

Chapter 26

Multi-Scale 3D Geovisualization of Urban Heat Island Data for Planning Dialogue in Toronto

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ABSTRACT

This e-planning visualization case study in the Toronto region investigated the use of 3D urban models as a visualization reference against which analytical models were visualized to identify micro-scale mitigation scenarios of urban heat island effects. The case studies were directed to processes of planning decision making. The Toronto region faces problems of urban heat island impacts due to the increasing frequency of extreme heat events (Bass, Krayenhoff, & Martilli, 2002). The City of Toronto and the Toronto and Region Conservation Authority (TRCA) have each implemented policies and programmes aimed at mitigating urban heat island and climate change effects (City of Toronto, 2006). This research explored ways of visualizing remote sensing heat island data to assist with the targeted application of planning policies and programs.

INTRODUCTION

Visualization strategies for identifying associations between urban surface types and heat island measures are explored in this case study research. E-planning visualization makes it possible to combine large scale remote sensing data that can geo-locate the hot and cool areas in a city experiencing extreme heat events with fine scale land use, built form, and urban forest land cover data (Figure 1).

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Figure 1. Visualizing Landsat infra-red data and 3D urban models



The work emerged from the GEOIDE National Centres of Excellence, Project TSII32 lead by Professors Sheppard and Feick (UBC and U Waterloo). This GEOIDE funded project aimed to reduce the gap between macro scale climate change research and the very real challenges of integrating this scientific research into practice at local and regional scales. The project focused on using 2D and 3D spatial information technology (e.g. GIS, CAD), analyses and visioning processes to help local planners and decision makers to investigate alternative climate change scenarios, compare adaptation and mitigation measures and communicate options to key stakeholders as well as the broader public. The collaborating universities in GEOIDE project PII-32 are the University of British Columbia, University of Calgary, University of Waterloo, the University of Toronto, and Queens University in Kingston Ontario.

The study area was located in the Greater Toronto Area (GTA). Two urban design scale sub study areas are reported on here that illustrate how visualization can be used to represent urban heat island effects in a 3D model of an downtown core area district and a suburban district. The study included an examination of downtown Toronto's complex 3-dimensional urban form in the core area and the adjoining 19th Century tree lined neighbourhoods. The suburban district study area looked at a contemporary industrial area surrounding the nation's largest airport and logistics node at the junction of Toronto's suburban periphery and the cities of Mississauga and Brampton. A regional watershed conservation authority (Toronto Region Conservation Authority - TRCA) promotes climate change adaptation among participating private sector industrial partners in the Pearson Eco Industrial zone. The zone encompasses three different municipal jurisdictions and the Partners in Project Green aims to tackle sustainability planning that reaches individual property owners and corporations. Toby Lennox, Vice President, Corporate Affairs and Communications, Greater Toronto Airports Authority describes the project in this way, "Partners in Project Green is the first large-scale effort at addressing climate change in a renewal setting. It's also significant because it takes an integrated approach. It doesn't just focus on energy and waste management issues – as important as they are – it also looks at green space improvements, employee health and productivity, and ultimately green jobs" (as cited in Partners in Project Green, n.d.).

THE EVOLVING CAPACITY TO UNDERTAKE 3D VISUALIZATION IN EVERYDAY PLANNING SITUATIONS

The Centre for Landscape Research (CLR) at the University of Toronto has been actively engaged in developing visualization techniques along with computational e-planning and urban design tools for thirty years. The research undertaken in the Centre is exploratory and based on inventing, adapting and

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