

Survey Methods Workshop, University of Toronto, 3 October 2014



CHANGING PRACTICES IN DATA COLLECTION ON THE MOVEMENT OF PEOPLE (CPiDC)

Summary of the study undertaken by Lee-Gosselin Associates Ltd. for
Transportation Association of Canada

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SPONSORS



- Agence Métropolitaine de Transport
- City of Edmonton
- City of Mississauga
- Ville de Montréal
- City of Ottawa
- Halifax Regional Municipality
- Ministère des Transports du Québec
- Metrolinx
- TransLink
- Transport Canada

PROJECT STEERING COMMITTEE

- This study was carried out under the supervision of a project steering committee of volunteer members. The participation of these committee members throughout the project is gratefully acknowledged.
- Timothy Spurr, Agence Métropolitaine de Transport (Co-Chair)
- Lisa Salsberg, Metrolinx (Co-Chair)
- Stéphane Brice, Ville de Montréal
- William Hui and Lorie Srivastava, TransLink
- Ahmad Subhani, City of Ottawa
- Arthur Tai, Ontario Ministry of Transportation
- Rhonda Toohey, City of Edmonton
- Pierre Tremblay, Ministère des Transports du Québec
- Bob Sasaki, Norbert Orzel, Joe Perrotta, City of Mississauga
- David Maclsaac, Halifax Regional Municipality
- Eric Sevigny and Arif Husain, Transport Canada

- Katarina Cvetkovic, TAC (project manager)

Project Objectives



The objective of the *Changing Practices in Data Collection on the Movement of People* project is to prepare a practical, comprehensive framework for the **coordination, collection, processing and management of data** on the movement of people by all modes in Canadian urban areas that is implementable and addresses data needs across the range of Canadian transportation agencies.

Project Components



- Literature Review
- Data Integration/Fusion Methods
- Review of Data Sources for Urban Transportation Applications
- Design, Conduct & Report on a Survey of Canadian Transportation Data Collection Practice
- A Framework for Urban Passenger Transportation Data Collection & Management

=> 6 volume, 295 page Report

Recommended Framework about:



1. An institutional (and political) commitment to on-going data collection and management
2. Assessment of an agency's data needs
3. A multi-method approach to comprehensively and cost-effectively meet an agency's full data needs
4. Integration using data fusion and synthesis methods
5. Controlled experimentation to evolve methods
6. Growing of metropolitan travel survey territories

Focus of Literature Review



- **Population-based Surveys**
 - Definitions and Basic Concepts in Survey Design
 - Household Travel Surveys
 - Issues and Challenges of Telephone Interview Surveys
 - Methodological Advances
- **Choice-based Sample Surveys**
 - Roadside Intercept Surveys
 - Transit User Intercept Surveys
- **Technology-based Data Collection Methods**

Data Fusion Applications studied



- Using the combined datasets for analysis/modelling purposes (e.g., combined revealed/stated preference model estimation).
- “Filling in” missing data in a dataset (e.g., adding income estimates to a household survey).
- Creating a synthetic population for model forecasting purposes.
- Creating a “pseudo-panel” from repeated cross-section surveys.

Possible Ancillary Data Sources for Urban Transportation Applications

- ❑ Canadian Census.
- ❑ Other Statistics Canada (StatCan) datasets.
- ❑ Other federal (non-StatCan) datasets.
- ❑ Data collected by professional transportation organizations (TAC, CUTA, etc.).
- ❑ Municipal datasets.
- ❑ Provincial datasets.
- ❑ Commercial/private sector datasets.
- ❑ Open source datasets (typically web-based).

Types of Data Sources Used by Canadian Transportation Agencies



From our own survey:

- Over 50% used the Canadian Census, Municipality data, and Provincial data
- Over 25% used StatCan's Labour Force Survey, Other StatCan data, and On-line, Open-source data

CPiDC Survey



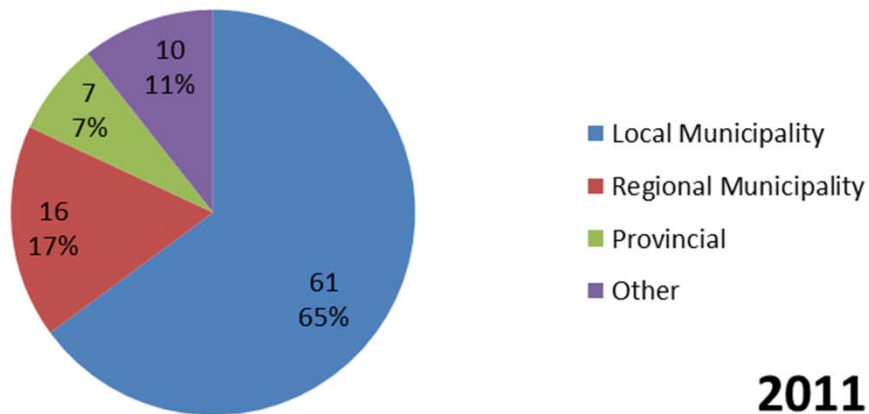
In order to identify current Canadian urban passenger transportation data collection practice, issues & needs, a national web-based survey of Canadian transportation agencies was conducted.

Respondent Characteristics

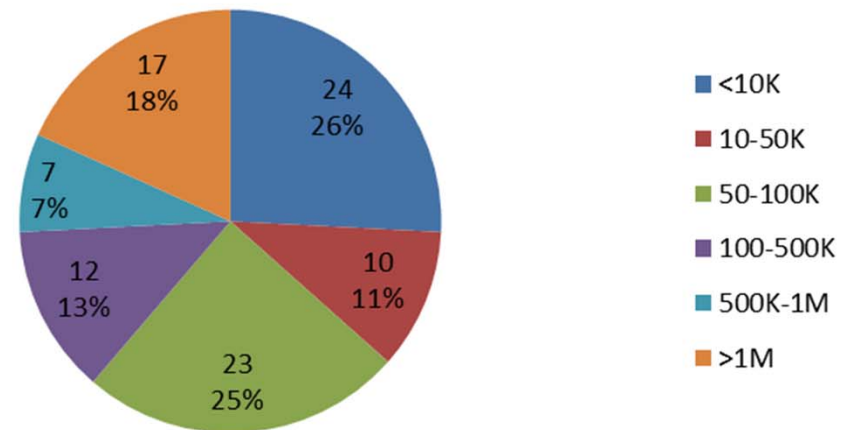
	Planning Department	Transportation Department	Public Works Department	Transit Agency	Other	Grand Total
Alberta	2	7		3	1	13
British Columbia	1	1	1		1	4
Manitoba				1		1
New Brunswick		2		3		5
Newfoundland & Labrador		1				1
Nova Scotia	2	1				3
Ontario	4	8	9	12	6	39
Quebec	2	4		12	3	21
Saskatchewan		1	1	1	1	4
Northwest Territories			1			1
Yukon					2	2
Grand Total	11	25	12	32	14	94

Respondent Characteristics

Level of Government

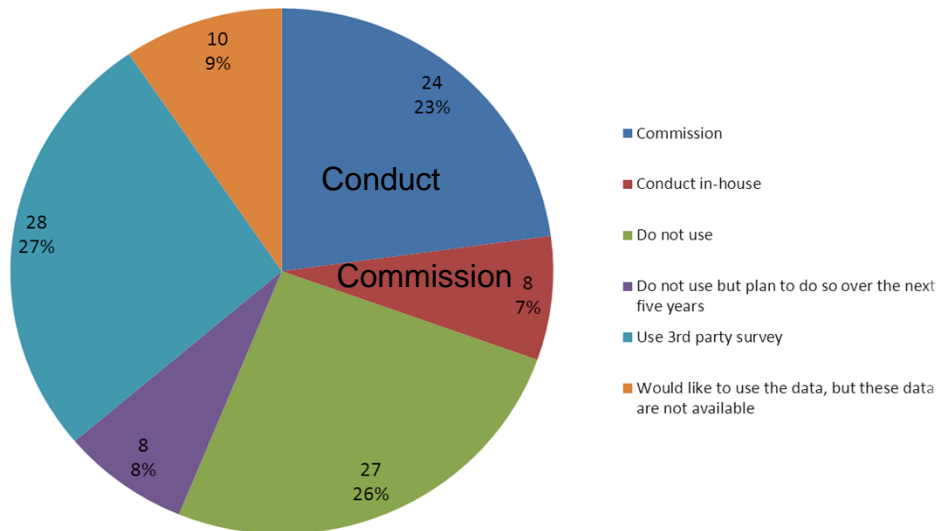


2011 Population Served by Agency

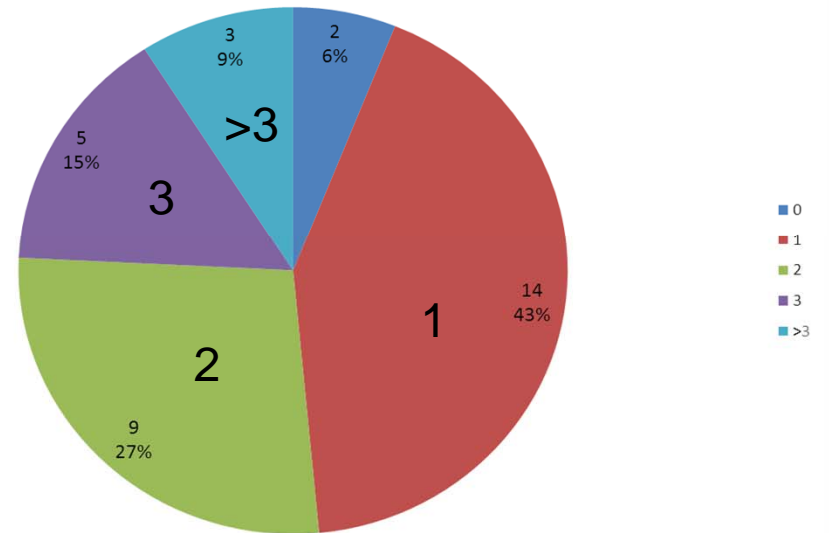


Household Travel Surveys

Agency's procurement and use of household travel surveys

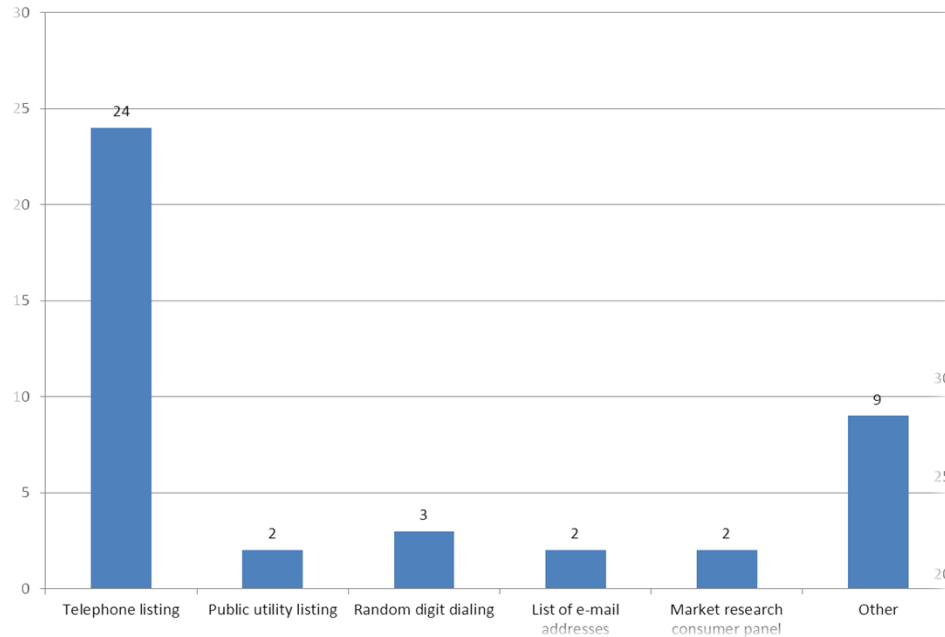


How many different Household travel surveys has your agency conducted or commissioned over the past ten years?

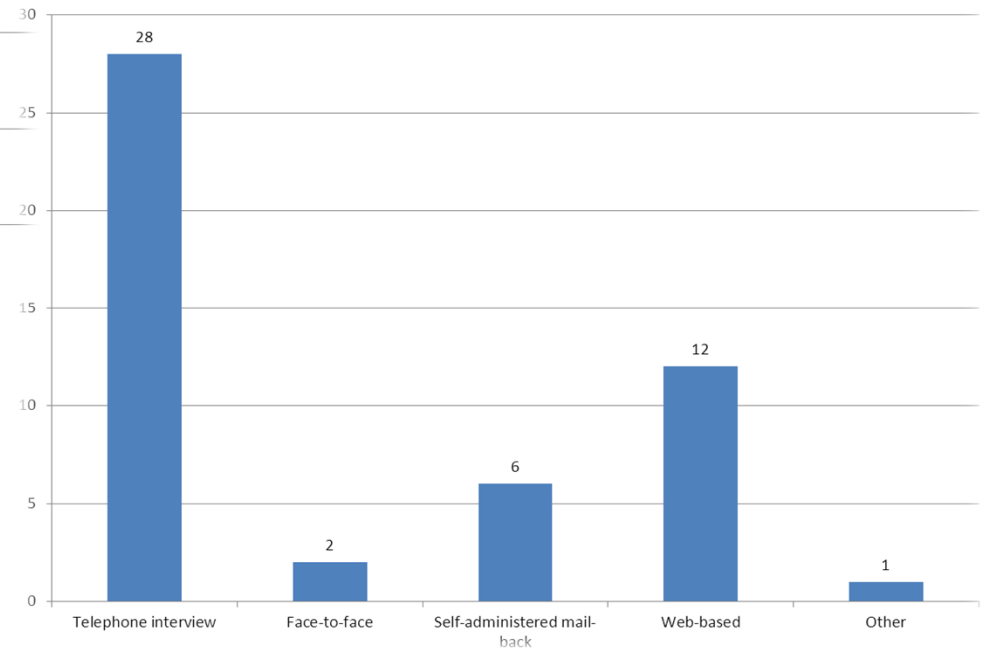


Household Travel Surveys

Sampling Frame

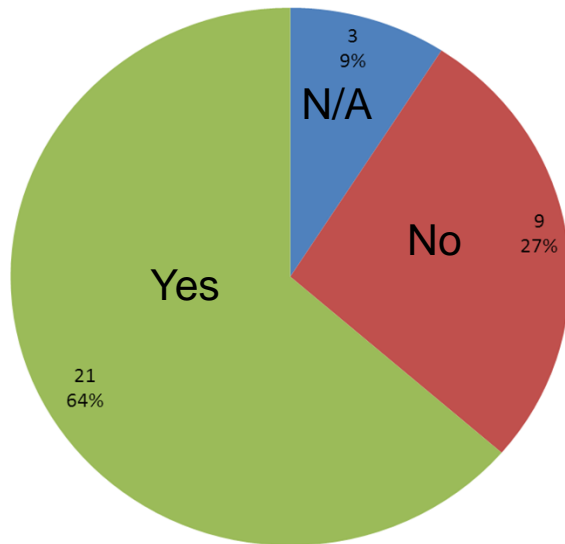


Interview Method

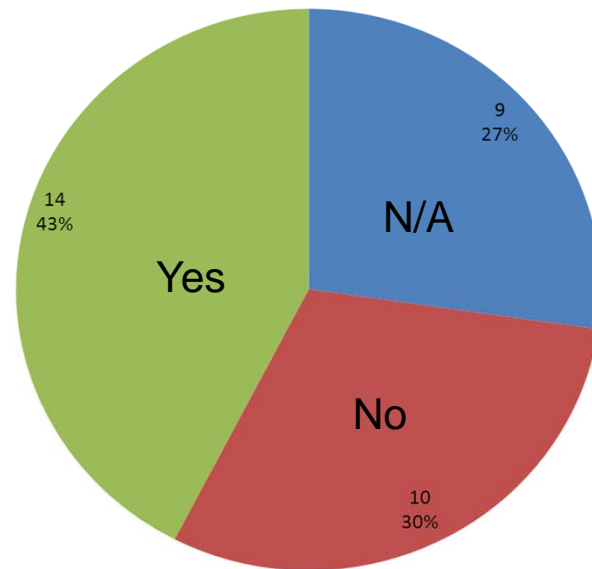


Household Travel Surveys

Do you have any issues/concerns with your current home-interview survey methods?



Do you have any plans for addressing these issues/concerns?



■ N/A
■ No
■ Yes

Technology-based Data Collection

	Use now	Plan to use in next 5 years	Do not use
Global positioning systems (GPS)	57	16	18
Other distributed or remote sensing technologies	42	3	43
Smartcards	25	19	46
Other transit pass technologies	16	6	63
Debit/credit cards	23	11	52
Social media	29	22	35
Other internet	45	12	30
Mobile devices	27	24	38
Other technologies	9	5	63

N = 93 public agencies

Barriers to Improved Data Collection



- Over 50% indicated inadequate budget, too few staff and competing priorities
- Over 24% indicated lack of perceived importance, lack of political support and/or limited technical capabilities of staff
- 13% indicated lack of management support
- Little else...

Framework must face these issues and trends

- Household surveys will remain a data collection priority
- Current methods face major challenges & must adapt:
 - ▣ Problems with land-line-based sampling frame
 - ▣ Problems with contacting & recruiting respondents
 - ▣ Problems with retrospective/proxy reporting
- New technology offer opportunities:
 - ▣ Multi-instrument surveys
 - ▣ Web-based surveys
 - ▣ Positioning (GPS/other) increasingly found on portable devices
- Social/Travel Behaviour Trends
- Technology Trends
- Trends in planning, policy issues, etc.

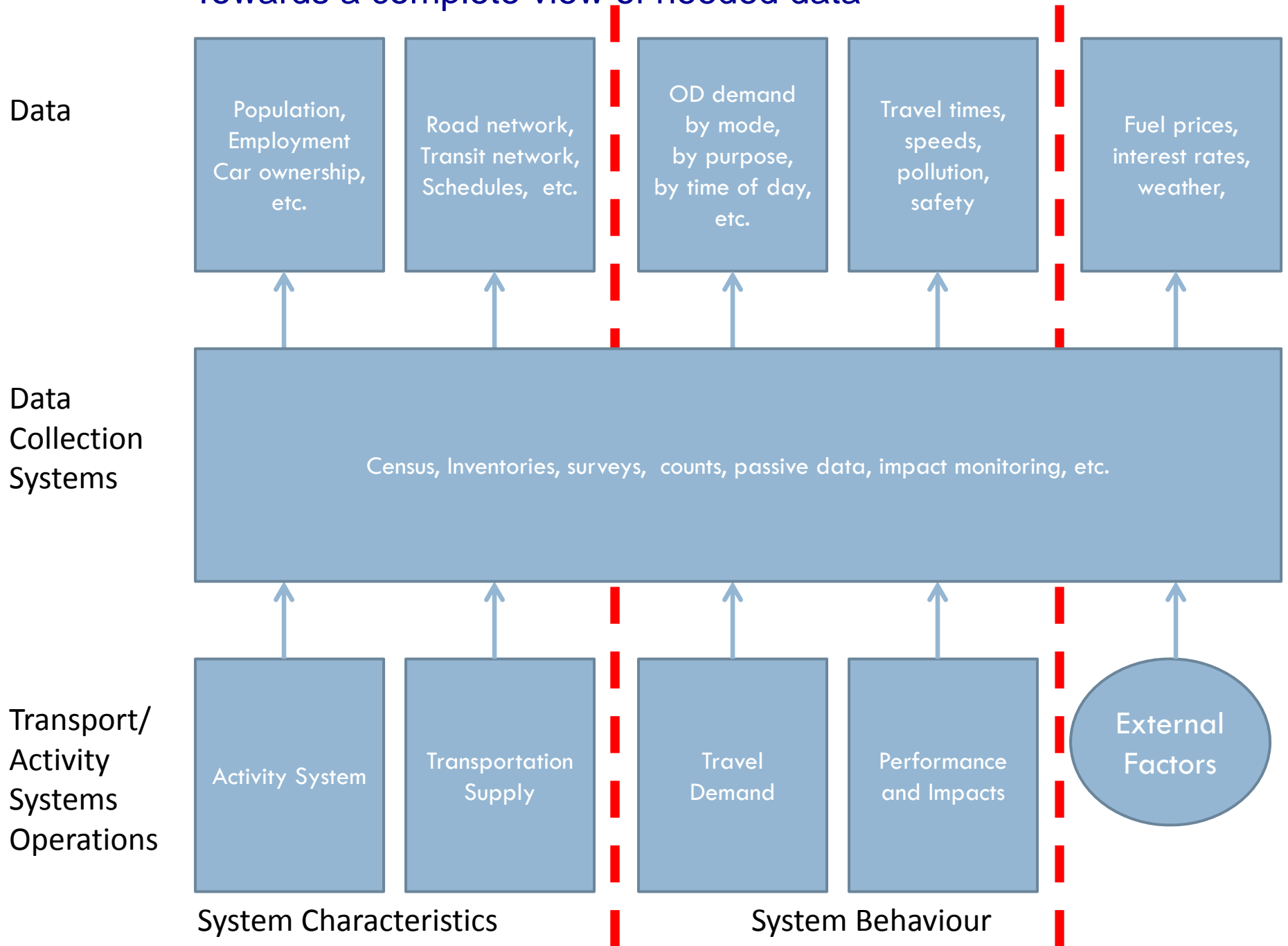
FRAMEWORK: main recommendations 1-3

1. An institutional (and political) commitment to on-going data collection and management, that is not ad hoc or fragmented, of secure, high-quality data to support evidence-based planning
2. A careful assessment of an agency's data needs, leading to a comprehensive, ideally object-oriented, model of its data requirements that guides the extent and timing of data collection, while protecting privacy.
3. A multi-method approach to comprehensively and cost-effectively meet an agency's full data needs through the wise and efficient utilization of a requisite variety of relevant data, including core and satellite transport surveys, and co-opted data from other sources.

FRAMEWORK: main recommendations 4-6

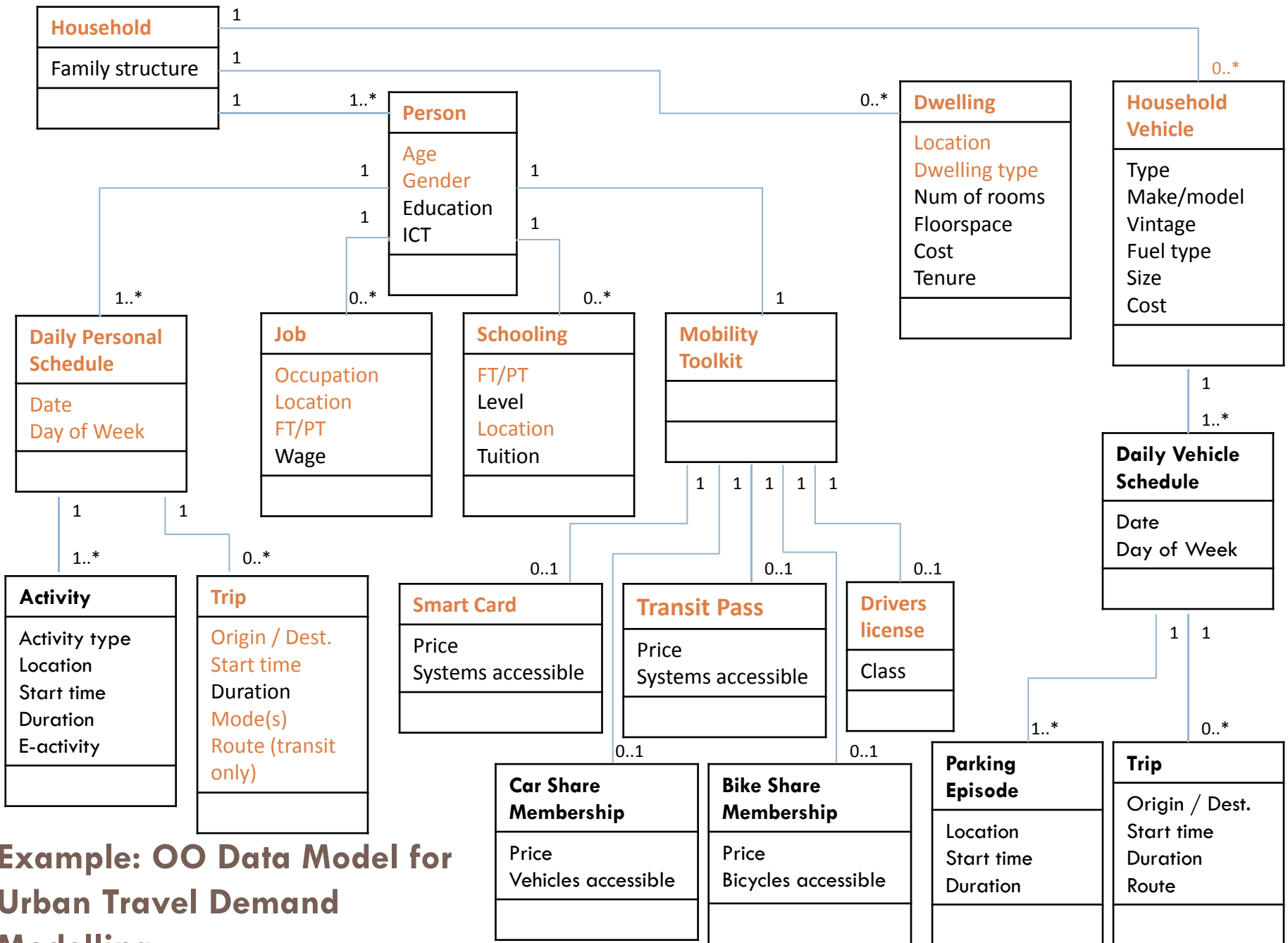
4. Integration using data fusion and synthesis methods that are *designed in* at the database planning stage to help operationalize the data model framework.
5. Controlled experimentation given changing needs and technological opportunities
6. Growing of metropolitan travel surveys to the provincial level

Towards a complete view of needed data



A Standardized Model of Transportation Data

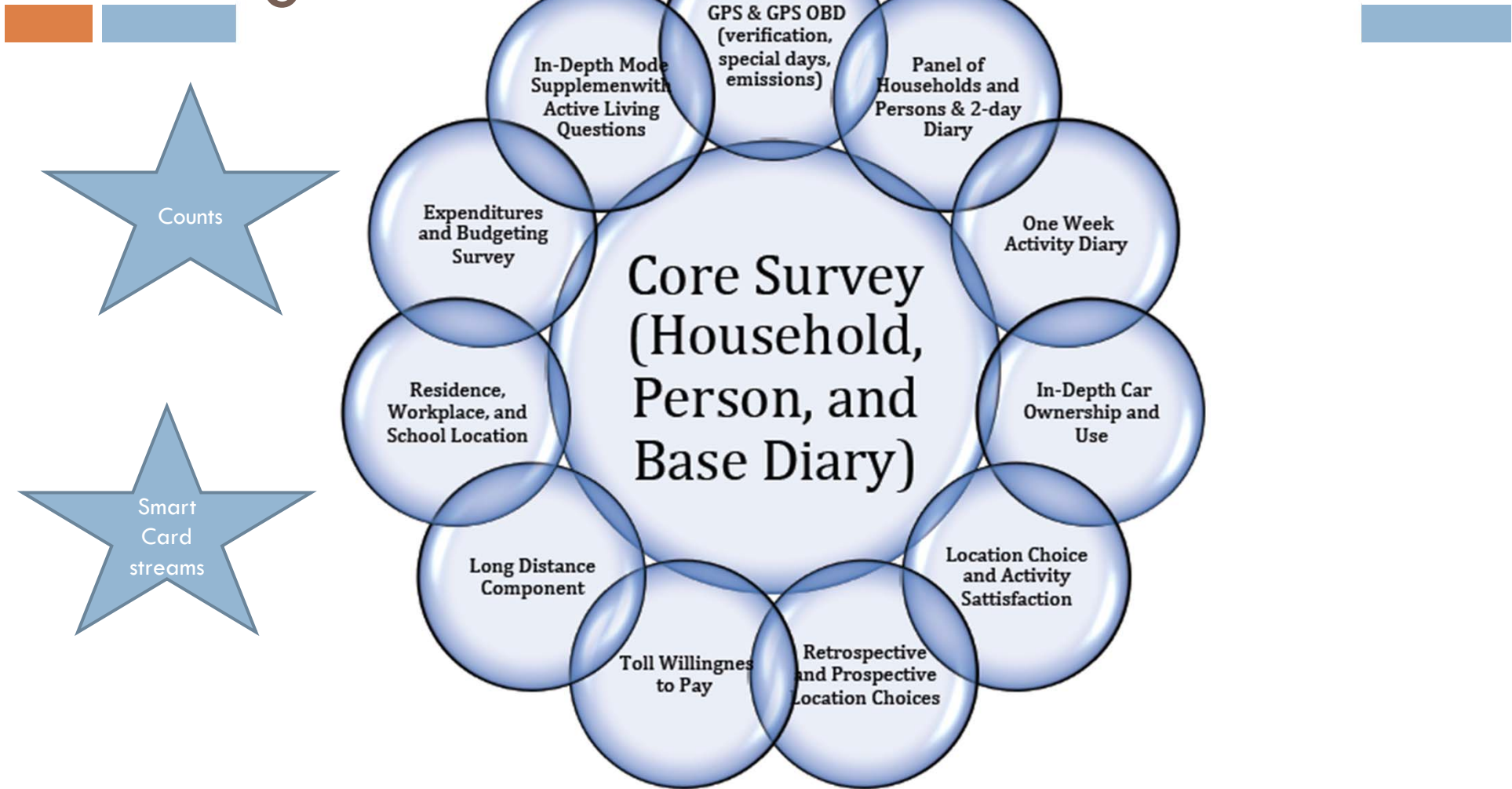
- To capture this “complete view”, an “object-oriented” (OO) model of transportation systems and the data characterizing these systems is recommended. Uses:
 - ▣ Provides a systematic, comprehensive representation of important data elements & their *relationships*:
determination of data needs for various applications.
 - ▣ Starting point for organizing data management systems.
 - ▣ Tool for model development



Example: OO Data Model for Urban Travel Demand Modelling

Core-Satellite Multi-Instrument Survey

Design



Adapted from: Goulias, et al., (2011)

Core Survey



- Large-sample survey that gathers primary information concerning respondents & their behaviour.
- Characteristics:
 - ▣ Key data fundamental to agency primary needs.
 - ▣ Common variables that link to satellite data for joint use (integration/fusion).
 - ▣ Sample size permits valid statistical inferences.
 - ▣ Expandable to full population.
 - ▣ Large geographic area.
 - ▣ Stable (but not necessarily static) over time: consistent time-series.
 - ▣ Relatively short (minimize response burden; cost-effective for large samples).

Satellite Surveys

- Smaller sample, more focused and detailed - enrich/augment the core for:
 - ▣ Special, detailed models
 - ▣ Analysis of special behaviours of interest
 - ▣ Analysis of small sub-populations
- Must be linkable to the core
- Examples:
 - ▣ Extra questions and/or instrumentation of a subset of the core.
 - ▣ Additional survey of a core sub-sample
 - ▣ Increased (stratified) sampling of specialty populations
 - ▣ Surveys conducted on different samples but with common data items for linking/fusion

Core-Satellite Paradigm



- Very flexible/generalizable approach.
- Applicable to a wide variety of contexts.
- Defined by content, not method.
- Permits controlled experimentation, evolution over time:
 - ▣ Use satellites to test new methods).
 - ▣ “Grow” data over time by adding satellites as need and opportunity permit.
 - ▣ Respond to “hot button”, new issues/needs in a timely, flexible manner.

Example Core-Satellite Data Collection Design

Screenline counts, all vehicle types

Transit boarding counts

Roadway speed-time studies

Transit line headways, speeds, etc.; transit fare policies

Parking supply & price

Auto operating costs, including tolls

Road segment capacities, speeds, etc.

Census data

Vehicles by type, vintage, fuel type, etc.

Capital & operating costs of vehicles by type, vintage, fuel type, etc.

HOV lane inventory, rules, ...

Satellite 1
HOV Usage

Satellite 2
Bicycle Usage

CORE SURVEY:
Home Interview Survey

- Large sample
- Key/core variables
- Key household & person variables
- Trips by mode, purpose & time of day

Satellite 4
Auto Ownership & Usage

Satellite 3
Elderly Travel Needs

Bicycle facilities inventory (bike lanes, bike parking, ...)

Bike-share services & usage

Inventory of major facilities for seniors: community centres, health care facilities, etc.

Provincial Surveys

- *NB: Unlike most industrialized countries, Canada has no National Travel Survey to measure everyday travel*
- The existence of well-established, large (population & geography) urban surveys in many provinces provides the potential to expand these surveys to the provincial level.
- Significant potential advantages:
 - ▣ Incremental, “bottom-up” approach to evolving an national data collection program (possibly the only way this is likely to happen).
 - ▣ Provides uniform/standardized data across the province.
 - ▣ Provides data to smaller/medium-sized areas very cost-effectively.
 - ▣ Eliminates “urban boundary” effects: very important for fast-growing regions.
 - ▣ Provides a framework for gathering long-distance & rural travel data.

Where do we go from here?

- Good case for creating a small and stable network of Canadian transportation data collection experts and major clients
- Possible first steps should focus on collaboration and sharing:
 - ▣ A Data Strategy Workshop for representative stakeholders from municipal, metropolitan, provincial and federal agencies, which as an output could specify....
 - ▣ ...the funding and creation of an all-Canada Working Group to design a coherent program of pilots and trials of the main components of the Data Framework, and translating its objectives (coordination, collection, processing and management) into action
 - ▣ The creation of a permanent Clearinghouse for data methodology and innovation

THANK YOU!

QUESTIONS?

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Extra slides for question period



FRAMEWORK: main recommendations

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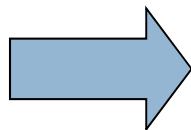
Data Management



- Sound, systematic data management procedures essential
- Key elements include:
 - Storage
 - Documentation (metadata)
 - Completeness (contextual data)
 - Access
 - Dissemination
 - Quality Control – cumulative lessons reported by analysts

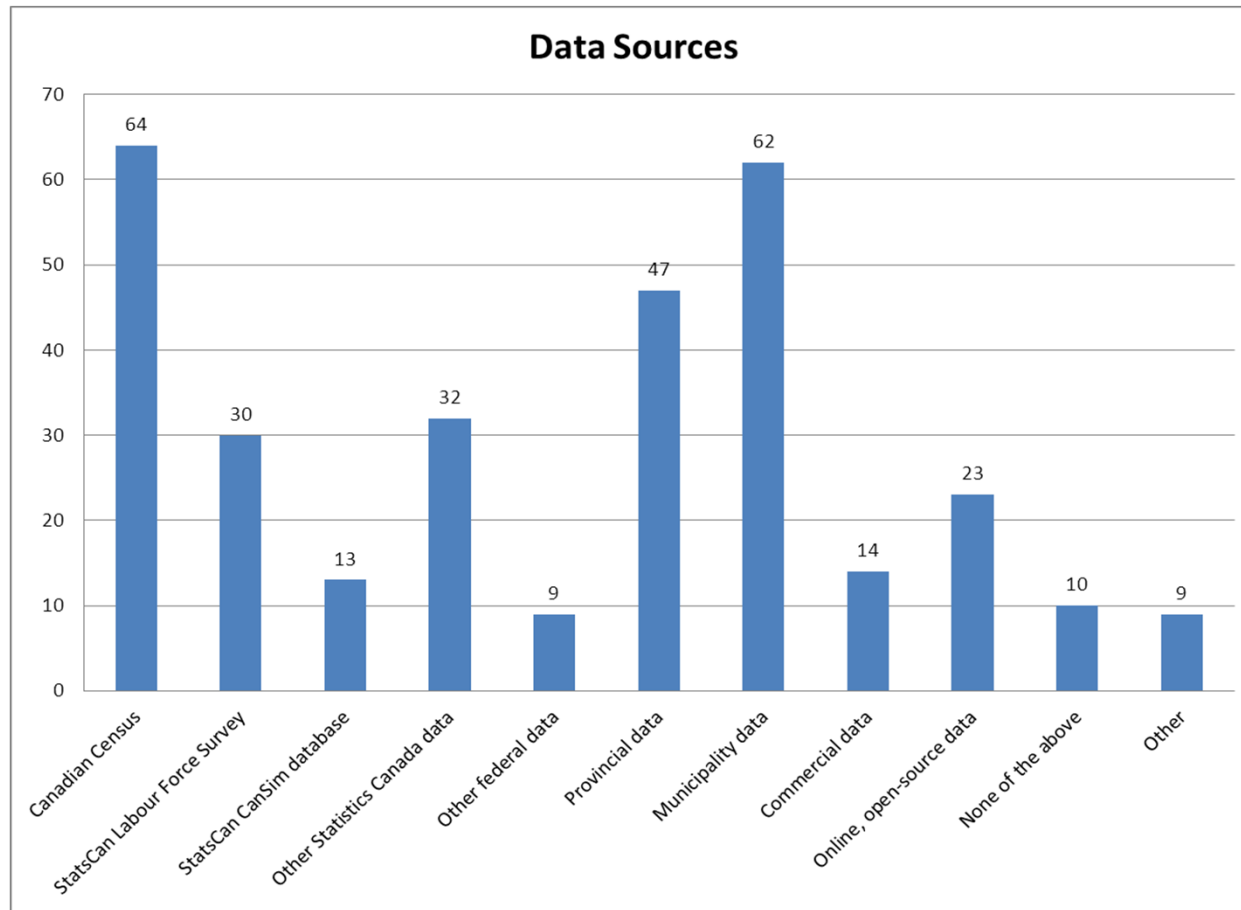
Privacy/Security

- Also essential; increasingly important:
 - ▣ Increasingly disaggregate datasets
 - ▣ Increasingly strict legislation, public concern
- Elements include
 - ▣ Gathering/storing private information
 - ▣ Access to confidential data
 - ▣ Identification of respondents
 - ▣ Secure, confidential archiving/storage
- Needs to be addressed at every point in the data point in the data collection process:
 - ▣ Survey design
 - ▣ Accessing respondents & gaining consent
 - ▣ Analysis of data
 - ▣ Storage/maintenance of data



“Privacy by design”

Types of Data Sources Used by Canadian Transportation Agencies



Source: Web-based survey of 93 public agencies conducted as part of project

Barriers to Improved Data Collection

