



## Visualization of Integrated Knowledge for Sustainable Development Decision Making Project

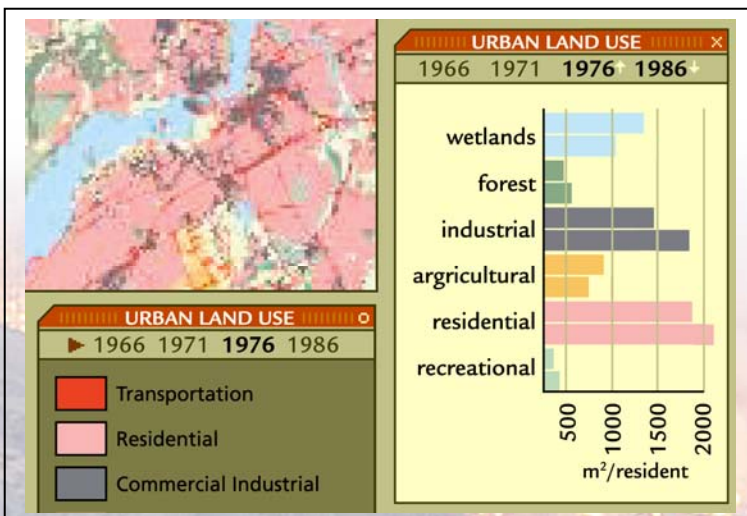
*"The nature of geographic information and its applications in science and society is in the midst of remarkable change - change stimulated by dramatic increase in data and rapidly evolving technologies for accessing and using those data."*

Alan MacEachren, GeoVISTA Center

The goal of visualization is to provide effective graphic representations of geospatial information. Visualization tools provide the means to move from static cartographic products, such as images, maps, and aerial photographs, to interacting with geospatial data through dynamic, interactive graphics that employ multi-media and multi-modal technologies. By facilitating the exploration of multiple data sets, both over time and space, visualization tools can be used to develop scenarios illustrating past or future landscape changes and to assist decision-makers to understand spatial and temporal relationships.

Land use change and urban sprawl is being analyzed using historical aerial photographs going back to 1920 and since the mid 1970s, using remote sensing imagery. Additional information is being obtained from the on-line Canada Land Inventory and census data from Statistics Canada.

A visualization interface for this type of data set enables interactive selection and comparison of indicators. The example shown compares urban land used per person (m<sup>2</sup>/resident) according to land use categories for a sequence of years.



### Sustainable Development through Knowledge Integration

#### Our role

The objective of the *Visualization of Integrated Knowledge for Sustainable Development Decision Making* project is to assess and develop visualization techniques that effectively translate complex scientific information into a form that readily communicates the current and anticipated impacts of different human actions on our environment. The project focuses on bridging the gap between the scientists who supply complex, quantitative data, and decision-makers who develop policies related to the sustainable development of Canada's natural resources. Equally important is the communication of scientific knowledge to the Canadian public.

#### Working in Partnerships

The visualization project team is working in collaboration with other Sustainable Development through Knowledge Integration projects, and is developing visualization techniques that can be applied in decision support systems for urban energy analysis, forest disturbances, and mine rehabilitation, as well as groundwater and geohazards assessment.

Innovative Web-based scaleable techniques are being developed in cooperation with national and international academia as well as Canadian geomatics industry.

#### Current Activities

Presently, the Visualization of Integrated Knowledge for Sustainable Development Decision Making project is focused on developing the following visualization techniques:

1. effective representation of time dependent information relevant to depict change in modes of transportation and its impact on urban land use;
2. interactive representation of 3-dimensional data for the dynamic portrayal of terrain and urban landscape;
3. integration of multi-source and multi-sensor data and information for the effective communication and information synthesis.

#### For more information

To learn more about the project, please contact:

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## Project Highlights

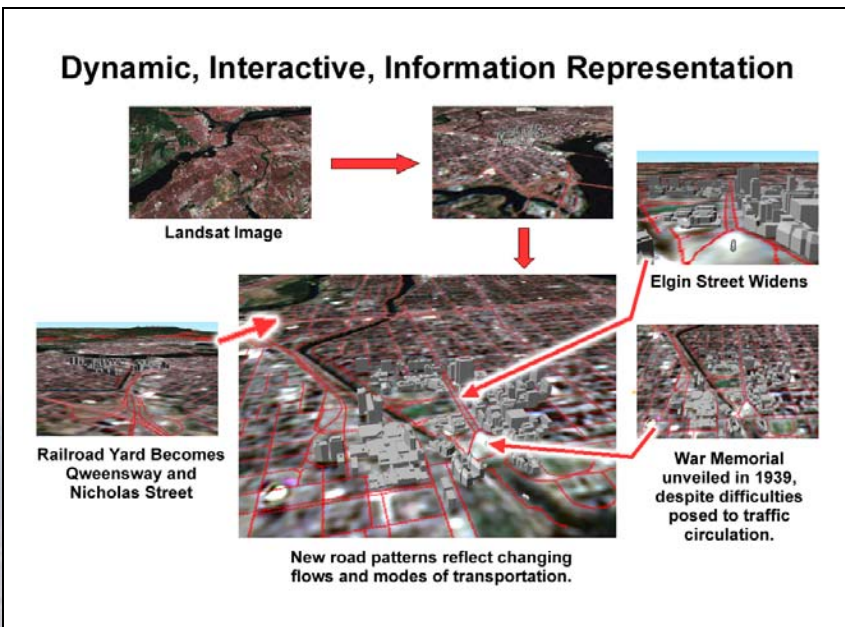
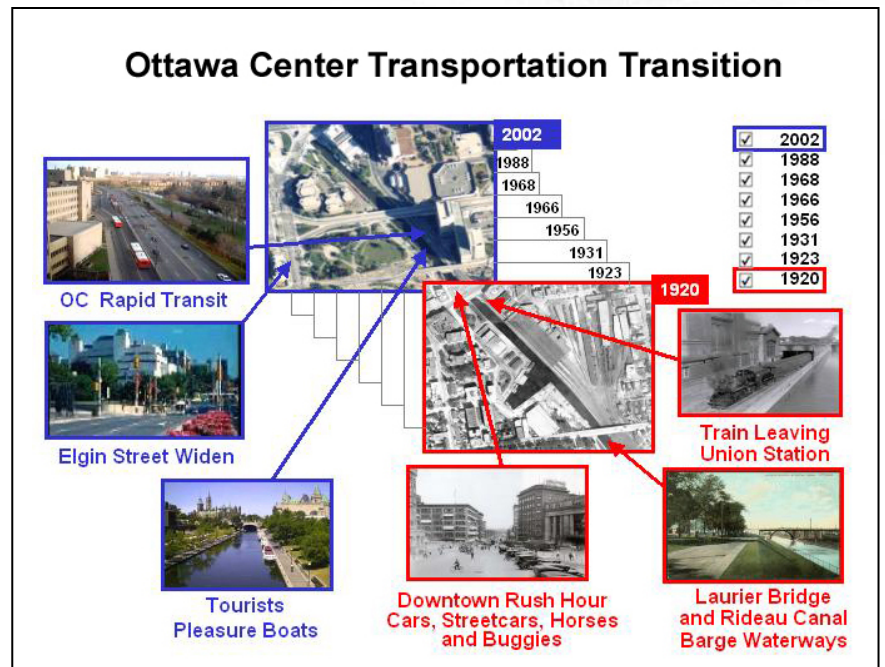


Sustainable Development through Knowledge Integration

### Interactive Representation of Urban Change in Downtown Ottawa

Aerial photographs are being used to examine the history of land use changes and their relationship to change in the transportation modes, which have occurred in response to changing city needs.

Transitions in the downtown regions of the City of Ottawa over a span of 82 years (1920-2002) can be analyzed using historic aerial photographs from the National Air Photo Library. The transitions can be visualized using the SVG (Scalable Vector Graphics) format, which permits interactive display, manipulation and linking to ancillary information in a Web environment.



### Dynamic, Interactive, Comprehensive Information Representation

Information from multiple geospatial data sources, such as remote sensing and digital elevation models, are being integrated to examine current and potential land use as well as create multiple scenarios for the future. Visualization tools facilitate the use of integrated information for transportation planning, plus the promotion of tourism and urban planning.

In this representation of integrated information for the City of Ottawa, Landsat-7 data is draped on a digital elevation model and roads from the National Topographic Database have been superimposed. In the city centre, a 3-dimensional city model, visualized using VRML (Virtual Reality Modelling Language), is present. A series of images illustrate how the integrated information can be interactively manipulated using the web-based visualization tools.

