FINNISH METEOROLOGICAL INSTITUTE

FMI-ENFUSER ilmanlaatumalli ja sensorit

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Ilmatieteen laitos

Air Quality Modelling & data fusion

- **Air quality has high temporal-spatial variability in urban environment**
  - Regional models too coarse, downscaling needed
- **No feasible amount of measurement devices will ever yield complete coverage**
  - AQ forecasting not accounted, obviously
- **Data from sensors can be difficult to interpret and utilize**
  - Differences in quality, measurement height, strong local sources nearby, malfunctioning…

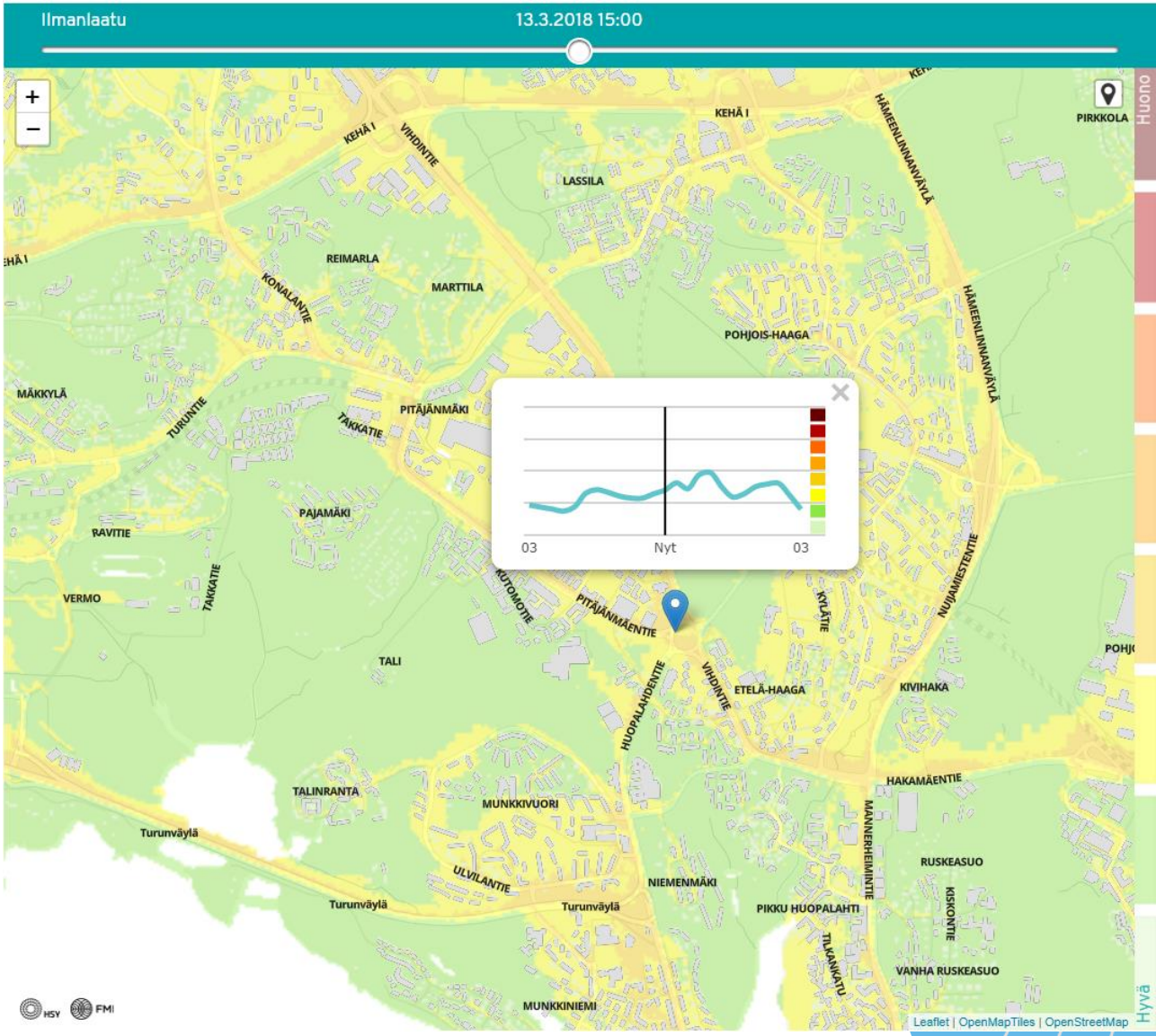
By applying **data fusion modelling**, all the abovementioned can be taken into account and a harmonized full picture on AQ can be derived with forecasts.

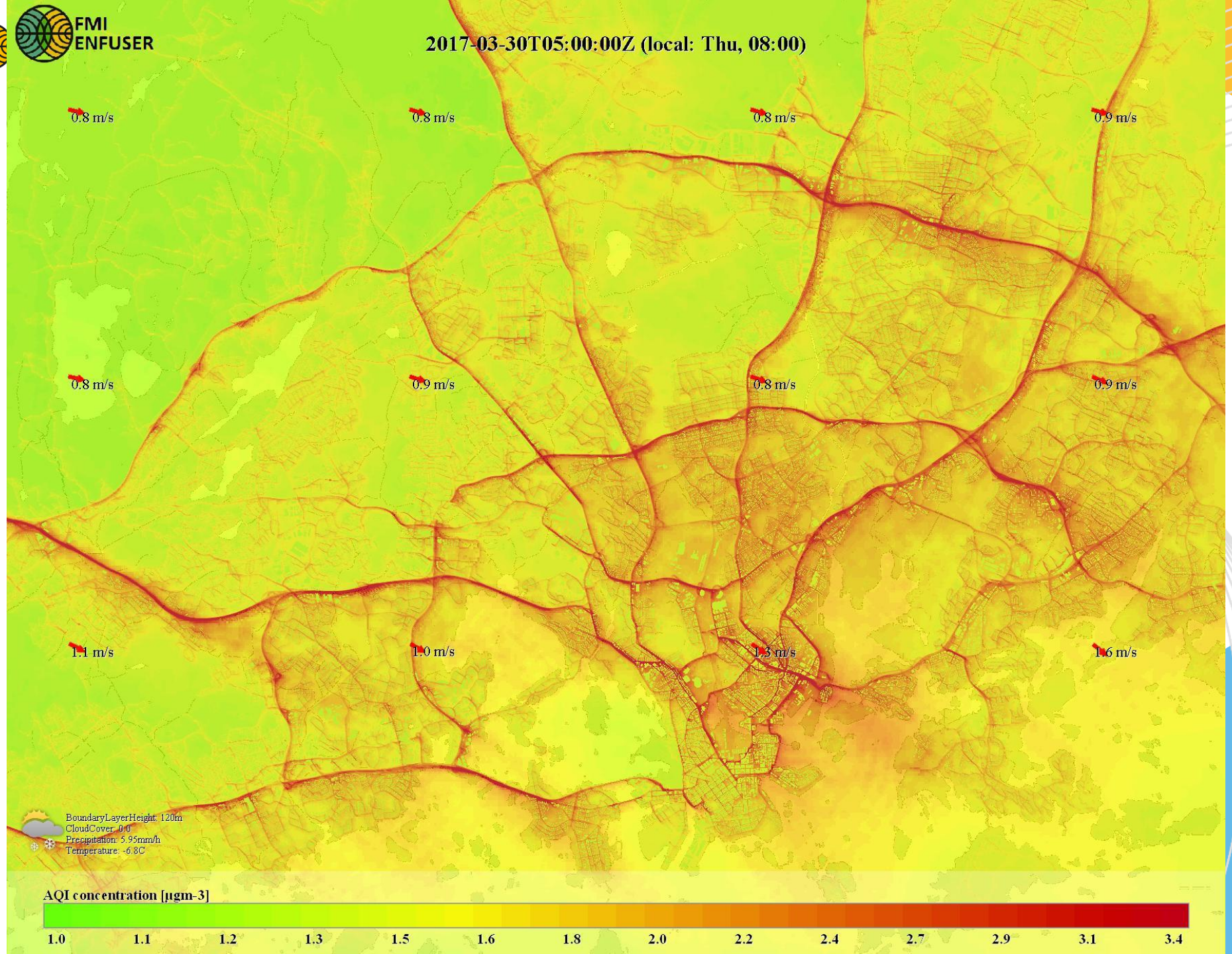
Accessing AQ model data

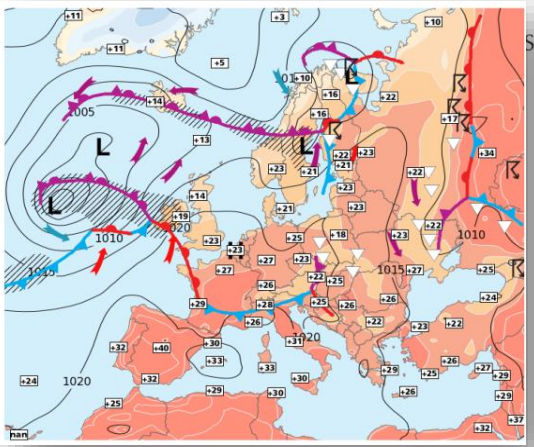
Real time information on Helsinki air quality has been made available since 6.3.2018.

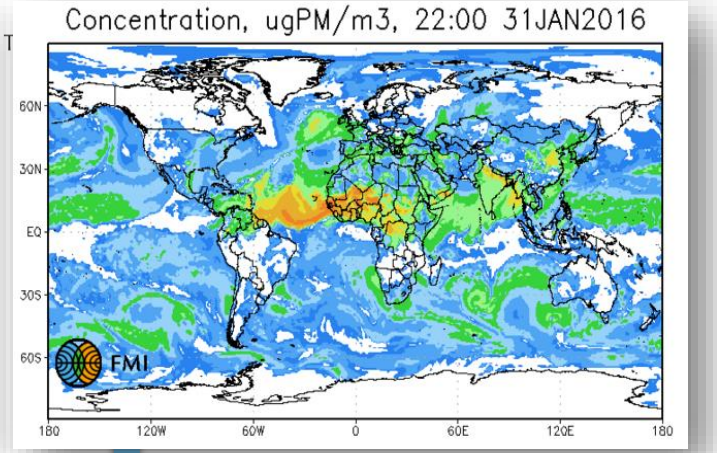
Accessible from:
ilmanlaatukartta.hsy.fi

Or
www.hsy.fi/fi/asukkaalle/ilmanlaatu/Sivut/ilmanlaatukartta.aspx




FMI
ENFUSER
2017-03-30T05:00:00Z (local: Thu, 08:00)
0.8 m/s
0.8 m/s
0.8 m/s
0.9 m/s
0.8 m/s
0.9 m/s
0.8 m/s
0.9 m/s
1.1 m/s
1.0 m/s
1.3 m/s
1.6 m/s
BoundaryLayerHeight: 120m
CloudCover: 0.0
Precipitation: 5.95mm/h
Temperature: -6.8C
AQI concentration [µgm-3]
1.0 1.1 1.2 1.3 1.5 1.6 1.8 2.0 2.2 2.4 2.7 2.9 3.1 3.4

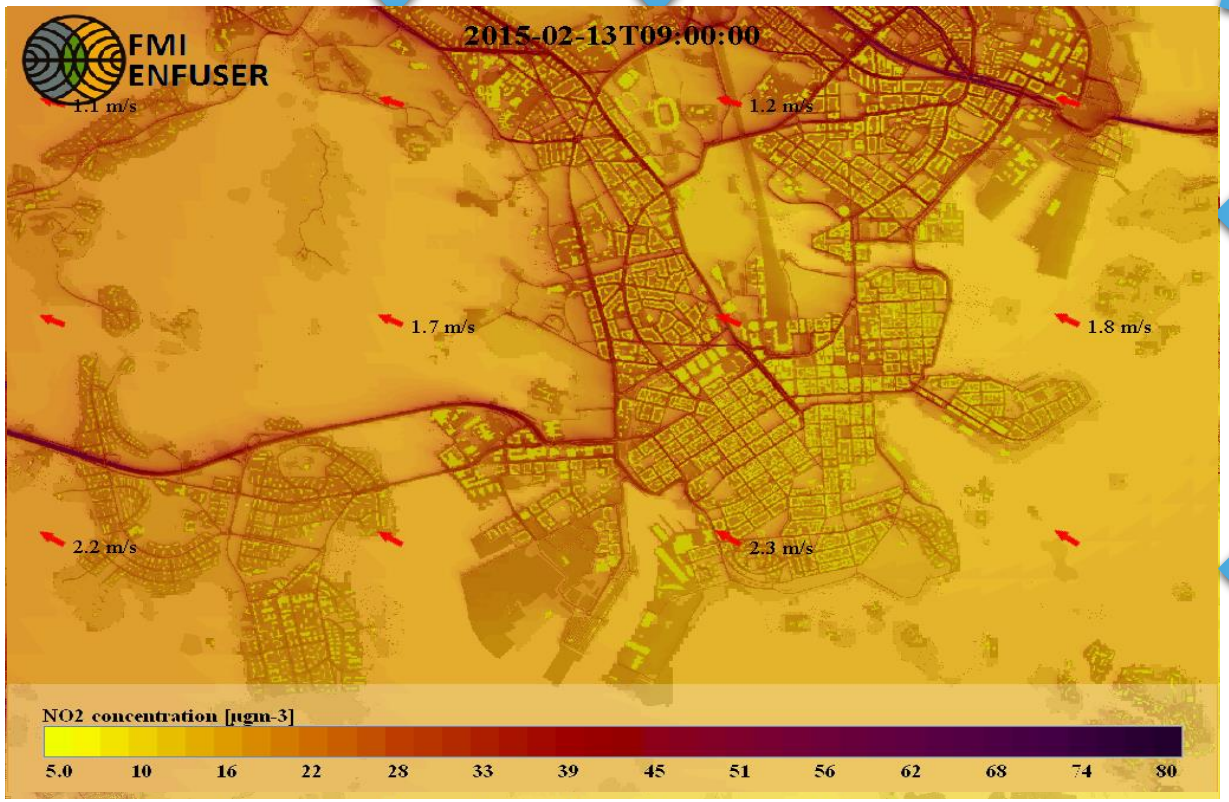




Weather data (HIRLAM)

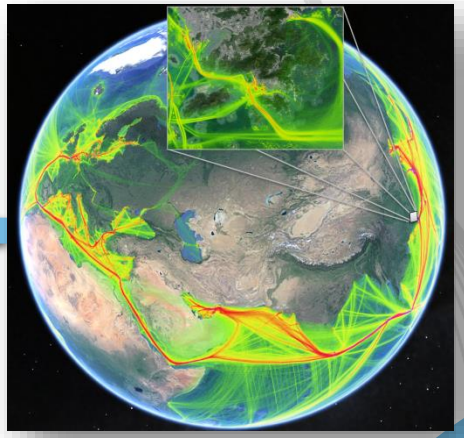
Regional AQ (SILAM)

AQ measurements

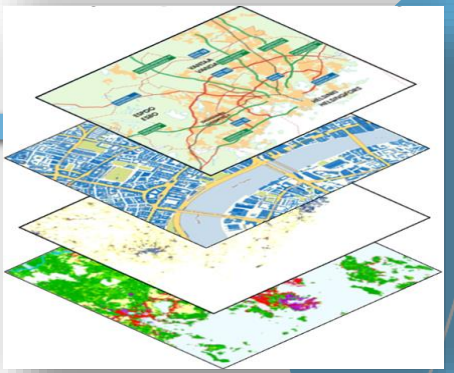


FMI-ENFUSER modelling system (2011 – 2018)

Supporting emission inventories



GIS-data



Why we need more measurements (1/2)

- More measurement data => better adaptation achieved
  - Fine-tuning of key meteorologial variables (wind speed, stability, BLH)
  - Fine tuning of emission sources's outputs

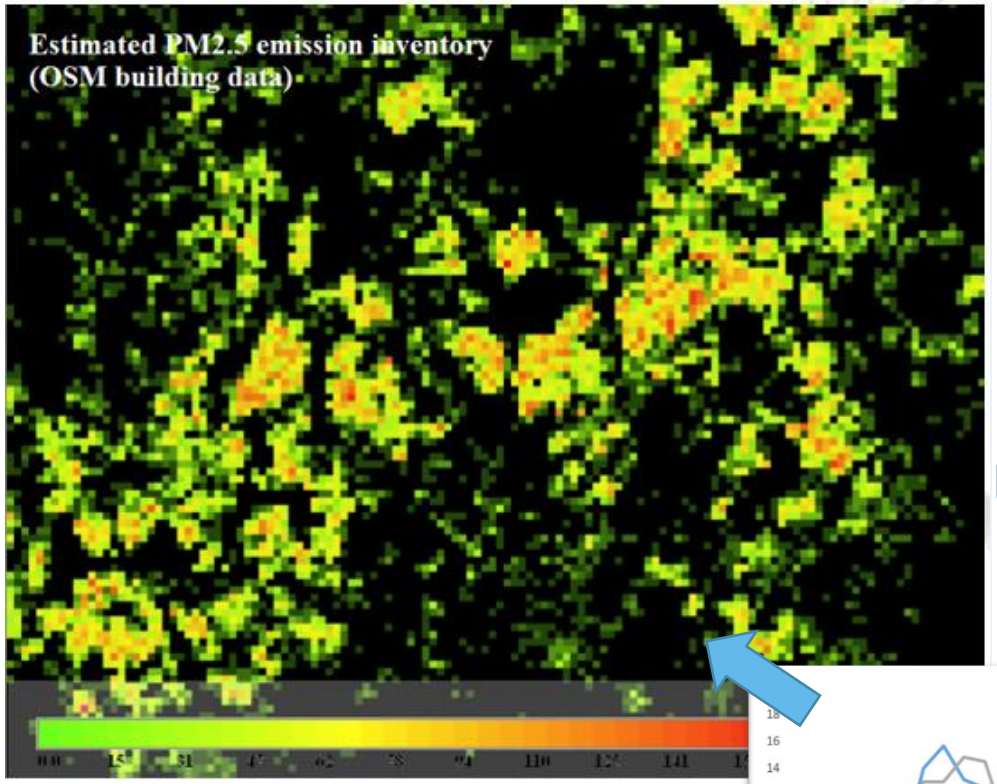
Data fusion algorithm

Imprecise/ disagreeing measurements
=> lower weight

20+ complementary AQ sensors will be installed in the Helsinki region (HAQT)

Why we need more measurements (2/2)

New information from local emission sources can be analysed from measurement data



Met. conditions

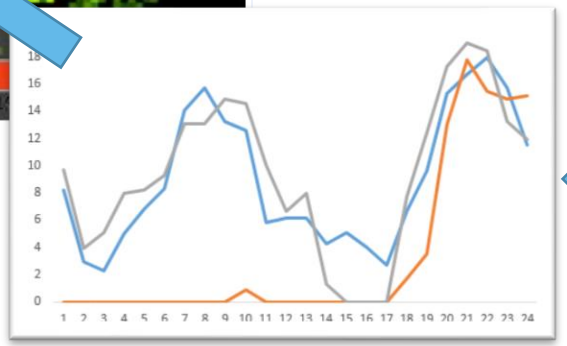
AQ measurements

data-point

Assumptions

e.g., temperature dependency

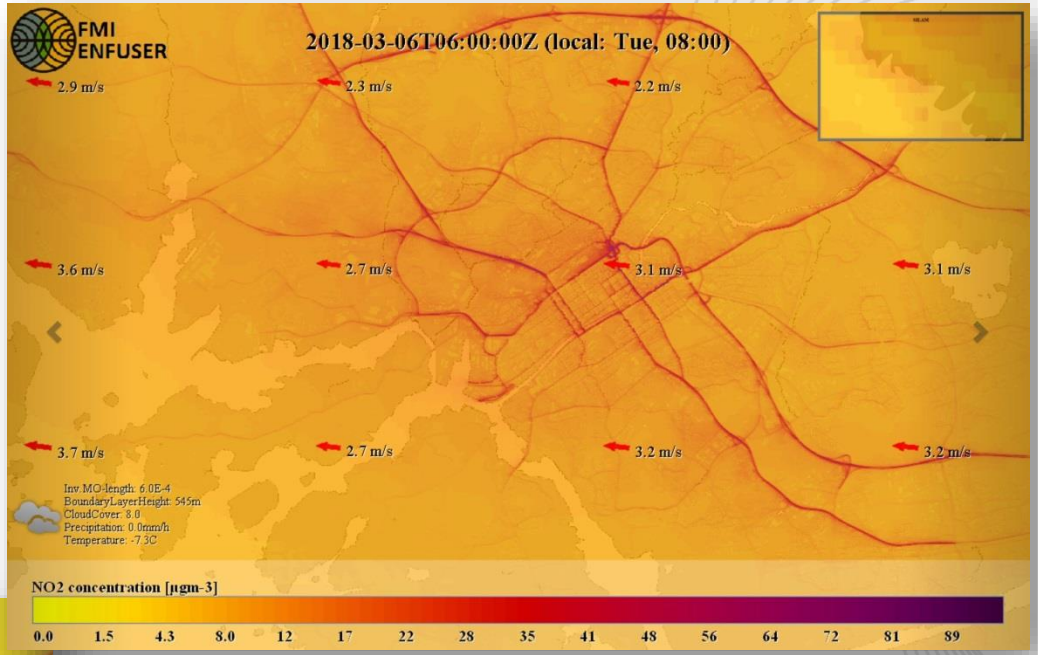
Optimize assumptions (max. Correlation)



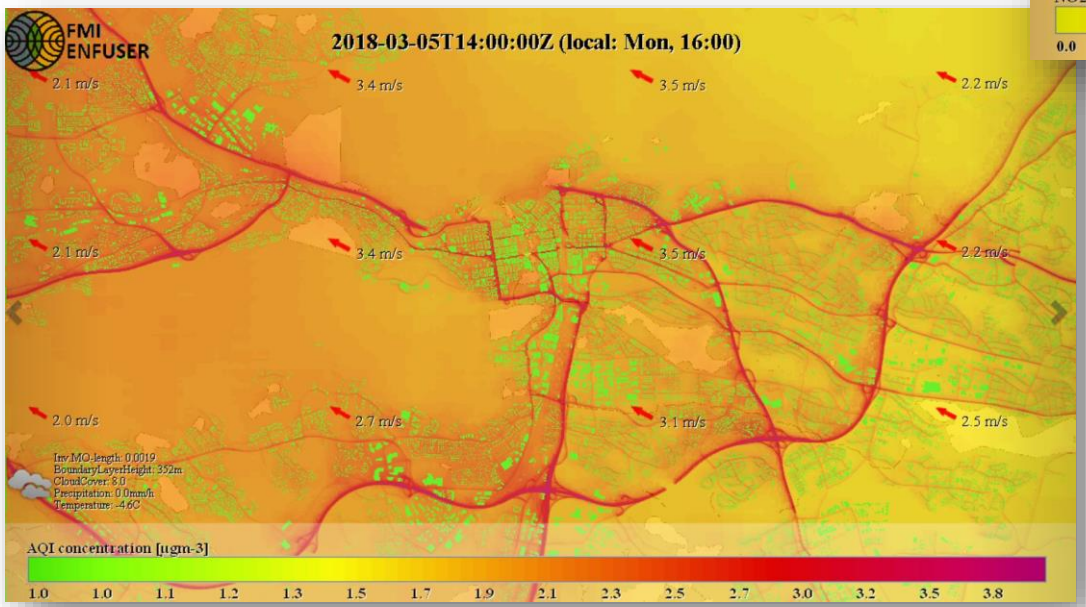
Emission factors and temporal profiles

Enfuser muualla Suomessa

- **FMI-ENFUSER can be extended to cover other main cities of Finland**
- **Limitation: measurement network should be extended**
  - Combination of low-cost sensors and higher quality devices
    - Non-AQ, supporting data should not be overlooked



ENFUSER is Turku



ENFUSER is Tampere