Transportation-Related Energy Sustainability in Canadian Urban Areas

Sustainable Development
Through Knowledge Integration

Canada's population is highly urbanized with, according to 2001 census data, 64% of the nation's population residing in twenty-seven cities, and more than 50% of the population living in four large urban regions – the extended Golden Horseshoe, the Montreal region, the Lower Mainland of British Columbia, and the Calgary-Edmonton corridor. With such concentrations, how cities grow can offer efficiencies and reduce environmental impacts. The 2002 final report of the Prime Minister's Caucus Task Force on Urban Issues, *Canada's Urban Strategy: A Blueprint for Action*, recommended the establishment of a national Transit/Transportation Program with the broad objective of facilitating the implementation of sustainable public transportation.

Sustainable Transportation Performance Indicators

The Centre for Sustainable Transportation (CST) has developed a suite of performance indicators, which were designed to gauge the sustainability of urban growth from a transportation perspective. These indicators address transportation-related energy consumption and the impacts of transportation corridors on ecological and human health. Relevant indicators from other sources are also being considered.

The *Transportation-Related Energy Sustainability in Canadian Urban Areas* project seeks to use geospatial data to quantify and to map specific sustainable transportation performance indicators (STPIs) that require land use and urban form information, for example, land use mix, transportation congestion, transportation land use, and fragmentation of ecological areas. Project work consists of three main activities.

Mapping land use patterns and urban form

The tight relationships among land use aspects of urban growth, urban transportation networks, and transportation-related energy consumption have been revealed in numerous studies. The combination of urban form and land use patterns can influence several aspects of travel demand such as trip length, as well as feasibility of various transit modes. Similarly, accessibility to transportation networks can influence patterns of urban development. The net result of this influence is that land use patterns and urban form characteristics, both of which can be mapped using remote sensing data, have the potential to provide insights into the transportation 'efficiency' of cities.

Advanced techniques for mapping land use patterns have been developed and presently, land use maps for 23 cities for the year 2000 are being generated by this project.

Quantifying SD performance indicators

Each STPI is designed to respond to a specific question relevant to sustainable development (SD). A decrease in STPI value over time indicates progress towards sustainable development. For example, urban land use per capita is a performance indicator for the question "Are land use, urban form, and transportation systems changing so as to reduce transportation effort?"

This project is developing methods to facilitate the integration of temporal data sets of geospatial information, such as census and historic land use, that are relevant for quantifying SD indicators.

Enabling decision-makers to use the indicators and land use histories for growth forecasts

Partners in the Energy Sector of Natural Resources Canada are reviewing results of project work quantifying SD indicators based on data for the year 2000. Revisions to methodology will be implemented based on feedback.

For more information

To learn more about the *Transport-Related Energy Sustainability in Canadian Urban Areas Project*, please contact:

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Project highlights

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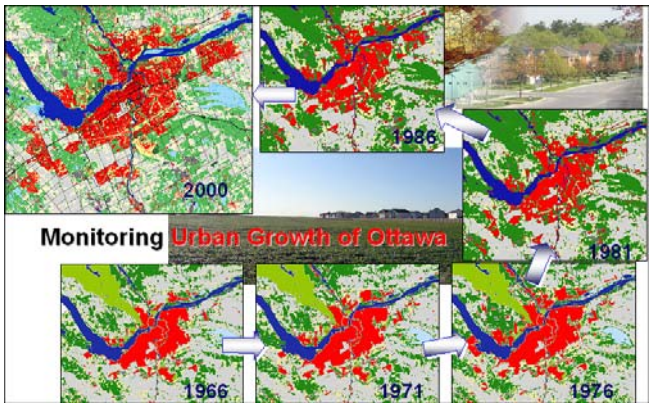
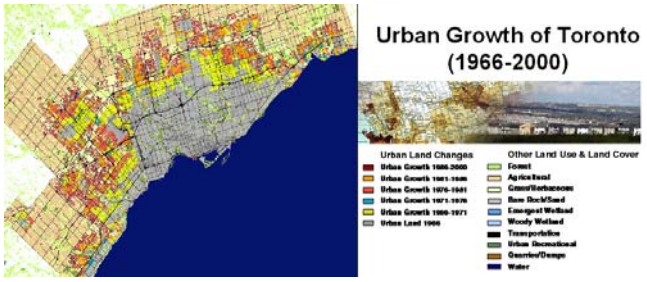
Monitoring Urban Growth of Ottawa

Remotely sensed imagery, aerial photography and geospatial data from other sources were used to map the urban growth of the City of Ottawa from 1966 to 2000. The areas in red, below, indicate built-up land at each epoch.



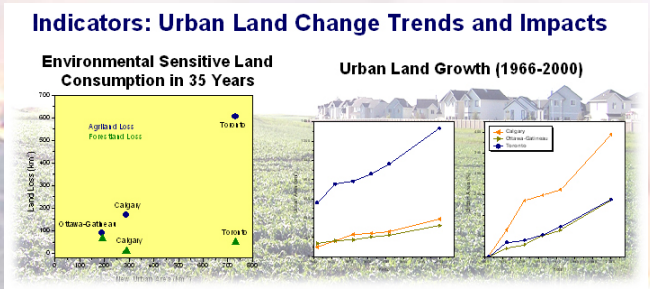
Urban Growth of Toronto

Toronto is Canada's most rapidly suburbanizing city, with newly developed land area representing more than 130% of the 1966 urban land area. To generate the map below showing the expansion of the City of Toronto between 1966 and 2000, satellite-based land cover maps and archival information from the Canada Land Use Monitoring Program (CLUMP) were assimilated into a coherent time series. In 1966, only the gray-coloured area was urbanized. The incremental increase of urban development up to 2000 is shown in the colour legend.



Indicators: Urban Land Use Change

One of the major impacts of suburbanization is the loss of valuable agricultural and forestlands. These lands play an important role in preserving biodiversity, as well as, in reducing air pollution and urban 'heat island' effects. The plots below are based on statistical summaries of land loss from agriculture and forestlands to urban growth, both of which feed into sustainable development indicators required by Natural Resources Canada's Energy Sector and other government partners.



Urban Grown of Calgary and Ottawa-Gatineau

Significant urban growth has also occurred in the Calgary and Ottawa-Gatineau regions between 1966 and 2000. The same techniques are being used to map 23 Canadian cities.