Modelling in Africa

The art of traffic engineering in modelling

Contents

- Clients and their requirements
- Official guidelines/specifications
- Examples of modelling methods

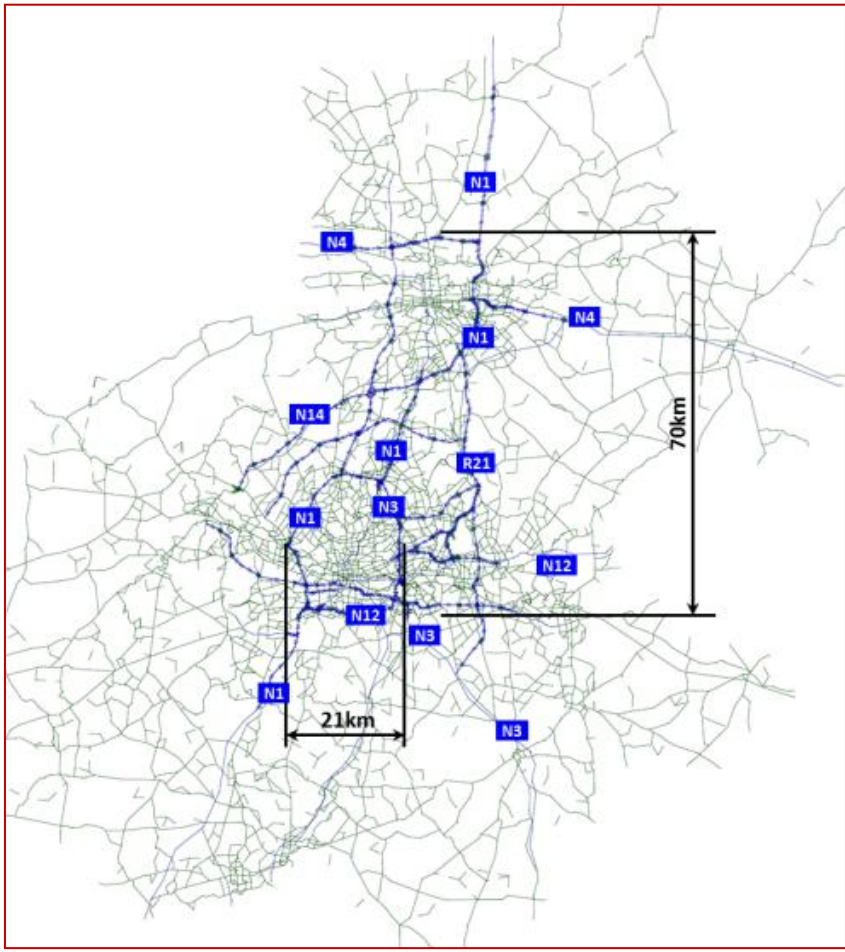
Clients & Requirements

- Public sector:
  - A traffic model for developments that generate >150 peak hour trips
  - A ranking of schemes based on economic benefits
  - Improvements developers must implement
- Private sector:
  - Concessionaires
    - A traffic model to satisfy the auditors and funders
    - Traffic forecasts for infrastructure design and revenue forecasts
  - Developers
    - Do as little as possible to get planning approval from the authorities

Official Guidelines

In the UK you have knowledgeable Clients that develop and follow guidelines and procedures (TAG Units).

In SA (and Africa) there are no official guidelines for transport modelling.



Official Guidelines

No guidelines leads to:

- No consistency of requirements and model quality between clients and consultants
- Model expectations – opt for strategic models and expect simulation results
- Expect results from limited budgets and insufficient data collection
- Colourful ways of presenting model calibration results. (Lies, big lies then statistics)

Official Guidelines

No guidelines allows:

- Freedom to make the best use of the data and modelling tools
- Innovation –provided there is sufficient motivation that the outcome would be more trustworthy
- Allows the engineer to be an engineer

Official Guidelines

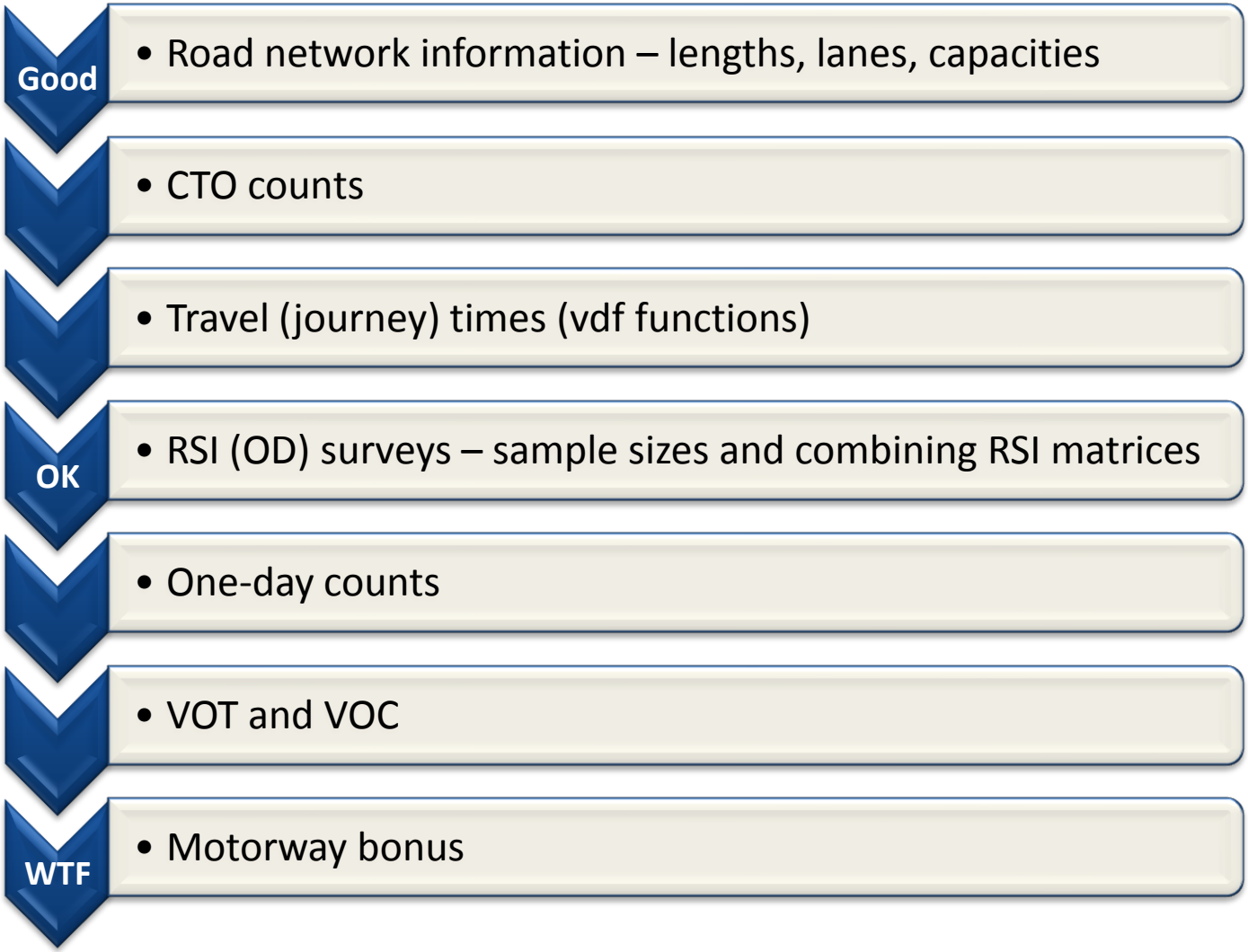
At the end of the day the engineer is responsible for the results.

- Signing off the calibration results
- Seen all sorts of “calibration” with little understanding of what the impact on the model has been.

Working with what you have

- Thorough understanding of the guidelines. Set the targets
- Thorough understanding of the modelling tools.
- Thorough understanding of the traffic patterns in the study area.
- Logic

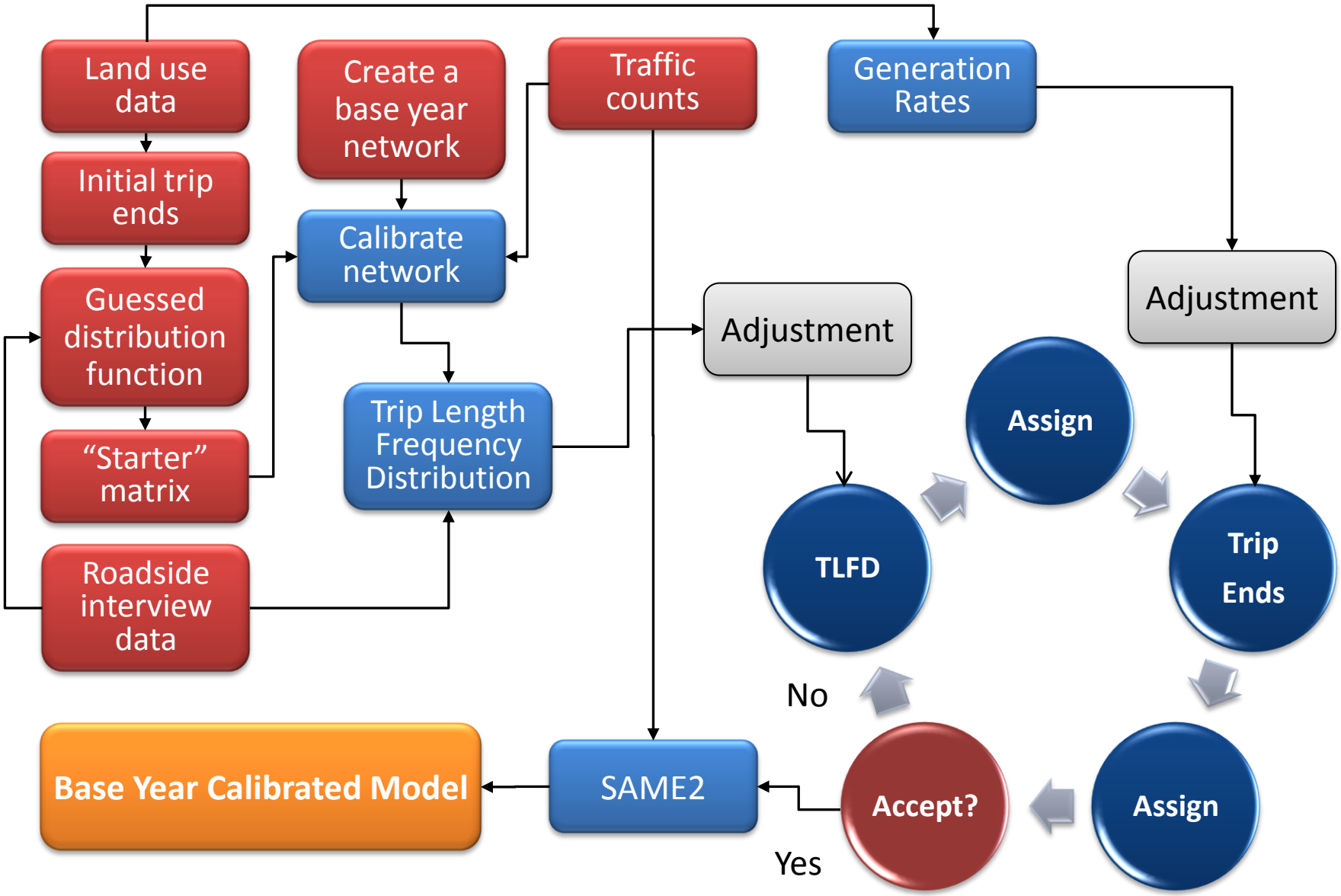
Data Ranking



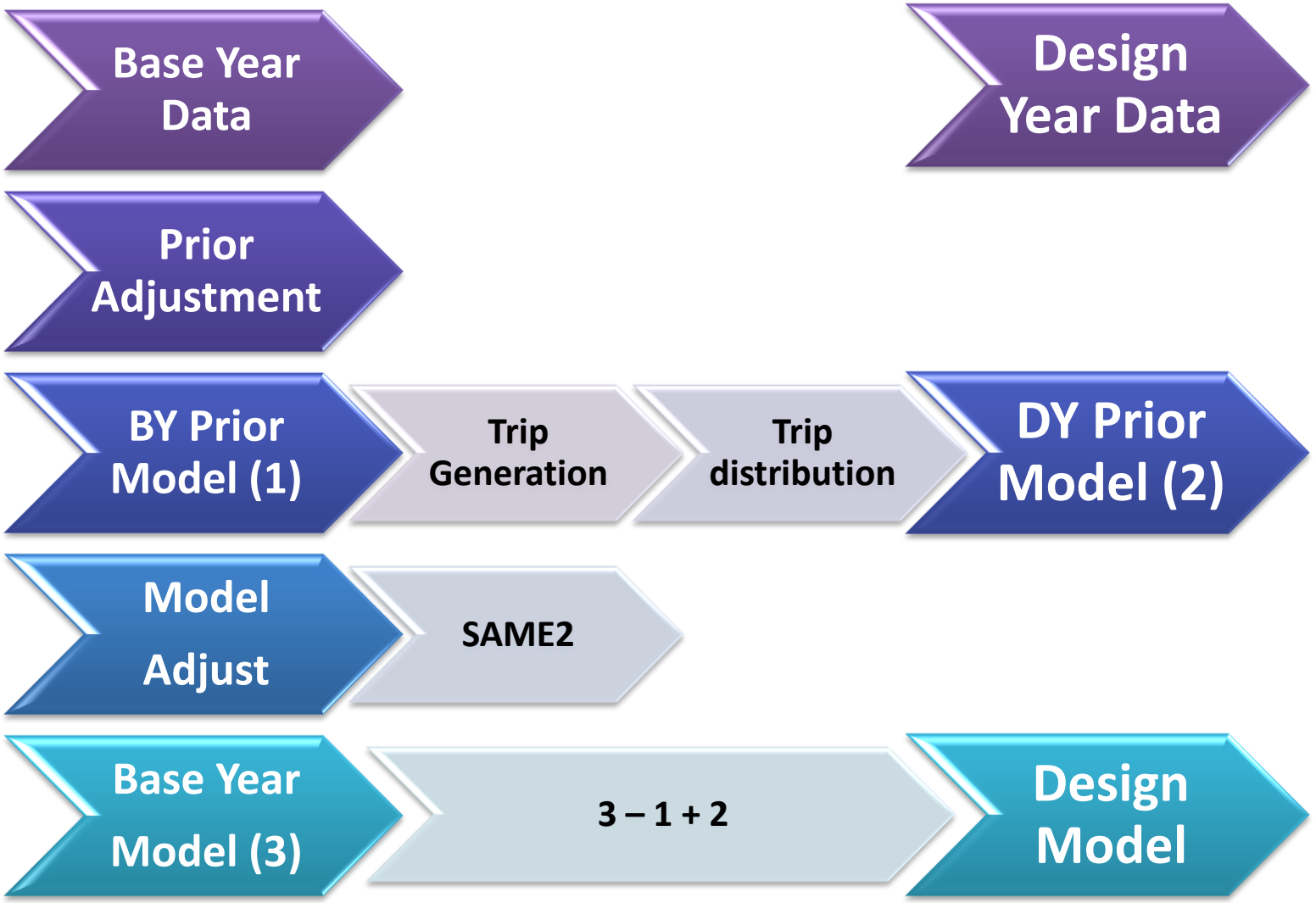
Working with what you have

- Understand what your software does (it is not a “do-it-all” black box)
- It is a tool box – know how the tools work
  - How will each process affect other processes?
- Use the data you have in the best possible way.

Base Year Model Development



Forecasting



“Improving” Traffic Count Data

- **Count balancing**
  - Different levels of accuracy in count data
    - Permanent counters – 24/7/365
    - Secondary counts – 2 weeks to 3 months
    - Day counts – 12 hour
  - Objective is to:
    - Maintain permanent count information
    - Minor adjustments to secondary count information
    - Maintain “order of magnitude” of day counts

“Improving” Traffic Count Data

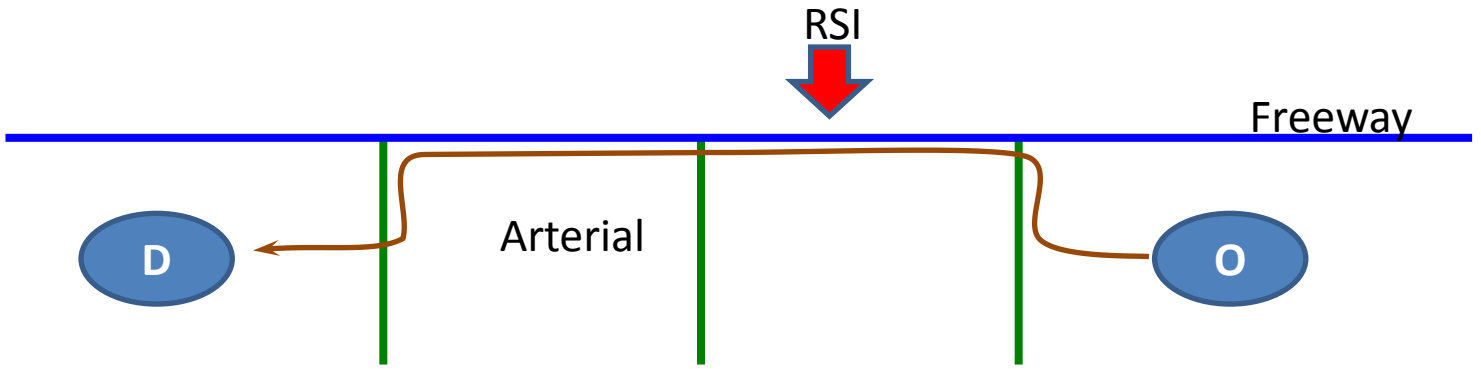
- **What to do with “dodgy” counts?**
  - Include them in the model?
    - Messes with the good data
  - Exclude them from the model?
    - Lose control at count location (no check)
- **Count balancing – (Winelands N1 and N2)**
  - Different levels of accuracy in count data
    - Permanent counters – 24/7/365
    - Secondary counts – 2 weeks to 3 months
    - Day counts – 12 hour
  - Objective is to:
    - Maintain permanent count information
    - Minor adjustments to secondary count information
    - Maintain order of magnitude of day counts

Manual Count Balancing

Counts from the field						Ramp	n Intchng	Ramp			Ramp	n Intchng	Ramp			Ramp	n Intchng	Ramp			Ramp	n Intchng	Ramp		
	1129					205	**1196**	10			155	834	27			99	736	76			55	**699**	56		
	33					10	**37**	2			8	26	2			6	25	11			1	**19**	11		
	25					6	**30**	1			7	16	1			5	15	7			0	**8**	0		
	8					7	**9**	1			7	8	1			3	7	6			0	**6**	1		
N2																									
	1181					158	**1244**	18			55	914	55			110	747	74			77	**714**	81		
	34					9	**42**	2			3	31	4			5	27	5			17	**21**	9		
	35					6	**30**	1			2	18	3			5	16	5			18	**9**	9		
	3					4	**7**	1			1	7	3			5	6	4			1	**6**	0		
Location			R300			Khayelitsha/Mew						Spine				R310 Baden					M9 Macassar				
Count	7 months					Full Year						3 weeks				3 weeks					Full Year				
Duration						Mew Way																			
N2																									
Balanced Counts		Balancing direction				Ramp	n Intchng	Ramp			Ramp	In I/C	Ramp			Ramp	In I/C	Ramp			Ramp	In I/C	Ramp		
		←										979					849								
Class 1	**1129**	→			205	**205**	**1196**	**10**	10	155	**227**	979	**20**	27	99	**150**	849	**50**	76	55	**200**	**699**	**100**	56	
												33					29								
Class 2	**33**				10	**10**	**37**	**4**	2	8	**8**	33	**2**	2	6	**6**	29	**10**	11	1	**20**	**19**	**6**	11	
												16					13								
Class 3	**25**				6	**6**	**30**	**2**	1	7	**16**	16	**1**	1	5	**4**	13	**5**	7	0	**10**	**8**	**4**	0	
												5					5								
Class 4	**8**				7	**7**	**9**	**3**	1	7	**7**	5	**3**	1	3	**3**	5	**6**	6	0	**5**	**6**	**2**	1	
N2																									
												1207					882								
Class 1	**1181**				158	**158**	**1244**	18	18	55	**55**	1207	**25**	55	110	**350**	882	**32**	74	77	**200**	**714**	**100**	81	
												41					40								
Class 2	**34**				9	**9**	**42**	2	2	3	**3**	41	**4**	4	5	**5**	40	**5**	5	17	**24**	**21**	**6**	9	
												29					27								
Class 3	**35**				6	**6**	**30**	1	1	2	**2**	29	**3**	3	5	**5**	27	**5**	5	18	**23**	**9**	**7**	9	
												7					5								
Class 4	**3**				4	**4**	**7**	1	1	1	**1**	7	**3**	3	5	**5**	5	**6**	4	1	**5**	**6**	**5**	0	
Location			R300			Khayelitsha/Mew						Spine				R310 Baden					M9 Macassar				
Count	7 months					Full Year						3 weeks				3 weeks					Full Year				

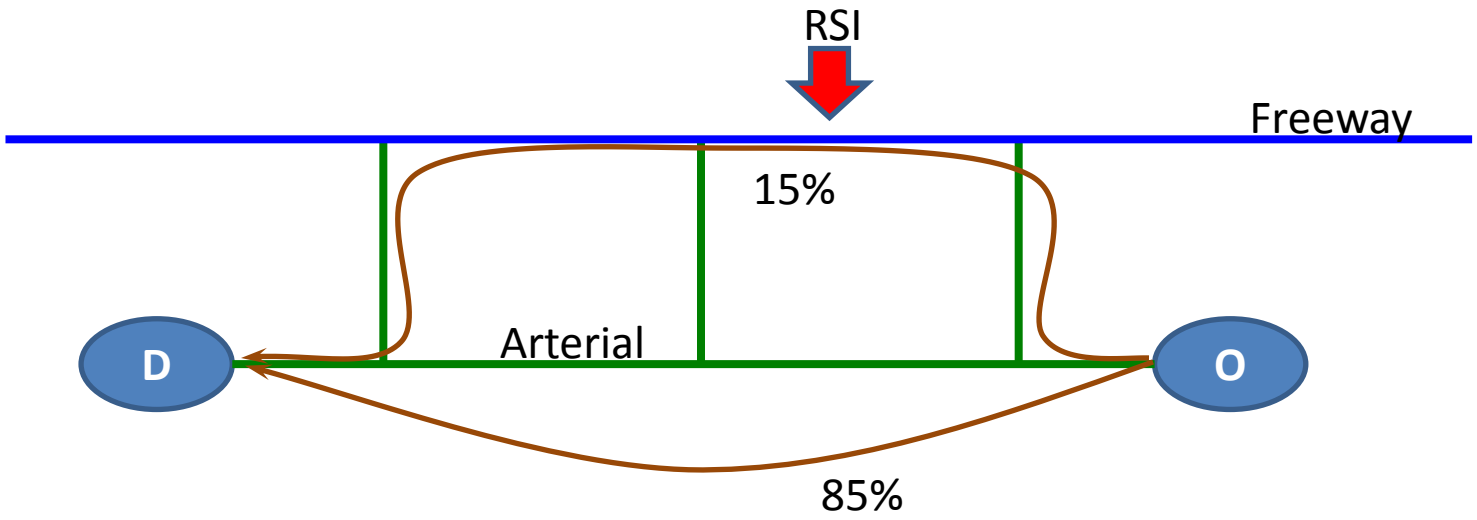
Combination of RSI Survey Data

- **Use of RSI Data**
  - RSI data provides “Know Trips”
  - Replace matrix OD cells with RSI results
  - RSI below records O-D = 10 trips/hour (expanded)
  - Replace matrix cell O-D with 15.



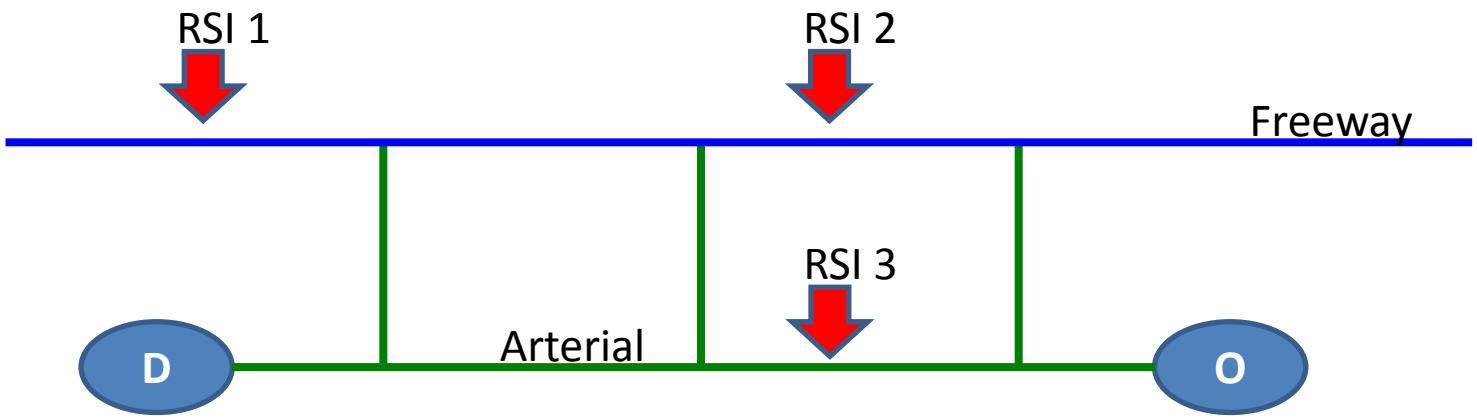
Combination of RSI Survey Data

- **Not necessarily**
  - RSI data is a sample
  - How much is carried by alternative routes?
  - OD cell could be 100 trips/hour



Combination of RSI Survey Data

- **Combining RSI Matrices**
  - Group RSI's that are in parallel (2 and 3) and add
  - Combine with RSI's in series
    - Weighted averages of sample size



“Nebulous” Inputs (VOT)

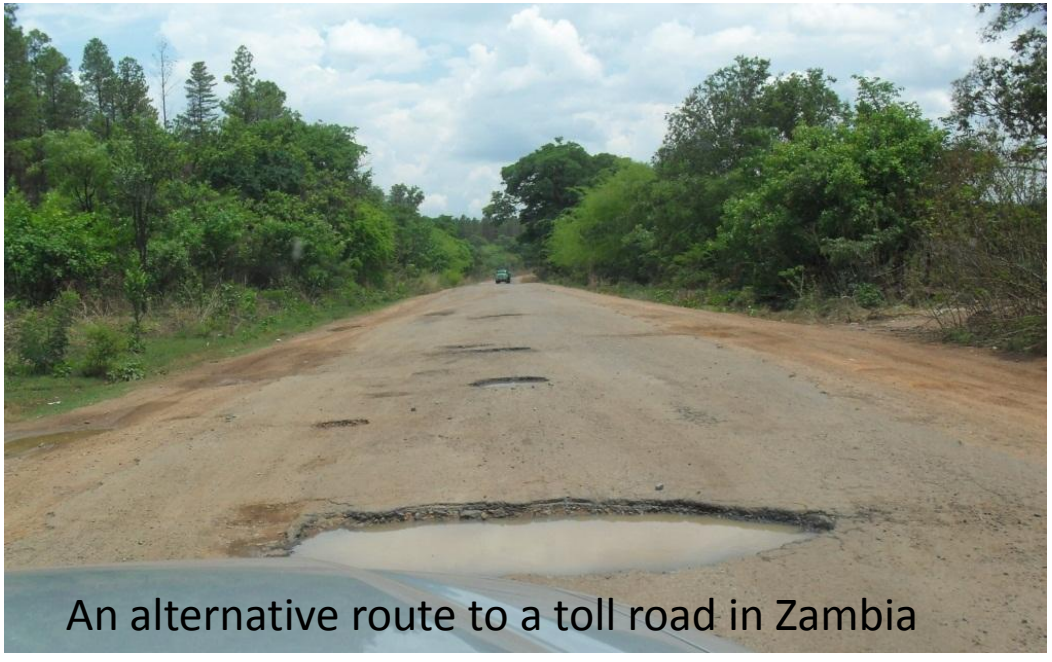
- **Revealed VOT – Eastern Europe / SA**
  - Based on existing toll roads (includes motorway bonus)
  - VOT in SA: ± R140.00/hr (±£10.00 / €13.00)
    - Eastern European stats – VOT €3.96
    - Statistician with data from existing toll road and alternative route – VOT €6.36
    - Needed Motorway bonus to calibrate model = 110% of VOT (i.e. €7.03)
    - Cost difference against the toll €13.39 since tolls converted to time penalty based on VOT

“Nebulous” Inputs (VOT)

- **Use of a Motorway Bonus (MB) There are occasions where a MB can be used:**
  - Auditors identified a route parallel to toll road
  - Google Earth showed this to be a good road
  - Insisted that there would be high diversion
  - We disagreed and had applied a “safety penalty”
  - After driving the route once our auditor agreed
- **N1 Platinum Toll Road – Hammanskraal**

Conclusions

- Modellers must spend time in the area being modelled to get a feel for the traffic conditions
- Understand the information you have to works with – get the basics right



An alternative route to a toll road in Zambia

Conclusions

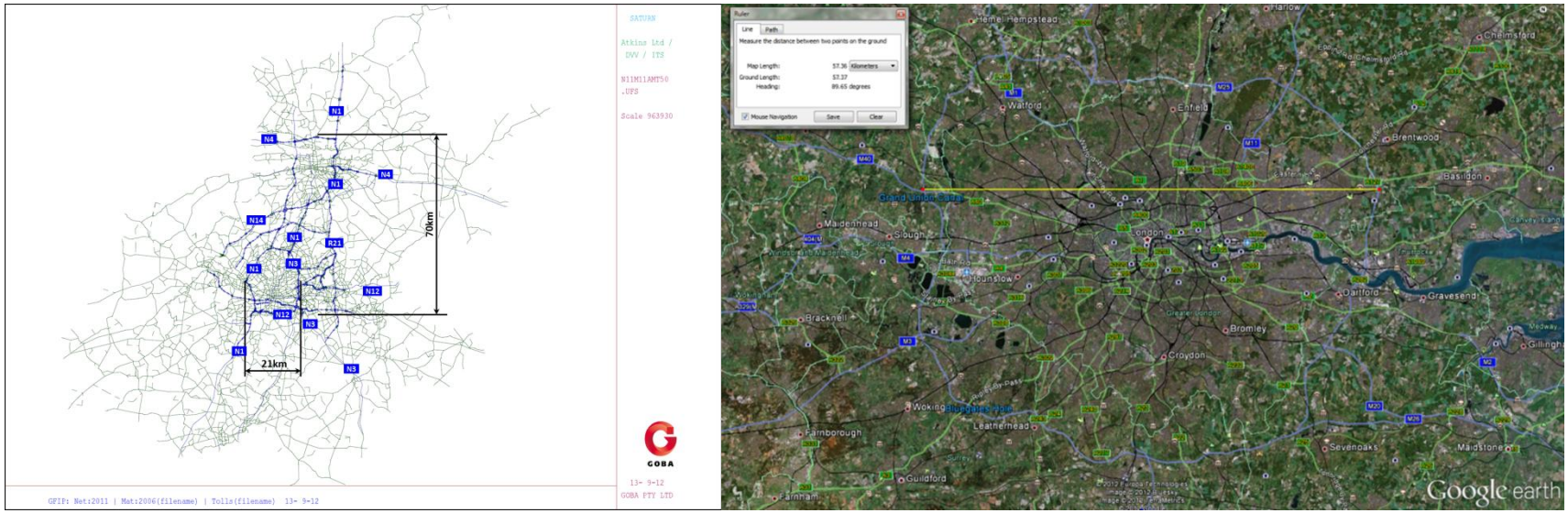
- Understand what the modelling variables do and use this knowledge to mould your model into shape
- Toll road results:
  - International average: actual traffic = 70% of forecasts
  - Our results: actual traffic = 95% to 103% of forecasts

Conclusions

- Understand what you are dealing with.

Toll road projects

- Gauteng Freeway Improvement Project
  - State toll road (SANRAL)
  - 186km of existing urban freeway network
  - Open road tolling (ORT) from 42 staggered gantries each tolling ±10km



Toll road projects

- Mauritius: Port Louis Ring Road Decongestion Project – (ORT)
- N1/N4 Platinum Toll Road (Concession) – Pta to Botswana
- N1/N2 Winelands Toll Road (Concession) – Cape Town – 200km
- Ghana: Accra to Kumasi – 220km
- Nigeria: Epe-Lekki Expressway (Lagos)
- Over 8000km of toll road projects; State, DBOT and feasibility studies

Goba (Pty) Ltd. : Toll Road Experience											
Project	Country	Year	Contract Type	Road (km) Length	Traffic Forecasting	Toll Strategy	Revenue Forecasting	Infrastructure Planning	Road Design	Toll Plaza Design	Economic Evaluation
N2 - Tsitsikamma	South Africa	1982	State	62	✓	✓	✓	✓	✓		
N1 Kranskop	South Africa	1984	State	106	✓	✓	✓	✓			
N1 Grasmere to Kroonstad	South Africa	1987	State	92	✓	✓	✓	✓	✓		
N3 Alberton to Cedara	South Africa	1987	State	480	✓	✓	✓	✓			
Eastern Region (N11, N2, N6, N10, R23, R35)	South Africa	2010	State	2500	✓	✓	✓				✓
N17 - Springs to Oshoek	South Africa	2009	State	284	✓	✓	✓	✓	✓	✓	✓
N2 Wildcoast - George to Port Elizabeth	South Africa	2007	State	318	✓	✓	✓	✓			
N4 - Maputo Corridor (TRAC)	South Africa / Mozambique	1998	DBOT	385	✓	✓	✓	✓	✓		
N1/N4 - Platinum Corridor (Bakwena)	South Africa	1999 - 2001	DBOT	382	✓	✓	✓	✓	✓	✓	
N3 Alberton to Cedara (Mafube)	South Africa	1997	DBOT	480	✓	✓	✓	✓			
Port Louis Ring Road	Mauritius	2010	DBOT	138	✓	✓	✓	✓			✓
Accra to Kumasi (N6)	Ghana	2011 - 2012	DBOT	220	✓	✓	✓	✓			
Epe-Lekki Expressway	Nigeria	2008 - 2012	DBOT	85	✓		✓				
Ndola - Chingola	Zambia	2010	DBOT	210	✓	✓	✓	✓			
Kazungula Bridge	Zambia / Botswana	2008	State	3	✓		✓				
Pozega - Horgos	Serbia	2006	DBOT	345	✓	✓	✓				
Gauteng Freeway Improvement Project	South Africa	2006 - 2011	State	185	✓	✓	✓	✓	✓		
Hellenic Republic ETC Standards	Greece	2000 - 2005	State		✓			✓			
Dehli-Gurgaon NH8	India	2006	Intertoll	18	✓	✓					
Egnatia Odos	Greece	2003	State	630	✓	✓	✓			✓	
N2/R72 Port Elizabeth to East London	South Africa	2007	State	428	✓	✓	✓	✓			✓
N10 Port Elizabeth to Cradock	South Africa	2006	State	243	✓	✓	✓	✓			✓
R300 - Cape Town (Penway)	South Africa	2000	DBOT	138	✓	✓	✓	✓	✓		
N1/N2 Winelands - Cape Town	South Africa	2010	DBOT	232	✓	✓	✓	✓	✓		
N2 South Coast Rd - Hibberdene to Southbroom	South Africa	1997	State	47	✓	✓	✓	✓	✓	✓	
Total Distance of Toll Roads				**8011 km**							

Limited survey data

- Household travel surveys (2000).
- Roadside interviews
- CTO counts on national and some provincial roads
- Strategically placed 7-day automatic counts
- One-day (12hr) counts are the norm
- Travel times – normally one run, two if we are lucky

Limited project periods

- GFIP: (900 zones; 20 000 links; 5 time periods; 6 User Classes; additional 185km of freeway tolled at 42 ORT gantries)
  - Initial traffic results for road designers – 4 months
  - Revenue forecasts – 8 months
- Winelands: 2 routes ±100km each
  - Traffic work and revenue forecasts – 5 months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STOP
Tollgate


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