

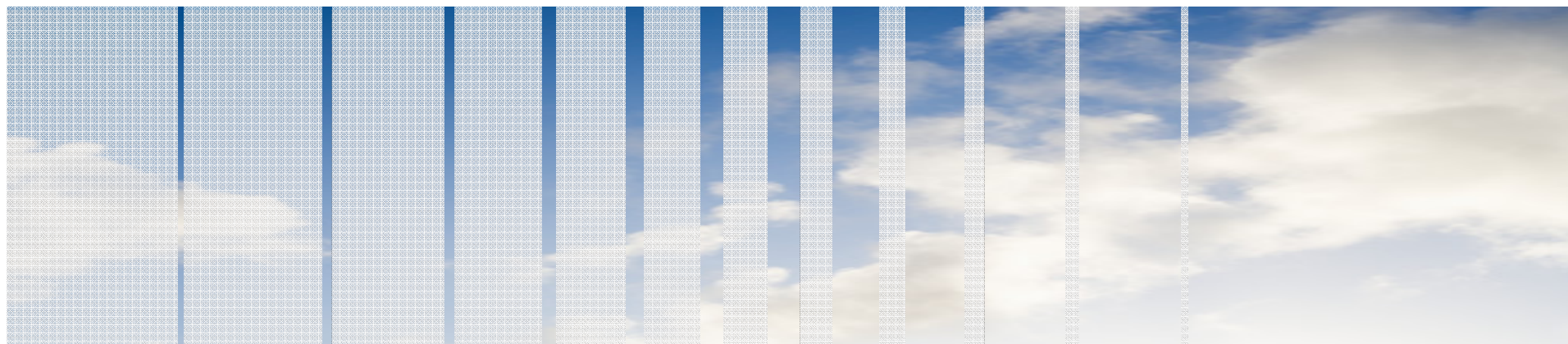


Netherlands Environmental Assessment Agency

Modelling framework to assess exceedances of NO₂ and PM₁₀ along city streets and motorways

NIAM 22 March 2010

Jan Aben



Generic Concentration Maps Netherlands (GCN)

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- Produced every year. Publication on March 15.
- Concentrations of NO₂, PM10, PM2.5, CO, benzene and other; resolution 1 by 1 km²
- For past year and future years (2010, 2015, 2020, 2030) with current legislation and additional policy plans
- Calculations with OPS model
- Emission input from Dutch PRTR, CEIP and GAINS
- Model output for past year is fitted to measurements
- GCN maps serve as background concentration for models that calculate concentrations along busy city streets (CAR) and along motorways (Luvotool)
- Simultaneous calculation of N-deposition. Serves as input for local management plans to preserve Natura 2000 areas

OPS model

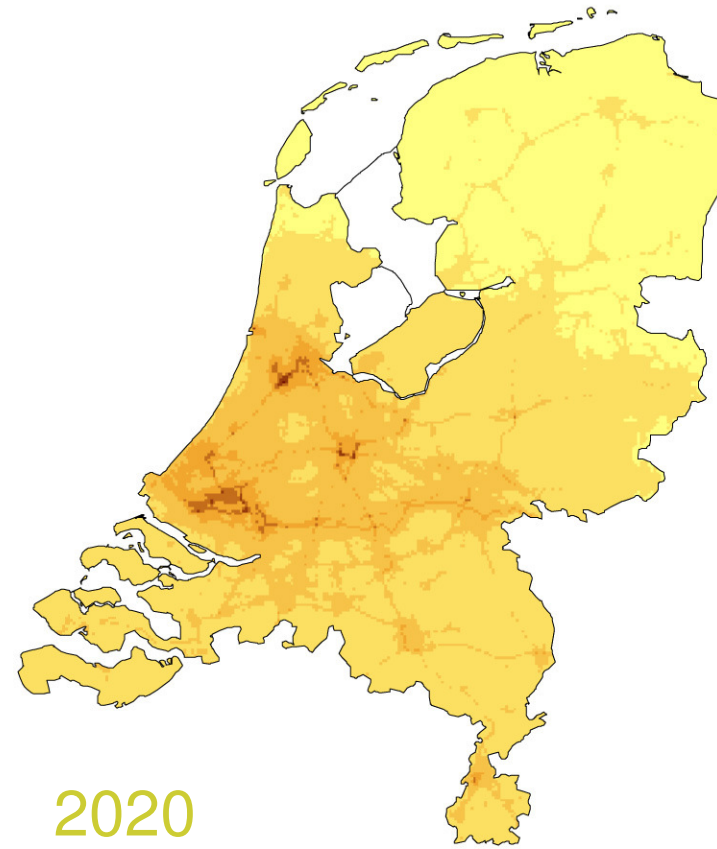
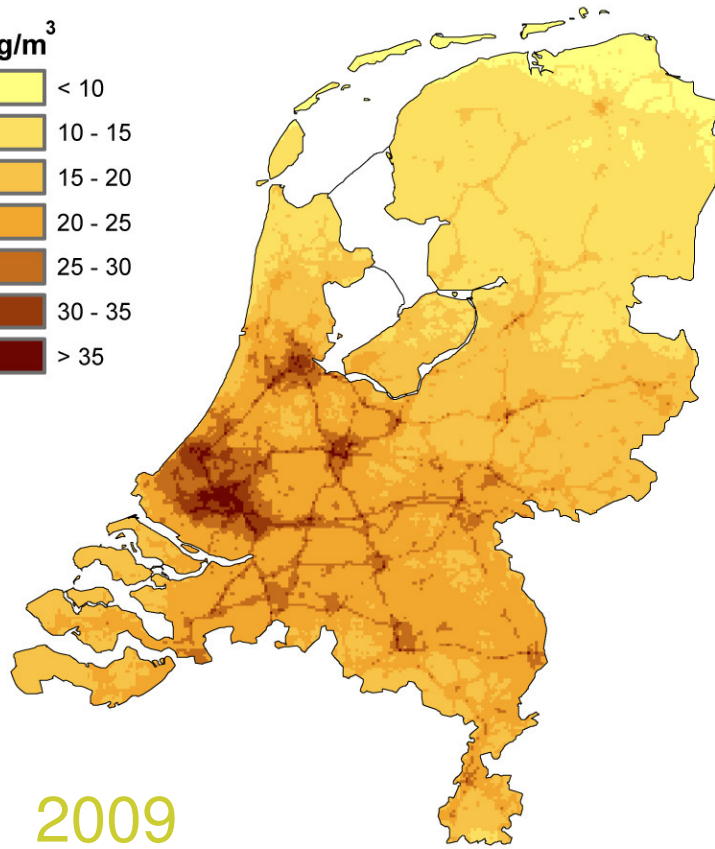
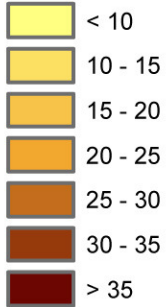
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- Time averaged concentrations and depositions
- Takes sources all over Europe into account
- Gaussian Plume model for short distance to source; Lagrangian trajectory model for longer distances
- Class model; Concentrations are calculated per stability class and then averaged (weighted)
- Simple 1e order chemistry
- Empirical relation for conversion of NO_x to NO_2

NO₂ concentration



µg/m³

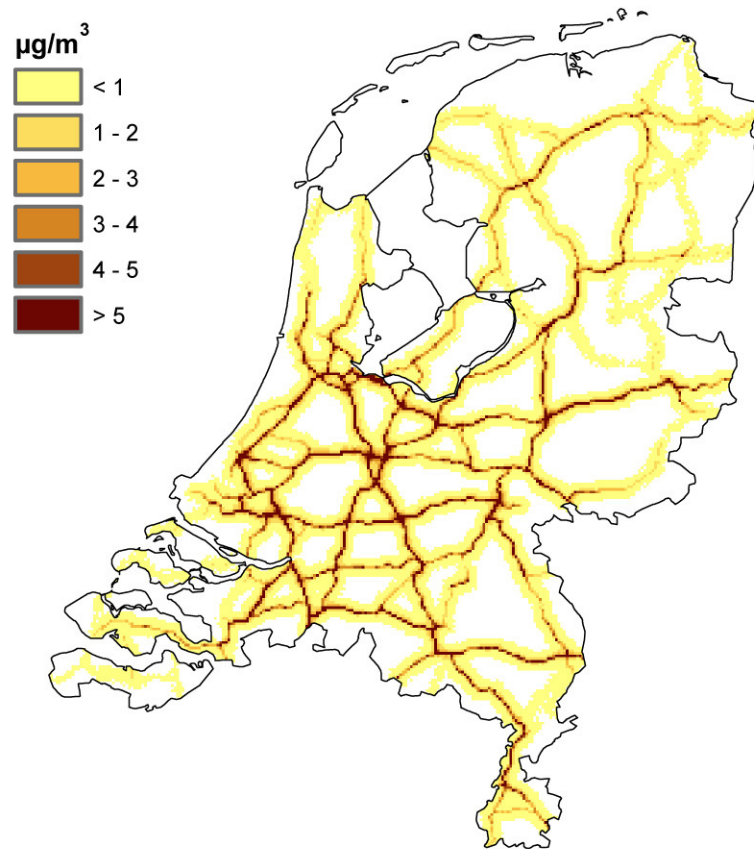


Local Scale Models

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- Luvotool
 - line source model
 - Gaussian dispersion
 - non linear
 - 25×25 m² resolution
- CAR
 - Concentration at 10 m distance from road side
 - $E = f$ (Number and type of vehicles, mean speed of vehicles, EF per vehicle and fuel type)
 - $\Delta C = E * DF$
 - $DF = f$ (wv, streettype, trees)
 - Empirical relation for conversion of NO_x to NO₂

NO₂ contribution of local motorway traffic

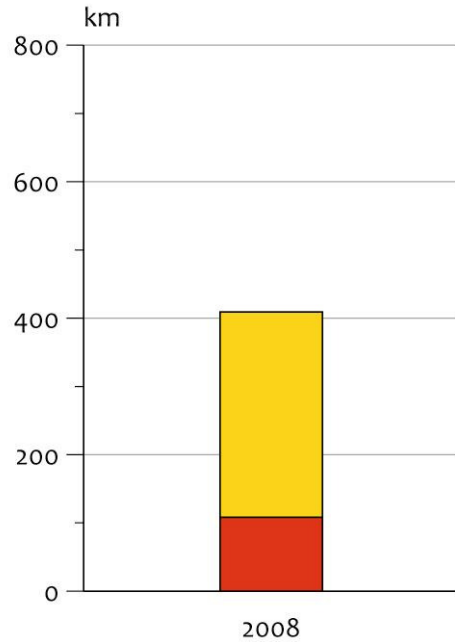


Each cell represents the contribution of local motorway traffic within a radius of 3.5 km

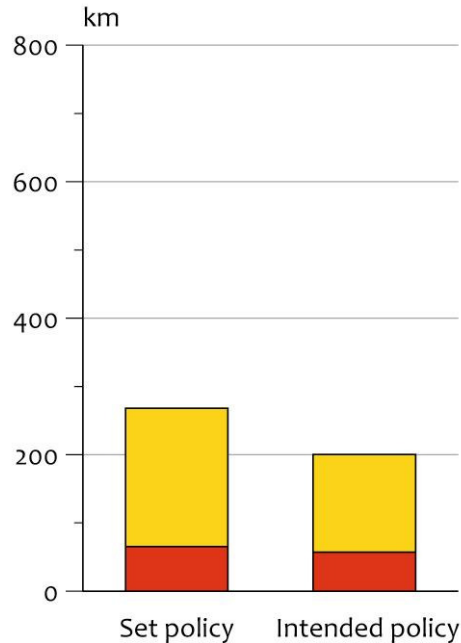


Exceedance probability of NO₂ limit value along motorways

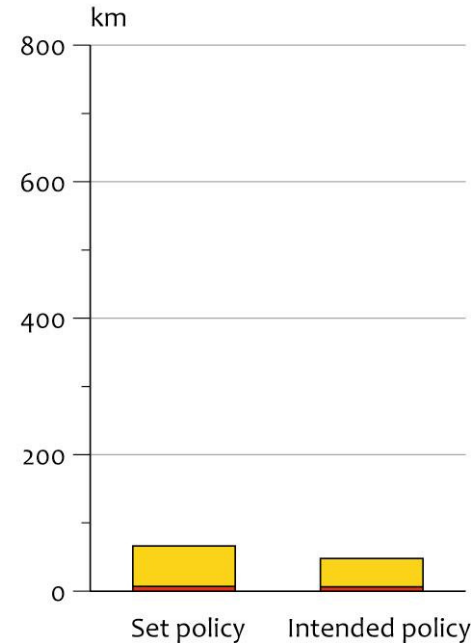
2008



2010



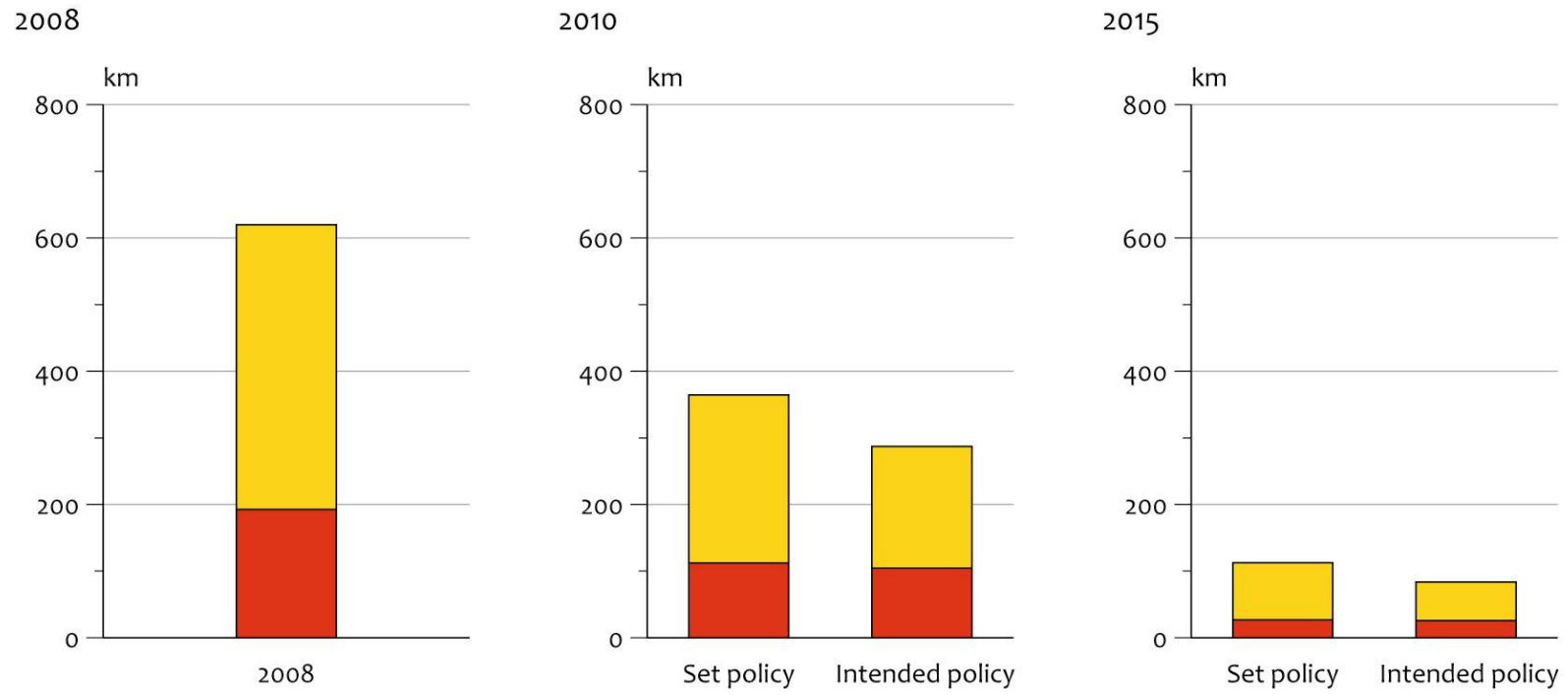
2015



- Around limit value ('fifty-fifty' probability)
- Likely exceedance (>66% probability)



Exceedance probability of NO₂ limit value along city streets



Around limit value ('fifty-fifty' probability)
 Likely exceedance (>66% probability)

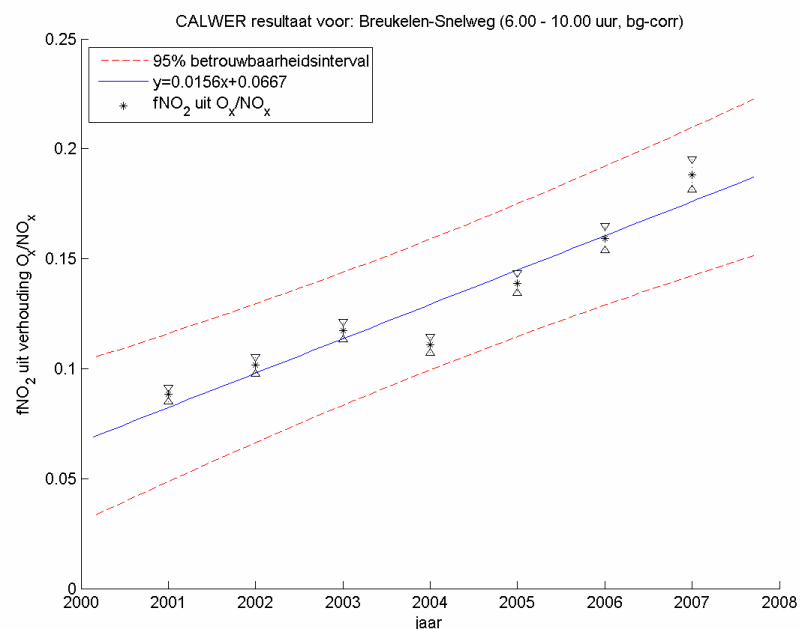
Sanitation tool

- Provided by government to local authorities
- CAR model and Luvotool-like model together with
 - Traffic data (road maps, road characteristics, intensities)
 - GCN maps with some local refinements (Schiphol, Rotterdam area)
 - GCN correction maps (contribution of local traffic)
 - Examples of local measures and their reduction potential
- Seek for local measures to clean up exceedances or compensate the negative effects of new infrastructure

Development of direct NO₂ fraction

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- Derived from O_x/NO_x relation at traffic stations
- Corrected for background
- Increase from 7% on average in 2000 to 14% in 2007
- Higher fraction for highway traffic (16-19% in 2007) than for inner city traffic (11-14%) reflecting differences in number of diesel cars and age of these cars
- Results confirm f_{NO_2} used in traffic models



Development of f_{NO_2} at a motorway station



The End

