Ministry of Infrastructure and the Environment

Regional Model application in The Netherlands

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KiM Netherlands Institute for Transport Policy Analysis

- **Research institute** within the Netherlands Ministry of Infrastructure and Environment

- **Established in 2006** to support evidence-based transport policymaking




KiM is part of the Ministry, but…

- Research content is **independent** of policy or politics

- All research studies are **peer-reviewed**
- All publications are **public**

Relationship with modelling:

- Application in our own projects
- Articulation of demand for decision support information for Ministry

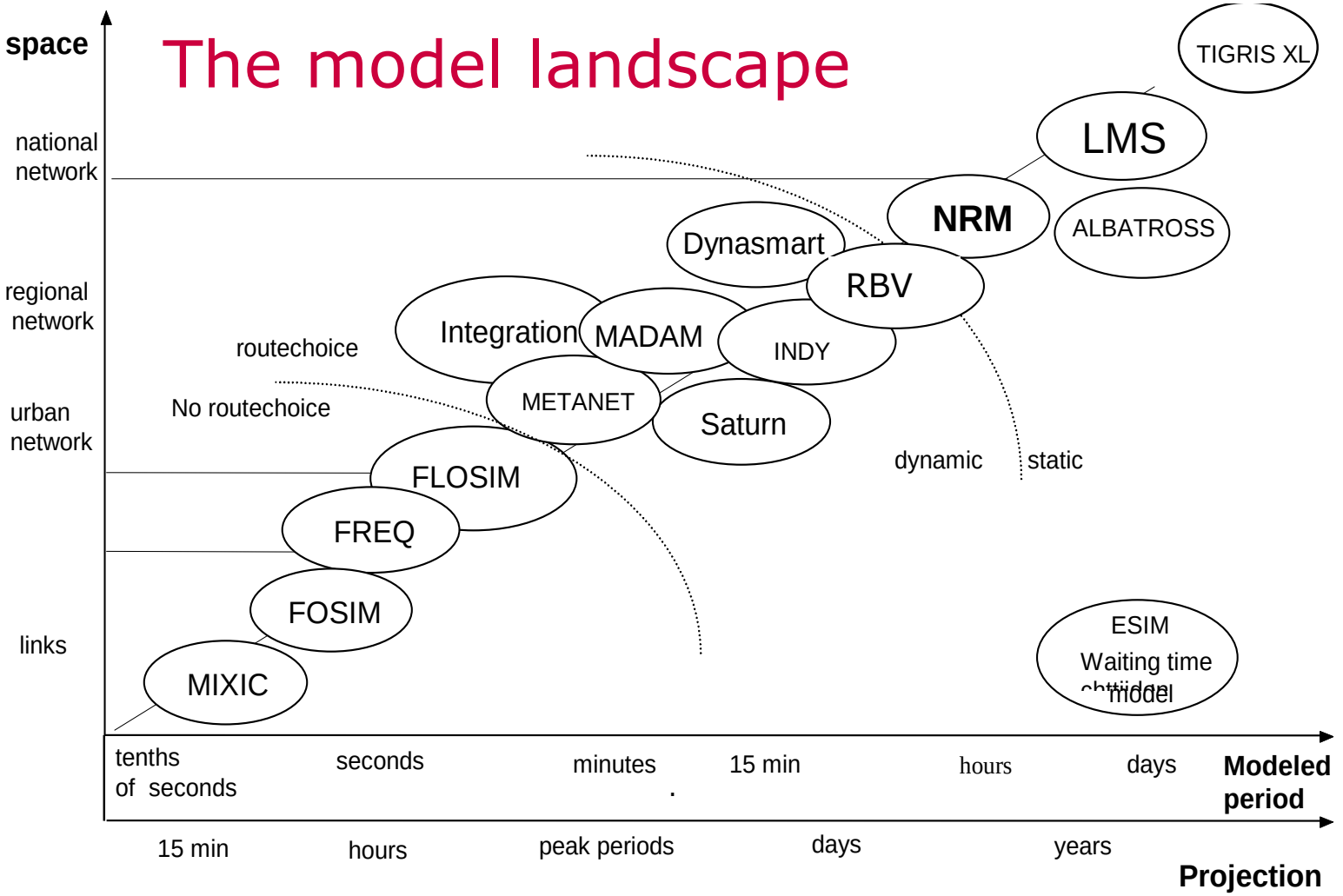
Model development in the Ministry

- By Rijkswaterstaat (RWS):
  - The implementation agency of the Ministry of Infrastructure and the Environment

What are models used for?

- "Reconnaissance" of the future
  - *problem identification*
- Policy impact assessment
  - *to compare impacts of alternative options*
  - *to test impacts of options against required standards*
- Ex-post evaluation
  - *Models enable the impacts of policy measures to be isolated from other factors*

The model landscape



LMS

- National Model System for Traffic and Transport
- Designed to make forecasts of mobility at national scale, and the use of the main road and rail network.
- Used to assist in strategic policy development on a national scale
- Developed and owned by Rijkswaterstaat
- Applications performed by a limited number of consultants
- Applications assigned by various parties in- and outside the Ministry

NRM

- NRM stands for Netherlands Regional Model
- Based on the same model philosophy as the LMS, but on a regional scale (4 models covering the country).
- Designed to produce regional transport and traffic forecasts
- Used for carrying out planning, exploratory and other studies
- An importants source of information on mobility in a region. It provides a better understanding and the information required to develop regional transport policy
- Build under responsibility of Regional Offices of RWS, in co-operation with Provinces
- Most applications are performed by consultants

LMS/NRM

- Both LMS and NRM take into account choice behaviour relating to car ownership, number of journeys, destinations, modes of transport and, for cars, departure times and routes.
- '4 stage' models with sub models for driving licence acquisition and car ownership.
- Highly disaggregated, incl. spatial characteristics
- Pivot point method:

  accurate description of base year combined with growth factors
- Based on cross section data (2004)

NRM applications (1)

Supply network design characteristics, testing against policy targets

- Traffic flow, V/C-ratios at link level
- Travel time ratios at route level
- Travel time delay at network level
- RWS internal quality standard = use NRM for traffic data

NRM applications (2)

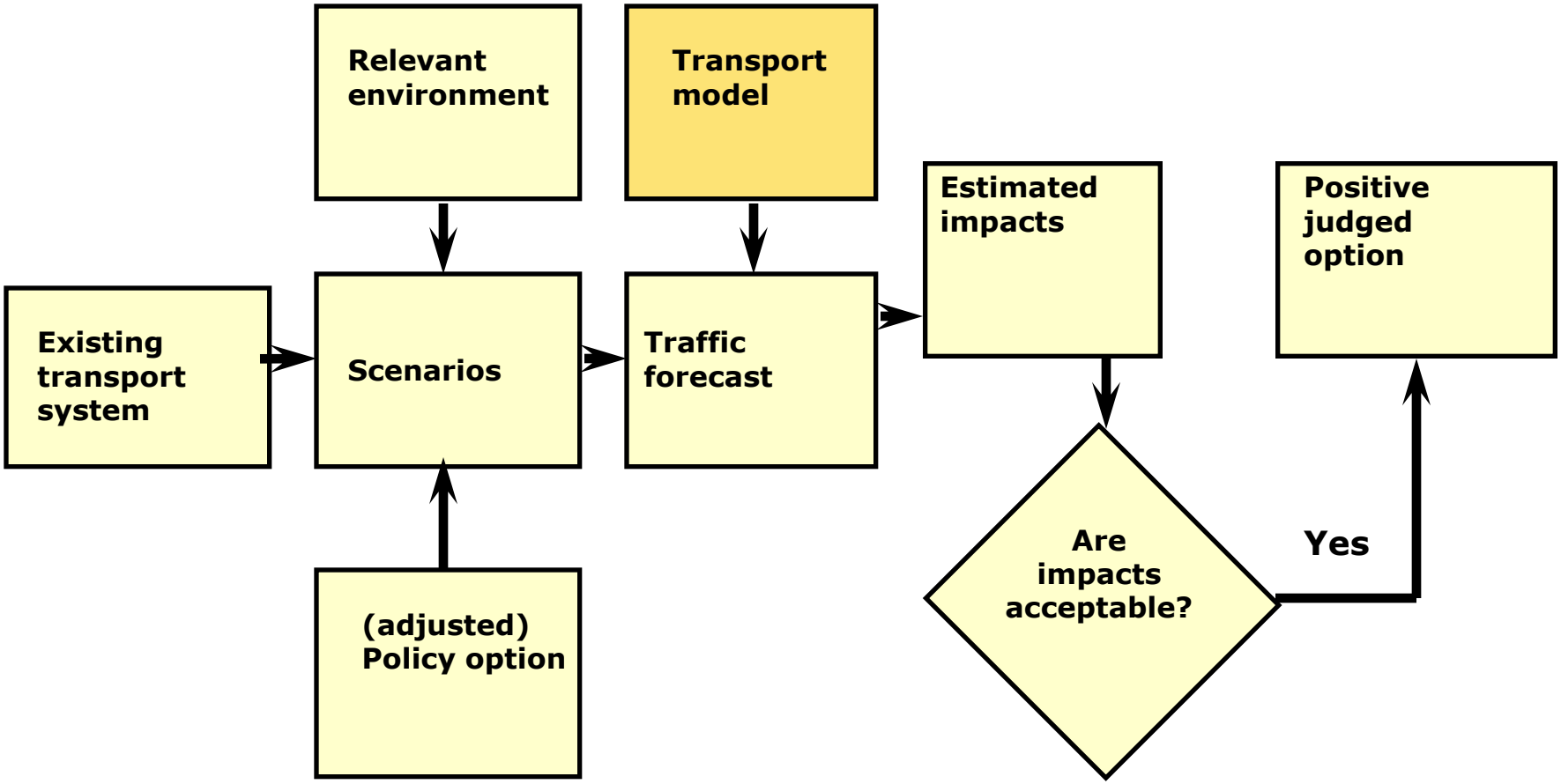
Supply information for CBA methodologies used at different stages of planning process, (using national CBA framework (OEI))

- Travel time data at link level
- Methods used set by Cabinet (Parliament approval)
- Framework prescribes the use of NRM
- RWS internal quality standard = use NRM for traffic data

NRM applications (3)

Supply information for environmental impact assessment report (MER) including testing against legally set targets for noise, local air quality (NOx, PMx, etc.), nature quality, water quality

- Traffic flow data at network or even link level
- Legal requirements to estimate impacts, but no standards for transport model use
- RWS internal quality standard = use NRM for traffic data



Where does the model fit in ex-ante evaluation

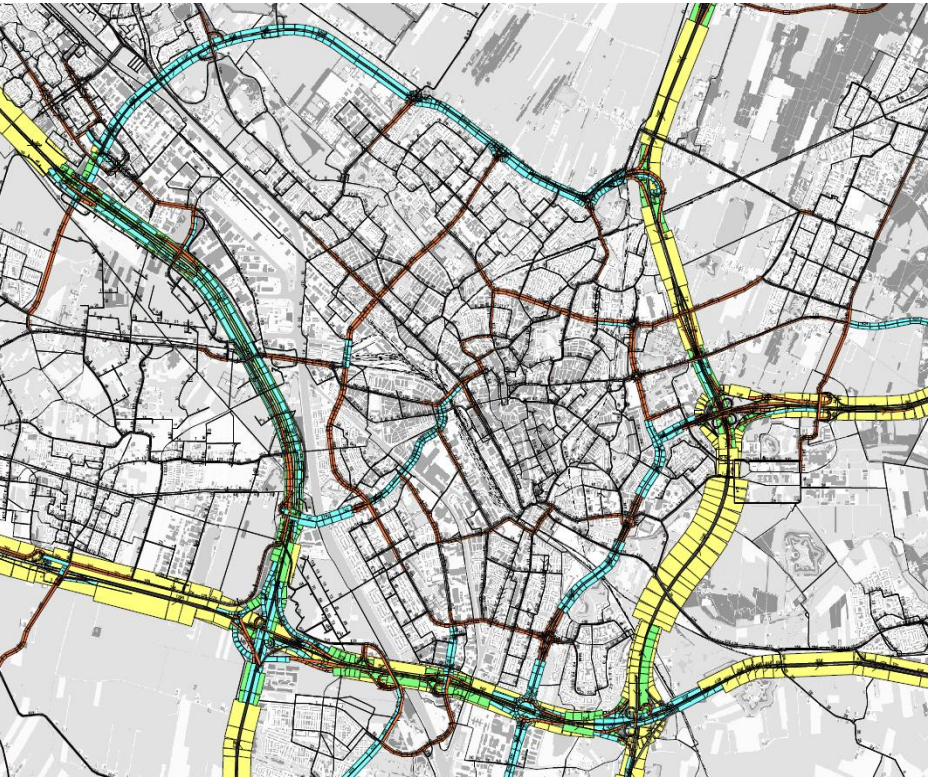
Issues to remember in application

- Each model is an abstraction of reality
- The future is “unknowable”
  - Many “futures” are possible
  - All input data for “The Future” have a high uncertainty
- The model itself has uncertainty
  - Base year description, model parameters
- Model complexity means a high probability of mistakes
  - It takes time; high risks for the planning process
- The transport model application is only one of many aspects of the policy planning process

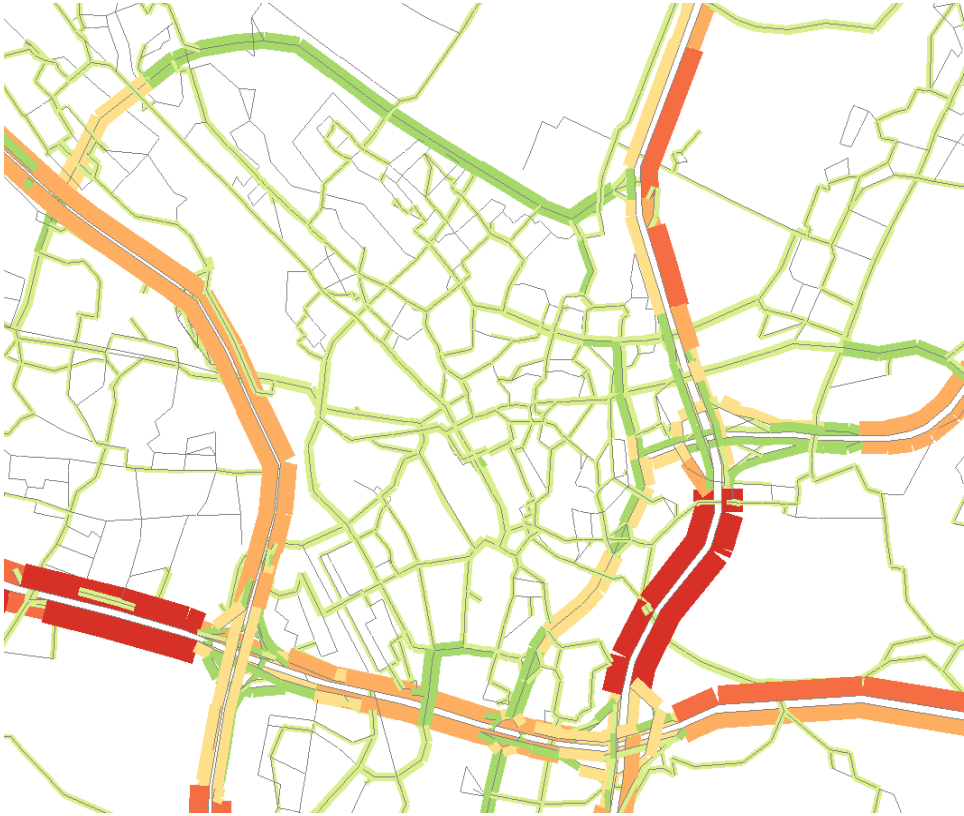
Each model is an abstraction of reality !

Different abstractions of reality

VRU



NRM



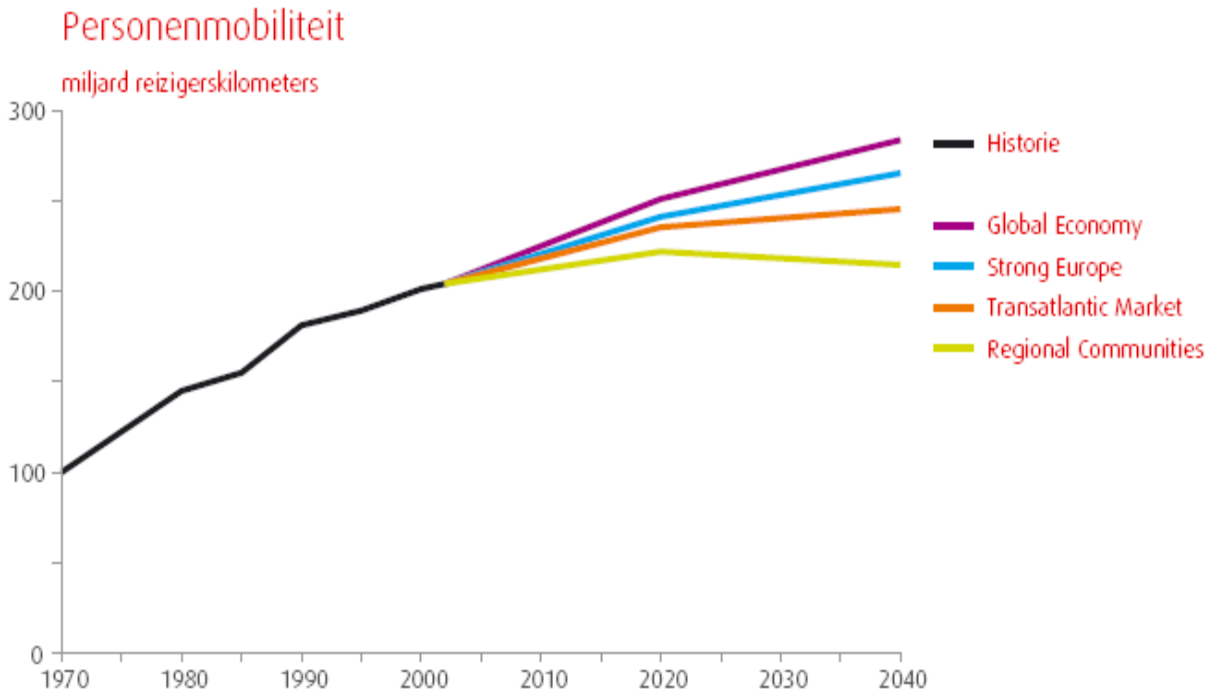
The future is “unknowable”

- All “futures” are possible
  - Some are more likely to happen
  - Some are less likely to happen
- All input data for “a future scenario” have a high uncertainty

An example of “reconnaissance”
The WLO Scenario study; 2004 (prosperity and the environment)

- 4 scenarios for national socio-econ. and spatial development
- Use of LMS
  - Translation of developments into LMS input
  - Producing scenario specific ‘images’ of the transport system and translating these into LMS input
  - Calculate mobility and accessibility effects using LMS
- Modelling issues: standard version LMS applied

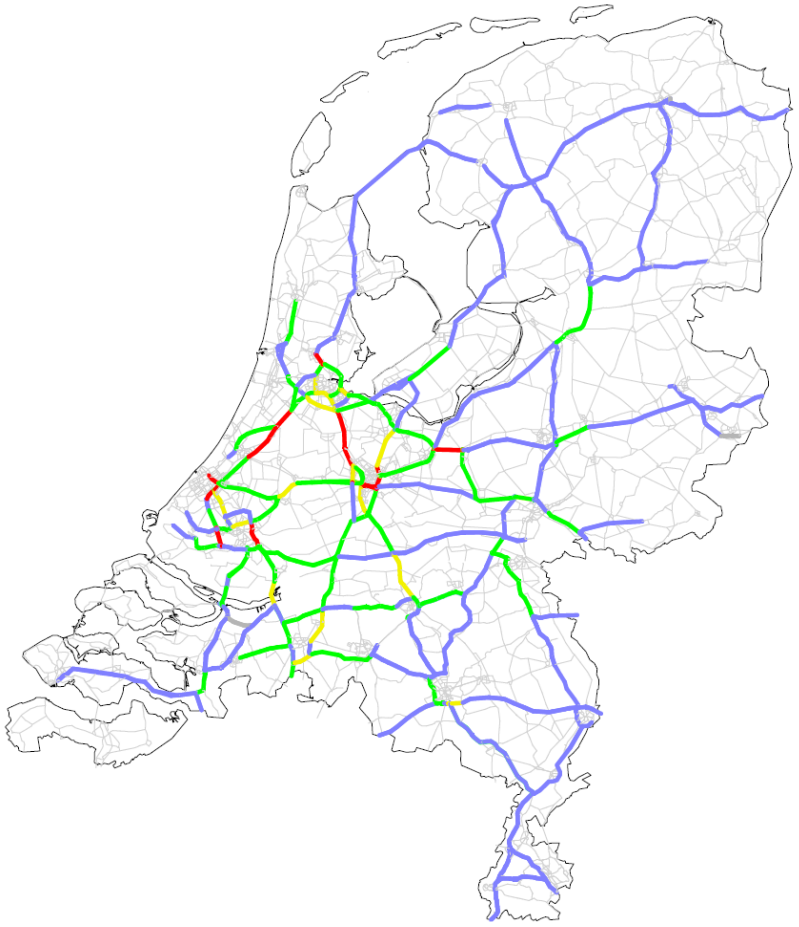
Personal mobility (personkilometres) under the four different WLO assumptions



Travel time delay on motorway network in 2020

GE

RC

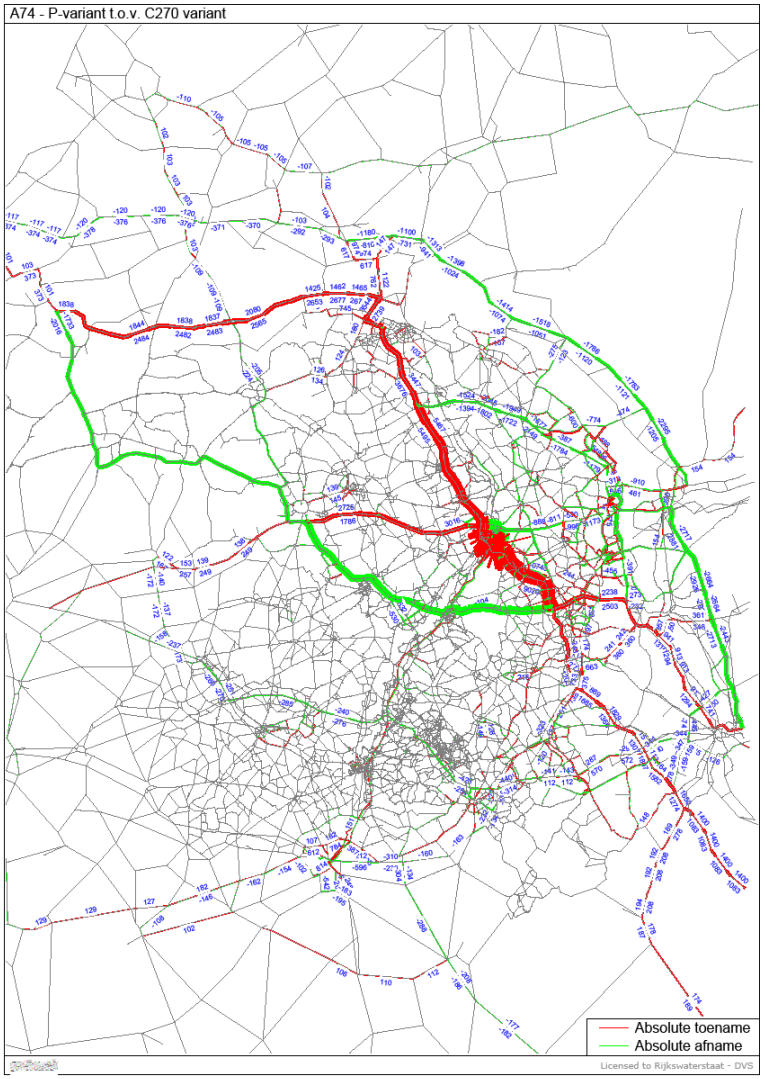


The model has uncertainty

- From base year description
  - Never better than the base year description
- From specification
  - Limitations through the abstraction of reality
- From estimation process of parameters

Model output has uncertainty

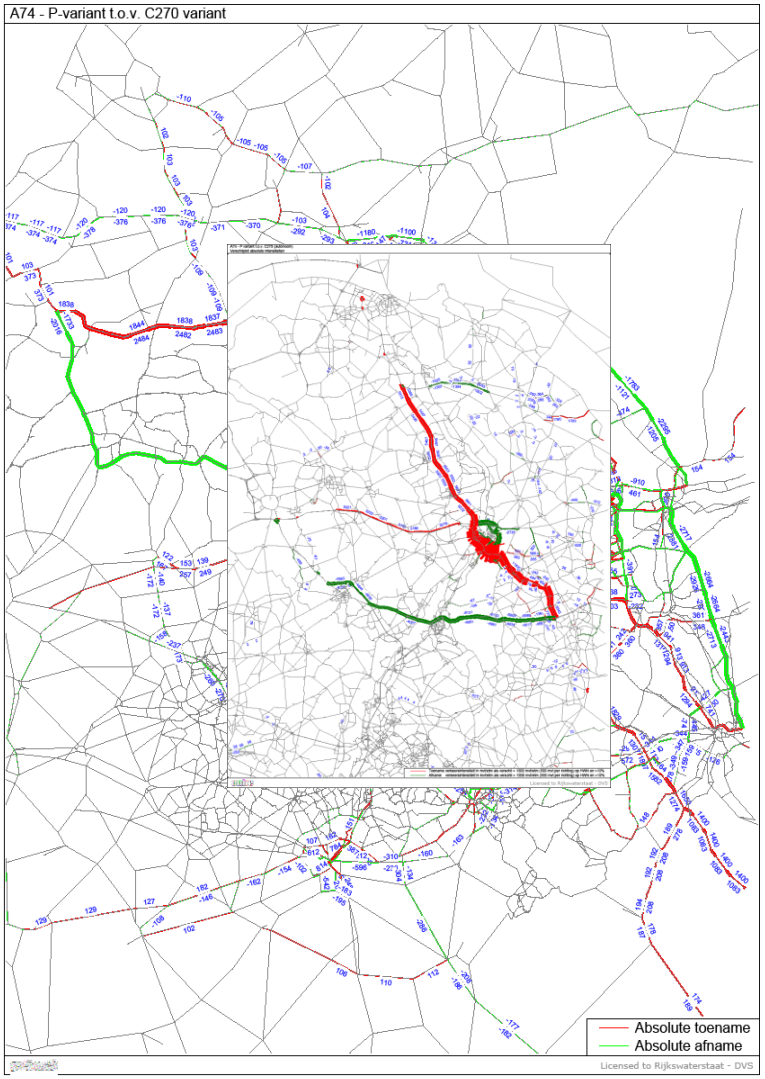
- even when we would be certain of the future developments
- remaining accuracy of flow on important links: 10%
- Full band-whith is 10% - ??% depending on scenario assumptions



Example model accuracy

NRM output:

Plotted differences
=
Difference in flow with or without the project

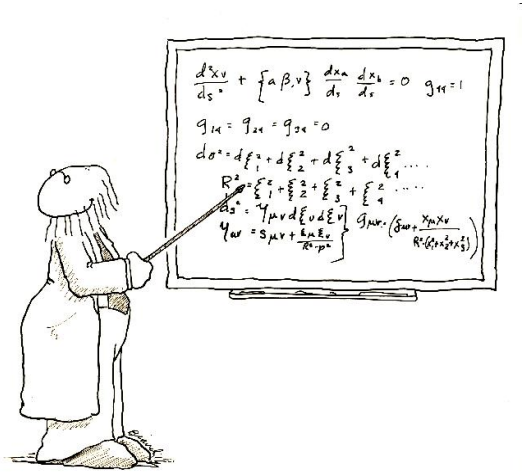


Example model accuracy

Flow differences significantly different from “0”

Model complexity,
means a high probability of "mistakes"

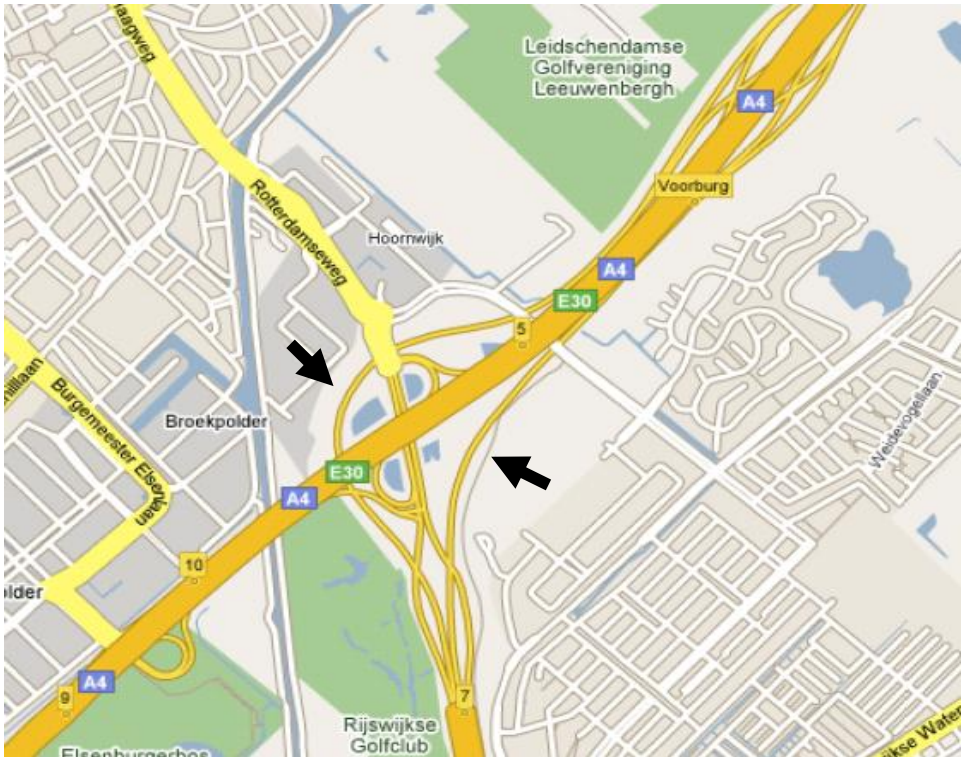
- Model application takes time
  - Not the model runtime
  - Collecting relevant assumptions and translating these into modelinput
  - Quality control in the application process
- Small 'mistakes' can have huge consequences



Model complexity,

means a high probability of "mistakes"

- The A4 "incident"



3 lanes instead of 4 coded on A4-A13 connection in the project scenario

Model complexity,
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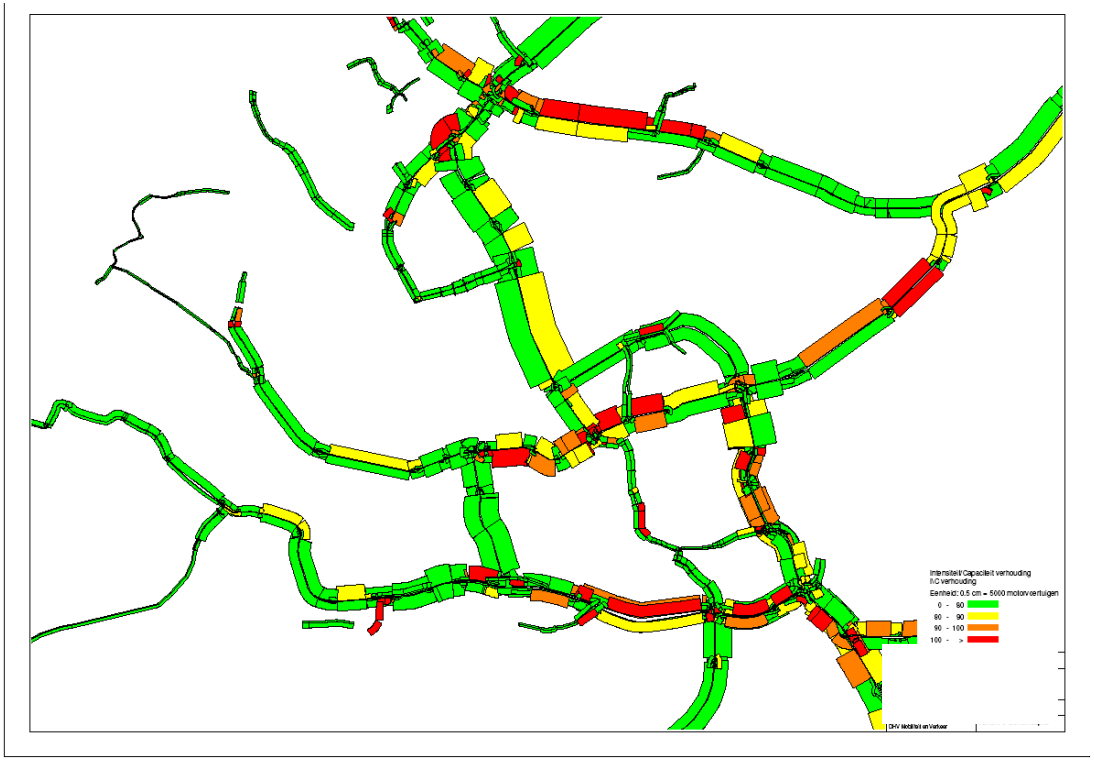

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The calculated bottleneck leads to the conclusion that 5 lanes are required, thus disqualifying a highly relevant alternative

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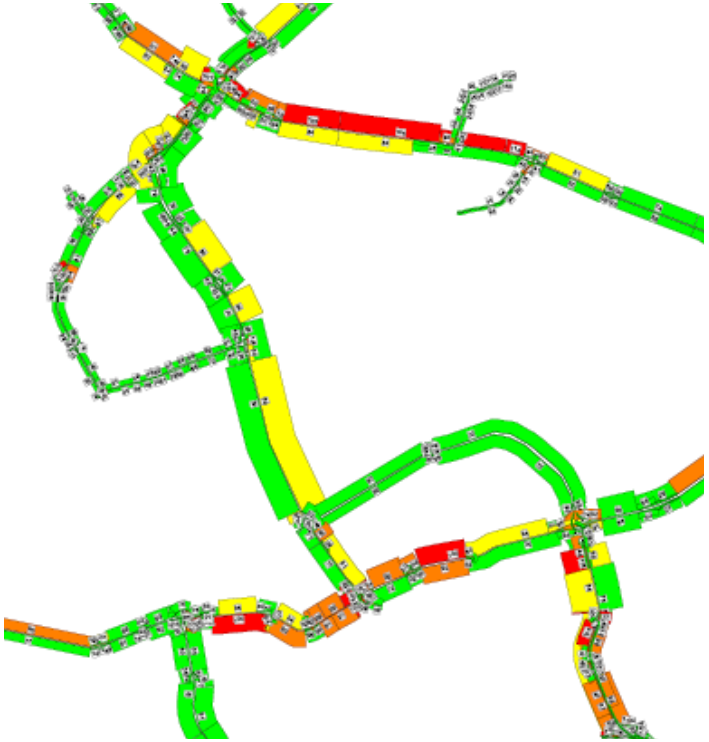


3 lanes instead of 4 coded on A4-A13 connection in the project scenario

The calculated bottleneck leads to the conclusion that 5 lanes are required, thus disqualifying a highly relevant alternative

"repair' leads to inclusion of the alternative

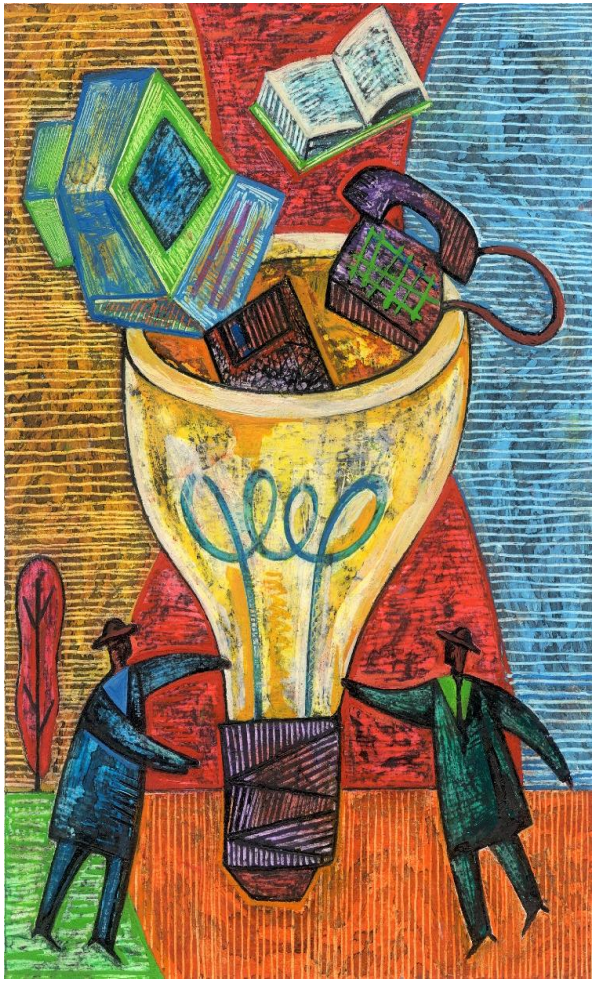
Co-ordination – The "How"

- Steering towards corporate approach by means of co-ordination and directives:
  - Development:
    - Use of one 'corporate' modelling technique
  - Application
    - Use 'corporate' set of assumptions in application
    - Use 'corporate' application rules (incl. a set of responsabilities/actor)
    - Laid down in 'Protocol for NRM-application'

The transport model application is only one of many aspects of the policy planning process

Lessons

- Only use the model for the purpose it was build for;
  - "to gain insight in possible impacts under given conditions"
- Only use the model to assess impacts on the level of detail it was designed for
- Never use the model as a cristal bowl;
  - the model output is not a prediction of the future!
- Be aware of the fact that the model is an abstraction of reality
- Application = A Model + An application process
- Be aware that the application process requires proper organisation and quality control!
- Keep using your common sense!



Remember that all models are wrong; the practical question is how wrong do they have to be, not to be useful

(Box and Draper, 1987)