Challenges to Using an Integrated Land-Use Transport Model in Australia

Professor Peter Stopher
Institute of Transport and Logistics Studies
The University of Sydney

Outline

- Introduction
- Overview of TRESIS
- State of Transport Modelling in Australia
- Efforts to introduce an integrated model
- Barriers
- Possible solutions
- The future

Introduction

- Australia has five major urban areas undertaking modelling:
  - Sydney
  - Melbourne
  - Adelaide
  - Brisbane
  - Perth
- In addition, the Bureau of Transport and Regional Economics (BTRE) undertakes national planning and modelling

TRESIS

- TRESIS – Transport and Environmental Strategic Impact Simulator – was developed at the ITLS in the 1990s and early 2000s
- Designed as a policy advisory tool
- Operates as an integrated model

TRESIS

- Deals with policies relating to:
  - Land Use
  - Transport
  - Environment
  - Regulatory policies
- TRESIS is a microsimulation package

TRESIS

- TRESIS evaluates policies at a strategic level, and assesses a number of environmental impacts
- TRESIS also outputs a substantial array of performance indicators

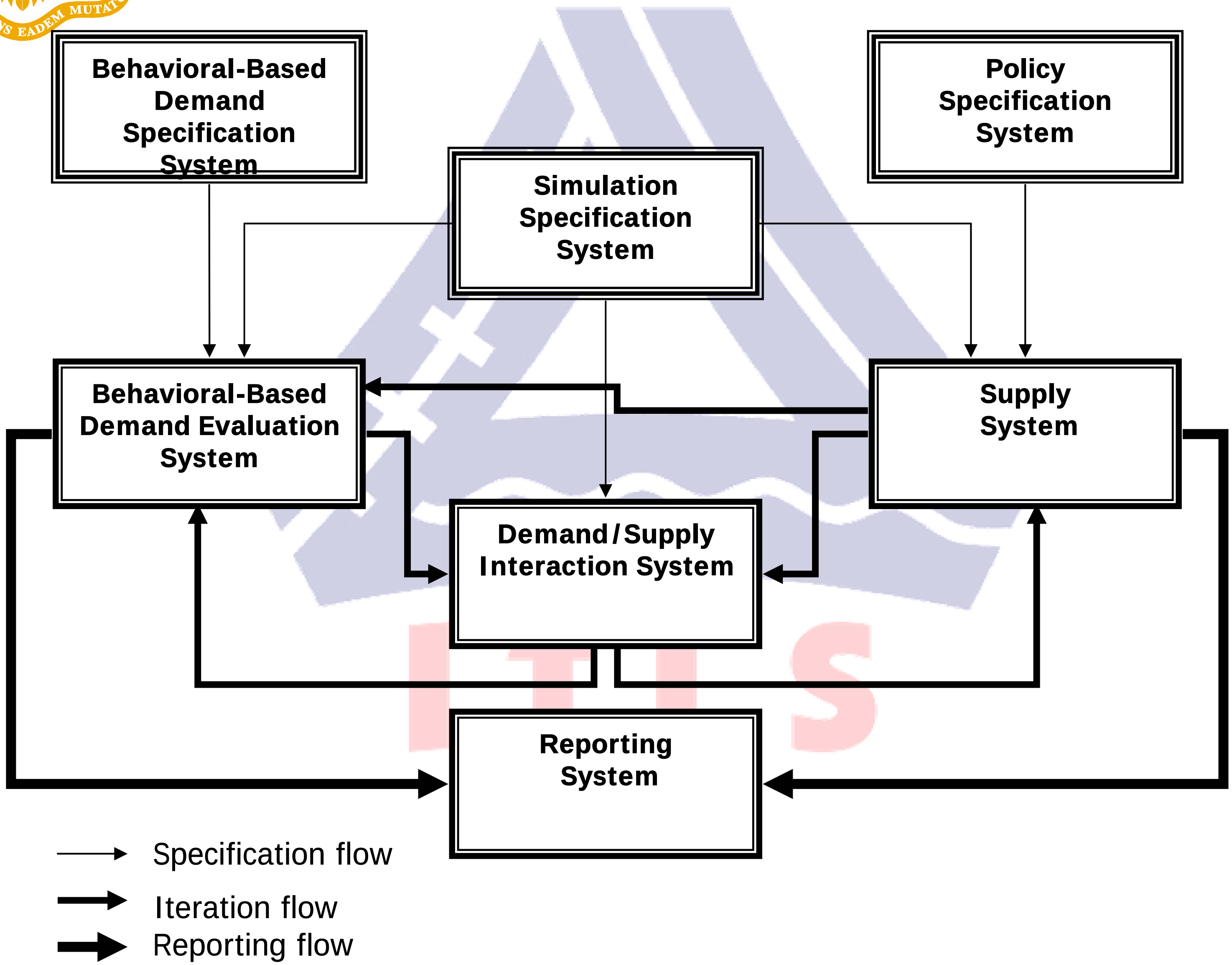
TRESIS in Outline

- TRESIS works with simulated households and contains the following models (discrete choice)
  - Household location and type of dwelling
  - Work locations for household workers
  - Number and type of vehicles owned by the household
  - Levels of use of vehicles by trip purpose
  - Means of travel by departure time

TRESIS in Outline

- TRESIS has been applied in six Australian urban areas
- The latest version has recently been applied to a specific strategic level policy issue in Sydney
- TRESIS provides year-by-year forecasts for up to 28 years from the base year

TRESIS Structure



Key Systems

- ***Simulation Specification System*** **–user control of TRESIS procedures, including inputs, number of years to forecast, and discount factors for annual change**
- ***Behavioural Demand Specification System*** **– Constructs synthetic households and includes behavioural models of household choices**

Key Systems

- ***Supply System*** **– Contains the transport network database, land-use zone database, auto technology and vehicle database, policy and environment factors**
- ***Policy Specification System*** **– Allows a rich variety of policies to be input, including tolls, congestion pricing, gas guzzler taxes, etc.**

Key Systems

- ***Behavioural Demand Evaluation System*** **– this takes the outputs of the behavioural demand and supply specification systems and derives the full set of choice probabilities for travel, location, and vehicles**
- ***Demand/Supply Interaction System*** **– this controls or equilibrates the three different types of interactions between supply and demand**
  - **Travel time**
  - **Housing**
  - **Automobiles**

Key Systems

- ***Reporting System*** **– this is the system that provides a comprehensive set of outputs including:**
  - **Performance indicators**
  - **Environmental impacts**
  - **Accessibility**
  - **Equity**
  - **Household consumer surplus**

Policy Options

SPECIFIC POLICY	ATTRIBUTES	SPECIFIC LOCATION APPLICATION	TIMES OF DAY
New/Existing PT	Frequency; Travel Time; Fare; Access; Egress	Origin-Destination	6
New/Existing Roadway	Distance; Capacity; Auto Travel Times: Congestion Pricing; Toll Cost	Origin-Destination	6
Parking Charges	Dollars/hour	Destination	6
Urban Density	Houses, semi-detached, apartment/flat; Prices	Not Location Specific	None
Carbon Tax	Cents per kg	Not Location Specific	None
GST on New Vehicles	Dollars per vehicle (from 2000)	Not Location Specific	None
Automobile Technology	Mass (kg); Wholesale price; Acceleration: Fuel efficiency	Not Location Specific	None
Fuel Excise Tax by Fuel Type	Wholesale price of fuel; Excise component of fuel price	Not Location Specific	None
Maximum Ages for Vehicle Scrappage	Maximum age to remove high emitters from specific vehicle classes	Not Location Specific	None
Vehicle Registration Changes	Dollars/year by vehicle class and type	Not Location Specific	None
Fuel Efficiency	Percentage of fuel efficiency of current fleet	Not Location Specific	None
Alternative Fuels – CNG	6 Classes (from class 11 to 16)	Not Location Specific	None
Vehicle Price Rebate/ Discounts	Rebate on new vehicles	Not Location Specific	None

Transport Modelling in Australia

- Each Capital City does its own modelling
- Models use various platforms, such as EMME/2, CUBE/VOYAGER, TransCAD
- Formal land use modelling is not undertaken in any of the major metro areas

Transport Modelling in Australia

- Models are fairly sophisticated, using disaggregate models for destination and mode choice
- Victoria, New South Wales, and South Australia have significant staffs devoted to modelling activities
- Modelling has been underway for most areas since the 1970s

Introducing TRESIS in Australia

- Little interest from Sydney, even though prototype was developed around Sydney data
  - TPDC not looking for a new model
  - Unconvinced about the value of the land use component
  - Concern over whether it would produce different numbers for the same analysis than the existing software

TRESIS in Australia

- Purchased by South Australia
  - Requires a lot of support to run
  - Input data created problems
  - Interpretation was unfamiliar to local agency staff
  - Lacks some of the land use data needed for validation

TRESIS in Australia

- BTRE also obtained a copy
  - Used to investigate a range of policies relating to greenhouse gas emissions
  - Outside this, BTRE is not generally in the business of running LUTP models
  - Used most recently in a study of bridge/tunnel options

Barriers to Use

- First issue is cost
- Second issue – TRESIS is not readily self-calibrated, but needs expert assistance
- Third issue is input data requirements and validation requirements
- Fourth issue is comparability to prior model estimates

Barriers to Use

- Fifth issue – tends to be more of a "black box"
- Sixth issue is the lack of training with such models among agency staffs
- Seventh issue is that the models are still largely seen as a curiosity – not a serious alternative to standard methods

Possible Solutions

- Cost is unlikely to be easily resolved, but payoff must be clearly demonstrated
- Need to pay a lot of attention to validation steps, and to validating each individual module
  - Model validation has tended to be done traditionally only at the end of the four-step process – not a good option

Possible Solutions

- Need to improve data collection techniques
  - Errors in self-report, diary-based surveys
  - Problems of increasing non-response levels
  - Respondent burden as more information is needed

Possible Solutions

- Comparability is unlikely to be solved and should not be if previous models were wrong
  - Demonstrable benefits from changing to new software
    - More accuracy in forecasts
    - Better responsiveness to policy options
    - Ability to handle questions not handled by existing models
    - Etc.

Possible Solutions

- Make models more transparent
  - Simplify user interface
  - Provide good tutorials for use of the model system
  - Demonstrate what happens when inputs are changed
- Teach integrated models to graduate students!!

The Future

- Integrated models are the way to go
- Should be developed to work with a tour-based or activity modelling process
- Only way to get realistic estimates of induced travel and land use changes
- But…

The Future

- Need to be developed initially to address specific planning and policy issues
- Need to be demonstrably much better than anything in current use
- Need to establish the "business case" for switching