Research and Information Gathering on Climate Change Mitigation and Adaptation

Final Executive Summary

January 2016

Prepared for:

Ontario Ministry of Environment and Climate Change

Prepared By:

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While the authors take full responsibility for any errors or omissions in this report, they wish to express their gratitude for the valuable contributions and feedback of the following advisors at various stages in this project including reviewing our research plan and intermediate results and providing ongoing advice to the research team.

- Pamela Blais, Metropole Consultants Ltd.
- Gordon McBean, University of Western Ontario
- Steven Rowe, Environmental Planner
- Jane Welsh, City of Toronto
- Carolyn Woodland, Toronto and Region Conservation Authority
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We would also like to thank participating representatives from the Ministry of the Environment and Climate Change (MOECC), the Ministry of Municipal Housing and Affairs (MMAH) and the Ministry of Natural Resources and Forestry (MNR) for providing necessary information and for their guidance and support throughout all stages of the project.

I. EXECUTIVE SUMMARY

This report was prepared for the Government of Ontario to provide research and recommendations to aid the Ministry of the Environment and Climate Change (MOECC), as well as other ministries and stakeholders selected by MOECC, in planning for climate change and responding to the coordinated review of the Growth Plan for the Greater Golden Horseshoe (Growth Plan), the Greenbelt Plan, the Oak Ridges Moraine Conservation Plan (ORMCP) and the Niagara Escarpment Plan (NEP) (collectively, the Provincial Plans).

The objectives of this report are:

1. To provide the most up-to-date linkages between land use planning and actions to mitigate (including greenhouse gas (GHG) reductions and carbon storage and sequestration) and adapt to climate change in the Greater Golden Horseshoe (GGH).
2. To provide land use planning best practices from leading comparable jurisdictions (city regions), including key land use indicators, land use planning objectives, key information needs, planning tools, policies and performance measures to mitigate and adapt to climate change.
3. To provide a comparison of best practices to Ontario's existing land use policy framework for the GGH, including the Growth Plan, the Greenbelt Plan, the ORMCP, the NEP and the Provincial Policy Statement 2014 (PPS).
4. To provide recommendations to support climate change mitigation and adaptation on changes that may be appropriate to the Growth Plan, the Greenbelt Plan, the ORMCP and the NEP.
5. To provide recommendations on potential performance measures, indicators or other metrics, which could be used to determine whether climate change-related objectives within the Provincial Plans are being met.
6. To provide a narrative description of climate resilient and low carbon communities to help provide a potential future vision for Ontarians.

The report proceeds in six sections. Section I summarizes findings from our literature review and explores the linkages between land use planning and actions to mitigate and adapt to climate change in the GGH. Research reviewed indicates that there is a strong connection between where and how we live, our GHG emissions and our ability to adapt to extreme weather and other climate change impacts. In particular, land use planning decisions will largely determine whether progress is made in two of Ontario's largest GHG-emitting sectors—transportation and buildings (which respectively account for approximately 36% and 19% of the provincial total).[1] Indeed, it isn't a stretch to say that land use planning decisions made today and into the future will determine whether Ontario meets its medium- and long-term GHG reduction targets. Land use planning decisions also influence the risk and vulnerability of human settlements and ecosystems to climate change-induced extreme weather events: hazards including heat stress and extreme precipitation affect health, habitats, infrastructure and economies, all of which influence not only where we live, but our quality of life. The literature review identified the following key substantive focus areas for addressing climate change through land use planning:

[1] Environment Canada, *National Inventory Report: Greenhouse Gas Sources and Sinks in Canada 1990-2013* (17 April 2015), online: Environment Canada <http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/8812.php> at 55, Table A10-13. Energy-based emissions from "Commercial and Institutional" and "Residential" Stationary Combustion Sources were combined to arrive at the building-related emissions referred to here.

- **Action Planning.** Develop and adopt strong objectives for adaptation and mitigation and, where possible, mainstream climate change into management and decision-making. Increase collaboration between government jurisdictions both vertically (province-region-city) and horizontally (city-to-city and across provincial ministries and municipal departments).
- **Energy.** Reduce fossil fuel consumption through energy efficiency and conservation and low carbon energy planning in aspects of infrastructure renewal and community development.
- **Research.** Collaborate and coordinate on research, including low carbon technology, climate data, impacts and adaptation. Harness partnerships with academia and the business community.
- **Resilience.** Enhance the resilience of infrastructure, communities, natural heritage and agricultural lands. Ensure that sites and opportunities for resilience are identified and reserved.
- **Technology.** Facilitate the deployment of technologies that advance mitigation and adaptation goals in buildings, transportation and utility systems, including increasing distributed low-carbon energy supply.
- **Environmental Design.** Construct, rehabilitate and maintain green infrastructure (including urban green infrastructure and green roofs) to support infiltration and water management and reduce flood risks. Recognize additional benefits of improved building energy efficiency and reduced heat island effects. Natural heritage areas and agricultural lands sequester carbon and have a significant role to play in adaptation.
- **Equity.** Ensure effective and ongoing public consultation to identify and prioritize areas and individuals with highest vulnerability. Recognize differing risk tolerance levels and risk perceptions.
- **Food.** Foster and support local food production and the reduction of travel distances for food. Protect and enhance agricultural lands.
- **Transportation.** Reduce car use through the development of compact, transit-oriented communities, better design of transit and urban form, and the provision of public and active transportation alternatives.
- **Urban Form.** Promote compact, mixed use, development to increase density, reduce sprawl, improve air quality and reduce transportation GHGs.

These focus areas were adopted as evaluation criteria for the policy review conducted by the project team. The first five focus areas (action planning, energy, research, resilience, technology) tend to be part of mainstreaming and include ideas and actions beyond just land use planning. The second five focus areas (environmental design, equity, food, transportation and urban form) are typical land use planning issue areas. The literature review also identifies the strongest linkages between land use planning and climate change mitigation and adaptation, supporting the assessment of changes that *must* take place to achieve Ontario's climate change objectives. These linkages form the basis for the high-level policy directions contained in Section IV.

The jurisdictional scan in Section II of this report provides an overview of best practices based on a review of comparable city regions outside of Ontario, which are considered leaders on climate change. City regions reviewed include: Calgary Region (Canada), Metro Vancouver (Canada), Metro Chicago (USA), New York City (USA), San Francisco Bay Area (USA), Metro Atlanta (USA), Greater London (UK), Randstad (Netherlands), Metro Sydney (Australia) and Southeast Queensland (Australia). These were selected on the basis of their comparability to the GGH considering a range of factors including economic structure, governance, climate action and climate risks. While no one place can be said to have completely addressed climate change adaptation or mitigation, a variety of best practices were identified and then used to supplement and inform the report's detailed recommendations. Best practices identified include:

- **Incentives and financing.** These are often used to support energy and/or water efficiency projects in homes and businesses, but may also include disincentives to carbon emitting activities such as road pricing.
- **Planning policies and instruments.** These may be in the form of building regulations and land use planning principles to both reduce GHG emissions and improve resiliency and better prepare for climate change.

- **Guidelines and toolkits**. Tools and guidelines for climate change mitigation and adaptation are often in the form of publications, visualization tools and interactive web-tools and can help decision-makers map climate change impacts and assess key risks.
- **Coordination and collaboration.** This refers to cooperation between government, business and scientific communities across departments and jurisdictions, which may involve the use of working groups and task forces specifically created to tackle climate change.
- **Natural systems.** The protection and restoration of wetlands, green spaces and urban forests to reduce flood risk, mitigate urban heat island effect, sequester carbon and provide other ecosystem services is key to addressing climate change risks through land use planning.
- **Vulnerable populations.** The best land use planning and climate change strategies ensure that populations with limited adaptive capacity or that are living in especially vulnerable locations are protected from the impacts of climate change.
- **Infrastructure.** Development of alternative fuel infrastructure, decentralized energy generation and storm water management are vital to ensuring the reduction of GHG's and resiliency of built and natural systems.

The policy review in Section III of the report evaluates the current planning framework for the GGH against the key substantive focus areas and best practices identified in the literature review and jurisdictional scan. The evaluation finds that Ontario has taken important steps to integrate sustainability and conservation of natural heritage into its legislation and supporting plans and policies. However, significant work remains if the Province wishes to meet its climate change objectives and ensure that the GGH works toward, and thrives in, a low carbon future. The policy review identifies several gaps in the current GGH planning framework, which the report's final recommendations seek to address:

1. **Gap between Ontario's climate change action plan and current planning framework.** Current provincial and local plans are not aligned with the provincial climate change policy framework; therefore "mainstreaming" of climate change in planning is recommended.
2. **Gap between evidence and data.** Research useful for planning and monitoring climate change action in land use approvals and decision-making in Ontario is lacking; therefore objective, longitudinal data collection—based on a standardized climate change performance measurement framework—and public reporting by the Province and municipalities is recommended.
3. **Gap between policies and implementation.** While policies promoting and encouraging sustainable land uses have been in place in the GGH for years, implementation of those policies through the planning and development approvals process has been less successful.
4. **Gap between energy and planning.** The drastic reduction in emissions from fossil fuel energy use required to meet Ontario's GHG targets means changes in land use patterns and local-scale relationships are needed, especially to better facilitate low carbon sources of heat in the building sector. Community energy planning needs to be incorporated into the planning framework.
5. **Gap between land use designations and areas of highest vulnerability to climate impacts.** Designating zones of high vulnerability is recommended to support action in areas of highest flood risk, aging infrastructure, poor accessibility and vulnerable residents.
6. **Gap between compact urban form and environmental design.** Climate change mitigation actions are focused on compact urban form to reduce car travel and support low carbon energy technologies, but adapting to climate change requires more space for biodiversity conservation, green infrastructure and low-impact development. Providing direction to resolve this tension is needed.
7. **Education gap.** Planners working in the GGH need education and training around climate change action in order to effectively incorporate mitigation and adaptation into planning activities.

The recommendations in Section IV address these gaps to improve the land use planning framework in the GGH as it relates to climate change mitigation and adaptation. Based on the key linkages identified in the literature review, the best practices compiled in the jurisdictional scan, the gaps uncovered in the review of the four GGH plans and consultation with the expert advisory committee, our team distilled seven policy directions to support climate change mitigation and adaptation in the areas governed by the Provincial Plans. For each of the seven policy directions, an extensive list of detailed recommendations for specific plan amendments and implementation guidance was developed (see Appendix 4). For each policy direction below, high priority recommendations are highlighted to illustrate changes to the Provincial plans that could help Ontario achieve its climate change objectives.

Policy Direction 1—Mainstream climate change considerations in Ontario's land use planning framework. Incorporate and integrate climate change mitigation and adaptation objectives and policies established by Ontario's Climate Change Strategy and the PPS into each of the covered four Provincial Plans and any municipal land use plans governed by the Growth Plan for the Greater Golden Horseshoe.

Example high-priority recommendations:

- **The Province should incorporate quantitative and qualitative climate change related indicators into the performance monitoring frameworks for Provincial Plans and the PPS**. Municipalities will then incorporate these performance indicators into their municipal official plan performance monitoring framework, as they are required to conform their official plans to the Growth Plan. In designing the indicators, the Province should ensure the indicators work on a municipal scale but can also easily roll up into a regional reporting scale. See section V for a recommended climate change performance monitoring framework developed as part of this project.
- **The Province should require municipalities to develop climate change plans.** Such plans should: (a) quantify GHG emissions located within their borders; set out emissions reduction targets and timelines, including from private transportation and buildings; allocate responsibility; and develop strategies to achieve targets; and (b) identify populations, areas and infrastructure of highest climate vulnerability; set targets and timelines for reducing vulnerability; allocate responsibility; and develop strategies to achieve targets. The Province should also require municipalities to report against their plans using the climate change performance measures discussed above periodically (i.e. as part of official plan reviews). Municipalities should prepare climate change plans in coordination with official plans and strategies such as transportation plans, watershed plans, natural heritage plans, infrastructure master/ asset management plans to ensure climate change considerations are incorporated into those plans and strategies as well.

Gaps in Ontario's Current Framework Addressed by Recommendations:

- #1 Gap between Ontario's climate change action plan and current planning framework
- #2 Gap between evidence and data
- # 3 Gap between policies and implementation

Policy Direction 2—Require the development of compact, location-efficient communities (development that is a convenient distance from workplaces, amenities, stores and urban hubs; has access to and provides the densities needed to support various modes of rapid transit); enables short commute times; and contains realistic opportunities to use transit and active transportation, allowing for improved transitions between modes).

Example high-priority recommendations:

- **Stop or dramatically limit sprawl and contain the outward expansion of urban built-up area of the GGH region into greenfields by taking one or more of the following approaches**:
    - Requiring the 2041 growth forecast to be accommodated within existing designated greenfield and built-up areas (i.e. no further urban expansion pending next 10 year review)
    - Prohibiting any new greenfield designation.
    - Establishing clear, permanent settlement area boundaries for municipalities within the Growth Plan such that settlement areas cannot be expanded through municipal comprehensive reviews.
    - Alternatively, amending the Growth Plan to prohibit expansion of the settlement area within any municipality that has not achieved its minimum density and intensification targets.
    - Conducting or causing to be conducted a review of the metrics for what constitutes "major office" and, if supported, reducing the threshold for lands classified as "major office" under the Growth Plan to include lower area and minimum jobs thresholds.
    - Adding a definition for "major institutional" development under the Growth Plan.
    - Prohibiting any new major office/major institutional uses outside of identified intensification areas or areas with existing/planned transit (e.g. urban growth centres, major transit station areas, intensification corridors).
- **Increase density targets in urban growth areas and create density targets for employment lands** that support appropriate mixed use and transit (consider conforming to transit-supportive densities set out in the Province's transit-supportive guidelines).
- **Set minimum density targets for major transit station areas and intensification corridors** via the Growth Plan. To this end, the Province could also develop rules that substitute a provincial density permitting scheme that will achieve targets within a fixed area of major transit station areas and intensification corridors for municipalities that fail to meet their targets within a specified time period (e.g. 5 years). Density targets could be set and achieved in coordination with the Ministry of Transportation, GO-Transit and Metrolinx.
- **Take action on key suburban employment lands such as areas surrounding Pearson Airport, the 404/407 and Vaughan** by specifically designating them and requiring a re-urbanization strategy to retrofit these areas in a way supportive of plan objectives: for instance, supporting the development of public transit and active transportation through employment infill, mixed use/residential infill, active transportation and a transit strategy. Go-Transit, Metrolinx and local transit providers would likely be partners in carrying out this recommendation, as would municipalities.
- **Amend the Growth Plan to recognize that significant concentrations of office space exist outside of the designated growth centres, and need to be integrated into transit planning**. The Province should work with local municipalities in the GTA to adjust priorities and fine tune the planned roll-out of rapid transit projects to better connect to the approximately 108 million square feet of office space that are

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- ❖ # 3 Gap between policies and implementation
- ❖ # 6 Gap between compact urban form and environmental design

currently dependent on automobile access. Consider requiring all free standing office to locate in urban growth centres, or around/along major transit stations areas or intensification corridors.

Policy Direction 3—Encourage urban design features and the layout of major land uses (e.g. institutions, greenspace, commercial areas) that support higher-order transit and active transportation.

Gaps in Ontario's Current Framework Addressed by Recommendations:

- #1 Gap between Ontario's climate change action plan and current planning framework
- # 3 Gap between policies and implementation
- # 4 Gap between energy and planning
- # 6 Gap between compact urban form and environmental design

Example high-priority recommendations:

- **Clearly prioritize public and active transportation in planning and investments by adding a passenger transportation hierarchy into the Growth Plan** to guide transportation infrastructure planning and major transportation investments by municipalities, municipal planners and transportation authorities. The hierarchy would be modeled off of the hierarchy in the Big Move and would prioritize active transportation and public transportation over personal vehicular use.
- **Require municipalities to develop minimum bicycling parking requirements** for residential, employment and commercial centres in new developments, clearly signaling that the Province places a priority on low-carbon active transportation.

Policy Direction 4—Require, integrate and support community energy planning (including district energy, renewable energy generation and energy efficiency) into our land use planning framework (e.g. integrated planning, codes, standards and permitting and voluntary incentives such as density bonusing and credits).

Gaps in Ontario's Current Framework Addressed by Recommendations:

- #1 Gap between Ontario's climate change action plan and current planning framework
- # 3 Gap between policies and implementation
- # 4 Gap between energy and planning

Example high-priority recommendation:

- **Require municipalities to prepare community energy plans** that, promote energy conservation, the deployment of low carbon electricity and district thermal energy, and enhance electricity system resilience to extreme weather events. The Province should also require municipalities to incorporate community energy plans into their land use planning.

Policy Direction 5—Protect and enhance green infrastructure (natural and built), through land use planning and through the use of offsets and other crediting mechanisms that provide economic incentives for the preservation, establishment and maintenance of natural heritage features and supportive green technologies that sequester carbon and help build resilience to extreme weather.

Example high-priority recommendations:

- **The Province should consider boundary expansions for the Greenbelt** that would achieve climate change adaptation objectives such as green infrastructure, flood control and food security; foster connectivity; and promote mitigation of GHGs through intensification (providing a limit on sprawl) and by preserving natural heritage assets that sequester carbon. The best candidate areas for boundary expansions will be consistent with the vision and goals of the Greenbelt Plan, connect to current Greenbelt

systems and complement the goals of the Growth Plan. From a climate change and flood prevention perspective, lands that are high priority for including in expansion include:
    - Significant source water areas and urban river valleys;
    - Systems within watershed headwaters that have little Greenbelt protection;
    - Middle reach areas of river and stream systems where the headwaters and downstream areas are currently within the Greenbelt; and
    - Lands identified as part of natural heritage systems and refined in watershed plans.
- **Develop protections for green infrastructure in areas within the GGH but not covered by the Greenbelt Plan, ORMCP or NEP.** Identify and develop new policies (over and above the provisions in the PPS) to protect natural heritage, water resource and agricultural systems, as well as specific features such as wetlands, forests, headwaters and recharges areas and in these regions. Prioritize lands with the highest ecosystem service values.

Gaps in Ontario's Current Framework Addressed by Recommendations:

- #1 Gap between Ontario's climate change action plan and current planning framework
- # 3 Gap between policies and implementation
- #5 Gap between land use designations and areas of highest vulnerability to climate impacts.
- #6 Gap between compact urban form and environmental design

Policy Direction 6—Require improved stormwater management through protection, enhancement and/or construction of new permeable surfaces, run-off control, low-impact development (LID) and green infrastructure (including updating of provincial storm water management standards).

Example high-priority recommendations:

- **Amend Provincial Plans to define and include as a clear objective low-impact development** that manages stormwater runoff at source and increases resilience throughout the affected watershed.
- **Require planning for stormwater management to incorporate resilient, redundant and fail-safe measures** that will function effectively in a future environment of unpredictable extreme rainfall.
- **Require municipalities to recover the full cost of sewage works** (as defined in the *Ontario Water Resources Act*), including long-term operations and maintenance of stormwater management facilities.
- **Amend Provincial Plans to require municipalities to incorporate LID and climate change resilience into new infrastructure and urban design**, including roads and buildings, as well as retrofits. Link requirement with funding opportunities to support implementation.
- **As part of any expansion of the urban boundary and any major urban redevelopment, watershed and subwatershed plans should be updated** to assess the cumulative impacts of development and climate change, in light of the most up-to-date climate science.
- **Require that stormwater management plans and processes target maintenance of the natural hydrologic cycle** by managing stormwater runoff at source and preventing increases in the quantity of runoff from developed lands. Ensure that areas of the landscape that are important for the natural retention

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and filtration of water (e.g. wetlands) and for the safe passage of floodwaters (e.g. floodplains) are protected, restored and enhanced to ensure their effective function.

Policy Direction 7—Provide tools that encourage effective and collaborative adaptation planning by local and regional governments, including updated climate impacts research, updated floodplain mapping, future climate scenarios and requirements to develop climate change risk inventories and adaptation implementation plans.

Example high-priority recommendations:

- **Require local planning authorities to use updated mapping of hazardous (flood prone) lands and sites (including appropriate buffers) to designate appropriate zoning for these areas in municipal planning documents.** Flood hazard mapping should be extended to include urban flood zones as well as riverine flood hazards and should consider both existing and future extreme weather risks. Restrict municipalities from permitting development in "flood fringe" and "spill zone" areas (especially in light of outdated floodplain maps). Consider requiring new greenfield development and redevelopment affecting flood prone areas to examine options for hazard remediation.
- **Provide adequate and ongoing support and funding to local planning authorities for floodplain maps to be updated** on a regular basis and in accordance with the best available information.

Gaps in Ontario's Current Framework Addressed by Recommendations:

- #1 Gap between Ontario's climate change action plan and current planning framework
- #2 Gap between evidence and data
- #3 Gap between policies and implementation
- #7 Education gap

Section V identifies a performance measurement framework, including recommended key performance indicators, metrics and in some cases targets, which, if implemented, could support the evaluation of regional progress toward climate change objectives. Recognizing the multiple spatial layers involved, as well as the numerous potential data points, the recommendations focus on indicators and metrics that scale effectively and, where possible, measure data important to multiple climate change mitigation and/or adaptation objectives.

Finally, Section VI ties together some of the evidence-based recommendations and indicators set out in this report through a descriptive narrative. This section describes Ontario today, Ontario in 2030 and Ontario in 2050, helping readers and policy-makers consider not just where we are, but where we could be: a region with a system for land use planning that helps us build livable, prosperous and low-carbon municipalities that will adapt and thrive for generations to come.