Transport policy evaluation in metropolitan areas: The role of modelling in decision-making

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Abstract

The adoption of Integrated Urban Models (IUMs) is increasingly being recognized as a tool to support transport policy appraisals in metropolitan areas. In Canada, the ILUTE (Integrated Land Use Transportation Environment) project is an IUM framework currently under development. While model development is undertaken by academics, the implementation of ILUTE is meant to occur within planning organizations thus rendering the success of model application dependent on available resources for modelling and planners’ attitudes towards the role of models. In an attempt to render the ILUTE modelling framework more “policy-sensitive”, a survey was conducted with planners and policy-makers pertaining to the three levels of government (municipal, provincial, and federal) in Canada. The survey collects information with respect to the current evaluation process of transport policy and its associated pitfalls as well as the desired state of policy appraisal and the need for more formal evaluation tools. Results show the presence of numerous challenges working against the proper development, adoption, and refining of models. The most notable of which include a general disbelief in the usefulness of models for decision-making, lack of resources for large-scale modelling exercises, and poor institutional integration among government departments. While local and national planning goals reflect the recent challenges of promoting environmental preservation, reducing social inequities, and improving the quality of life, modelling tools that can assess the impacts of proposed policies on these goals have lagged behind.

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1. Introduction

Travel demand forecasting is a crucial element in the overall transport planning process as it enables planners and policy-makers to formally test alternative policy scenarios and provides decision-makers with a basis for comparing costs and benefits of tested alternatives (Meyer and Miller, 2001). Most metropolitan planning agencies recognize travel demand modelling as a major component of transport planning. Yet, despite the growing role of travel demand models, there remain a large number of jurisdictions within Canada, the United States (US), and around the world that adopt outdated models or do not rely on modelling to support decision-making. This can be due to a range of factors such as a lack of resources, expertise, and data for model development or political resistance towards formalizing policy appraisal. In recent years, various research boards and high-level governments expressed concerns over the prevailing state of practice for organization, financing, development, and implementation of travel demand models in transport planning and raised questions regarding the role that “advanced” tour-based or activity-based models of travel demand can play in policy appraisal and the propensity of planning agencies to switch from traditional to advanced modelling practices. In order to address these issues in a
systematic way, a number of studies have been conducted that rely on reviews of strategic plans, questionnaire-based surveys, or semi-structured interviews as means for collecting information regarding the state of practice in travel demand modelling within planning agencies.

In 2007, the Transportation Research Board/National Research Council published the findings of a web-based survey conducted with more than 200 Metropolitan Planning Organizations (MPOs) around the US and in-depth interviews conducted with a smaller sample of MPOs (VHB Inc, 2007; TRB, 2007). The aim of the study was to capture the state of practice in metropolitan area travel forecasting both on the technical (general modelling methodology) and institutional (funding mechanisms and organizational structures) levels. In terms of the general methodology for travel demand forecasting, it was observed that the large majority of MPOs currently rely on trip-based four-step travel demand modelling, while only a few MPOs are using activity-based or tour-based models, and a small number of MPOs do not use travel demand modelling. In-depth interviews revealed that many MPOs are satisfied with their current model and believe it is adequate for most of their planning needs. Most areas have reported an increase in staff and budget for modelling since 2003 with a 78% increase in federal funding to support planning activities between 1992 and 2006. The most cited barriers to improvement of models were staff and budget; agencies that were found to be most active in exploring advanced practices were the ones with the larger staffs and budgets. In addition, a major issue that was brought-up was the level of comfort of agency staff in model results in general and in the advanced models in particular. Many agencies mentioned a reluctance to switch to more complicated and data-intensive tools unless it is proven that the new model structures would produce “better” results.

In the context of a research dissemination initiative, face to face interviews were conducted with participants in higher and lower-tier municipalities in the Greater Toronto Area (GTA) as well as provincial ministries in Ontario, Canada (Roorda et al., 2006). The survey aimed at capturing participants’ reactions towards the potential for applying integrated land-use and transportation models as well as activity-based models of travel demand in policy and planning. Most of the participating organizations expressed limited capabilities to run large-scale integrated land-use and transportation models while stressing the need for such models in assessing the sustainability of transport and land-use plans. Reservations were also expressed regarding model specification and logistics for running advanced models and processing their results. One participant suggested that such models are so far beyond the industry standard that it would be unlikely for practitioners to use them directly. Davidson et al. (2007) discuss the reluctance of many large MPOs to adopt advanced models because they perceive them as yet unproven and hence are unwilling to abandon the techniques they are used to. The authors stress on communication between modellers and practitioners in order for transportation planners to understand how the new approaches can better address their planning needs. Four key issues that need to be communicated to practitioners are suggested: (1) theoretical advantages of activity-based/tour-based models in terms of their behavioural realism, (2) practical advantages of advanced models, discussed in terms of particular policy issues and project types, (3) addressing misunderstandings and widely shared beliefs that added complexity is an opportunity to introduce errors rather than additional accuracy and that simpler models are more robust, (4) valid concerns with advanced models that are objects of ongoing research.

In 2006, Shepherd et al. (2006) published a paper summarizing the results of a study conducted in the UK designed to provide input guidance to the second round of Local Transport Plans (LTPs) covering the period 2006–2011. The research included a review of available LTPs as well as a series of interviews conducted with five local authorities of different sizes. The authors observed a wide range of levels of model use among authorities in the preparation of the LTPs. In general, authorities whose LTPs were of higher quality were those that used modelling more than those with the less successful LTPs. The interviews highlighted concerns regarding the resources and skills required for modelling. Other issues that arose during the interviews include: the need for support in terms of expertise and models rather than just financing local authorities to develop and implement models; the need for local models to be approved prior to application since their results would be used to allocate funds; the need for research into ways of assessing the impacts of new instruments – such as information provision and telecommuting – as well as ways of representing the impacts of policy combinations within one model.

Through a review of strategic regional transportation plans of selected MPOs in the US, Handy (2008), observed a discrepancy between planning goals and the technical aspects of policy appraisal namely; performance measures and travel demand forecasting tools. The author notes evident change in regional transportation goals which may be attributed to a shift in thinking brought about by recent challenges facing planning organizations in terms of achieving smart-growth and urban sustainability, reducing greenhouse gas emissions, and improving the quality of life of urban populations. Nevertheless, the fit between goals and measures was found to be weak; the most widely used performance measures remain traditional, using the concept of level-of-service. The single MPO that had measures matching its goals, made little use of modelling while the other MPOs that relied more heavily on modelling, did not closely match measures to goals. In addition, the author investigated the use of forecasts to support strategic planning and provide data for computing performance measures. A potential struggle on the part of MPOs is suggested, in terms of how to use forecasts in the planning process especially with the widening range of transportation goals, most of which cannot be assessed using traditional models. The author suggests potential evolutions of regional planning ranging from becoming “a much less quantified process” as new goals may not all be apt for inclusion within models, to “a more sophisticatedly quantified process” in light of the emergence of activity-based and microsimulation models.

These earlier studies suggest a need to improve travel demand modelling practices currently adopted in metropolitan areas in order to enable planning organizations to appraise policy measures based on the “new planning goals” in a systematic way.
While many success stories exist whereby planning agencies have transitioned from the use of traditional 4-stage models to activity-based or integrated land-use and transport models, means adopted to achieve such a transition are highly context-specific and depend on local organizational structures for metropolitan transportation planning.

Planning agencies in Canadian urban areas are no exception to the global pressures for improving policy appraisal tools in order to reflect the growing complexity in travel demand patterns and the wider range of planning goals such as accessibility, environmental protection, and quality of life. In Canada, the ILUTE (Integrated Land Use Transportation Environment) project is an integrated land-use and transport framework currently under development by a consortium of researchers (Miller et al., 2004; Salvini and Miller, 2005); it incorporates a microsimulation, activity-based travel demand model, TASHA (Travel Activity Simulator for Household Agents) (Miller and Roorda, 2003). ILUTE can simulate a wide range of policies, reflecting performance measures that better match new goals of environmental preservation and social equity. Nevertheless, its use by planning organizations in Canada bears many challenges, notably related to available resources for modelling and formal policy evaluation. Besides modelling capabilities, it is hypothesized that the attitudes of senior planners and policy-makers with respect to the role of travel demand modelling as well as political climates within specific agencies have an effect on the adoption of advanced models to inform policy decisions. For this purpose, assessing the viability of such hypotheses holds value in bridging the gap between modelling and decision-making and understanding the potential for using integrated land-use and transportation models when evaluating strategic policy directions.

Motivated by the need to inform model development and application as well as render the ILUTE modelling framework more policy-sensitive, a survey was conducted with planners and policy-makers pertaining to the three levels of government (municipal, provincial, and federal) in Canada. The survey targets three main components of transport policy namely, (1) modelling capabilities within agencies and attitudes towards models and decision-making; (2) current evaluation of external impacts of plans and assessment of transport sustainability; and (3) institutional framework for modelling and decision-making of transport plans and the extent to which transport decisions are integrated among different agencies. This paper summarizes the results of the first survey component, namely investigating the role of models and decision-making. The other two survey components (Hatzopoulou and Miller, 2008a,b) are summarized in light of their interaction with and importance to modelling and decision-making. Indeed, the second survey component provides an indication of the relationship between planning goals and actual modelling to assess the impacts of policy measures on these goals while the third survey component presents existing organizational structures for modelling and policy appraisal in Canada and discusses ways to enhance institutional integration in transport decisions.

Beyond this introduction, the paper starts with a description of the survey methodology and participating agencies including a description of the role of each agency in transportation planning; the second section gives an overview of time frames for planning within surveyed agencies; the third section presents the existing modelling tools for long-range planning and discusses the role of modelling in decision-making; the fourth section describes the types of personnel involved in modelling and decision-making; the fifth section summarizes the second survey component, discussing the effect of new planning goals on modelling and analysis tools; the sixth section summarizes the third survey component, discussing organizational structures for modelling and decision-making; the paper then concludes with a synopsis on the main challenges facing policy analysis in Canada and ways to overcome them.

2. Survey methodology and participants

2.1. Selection of agencies and participants

The resources available have limited the survey to Canadian cities that are either major metropolitan areas or medium-sized cities that are expected to grow as a result of an increasing rate of immigration (Statistics Canada, 2006). These areas are expected to have more pressure in terms of developing and implementing strategic growth plans and integrated transportation policies and therefore more exposure to the process of policy appraisal, implementation, and monitoring. The following cities were selected: Vancouver, British Columbia; Calgary, Alberta; Edmonton, Alberta; Montreal, Quebec; Quebec City, Quebec; Ottawa, National Capital; Waterloo-Kitchener, Ontario; and various regions within the GTA, Ontario as it is the fastest growing area in Canada in terms of population.

A literature review of various strategic growth plans, transportation master plans, and municipal official plans related to the selected urban areas was conducted (Region of Waterloo, 2006; City of Vancouver, 2006; GVRD, 1999, 2006; CMM, 2005; RTC, 2005; Region of Peel, 2005; MPIR, 2005; AMT, 2003; COSGP, 2003; City of Markham, 2002; City of Toronto, 2001). The review allowed for pinpointing the different agencies that have a role in transport planning and policy-making as well as relevant individuals that are senior enough to provide both a technical and a policy perspective. Selected individuals were contacted by email and invited to participate in the survey, a brief description of the survey and its goal were provided. The contacted individuals were also asked to suggest other individuals in their agency or in other agencies within the urban area that were involved in plans or policy that would be of interest to this study. A total of 35 individuals were contacted out of which four did not respond to the invitation and the rest were interviewed.

1 University of Toronto, University of Calgary, Université Laval, McMaster University, Wilfred Laurier University.
2.2. Description of questionnaire

The survey consisted of 27 interviews conducted between May and October 2006. Interviews were semi-structured and lasted for 1–1.5 h. Semi-structured interviews enabled the researchers to focus the discussions around the main survey themes and at the same time, not restricting the participants to a fixed structure. Most of the interviews were conducted with one participant while four interviews were conducted each with two participants at the same time, thus amounting to a total of 31 participants. All interviews were recorded.

The questionnaire is divided into three components and seven sections: **Component A:** (1) time frame for planning (long-range vs. short-range planning); (2) existing modelling tools and role of models in decision-making; (3) involvement in modelling and decision-making; **Component B:** (4) assessment of external impacts of plans (environmental, economic, and social) and sustainability planning (including a discussion on the potential use of sustainable transport indicators as a link between models and policy-making); (5) foreseen business as usual future of transportation in the region; and **Component C:** (6) major changes in policy environment witnessed in agency and region; (7) existing and desired institutional framework for integrated policy appraisal and decision-making.

The first three questionnaire sections (**Component A**) are of most significance to the discussion on the extent of model influence on decision-making. Given this, their results are described in detail within this paper. The two other survey sections are summarized as they highlight the broader implications of modelling and policy appraisal.

In addition to responses to the survey questions, background data on agencies (types of plans and policies currently being drafted/implemented and time frames for long-term and short-term plans) and participants (position in agency, years spent in current position, educational background, and main responsibilities) were collected.

2.3. Participant profiles

A generic list of agencies, departments, and participants’ positions surveyed is presented in Table 1. Most surveyed departments are planning departments and most participants are either heads of departments or managers of transportation thus indicating a certain level of seniority within the survey sample. In addition to the occupied position, the number of years spent at the current position was collected. Out of the 31 participants, 11 have been in their current position for more than 10 years while 12 have been in the current position for 6–10 years and 8 have been in the position for less than 6 years.

<table>
<thead>
<tr>
<th>Agency</th>
<th>Department/division</th>
<th>Interview 1 – Participant(s)</th>
<th>Interview 2 – Participant(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Municipality</td>
<td>Transportation planning</td>
<td>Head of modelling</td>
<td>Manager – Forecasting</td>
</tr>
<tr>
<td>Municipality</td>
<td>Transportation planning</td>
<td>Director</td>
<td>Program manager of transportation planning</td>
</tr>
<tr>
<td>Municipality</td>
<td>City planning</td>
<td>Manager of transportation</td>
<td>Director of data and modelling group</td>
</tr>
<tr>
<td>Municipality</td>
<td>Engineering</td>
<td>Director</td>
<td>Director of infrastructure planning branch</td>
</tr>
<tr>
<td>Municipality</td>
<td>Transportation – Strategic planning</td>
<td>Director</td>
<td>Director of transportation planning</td>
</tr>
<tr>
<td>Regional municipality</td>
<td>Planning and development services</td>
<td>Director of data and modelling group</td>
<td>Manager of transportation planning</td>
</tr>
<tr>
<td>Regional municipality</td>
<td>Planning</td>
<td>Director</td>
<td>Director of infrastructure planning branch</td>
</tr>
<tr>
<td>Regional municipality</td>
<td>Regional development</td>
<td>Manager</td>
<td>Director of land-use planning</td>
</tr>
<tr>
<td>Regional municipality</td>
<td>Planning</td>
<td>Director</td>
<td>Director of transport planning</td>
</tr>
<tr>
<td>Regional municipality</td>
<td>Directorate of metropolitan planning</td>
<td>Director</td>
<td>Manager of transportation planning and research</td>
</tr>
<tr>
<td>Regional municipality</td>
<td>Planning department works department</td>
<td>Manager of transportation planning and research</td>
<td>Manager of transportation infrastructure</td>
</tr>
<tr>
<td>Transit Service planning</td>
<td>Service planning</td>
<td>Director</td>
<td>Superintendent – Route and system planning</td>
</tr>
<tr>
<td>Transit Service planning</td>
<td>Planning and development</td>
<td>Project manager</td>
<td>Coordinator: Systems &amp; IT of metropolitan transport</td>
</tr>
<tr>
<td>Provincial ministry</td>
<td>Transportation planning</td>
<td>Director</td>
<td>Chief</td>
</tr>
<tr>
<td>Provincial ministry</td>
<td>Planning</td>
<td>Vice president</td>
<td>Director of surveys and project manager</td>
</tr>
<tr>
<td>Provincial ministry</td>
<td>Modelling of transport systems unit</td>
<td>Senior planner</td>
<td>Director of surveys and project manager</td>
</tr>
<tr>
<td>Provincial ministry</td>
<td>Ontario growth secretariat</td>
<td>Assistant deputy minister</td>
<td></td>
</tr>
<tr>
<td>Provincial ministry</td>
<td>Economic analysis</td>
<td>Director: Economic and environmental analysis and research</td>
<td></td>
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<tr>
<td>Provincial ministry</td>
<td>Environmental affairs</td>
<td>Director general</td>
<td></td>
</tr>
<tr>
<td>Federal agency</td>
<td>Transportation energy use</td>
<td>Director general</td>
<td>Assistant director</td>
</tr>
<tr>
<td>Federal agency</td>
<td>Economic analysis</td>
<td>Director general</td>
<td></td>
</tr>
</tbody>
</table>
that if this classification is made based on the years of experience, a significantly higher number of participants would be in
the >10 years range since a large portion of “new directors” with less than 5 years in their current position, have had senior
positions in other agencies or other departments within the same agency.

In terms of participants’ training, the three backgrounds encountered among the survey sample include, economics, engi-
neering, and planning/geography. Federal level, participants are predominantly economists while in municipalities, there is
predominance of engineers (Table 2).

2.4. Agency profiles

The 27 interviews were distributed among the three levels of government (four interviews at the federal level, three inter-
views at the provincial level, and 14 interviews at the municipal/regional municipality level) and six interviews were within
transit agencies. Beside the four interviews conducted at the federal level (National Capital), the rest had a cross-country
representation with 12 in Ontario (Ottawa, Toronto, York, Peel, Durham, Markham, Waterloo), six in Quebec (Quebec City,
Montreal), two in British Columbia (Vancouver), and three in Alberta (Calgary, Edmonton). A total of 20 different agencies
were surveyed (Fig. 1).

The breadth of agencies surveyed represents the wide range of government departments with transport-related respon-
sibilities in Canada. In fact, the decentralization of the Canadian government structure, involving three levels of government
(federal, provincial, and municipal) has led to a spread of the transport-related jurisdiction over a number of government
departments.

The federal government is responsible for policies and programs targeting the national transportation system. It is also
responsible for international issues in transportation, new vehicle standards, aviation, and with some exceptions, marine

Table 2
Participants’ training/education.

<table>
<thead>
<tr>
<th>Agency</th>
<th>Economists</th>
<th>Engineers</th>
<th>Planners</th>
</tr>
</thead>
<tbody>
<tr>
<td>Federal</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Provincial</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Municipal</td>
<td>–</td>
<td>14</td>
<td>3</td>
</tr>
<tr>
<td>Transit</td>
<td>1</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>5</strong></td>
<td><strong>20</strong></td>
<td><strong>6</strong></td>
</tr>
</tbody>
</table>

Fig. 1. Geographic distribution of agencies surveyed, AMT = Agence Métropolitaine de Transport, CMM = Communauté Métropolitaine de Montreal,
GVRD = Greater Vancouver Regional District, MPIR = Ministry of Public Infrastructure Renewal, MTO = Ministry of Transport Ontario, MTQ = Ministry of
Transport Quebec, NRCan = Natural Resources Canada, TC = Transport Canada, TTC = Toronto Transit Commission, RTC = Réseau de Transport de la Capitale.
transportation, as well as national and interprovincial rail, bus, and truck transportation. On the federal level, Transport Canada is the major regulator and policy maker. The provincial government is responsible for intraprovincial transportation, economic regulation of interprovincial trucking, construction and maintenance of major highways, vehicle licensing and inspection, as well as enforcement of traffic rules. Most provinces involve their departments of transportation, public works, economic development, and environment in decision-making related to transportation. Often, provincial responsibilities are passed-on to regional and local municipal governments to provide for a more sensitive delivery of services. Municipalities are usually responsible for local planning decisions, such as municipal transportation, public transit, and parking fees. They are also responsible for the development and appraisal of strategic transportation plans, including the generation of forecasts. Strategic forecasts are conducted by each municipality on its own with occasional external (federal and provincial) funding. In general, strategic transportation plans are funded by municipal general levy and development charges. Municipal responsibilities mainly depend on the degree of delegation by provincial governments and on their size; larger municipalities generally have more scope for action than smaller municipalities. In certain areas such as the GTA, regional municipalities are established which mainly work with the lower-tier municipalities in their region since by law, municipal long-range plans have to be consistent with those of the region. Also, when municipalities prepare their transportation plans, the region has to approve these plans and can change them. In general, municipalities develop and generate forecasts for their own strategic plans which, in-turn, are reviewed by the region. The Federation of Canadian Municipalities (FCM) provides guidance to municipalities on issues including transportation and environmental protection (TC, 2004).

Beside the three levels of government, specific agencies have been established in some Canadian cities as a proxy to regional municipalities or as a means to link municipal and provincial visions as well as integrate various actors in transport decisions. Such agencies that were included in this survey include the Greater Vancouver Regional District (GVRD), TransLink, Communauté Métropolitaine de Montreal (CMM), and Agence Métropolitaine de transport (AMT). The following discussion provides a brief overview of the role and responsibilities of each.

The Greater Vancouver Regional District (GVRD) is a partnership of 21 municipalities and one electoral area. The Board of Directors comprises mayors and councillors from the member municipalities, on a Representation by population basis. It was established in 1967. The GVRD is responsible for the delivery of water, sewerage and drainage, solid waste management but also for developing plans and activities aimed at improving air quality, regional parks, and housing (Alexander et al., 2005). GVRD’s most significant and innovative role was the creation of its regional strategic plans thus allowing it to develop a sustainability agenda (GVRD, 2006).

The Greater Vancouver Transportation Authority (GVTA), more commonly known as TransLink, was created by the British Columbia Greater Vancouver Transportation Authority Act in 1998. Translink is governed by a 15 member board of directors. The GVRD is responsible for appointing 12 of the board members, and the Province is responsible for appointing the other three members. GVRD approves and ratifies TransLink strategic transportation plans, property taxes, toll charges, parking taxes or vehicle levies. TransLink has responsibility for the following, within the GVRD: transportation planning and funding, operation of the regional transportation system (bus, rail, custom transit services, and ferry service), funding cycling facilities, transportation demand management, the Major Road Network (in conjunction with the municipalities), and administering GVRD’s portion of the AirCare program (vehicle inspection and maintenance program) (TransLink, 2004).

The Agence Métropolitaine de transport (AMT) was established in 1996. It is governed by a council consisting of seven members: four are assigned by the Province of Quebec and three are assigned by the Communauté Métropolitaine de Montreal (CMM). It is responsible for planning, managing, coordinating and supporting the Montreal metropolitan transit system (bus, metro, taxi-bus, commuter trains and adapted transit), as well as for improving the efficiency of roads of metropolitan significance. AMT has the capability to implement high vehicle occupancy (HOV) lanes, integrate fares and services, and manage and develop the commuter train network. The territory of the AMT includes 82 municipalities, 13 regional county municipalities, and 14 transit authorities (MAMM, 1999).

The Communauté Métropolitaine de Montreal (CMM) is a planning, coordinating and financing agency which regroups 82 municipalities in the Montreal metropolitan area, it was created in 2001. CMM’s mandate spans land-use planning; economic development; cultural development; social housing; metropolitan infrastructures, services, or activities; public transport and the metropolitan arterial road network; solid waste management; air quality management; and water treatment. It has five commissions: land-use, environment, economic development, social housing, and transport. In terms of its involvement in public transport, CMM approves the strategic plan of AMT and has the authority to reject proposed changes in fares. It also reviews and has the power to approve or reject AMT’s budget. CMM also approves the strategic plans of public transit operators in metropolitan Montreal (CMM, 2002).

3. Time frame for planning

In assessing the extent and type of modelling within surveyed agencies, the time frame for planning is investigated, as it provides an indication of the planning horizon for long-range models and whether short-range plan appraisal is more or less common than long-range. As such, three main aspects of planning are captured, namely (1) whether an agency is more involved in short-range, operational planning or long-range, strategic planning; (2) differences in decision-making and policy analysis between long-range and short-range planning; and (3) credibility of long-range vs. short-range plans. Public engagement in long-range planning is also discussed.
3.1. Involvement in short-range vs. long-range planning

Table 3 presents a summary of the types of plans (and their time frames) which surveyed agencies are involved in. Federal level participants mentioned that they are not really engaged in planning but more in setting a framework related to national transportation policy. Short-range applications at this level are related to implementation of policies and programs. Long-range applications look at transportation markets (in terms of infrastructure, vehicles, fuels, etc.). They also mentioned that new realities are currently facing the federal government to push forward short-range policy rather than longer run strategic programs. They talked about a need to build model systems that can be fast enough to respond to decisions-makers’ requirements. They also highlighted the growing need for real-time data as a basis for short-range forecasts.

Provincial ministries surveyed said that they were not engaged in long-range modelling or planning. In one of the provinces, it was a political decision not to engage in long-range planning due to limited financial means. Needs and means are available only for small projects rather than strategic plans. According to one participant in Quebec, the current challenges facing the province do not warrant the development of new infrastructure but rather maintenance of the existing one.

At the municipal level, participants in planning departments (except in small municipalities) mentioned being more engaged in long-range planning rather than short-range planning. The latter is typically under the responsibility of other departments (operations, infrastructure, etc.). All interviewed cities were proud to say that they had a master plan or growth strategy which includes a long-range transportation vision. In fact, most municipal participants agreed that long-range visioning exercises were essential as precursors to long-range plans (“Visioning is an essential part of setting-up a road plan; how are we going to move from this point to a future we envision and want to end-up”). All plans have more or less the same goals of promoting economic growth, improving the environment and safety, reducing social disparities, and alleviating congestion. Transit investments and an increase in transit share were considered as a priority in all master plans. Most participants agree that long-range plans used to be less credible than short-range plans but now they are becoming more sophisticated and there is a higher “appetite” for them especially to establish a direction to a certain government.

In the case of transit agencies, except for one (which only conducts short-range operational planning), the surveyed organizations are involved in short-range, operational planning, as well as have their own medium range plans (10-years). Most transit agencies surveyed are distinct and autonomous entities from the cities. They mention having an advisory role in terms of the cities’ official plans which all have distinctively pro-transit orientations. According to transit agency participants, they provide cities with only an opinion but it is not necessary that their visions be adopted. Most transit agencies feel that they are facing the province do not warrant the development of new infrastructure but rather maintenance of the existing one.

In all cases, review of long-range plans is mandated every 5 years, however only in one case is an update actually being conducted exactly 5 years after plan enactment.

3.2. Differences between short-range and long-range planning

When asked about the main differences in both analysis and decision-making between long-range and short-range plans, two main points of view arose.

In terms of modelling and analysis; one portion of participants think that short-range plans are subject to short analyses and to political pressures while long-range plans have a more holistic approach and therefore a more thorough analysis of all

<table>
<thead>
<tr>
<th>Agency</th>
<th>SR planning</th>
<th>SR time frame</th>
<th>MR planning</th>
<th>MR time frame</th>
<th>LR planning</th>
<th>LR time frame</th>
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<tr>
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<td>x</td>
<td>25</td>
<td>√</td>
<td>10–15</td>
<td>√</td>
<td>20–50</td>
</tr>
<tr>
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<td>2–5</td>
<td>✓</td>
<td>10</td>
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<td>Provincial</td>
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<td>Provincial</td>
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<td>10–15</td>
<td>√</td>
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<tr>
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<td>3 months-1 year</td>
<td>x</td>
<td>x</td>
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<td>20–25</td>
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<tr>
<td>Regional municipality</td>
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<td>3 months-1 year</td>
<td>x</td>
<td>x</td>
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<td>20–25</td>
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<tr>
<td>Regional municipality</td>
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<tr>
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<tr>
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<td>3 months-1 year</td>
<td>x</td>
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<td>x</td>
<td>20–25</td>
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impacts/elements. Another portion think that long-range plans have a less thorough analysis while short-range plans are more apt for thorough analysis; they think that long-range planning has a vaguer context and its needs for precision are minor.

In terms of decision-making, a portion of participants stated that long-range plans are more abstract and more about a vision and an end state of what the region will look like while short-range plans are more detailed and more focused on implementation. They feel that short-range plans are more thorough in terms of details but long-range plans are more thorough in terms of comprehensiveness and vision/direction; they allow us to see priorities. Contrary to the latter statement, the other portion of participants stated that long-range plans represent some goals or directions but they rarely allow us to see priorities.

Most respondents agreed that political expediency and immediacy make short-range planning more prevalent whereby decisions are more imminent and people are more active (“Generally, long-range planning is constrained by provincial and regional visions and corporate policies while short-range planning is constrained more by political realities, funding availability, market conditions (where to improve the transportation system, what areas), and more immediate types of inputs that are not transportation-related or engineering related factors”).

3.3. Credibility of short-range vs. long-range plans

In terms of whether long-range plans are more or less credible, few participants had fixed positions (“long-range is more speculative, more uncertain which makes it less credible” or “short-range is more concrete, more defined but lacks depth which makes it less credible”) while the majority stated that there is no difference in credibility and that credibility is mainly a question of how much time is devoted to the document and highly linked with implementation (“No difference between long-range and short-range plans, credibility is tied to the way a plan is crafted, presented, and implemented”). In only a few cases, participants recognize the need for long-range credibility to achieve short-range credibility (“No difference between short-range and long-range in credibility. For short-range plans, generally the need and justification are based on long-range forecasts (capacity needs, network connectivity factors) and long-term needs. So the short-range also depends on the forecasts of the long-range”).

3.4. Public engagement in long-range planning

In terms of public engagement in long-range planning, most municipalities explained that they were facing difficulties in engaging the general public. Public hearings organized for strategic plans often attract only a few members of the community. The public feels that such plans will not materialize and as such people become more involved when specific projects are in effect, both at the planning but mostly implementation stages, and especially through project-specific Environmental Assessments (EAs) (“People are more interested in what will happen within the next 2 or 3 years. There are basic principles that people value (associated with the general concepts of their quality of life) but people cannot tie their daily actions with overall long-range goals. But when we talk about a new rail route or bus route or a new subway system, it is very much in their face and they do want to talk about it: cost, impacts on the community”). Indeed, according to the Canadian Environmental Assessment Act (1992), the project EA focuses on site-specific design and construction, operation or decommissioning issues. By contrast, the Strategic Environmental Assessment (SEA) applies at the level where decisions are initially made regarding a particular strategic direction. It addresses broad policy issues, long term planning and regional environmental concerns. The Canadian Environmental Assessment Agency requires an SEA if the proposal for a policy, plan or program is submitted to an individual Minister or to Cabinet for approval and/or if implementation of the proposal may produce a significant environmental impact, whether positive or negative (CEAA, 2004). Among all of the surveyed agencies, none of them has conducted an SEA for their transportation master plans.

4. Existing modelling tools and role in decision-making

A series of questions were designed in order to capture the different facets of modelling and its use for informing transport and land-use planning and policy; these questions target (1) the types of models developed and run within surveyed departments, (2) challenges faced in modelling, (3) extent of reliance on consultants for modelling, (4) roles of models in decision-making, (5) level of confidence in existing models, and (6) current questions facing the agencies and for which there is a need for better tools.

4.1. In-house modelling capabilities

The first question in this section directly probes participants to describe the types of models and analysis tools developed and run within the department. Three main categories emerge: namely; those who have relatively advanced models (Group
1), those who adopt classical modelling approaches (Group 2), and those who do not conduct much modelling but rely more on trends in existing data and mapping/visualization (Group 3).

Among the 22 departments surveyed, 3 have relatively advanced modelling capabilities. These include an enhanced 4-stage model that looks at all day travel and weekly data, might have a feedback loop to trip generation, and includes more choices than the classical 4-stage model. In addition, those agencies run dynamic and microsimulation models in-house. In one of the cases, the agency also has a tour-based commercial vehicle travel model.

Most of the departments (10) are classified under the “classical models” category. In this case, most of the tools used are aggregate static equilibrium models (e.g. the 4-stage modelling approach incorporating static user equilibrium traffic assignment, travel time-based elasticity models, and Cost Benefit Analysis or Cost Recovery Analysis). Little microsimulation is done and when needed, it is often outsourced.

In the last category, eight departments have significantly lower modelling capabilities whereby most of the tools are spreadsheet-type tools; or else, trends in existing data and professional judgement are relied upon. Among the participants in this group, some seem to be quite satisfied with the tools at hand (“I find that these types of models are more informative than the simulation models. Also simulation takes a lot of time and most often, we do not have that much time”) while others recognize some drawbacks (“We use a lot of professional judgement, stakeholder advice and indirect input. Also we use some analytical information and look into the results of academic research. We had long discussions, so our professional judgement is fine but we also need better understanding of the interactions between policies”).

4.2. Challenges in modelling

Participants were probed to cite the main challenges experienced in modelling, as presented in Table 4. The main cited challenges include a lack of resources, lack of skills/expertise, low confidence in existing models, high needs for refining and calibration of existing models, and data. In terms of the lack of resources for modelling, many participants tied this issue with a certain “agency culture” or prevailing political climate whereby there is a general cut-back in in-house modelling resources and a reduction in the number of modelling personnel within government agencies (“The main challenge is usually a resource challenge. We have very few resources with limited budget but overwhelming demand. Previously, we used to do everything in house but in the past 5 years the government changed its policy and decided that government agencies will become managers not doers”).

Beside the lack of resources, a large portion of participants feel that their low level of confidence in existing models is their most important challenge. Some of the responses include the fact that existing models are static, not sensitive to minor modes, can only model peak-period travel, and are not able to predict the effects of various Transportation Demand Management measures.

Most participants who complained about data mentioned the fact that existing trip diary data are not sufficient for modelling of transit and walk trips, especially in small cities as the number of households that are captured becomes small.

Many participants raised the issue that they are having a hard time finding skilled modellers and that junior modellers generally have a short lifetime in the agency (“You can’t hire experienced modellers since they don’t exist”). One participant raised the issue that academic institutions dedicate more time on the theoretical basis of models rather than making them operational (“In public organizations, maybe we have the ability to evolve models and maintain them alive but refinement of models is done in the academic field and if a model is disconnected from the university environment, it loses its precision and methodology. One problem of the academic field is that academics attach too much importance on the theoretical basis instead of finding a sub-optimum to be able to advance the model more rapidly”).

Table 4
Summary of main cited challenges.

<table>
<thead>
<tr>
<th>Challenge/response</th>
<th>Number of times mentioned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resources (staff and funding)</td>
<td>14</td>
</tr>
<tr>
<td>Skills/expertise</td>
<td>8</td>
</tr>
<tr>
<td>Level of confidence in the models</td>
<td>7</td>
</tr>
<tr>
<td>Refining, calibration, evolution of models</td>
<td>5</td>
</tr>
<tr>
<td>Data</td>
<td>5</td>
</tr>
<tr>
<td>Understanding of problems to be modelled</td>
<td>2</td>
</tr>
<tr>
<td>Explaining model results</td>
<td>2</td>
</tr>
<tr>
<td>Difficulty to keep up with the demands for analysis</td>
<td>1</td>
</tr>
<tr>
<td>Questions have become increasingly complex</td>
<td>1</td>
</tr>
<tr>
<td>Current impact measures are not enough</td>
<td>1</td>
</tr>
<tr>
<td>Tools are limited and don’t allow them to do the type of calculation and manipulation easily</td>
<td>1</td>
</tr>
<tr>
<td>Cannot take responsibility of developing models</td>
<td>1</td>
</tr>
</tbody>
</table>

* Some participants mentioned more than one response.
4.3. Extent of reliance on consultants

In terms of outsourcing of modelling exercises and reliance on consultants for the purpose of modelling, five different types of responses are distinguished namely (1) work with universities rather than consultants (five agencies), (2) use consultants to develop and maintain the tools but run them in-house (seven agencies), (3) work with consultants in a partnership (five agencies), (4) employ consultants only for specific studies such as Environmental Assessments (EAs) or microsimulation projects (10 agencies), and (5) fully rely on consultants for analysis (two agencies). Note that category 4 (specific studies) includes agencies in other categories as well.

Most of those who mention relations with universities have the best modelling capabilities. Their main concerns include refining and evolution of models and the ability to keep up with the increasing complexity of the questions faced. In the most advanced modelling groups, it seems that resources and data are not the most significant issues. They are more concerned with improving their models and advancing their modelling capabilities.

As reliance on consultants starts to increase, participants’ fear of becoming dependent on consultants’ work increases as well. Most of the agencies that use consultants to develop the models, calibrate them, and maintain them, prefer to run the models and interpret them in-house so as not to have to introduce a situation where they are dependent on consultants. Often, when an outsider develops a tool, they also get involved. Work done by consultants is viewed as a “black box” and when a consultant provides numbers they are not very confident. Within this group, the main challenges mentioned include resources, data, and expertise. It seems that consultants are relied upon to fill these gaps even though agencies are very cautious with respect to the work conducted by consultants and the “fear of dependency” is quite prevalent. Note that four of the six participants in this group are from the federal level. Four of the six participants in this group were categorized in the “lowest modelling capabilities” group.

Opposite to the previous group, where consultants are hired for development of the tools but where most of the modelling is done by the agency itself, this group works with consultants in a partnership relation. Irrespective of whether a consultant was hired to develop the model or not, the consultant would be working with the in-house team on the same project. In most of the cases, the consultant develops the scenarios and prepares the input data while the agency runs the model and provides the consultant with the results for high-level interpretation and report writing. This group has less modelling expertise and resources than Group 1 but not necessarily less modelling expertise than Group 2. The relationship with the consultant is established based on a certain “culture” within the institution. Note that among the participants within this group, mistrust and lack of credibility in the work of consultants is rarely mentioned. Participants do not have a problem trusting the work of consultants especially since the work is conducted in partnership. However, they mention previous bad experiences with consultants that led them to become more proactive when a consultant is hired for a specific task. The main challenges mentioned by this group include resources, data, and expertise. All of the agencies in this group were previously categorized in the “classical models” group.

In most of the cases, consultants are also hired for specific studies such as EAs or work requiring advanced simulation (e.g. traffic microsimulation). In this case, modelling, high-level analysis, and report writing are entirely dedicated to the consultant. Two participants mentioned a complete reliance on consultants for any type of modelling/analysis. Those two agencies do not want to invest in a modelling unit.

4.4. Role of model in decision-making

Based on the existing conditions within each agency, participants were asked to discuss the role that their own models and model results play in decision-making within their urban area. Participants were urged to talk about the current situation rather than provide their opinion on how they view the model’s role to be. Attitudes with respect to the role of models were classified into five main categories ranging from those who treat the model as a cornerstone in the evaluation of strategic directions to those who find their models not useful for decision-making. Table 5 summarizes the five main categories of responses as well as the number of interviews in each category; each participant was attributed to only one category based on his/her attitude towards modelling in the context of decision-making. Two participants did not address the question per se and responded by associating the usefulness of the model with understanding its limitations or the extent to which results are explainable.

The four participants who mentioned the model to be a real driver of decisions belong to Group 1 in the modelling capability classification, i.e. they have the most advanced models. This is not surprising as the more advanced the tools are in a certain agency, the higher the level of trust in those tools, the more modelling is actually conducted, leading to more reliance on model results (“We rely fairly thoroughly and excessively on the results of models to justify some of the decisions and look at some of the policies that shape the transportation system as well as set directions as to where we should be investing our capital and resources”).

The next category in Table 5, includes the majority of the responding agencies whereby participants mention that they attribute a certain role to models in decision-making but also acknowledge that other factors (such as public opinion, political agendas, “externalities”) come into play that diminish the weight of the model on the ultimate decision. This is not to say

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4 In this case, one response per interview is included even if an interview is conducted with more than one person at the same time since participants in the same interview had the same positions/attitudes.
that the previous group states that decisions are made solely based on modelling results but in the case of this group, the model seems to be relied upon but not as heavily thus giving more weight to the other components (“We could make better decisions if a model was available but even without a model we can still make the right decisions”). Most of the participants in this group adopt “classical models”.

Participants in the third category view the usefulness of models mainly for operational planning or optimization of design solutions rather than for informing strategic decisions (“Models are useful but secondary to decision-making. They are mainly useful for technicians for optimization issues”; “We should not start with modelling to make a decision but start with a decision and go down to modelling”).

Participants in the fourth category view models as useful only to add credibility to the planning process by “generating a number” but are not really useful in the ultimate decision (“The model definitely adds credibility to the questions we were trying to answer. But it could also be argued that it didn’t tell us anything that we didn’t know at the onset. It just proved what we always thought. In no case did the results of a simulation really affect the final decision. Information was only used in support of the decision we were leaning towards”).

The four participants in the last category, who are very pessimistic with respect to the role of models in decision-making, hardly conduct any modelling. It seems that the weight of model results in the final decision is related to the level of model sophistication whereby as the model is more advanced, it is relied-upon more heavily which in-turn puts pressure to keep on improving and refining it. In contrast, in the case where models are not developed or run to start with, there is a resistance to internalize “analytical results” into a decision (“Transport planning decisions are not modelling decisions but societal choices. In the context of decision-making, we think that we will make decisions based on the strength of analysis. In reality, we make decisions where sometimes the strength of analysis has no role in the final decision”).

4.5. Confidence in existing models

This question was mainly addressed to agencies with reasonable modelling capabilities (not the ones who mostly rely on data and expert judgement). Most of the responses are in the same range; there is a kind of overall satisfaction with the models available despite the recognition of their main weaknesses. Whether they have advanced modelling capabilities or less advanced ones, participants have more or less the same level of confidence in the analysis they conduct. In general, participants are aware of the drawbacks of current models but are fairly satisfied with the way the analysis is conducted and the way model results are handled (“We have a good level of confidence in the model but we recognize the limitations of such models that we are trying to capture a myriad of individual decisions into basic aggregates and averages for the populations”, “We recognize that the model will give the right indication or analysis but there will always be variations in the numbers”). The highest level of confidence is portrayed by the agencies that were classified under the “advanced models” category in the previous section (“We have a high confidence in the model; it is a very powerful tool because we have spent much time trying to produce something that is useful and provides sensible results”).

Some participants mentioned the desire to improve their models but in only two cases did participants mention a strong need for integrated land-use and transportation models to be developed for their region (“By having only a transport model, we are not taking into account feedbacks that will result in different spatial allocations and give different economic outcomes so we need to have an integrated land-use transport model. The reality now is that everyday we have to support decisions with only the transport part and try to get people a level of confidence that the decisions we are making are good decisions while cautioning them that they do not have the whole picture. You cannot tell them that without an integrated model, you cannot make good decisions because it means that you are leaving them in the vacuum. We need to caution them about what the model does not take into account but also give them something that can support their decisions”). One participant is a strong advocate that the ability to understand is fundamental to making better decisions (“We need more understanding of transportation and land-use effects to be able to plan for transportation and land-use together”).

4.6. Policy questions that current models do not address

The main drawbacks in existing models were briefly discussed by some participants when they were probed to cite the main challenges they are currently faced with in terms of modelling (Table 4). This issue was reiterated when all participants

<table>
<thead>
<tr>
<th>Category/response</th>
<th>Number of participants/interviews</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model is a cornerstone in the evaluation of strategic directions</td>
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</tr>
<tr>
<td>Recognize role in decision-making but acknowledge other factors (public and stakeholder, political agendas)</td>
<td>8</td>
</tr>
<tr>
<td>Help refine and optimize projects. Are useful more at the design stage after a decision has been made</td>
<td>5</td>
</tr>
<tr>
<td>Help remove ideologies/anecdotes in debates. Increase credibility of the planning process</td>
<td>4</td>
</tr>
<tr>
<td>Models are not useful for decision-making</td>
<td>4</td>
</tr>
<tr>
<td>Understand limitations of models and try to compensate for that</td>
<td>1</td>
</tr>
<tr>
<td>Usefulness associated with explainability of results</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 5
Summary of participants' view of the roles of models in decision-making.
were asked about the most pressing policy concerns that they are currently facing and that current models fail to address or provide an explanation for.

From a land-development or planning perspective, the issues raised by participants relate mainly to the effect of increased population and employment densities as well as live/work opportunities. Most of the issues are tightly linked with projects that are currently on the agenda of municipalities and where the outcomes of such initiatives are still uncertain. For example, in the Greater Golden Horseshoe area, in Ontario, the Places to Grow Act, developed by MPIR (2005), has imposed on municipalities target population and employment densities to be achieved within a specific time frame. This has put enormous pressures on planning departments in terms of figuring out how to achieve those densities and where to put their urban boundaries. In one of the cities, the participant mentioned that a density cap had recently been lifted to promote an increase of densities thus allowing them to become “anything that a community can sustain”. However, planners are faced with the question of what a sustainable density is (“From a transportation perspective would we allow congestion to occur? Do we try to manage it?”). Another participant also raises the issue of intensification and its extent (“Intensification is now on the agenda but it is hard for us to know how much of a walkable community is feasible”). In another city, where expansion of the light rail transit (LRT) network is planned, one question that planners are trying to answer relates to the development close to LRT stations (“...from a market perspective, what does it take for developers to build close to LRT?”) One municipality mentioned difficulties in assessing the success of live/work developments and the types of residences and jobs that must be promoted (“For the master plan, we have developed a live/work area but the houses are expensive therefore, the people living there are not employed in the area and the people who have jobs there cannot afford to live in the residences provided. We wish we had a model that can predict who will locate where and who will work where. The main question is how far do we rely on the market and how far do we become social engineers. Do we have the capability to match residences and jobs? We need to look beyond providing population and employment: What kind of employment? What type of people? What kind of socio-economics?”).

In addition, several questions were raised with respect to the representation of minor modes within existing models and the need for models that have a better representation of transit and walking. One participant also mentioned the need for measures of transit reliability within existing models. In terms of assessing the impacts of transportation demand management (TDM) measures on actual travel, many participants raised the issue that no tools are capable to analyse TDM and they have to rely on assumptions at this stage. There is also a need to assess expenditure on transportation such as the percentage of household budgets devoted to transportation (as a social issue) in addition to the opportunity cost of dedicating urban space to roads and parking.

Finally, many participants mentioned their concern about the value of travel time; stating that current estimation procedures are not appropriate (“We are ending up with a flawed estimation with the way we are estimating travel time right now which could lead to biased results in favour of long distance commuting and large projects”).

5. Involvement in modelling and decision-making

This section deals with the human involvement in modelling and decision-making; as such, participants were asked to describe (1) the type of personnel responsible for modelling, mainly in terms of background/training, and (2) the relationship between modellers and non-modellers within the same agency.

5.1. Personnel in surveyed departments

Survey participants – who are often heads of planning departments or of modelling groups – were asked to list the backgrounds of their staff; three main disciplines were mostly mentioned: engineering, planning/geography, and economics (Table 6). At the municipal level, there is a prevalence of engineers (civil and transportation); planners and geographers are also employed but they are less numerous than engineers. In transit agencies, there is a mix of geographers/planners and engineers with more planners than engineers. On the provincial level, there are some engineers and planners, but also the presence of mathematicians, statisticians, and economists starts to be noticeable. On the federal level, the dominance of engineers over economists or planners is clear. Backgrounds of the different heads of departments follow this pattern as well.

5.2. Relation between modellers and policy group within the same agency

Mutual reinforcement between analytical work and policy advice is very important. In most of the agencies, participants noted a good working relation between modellers and non-modellers. In many cases, teams of modellers and analysts are formed on a project or task basis and discuss both modelling and interpretation approaches within the team. In a few cases, incomprehension between modellers and the policy-group were noted especially on the federal or provincial level. This could be mainly attributed to the fact that on the municipal level, there isn’t much segregation between the two groups; they normally comprise common members, are under the same department, and physically in the same space. While on the provincial and especially the federal level, modelling/analysis and policy/program groups are under different departments, physically in different locations, and headed by different people, which could promote different cultures and ways of thinking thus causing more clashes.
In many cases, modelling groups act also as service groups for outside clients. In that case, they not only conduct modellng related to the short-range and long-range plans of the department but address the needs of other departments within the agency (environmental or energy groups, etc.) as well as external clients such as community leagues and environmental groups.

Another issue that was mentioned during several interviews at the municipal level are the clashes between planning groups and operations groups within cities. As interviewed city personnel are all from transportation planning departments that mainly deal with long-range planning and public transportation, many of them expressed differences in thinking due to the differing mandates of planning and operations groups. While the operations department’s main motive is mobility; for the planning group, it is accessibility and alternative transportation (“We are not quite working to the same end. The operations side are doing the day to day work, but the planning department is not yet at a stage where they can communicate and convince them to divert some road funding into transit. We still need more integration and dialogue between operation and planning functions to make sure that the capital planning is met with the strategic planning because this is the biggest difficulty for the moment. The main challenge is coming to a compromise where planning will maintain the existing operations but not expand... this is a fundamental shift”). Other clashes within municipalities are noted between planners and engineers whereby one participant mentioned the need to overcome a “cultural divide” between engineers and planners who see models differently (“The main issue is not running the models but dealing with the planners and the land use department. A change process is needed within the municipality but also a significant cultural change from the part of land use planners. This is a significant challenge. The stumbling block is not in maintaining or developing models since expertise and knowledge are fairly available to us. The main problem is in overcoming the fear of planners that the model is going to take away their decision capabilities. Engineers see the model as a decision-support tool but planners see it as a threat. They are afraid that the model will tell them what to do and they won’t be planners anymore. A human change process is therefore required”).

6. Sustainability goals and modelling needs

Most Canadian urban areas have witnessed in recent years a prevalence of sustainability visions and goals within strategic transportation plans. Indeed, sustainable development objectives have become at the forefront of planning initiatives, incorporating goals such as transit expansions, promotion of live/work areas, intensification of development, and improvement of quality of life. Participants mentioned an increased sensitization of decision-makers and the public towards sustainability, environmental issues, and the importance of transit and alternative modes of transport. Some participants even
mentioned a change from the perspective of engineers and planners whose approach has moved from “building roads” to planning for sustainable transportation and “building communities”. In spite of the growing awareness of the need to shift growth patterns and promote more sustainable communities, very few participants mention an actual increase in funding. Indeed, most participants recognize a failure to induce change in current development trends despite a change in thinking and crafting plans (“The main question is: what did our master plans bring to the area? In fact, through these plans, we have managed to sensitize decision-makers to the pressing issues. However, we cannot really say that our master plans have succeeded in modifying growth patterns in the metropolitan area”). In addition, when asked about the types of external impacts assessed and performance measures, participants mentioned that at this stage of policy analysis, the most widespread measures being estimated are the ones that are directly output by transportation models, e.g. travel time, delay, speed, mode split, transit ridership, vehicle kilometres travelled, and trips; in addition to direct costs and benefits. Currently, estimation of environmental, social, and economic impacts of strategic plans is still in its infancy. While most participants recognize the importance of estimating the impacts of strategic scenarios, few agencies have impacts measures that are derived from model results. Even in these few cases, most measures are environmental (especially air pollution, greenhouse gasses, and land consumption) and economic. The latter are not clearly defined by the agencies and could be mistaken for direct costs and benefits. Federal and provincial institutions seem to be in a better position than municipalities with respect to impact estimation and seem to be more aware of such impacts and their importance in policy analysis. Sustainability measures are a subject of discussion when it comes to making strategic decisions in all agencies; still, there is no formalized way of internalizing these impacts within policy analysis.

Most participants attributed the lack in estimation of measures reflecting sustainability goals to a lack in funding and adequate modelling tools. Municipalities are still struggling with their own modelling tools in terms of updating them and finding modelling personnel and are not yet at a stage where they can estimate – or process information related to – sustainability impacts of policies. In addition, many participants mentioned reservations towards internalizing sustainable development objectives within the decision-making process. Their main objection was that sustainable development principles are too demanding and overwhelming to the planning process (both in terms of resource needs and analytical tools) and the results may not be very satisfying (“Questions will become much more complex and the answers will not say much”).

7. Institutional structures for modelling and policy appraisal

The complexity and interdependency of sustainable development goals call for greater policy integration across government departments both for modelling and discussion of policy scenarios. Yet, institutional structures in Canadian cities seem to be struggling between attempts to centralize decision-making under the umbrella of regional organizations and trends towards fragmentation and decentralization of decisions. Despite an emerging sensitization of the public and decision-makers in terms of the negative impacts of urban sprawl and a wider acceptance of public transit, the proper institutional mechanisms for travel demand forecasting, funding, implementation, and integration of the concerned agencies are still lacking. There is low institutional integration among the three levels of government and weakened regional visions within most urban areas. Most municipalities complain about the lack of involvement of the federal government in urban issues. They also suffer from clashes between municipal and provincial visions. Because of their mandate, provincial governments are mostly interested in provincial highways while municipalities are currently at a turning point whereby the provision of alternative transportation is crucial. The GTTA, GVRD, and CMM are all examples of sub-optimal attempts at integrating decisions.

Still, most participants stress the need for making decisions and implementing plans on a regional level. They mention the importance of regions and the need to establish new strategic institutions and cross-departmental working groups. Some participants think that there is a need in Canada for bodies like MPOs in the US to achieve better integration; while other participants think that there is no need for new institutions and that provincial governments are in a good position to play that role provided there is enough interest and leadership. Most participants agree that the federal level should not play this role due to its general detachment from urban/local issues (“The federal level is out of touch; it is only good at collecting and redistributing funds. Most transportation is local so the federal level is not really needed. Provincial and municipal governments are best at coming up with the blueprints”; “I have a good feeling about the provincial government playing this role but not the federal, a federal judge would be horrible!”). This point goes in parallel with the observation of Haynes et al. (2005) regarding the evolution of US transportation institutions which suggests that universal and far-reaching federal mandates may undermine long-term institutional sustainability.

8. Conclusion

This paper has presented the outcomes of the first component of an interview-based survey conducted with transport planners at the three levels of government in Canadian urban areas. This first survey component is targeted towards assessing the status of existing long-range urban transport models and their role in decision-making. The paper also summarizes findings of the other two survey components which help complete the picture as they discuss sustainability goals and their effect on current modelling and policy analysis tools as well as current institutional structures for planning and their role in improving policy appraisal.
The survey model adopted in this study proved highly effective whereby the semi-structured nature of the interview allowed participants to elaborate on their views and opinions regarding the status quo and a desired future. The survey starts with an investigation of the technical aspects of travel demand modelling within agencies and moves on to discuss the usefulness of models, the pressures of sustainable development objectives, and institutional structures. Those three components are highly interrelated and it is important for future surveys to address this interrelation rather than focus on one aspect. In addition, capturing participants’ opinions and views proved highly useful. While it is acknowledged that such a small-sample survey may not provide the breadth of existing views across the different agencies; still, it has provided an overview of prevailing attitudes among planners and policy-makers. Attitudes towards models can be an important factor working for or against model improvement and it is important for a survey of travel demand forecasting capabilities to capture this aspect.

The first survey component substantiates the ever-existing debate on the usefulness of models for decision-making, the need for improved models, and the obstacles to improving current modelling structures or switching to more advanced models. This situation is more accentuated Canada due to the following factors: (1) there is a lack of sustainable funding for modelling and policy appraisal, which translates into reduced capabilities for staffing and model improvement; (2) responsibility for strategic transportation planning and travel demand forecasting is primarily attributed to local municipalities, each municipality has its own travel demand model, and has responsibility over funding and maintaining it; and (3) where local municipalities and regional municipalities coexist, it is not always the case that local municipalities would rely on the travel demand forecasting capabilities of the region; often, they would have their own travel demand model for assessment of their own strategic plan which eventually have to be in-line with the region’s plan.

At this stage, the most pressing need is not to move selected planning agencies in Canada to more advanced activity-based or tour-based models but rather to provide the wide majority of agencies with support to fully maintain and improve their traditional models in order to achieve “good” state-of-practice travel demand models. In order to achieve this, changes need to occur on various fronts: funding and staffing, expertise, standardization of models, and organizational structures. Funding, staffing, and expertise go more or less hand in hand; with a lack of sustainable sources of funding for travel demand modelling, it is a tremendous challenge for municipalities to improve their models and build modelling expertise. This situation is particularly relevant to the Canadian context since most municipalities fund their modelling activities from general levy and development charges, which inevitably disadvantages smaller municipalities. There is no standard and sustainable mechanism for funding of models. Federal and provincial funding may be offered on occasions but the situation differs from one urban area to another and among provinces. Funding mechanisms for travel demand modelling need to be improved and “standardized” within Canadian provinces and urban areas to ensure a level playing field for all municipal agencies. In addition to funding, local municipalities within large metropolitan areas should “share” the same model structure to ensure that local municipal plans within large regions are in-line with regional plans. At this stage, since different models are used by different municipalities within regions or by neighbouring regions, a multitude of forecasts can be obtained by the jurisdictions involved in a specific project; this is particularly important in the treatment of cross-boundary projects. Finally, organizational structures for travel demand modelling need to be improved in the Canadian context whereby centralization of modelling should occur at the level of specific metropolitan agencies which in-turn can devote funds for building modelling expertise. This responsibility is overwhelming to small municipalities which can benefit from the use of a central model refined to their local area and updated/maintained by a central agency. Lessons can be learned from the organizational structures in the US, in particular, the relations between MPOs, state transportation agencies, and local counties.

Faced with these challenges, sporadic and localized attempts at improving models, representing sustainability impacts, and integrating decisions and modelling capabilities have been made in some urban areas. Such attempts have not been very successful thus stressing the need for more aggressive Canada-wide initiatives. It remains to be seen whether the views expressed by Canadian planners and policy-makers are shared by their American or European counterparts. Comparable sur-

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