



## **Dissemination Conference**

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# Quality of models and methods for IA

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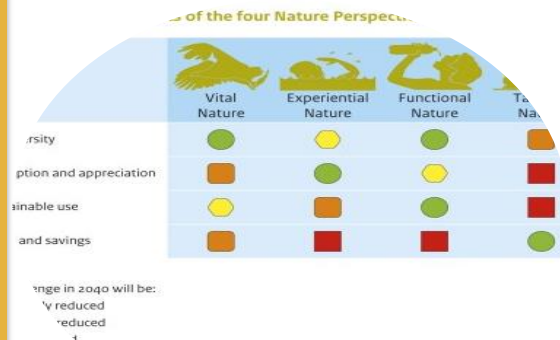
Sjoerd Hardeman, JRC

Jacques Jansen, Alterra

Brussels, 1 April 2014

# Overview

1. Lessons learned in Dutch Modelling for Nature Policy (Paul Hinssen, Alterra)
2. Comments: Rob Maas (National Institute for Public Health and the Environment); Sjoerd Hardeman (EC-Joint Research Centre)
3. The LIAISE approach: reflection on the progress so far and the challenges ahead (Jacques Jansen, Alterra)



# Paul Hinssen: Lessons learned in Dutch Modelling for Nature Policy (MNP)

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1. History of the Dutch Modelling for Nature Policy
  - a) The MNP Model for Nature Policy
  - b) History of the model
  - c) Expiry date: a method's life cycle
2. Organisation of quality assurance, the MNP-case
  - a) Intro: The cycles of model development and quality assurance
  - b) The system of QA at Alterra
  - c) Organisational Implementation
3. Uncertainty and communication to policy makers

# MNP Model for Nature Policy Assessment

- <http://themasites.pbl.nl/natureoutlook/>
- Used intensively
- Evolved from other models during 15 years
- On-going process of investments in improvements and applicability
- Focus on birds and plants



# History of MNP: Model development and application in Nature Policy Assessments (NVK)

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1990-2000: **Growing collaboration RIVM and Alterra**: different modules emerge and evolve (MOVE, LARCH, SUMO).

Application complex and time consuming (NVK-1997, NVK-2001)

2000-2010: **modules converge** into one platform: the Nature Policy Assessor (NP). Application easier but still time consuming (NVK-2006)

2010-now: **Simplification**: the Model for Nature Policy assessments (MNP): easy to use, fast calculation. (NVK-2010)

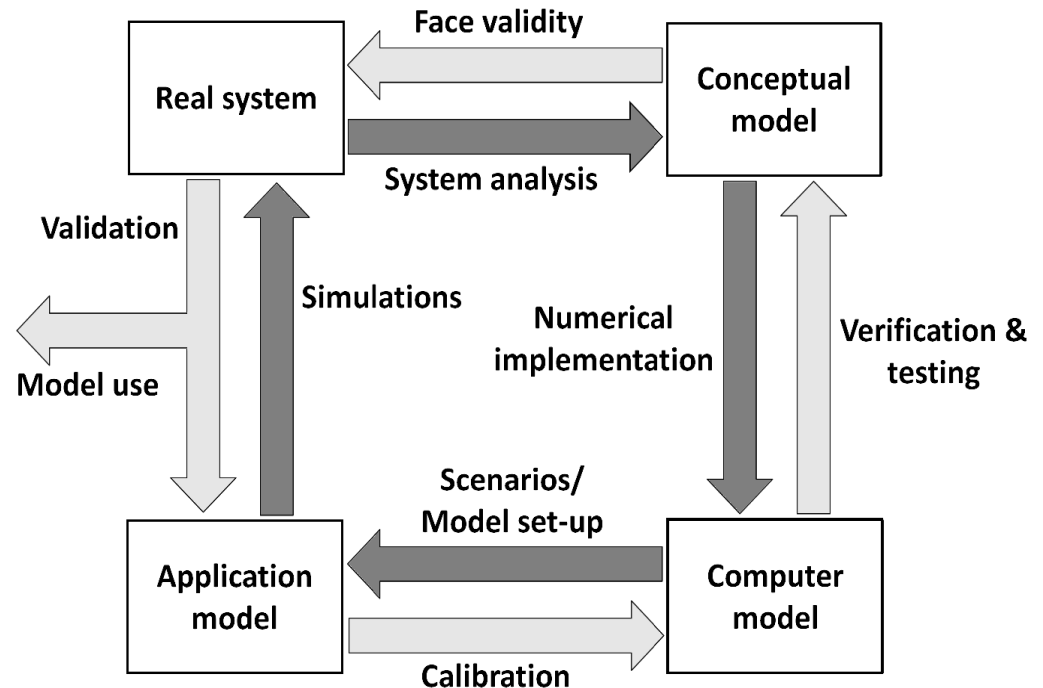
*NVK = Natuurverkenning (Nature Policy Assessment)*

## Expiry date: MNP's life cycle versus policy life cycle

- ❑ Do you know the expiry date?
  - LARCH → NP → MNP → next?
- ❑ When is it time to abandon the MNP method?
  - Renewal of policy goals (MNP fit for purpose)
  - Policy of decentralization (MNP might not survive)
  - Acid rain as environmental indicator (pré MNP)
  - DNA reveals new features (not relevant to MNP)
  - New data in GIS (core feature of MNP)
  - New ICT technologies (MNP fast performance)

# The cycles of model development and quality assurance

1. Development: system analysis, numerical implementation
2. Preparation: scenarios/model set-up
3. Application: simulations
4. QA (reversed arrows)
  - a) Face validity
  - b) Validation
  - c) Calibration
  - d) Verification
5. Costs



# The system of QA of models and databases at Alterra

1. Key question: Is model/database fit for purpose? → two-way judgement (from a scientific and a user perspective)
2. Quality is not attribute of model as such, but of the combination of model and use-case
3. Quality criteria targeted at enabling potential users to answer question 1)
4. Key features of QA approach:
  - Experimental vs. operational versions of models/databases
  - Operational: Status A (minimum requirements) and AA (additional)
  - Quality system for models and databases embedded in general ISO-certification of Alterra



# QA at Alterra: Experimental vs. operational models, current website

**WAGENINGEN UR**  
For quality of life

Onderwijs & Opleidingen   Onderzoek & Resultaten   Expertises & Dienstverlening

Home   Expertises & Dienstverlening   Onderzoeksinstituten   Alterra   Faciliteiten & Producten   Software

• **MOVE** Experimenteel

• MultiSWAP Experimenteel

• NMI 3

• STONE Experimenteel

• **SUMO**

• SWAP

• Synbiosys

• Idefics Experimenteel

• INITIATOR

• **LARCH**

• Operationeel:  
deze modelsoftware kan in alle projecten en opdrachten worden gebruikt. De kwaliteit wordt geborgd door een proces van continu verbeteren en door productcertificering

• Experimenteel:  
deze modelsoftware is tot nu toe alleen gebruikt in de projecten waarin het is ontwikkeld. De kwaliteit kan nog niet zonder meer worden geborgd en de toepasbaarheid in een andere context moet van geval tot geval bekeken worden.

• Alterra Experimenteel

• ANIMO

• Bioscore

• CASCADE

• CCAT

• DIMO

• DROPLET

• EFISCEN

• FOCUS PEARL 3.3.3

• GEOPEARL

• GridWalk/SmallSteps Experimenteel

• Grondwaterdynamiek Experimenteel

• HAIR

• HGN 1990

• Idefics Experimenteel

• INITIATOR

• LARCH

• LGN5

• MASOOR Experimenteel

• MASTEP Experimenteel

• METAPHOR Experimenteel

• MetaSWAN Experimenteel

• MOVE Experimenteel

• MultiSWAP Experimenteel

• NMI 3

• NTM Experimenteel

• Nuswa Experimenteel

• OMI Experimenteel

• PERPEST Experimenteel

• PESTICIDEMODELS

• Phytodec Experimenteel

• Primet Experimenteel

• MAPTALK

• SIMGRO Experimenteel

• Simple Experimenteel

• SIWARE Experimenteel

• SmallSteps Experimenteel

• SMART2

• SPLASH! Experimenteel

• STONE Experimenteel

• SUMO

• SWAP

• Synbiosys

• TOXSWA

• ViewScape

• Waterwijs/ Waterwise (in het Engels)

• WOFOST

## 2d. QA at Alterra - Status A models: 8 quality criteria

1. Theory base
2. Technical documentation
3. User manual
4. Verification and testing
5. Calibration
6. Sensitivity analysis
7. Validation
8. Management plan (ISO)

# Organisational implementation at institute and national level

1. Alterra steering group on Quality of Models and Data

*MNP Status A?*



2. Cross-departmental steering Group Quality Assurance

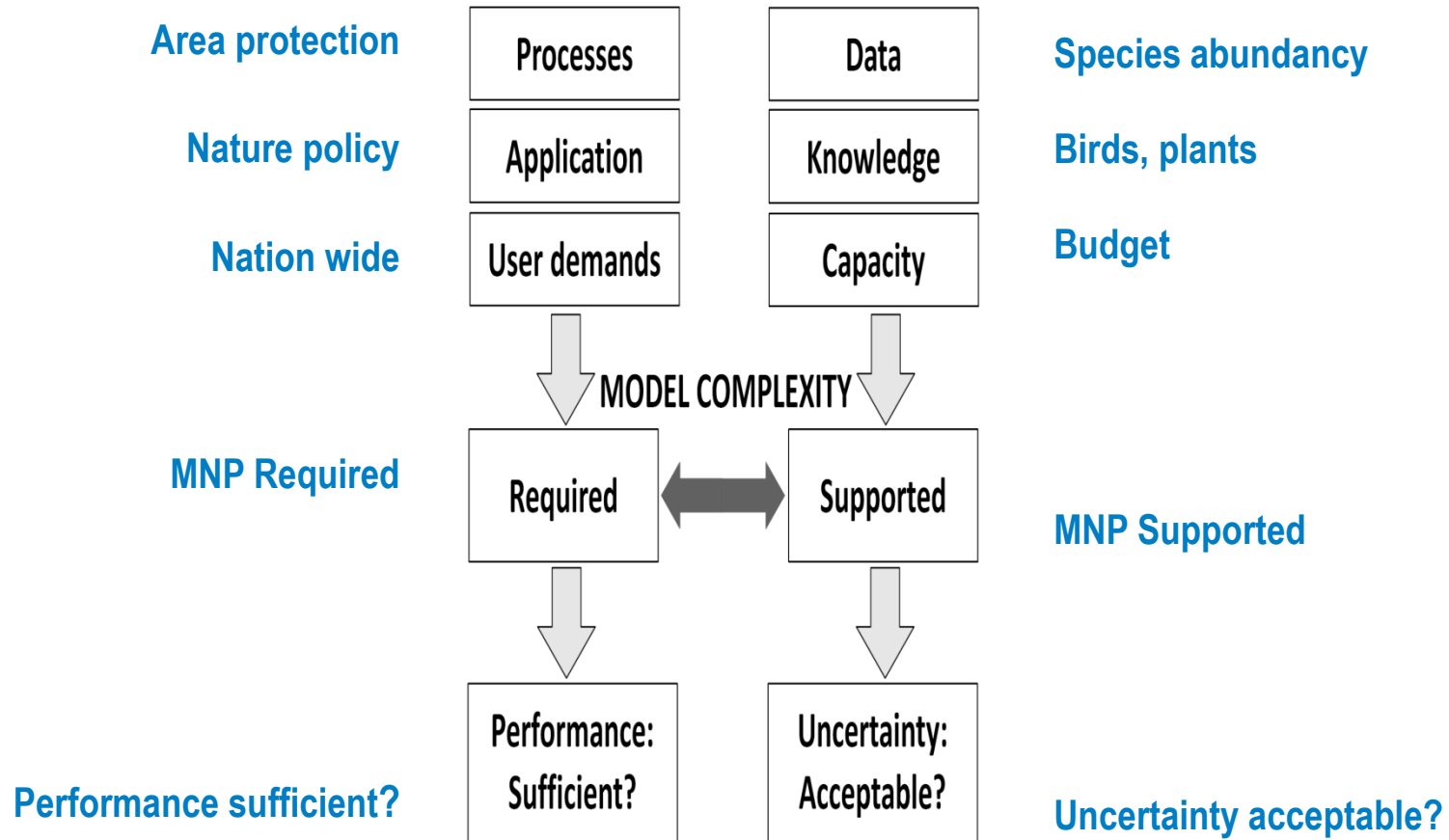
*MNP fit for purpose?*



3. National steering group Nature Policy Assessments

*MNP uncertainty acceptable, performance sufficient?*

# Model complexity of MNP: uncertainty versus performance



# Sources of uncertainty in MNP

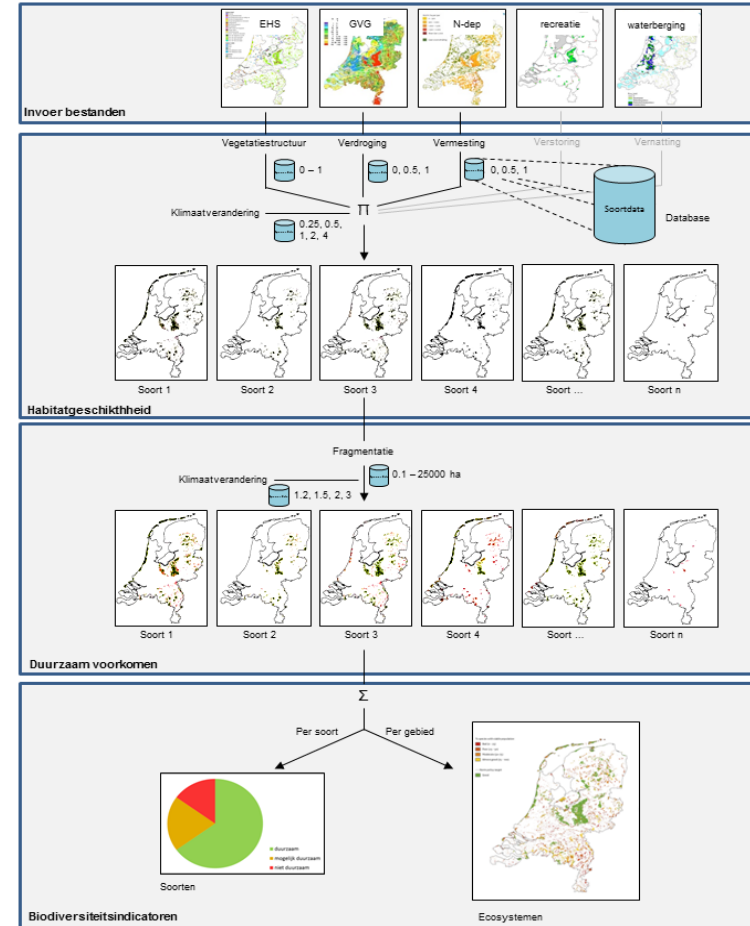
1. Statistical estimation of parameters
  - Based on data → Volunteers collect species data
  - Techniques → Quality control by Bureau of Statistics
2. Assumptions that structure the model
  - Leave out: MNP is only about birds and plants
  - Simplify: in MNP species react directly on environment
  - Dependencies: In MNP biodiversity depends on hydrology, nitrification and isolation
3. Quantification of policy measures
  - Mitigation of nitrification: When? Where? How?

# Uncertainty and communication to policy makers

## Steps in MNP:

*from data to likelihood indicators*

1. Geo-information input
2. Check habitat suitability
3. Check presence of species
4. Biodiversity indicator
  - Red
  - Yellow
  - Green
5. Policy options and evidence



# Uncertainty and communication to policy makers

## The PBL guidance for uncertainty communication: Likelihood indicators in 4 nature perspectives

- Vital
- Experiential
- Functional
- Tailored

Comparison of the effects of the four Nature Perspectives, 2040

	 Vital Nature	 Experiential Nature	 Functional Nature	 Tailored Nature
Biodiversity				
Perception and appreciation				
Sustainable use				
Costs and savings				

The challenge in 2040 will be:

-  Greatly reduced
  -  Slightly reduced
  -  Unchanged
  -  Increased
- Relative to 2010

# Uncertainty and communication to policy makers

- ❑ Political bias: “MNP results prove policy goals achieved”
- ❑ Tricks if results are politically undesirable?
  - Adjust goals:
    - Postpone target year
  - Adjust policy measurements:
    - Nitrogen reduction instead of area acquisition
  - Adjust the environment:
    - Exclude small scattered patches of nature from policy
  - Adjust the assumptions:
    - “Dehydration is not the cause of environmental degradation”



# Conclusions

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1. History matters: no steady state for any method
2. QA organisation required but not sufficient
3. Options to reduce uncertainty are limited, therefore:
4. Increase uncertainty awareness by communication

# The LIAISE approach to Quality and Quality Assurance (Jacques Jansen, Alterra)

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- ❑ Quality Assurance is about finding a balance between dynamic chaos and well organised standstill
- ❑ Recommendations for QA from 2013 UK review
- ❑ The LIAISE approach and progress so far
- ❑ Challenges ahead

## Scientific strive for quality → risk: dynamic chaos



# Bureaucratic strive for Quality Assurance → risk: well organised standstill





# Recommendations for QA from Review HM Treasury in UK (2013)

1. All **critical** models require appropriate QA
2. Models to be managed in a framework for QA
3. Senior Responsible Owner
4. QA framework statement in annual report
5. (Plan for) suitable QA environment
6. (Plan for) suitable QA process
7. Implementation: cross-departmental expert group
8. Assessing progress periodically

## Observations from a LIAISE perspective:

- Recommendations apply to organisation that **uses** IAs
- Quality = 'fit-for-purpose'; critical = critical in relation to a specific policy process
- MNP approach follows UK recommendations



HM TREASURY

Review of quality assurance  
of Government analytical  
models:

final report

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March 2013

# The LIAISE approach and progress so far

1. Quality = 'fit-for-purpose' (to be judged in relation to a specific use case)
2. Activities/results:
  - a. Development of a standard to describe models: The Reference Model for Impact Assessment Tools (RM-IAT)
  - b. Interviews on IA practices in MS → beware of de-contextualization
  - c. User requirements analysis with IA users to develop new and improved tools
  - d. Inventory and review of options for Product Standards
  - e. LIAISE KIT provides contextualized and harmonized descriptions of IA tools and methods to ensure relevancy for the IA process
  - f. Lead editors to safeguard consistency and harmonization

Initial goal to provide standardized IA products doesn't answer user needs. The policy processes are inherently diverse and have complex and ever changing requirements → need for contextualization

# Challenges for an improved use of IA models in EC policies

1. Create more overlap between models used by EC and MS / models in LIAISE KIT
2. Select models that are critical from a policy perspective in order to:
  - a. LIAISE KIT: upgrade QA procedures for existing models
  - b. Shared IA Research Agenda: fine-tune research for new models with future policy needs
3. Improve information exchange with users about uncertainties and risks
4. Improve efficiency of investments in research for new IA models by systematic reflection on actual use of IA models ('orphan tools') developed in FP5-FP6-FP7

## Challenges require more structured communication between:

- Research institutions (e.g. JRC and national institutes/universities)
- Research networks and networks of IA practitioners
- IA units of the EC policy DGs and the European Parliament, IA units at MS level
- Organisations that oversee the use of IA in the policy process (e.g. the EC - IA Board / EC Inter-Services group)
- Research funders at EC and national level

**The LIAISE CoP is looking forward to a role in tackling these challenges**

