

IMAGINE

Budapest Workshop

Everything you ever wanted to
know about traffic modelling

imagine

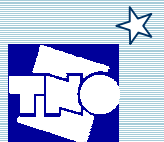
WP2 Workshop on Road Traffic Modelling and the
European Environmental Noise Directive

Presenter: Isabel Wilmink, TNO, The Netherlands

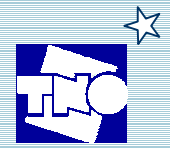
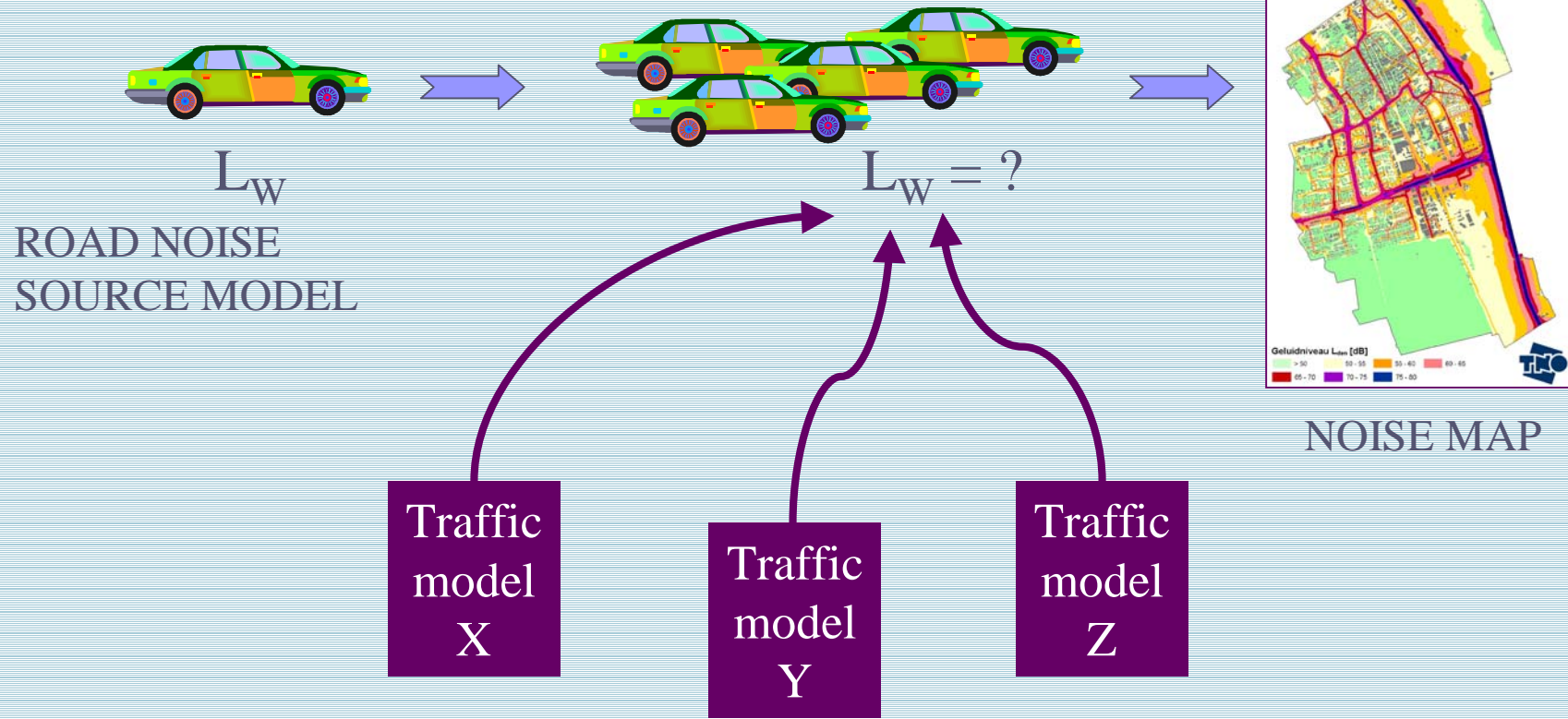
Word of warning

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- “Everything” is a bit exaggerated... there is not enough time today
- For anything this presentation does not cover but you still want to know: ask me afterwards or send me an e-mail (isabel.wilmink@tno.nl)



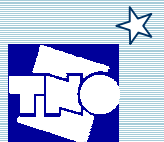
Objective of WP2



Content

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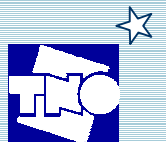
- Traffic models:
 - what are they used for
 - how do they work
 - what sort of output
- General aspects important for noise mapping and noise action planning
- Modelling measures to reduce noise



Traffic models are used to determine...

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- Where people want to go, by which mode, when they want to get there, which route they take and how they behave on the road
- What traffic flows this results in (volumes, speeds, etc.)

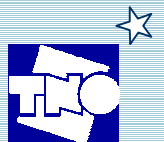


How do traffic models work?

Traffic and transport is modelled as a chain of decisions:

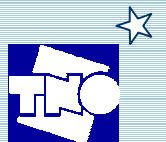
- To make or not to make a trip **Economics**
- Choice of destination
- Choice of travel mode
- Choice of departure time
- Choice of route
- Choice of driving manoeuvres **Engineering**

Each type of traffic model focuses on part of this decision chain



To make or not to make a trip **agine***

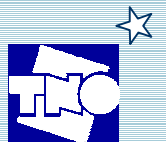
- Why and how often do people travel?
 - work, education, leisure, ...
- Measures:
 - combining trips: shop near work or home, etc.
 - telecommuting etc: can people work, shop, learn from home?



Choice of destination

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- Which destinations (businesses, schools, shops, homes etc.) can be reached within acceptable costs (time and costs of petrol, public transport ticket, etc.)?
- Measures:
 - land use, tolls, parking fees, etc.



Choice of travel mode

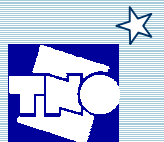
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- Which mode of transport (car, public transport, bike, plane, ...) is used?
 - availability of mode of transport
 - costs of use to reach a certain destination
- Measures:
 - improving network and services for certain modes, increasing/decreasing costs of use, etc.



Choice of departure time

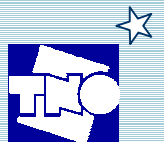
- When are trips made? For instance:
 - work trips: weekdays, usually peak hours
 - school: weekdays, usually morning peak, home before evening peak
 - leisure: usually weekend, evening, but also during the day
- Measures:
 - opening times of facilities, time windows for lorries, working from home until after peak hours, etc.



Choice of route

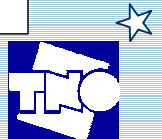
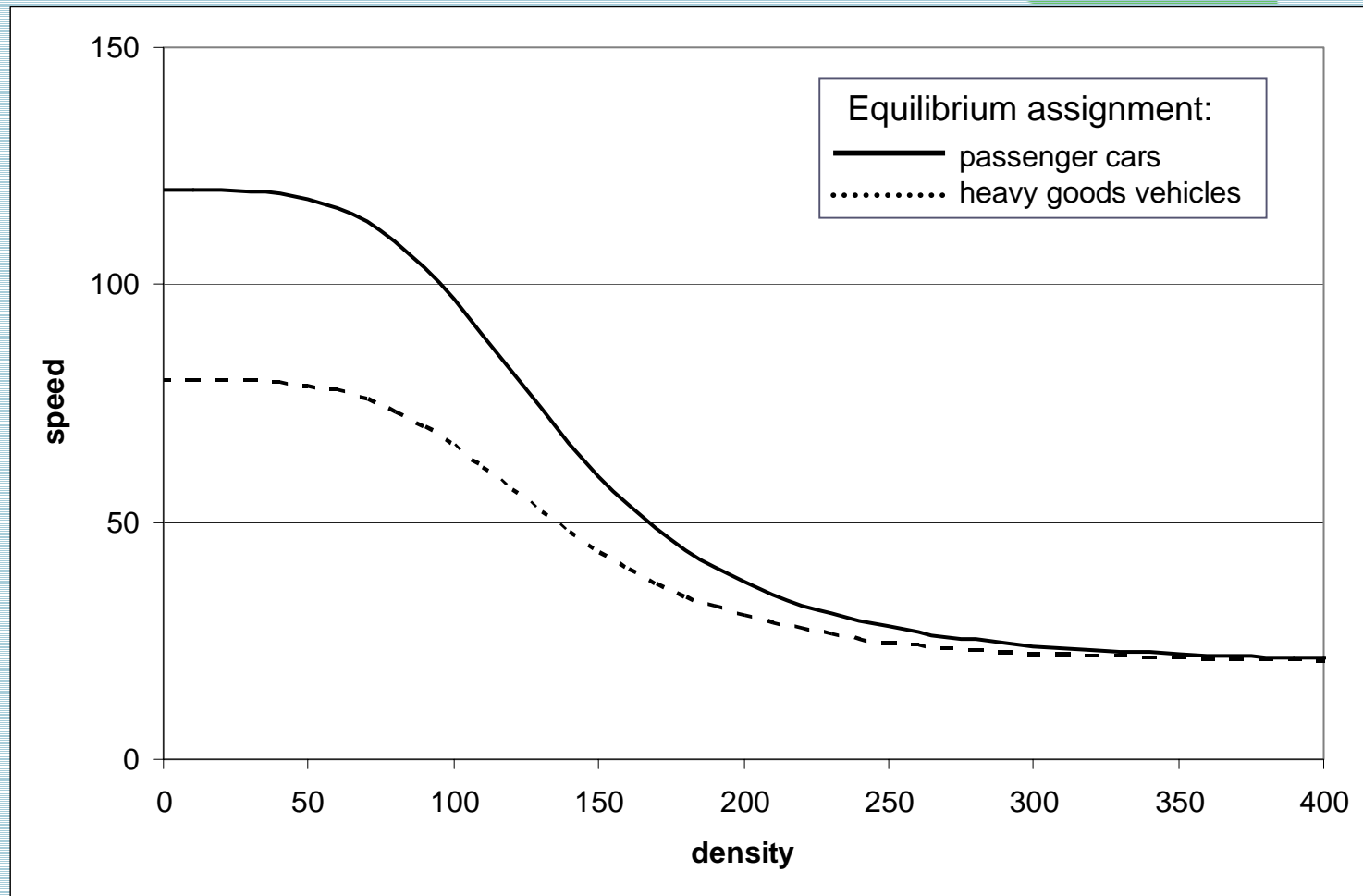
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- Different routes between origin and destination: which one is chosen?
 - costs of each route (time, toll, reliability...)
- Different assignment techniques
 - All-or-nothing, Equilibrium, Stochastic assignment
- Measures:
 - Add links to network (or remove them), increase/decrease capacity, increase/decrease costs, change speed limit, give information on travel times on routes etc.



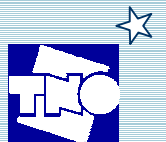
Assignment: Example of a travel time function

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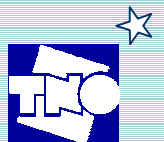
Choice of driving manoeuvres

- Different driver-vehicle combinations have different driving behaviour
 - impact on speeds & accelerations
- Measures:
 - change geometry, enforce speed limits, traffic management, etc.



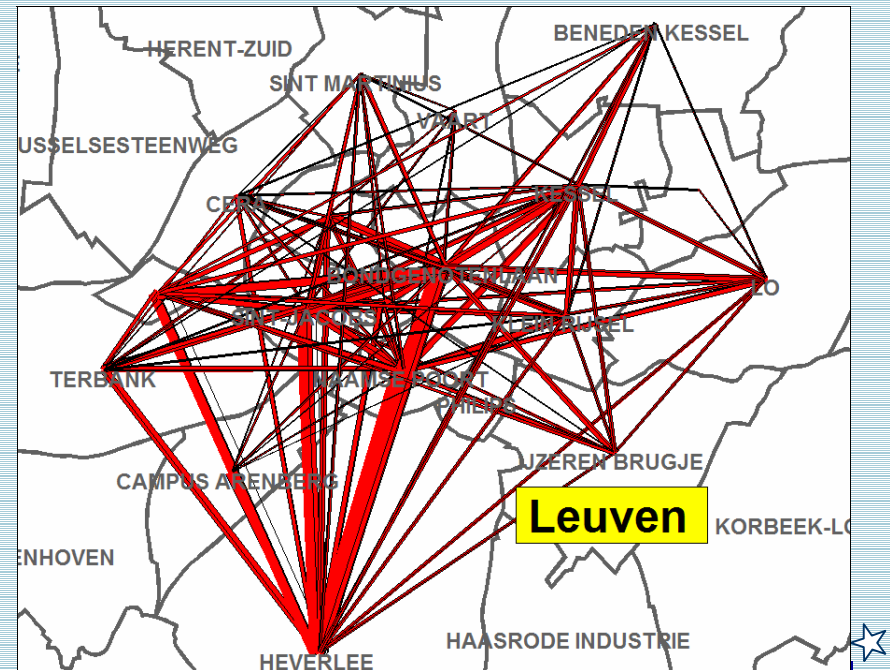
Model building and calibration

- Traffic modelling requires the collection of large amounts of data
 - socio-economic data (land use, inhabitants, jobs, car ownership, income, etc.)
 - network data
 - data on the decisions people make
 - data for calibration: to check model output against measured data (flows, speeds)



First step: Demand model **imagine**

- Uses socio-economic and network data to construct Origin-Destination table
 - via trip generation, destination & mode choice
- Data-intensive
- OD-tables costly to make
- Garbage in = garbage out



Types of traffic models

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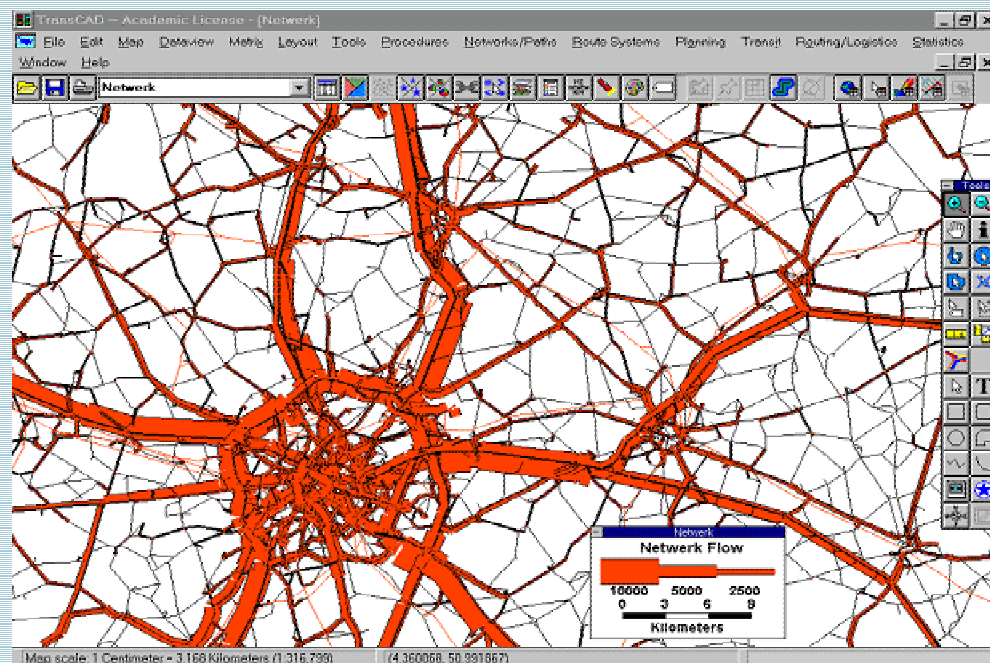
- Macroscopic models:
 - Static assignment
 - Dynamic assignment
- Continuum models
- Micro-simulation models



Output of traffic models

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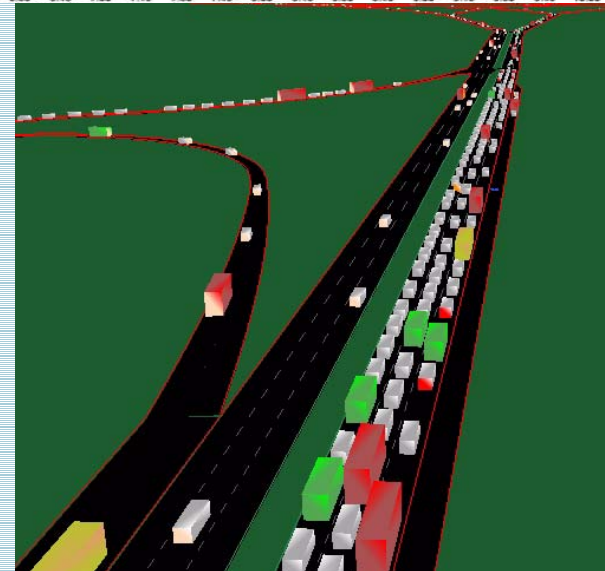
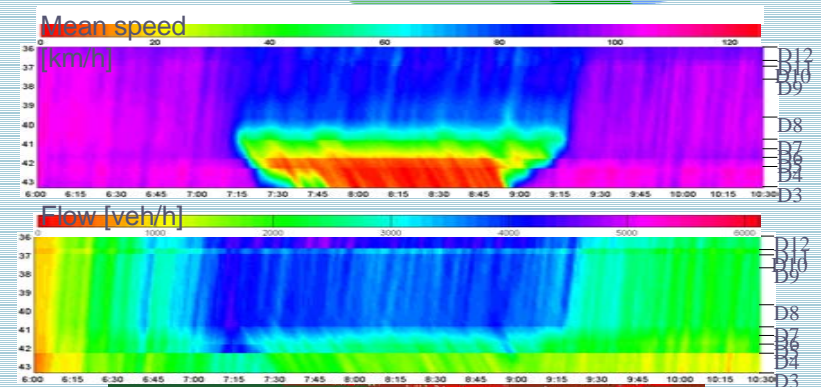
- Static assignment models: average flows and speeds, per link of the network
- Dynamic assignment: flows over time, dynamic travel times over all links



Output of traffic models

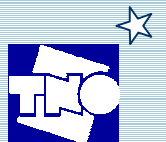
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- Continuum models: flow, density, speed, variance of speed, in time and space
- Micro-simulation: position, speed and acceleration for each vehicle for each time-step in simulation



Which is the best type of model?

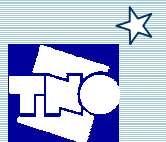
- There is no superior type of traffic model
- Dynamic assignment and micro-simulation 'rising stars'
- Choice of model depends on
 - study area (main roads/urban area)
 - model currently in use
 - availability of data
 - measures that have to be assessed



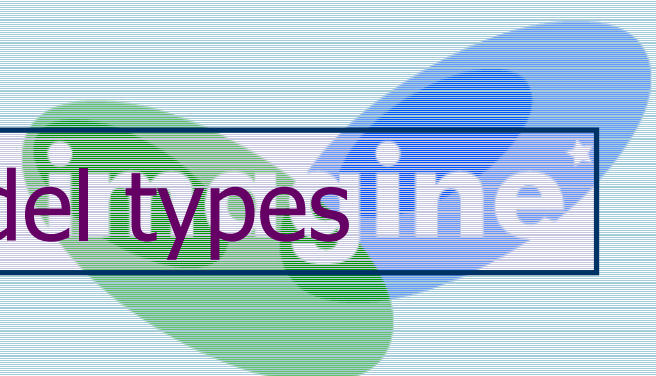
Traffic models and noise mapping: General problems

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- Traffic models are not 'designed' for environmental analyses
- General problems:
 - models cover only peak periods on working days or do not distinguish day-evening-night
 - models do not include (reliable) data on all vehicle categories
 - models do not include lower level roads
 - intersections are not modelled separately
 - quality of demand models
 - accuracy and level of detail output data (in time and space)
 - interface between traffic and noise model



Differences between model types



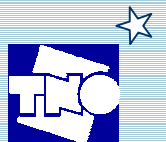
	Static assignment	Dynamic assignment	Continuum models	Micro-simulation
period modelled	Dark Purple	Light Purple	Dark Purple	
vehicle categories	Light Purple	Light Purple	Light Purple	
quality demand models	Light Purple	Light Purple	Light Purple	
low flow roads	Dark Purple	Dark Purple	Light Purple	
level of detail output data	Dark Purple	Dark Purple	Light Purple	
junctions	Dark Purple	Light Purple		
interface traffic/noise model				Light Purple
	Dark Purple	usually a problem		
	Light Purple	often a problem		



Noise action planning: measures in traffic models

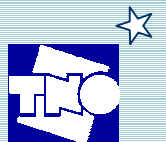
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- Measures can influence:
 - traffic volumes
 - composition of traffic
 - traffic flow characteristics
 - What decisions are affected – what model types can model that?
- Use model that focuses on choices that are affected by measures



Strategies to deal with problems

- IMAGINE WP2 aims to develop strategies to apply/improve traffic models to obtain good quality data for noise mapping and noise action planning
- Strategies will be tuned with Good Practice Guide
- Some strategies will be common to all models, other will be model-specific



The next presentations... imagine*

...will go into:

- strategies to improve traffic model output in general
- the specific strong and weak points of micro-simulation
- a case-study on corrections for intersections

