprawl" by Dr. Enid Slack are appended as Appendices 3 and 4 respectively.

Key Findings:

- Driving forces for environmental change are population growth and distribution, economic trends away from manufacturing toward a service economy, the automobile culture and lack of urban transportation alternatives, sprawl as the dominant urban form and public policies that favor unsustainable practices.
- Pressures from human activities include air quality impacts from increased reliance on vehicular transportation, increased energy and water consumption, the impacts on water quality and quantity from conversion of natural land surfaces to impervious cover as a result of development, pressures on infrastructure and planning governance systems and inadequate infrastructure such as sewage

treatment plants, stormwater retention/conveyance and transportation systems.

- The state of the basin ecosystem is negatively affected as a result of deteriorating air and water quality conditions arising from urban development.
- Impacts include loss of biodiversity, nearshore degradation, health effects from exposure to pathogens and toxics as well as traffic-related concerns for human health.
- Responses to forgoing require public policy foundations that encourage energy efficiency and a reduction in commuter and commercial distance traveled. These broad goals can be accomplished with a combination of the following strategies: efficient public transit, compact urban design, sustainable building practices, regional coordination, intensification of development within existing urban areas, protection of agricultural lands and heritage features and governance policies that clarify the roles of the orders of government and make optimum use of spending authorities to influence positive change.

The development of cities is an integral part of the economic and social development of nations. Over the last century, the Great Lakes basin has been the industrial heartland of the North American continent and has benefited from the high standard of living that its cities produced. As world oil supply declines, and the costs of addressing the needs of sprawling cities increases, the optimum space cities occupy will be inevitably restricted by economic, as well as land, transportation and environmental factors. With the emergence of renewable energy, it is conceivable that the urban paradigm of sprawling cities could shift. Under such a scenario, the future could favor smaller towns and villages as energy sources from alternative fuels; solar, wind and small-scale hydro are fundamentally geographically diffuse technologies. Large cities with a high density pattern of development; heavy reliance on walking, cycling and public transportation; and mixed land uses also would be less affected by rising energy costs. It is clear that even now, cities that ignore the high costs of their current sprawling form of low-density development face the future seriously disadvantaged from lack of economic viability. The ten largest cities in the Great Lakes basin risk not being sustainable in the future because of their reliance on cheap petroleum-based energy based on a bygone era.

In terms of Great Lakes protection and water quality management, best land use management practices are well known by knowledgeable experts in the field and rely on recognized science. Their widespread adoption and implementation by local governments within the basin has only begun recently in earnest. For example, the adoption of wet weather plans, multi modal transportation plans, intensification policies and green building programs are mostly still at the planning stage – it will take at least 25 years for them to be fully implemented. In isolation, and on an ad hoc basis, there are many

individual success stories to be told. But when taken together, the question is whether the cumulative application of today's science and knowledge will result in Great Lakes protection and progress.

Smart Growth

Following the conclusion of the expert meetings, a synthesis report was commissioned from Dr. Ray Tomalty (Appendix 1). This report summarizes the current research on the impacts of urbanization in the Great Lakes Basin and discusses the potential of "smart growth" to lead us toward a very different future.

Despite the widespread interest that exists in smart growth policies throughout the basin, there are barriers to smart growth that reinforce the status quo and represent significant challenges in moving forward to implementation. These include:

- disjointed land use and transportation planning
- environmental issues not integrated into the mainstream of municipal planning
- insufficient development and building standards
- conventional zoning practices
- ineffective municipal planning
- inadequate regional coordination
- lack of agricultural land protection
- imbalanced investment in highways and transit
- infrastructure financing mechanisms and taxation policies
- risk averse private financing
- decentralization of retail and employment
- appeal of suburban landscapes and car usage
- public resistance to smart growth proposals

According to Dr. Tomalty, each order of government has a role to play in implementing smart growth and achieving more sustainable cities. These roles are summarized as follows:

- Federal Governments
    - funding urban infrastructure from federal programs
    - improved transportation policy and infrastructure investment in public transit
    - federal spending authority directed to green expenditures
    - technical support and guidance
    - taxation and research

- Provincial/State Governments
    - improve regional coordination
    - provide planning guidelines and directives
    - link land use and environmental issues in planning frameworks
    - revise building codes
    - provide technical support on green infrastructure

- Local Governments
    - reorient municipal infrastructure investment decisions
    - link fiscal planning instruments such as development charges, property taxes and other user fees to growth management
    - integrate land use and transportation planning
    - address resident opposition to compact housing
    - promote creative design
    - adopt alternative development standards and best management practices
    - facilitate redevelopment of brownfield sites
    - preserve agricultural land
    - conserve ecologically sensitive lands

Summary Findings and Recommendations

(1) Major Finding:

Urban and urbanizing areas within the Great Lakes basin have an adverse basin-wide impact on natural systems. This impact is exacerbated by location and urban form and results in water quality degradation and contributes to "impairment of beneficial use(s)," as defined in Annex 2 of the Great Lakes Water Quality Agreement. The impact from urban areas is caused directly and indirectly from urban run-off from impervious surfaces, inadequate urban infrastructure for storm and waste water treatment, air deposition of contaminants, transportation, increasing demand for water, climate change, loss of biodiversity due to habitat loss and alteration to natural hydrologic systems arising from land development. Serious human health impacts of urban development result from increased exposure to air- and water-borne pollutants due to sprawl. Urban areas produce both point and non-point source contaminants.

Recommendations:

(1.1) International Joint Commission:

- Continue to focus specifically on the impact of the 10 major urban areas within the Great Lakes basin, as defined by the Commission in its 12th Biennial Report in terms of sustaining progress under the Agreement and the measures being implemented by the Parties to address urban development challenges.
- Integrate future IJC activities such as the 2007 – 2009 Nearshore Priority to ensure that urban development continues to be assessed and linked as a Great Lakes water quality issue.
- Encourage dialogue and research on the social and economic drivers of sustainable and unsustainable development.
- Host a broadly based forum to develop a future vision for sustainable development in the Great Lakes Basin and explore the priority actions needed to begin working toward achievement of that vision.

(1.2) Federal Governments

- Address the impact of urban areas on Great Lakes water quality as an integrated urban strategy encompassing State of the Lake Ecosystem reporting including the

further development of appropriate indicators, Lakewide Management Plans and Remedial Action Plans including Annex 13, and infrastructure funding, research and other incentives that support action and implementation.
- Set goals and targets with other orders of government to implement sustainable urban development and fund monitoring programs to track progress.

(1.3) State/Provincial Governments
- Review existing land use management and decision-making processes, policies and laws to identify opportunities to implement smart growth and sustainable practices.
- Integrate policy and planning efforts for regional transportation, air, water and land management activities that implement smart growth and sustainable development goals and objectives.

(1.4) Local Governments
- Follow metropolitan-wide guidelines promoting smart growth and sustainable practices.
- Explore and advance local approaches that could contribute to reducing the environmental impact of cities.
- Adopt neighbourhood Leadership in Energy and Environmental Design principles, especially those elements that protect ecological and water resources.

(2) Major Finding:

The impact of urban areas on Great Lakes water quality occurs at a basin-wide scale and thus requires regional solutions. Basin-wide coordination and cooperation with respect to land management implies multiple orders of government and binational management in order to achieve Great Lakes protection, restoration and management. An ecosystem approach by basin is needed to regionalize planning and development similar to the model of Ontario's Conservation Authorities but at a basin scale. However, in both Canada and the US land use decision making is primarily a local authority. All orders of government need to seek ways to address this governance challenge, and the federal governments must use their mandate over Great Lakes water quality to be advocates for the successful stewardship of major urban areas within the ecosystemic context of the Great Lakes. In general, measures intended to make cities more energy efficient and water efficient and to reduce their overall impact on the environment are also beneficial to Great Lakes water quality. Also, developing, disseminating and promoting innovative

techniques and technologies to achieve sustainable urban development including water conservation and stormwater management must be promoted at all orders of government.

Recommendations:

(2.1) International Joint Commission:

- Establish a multi-Board task force/work group to evaluate the ongoing progress of the orders of government over the next decade in addressing the impact of urban growth and development on Great Lakes Water Quality.

(2.2) Federal Governments:

- Provide binational leadership for state/provincial and local governments by coordinating regional land management summits to address urban development within the context of Great Lakes ecosystem management.
- Assess the cumulative impact of urban development by basin, focusing on the 10 major urban areas defined by the IJC in its 12th Biennial report and address the governance challenges for their mitigation.

(2.3) State/Provincial Governments:

- Coordinate state/provincial watershed and land use planning programs and policies at a regional level to achieve an ecosystem approach by basin, with a priority emphasis on the 10 major urban areas in the Great Lakes Basin as defined by the IJC in its 12th Biennial Report.

(2.4) Local Governments

- Those local governments identified among the 10 major urban areas in the Great Lakes Basin as defined by the IJC in its 12th Biennial Report are encouraged to modify their land use management decisions and best management practices to minimize their impact on the binational waters of the Great Lakes Basin Ecosystem.
- Local governments are encouraged to participate in the development of LaMPs and RAPs and to ensure that Official Plans and Watershed Plans are fully coordinated at a basin scale.

(3) Major Finding

There are two types of solutions to environmental problems caused by urban areas. One involves transforming urban development patterns to reduce energy consumption and environmental impacts by creating “smarter” urban forms. The other involves more

immediate interventions targeted at specific causes of water quality degradation. Effective local and metropolitan solutions that address the impact of urban areas on Great Lakes water quality are available and need to be supported by senior levels of government in terms of:

- improving waste, wastewater, stormwater and transportation infrastructure
- implementing best management practices to manage stormwater to increase infiltration and reduce runoff
- restricting future land development beyond current urban boundaries
- ensuring that tax policy does not encourage urban sprawl by subsidizing suburban land use and greenfield development
- adopting transportation, land use planning and fiscal measures that deter urban sprawl, encourage more compact forms of urban development and support public transit
- protecting and restoring natural heritage features such as wetlands, watercourses, shorelines and groundwater recharge areas, significant habitat and agricultural lands from urban development

Recommendations:

(3.1) International Joint Commission

- Speak out to governments at every opportunity to remind them of the basin-wide challenge that urban sprawl represents: particularly, IJC Biennial Reports to Governments, LaMP and RAP progress assessments, ad hoc meetings with the Governments and Commission public speaking engagements.
- Inform and educate major stakeholders including financial institutions, developers, local government officials and staff about the impacts of urban development and the opportunities available to modify existing practices.

(3.2) Federal Governments

- Ensure that infrastructure funding provided to local governments supports priority remedial and mitigative projects that sustain progress under the GLWQA such as combined sewer overflow controls, sewer separation and improved sewage treatment.
- Review and adjust fiscal, spending and regulatory policies and programs to provide incentives for sustainable urban development.
- Provide leadership through decisions and practices in the location and design of government buildings.

(3.3) State/Provincial Governments

- Identify as a priority and strengthen infrastructure funding for the 10 major urban areas identified by the IJC in its 12th biennial report in consideration of the impact that these areas are having on the Great Lakes.
- Revise building codes to recognize sustainable building design.
- Provide guidance and assistance to local governments regarding best practices.
- Adopt intensification targets and water conservation goals applicable to local governments.
- Remove disincentives to brownfield redevelopment.
- Strengthen standards for wastewater pretreatment.

(3.4) Local Governments

- Take immediate action to require intensification of development within existing urban areas by limiting outward expansion, redeveloping brownfield sites and encouraging infill development.
- Adopt wet weather and watershed management plans that complement the purpose of the Great Lakes Water Quality Agreement.
- Adopt innovative practices to strengthen existing urban environments and reduce sprawl, such as ensuring that property taxes and development charges do not promote outward development, impose user fees that capture the full cost of private vehicular use and low density development and provide greater economic incentives to encourage the redevelopment of brownfield sites and other infill projects.
- Revise zoning regulations to allow more multiple uses and transit-oriented compact development and reduce parking requirements in urban areas in order to protect rural and agricultural lands and natural heritage features from development.
- Adopt best management practices for stormwater management.
- Adopt innovative development standards that implement sustainable design.

References

Binational Executive Committee, 2007. Great Lakes Water Quality Agreement Review 2007. Retrieved August 19, 2008, from Binational Executive Committee Web site: http://binational.net/glwqa_2007_e.html

Cronon, William 1991. *Nature's Metropolis, Chicago and the Great West*. New York: W.W. Norton & Company.

Great Lakes Regional Collaboration, 2005. Great Lakes Regional Collaboration to Restore and Protect the Great Lakes. Retrieved August 19, 2008, from Great Lakes Collaboration Web site: http://www.glrc.us/documents/strategy/Sustainable-Development-Appendix.pdf

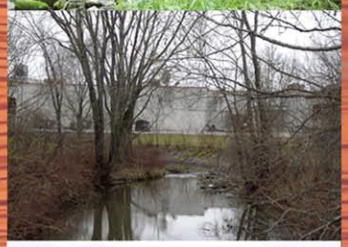
International Joint Commission, 2004. Twelfth Biennial Report on Great Lakes Water Quality. Retrieved August 19, 2008, from International Joint Commission Web site: http://www.ijc.org/php/publications/html/12br/english/report/index.html

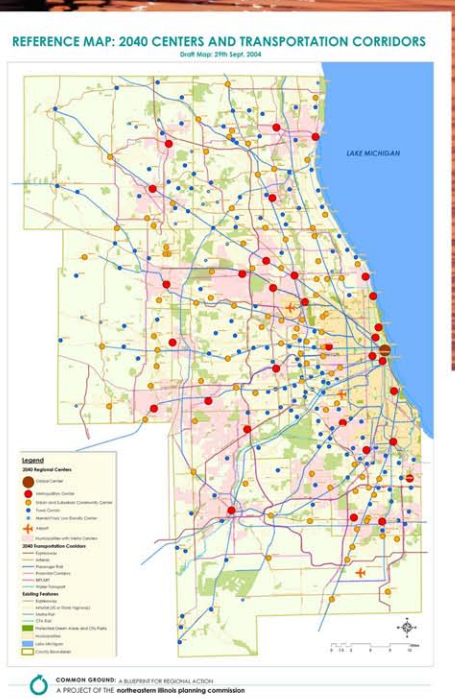
International Joint Commission, 2003. 2001-2003 Priorities and Progress under the Great Lakes Water Quality Agreement, 106-111. Retrieved August 19, 2008, from International Joint Commission Web site: http://www.ijc.org/php/publications/pdf/ID1541.pdf

International Joint Commission, 2000. Tenth Biennial Report on Great Lakes Water Quality. Retrieved August 19, 2008, from International Joint Commission Web site: http://www.ijc.org/php/publications/html/10br/en/index.html

International Joint Commission. 1990. *Pollution in the Great Lakes Basin from Land Use Activities*. Washington, D.C., Windsor and Ottawa, Ontario, p. 26.

Jackson, J. and K. Kraft Sloan, 2008. A Way Forward: Strengthening Decision Making and Accountability under the Great Lakes Water Quality Agreement. Retrieved May 12, 2008, from Great Lakes United Web site: http://www.glu.org/english/water_quality_agreement/files/governance_glu_jan08.pdf





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