

Imagine WP2 workshop

Budapest, August 2005

WP 2 Demand and Traffic Flow
Management

imagine

WP-leader: TNO-Inro

What is IMAGINE about?

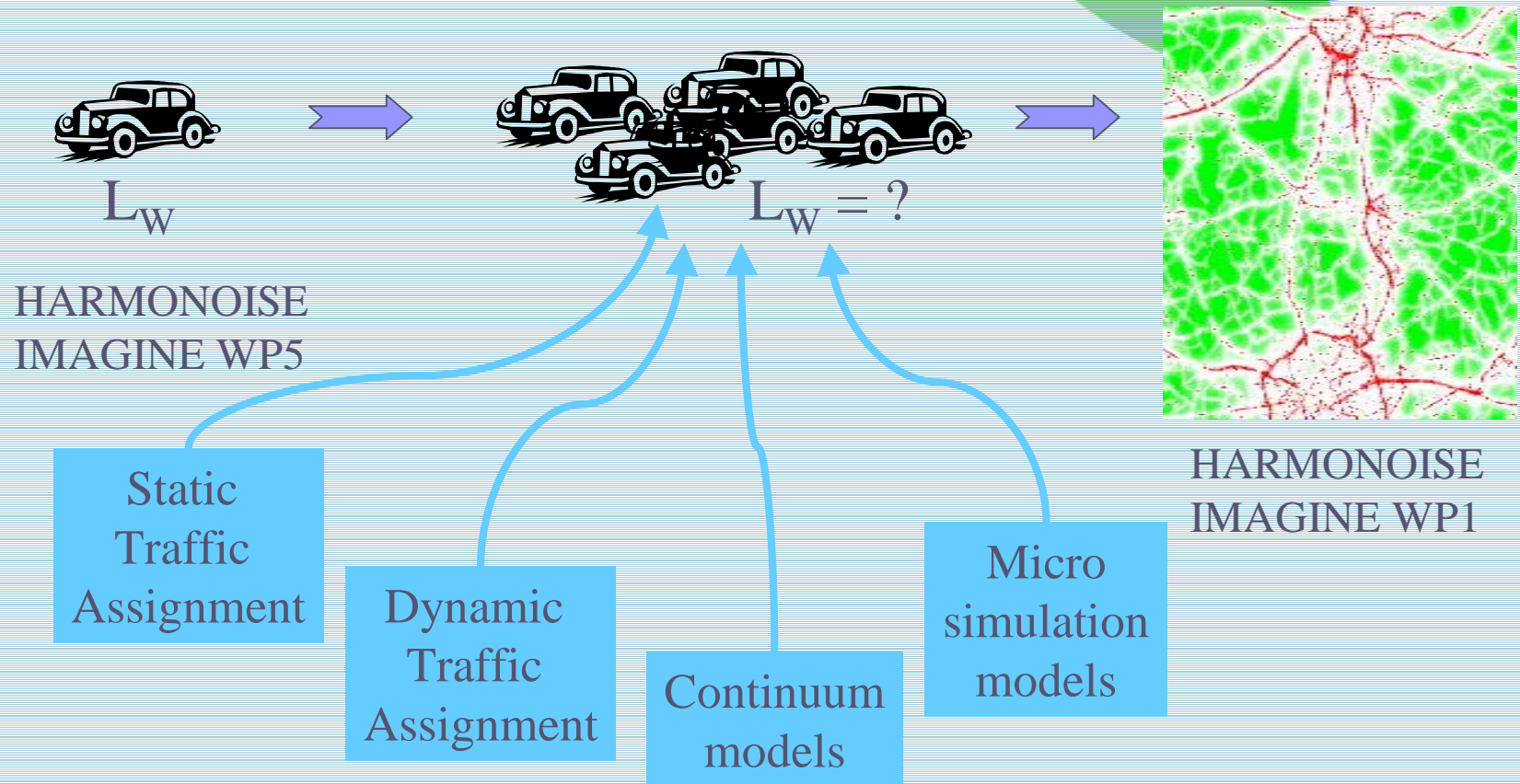
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- The European project IMAGINE is developing new calculation methods for railway, road, industrial and aircraft noise.
- IMAGINE will standardise the Harmonoise methods and will provide guidelines on how to use these methods for noise mapping and noise action plans (e.g. traffic flow management) in the EC.

AEAT NL, AEAT UK, Anotec, ARPAT, Autostrade, Boeing, BUTE, CSTB, DeBAKOM, DGMR, EDF, EMPA, EURO-CONTROL, JRC, Kilde, LABEIN, Leicester, M+P, MBBM, SP, TML, TNO, TRL, TUG, UGent, ULeeds, Volvo

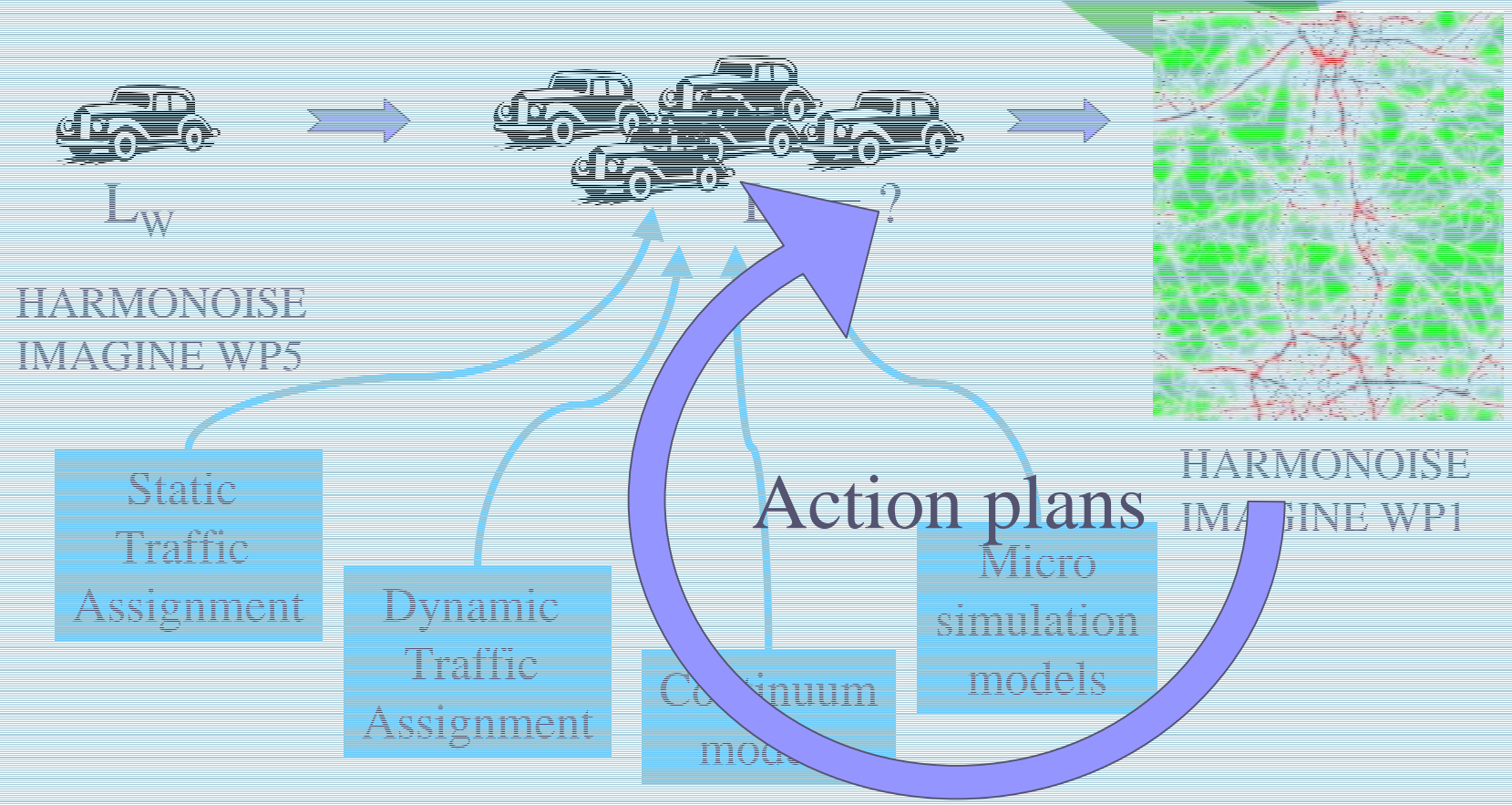
Objective of WP2

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- Provide guidelines

Objective of WP2



- Special focus on action plans

Today's workshop

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- Goal:
 - Bring together those involved in using traffic models in preparation of noise maps and action planning
 - A forum for practitioners to let us know their concerns



www.imagine-project.org

Today's workshop

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- 12:10 The Environmental Noise Directive, WG-AEN, and IMAGINE
John Hinton, Birmingham City Council, UK
Chair of the EC Working Group - Assessment of Exposure to Noise
- 12:30 What do noise mappers want from traffic models?
Dick Botteldooren, INTEC, Ghent University, Belgium
- 12:50 Everything you ever wanted to know about traffic modelling
Isabel Wilmink, TNO-INRO, The Netherlands
- 13:10 How can we tune static and dynamic assignment models to meet noise mappers needs?
Isabel Wilmink, TNO-INRO, The Netherlands
- 13:30 How can (micro) simulation be used in a noise mapping and action planning?
Filip Vanhove, Transport & Mobility Leuven, Belgium
- 13:50 Break, coffee and sandwiches
- 14:20 Examples, case studies, opinions: open forum (<15 minutes each)
Contributions foreseen by: John Hinton, Christian Popp, Dick Botteldooren, Hans Van Leeuwen, ...
- 15:40 Summary and closing debate

What do noise mappers want from traffic modelers?

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- Unlimited demand:
 - Position of all vehicles, their speed, acceleration, complete description of the vehicle type on all roads during one years
- More realistic:
 1. Don't ask for something that make no difference
 2. Don't ask for something you cannot or are not going to use
- These considerations are used in IMAGINE to formulate more realistic demands for traffic models

Aspects to consider?



	Main roads	Urban noise maps	Action plans
Road traffic flow			
Overall accuracy			
Diurnal pattern			
Annual pattern			
Spatial detail			
Composition of road traffic			
Heavy traffic			
Detailed fleet (electric, diesel, public transport, ...)			
Speed & acceleration			
Average speed			
Speed distribution			
Acceleration			

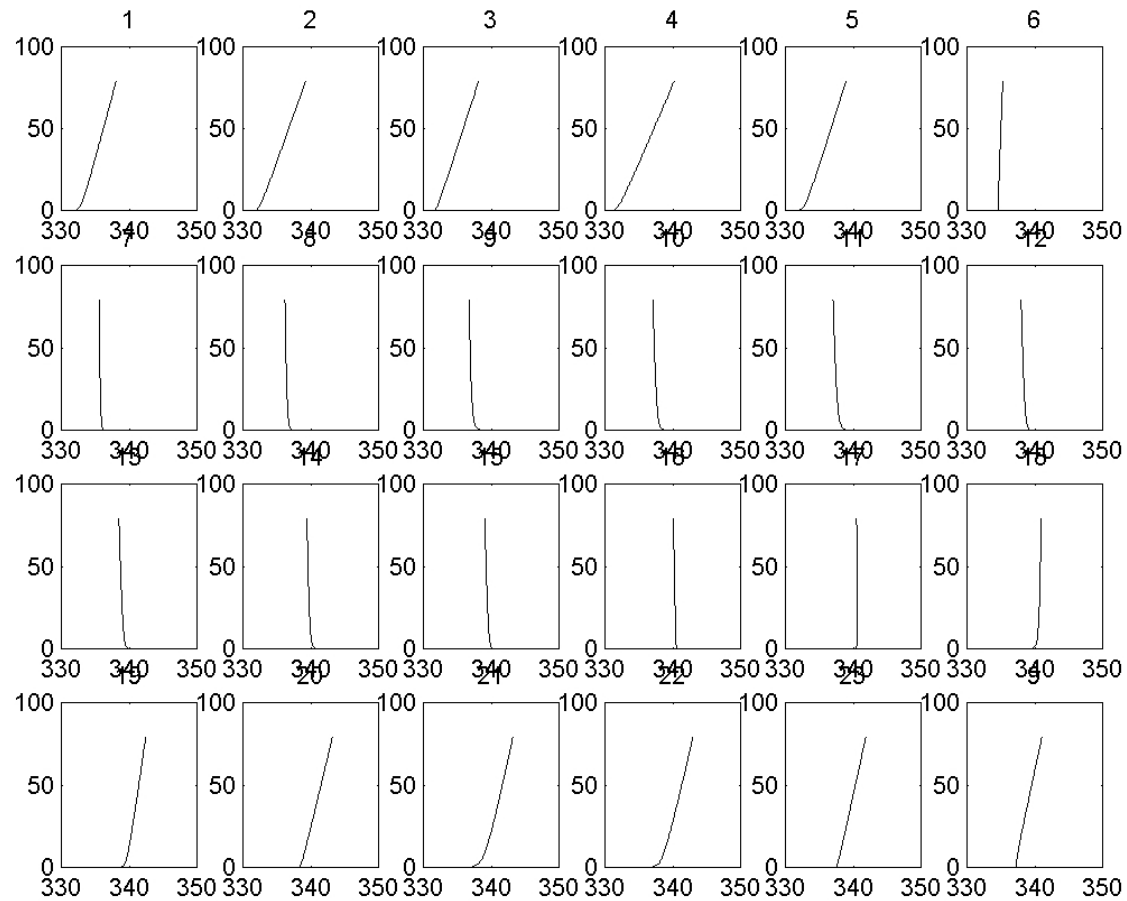
Results from review of data needs for noise emission models (task 2.1)

- <1 dB error in equivalent sound power level if accuracy is within:
 - 25% for vehicle intensity
 - 5% in share of heavy motor vehicles
 - 10km/h in average vehicle speed
 - 0.3m/s² in acceleration for accelerating, 0.8m/s² for decelerating
- Required detail depends on situation
 - Highway -> intensity & average speed
 - Urban (50km/h) -> distribution of acceleration
 - Intersection -> acceleration, individual vehicle data
- Internal report available on Imagine website

L_I diurnal pattern / main roads

- Check the effect on diurnal pattern in meteo on immission to find out the required resolution over time
- Procedure
 - 24 hourly meteo data (wind and temperature profile, Meppen Germany for Harmonoise)
 - 20 days in May / 20 days in December
 - Calculate (PE = Harmonoise reference model) propagation to 20m - 1000 m in 8 directions, over flat grassland
 - Use typical diurnal pattern for traffic intensity from Belgian highway (Wetteren)
 - Calculate Lden as follows:
 - Use hourly traffic intensity and propagation
 - Use day / evening / night traffic and propagation
 - Use daily average traffic and propagation

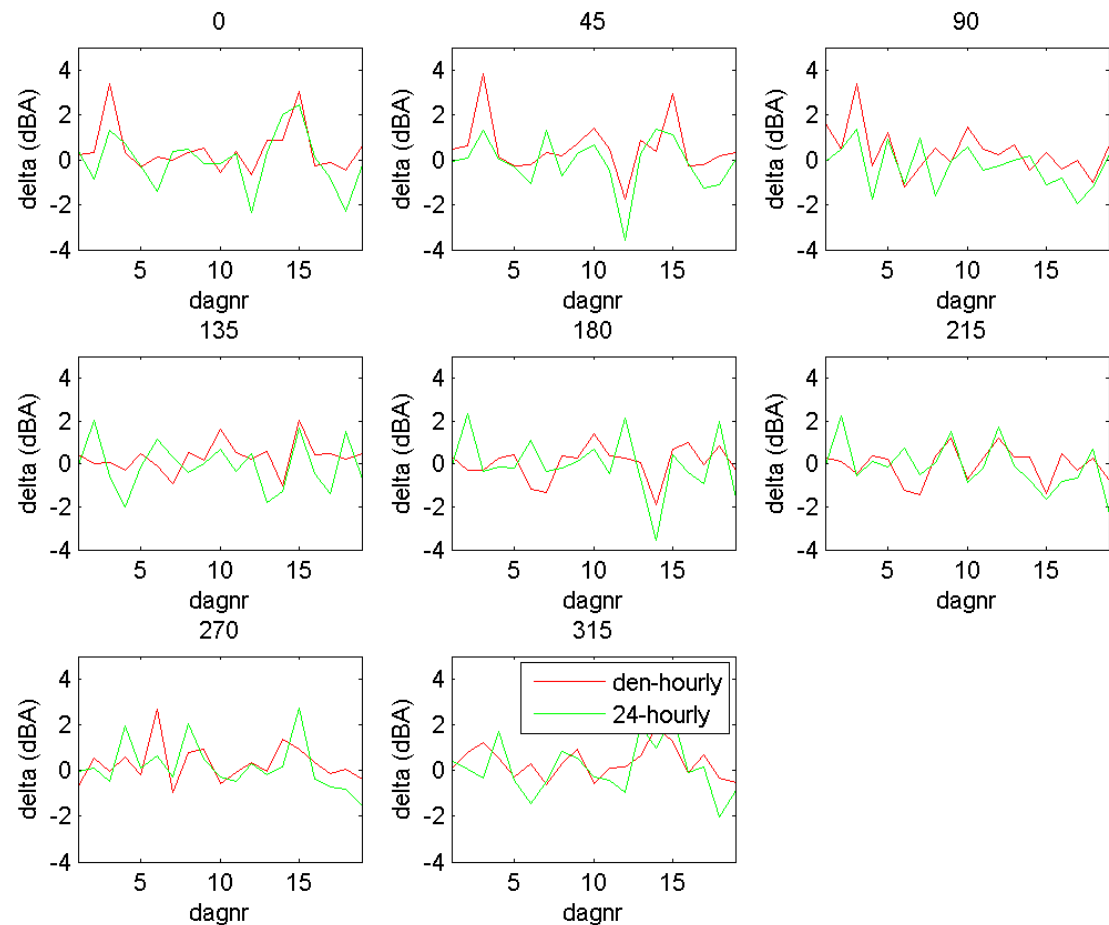
L_I diurnal pattern / main roads



L_I diurnal pattern / main roads

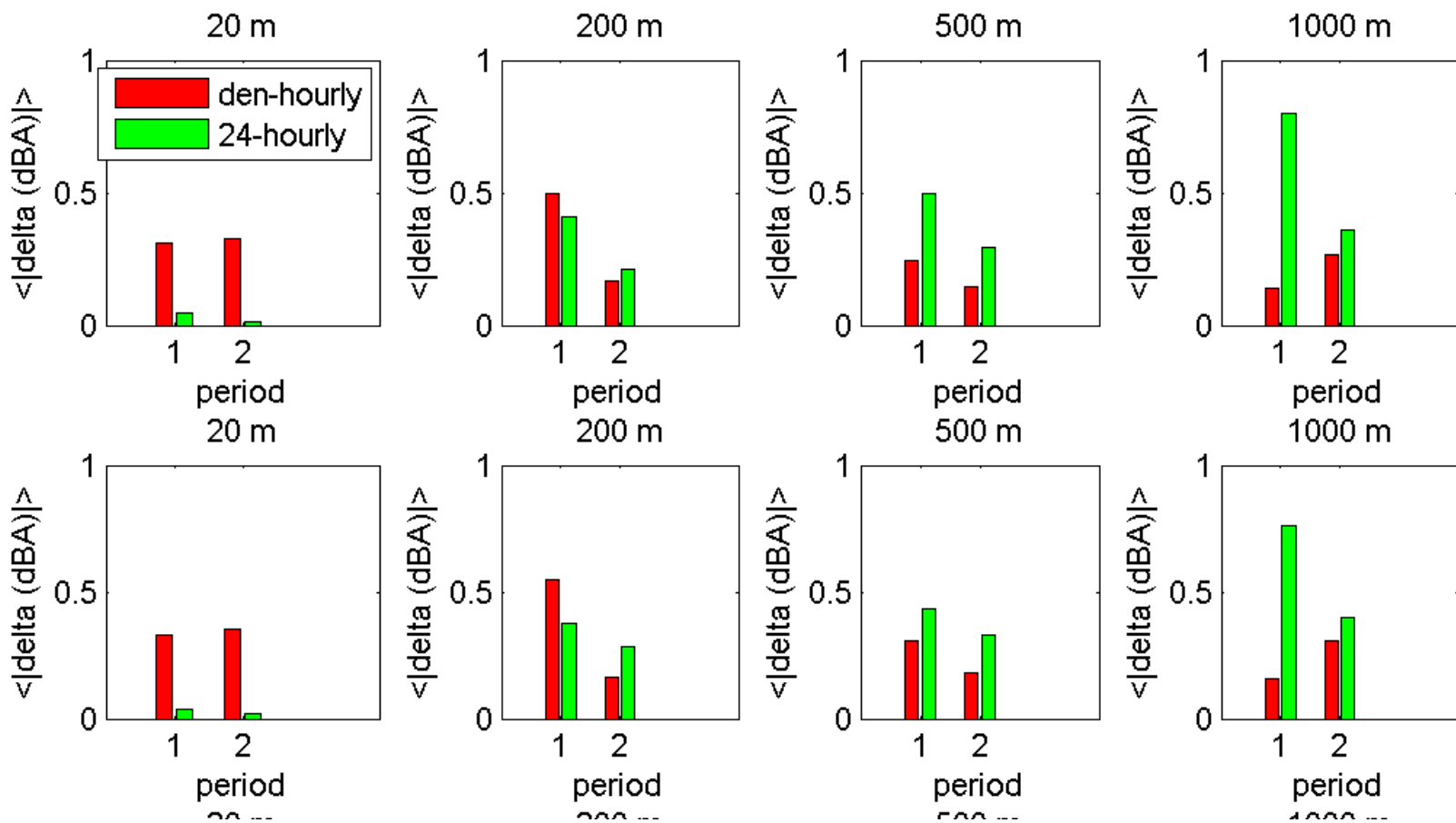
**20 days in
December
@ 200m from
source**

**Shown is error
introduced by
using d/e/n or
24h traffic data
rather than
hourly values**



L_I diurnal pattern / main roads

Shown is average error introduced by using d/e/n or 24h traffic data rather than hourly values



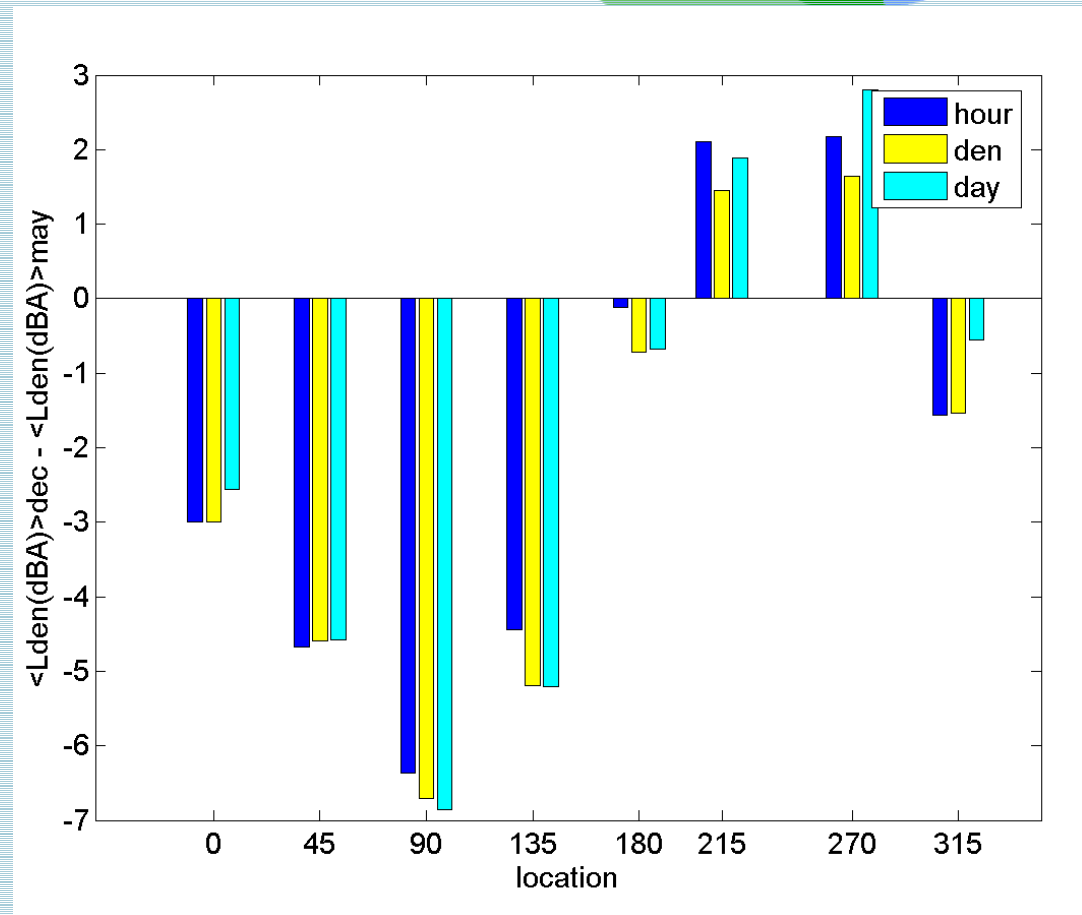
L_I season / main roads

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Difference between
average in May
and average in
December

@ 200m

Strong dependence
on orientation of
highway



L_I diurnal pattern / main roads

- Conclusion

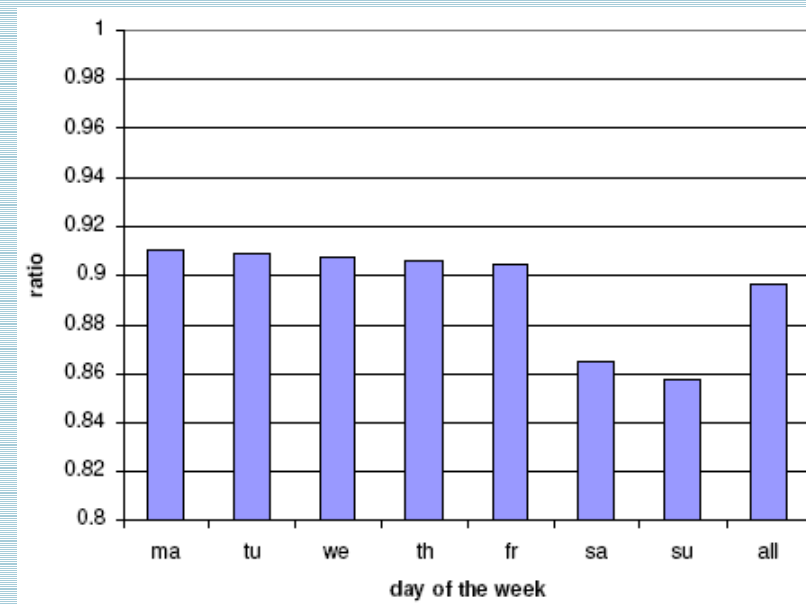
- Even with the most accurate propagation modeling, at most 0.5 to 1 dBA is added to the inaccuracy on the sound power
- Caused by correlation of traffic pattern with diurnal weather
- Traffic model has to predict L_{Wden} correctly

L_W diurnal pattern / main roads

- Assume no distinction between day/evening in traffic model
- Solution: default distribution of 16 h day traffic between day and evening
 - WG-AEN BPG d: 75%, e: 25%
 - Reality in Flanders d: 85%, e: 15%
 - Average error on $L_{den} = 0.1$ dB
 - For any specific main road:
 - Error = 0.1 to 0.7 during weekend
 - Error = -1.1 to 0.7 during week

L_W diurnal pattern / main roads

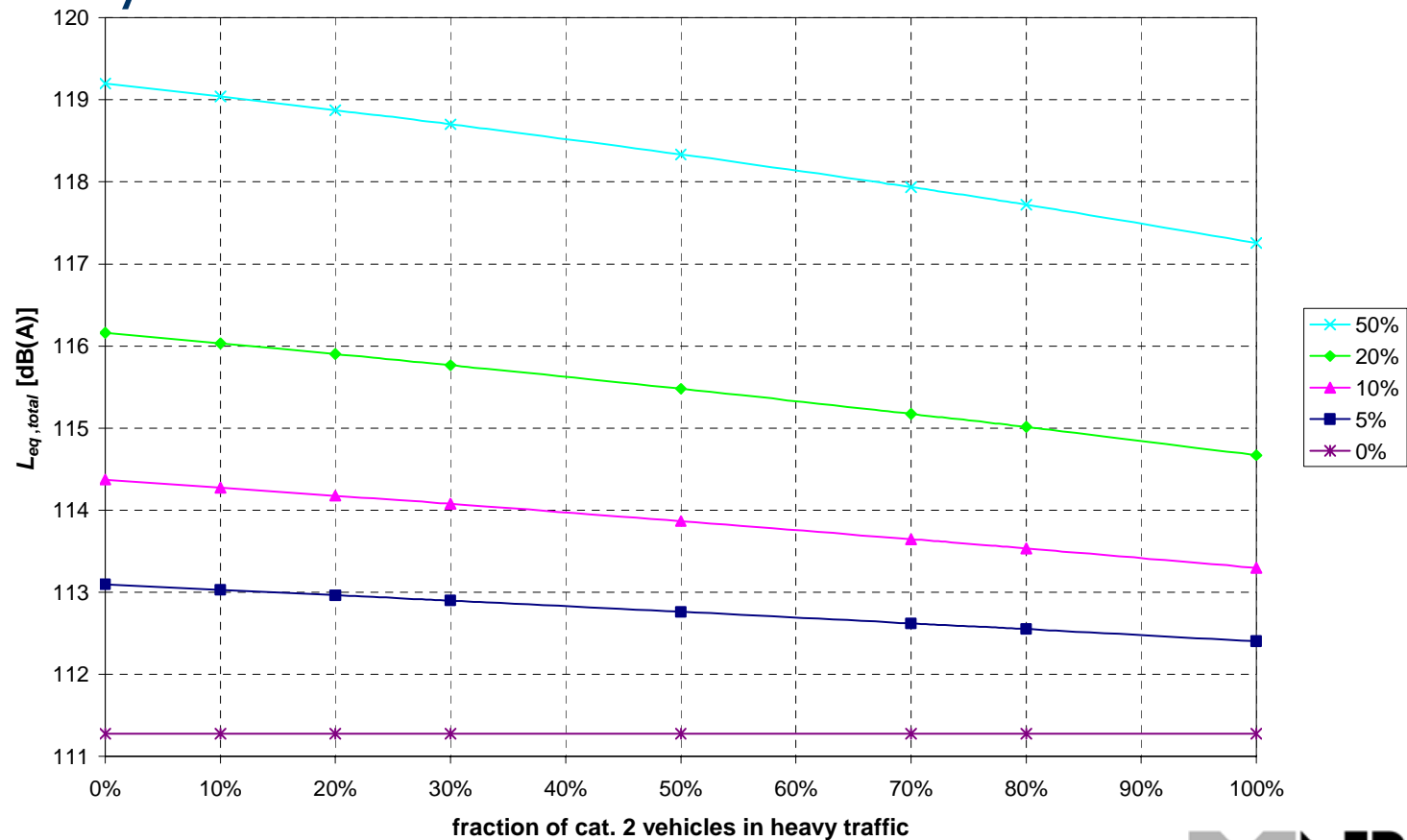
- Assume only weekday is modeled
- Solution: use weekday pattern for whole week
 - Ratio of 16h day to 24h road traffic over the week



- L_{dn} underestimate of 0.8 dB during weekends
- error on yearly average is 0.2 to 0.3 dB "only"

L_W vehicle categories / urban, main

- How important is it to distinguish between light and heavy trucks?



L_w vehicle categories

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- Knowing percentage of different truck categories is not very critical for accuracy of 1 dBA
- Two-wheelers: being studied

Combined error: 3 maps



Traffic model:
micro-simulation

- All streets
- Velocity
- Acceleration
- 3 vehicle types

Propagation

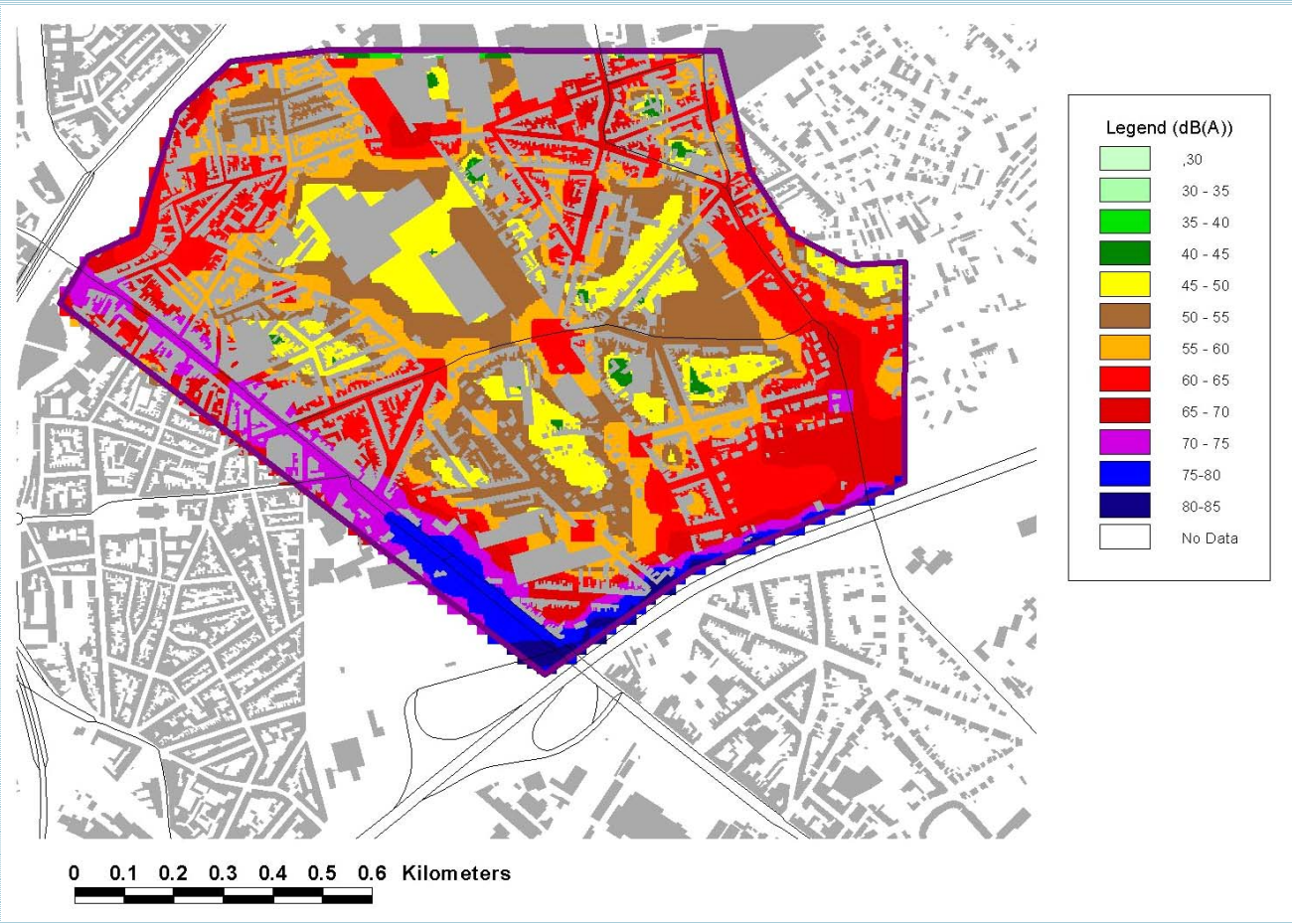
- All houses

Purpose

- Neighborhood action plan



Combined error: 3 maps



Traffic model: static assignment

- Most streets
- Velocity distribution per road category
- Fixed % v. types

Propagation

- All houses

Purpose

- City mobility plan



Combined error: 3 maps

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Traffic model: count interpolation

- Main roads
- Velocity distribution per road category
- Fixed % v. types

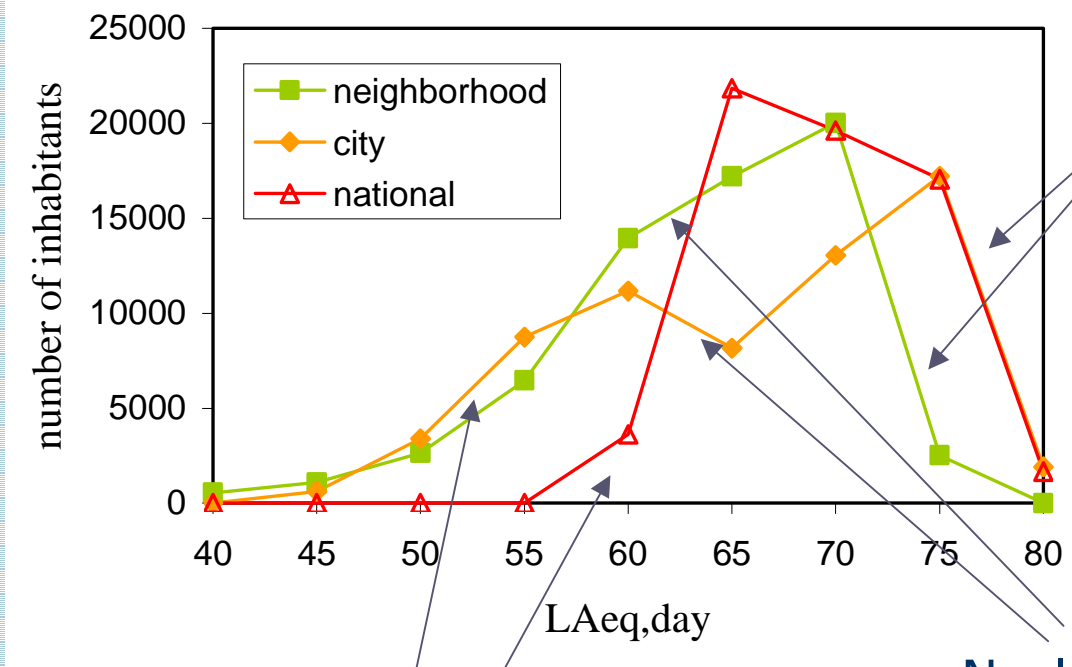
Propagation

- Building density

Purpose

- National S.o.E.

Combined error: 3 maps

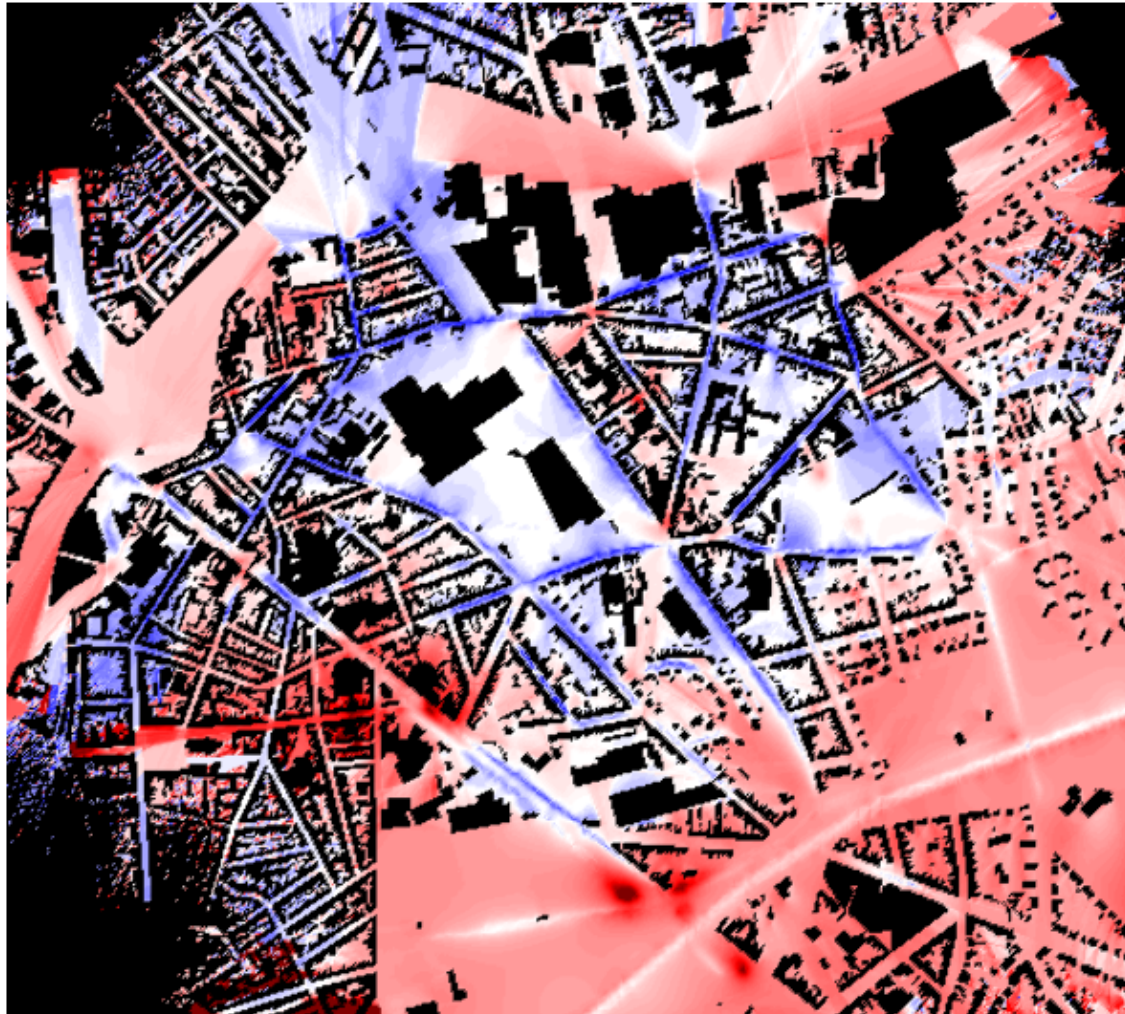


Inaccuracy due to velocity distribution
Main road entering the city has atypical dynamics not predicted by macroscopic models

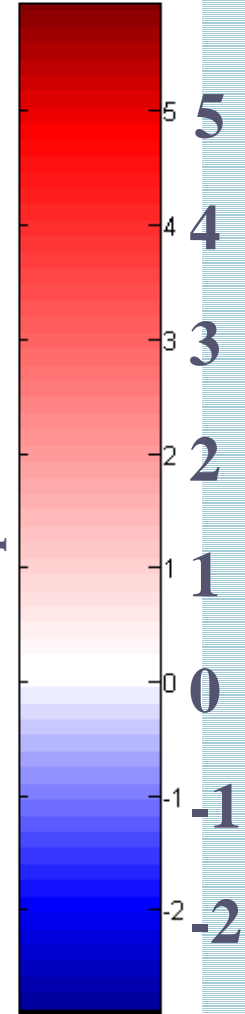
Neglecting a few smaller roads is not that important

Screening by buildings in urban area is rather important

Combined error: micro-model speed



Difference between speed limit and
micromodel speed + acceleration



Combined error: conclusions

- Vehicle speed on most important roads is extremely important and may not be well predicted in particular in urban area
 - Combination of high intensity with unaccurate speed!
- Neglecting lower level roads or approximate redistribution of traffic is less important
 - Other people are exposed but partly averaged out in distribution

Refined demands



	Main roads	Urban noise maps	Action plans
Road traffic flow			
Overall accuracy	25%	25%	<25%
Diurnal pattern	If meteo: hourly den-value	den-value	hourly
Annual pattern	If meteo: season no	no	not or worst case
Spatial detail	>20000/16h	>5000/16h	>5000/16h
Composition of road traffic			
Heavy traffic	5%	5%	5%
Detailed fleet (electric, diesel, public transport, ...)	no (light / heavy truck: 25%)	maybe in future (public transport)	Yes, depending on action
Speed & acceleration			
Average speed	10km/h	10km/h	10km/h
Speed distribution	no	Distribution (20 km/h classes)	Individual vehicle data (+/- 10km/h)
Acceleration	no	Distribution (a: 0.3 m/s ² , d: 0.8 m/s ²)	Individual vehicle data (a: 0.3 m/s ² , d: 0.8 m/s ²)