



How land use change due to biofuel policy affects Europe's biodiversity

A BioScore case study

Ben Delbaere

IEA Bioenergy workshop, 30 March 2009, Helsinki

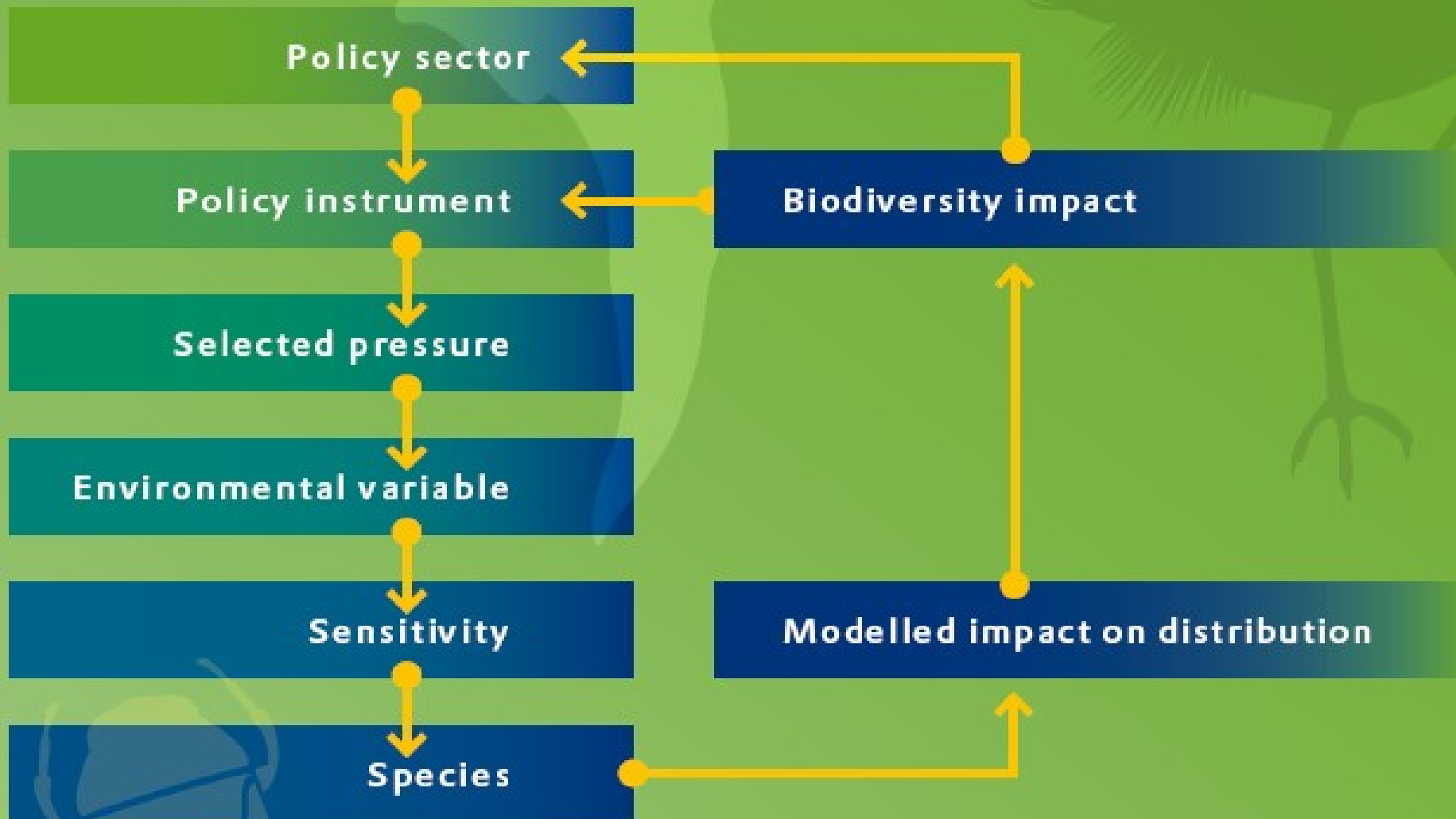


What is BioScore?

- Policy support project
- Co-funded by EC DG Research FP6
- Biodiversity impact assessment tool
- Species sensitivity scores
- User defines changes in environmental variables
- Rapid assessments and fine-scale analyses



Conceptual framework



Missing link in DPSIR

D: increasing fuel consumption

P: high CO₂ levels » increased temperature

Sensitivity of species to temperature

S: abundance of thermophilous plants

I: changing distribution pattern

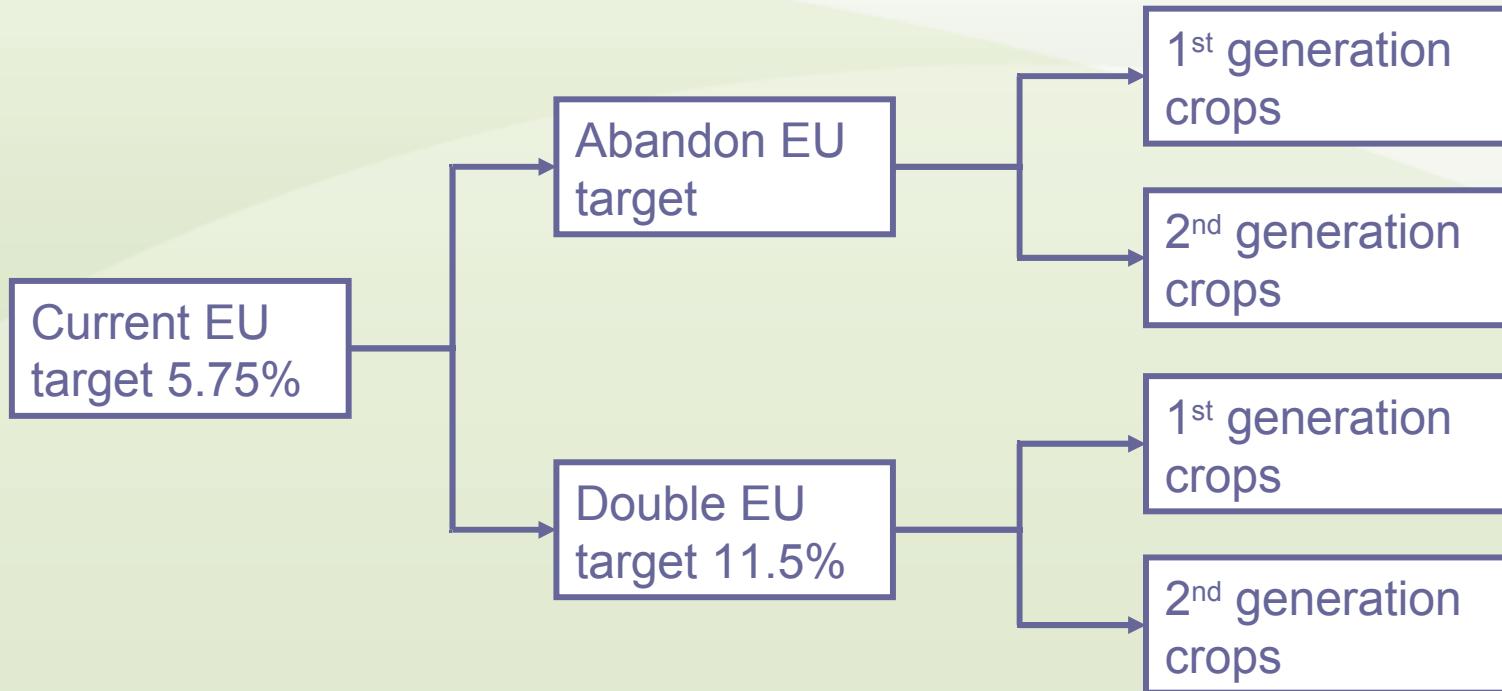
Species considered

	Total	With data	In BioScore
Mammals	295	60	60
Reptiles	217	30	28
Amphibians	88	20	20
Birds	526	478	179
Butterflies	576	152	77
Dragonflies	130	122	122
Vascular plants	15974	3000	390
Freshwater fish	450	216	216
Total	18256	4078	1092

Environmental variables

- 37 variables in total
- Mix of environmental parameters, pressures and traits
- Land cover change, based on Corine land cover
- Sensitivity scores:
 - 0: indifferent
 - 1: low
 - 2: medium
 - 3: high

4 scenarios for biofuel policy

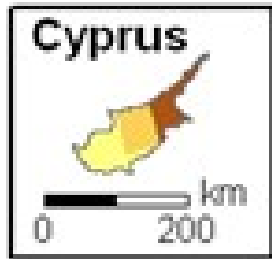


Land use change scenarios

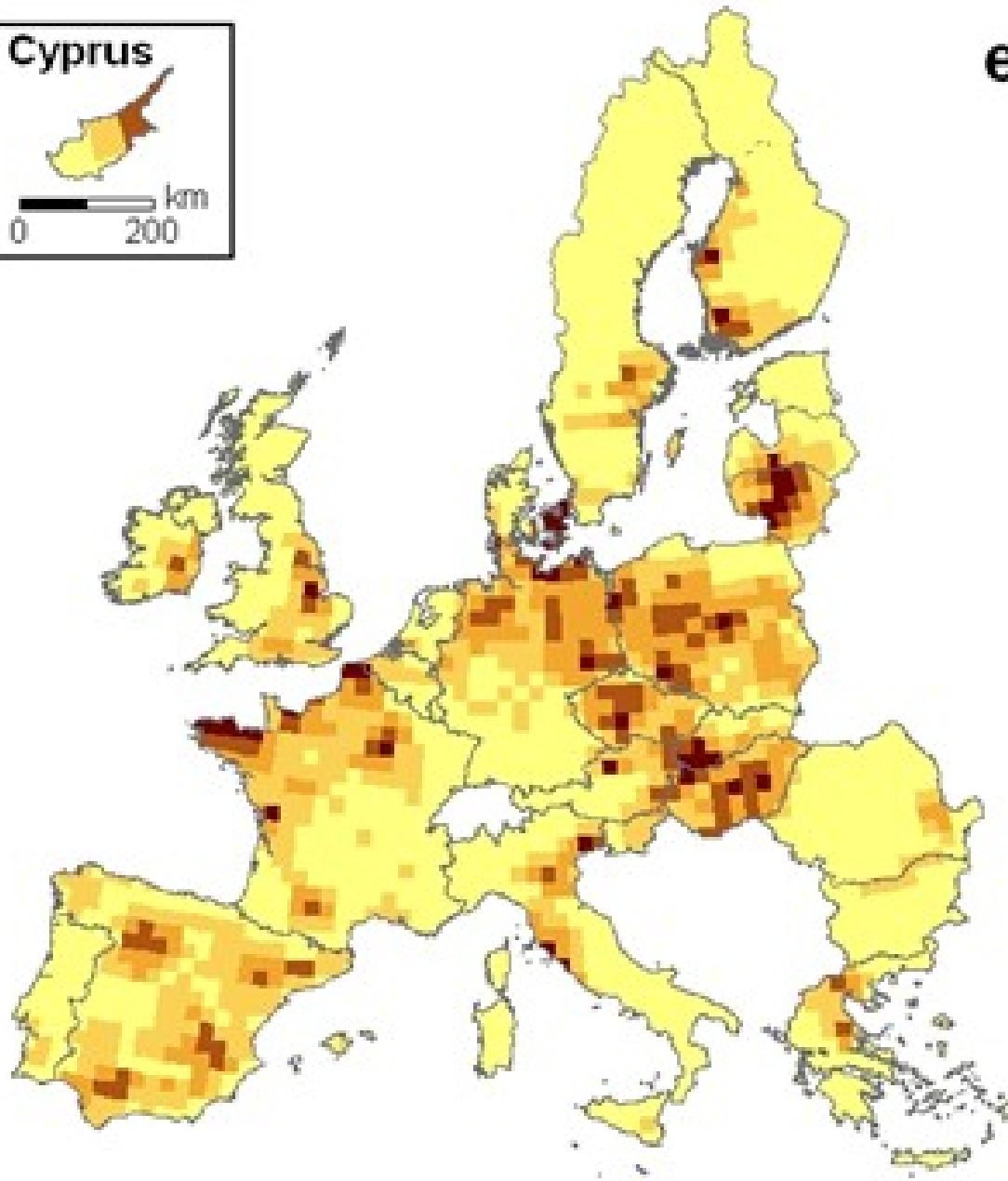
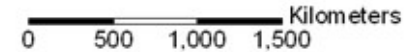
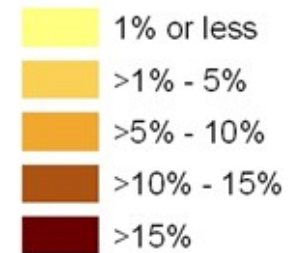
- Taken from EURuralis 'Global Economy' scenario: globalisation, open trade, rapid economic growth, low level of government intervention (cf. IPCC A1)
- Mix of land cover changes
- Calculated per biogeographic region
- E.g. for boreal, arable land for annual biofuel crops
 - 2001: 0.37% (Europe 0.5%)
 - 2030 abandon target: 0.78% (1.2%)
 - 2030 current target: 1.74% (2.7%)
 - 2030 double target: 2.38% (3.9%)

Current EC target

e2



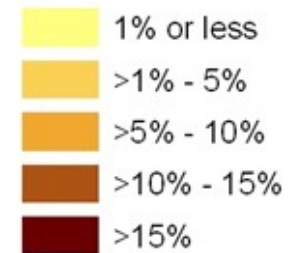
Percentage of area covered with biofuel plantations



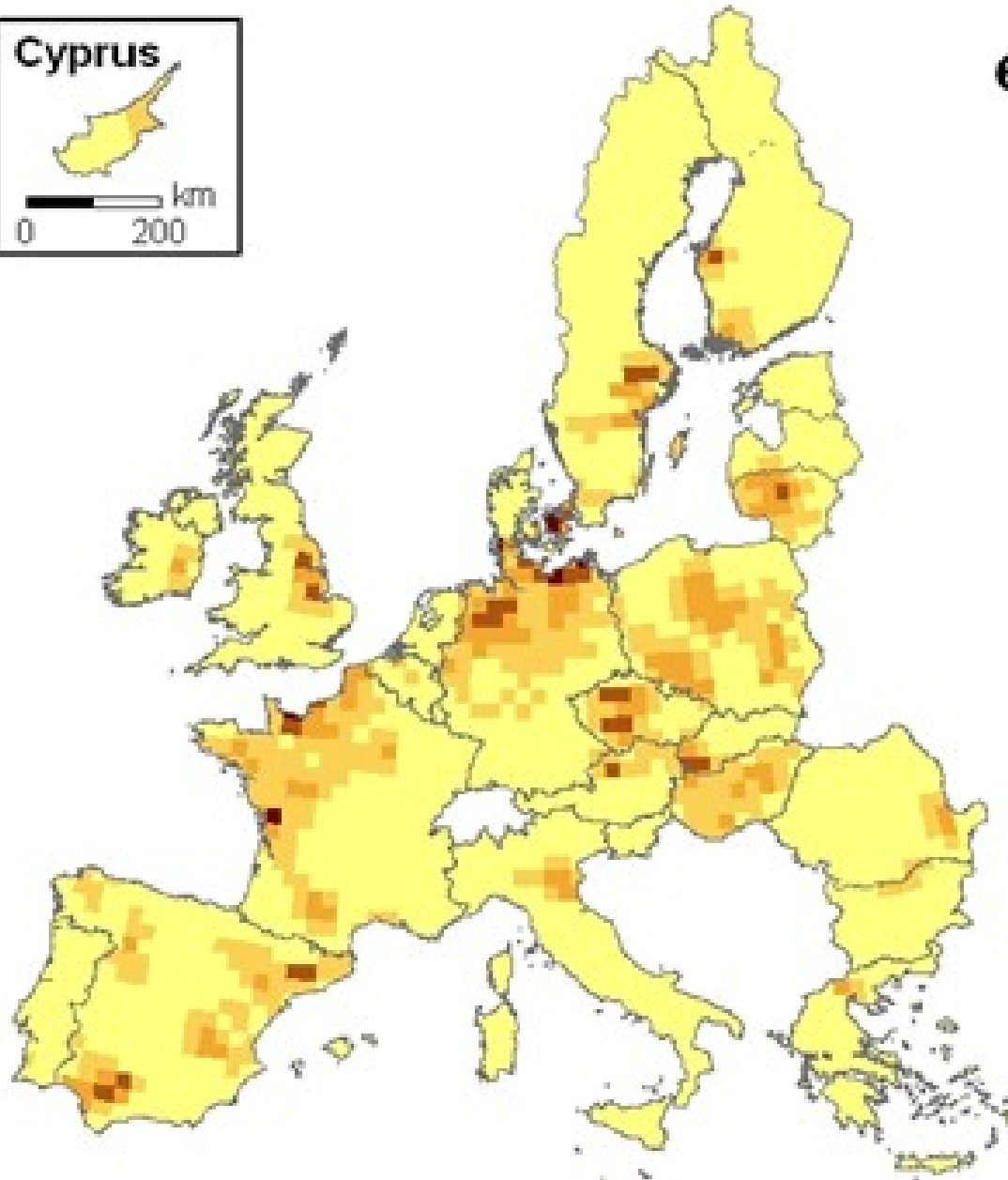
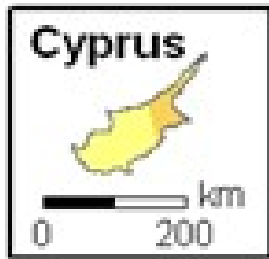
Abandon target

e1

Percentage of area covered with biofuel plantations



0 500 1,000 1,500 Kilometers

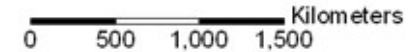
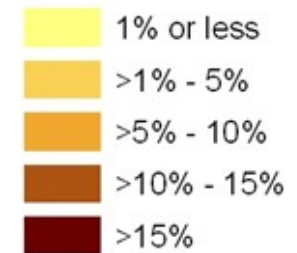


Double target



e3

Percentage of area covered with biofuel plantations



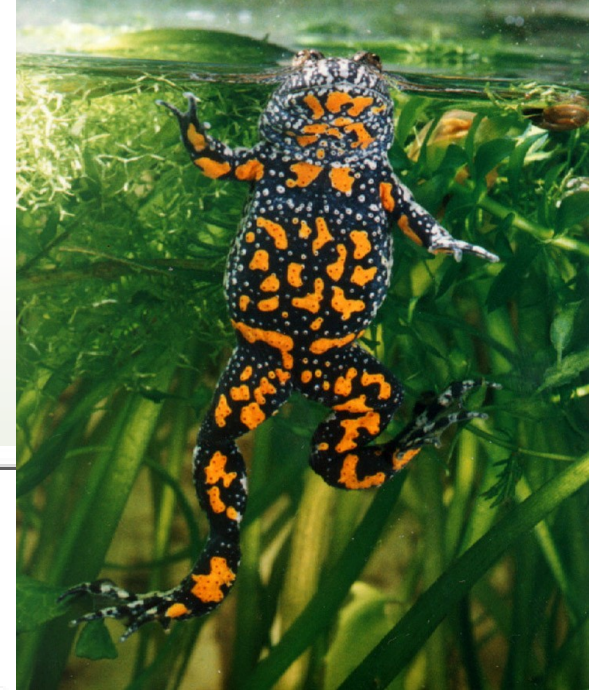
Biodiversity impacts

- Based on habitat suitability of land cover types
 - Medium and high: potential species presence
 - Low or not: potential species absence
- Using mammals, amphibians, reptiles and birds
- Based on a different mix of land cover types per scenario
- Scenarios for arable crops
- Comparison with woody crops only for the current target

Downscaling of results

- Original species distribution with resolution 50x50 km
- Formula incorporating habitat suitability, elevation, Corine land cover maps and biogeographic regions
- Maps at 1x1 km

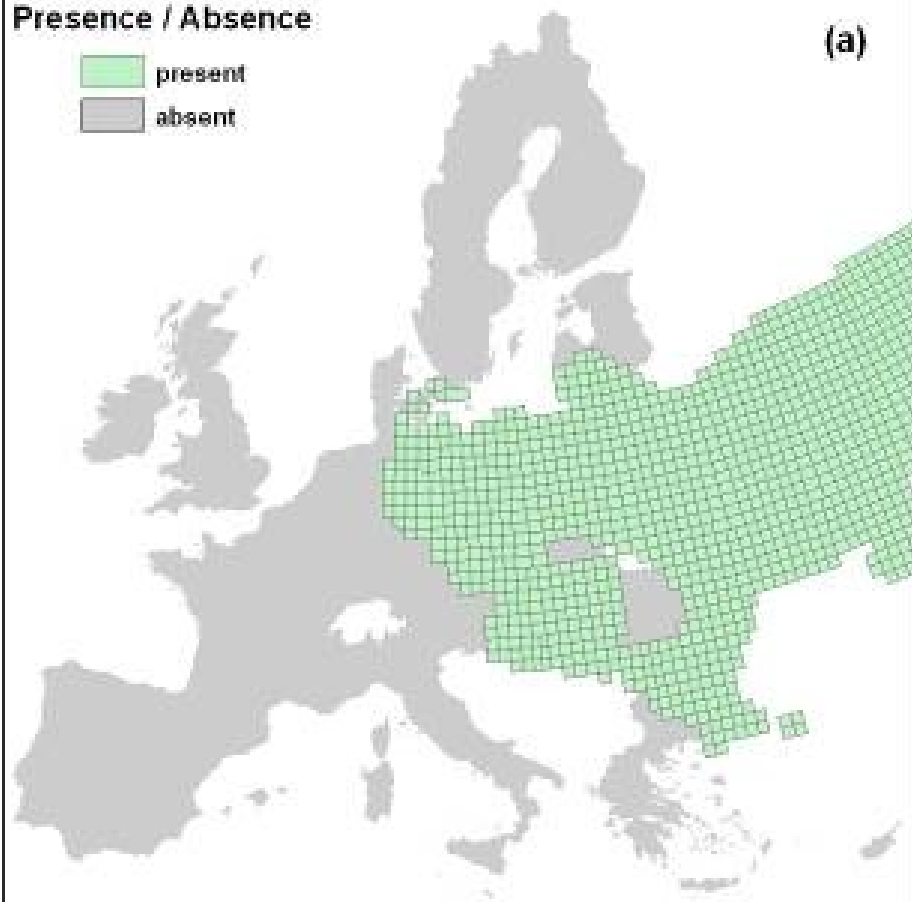
E.g. Fire-bellied toad



Presence / Absence

- present
- absent

(a)



Suitability

- low
- medium
- high
- absent or not suitable



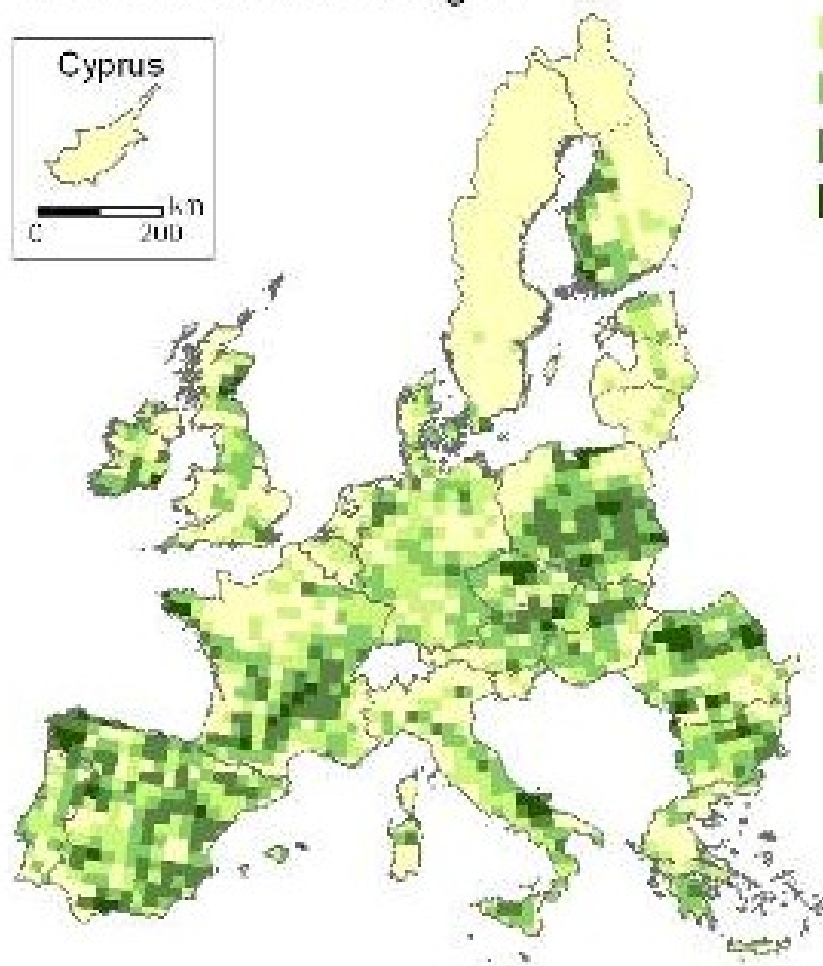
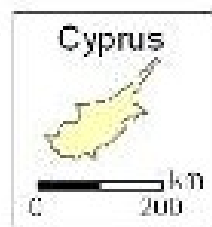
Aggregating results

- Calculating number of species per group and total potentially present per 1 km
- Aggregating to 50 km for potential species turnover (ratio of species gaining or losing their habitat over original species number)

What might happen if we abolish or double the biofuel target?

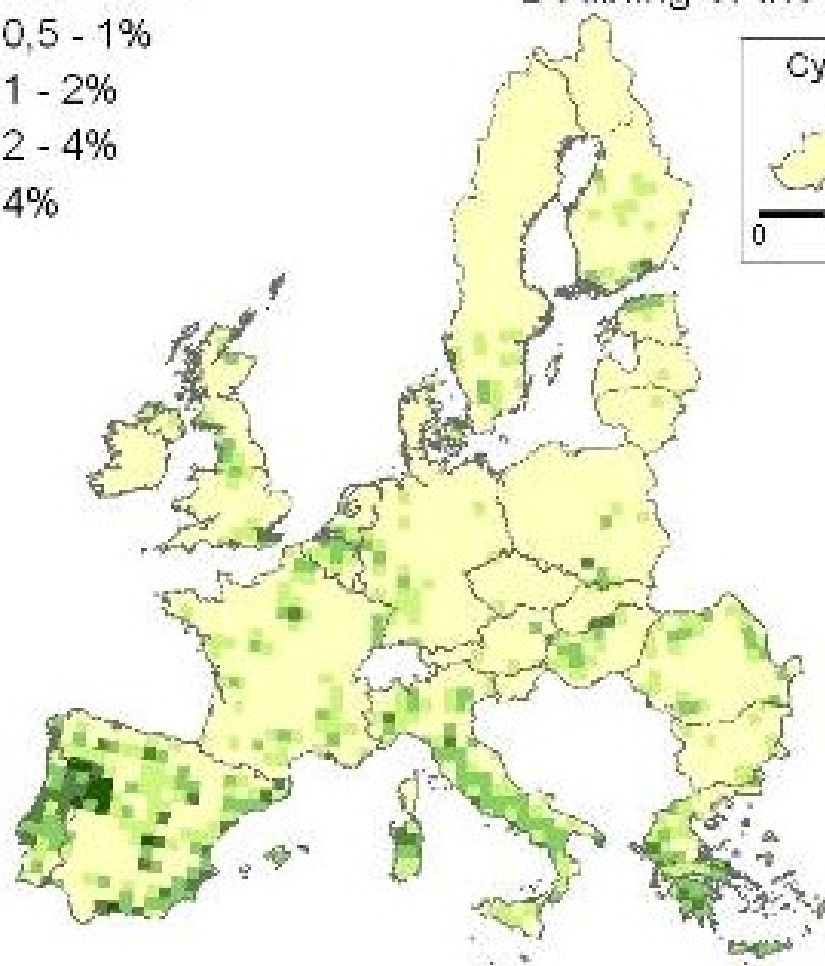
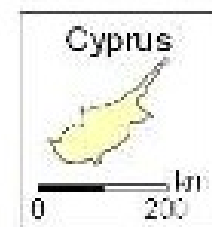
Percentage of total area with potential species gain of >50%

Abolishment of the target



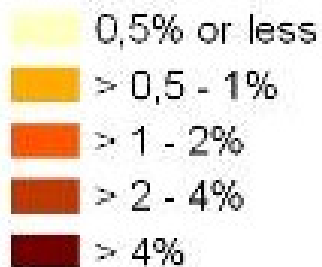
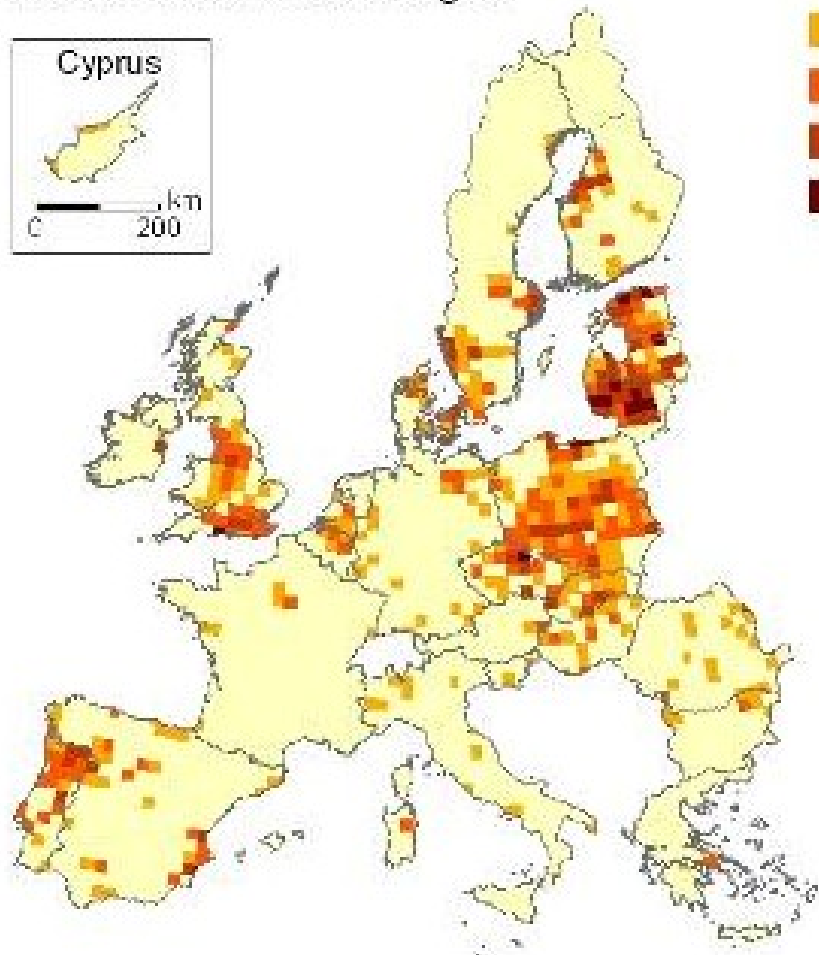
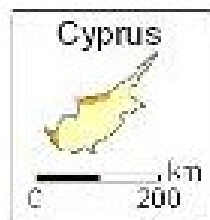
- 0,5% or less
- > 0,5 - 1%
- > 1 - 2%
- > 2 - 4%
- > 4%

Doubling of the target

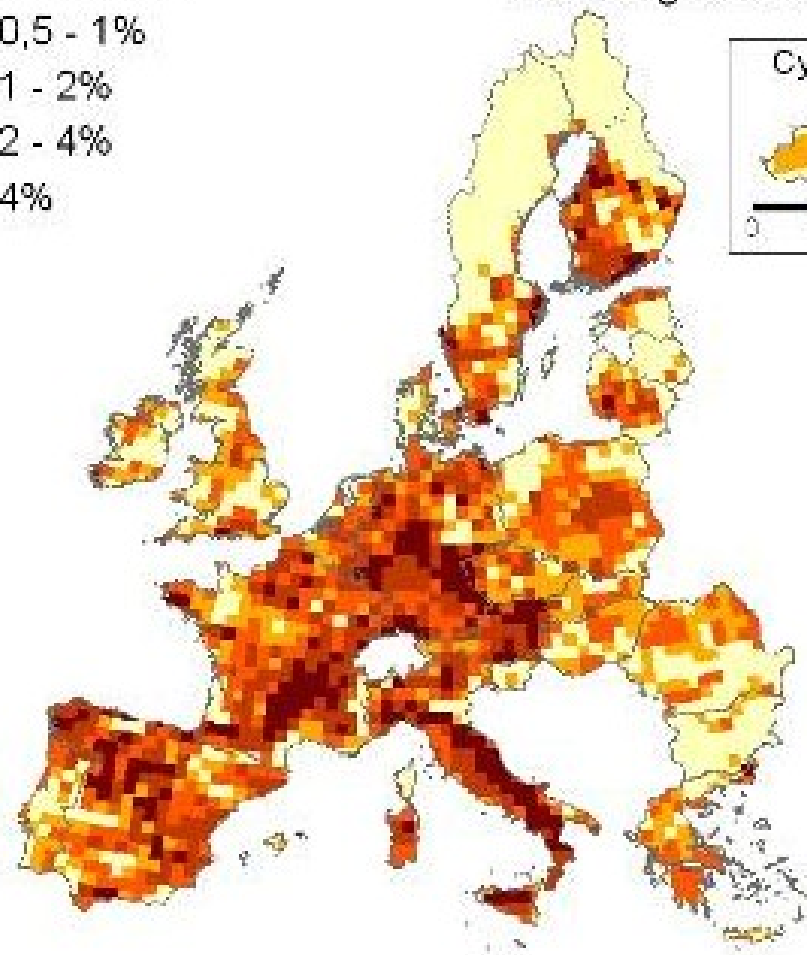
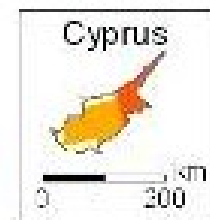


Percentage of total area with potential species loss of >50%

Abolishment of the target



Doubling of the target



Conclusions regarding impacts

- Spatial variation in impacts
- Substantial differences between species groups
- More species would suffer than benefit from doubling the biofuel target
- Woody crops might have an overall positive effect, arable crops a negative effect
- Total impacts relatively small, but yet another addition to other ongoing pressures on biodiversity

Assumptions and restrictions

- Coarse distinction 1st and 2nd generation biofuels, without distinguishing between crops
- Woody crops cultivated on same areas as arable crops
- Focus on biofuels impacts through land use change, not other environmental changes
- Only 'Global economy' scenario analysed
- Sensitivity scores based on expert judgement
- Time lag in species response
- Corine land cover classes do not match habitats or biofuel crops
- Selection of species
- No interspecific relations analysed

Thank you!

**Details of the model:
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