Decision Support Tool to unlock the potential of large-scale agent-based transport demand simulation for planning practice

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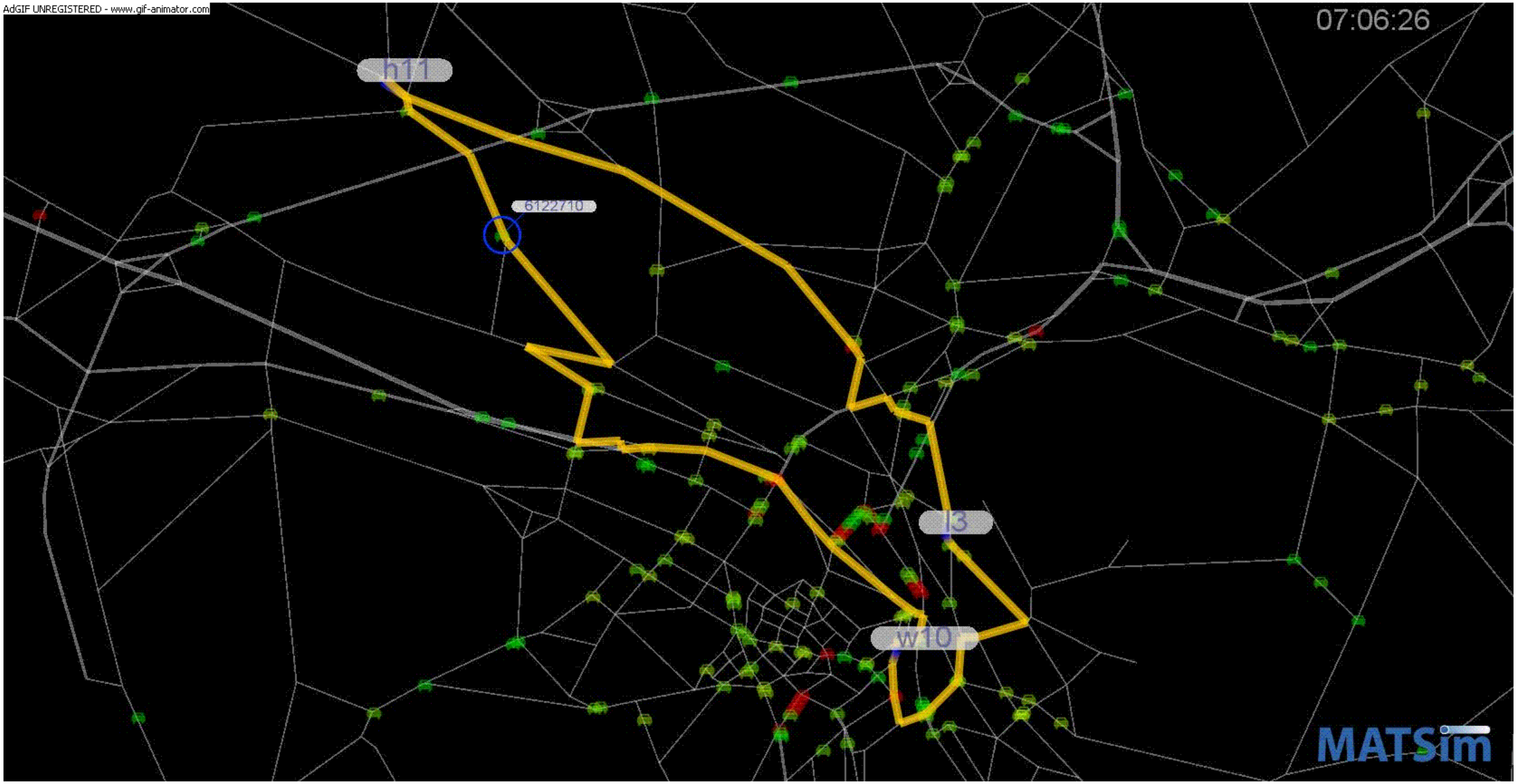
Principles of agent-based transport modeling

Example of an agent's daily activities and travel



Agent-based transport simulation for planning

Fourie, Pieter J. (2013). Updated Multi-agent Transport Simulation (MATSim) of Singapore, Version 2.2. http://vimeo.com/65878227

Agent-based transport simulation for planning

Advantages

Full temporal dynamics

- Bunching phenomena
- Overcrowding of individual vehicles
- Time-dependent demand management

Agent-based paradigm

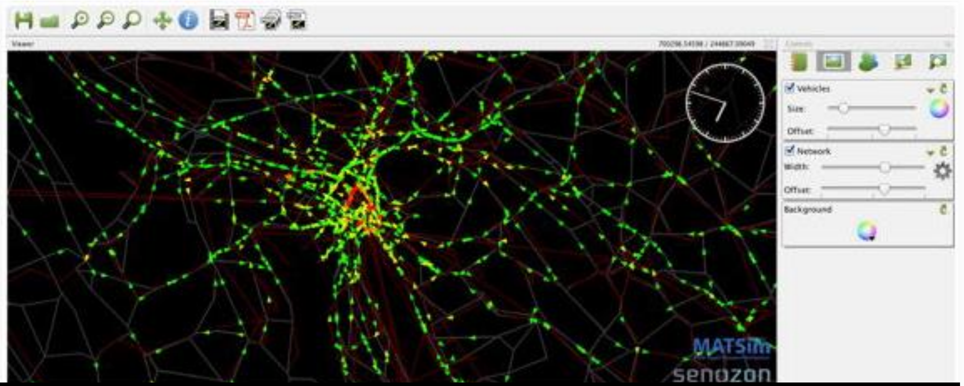
- Individuals
- Parcel or building (or unit) as base unit
- Interdependency of trips and activities, e.g. tour based mode choice

Challenges

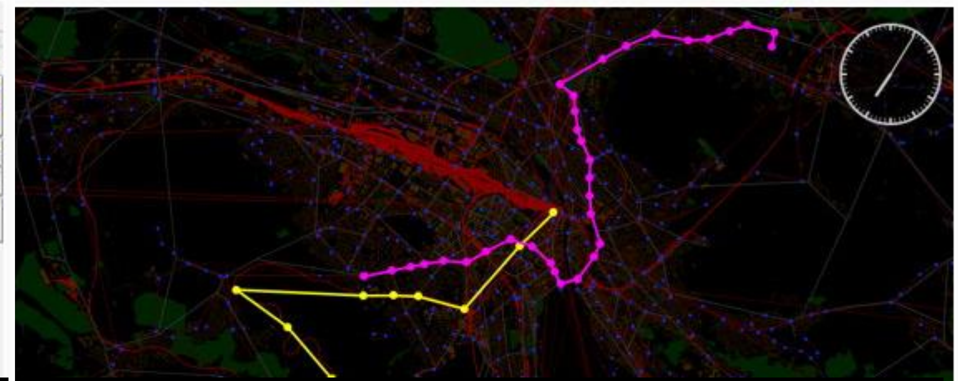
How to deal with the **wealth of data**?

- **Who**?
- With how much **time**?
- What **skills**?
- New questions?

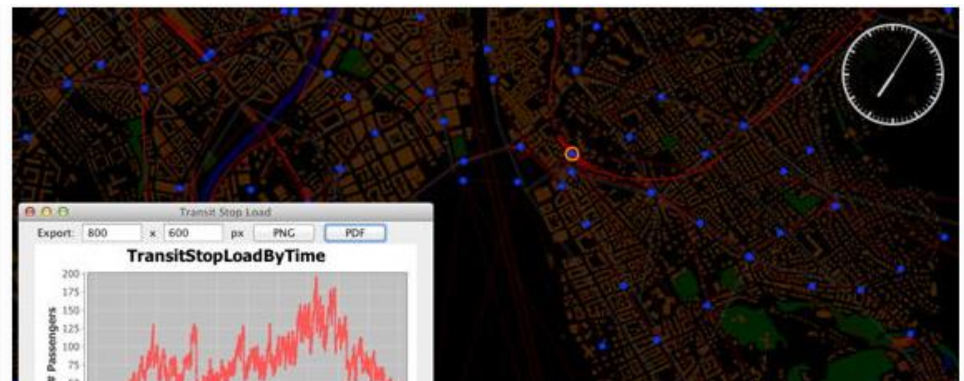
Current situation I



Network and moving vehicles

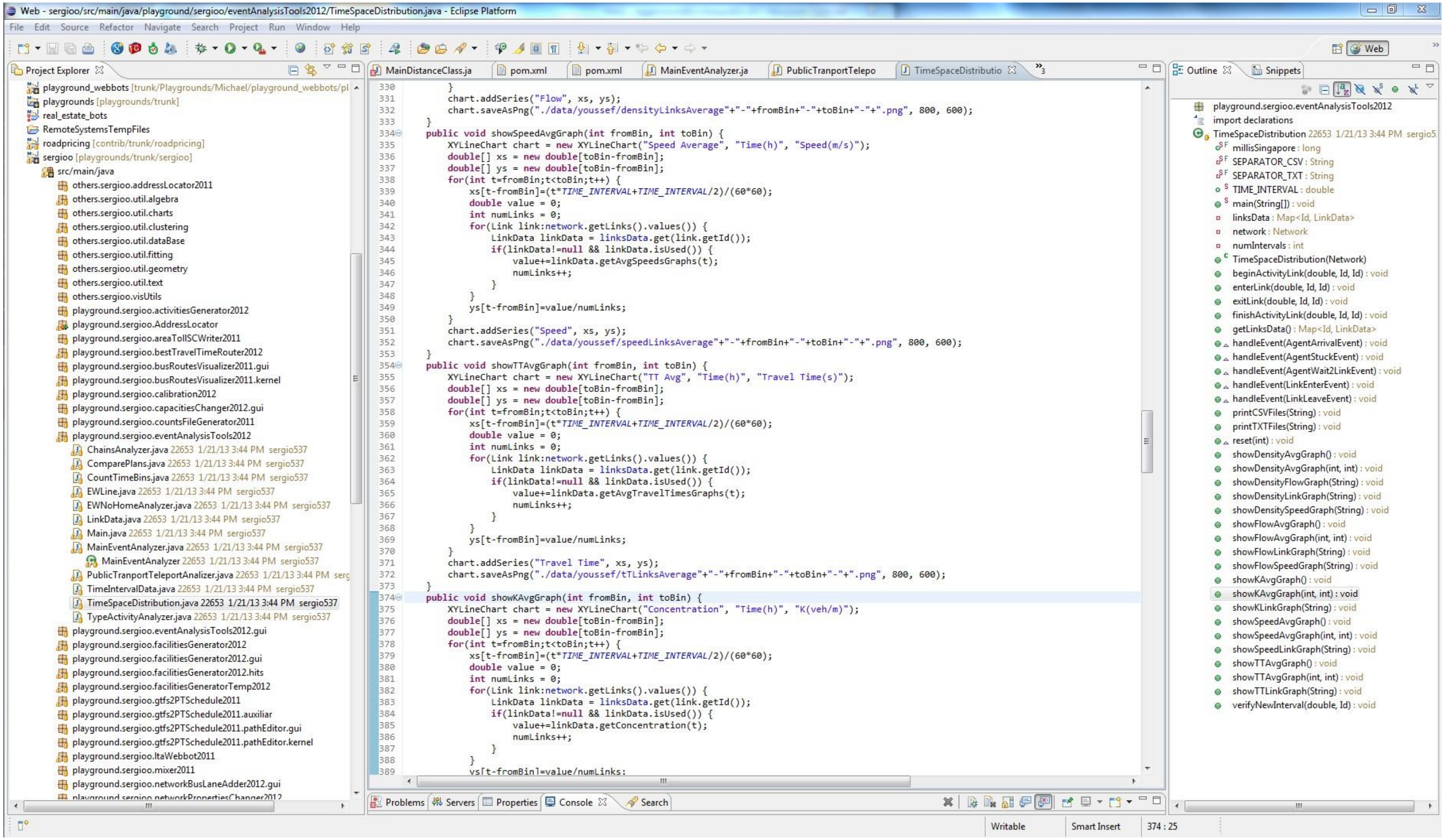

Highlight transport lines

Follow individual agents



Public transport demand analysis

Current situation II



Decision support system for transportation

Transport planners

- Effects of new bus services/network
- Impact of travel demand management schemes

Urban planners:

- Temporal patterns of buildings and neighbourhood
- Flow between public transport stops to surrounding buildings

Policy-makers

- Costs and benefits of a infrastructure measures?
- Who and where are the winners and losers?

Public transport operators

- Who profitable will a new line be?

Service industry

- Which customers are in catchment areas, separated by mode?

Requirements for DSS in transport planning

Functional:

Appraisal

- Cost-benefit
- Winners and losers

Scope

- Journeys
- Stages
- Activities

Temporal analysis

- Full temporal resolution for filtering and aggregation

Technical:

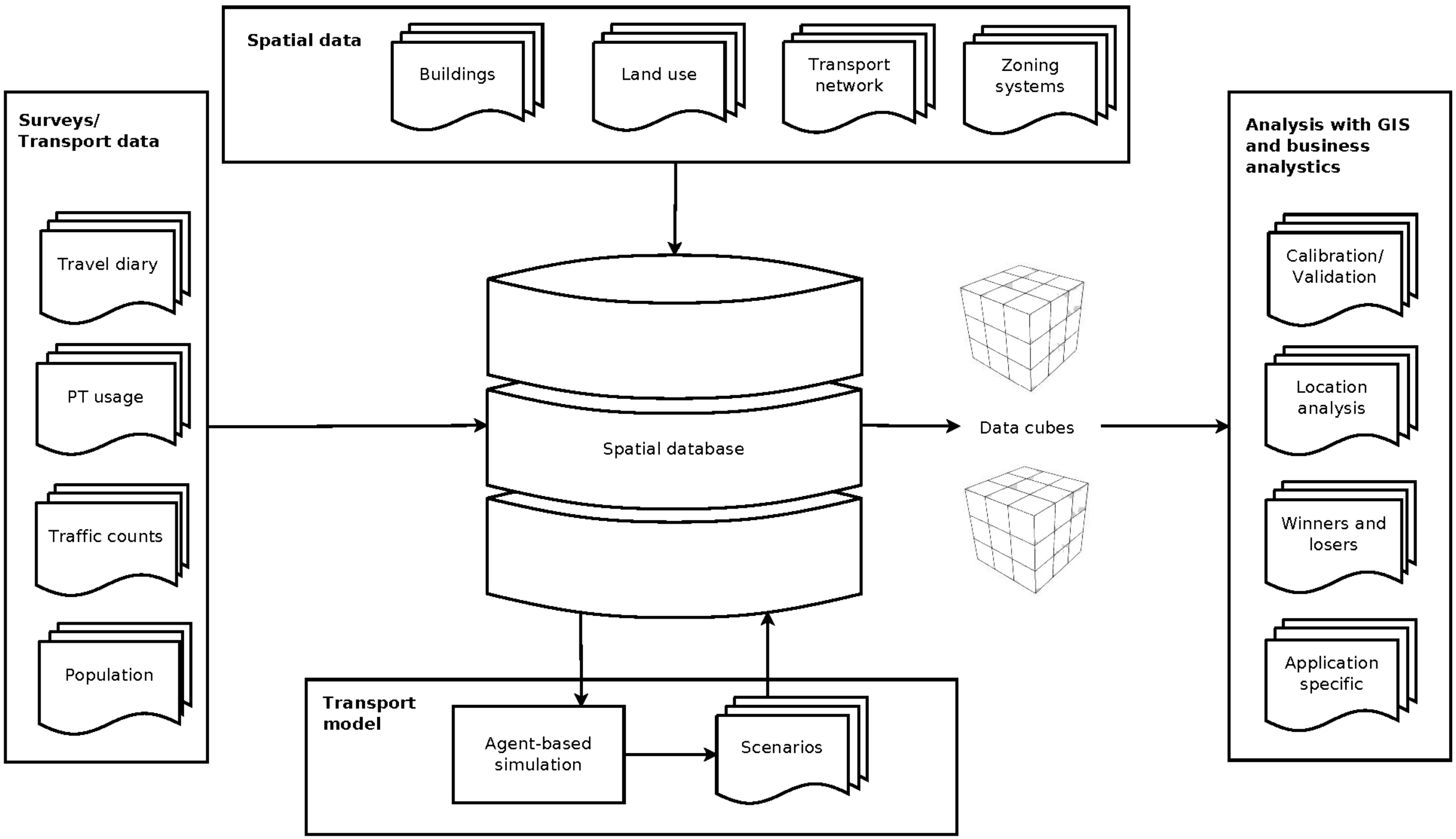
Database

- Open source with open interface
- Spatial queries
- Flexible permission setting

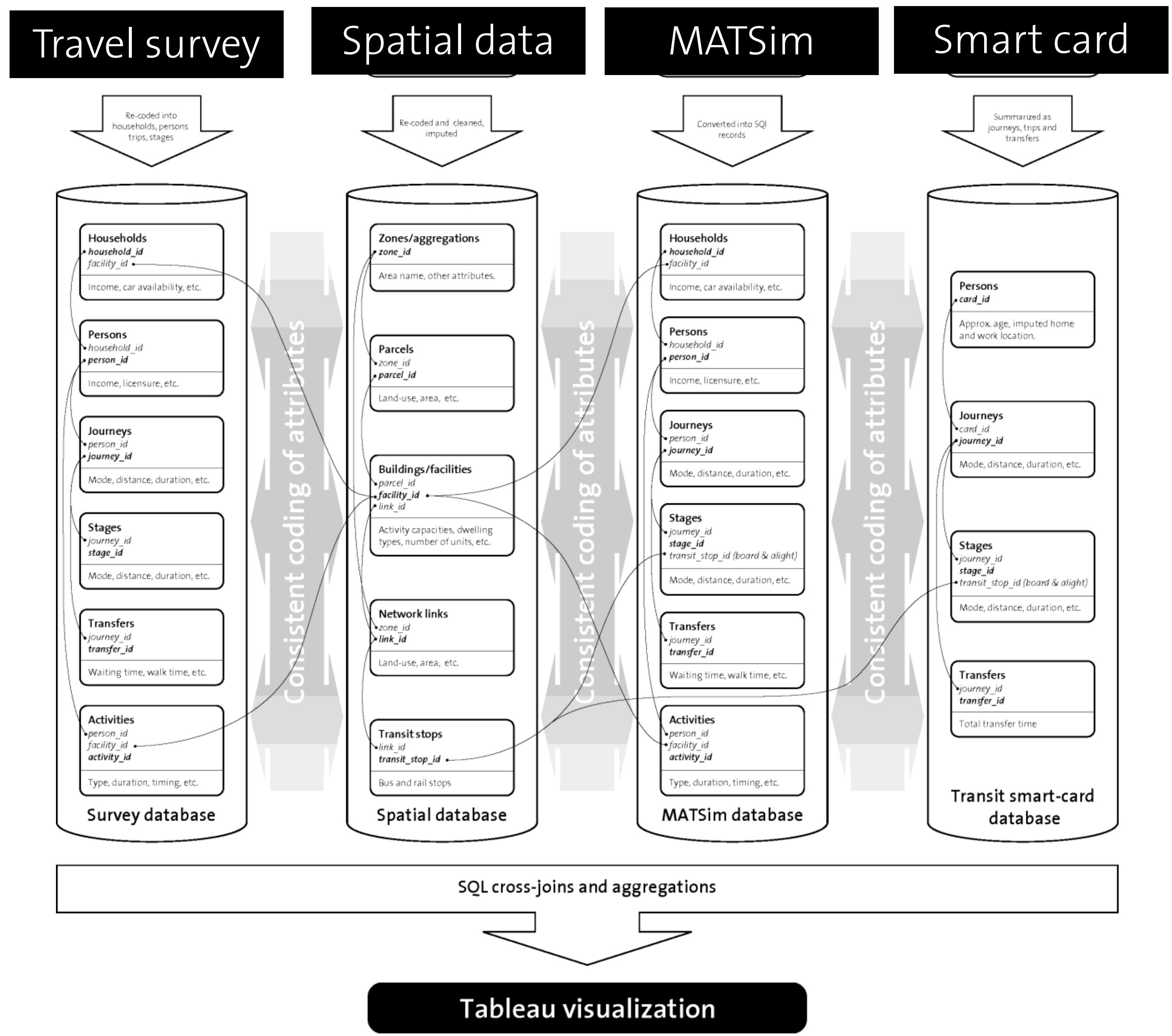
Front-end

- Business analytics software for customisable and interactive analysis
- GIS

General Framework



Case study: decision support tool for Singapore



Two case study applications

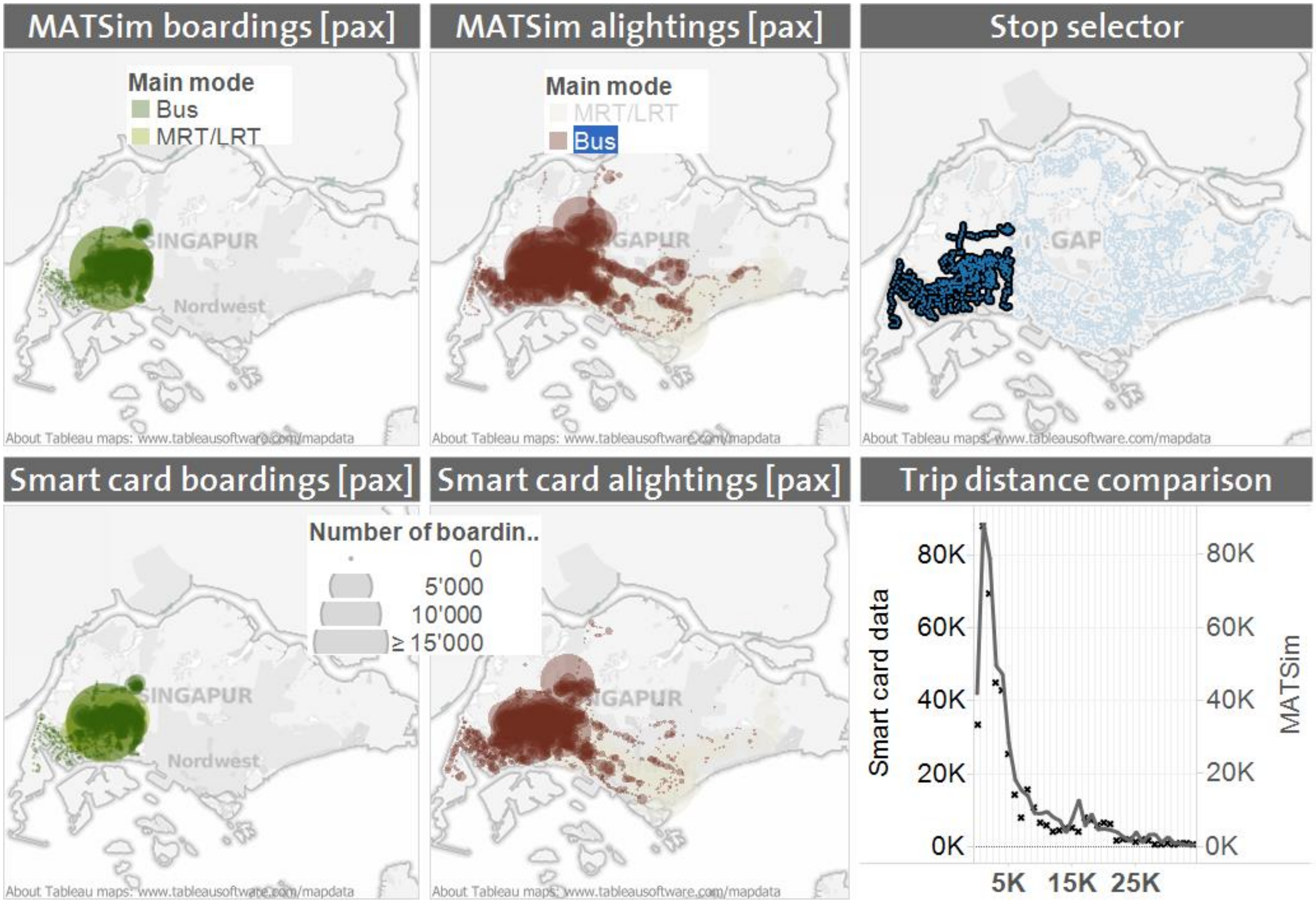
Comparison between modeled and actual travel demand patterns

- Data available from same data platform
- Public transport smart card transactions replicate level of disaggregation provided by agent-based transport simulation

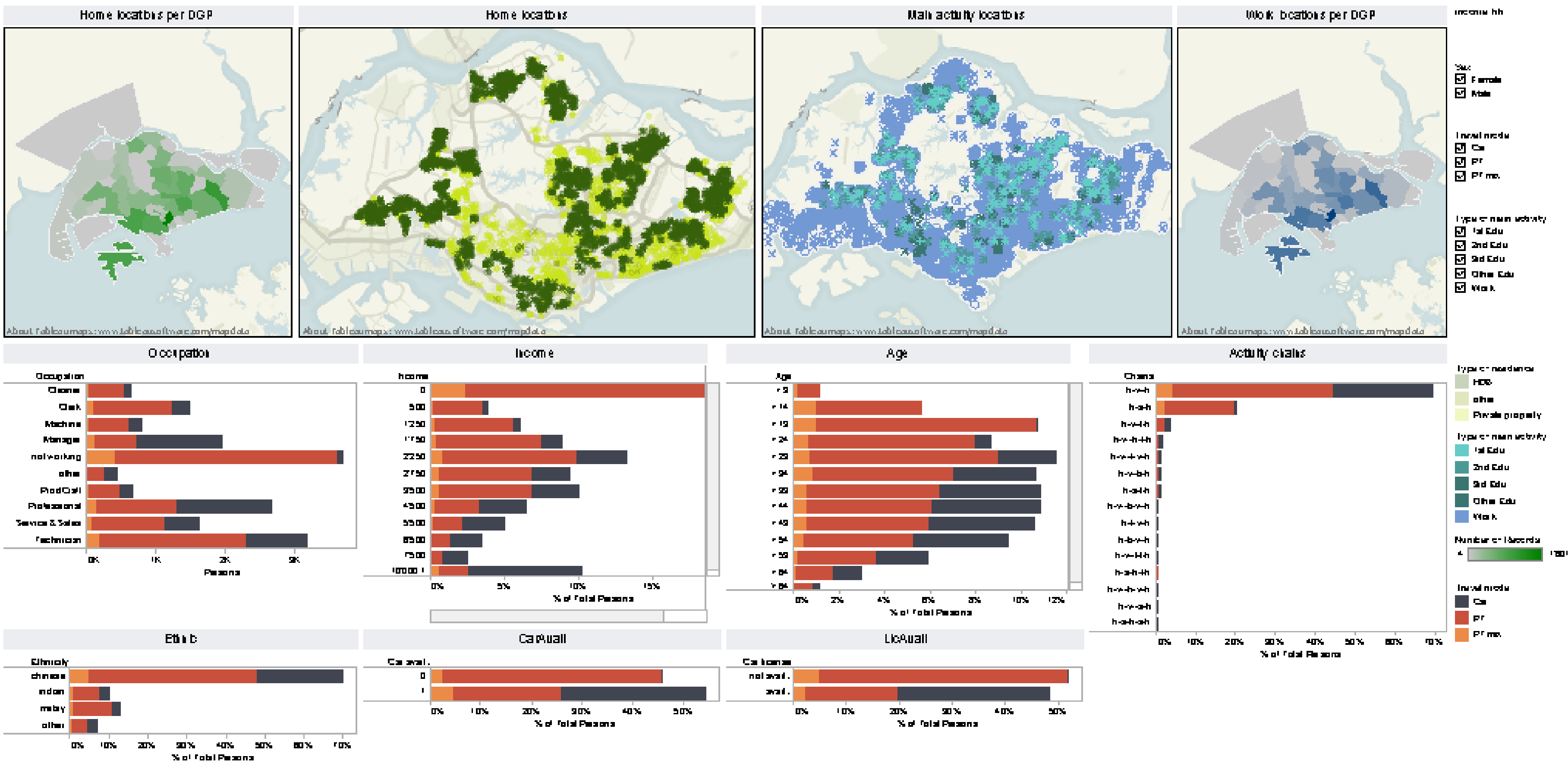
Travel demand explorer

- Spatial selection
- Special focus
  - Mode share
  - Commuting trips
- Socio-demographics

Public transport trips data explorer



Travel demand explorer



Vision, Mission and Strategy

Vision

- Continuously updated data input
- Living (3d) city model to be maintain and shared data across stakeholders
- Automatic generation of MATSim ‘live’ scenarios

Mission:

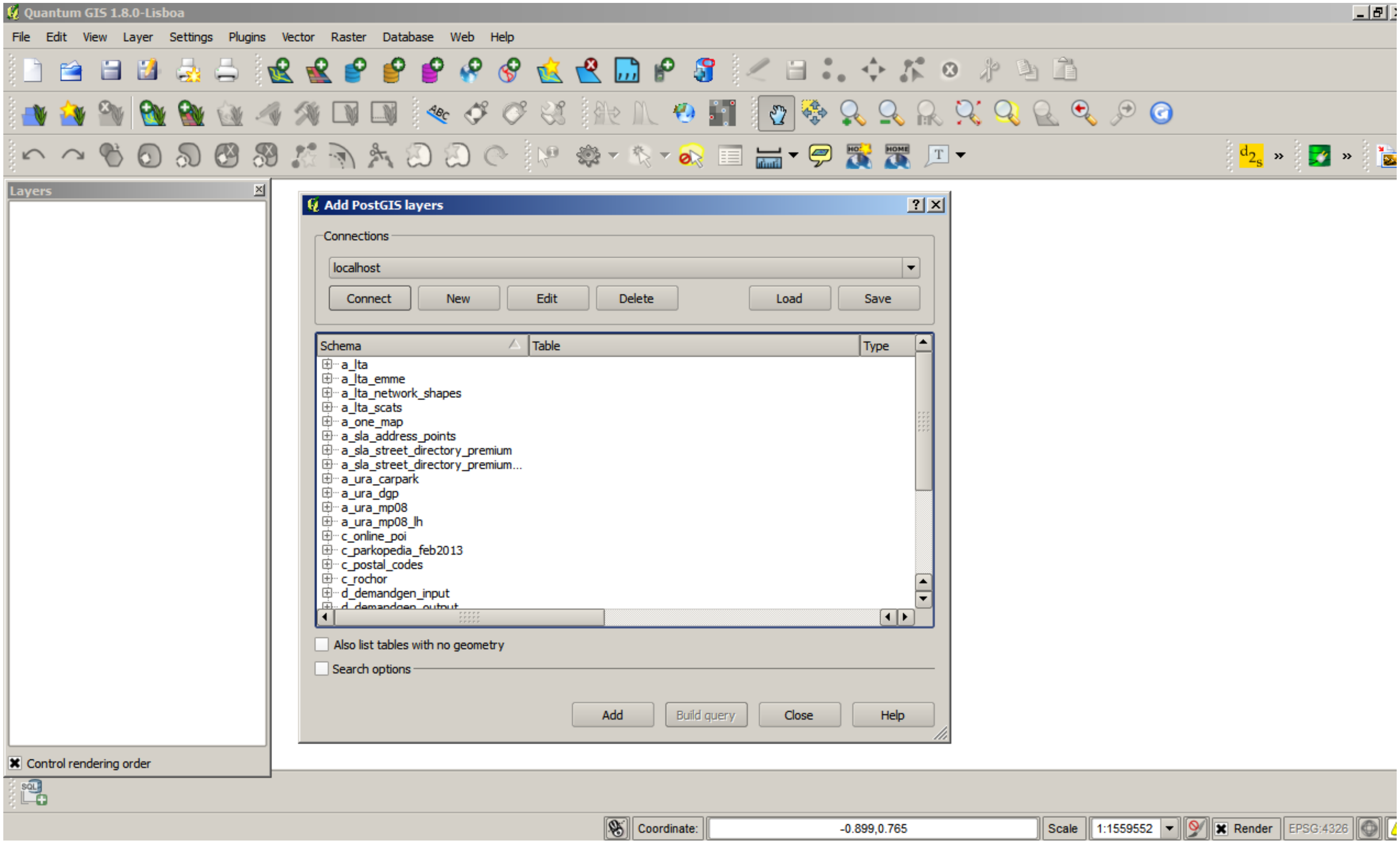
- Developing the necessary tools to make MATSim more accessible for practitioners
- Engaging with practitioners in workshops to overlap of pressing needs with abilities new modelling technology offers

Strategy / Next steps

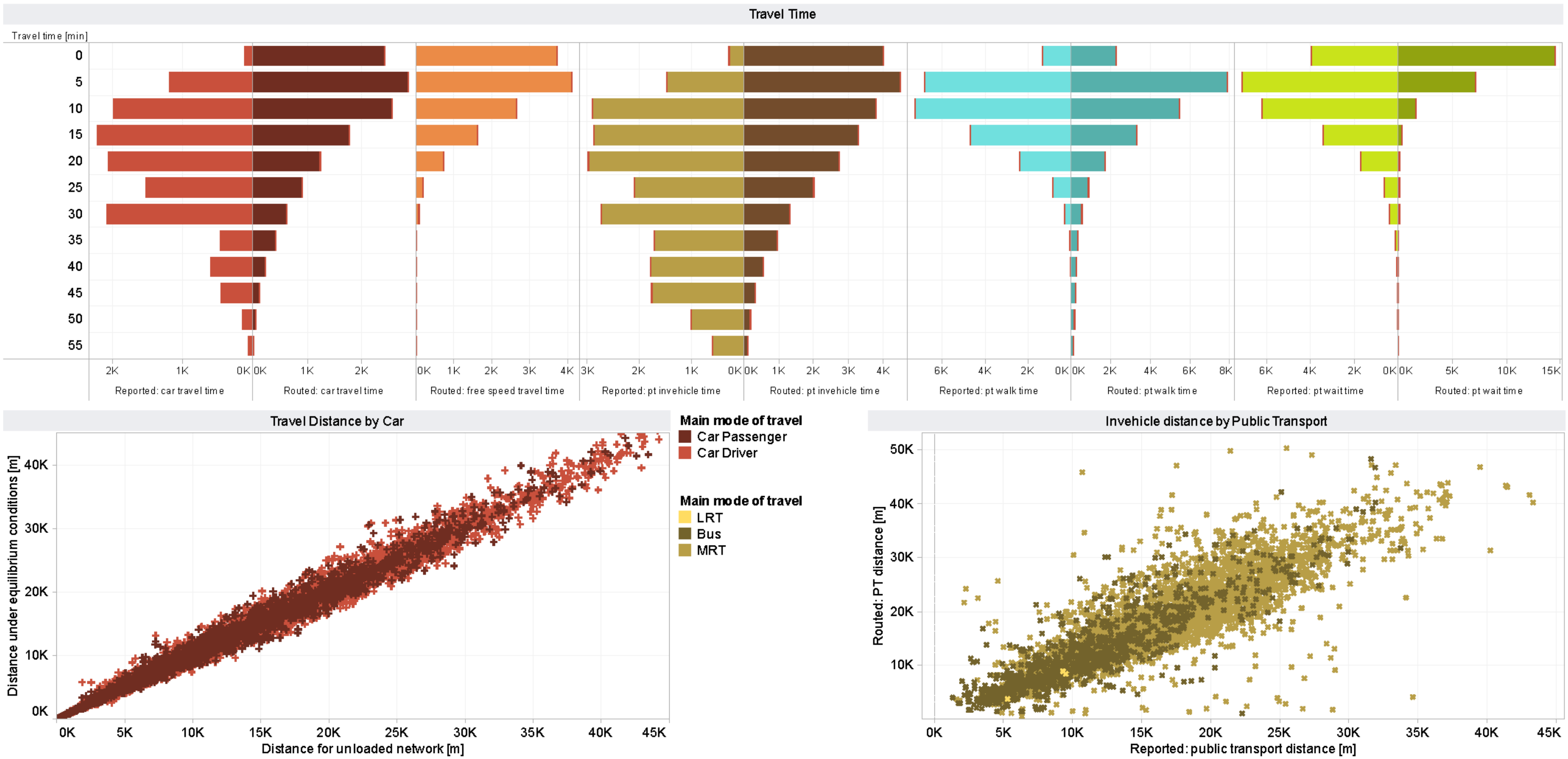
- Calibration and validation of MATSim Singapore with DSS

Appendix

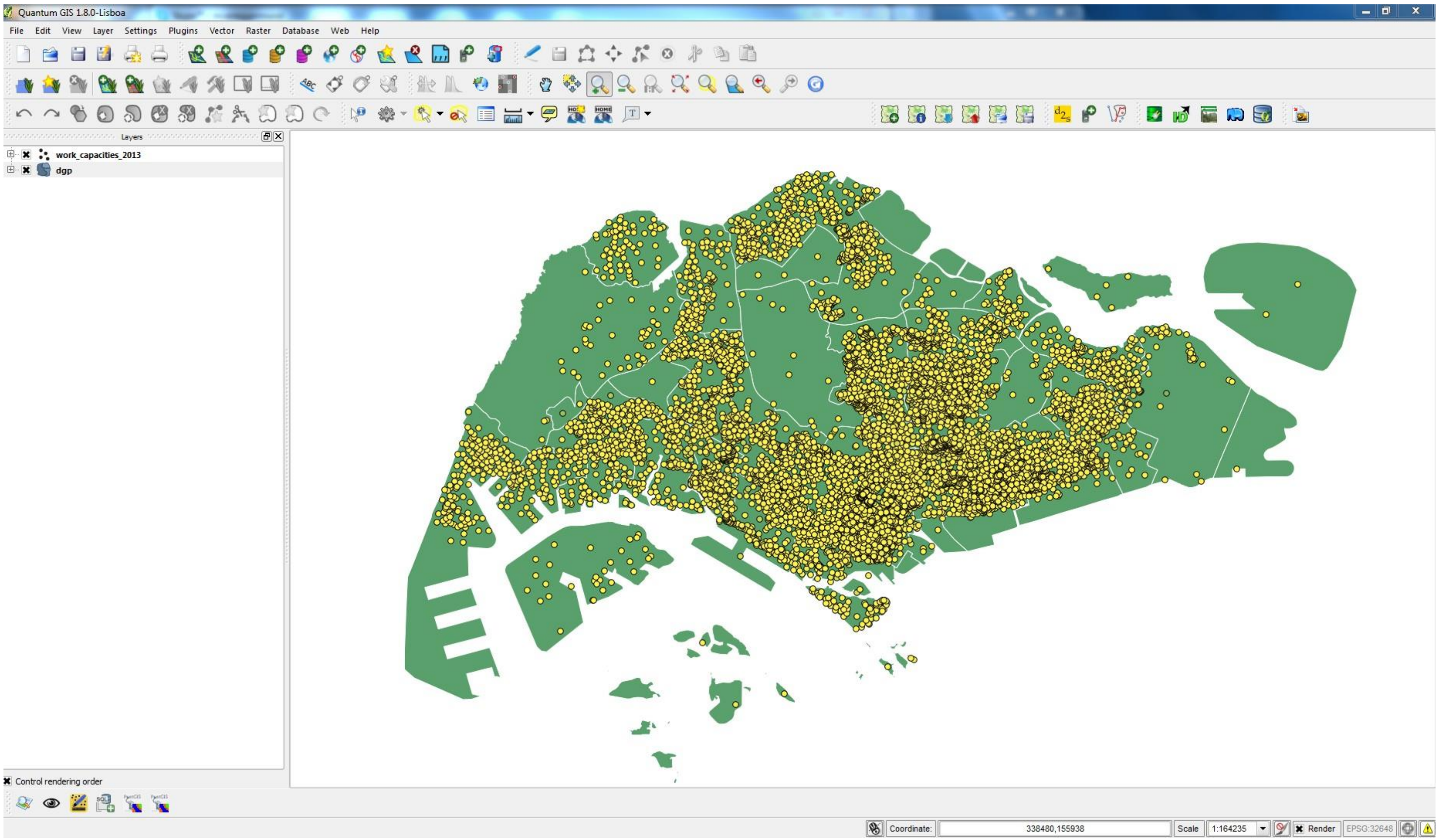
Connect and edit spatial database with Quantum GIS



Travel survey: reported vs MATSim routed



Connect and edit spatial database with Quantum GIS



How do other disciplines deal with the problem?

1960: First Management Information Systems

- Interactive analysis
- Single decision maker

1970: Computer Based Systems to aid decision making

- Databases and models
- Financial planning

1980: Decision Support Systems (DSS)

- Data -> Model -> management software for end user
- Cognitive psychology and operations research join the club

How do other disciplines deal with the problem?

1990: Group decision support system

- Various stakeholders with different agendas

2000: Business intelligence

- Procter&Gamble links retails scanner data to DSS
- On-Line Analytical Processing (OLAP) for interactive analysis
- Linkage of various data sources, e.g. from different departments

2010: Visualisation

- Analyst circumvents data warehouse specialists
- External, interactive visualisation tools
- State-of the –Arte visualisation principles