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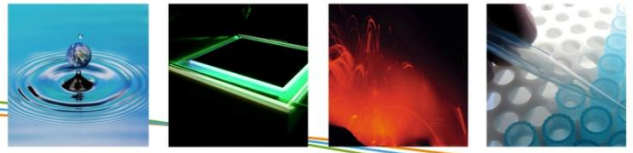

Applying an environmental modelling framework to assess the impact of transport on air quality

Carolien Beckx

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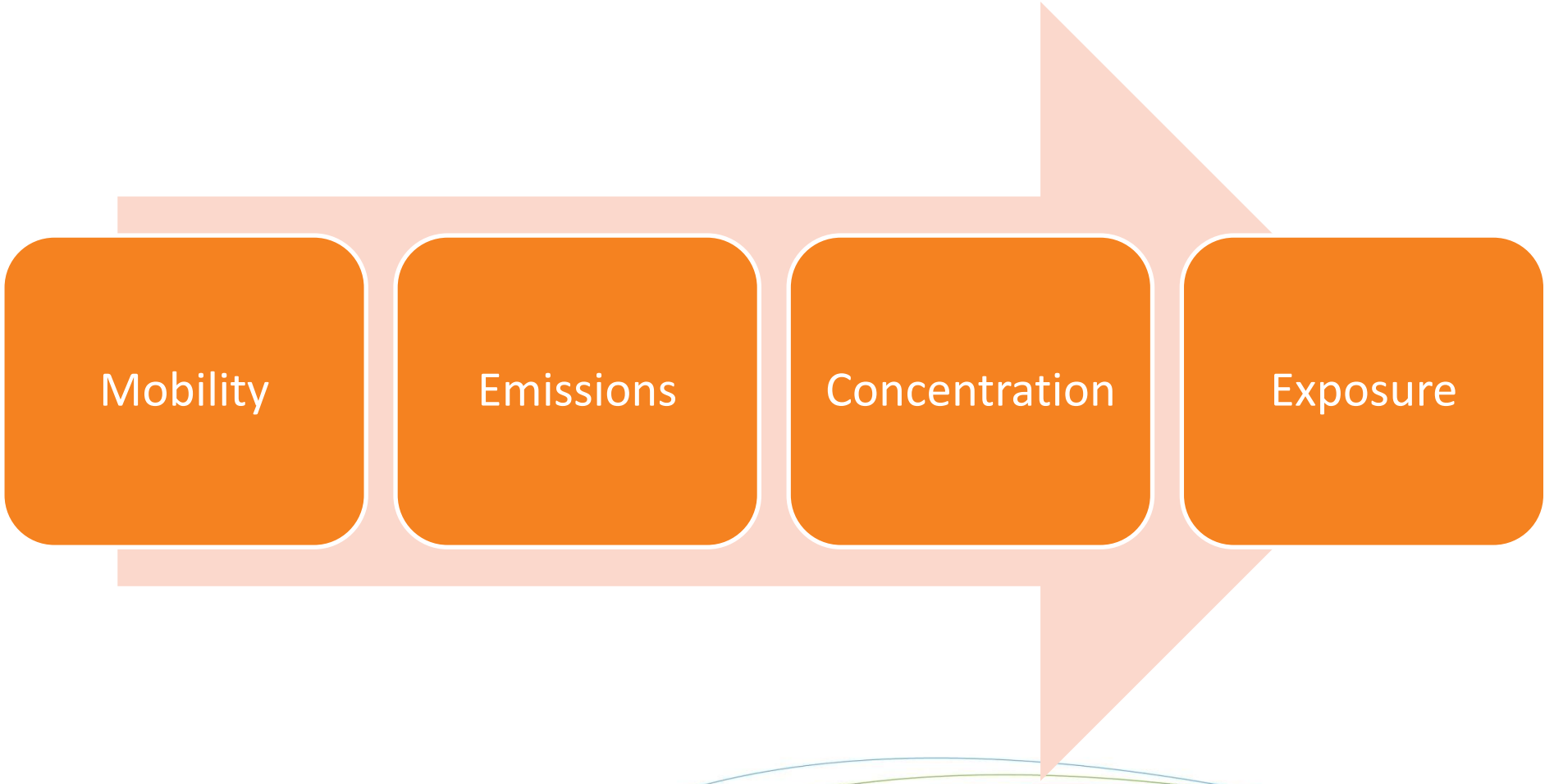
B. Kochan and T. Bellemans

Modelling framework: overview

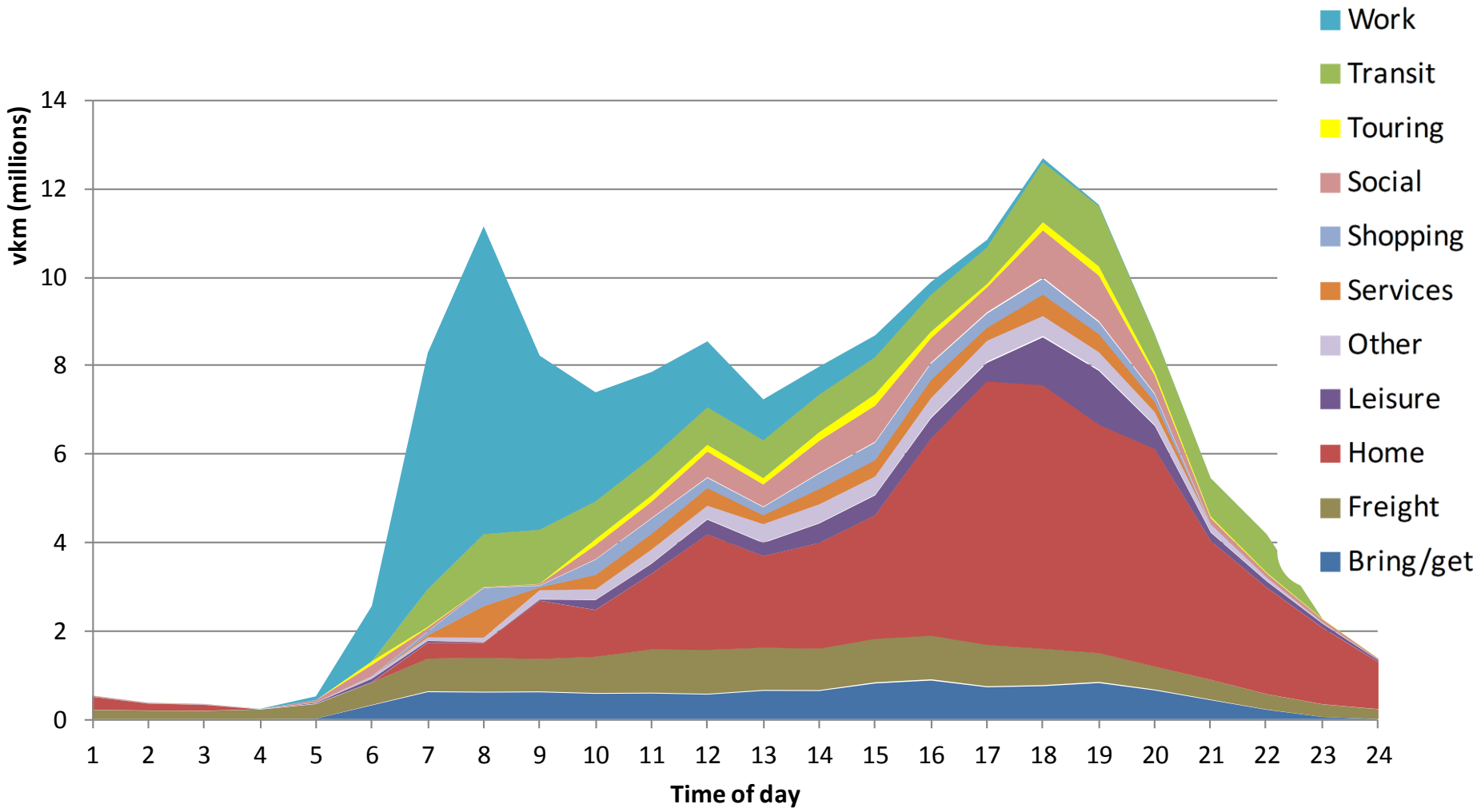


Modelling transport

=> Activity-based travel demand model '**FEATHERS**' (Bellemans et al. 2010)

- Agent-based
- Activity-schedules for individuals (what, where, when,…)
- Transport is derived from the activities
- Study area: Flanders + Brussels (appr. 5 million adults)
- Only motorised vehicle trips were analysed
- Trips per hour for average week
- Traffic assignment: number of vehicles per traffic link, per time of day
- "Why are people travelling?" -> **Analysis per trip motive**

Modelling transport: vkm per trip motive

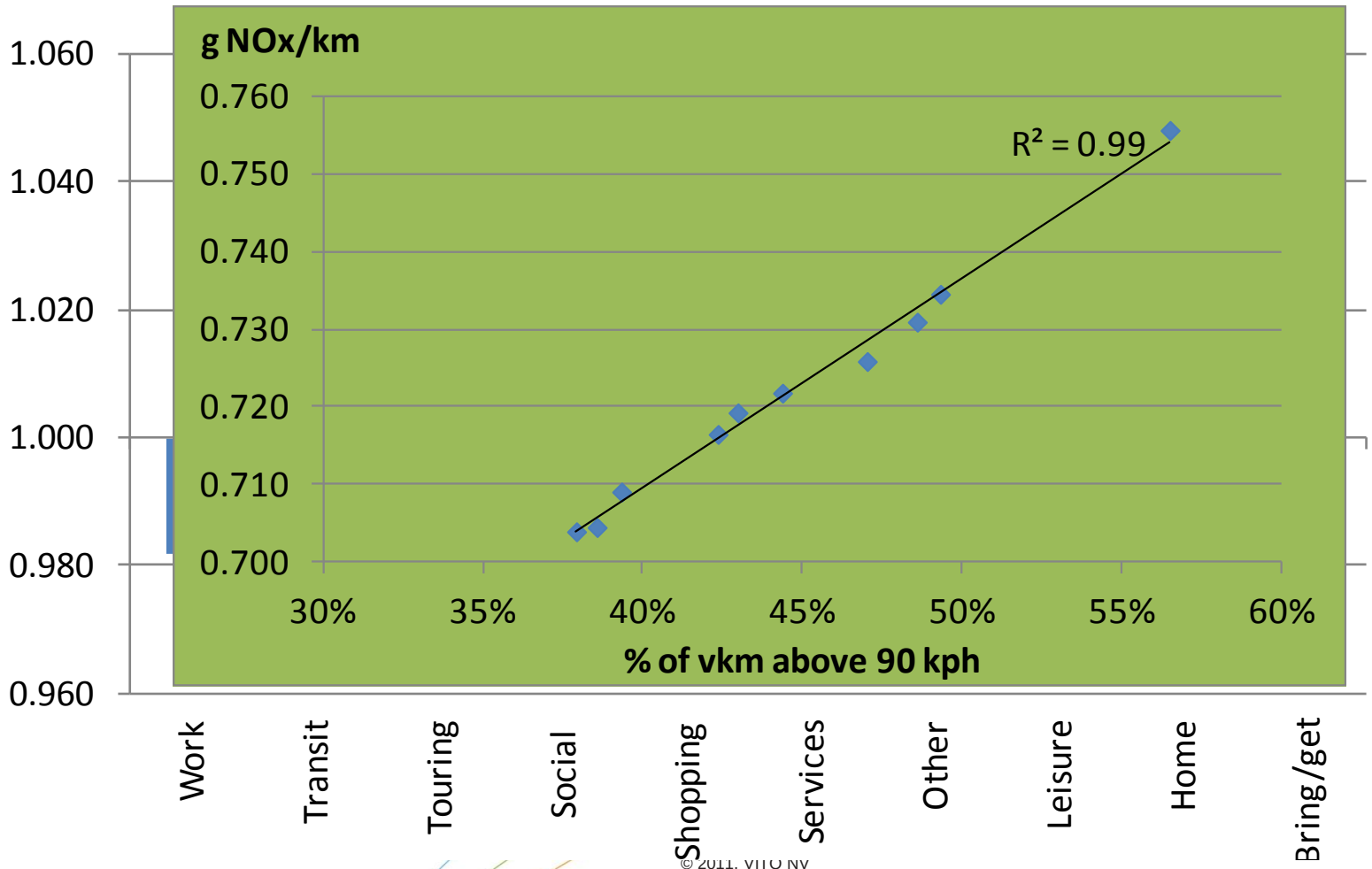


Modelling emissions

- VITO's emission model **MIMOSA 4** (E-motion Road)
  - CopertIV
  - Traffic volume
  - Fleet composition
  - Speed
- Spatially and temporally distributed emissions
- Emission factors per trip motive

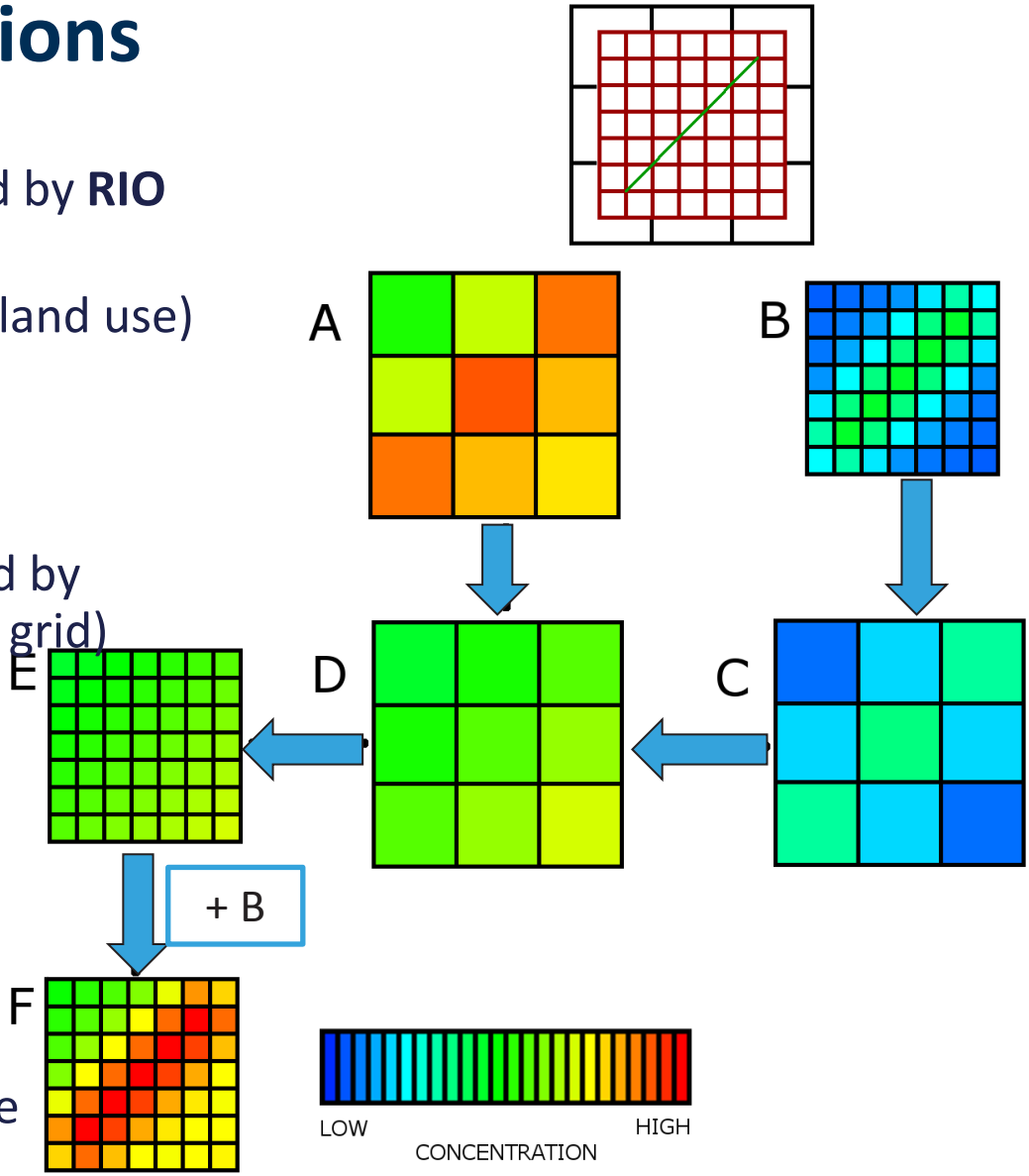
Modelling emissions: EF per trip motive

- EF Freight: 8 to 9 times higher than car (6.282 g NO_x/km; not shown)
- Speed



Modelling concentrations

- Background concentrations provided by **RIO** (regular grid) (Janssen et al. 2008)
  - Measurements + interpolation (land use)
  - Hourly scale
  - 4 x 4 km
- Local concentration gradiënts caused by traffic, calculated by **IFDM** (irregular grid)
  - 1 x 1 km
  - + line source following grid
- Eliminating double counting of emissions
- Concentration impact per trip motive



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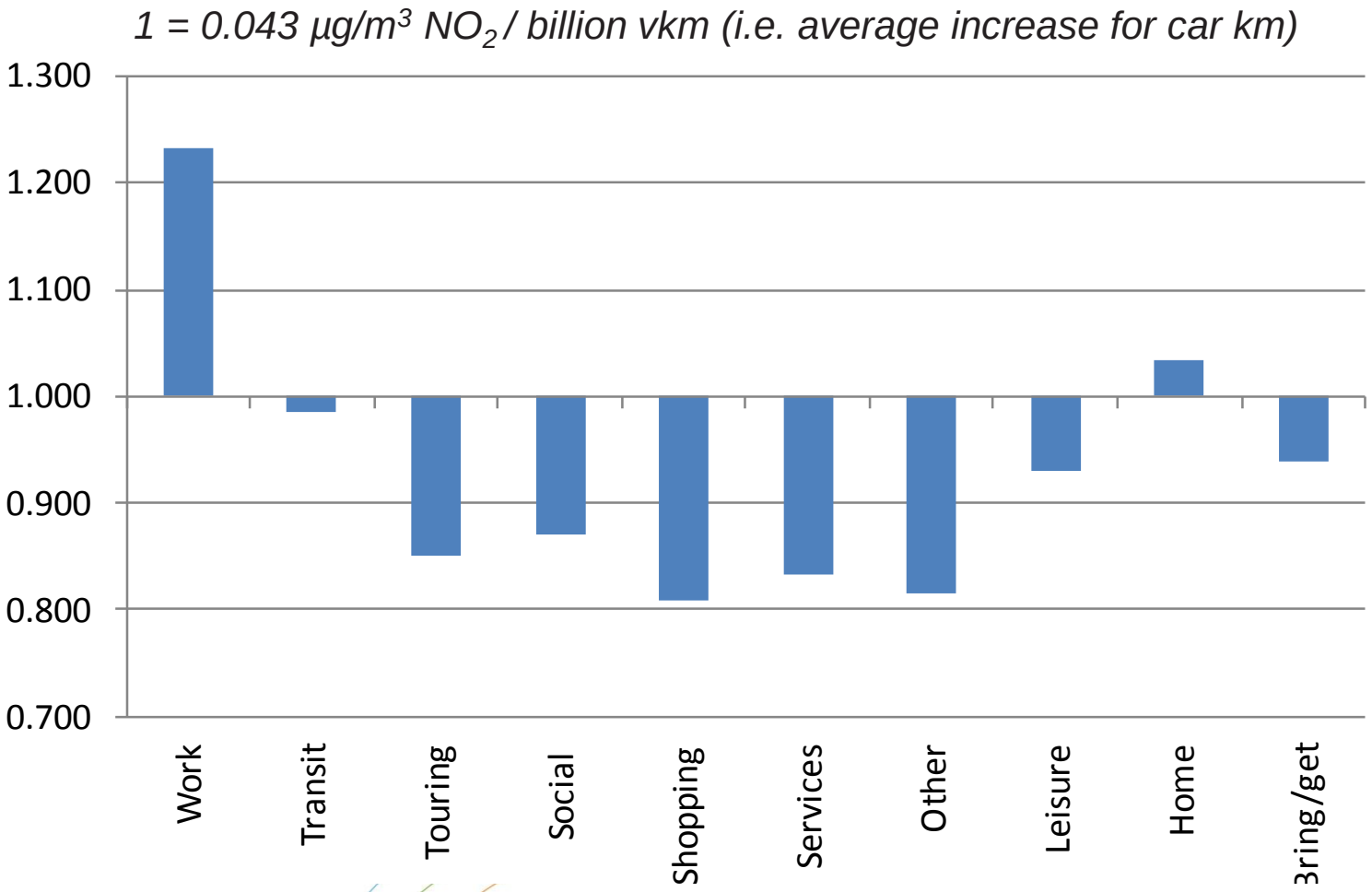
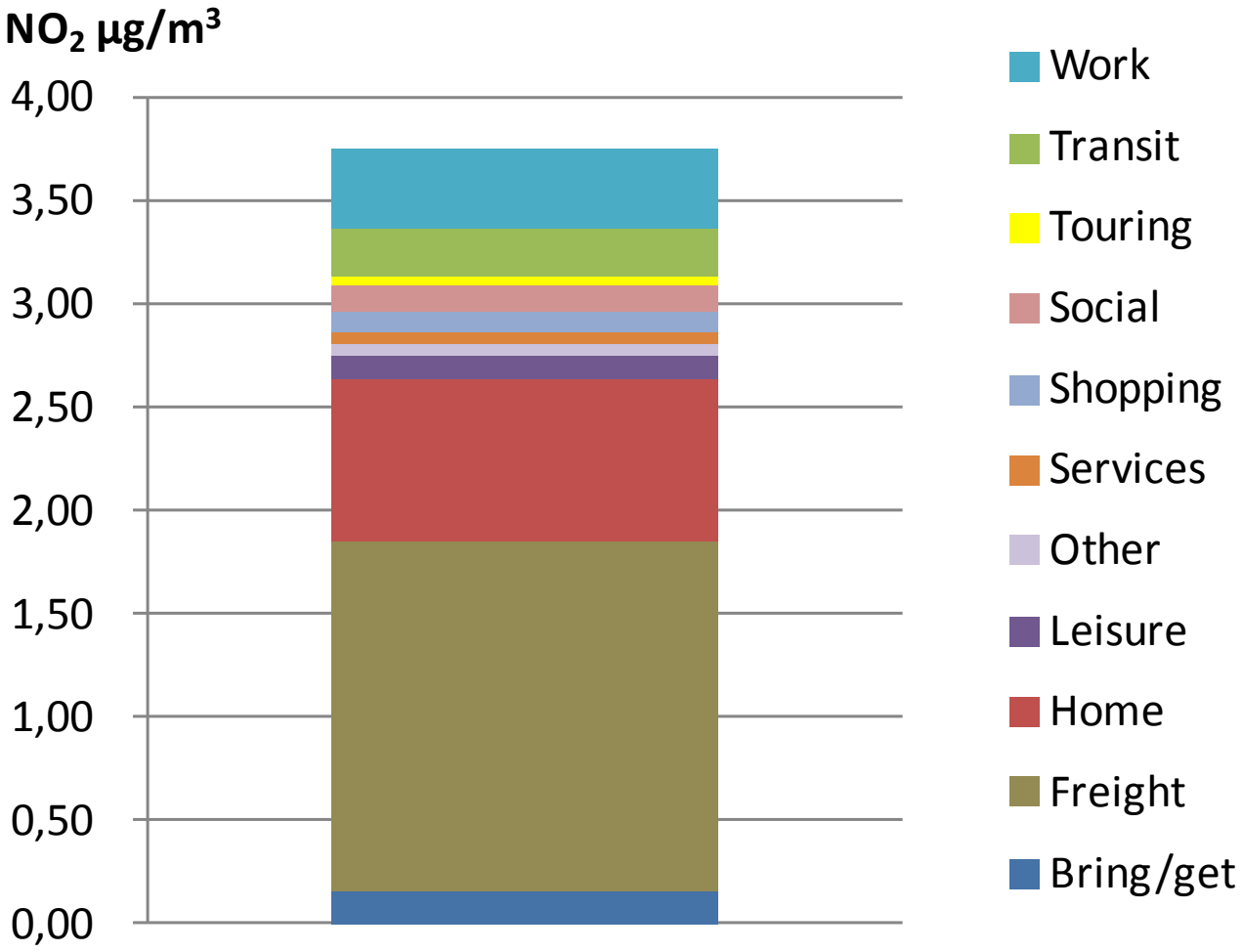
Modelling concentrations

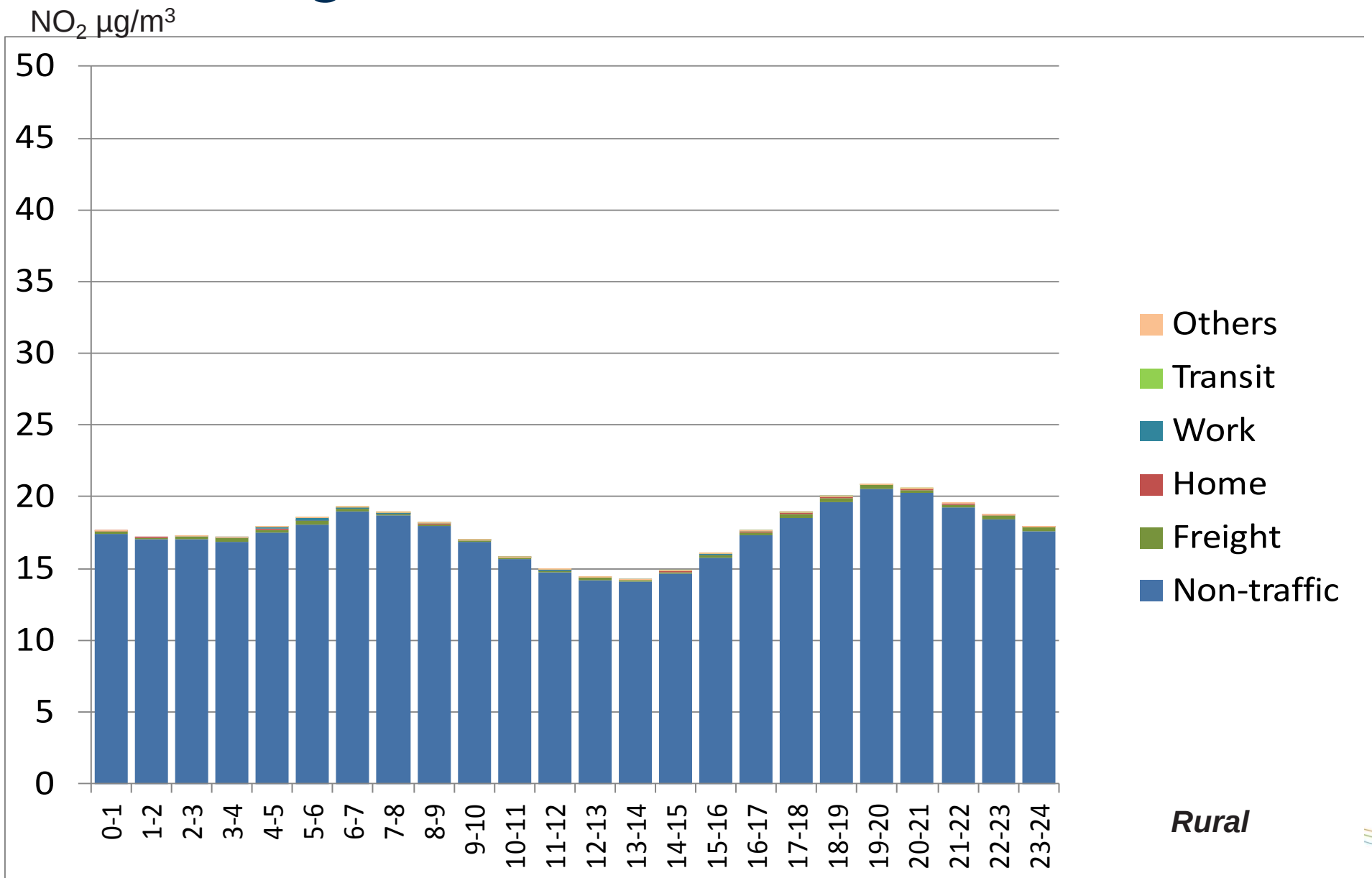
- Freight: 8 to 9 times higher (0.0385 µg/m^3 NO_2/billion vkm; not shown)
- Early morning trips -> large atmospheric stability -> bad dispersion



Modelling concentrations

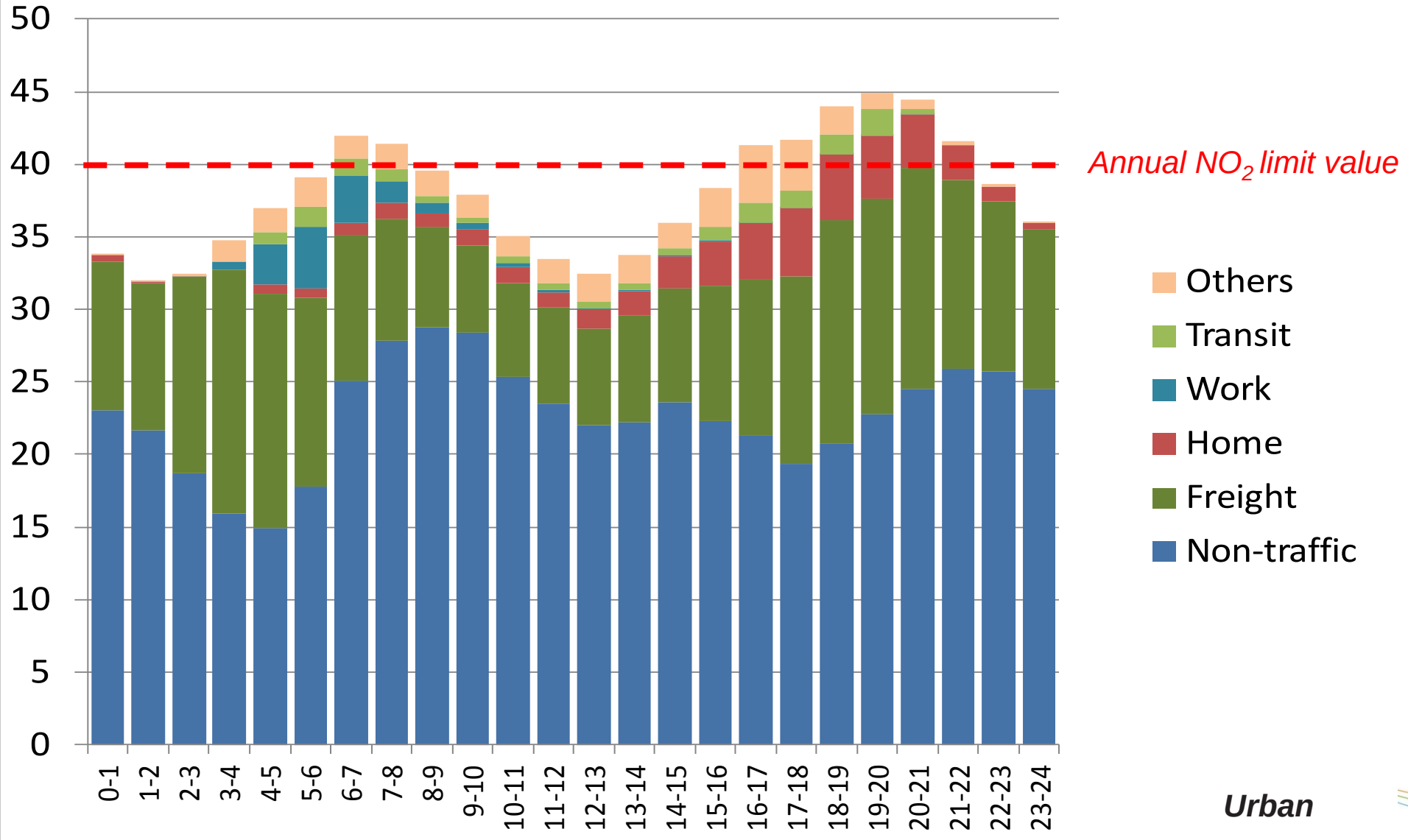


Modelling concentrations



Modelling concentrations

NO_2 µg/m^3



Urban

Exposure

- Residential address information (static)
- High resolution population data (up to 5m)
- Only outdoor exposure

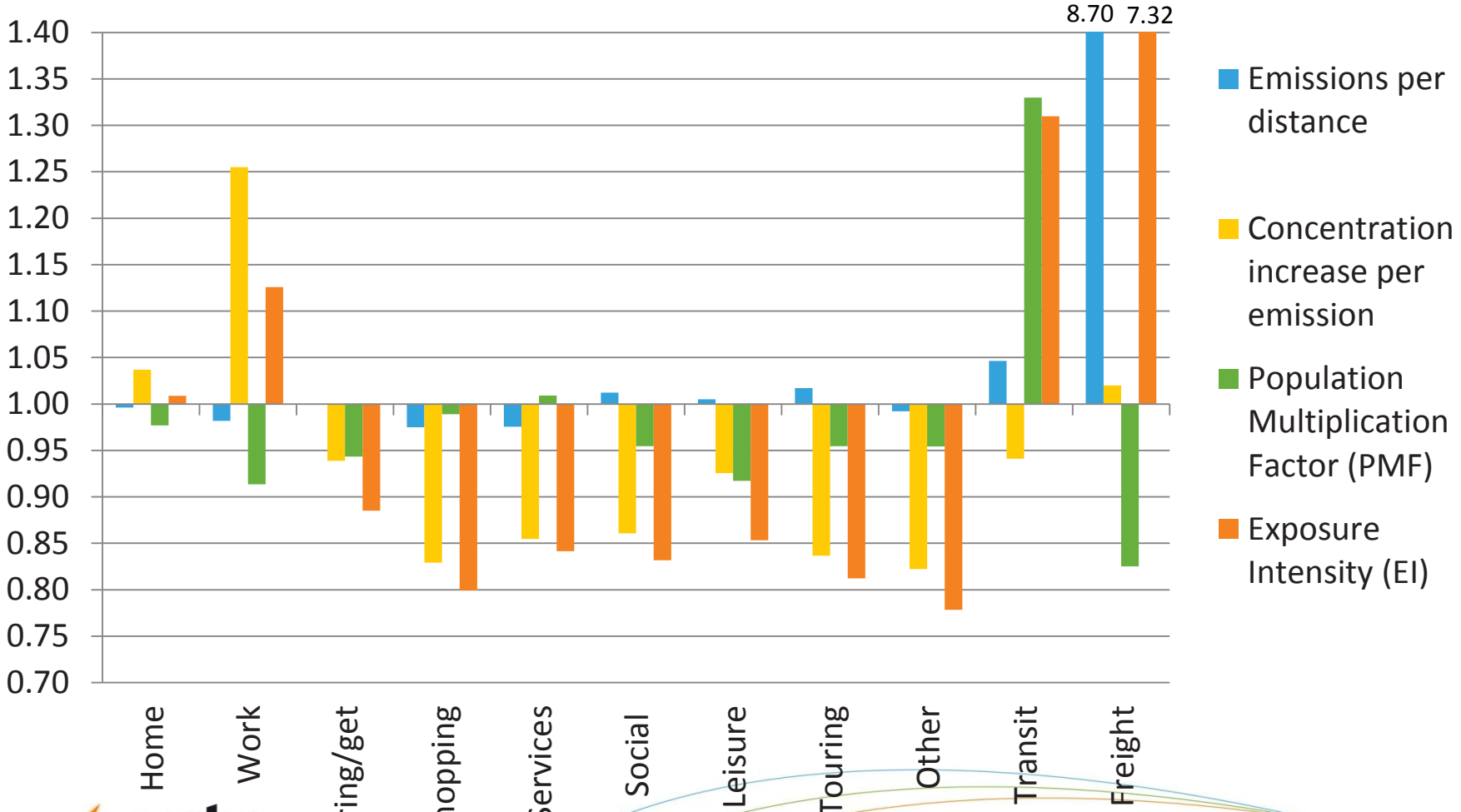
- Exposure intensity (EI)

$$EI = \frac{n\Delta C}{Vkm}$$

- Population Multiplication Factor (PMF)

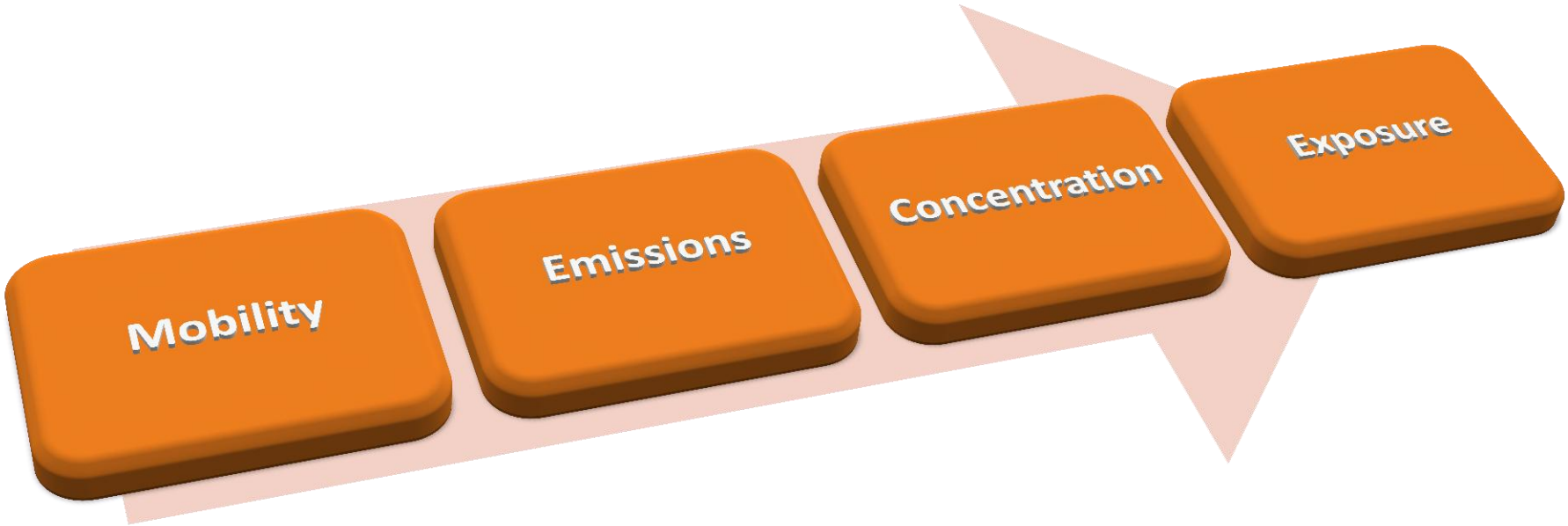
$$PMF = \frac{n\Delta C}{N\overline{\Delta C}}$$

(Marginal) impact of transport on air quality per trip motive



Impact of transport on air quality?

"Not every trip (kilometer) yields the same impact on the environment"



Emissions => **Vehicle type** (car vs. trucks) and **speed**

Concentrations => Emissions and **time of day**

Exposure => Emissions, concentrations and **location**