Data collection for modelling urban freight transport

Dr Russell G. Thompson
Urban Logistics Studies Group
Department of Civil and Environmental Engineering
The University of Melbourne
Outline

Why collect data?
Model development process
Freight Movement Model (FMM) for Melbourne
Recent studies
Knowledge management
Innovative methods
Why collect data?

Data is typically required for:

• Describing the physical system (transport networks & land use)
• Representing the population (business registers)
• Developing demand submodels (esp. production, distribution & vehicle loading)
• Overall model validation (controls: traffic surveys)
• Developing impact models (economic, social, environmental)
Model Development Process

City Logistics: Network Modelling and ITS, Taniguchi et al, 2001
Freight Movement Model (FMM) for Melbourne

Aim

To develop a practical & operational freight movement modelling and forecasting capacity to assist the strategic planning of freight movements as a component of the total metropolitan Melbourne travel task

Being developed for the Department of Infrastructure, Victorian Government by a team led by IMIS
FMM Applications

Predict road freight demand for changes in:

- Economy
- Locations & magnitude of freight generators & attractors (e.g. ports & rail terminals)
- Transport network
- Demographics (population & employment)
- Road freight & logistics sectors
- Location & operation of intermodal terminals
- Freight vehicle technology (e.g. B doubles)
- Infrastructure pricing policies
- Industry cost structures
Integrated Commodity & Freight Database for Melbourne

The FMM project will effectively integrate existing and new data on commodity production and freight movement in Melbourne. The data will be used for:

• development of commodity production and freight movement models;
• development of freight vehicle ‘loading’ models and, in future, tour based vehicle models;
• statistical ‘controls’, to ensure that the FMM estimates match total commodity production in Melbourne and freight movements across screenlines.
FMM Survey Components and Sequence

IMIS 2006
On-Road Vehicle Survey

Survey at locations on screen- lines between freight areas in Melbourne

Provides following data items, extracted from video images and automatic counters:

Freight vehicle classification (AUSTROADS)
Freight transportation type (eg. tanker & container carrier)
Freight shipment class/packaging (eg. dry bulk & palletised)
Commodity class (ANZSCC)
Vehicle registration plate details (contacts for business surveys)
On-road Freight Vehicle and Freight Type Survey

IMIS 2006
Matched Video Images

Matched images are recorded for each freight vehicle registration numbers are used to access road freight transport businesses (number obscured for privacy). Freight and/or shipment types are recorded, providing ‘control’ data on commodity/shipment volumes across screen lines.
Road Freight Business Survey

Interview of businesses sampled from the On-road Survey, or identified through a Business Register

Provides following data items, obtained from emailed Excel based questionnaires:

Freight transport business type and size
Commodity types and quantities carried for the observed vehicle trip
Receipt and dispatch time windows
Locations and contacts for upstream and downstream businesses
Agreement to participate in the Freight Vehicle Tour survey
Commodity Production Business Survey

Interview of businesses engaged in commodity production, contacted through the Freight Transport Business Survey, or a Business Register

Provides following data items, obtained through emailed Excel-based questionnaires and face-to-face interviews:

- Industry class(es) for the business (ANZSIC)
- Type and quantity of major commodities produced
- Production resources – employees and plant capacity
- Freight distribution to downstream supply nodes and external locations
- Transport modes and time periods for freight movements
Commodity Distribution Business Survey

Interview of businesses engaged in commodity storage and/or transportation, contacted through the Freight Transport Business Survey, or a Business Register.

Provides following data items, obtained through emailed Excel-based questionnaires and face-to-face interviews:

Same data items as for the commodity production businesses, but focusing on the freight distribution data items, to downstream supply nodes.
Road Freight Vehicle Tour Survey

Tracking of freight vehicle tours, for a sample of vehicles identified through the Freight Transport Business Survey

Data items, obtained through simultaneous use of GPS units & vehicle run sheets:

*GPS data*
Origin, destination, chosen route, travel times between stops, travel distances & dwell times

*Run sheet data*
Commodity type(s), vehicle & transport type, time windows, commodity quantities & % laden
Recent Studies

AUSTROADS (www.austroads.com.au)
  Best practice in road use data collection, analysis and reporting (AP 84/04)
  Review of Freight Data Collection and Generation Procedures and Opportunities (AP 83/06)

National Transport Commission (NTC)
  Twice the task (www.ntc.gov.au)

Victorian Government
  Inquiry into Managing Transport Congestion (www.vcec.vic.gov.au)
Review of Freight Data Collection & Generation Procedures & Opportunities

- Collecting freight data once & using many ways is cost effective
- Major issues: confidentiality, security, access & distribution
- Lack of consistency, transferability & standardisation of data collection procedures

AUSTROADS AP-R283/06
Review of Freight Data Collection & Generation Procedures & Opportunities

Need for:
• Data co-operation
• Meta data directories
• National Transport Data Framework: AusLink, a mechanism to better collect, manage & exchange data
  – Architecture & portal
• Determining a case for collaboration
  – Estimation of benefits & value
  – Identification of areas, desire & opportunities
  – Determine a business case for support

AUSTROADS AP-R283/06
Best Practice in Road Use Data Collection, Analysis and Reporting

*Principles*

- Accuracy
- Effectiveness
- Efficiency
- Reliability
- Accessibility
- Transparency
- Timeliness
- Relevance

*AUSTROADS AP-G84/04*
Road Use Data Planning & Management Process

1. Stakeholder consultation (register & needs)
2. Data planning (review, goals & evaluation)
3. Budget and programming (equipment & maintenance costs)
4. Data management (data collection, validation, processing & storage)
5. Data delivery (analysis, access & training)
6. Review & audit (stakeholder consultation surveys)

AUSTROADS AP-G84/04
CULWAY

- Unobtrusive, high speed Weigh-in Motion (WIM) system
- Based on strain gauge technology
- Two lanes of traffic
- Semi-permanent within pavement installed
- > 140 sites operating in Australia
- Accuracy GVM (±7% at 95%)

ARRB: www.arrb.com.au
Load Distribution for "123" vehicles

CULWAY output
Data Mining

- Identify sources of available data
  - data access & use, updating, maintaining data's currency
- Identification of data sets in all necessary categories
- Data audit
  - availability
  - useability
  - cost
  - confidentiality
  - commercially sensitive
Meta Data

Database of data resources available

- Data holders
- Availability: access/acquisition conditions (incl. time)
- Costs,
- Scope & scale
- Data items & format
- Quality
- Limitations
Innovative Methods

• Information from track & trace systems
  (eg. www.track-trace.com)
• Satellite images: identify the composition of
  the traffic stream & to count freight vehicles