The Auckland Transport Models Project
- Overview and Use to Date -

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Auckland Transport Models Projects (ATM2)

CONTENTS

Overview of integrated transport and land use models
– Auckland Regional Transport model (ART3)
– Auckland Strategic Planning model (ASP3.2)

Modifications

Outputs and applications
History

1990’s land use and transport models
  - Linked but not integrated
  - 1991 data
2001 ART re-based → ART2
Auckland Passenger Transport model (APT)
Re-developed in 2006
  - Based on 2006 Census and surveys
  - 2006-2008 surveys and model build
  - Multidisciplinary team led by SKM

Photos: Queenswharf.org.nz
ATM2 Overview

Economic and Demographic: ARC (employment and population forecast)
ASP3.2: DELTA (land use scenarios developed)
ART3: EMME (networks by time period and forecast year)
Model Sequence

Forecast 2006-2051

DELTA: increments every time period (1 year)

EMME: called every five years (transport values only updated every 5 yrs)
2006 Data and Model Build

2006 Census data
- Economic and demographic base
- Cross tabs

2006-07 Surveys
- Household and travel (1.4% sample)
- Passenger transport
- Traffic counts
- Commercial vehicles
- Travel time

“New” surveys
- Commercial vehicles, cycle diary, Saturday travel data
New Model Concepts - ART3

ART2 and ART3 versions of 4-step model

<table>
<thead>
<tr>
<th>Item</th>
<th>ART2</th>
<th>ART3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zones</td>
<td>202</td>
<td>512</td>
</tr>
<tr>
<td>Trip ends</td>
<td>Peak (AM and IP)</td>
<td>Daily</td>
</tr>
<tr>
<td>Modelled periods</td>
<td>AM, IP (+PM)</td>
<td>Daily, AM, IP, PM</td>
</tr>
<tr>
<td>Car ownership</td>
<td>Cross-sectional</td>
<td>Cross-sectional and temporal</td>
</tr>
<tr>
<td>DMS and ToD</td>
<td>Sequential, re-timing (AM only)</td>
<td>Sequential and simultaneous, in/out tours $\rightarrow$ ToD</td>
</tr>
<tr>
<td>Commercial vehicle</td>
<td>Incl taxis, vans and trucks, by period</td>
<td>Heavy and medium comm vehicles, by period</td>
</tr>
<tr>
<td>Active</td>
<td>Period (AM, IP)</td>
<td>Daily productions</td>
</tr>
</tbody>
</table>
Model Concepts – ASP3.2

Development, Employment, Location, Transition, Area-quality
Incremental change (1 year)
Highly segmented
Floor space used by 5 activities
Six activities do not use space
Two residential housing types
Scenario: permitted development over time by type and zone
Accessibility, rents
ART3 integration
ART3 Model Validation

Screen lines, aggregated trip matrices

Vehicle screen lines (modelled vs counts):
- Overall peaks -1% to +3%
- Individual: -20% to +40%
- 85% < 10% difference
- $R^2 = 0.98$

Link flows
- 65% < 10% difference
- $R^2 = 0.88$

Travel times (routes)
- 80% < 20% difference

PT screen lines (modelled vs counts):
- Overall peaks +2% to +6%
- Similar to vehicle flow differences

FHWA
Target for regional models
- Freeways +- 7%
- Collector +- 25%
- $R^2 > 0.88$

PEM
Project models
- 90% slines GEH<12
Modifications and Refinements

Active modes
  – Different rates for CBD and inner city
  – Varies with within-zone activities (ratio of residents to jobs)
  – Need to identify (future) zones

Under-reporting factors
  – Household travel survey gaps
  – Initially factors used but modified to all purposes/modes

TDM
  – External targets set
  – Percentage reductions to car trips (over time and space)
  – Shifts to other modes

ASP3.2
  – Model stability
  – Two housing types (high, typical)
  – GIS to assist scenario development
Outputs

Land use and transport outputs
Cascade down through 512 zones / 45 year forecast / multiple demographic and transport segments = too much data!

Aggregated spatially
- Regional (1)
- Local council districts (7)
- Sectors (18)
- Zones (512)

Reduce forecast year reporting (10-yr gaps)

Tabular and graphical

GIS presentation

Post-processed
Outputs – Flow Plots

PT (2006 AM)

- Rail
- Bus
- Ferry

Radial to CBD dominates
Bus largest share
Outputs – Boarding / Alighting Plots

PT (2041 AM)
Rail options testing: pax boarding and alighting totals as scaled pie charts
Zonal Employment Changes over Time by Employment Type (ASP3.2 model)
Outputs – Land use (DELTA)

Accessibility Changes over Time by District (ASP3.2 model)
TDM
Low roading
RTN expansion
Retain 2006 service levels
Land use options

<table>
<thead>
<tr>
<th>Item</th>
<th>2006</th>
<th>2041 Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population (ART3)</td>
<td>1.35M</td>
<td>2.06M</td>
</tr>
<tr>
<td>Employment (ART3)</td>
<td>520,000</td>
<td>866,000</td>
</tr>
<tr>
<td>Education Roll (ART3)</td>
<td>347,000</td>
<td>492,000</td>
</tr>
<tr>
<td>Fuel price (2006$/litre)</td>
<td>$1.55</td>
<td>$3.71</td>
</tr>
<tr>
<td>Road network changes</td>
<td>-</td>
<td>+9% lane kms</td>
</tr>
<tr>
<td>PT network changes</td>
<td>-</td>
<td>+170% serv kms</td>
</tr>
<tr>
<td>Travel Demand Management</td>
<td>Low</td>
<td>Moderate</td>
</tr>
<tr>
<td>Daily person trips</td>
<td>4,600,000</td>
<td>6,500,000</td>
</tr>
<tr>
<td>Daily person trips in cars (share)</td>
<td>4,010,000(87.3%)</td>
<td>4,980,000(76.4%)</td>
</tr>
<tr>
<td>Daily person trips in PT (share)</td>
<td>145,000(3.2%)</td>
<td>545,000(8.4%)</td>
</tr>
<tr>
<td>Daily Active trips (share)</td>
<td>438,000(9.5%)</td>
<td>997,000(15.3%)</td>
</tr>
</tbody>
</table>

**AM Peak Period Network Statistics**

<table>
<thead>
<tr>
<th>Item</th>
<th>2006</th>
<th>2041 Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle kilometres</td>
<td>5,094,000</td>
<td>6,547,000</td>
</tr>
<tr>
<td>Vehicle minutes</td>
<td>7,432,000</td>
<td>9,407,000</td>
</tr>
<tr>
<td>Vehicle trips</td>
<td>489,000</td>
<td>675,000</td>
</tr>
<tr>
<td>Av trip length (km)</td>
<td>10.4</td>
<td>9.7</td>
</tr>
<tr>
<td>Av trip time (min)</td>
<td>15.2</td>
<td>13.9</td>
</tr>
<tr>
<td>Av trip speed (kph)</td>
<td>41.1</td>
<td>41.7</td>
</tr>
</tbody>
</table>
Current Status and Future Work

**ART3**
- Core vs external modelled area
- Variable trips rates (over time)
- Freight lanes
- SOV/HOV split
- Airport flight-related trips mode split
- Weekend (Saturday model)
- Split Active → walk and cycle
- Land use integration with growth strategy

**ASP3**
- Update to include 2006-08 changes

**Completed**
- Future
- Being considered
- Development
- Not urgent
- On-going
- Completed
Thank you

Questions?

Enjoy Auckland!