Effective road safety management using network-wide historical speed data – commercial speed data as big data source to improve road safety intelligence
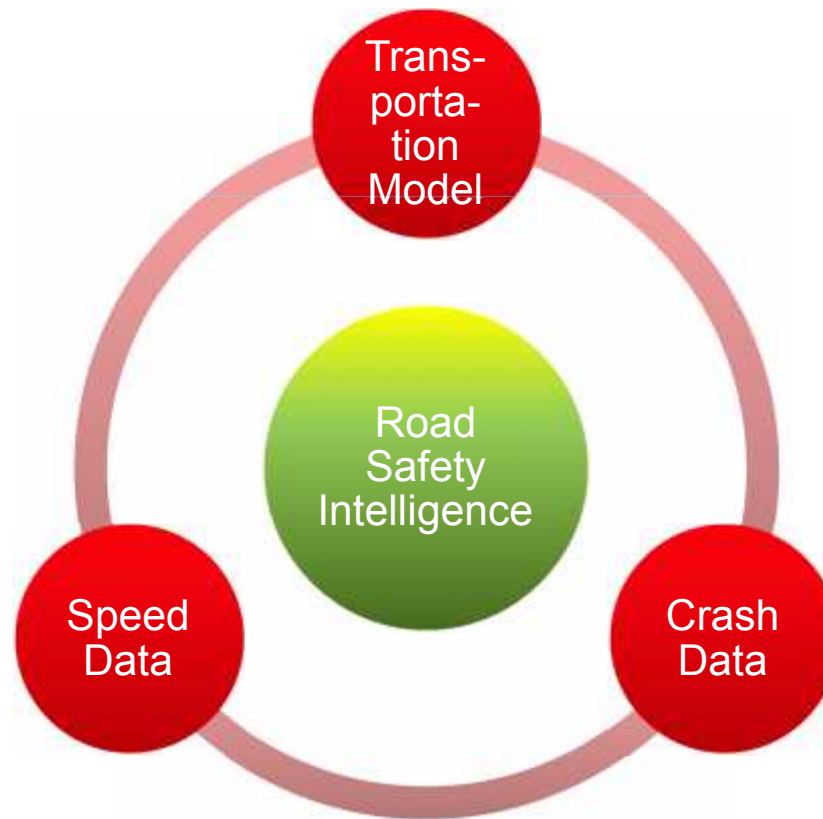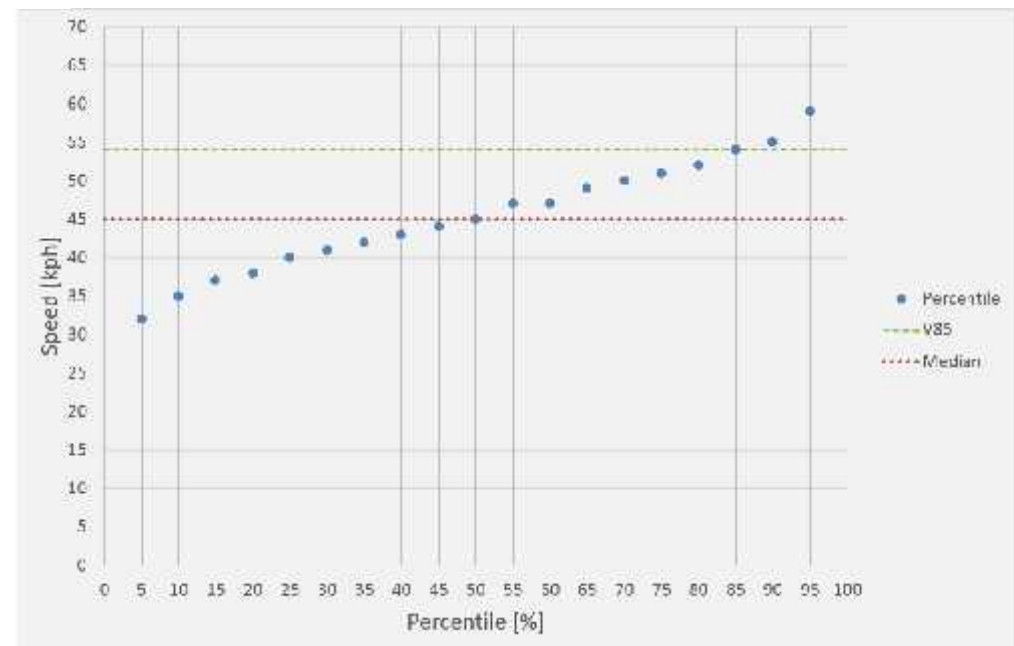
Timo Hoffmann, PTV Group

OVERVIEW

Effective road safety management using network-wide historical speed data – commercial speed data as big data source to improve road safety intelligence
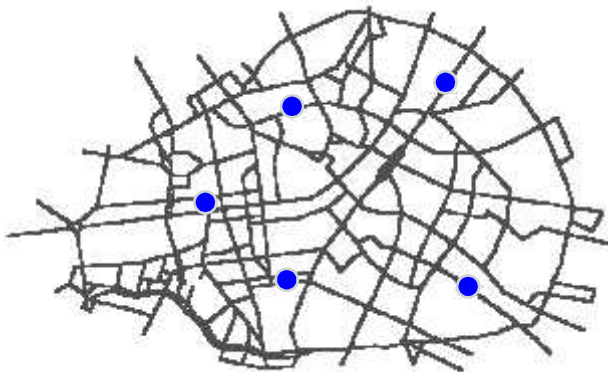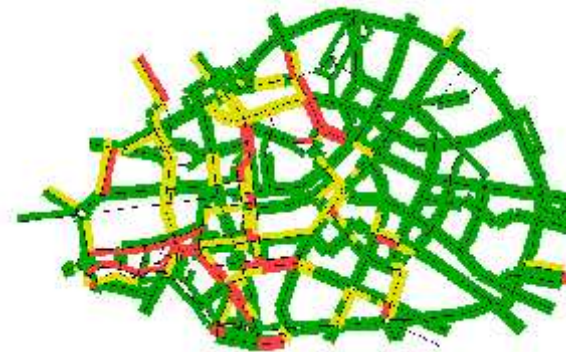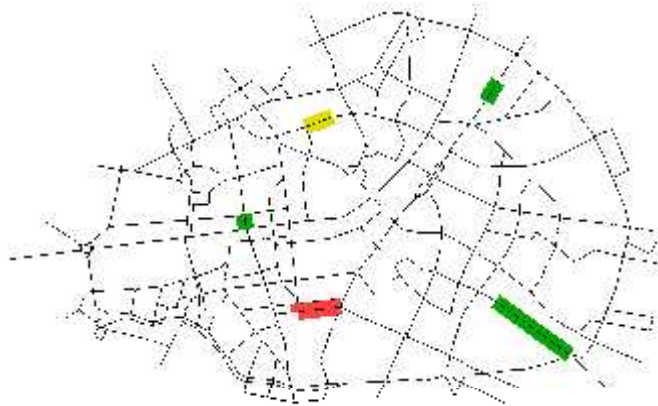
COMMERCIAL SPEED DATA
TOMTOM EXAMPLE

Sources - Floating Car Data from TomTom Navigation Devices

SINGLE SPEED MEASUREMENTS SITES VS. NETWORK WIDE SPEED DATA

USE CASES AND BENEFITS OF USING SPEED DATA TO INCREASE ROAD SAFETY INTELLIGENCE

1. Design speeds

2. Effect of changes

3. Crash site investigation

4. Time dependent speed limits

5. Transportation models:
   travel times, emissions, crash prediction

6. Microsimulations

COMPARE DESIGN SPEEDS WITH ACTUAL DRIVING SPEEDS

Design Speed → **?** ← **Real Speed**
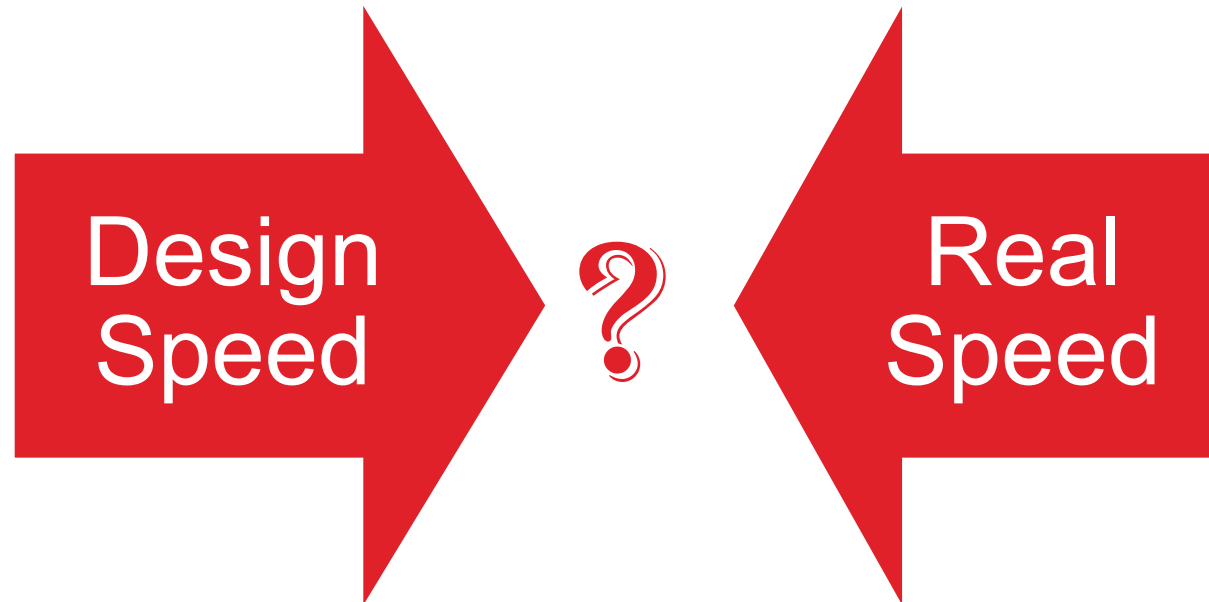
- Actual design speeds
- Speed limit
- Free flow speed

- Median speed
- V_{85} (85th percentile)
- V_{95} (95th percentile)

For different times of the day, weekdays, date periods…

COMMERCIAL SPEED DATA
COMPARISON OF DESIGN SPEEDS WITH DRIVING SPEEDS

Digital road network of Basel showing ratio of night time (free flow) speeds vs. morning peak speed in different colours

Digital road network of London showing free flow speeds and Sunday night/early morning speeds
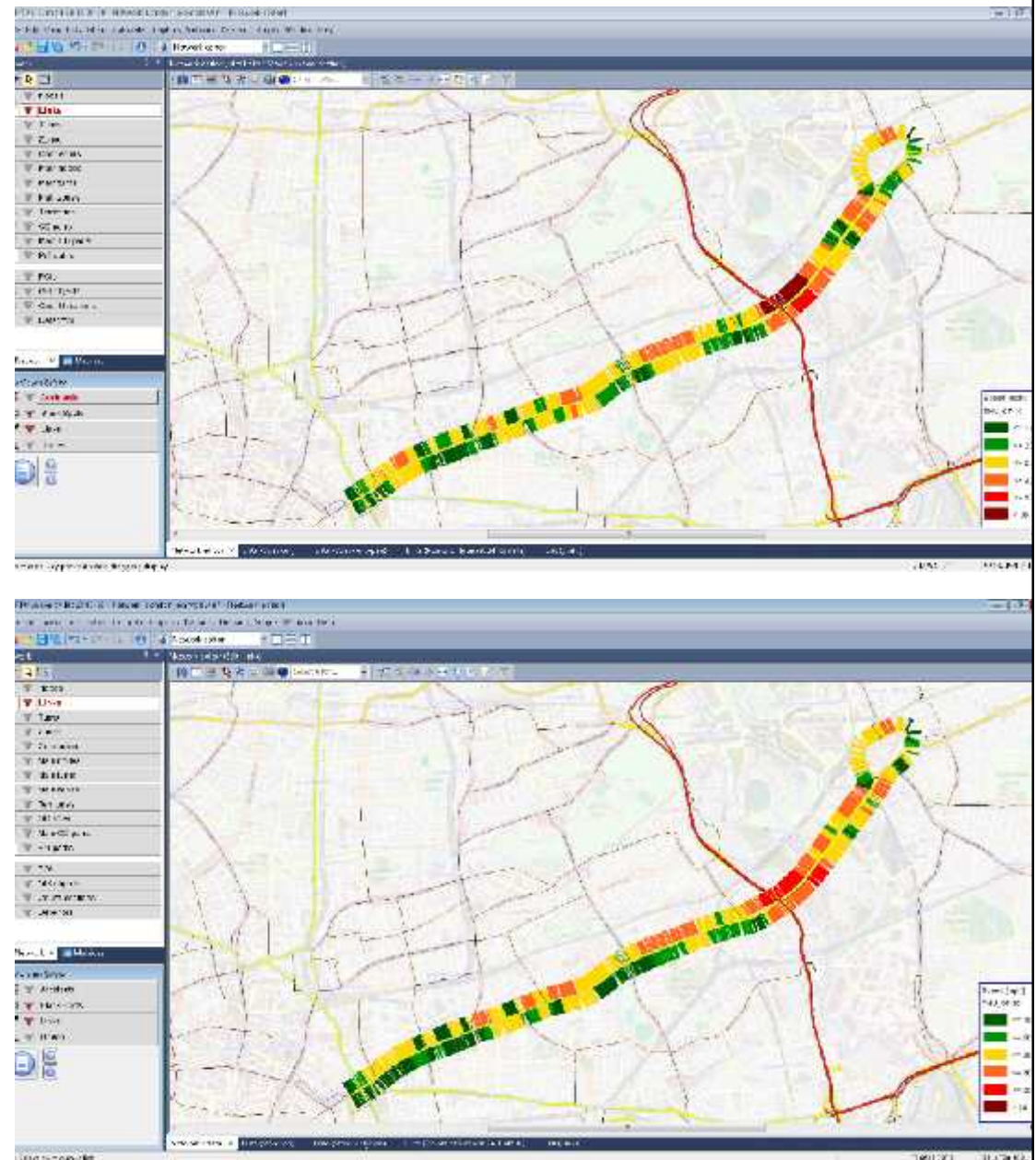
EFFECT OF ROAD INFRASTRUCTURE CHANGES

Assess the effect of
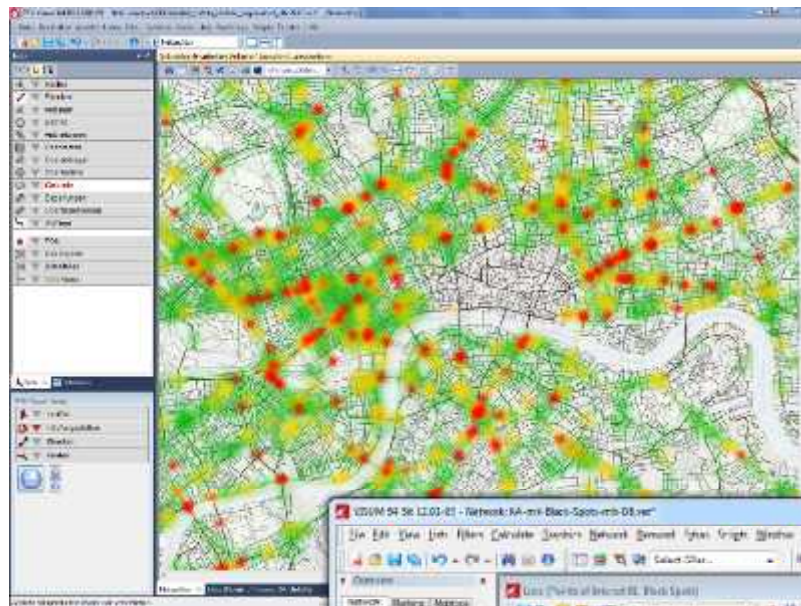
- ➡ road infrastructure changes
- ➡ speed enforcement tactics
- ➡ introduction of cycle or bus lane
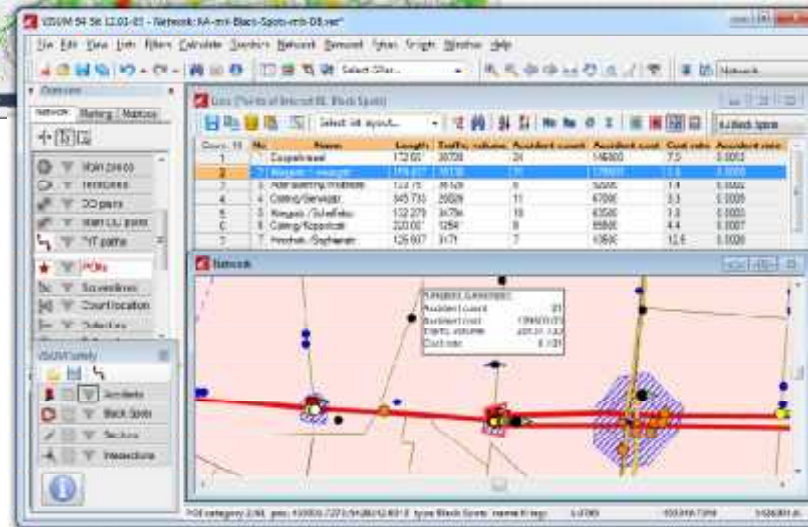- ➡ road safety campaigns
- ➡ etc

on the driving speeds

- ➡ at a specific site
  &
- ➡ in its vicinity

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BLACK SPOT MANAGEMENT

- ▶ Identify Black Spots in a network based on crash data

- ▶ Analyse crash data and possible safety deficits or risks at Black Spots

- ▶ Develop measures to eliminate Black Spots

ANALYSE SPEEDING BEHAVIOUR AT CRASH SITES

➥ For certain black spots road authorities need to assess if speed reduction / enforcement is a good countermeasure

➥ Actual speeds driven at a crash site are generally not known
➥ Quality of collected crash data often not good

➥ Speed data in combination with crash data improves knowledge about road situations
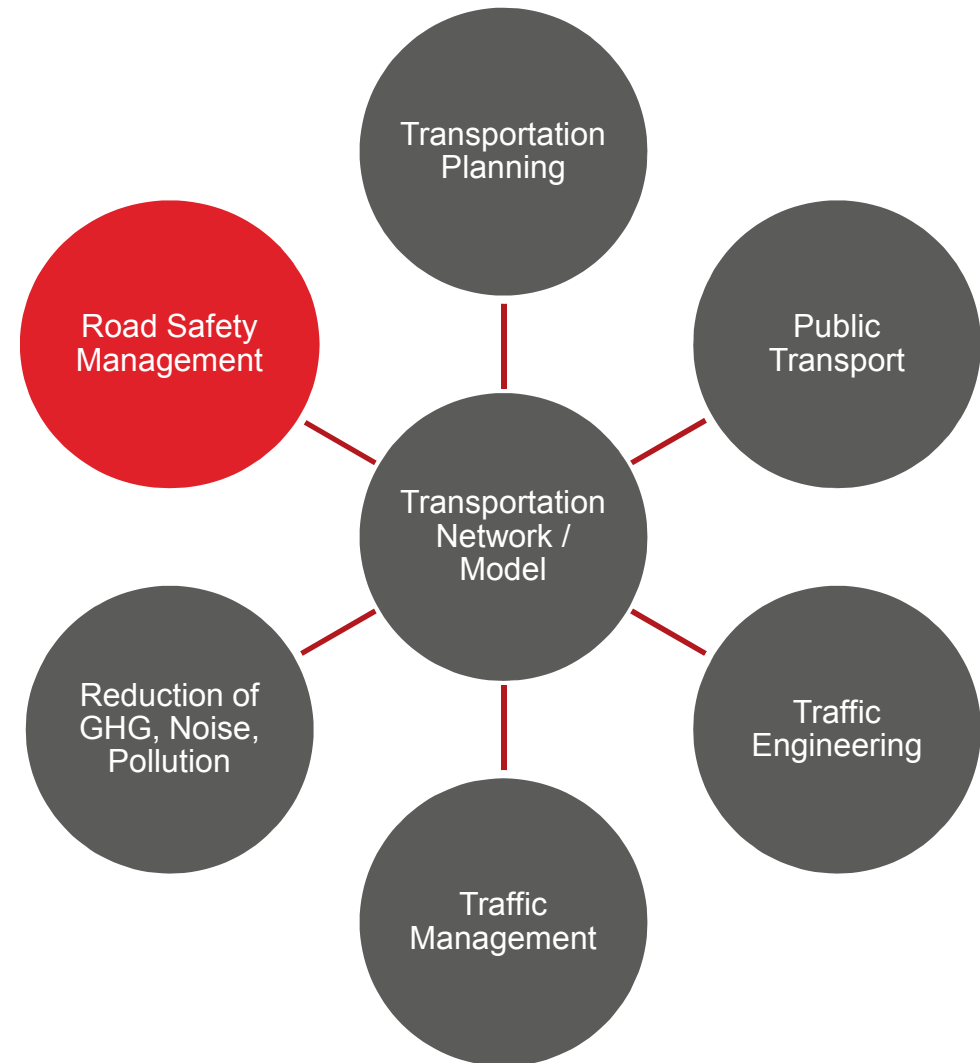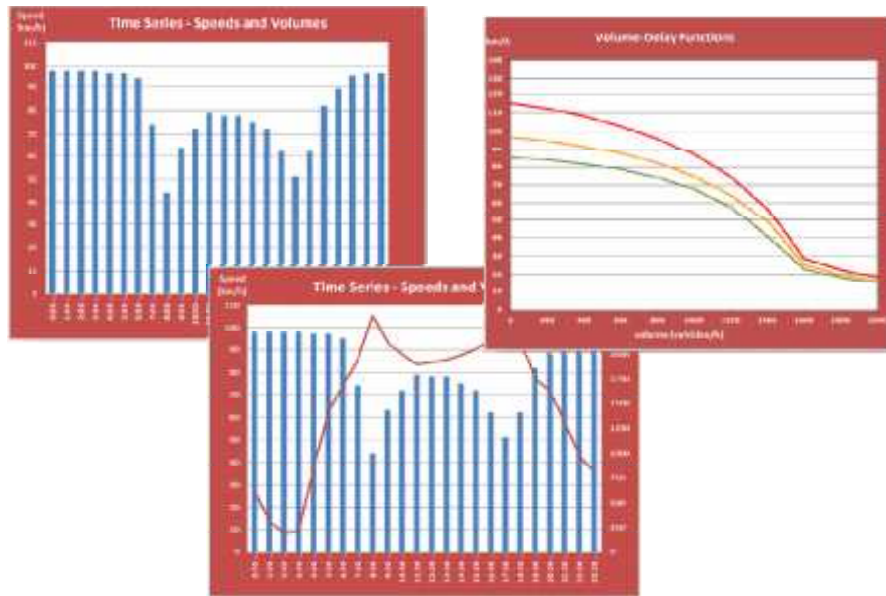

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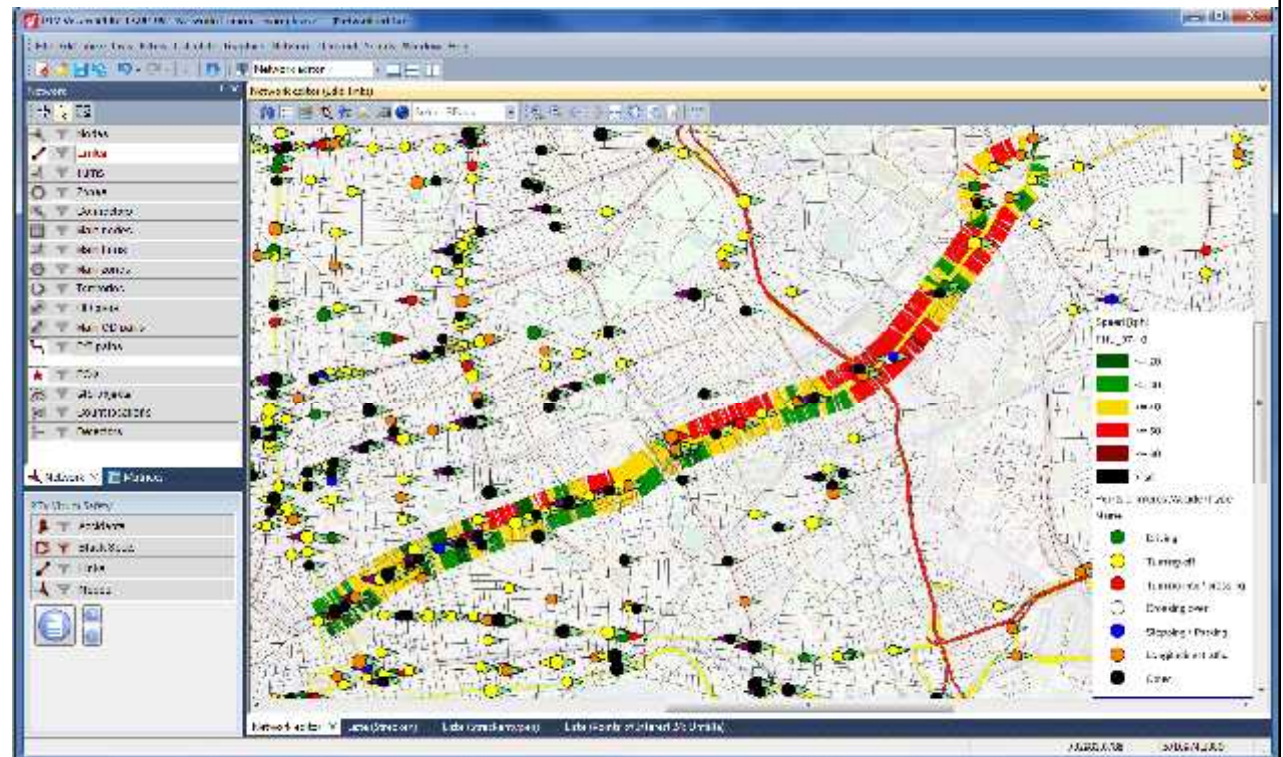
TIME DEPENDENT SPEED LIMIT VS GENERAL SPEED LIMIT

➤ General speed limits are not always wanted or needed

➤ Speed data can help define times for time dependent speed limits
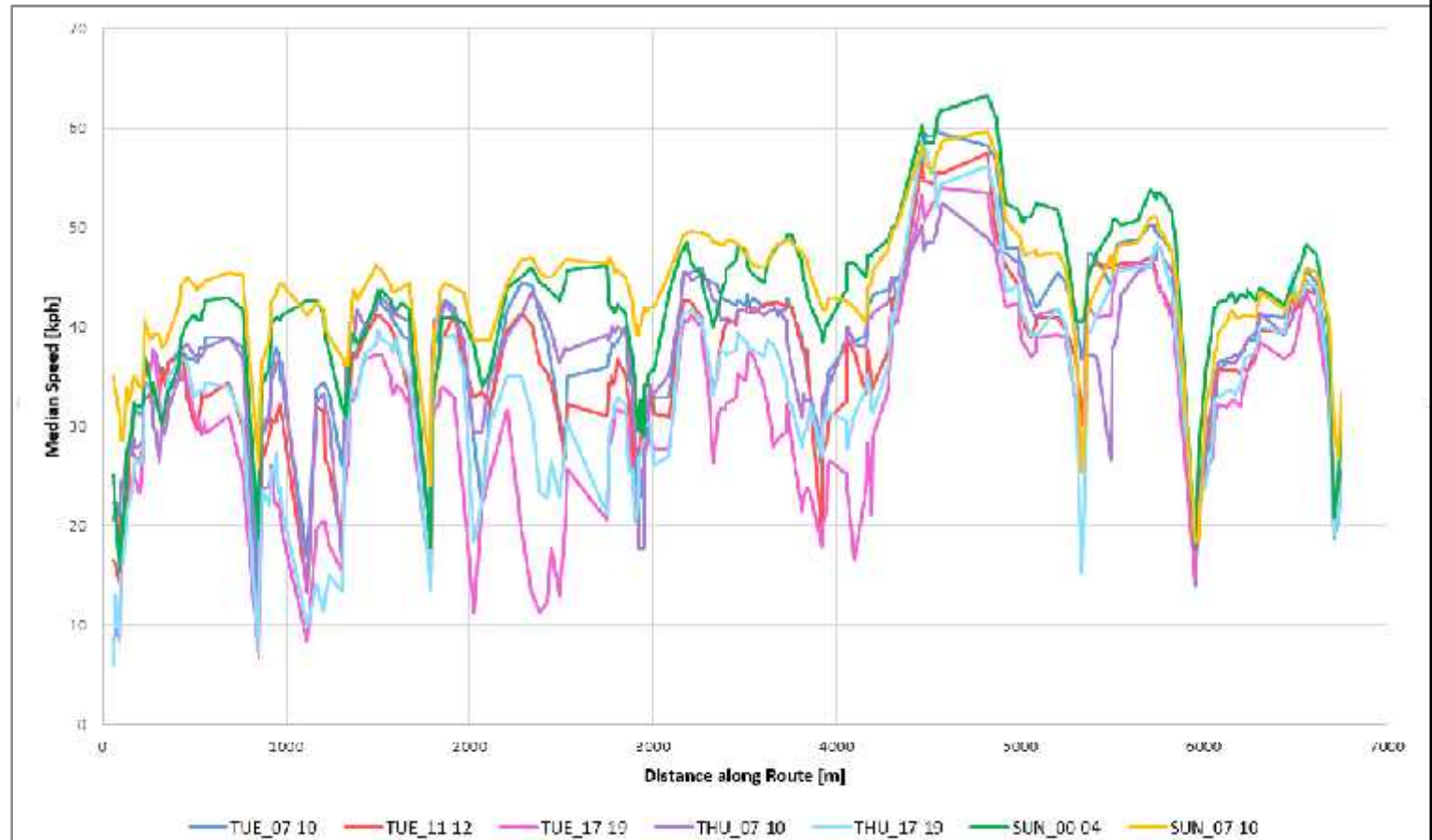
COMMERCIAL SPEED DATA:
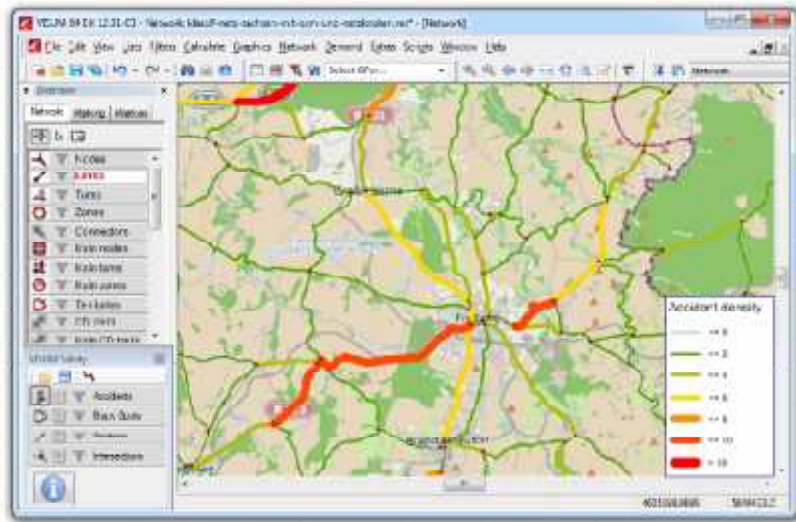# CALIBRATION OF MACROSCOPIC TRANSPORTATION MODELS

- Defining free flow speeds
- Estimation of capacity
- Speed calibration
- Calibration of Volume-Delay-Functions
- Validation of model results

Transportation Planning

Road Safety Management

Public Transport

Transportation Network / Model

Reduction of GHG, Noise, Pollution

Traffic Engineering

Traffic Management

APPLICATIONS OF TRANSPORTATION MODELS:
NETWORK SAFETY MANAGEMENT

➡ Evaluate the safety level of the road network based on crash data and traffic volumes

➡ Identify road stretches with high potential for safety improvements

➡ Define further actions

➡ Speed data used to calibrate the model ⇨

➡ Model is of a better quality and delivers more realistic traffic volumes across the network ⇨

➡ More accurate crash rates (crashes per vehicle kilometers) ⇨

➡ Better identification of safety potentials

APPLICATIONS OF TRANSPORTATION MODELS: ROAD SAFETY IMPACT ASSESSMENT

➡ Using crash prediction models (CPM) to model shift in crash costs

➡ Using speed parameters as parameters in a CPM
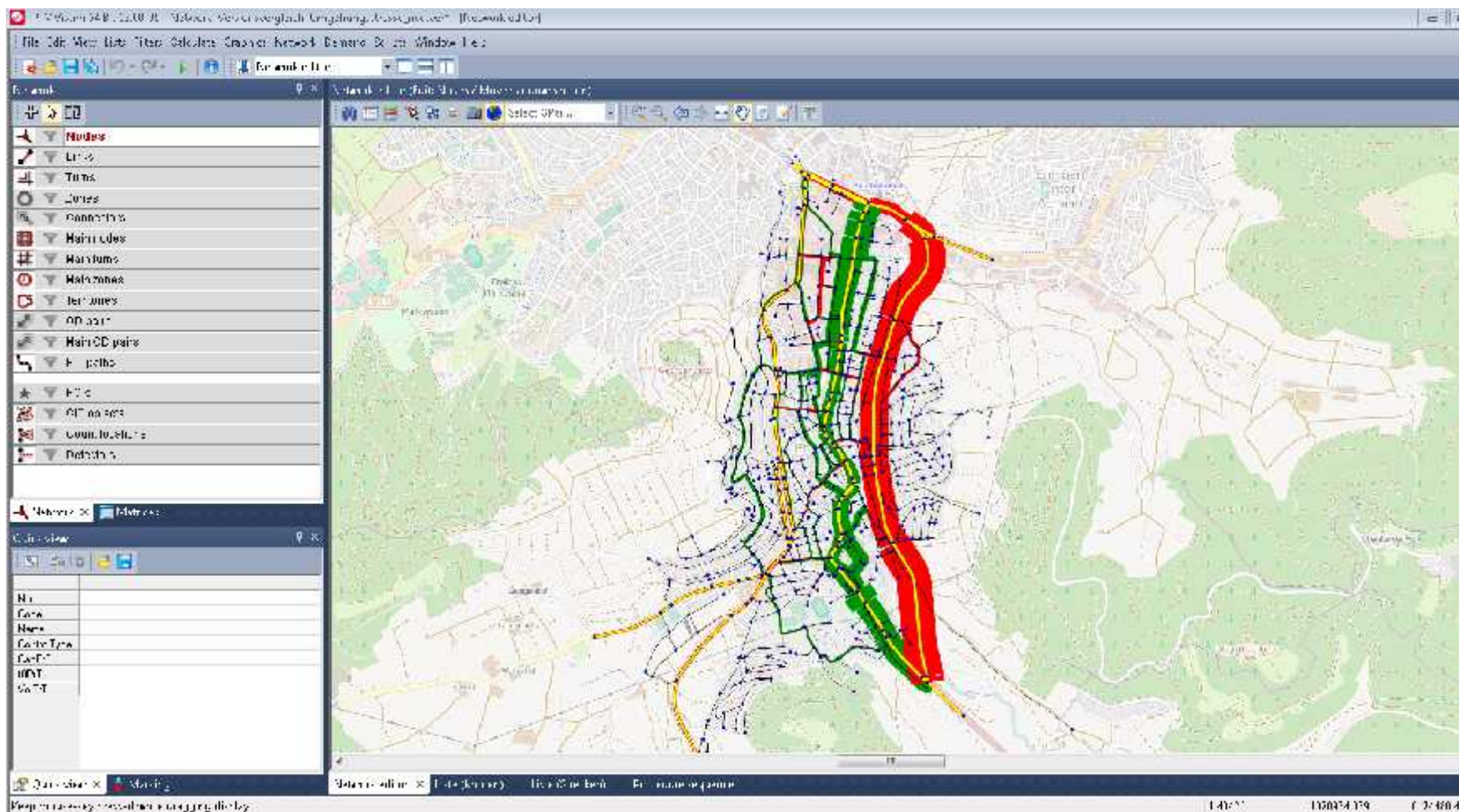
USING MICROSIMULATIONS FOR SAFETY EVALUATIONS

➤ Microsimulations cannot predict crashes

➤ Nevertheless, it is possible to evaluate safety levels using surrogate measures

➤ Safety comparisons of different scenarios are possible

➤ Speed data used for desired speed distribution and calibration