# *Population viability analysis: an example of theory, tools and planning from the Netherlands*

Theo van der Sluis / Paul Opdam – ALTERRA

*ECONNECT Workshop*
*Grenoble, 5th November 2009*




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# Contents of the presentation

- Introduction, ALTERRA
- Start of the National Ecological Network of the Netherlands
- Different phases, and how we approach it now
- New challenges
- Conclusions

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# Countdown 2010: stop decline biodiversity (IUCN)

- In 2010 it will  become obvious that this target won't be reached

- Europa develops the Natura2000 network
- The first phase: designating protected areas, is almost finalised
- The second phase (article 10 Habitats Directive) which guarantees development of connections of the network, is in most European countries still at an initial stage
- Connections are most urgent in the view of climate change, in particular in fragmented areas

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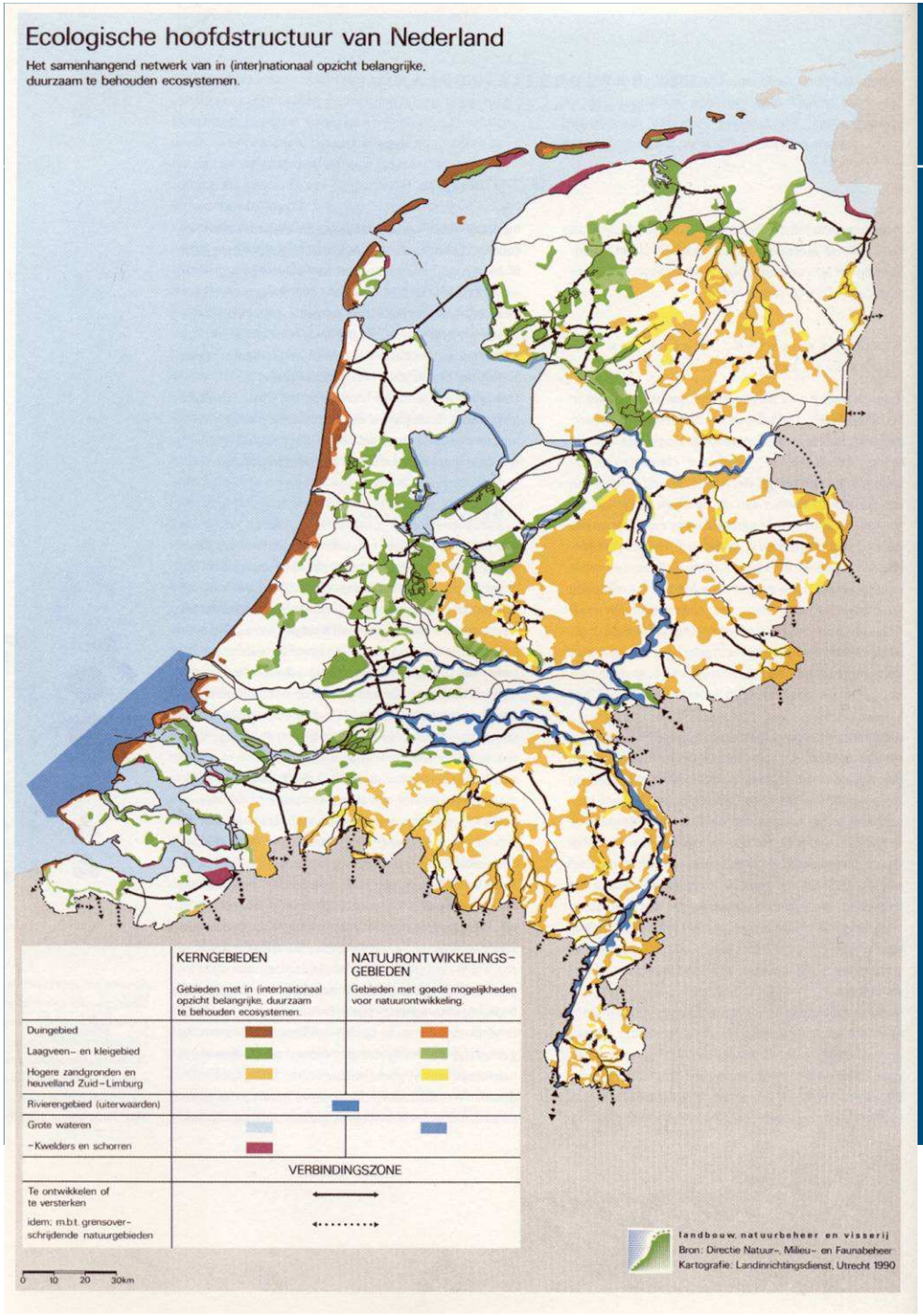


National Ecological Network
NEN 1990:
A work map

- Existing natural areas
  (core areas)
- Additonal natural areas
  (expansion areas)
- Indicative connections

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# Planning the Dutch Ecological network

Area target

Biodiversity target

Climate change as add. stress

+Robust corridors

adaptation

**1990** **2000** **2006>** **2012>**

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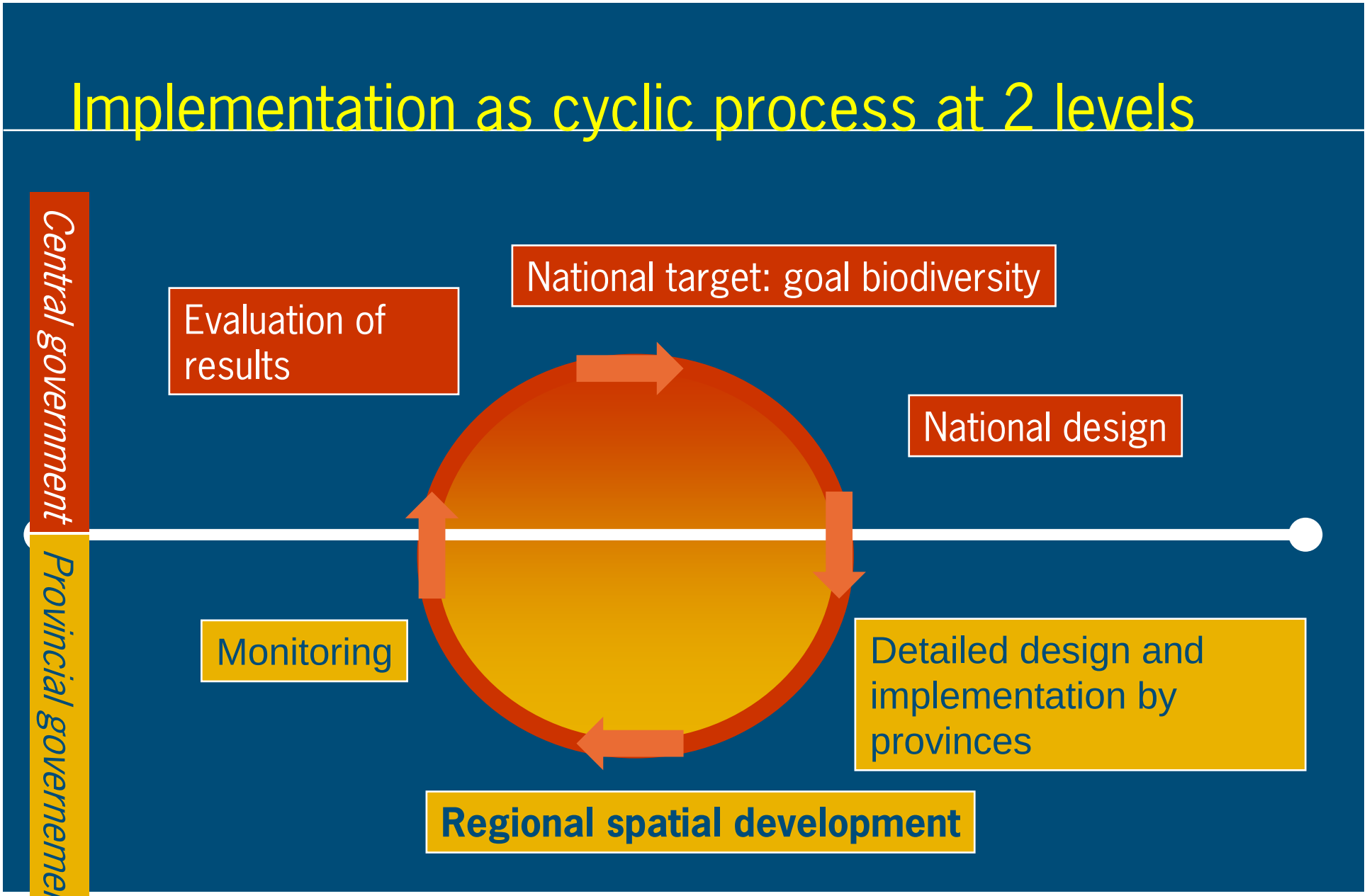
# Implementation as cyclic process at 2 levels

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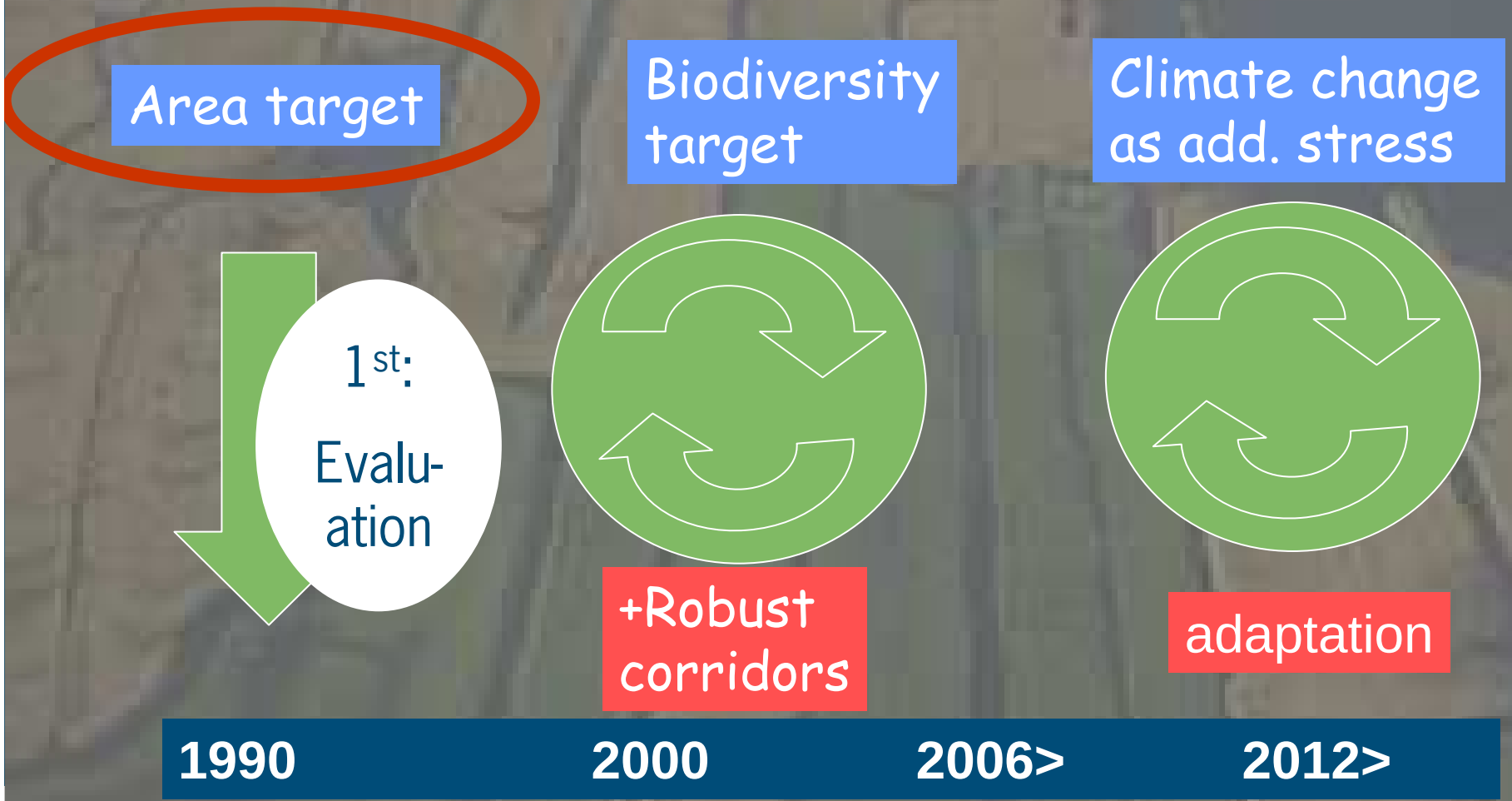
# 3 Lessons learned

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# 1st Lesson: ecological conditions instead of species

- Because it is about land cover, change of spatial structures
- Spatial planners and decision makers can not handle technical information about species, but they work with areas, distances, landscape patterns, and groundwater tables
- Species are too dynamic and unpredictable to rely upon

- Species legitimate planning though!

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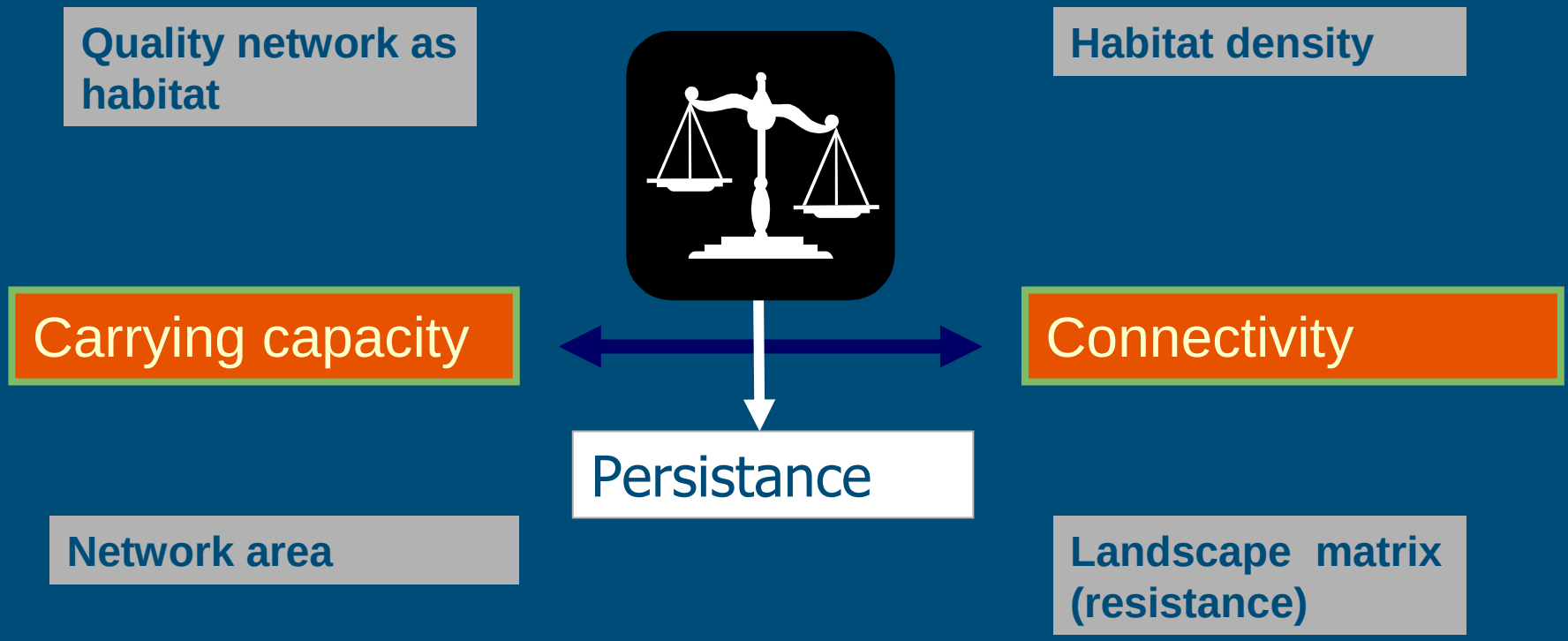
# Translate metapopulation knowledge into spatial parameters for long-term persistence

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Opdam, Verboom & Pouwels 2003

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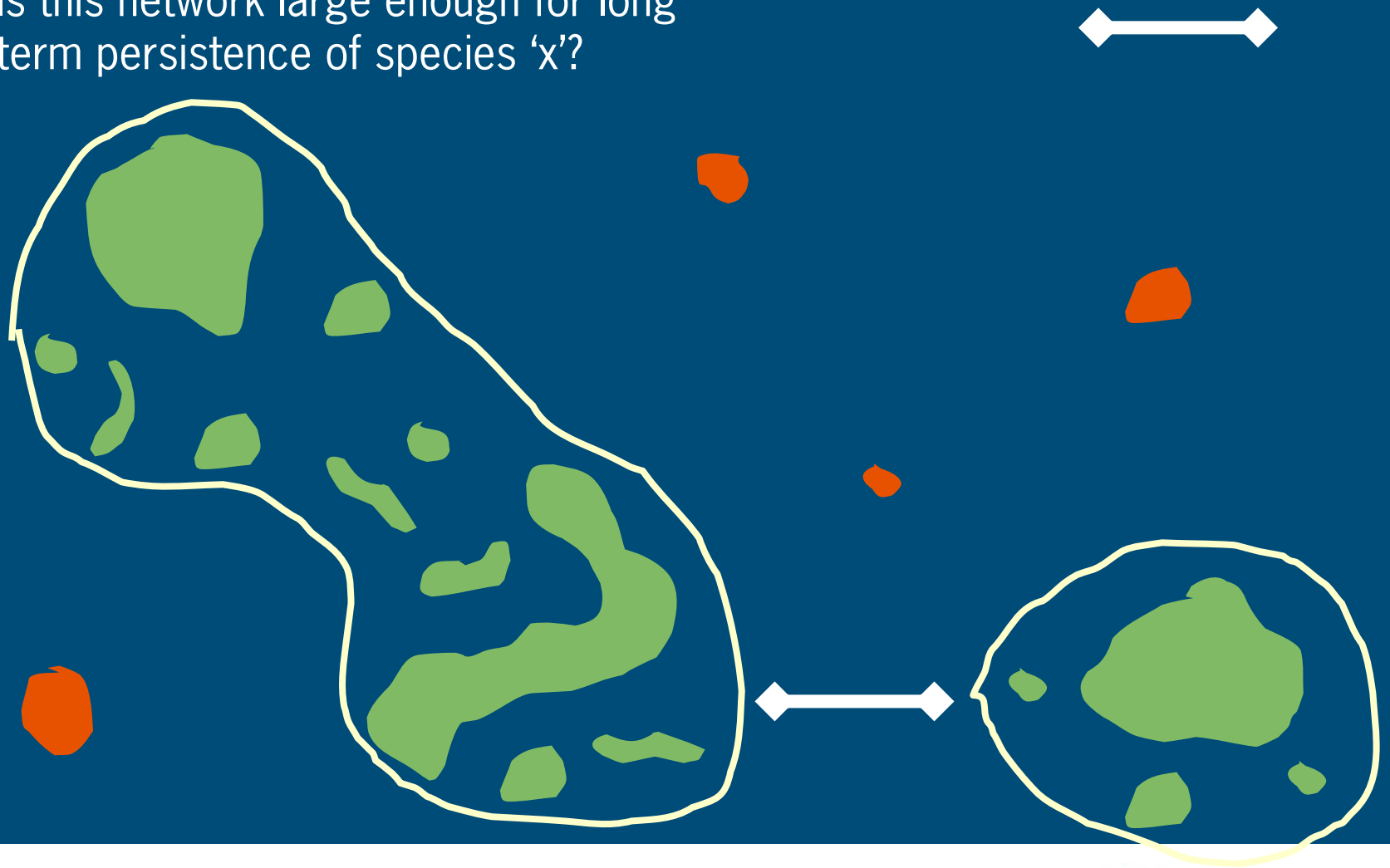
# Define population networks by dispersal distance

Is this network large enough for long term persistence of species ‘x’?



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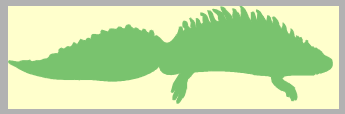
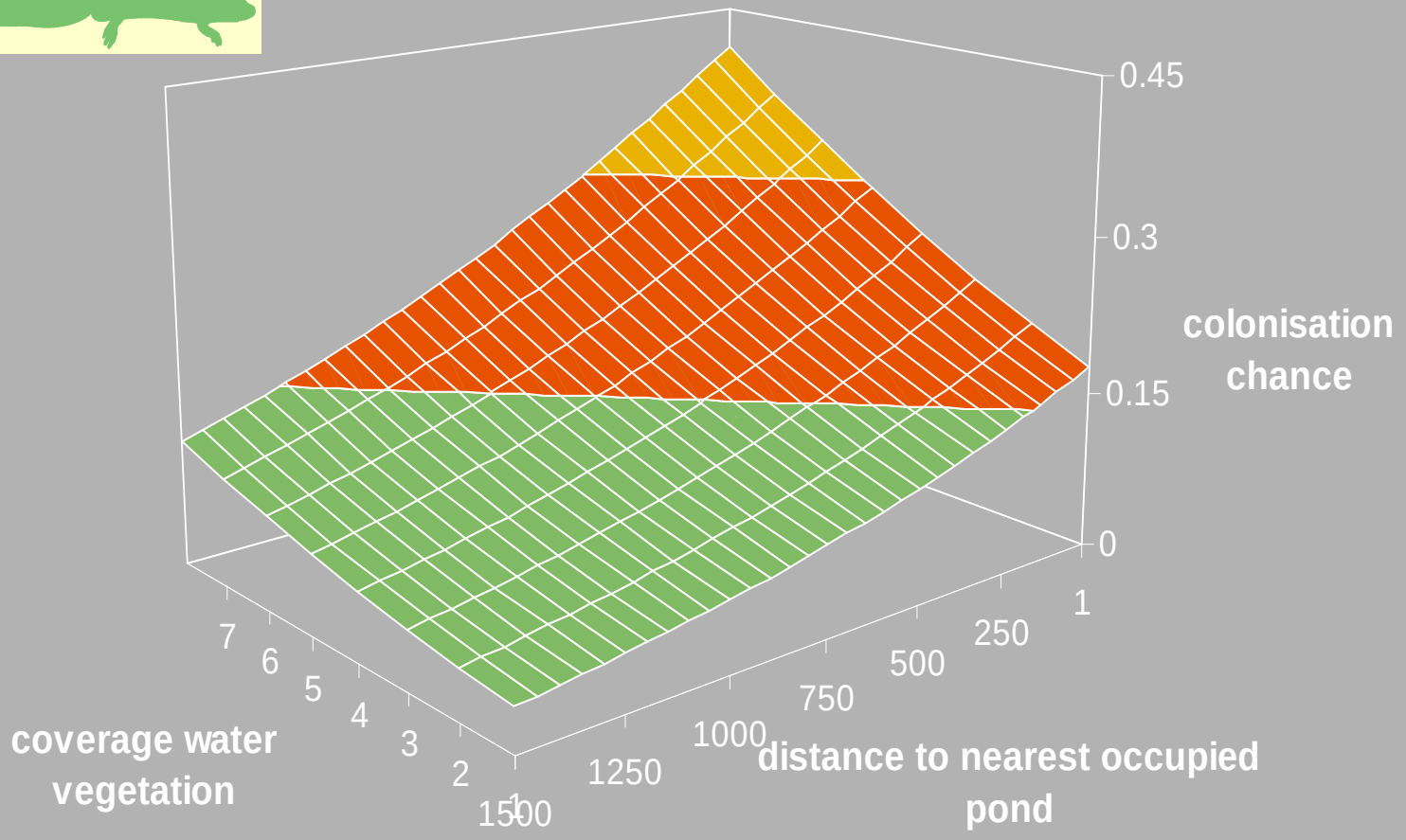
# Define population networks by dispersal distance






Van der Sluis et al. 1999

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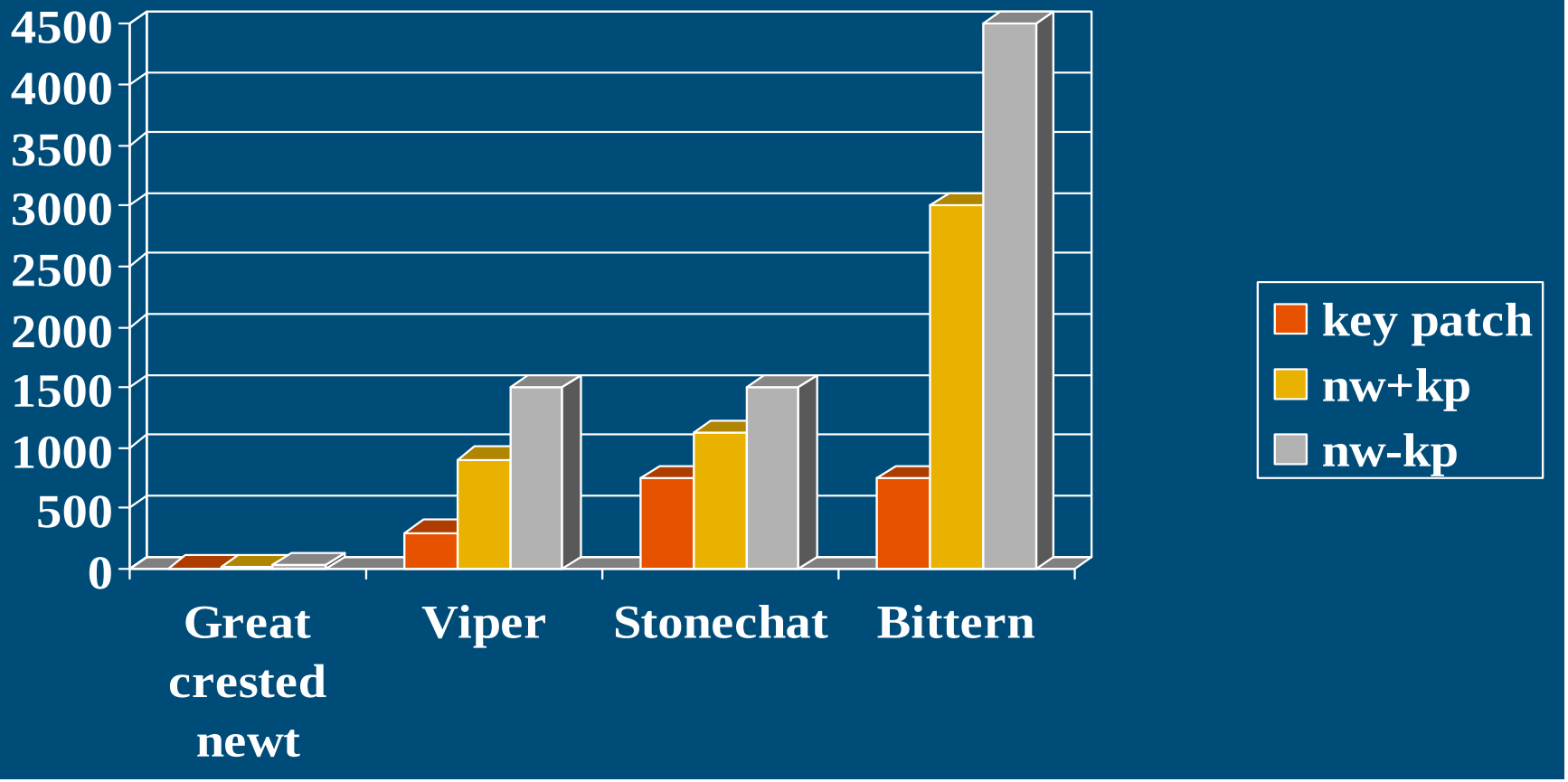
# Minimum area persistent population network (ha)

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**Verboom et al. 2001**
**Landscape ecology**

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# Applied in evaluation progress realisation NEN

Target species

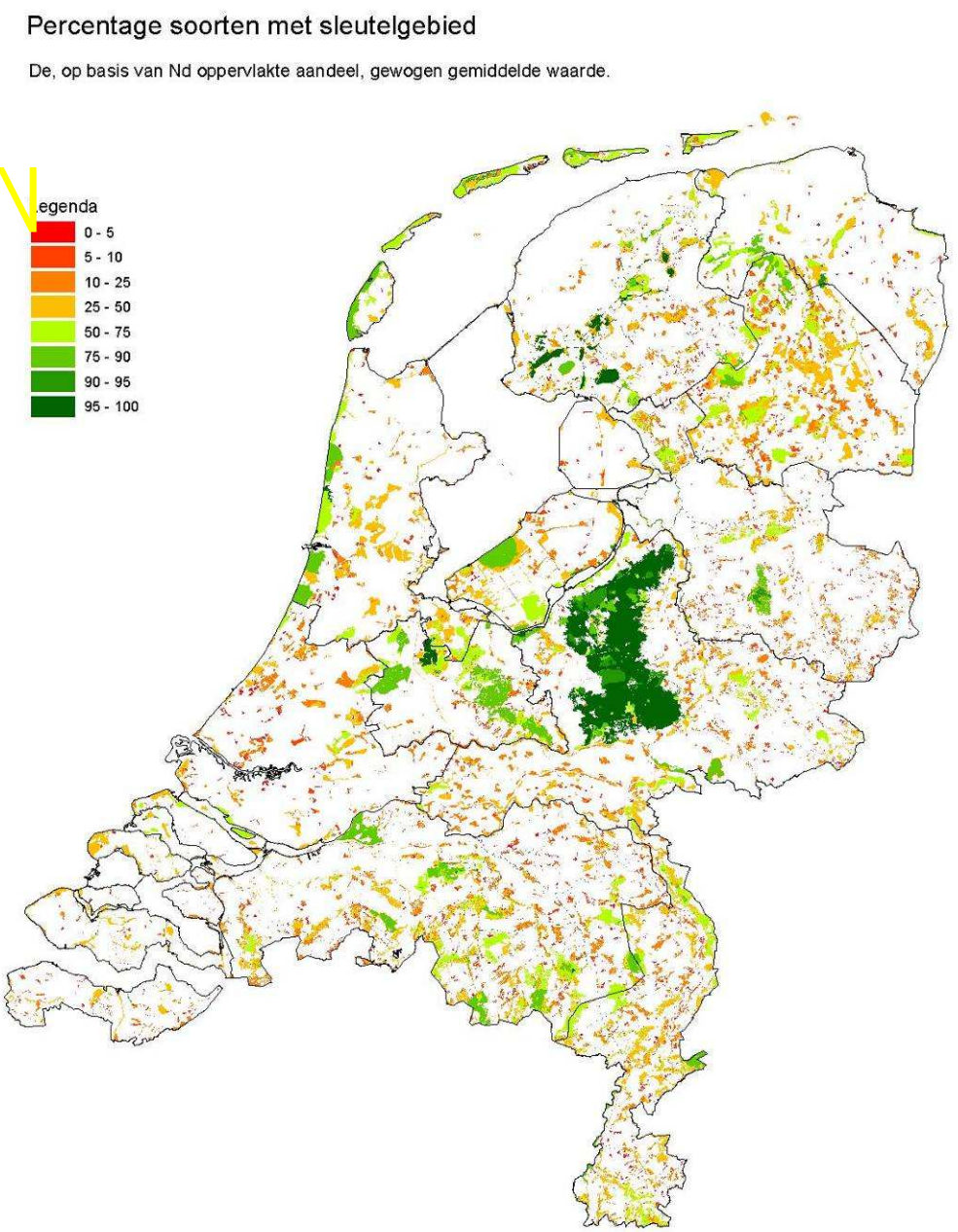
▼

Required area

⇕

Expected area

Model: LARCH (Alterra)

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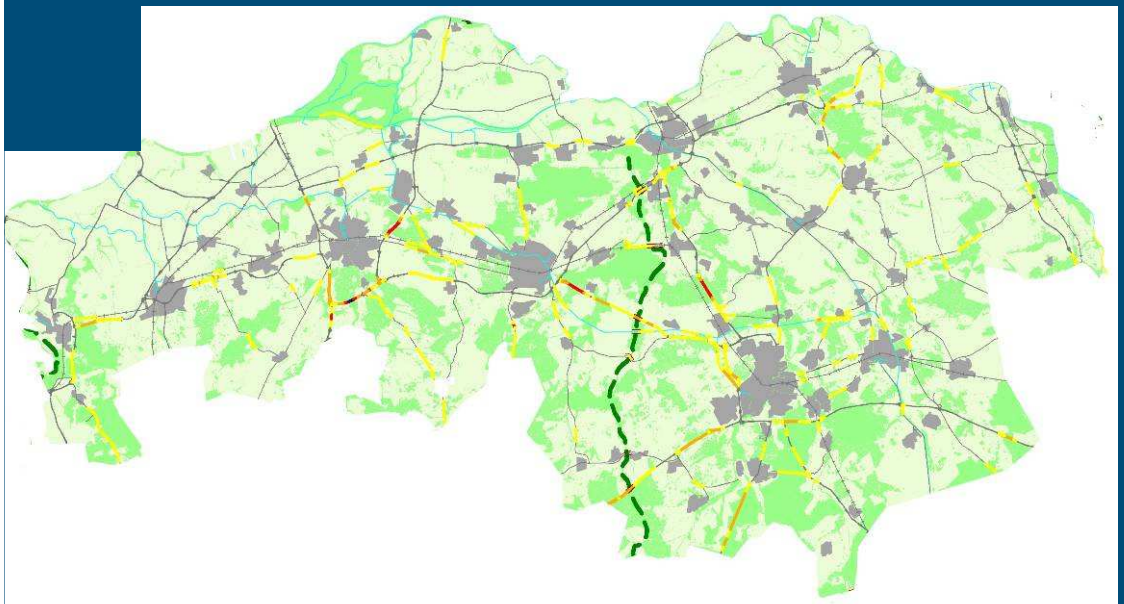
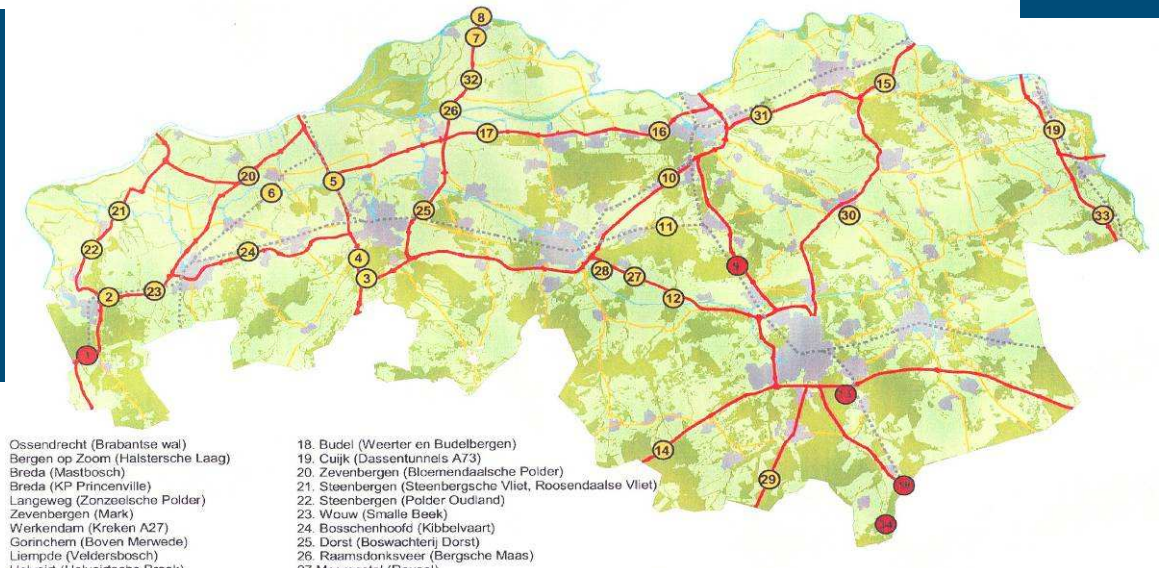
% target species for which key-patch is realised

# Eliminating Barriers: Noordwest Brabant Province



Analysis Alterra
LARCH model

Comprehensive national study Ministry of Roads & Infrastructure



Ossendrecht (Brabantse wal)
Bergen op Zoom (Halstersche Laag)
Breda (Mastbosch)
Breda (KP Princenville)
Langeweg (Zonzeelsche Polder)
Zevenbergen (Mark)
Werkendam (Kreken A27)
Gorinchem (Boven Merwede)
Liempde (Veldersbosch)

18. Budel (Weerter en Budelbergen)
19. Cuijk (Dassentunnels A73)
20. Zevenbergen (Bloemendaalsche Polder)
21. Steenbergen (Steenbergsche Vliet, Roosendaalse Vliet)
22. Steenbergen (Polder Oudland)
23. Wouw (Smalle Beek)
24. Bosschenhoofd (Kibbelvaart)
25. Dorst (Boswachterij Dorst)
26. Raamsdonksveer (Bergsche Maas)

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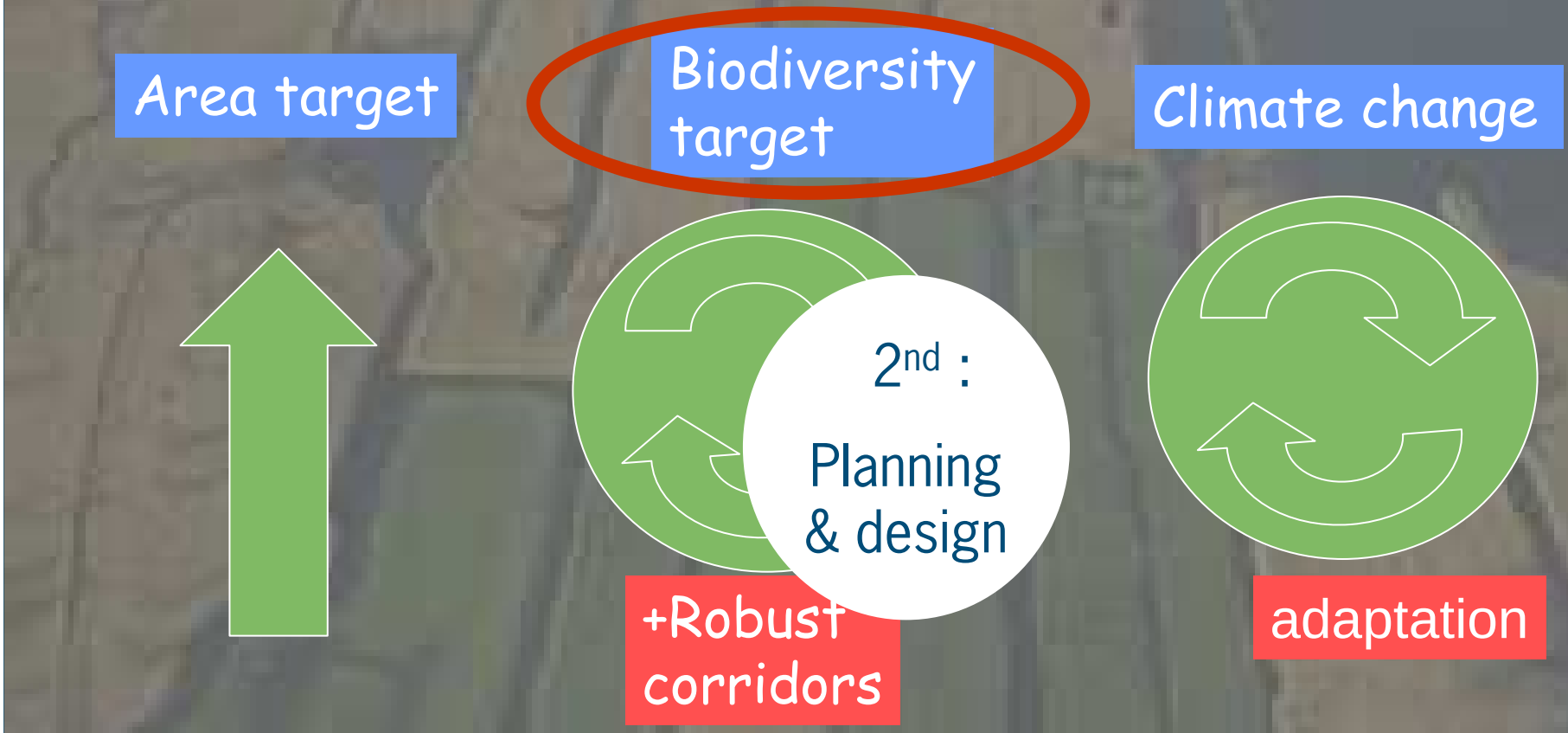
# 3 Lessons learned

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# Lesson 2: planning and design

- The ecological variability of species needs to be simplified to define targets in planning and design of ecosystem networks
- Spatial-ecological species groups, ‘traits’ or ‘guilds’, can be linked to ambition levels

→ Allows for negotiations!

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# Ecological guilds, species groups

- **Stress similarities in spatial requirements of species with regard to ecosystem networks:**

- Type of habitat
- Required area for a sustainable population
- Maximum dispersal distance

**(Opdam et al. 2008, Ecol & Society)**

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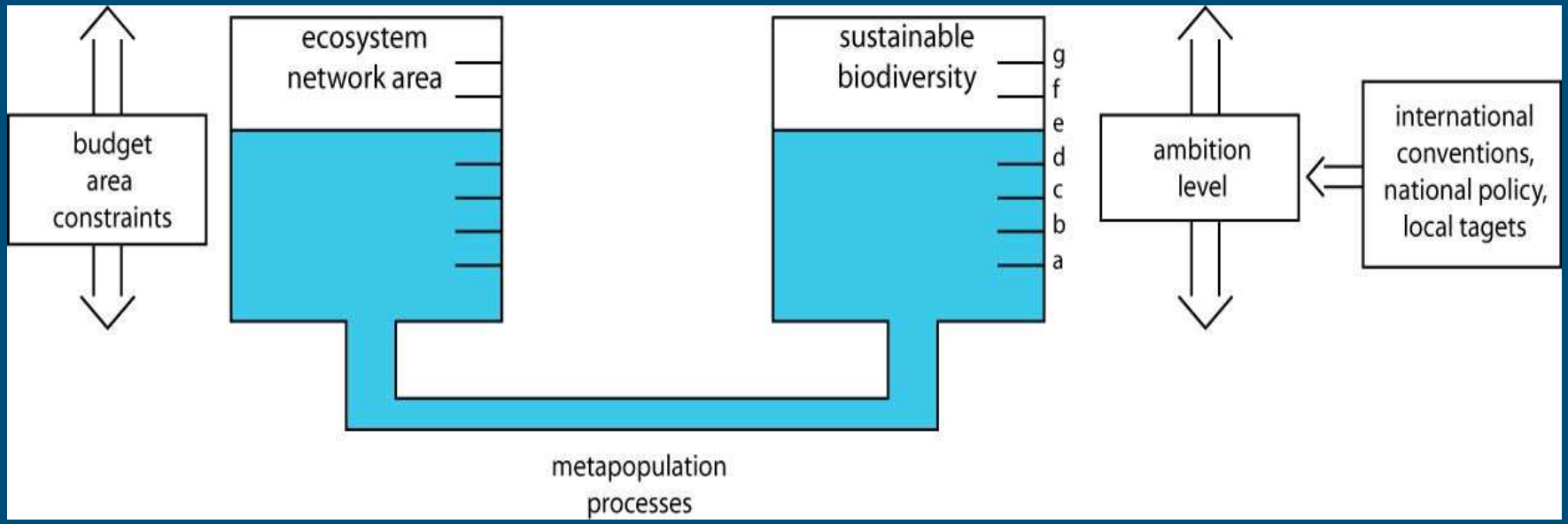
# How to use this knowledge in the planning process?

Spatial conditions

Target, ambition level




**Opdam et al., Ecology and Society 2008**

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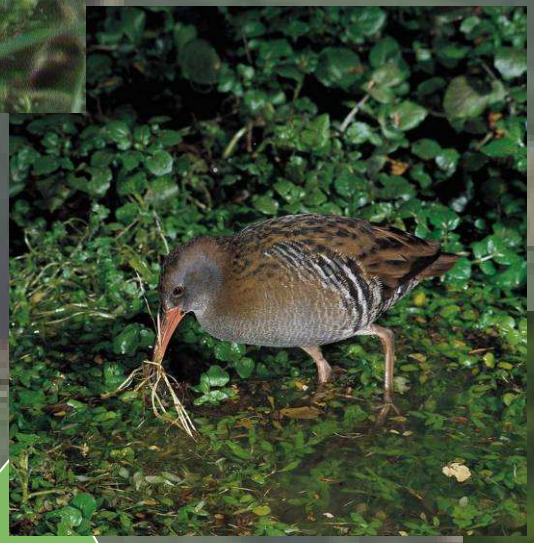
# Ecological traits approach

**(Opdam et al Ecology & Society 2008)**



More area needed for sustainable conditions

Larger spatial scales

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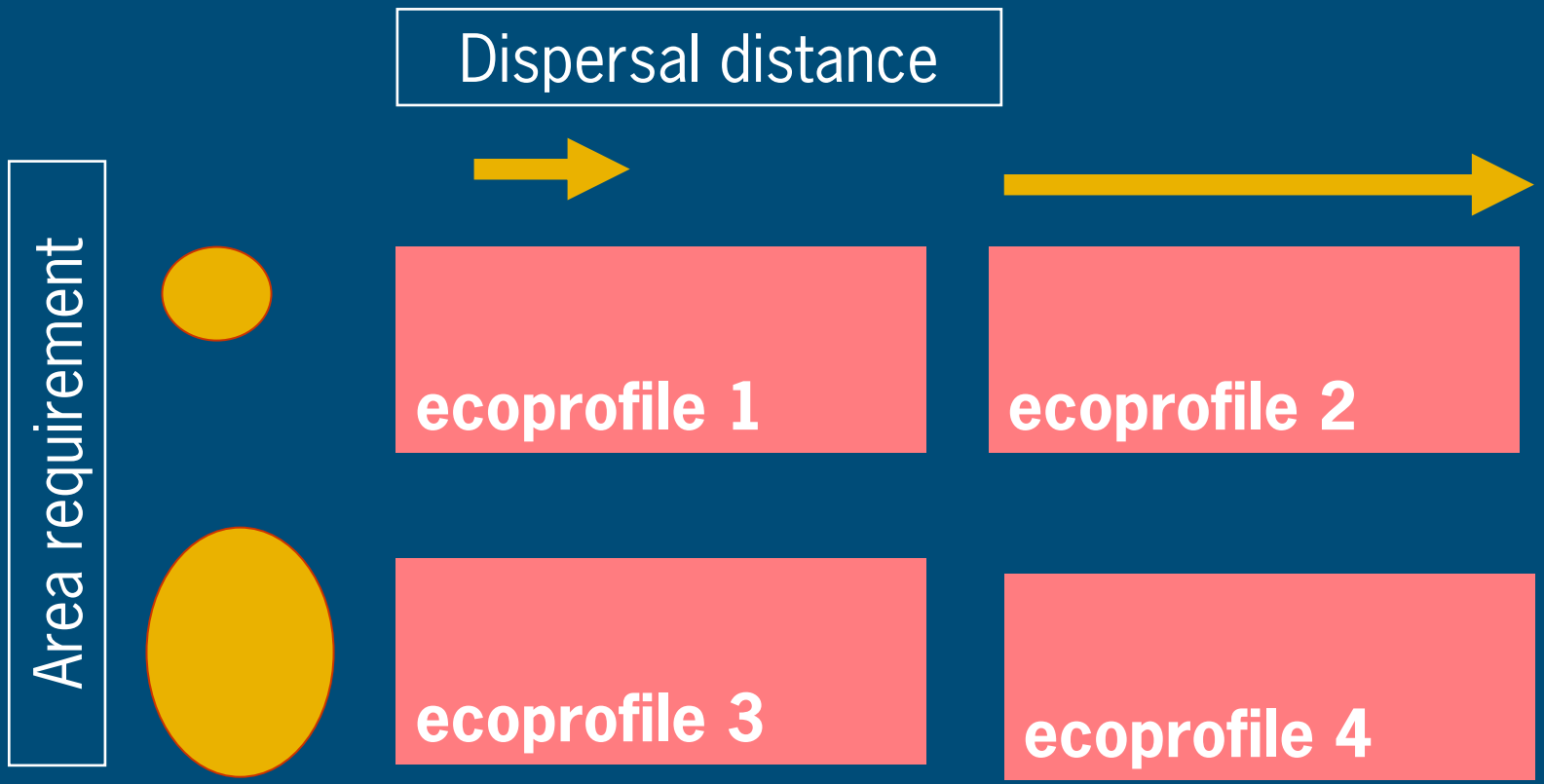
# Ecological traits: choose ambition level




**For each Ecosystem type**

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# Which species require cohesive networks most?

| | Dispersal poor | Dispersal good |
|---|---|---|
| **Small network area is enough** | Habitat specialists, poor dispersers | |
| **Large network area required** | | Large area requirements |

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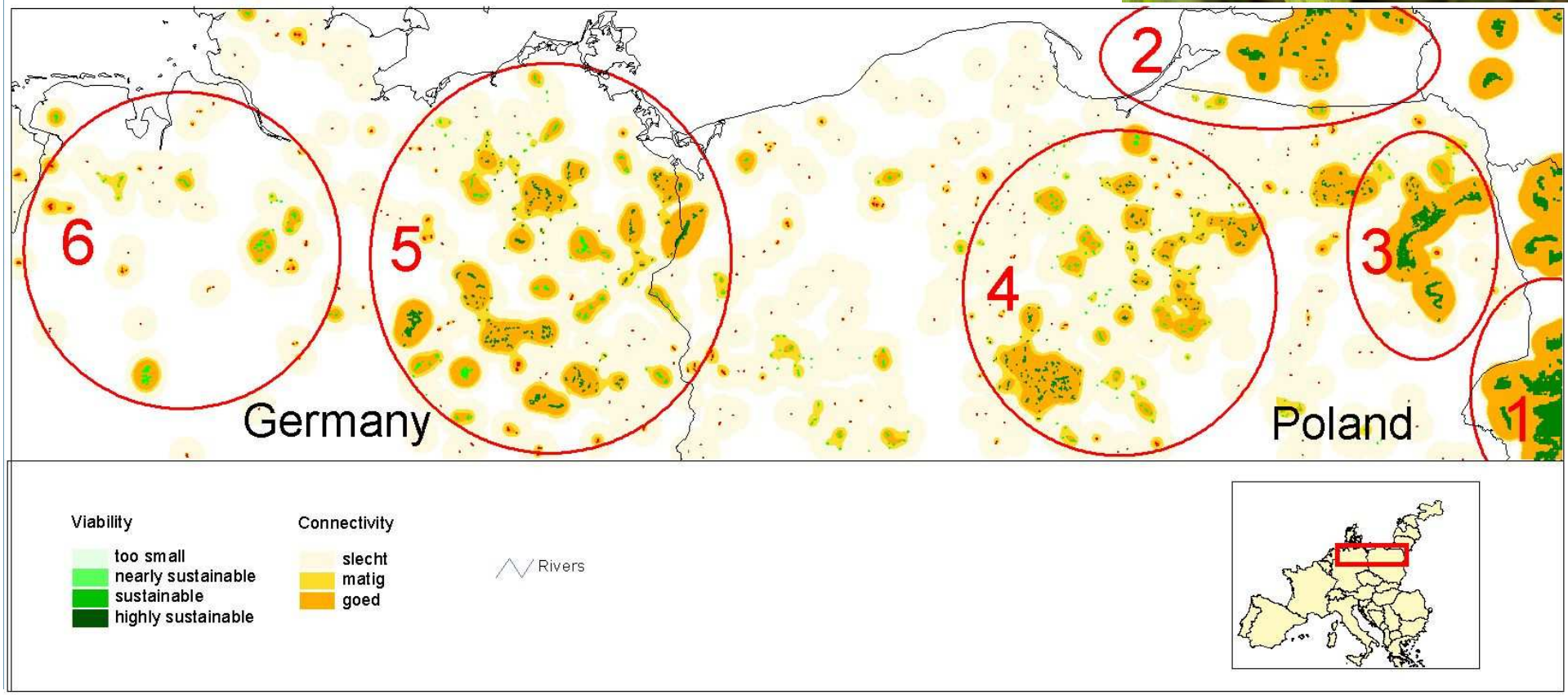
# Which species require networks most?

## Network analysis with LARCH model

### Red copper in Middle Europe

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Van Swaay in: van der Sluis et al, 2004

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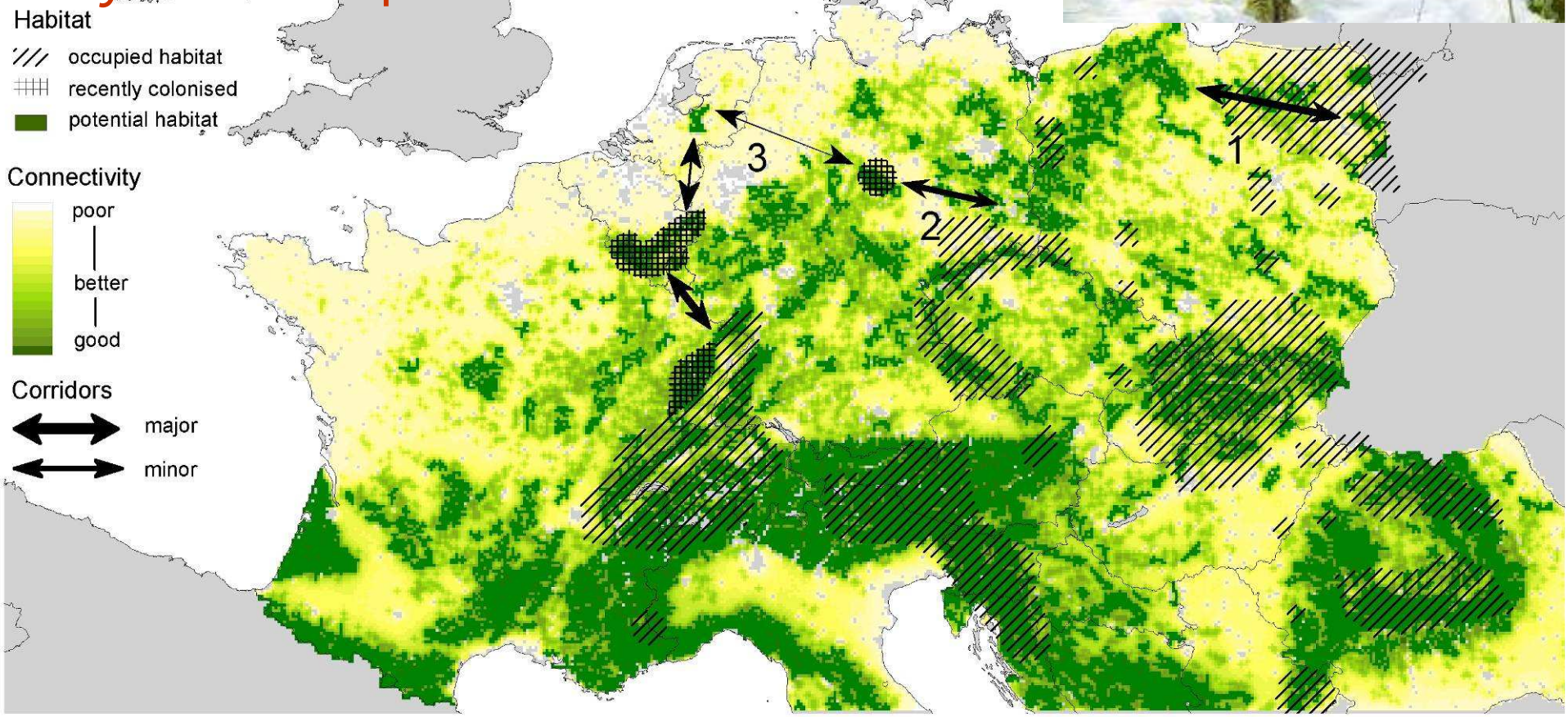
ECNC
european centre for nature conservation

# Which species require networks most?
## Network analysis with GRIDWALK model
## Lynx in Europe

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Groot-Bruinderink in: Van der Sluis et al, 2004

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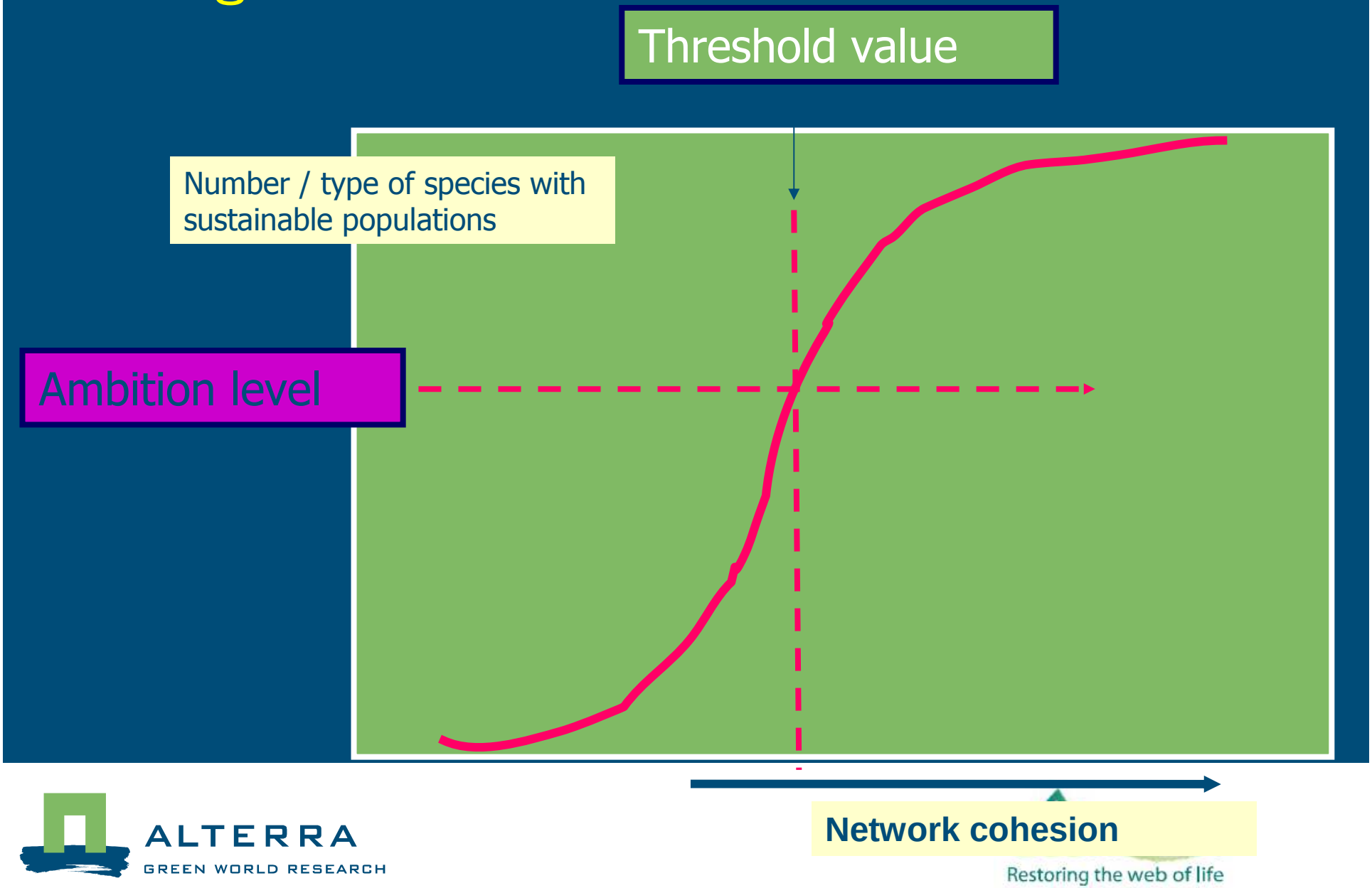
# Ecological traits: choose ambition level

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# choose ambition level Ecological traits:

Threshold value

Number / type of species with sustainable populations

Ambition level








Network cohesion

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# 2001 – Robust corridors: start of second planning cycle

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# Implementation of robust corridors

- Extra ambition NEN (national level)
- More budget for the Provinces
- Negotiations central government-Provinces about aims and targets, ambition level
- Link ambition level, aims – area requirement and demand for spatial cohesion
- ‘Handbook Robust Corridors’ as tool for design
- Planning guidelines developed

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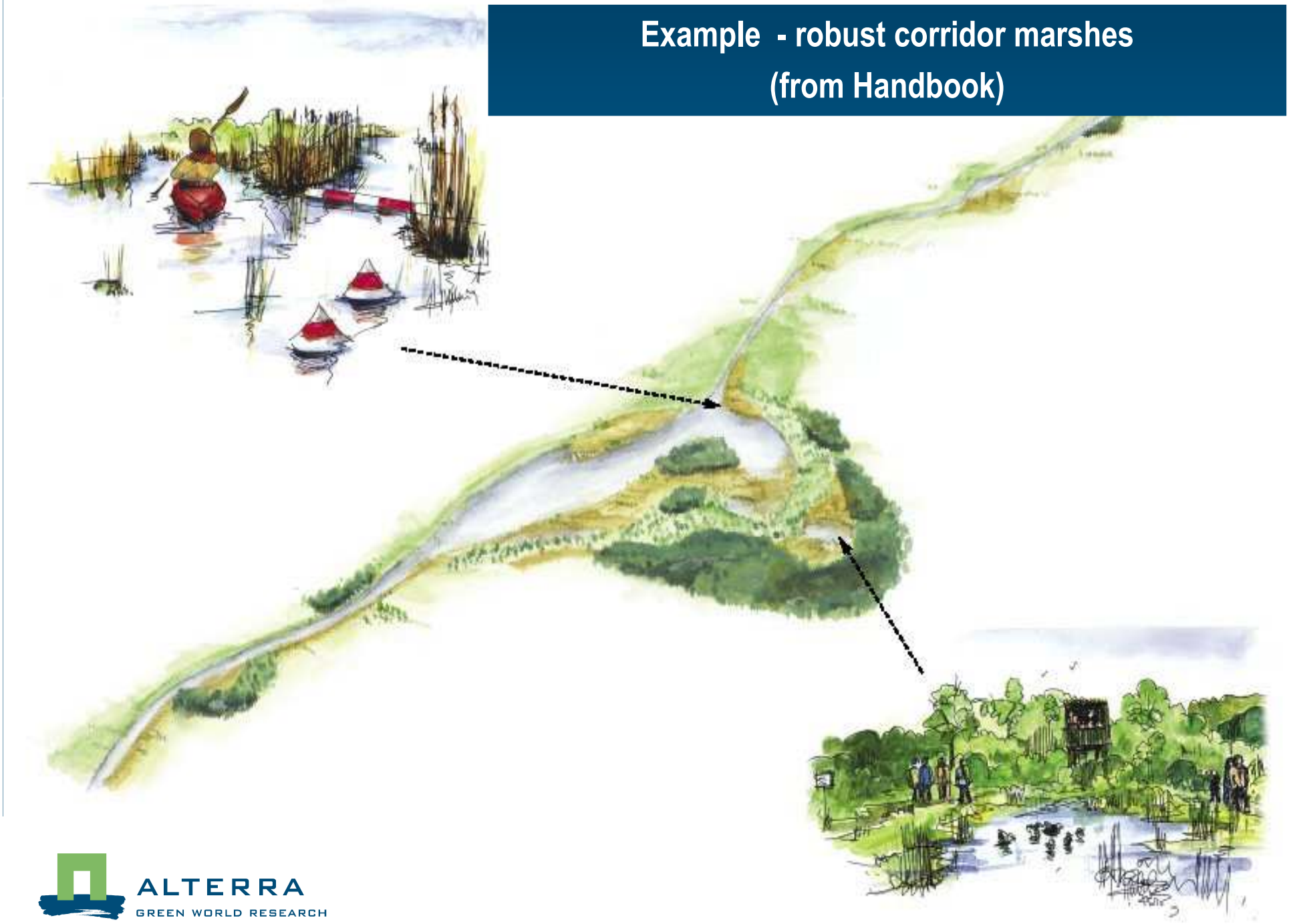
# Example - robust corridor marshes (from Handbook)



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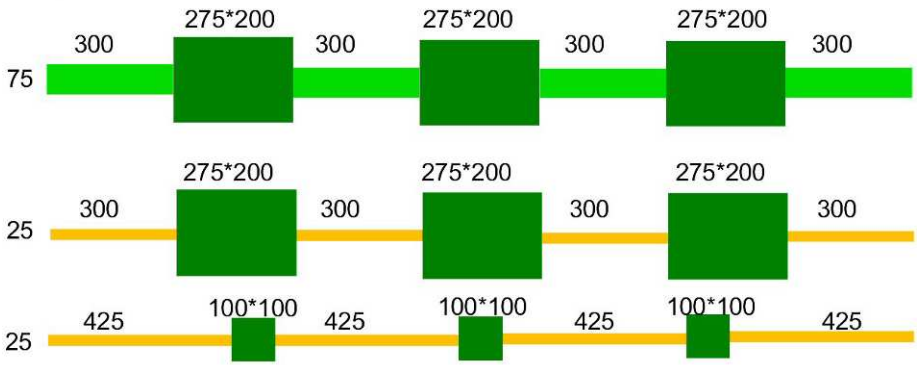
# Example: robust corridors, design with ecological traits

## Shrubs with some aquatic habitat




Corridor, 9 ha; stapstenen/leefgebieden 16.5 ha, totaal 25.5 ha

Corridor, 3 ha; stapstenen/leefgebieden 16.5 ha, totaal 19.5 ha

Corridor, 5.5 ha; stapstenen/leefgebieden 3 ha, totaal 8.5 ha

**(Handbook Robust Corridors, 2001)**

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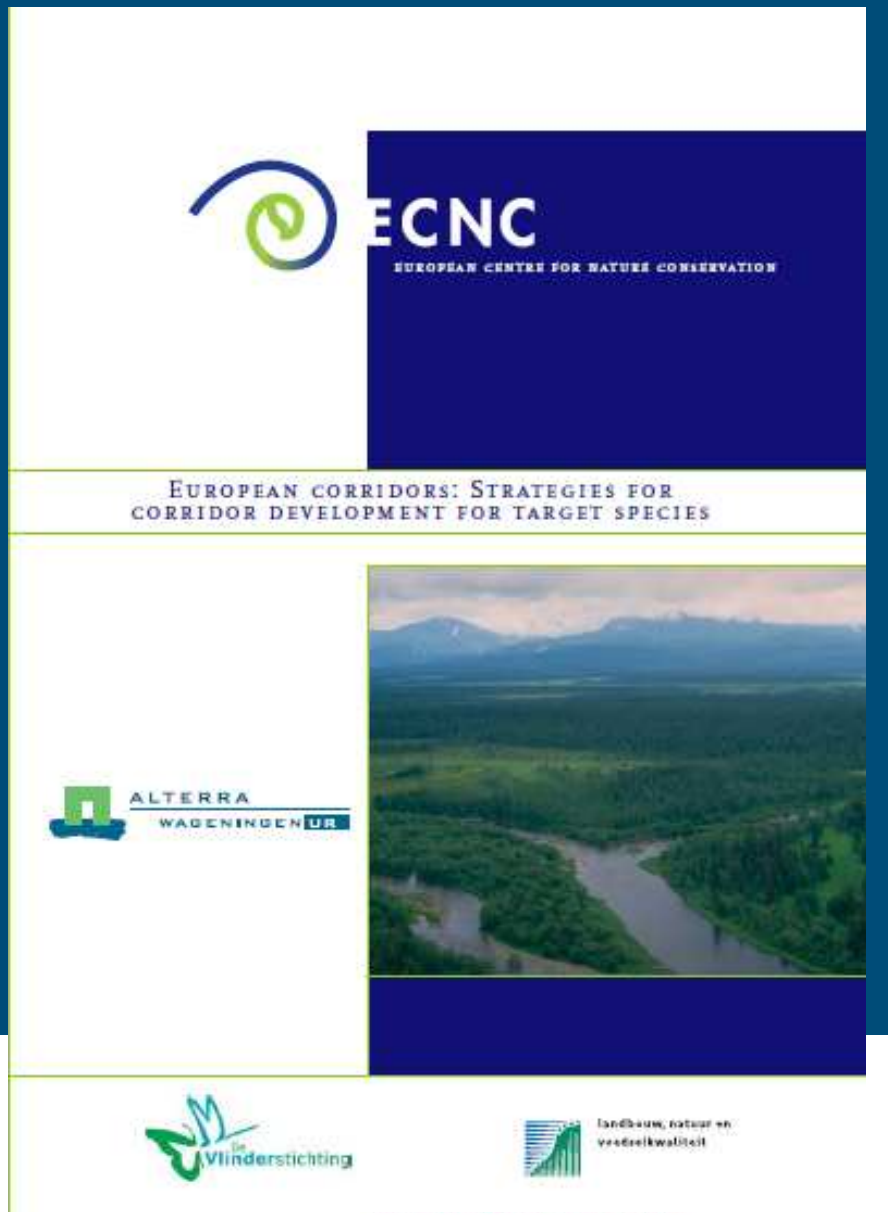
# Thinking about corridors….

| Shape \ Function | Dispersal | Migration | Commuting |
|---|---|---|---|
| linear corridor | Atlantic salmon<br>Sea lamprey | Atlantic salmon<br>Sea lamprey | |
| linear corridor with attached nodes | Stag beetle<br>Large copper<br>Yellow-Legged-Dragonfly | | Large copper |
| stepping stones | Lynx<br>Yellow-Legged-Dragonfly | Brent goose<br>Eurasian crane<br>Yellow-Legged-Dragonfly | |
| landscape mosaic | Brown bear<br>Large copper | Brown bear | Brown bear |

http://www2.alterra.wur.nl/webdocs/internet/corporate/prodpubl/boekjesbrochures/ecnc_compleet.pdf




Van der Sluis et al, 2004

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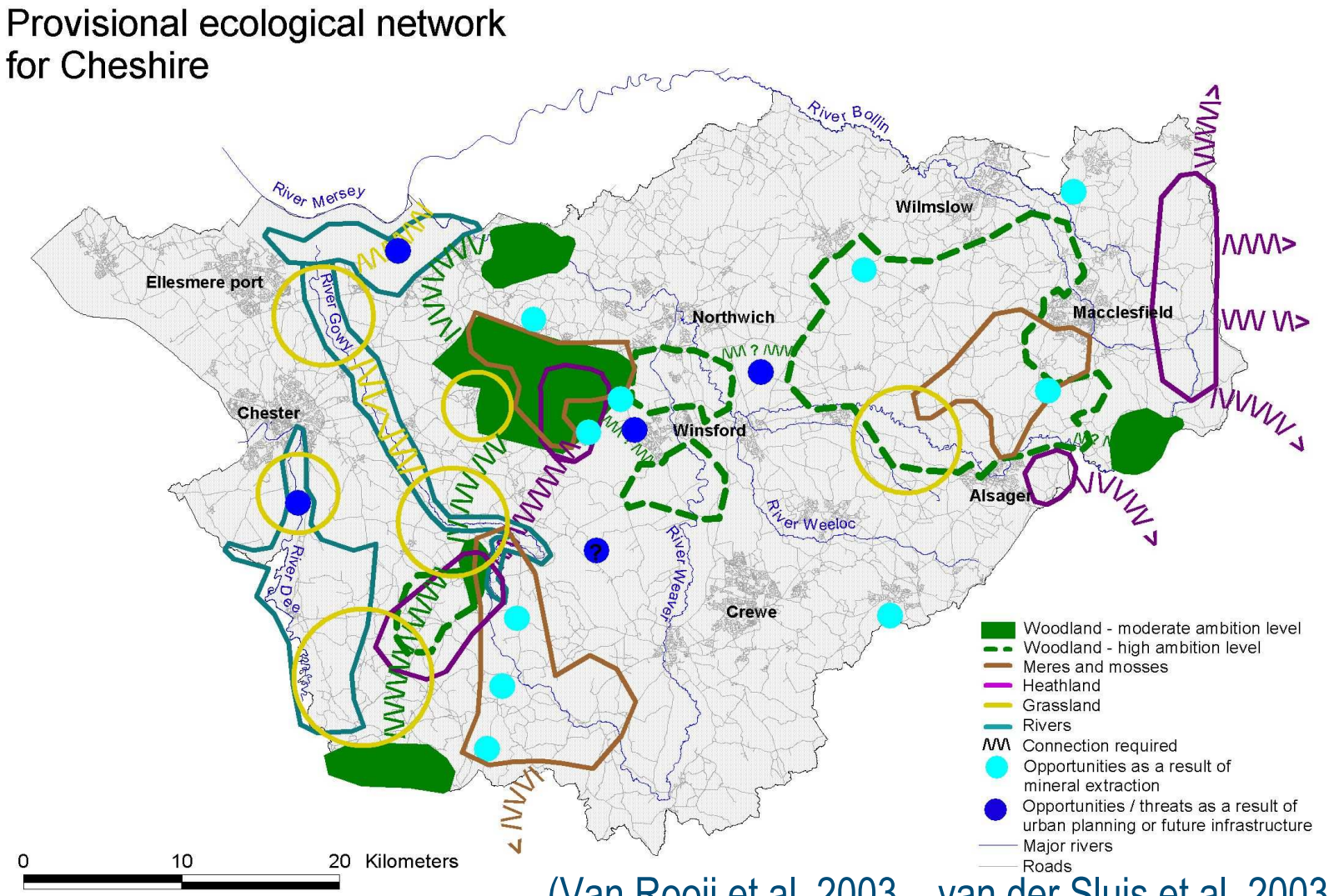
# Example: Ecological Network Cheshire County, UK




(Van Rooij et al, 2003, van der Sluis et al. 2003)

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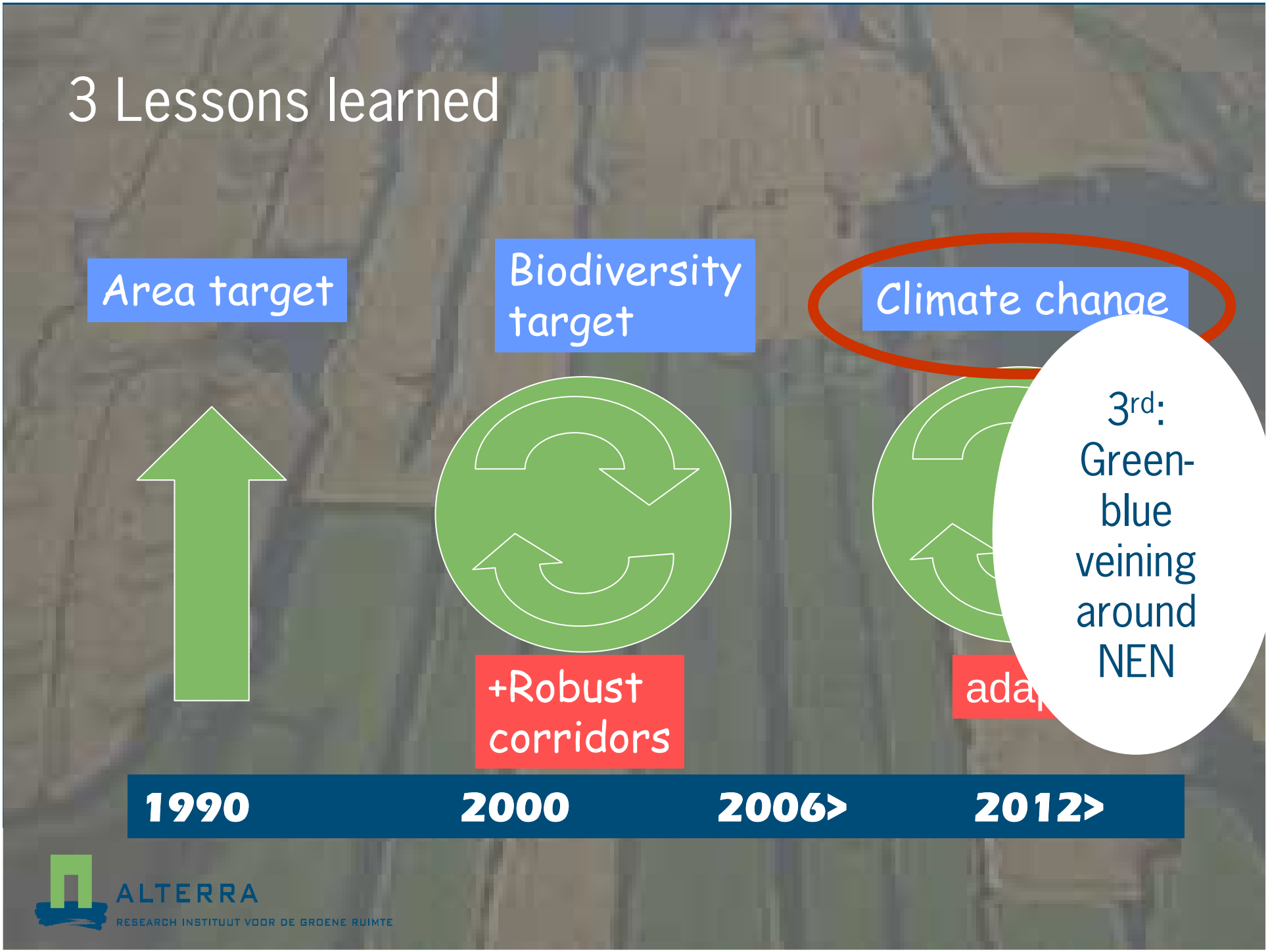
# 3 Lessons learned

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# Climate change

Results:

- Shifting climate zone
- More weather extremes

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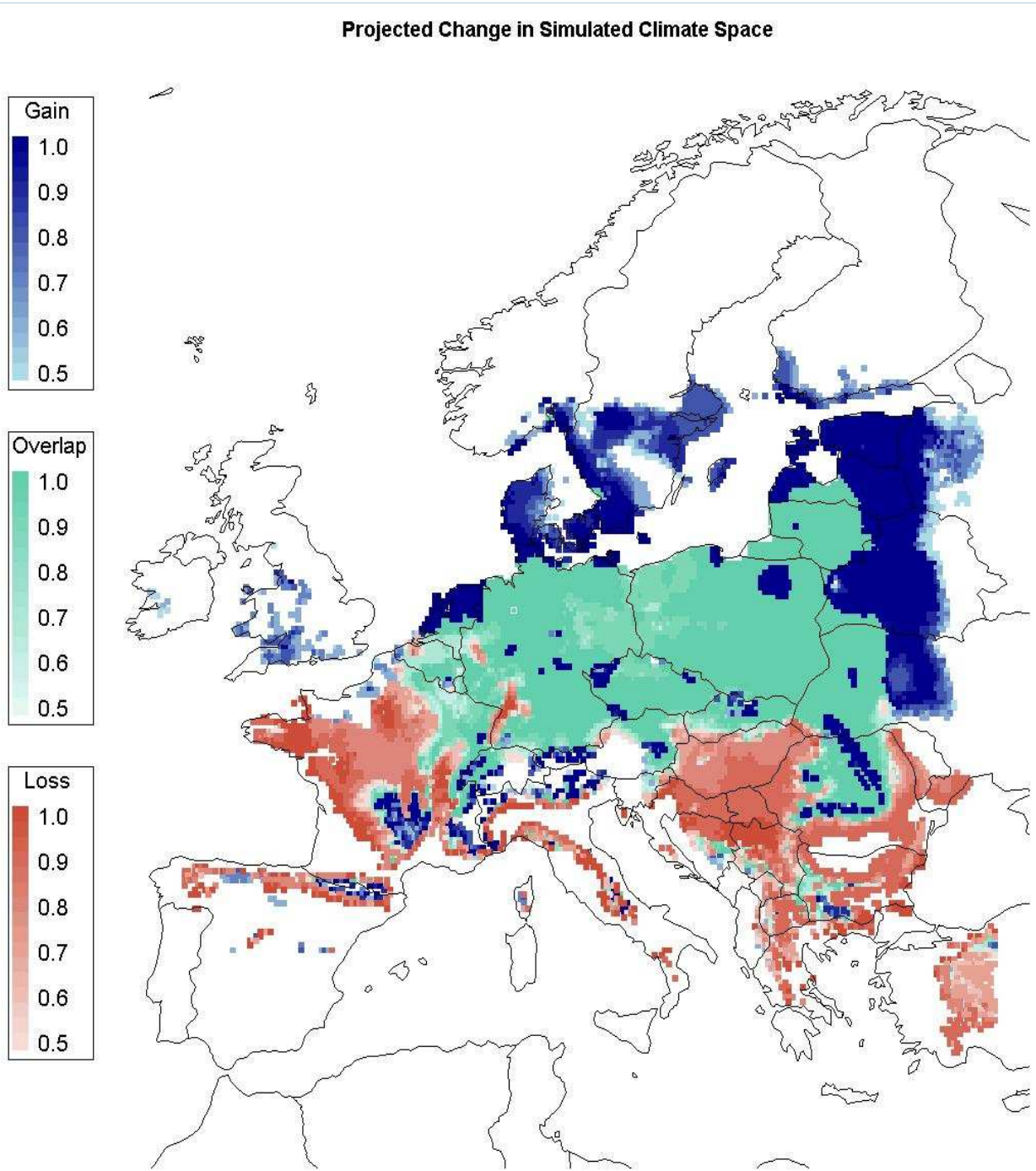


# Prediction of shifting climate zones

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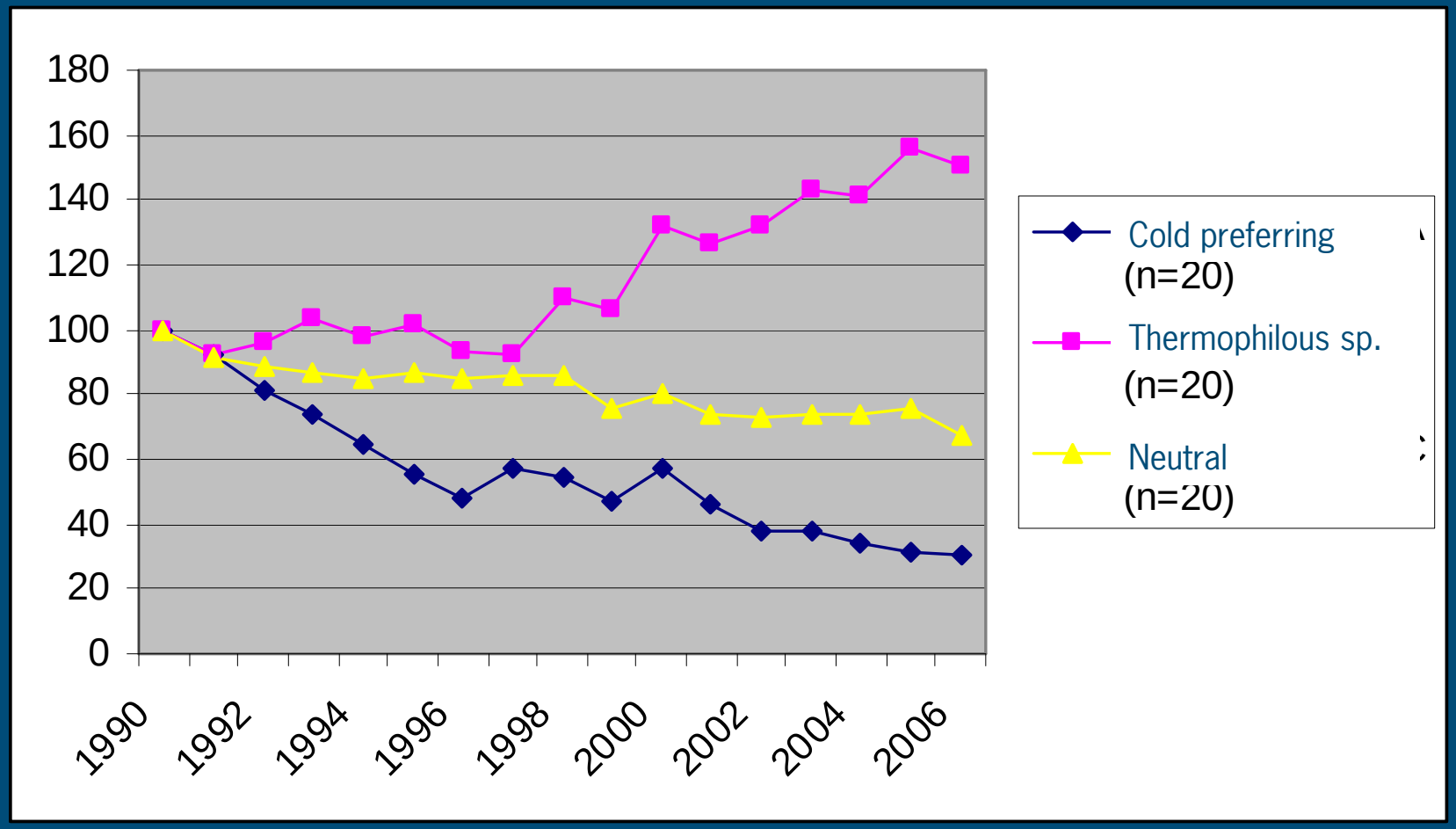
# Climate change

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# Climate change

The assumptions for critical thresholds for spatial cohesion do not hold anymore

**Quality network as habitat**

**Habitat density**

Carrying capacity

Connectivity

Persistence

**Network area**

**Landscape matrix (resistance)**

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# Climate change

The assumptions for critical thresholds for spatial cohesion do not hold anymore

Weather fluctuations change

Accessibility of habitat in new regions

Carrying capacity

Connectivity

Persistence at higher scale level

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# Challenge: how to adapt NEN to climate change?

To acquire more land for nature is (politically) not feasible

- Our proposal: develop “climate buffer”:
- Strengthen the green-blue veining (Trame Vert et Bleue) of the multifunctional landscape nearby the NEN
- Transboundary corridors!

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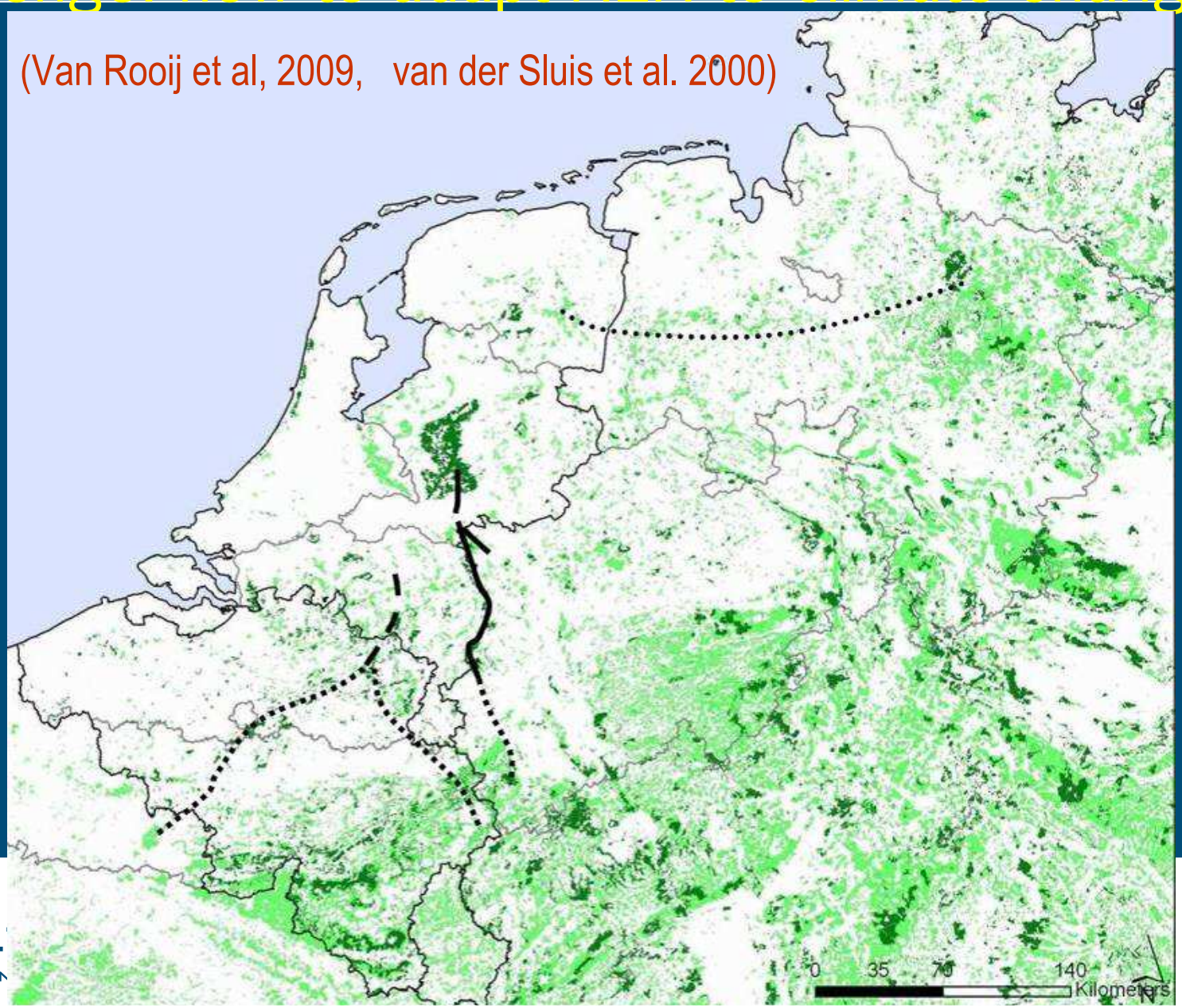
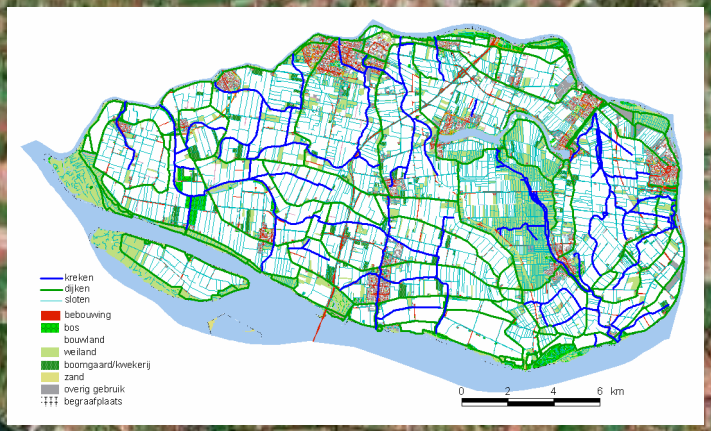
# Challenge: how to adapt NEN to climate change?



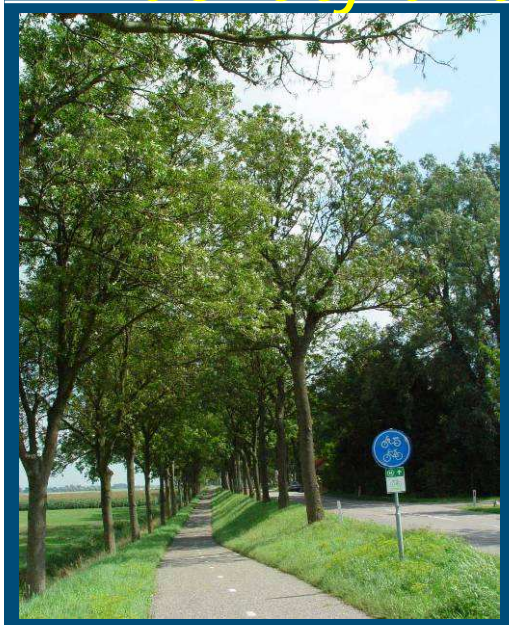
# Case study the Hoeksche Waard

(Steingröver et al submitted)

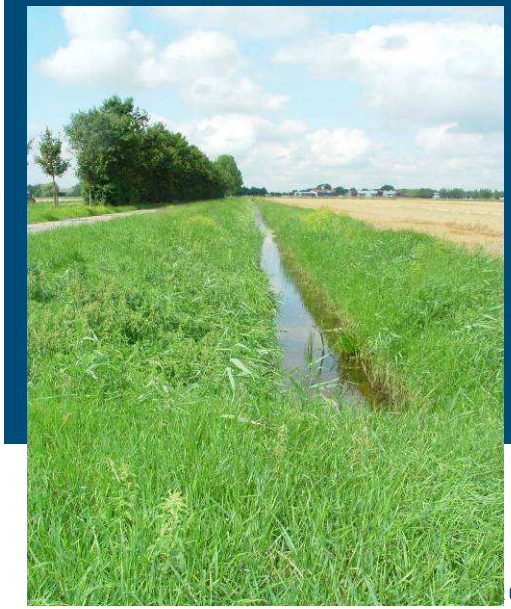
- **Surface area: 26.550 ha**
  - **60% arable land**
- **Identity**
  - **Dikes: 335 km**
  - **Creeks: 172 km**



# The green-blue network: carrier of landscape identity and provider of biological control



- Robust elements
  - creek banks
  - dikes
  - forest patches
  - main road verges
- Fine elements
  - field margins
  - road verges
  - ditch banks



# Cost-benefit analysis


| | Optimal situation biological control | Investment in public space only |
|---|---|---|
| Costs | 64,8 | 25,6 |
| Benefits | 102,4 | 50,8 |
| **Balance** | **46,5** | **25,7** |

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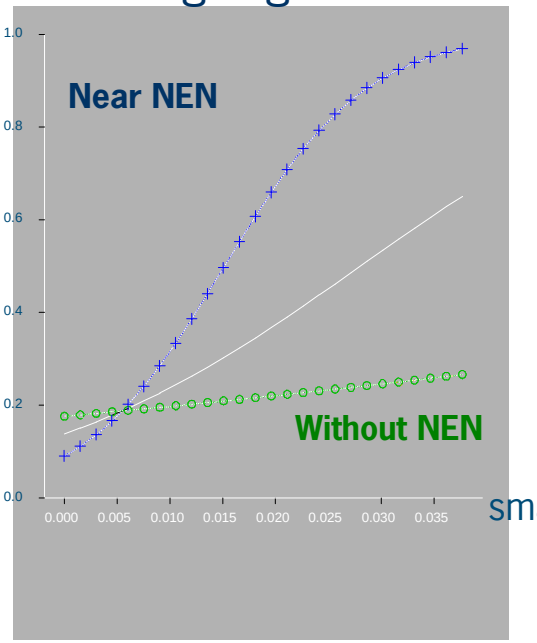
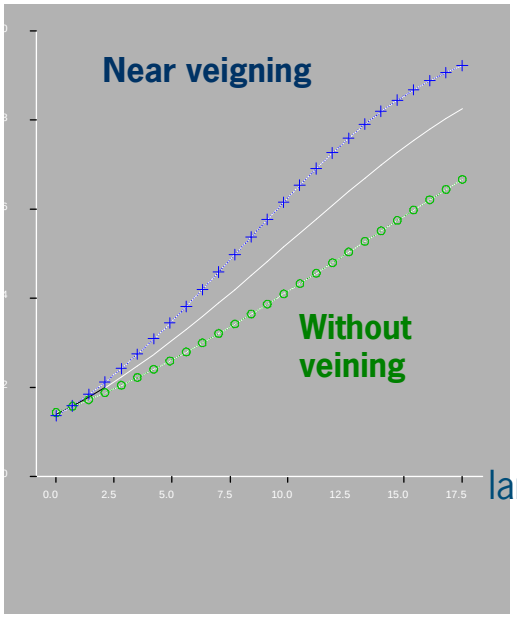
# NEN + green-blue veining: more biodiversity

Greater stitchwort (Stellaria holostea) in green-blue veigning

Bullfinch (Pyrhulla pyrhulla) in NEN




**More often in green-blue veining near NEN**




**More in NEN surrounded by green-blue veining**

*Grashof et al 2009, Landscape ecology special issue*

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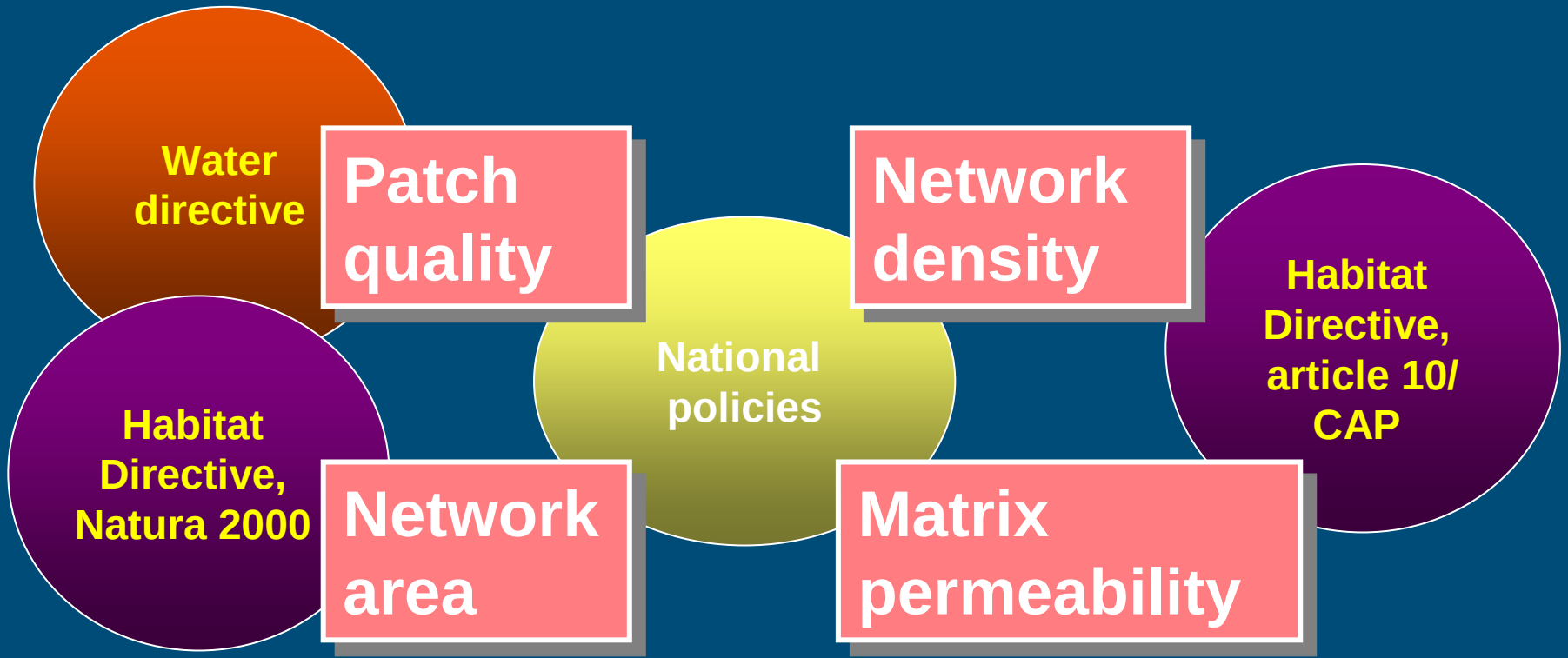
# Current policy supports different strategies




Opdam, Steingröver, Van Rooij 2006

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# Lessons learned

- Ecological networks should be species based
- Cyclical planning process required
- For planning and design: ecological ‘guilds’ are a good proxy for conserving biodiversity
- Green-blue veining for networks as multifunctional strategy, in addition to robust corridors
- Species approach may be slightly outdated, but still important in communication with stakeholders (umbrella species, flagship species)

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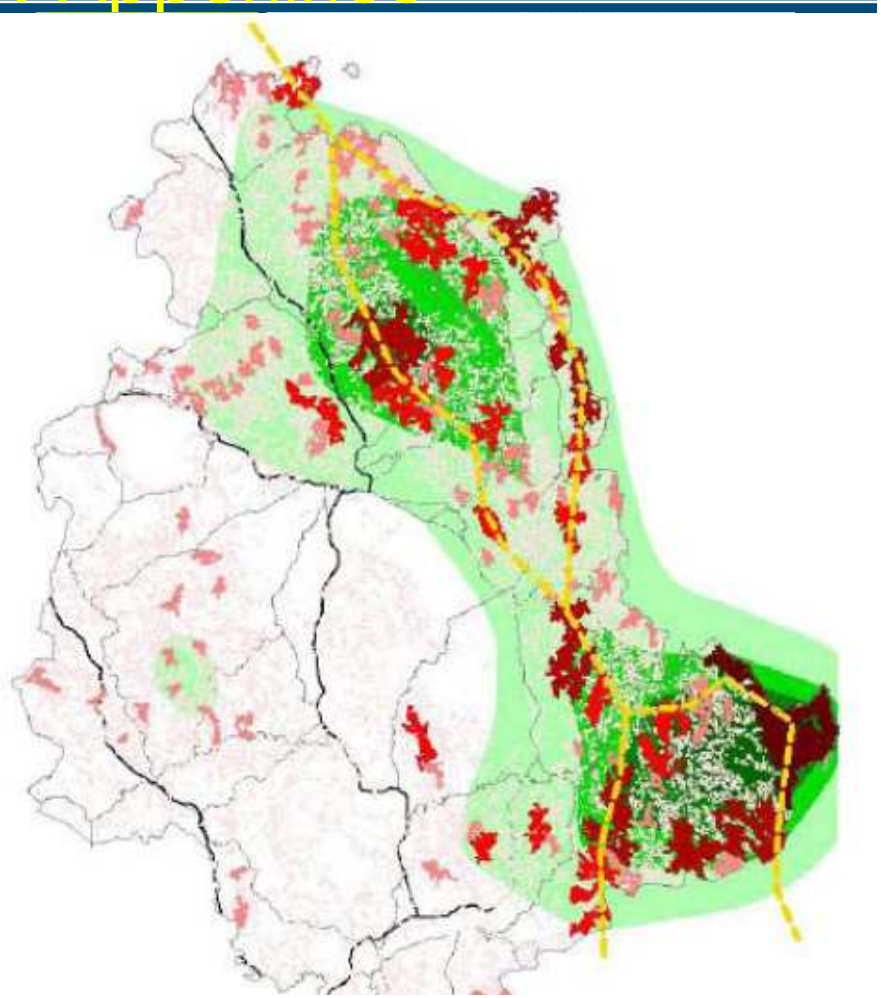
# Thinking about corridors….

# Thinking about corridors…. Appenines

Experiences gained in LIFE-Econet projects

- Emilia-Romagna
- Persiceto
- Abruzzo
  - Study brown bear
- Umbria



Disegno della rete ecologica per il culbianco nell'ecosistema steppa.

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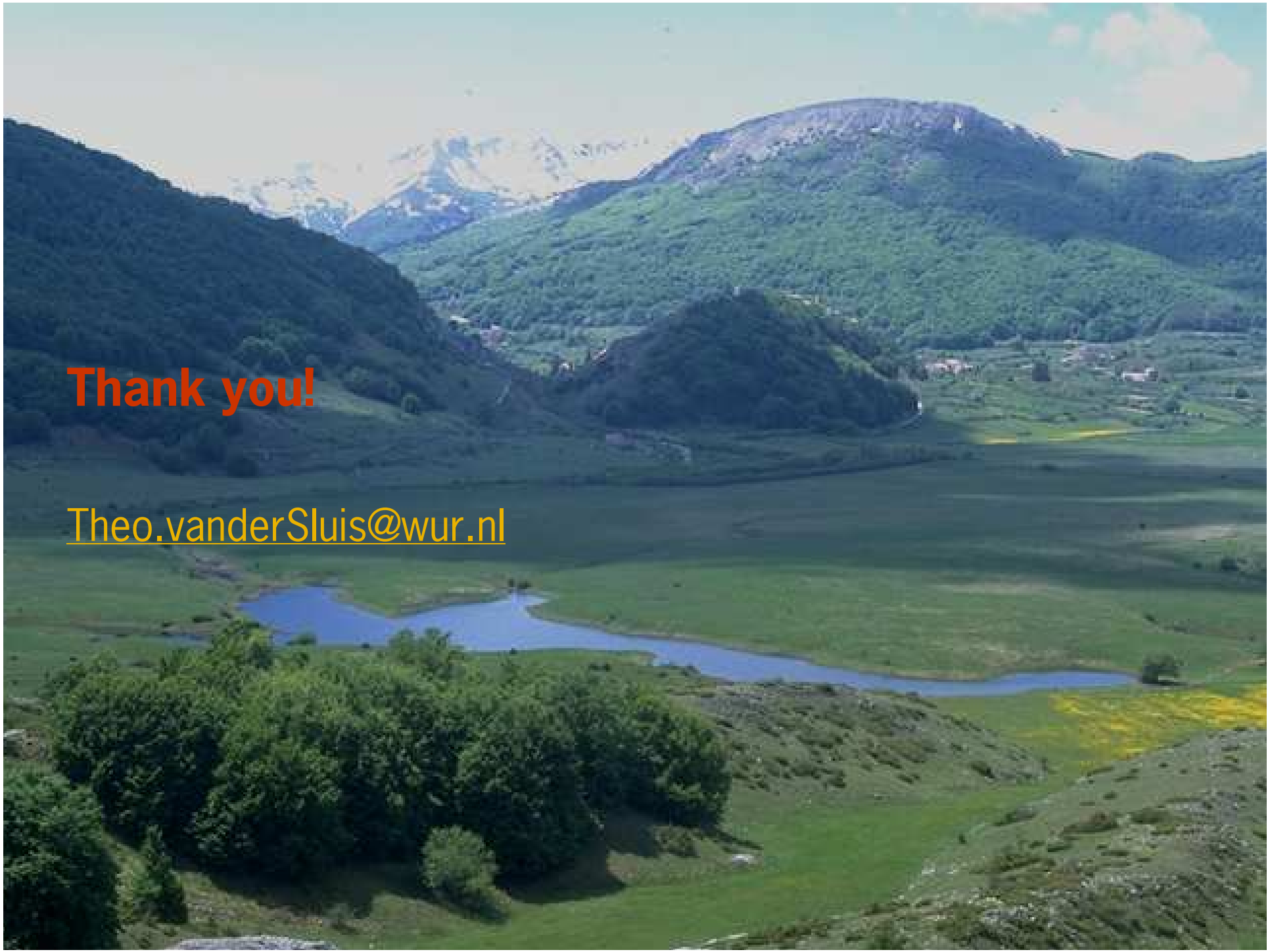
Thank you!
Theo.vanderSluis@wur.nl