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Assessment of climate change risks and vulnerabilities and development of adaptation measures in the area of biological diversity and ecosystem services

ELLE (SIA Estonian, Latvian & Lithuanian Environment)

INSPIRING
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Outline

- Expert team
- Current context
- Methodology and data
- Identified risks ("cause – effect chains" and shortlisted risks)
- Further steps

Experts

Project experts (in-house)

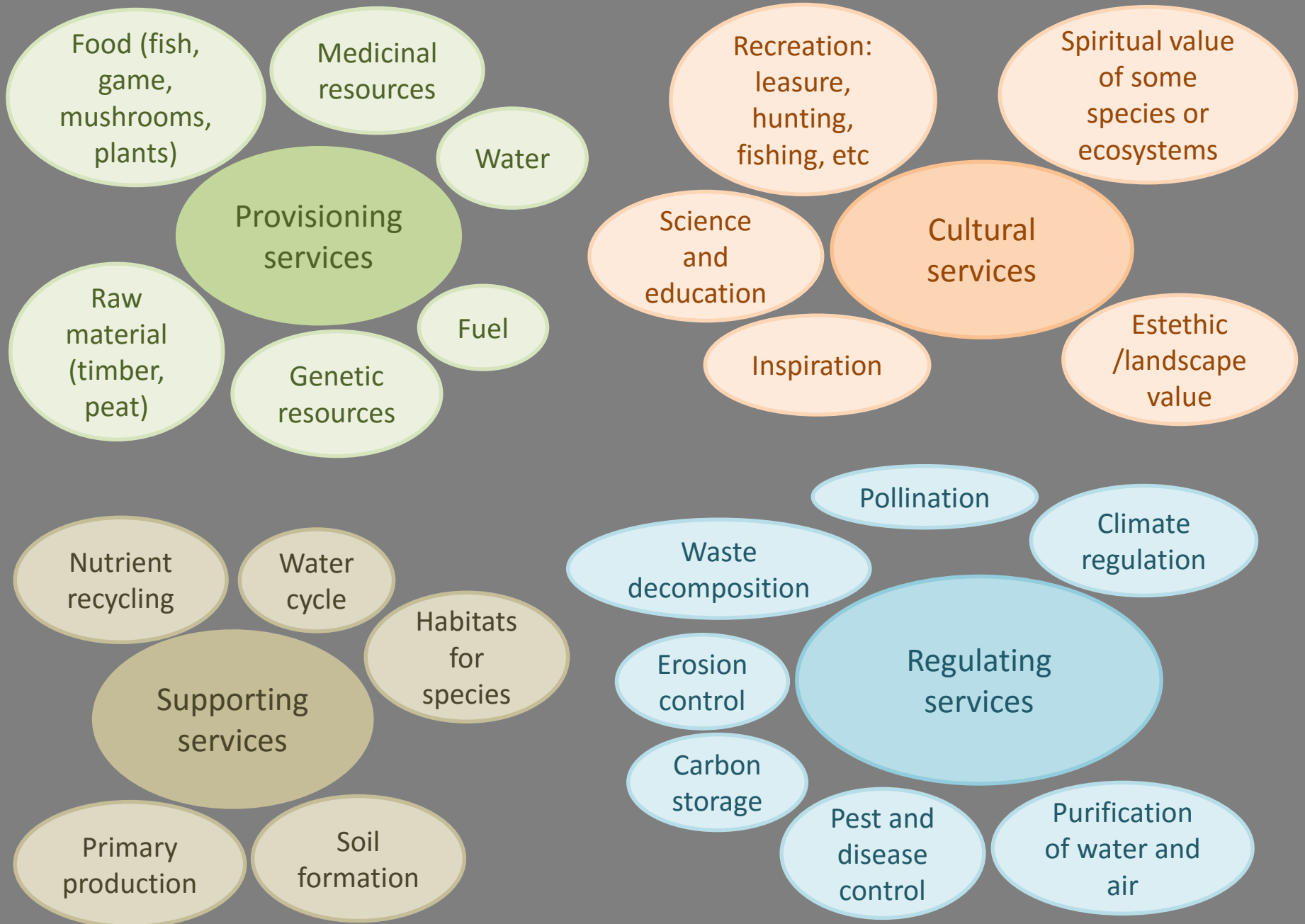
- Biologist / Project manager – Valts Vilnītis
- Project coordinator – Olga Meļņičenko
- Economist – Artūrs Caune

Expert team

- Viesturs Ķerus (Latvian Ornithological Society)
- Ainārs Auniņš (University of Latvia)
- Voldemārs Spuņģis (University of Latvia)
- Guntis Brūmelis (University of Latvia)
- Brigita Laime (University of Latvia)
- Laura Grīnberga (Latvian Museum of Natural History)
- Solvita Strāķe (Latvian Institute of Aquatic Ecology)
- Jānis Ozoliņš (Latvian State Forest Research Institute "Silava")

Context

- Good scientific evidence for:
  - ✓ climate change impacts on biological diversity, and
  - ✓ climate change being an additional risk (changes and depletion in biodiversity make it less able to adapt to climate change).
- Climate change impact on biological diversity and ecosystem services is less significant, than direct impacts, caused by human activities
- Weak statistical basis


Food (fish, game, mushrooms, plants)
Medicinal resources
Water
Provisioning services
Raw material (timber, peat)
Fuel
Genetic resources
Recreation: leasure, hunting, fishing, etc
Spiritual value of some species or ecosystems
Science and education
Cultural services
Inspiration
Estethic /landscape value
Nutrient recycling
Water cycle
Habitats for species
Supporting services
Primary production
Soil formation
Pollination
Climate regulation
Waste decomposition
Erosion control
Regulating services
Carbon storage
Pest and disease control
Purification of water and air

Scientific evidence (1)

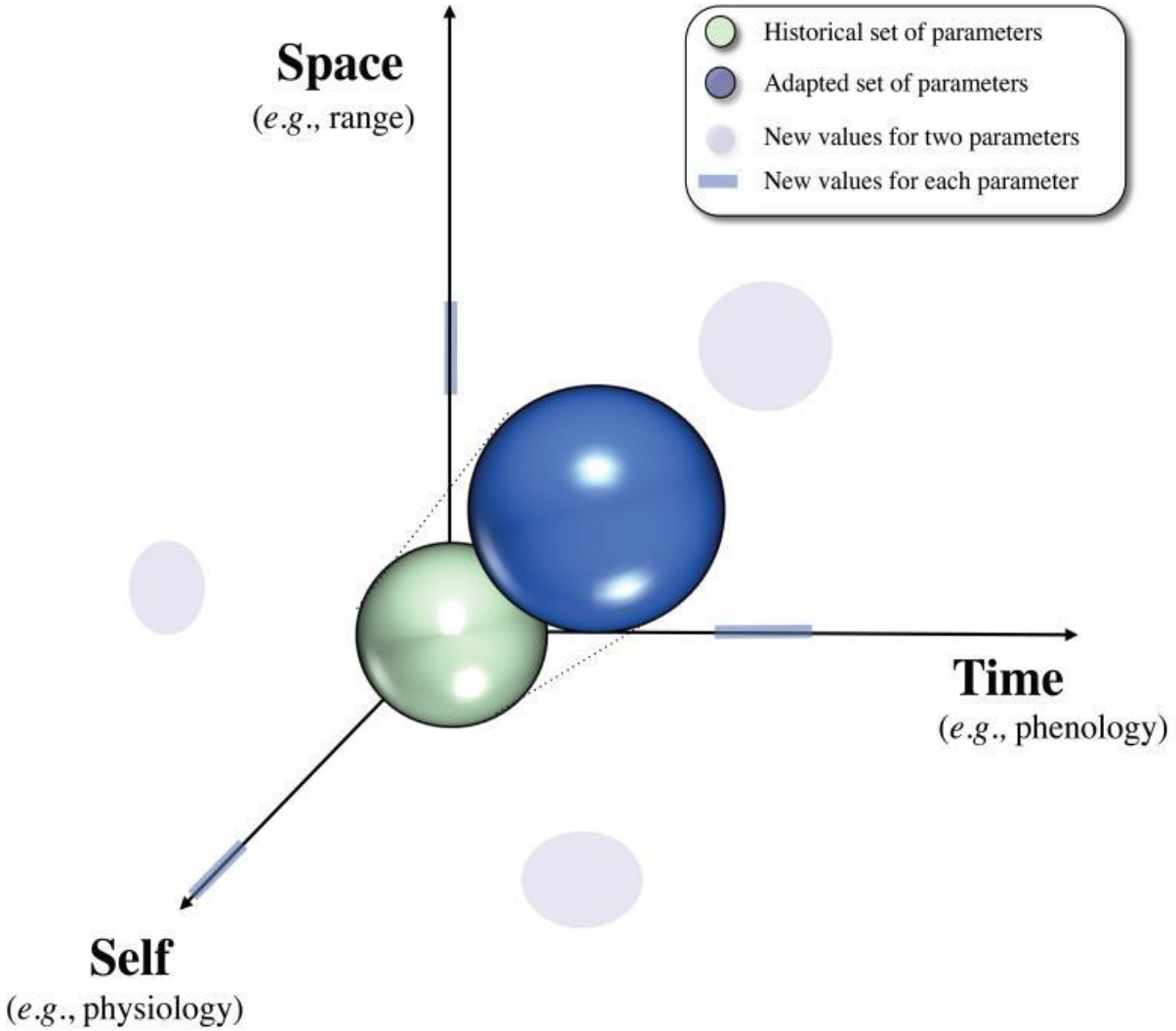
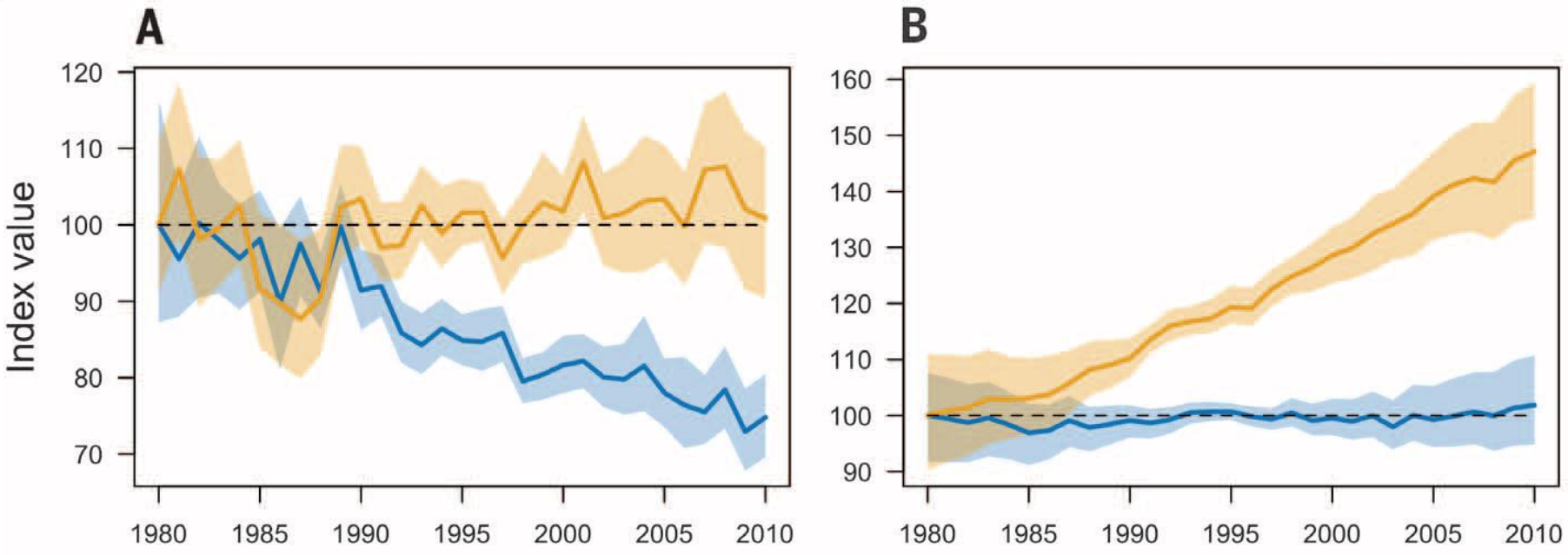


Figure from *Bellard, C., Bertelsmeier, C., Leadley, P., Thuiller, W., Courchamp, F. 2012. Impacts of climate change on the future of biodiversity. Ecology letters, 15(4); 365 – 377*

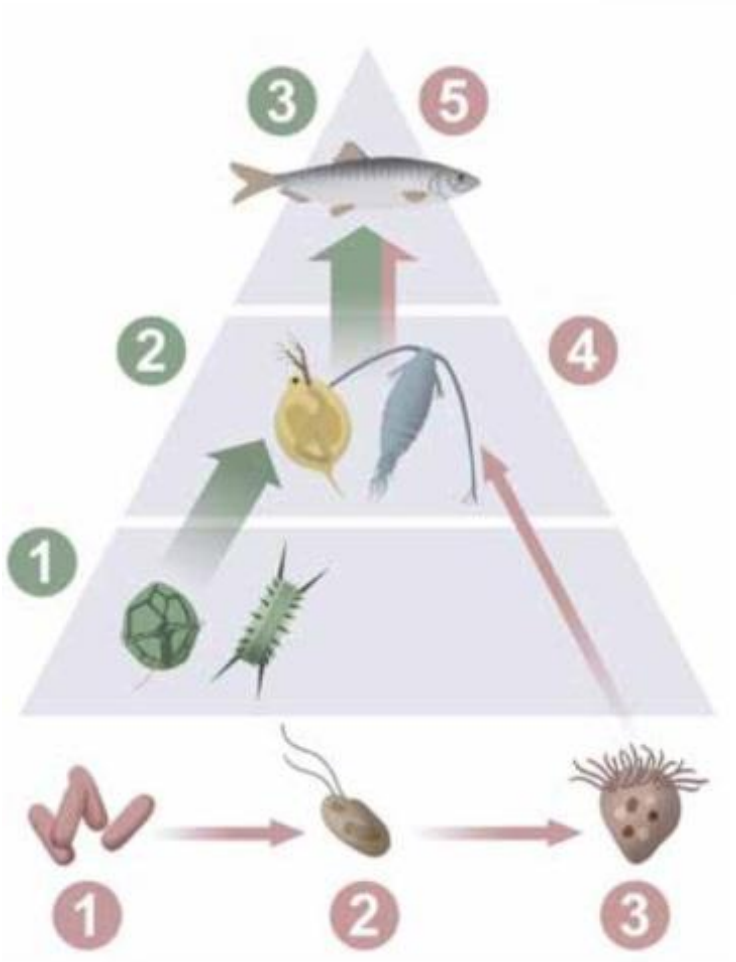
Scientific evidence (2)



Effect of climate on abundance trends of common birds. Multispecies population indices for CST+ (orange lines) and CST– (blue lines) groups combined across Europe (A) and states of the United States (B). Shaded polygons in each case indicate 90% confidence intervals. The index is arbitrarily set to 100 in 1980. Horizontal dashed lines at index values of 100 show the expectation if there is no trend. Figure from *Stephens et al. Consistent response of bird populations to climate change on two continents. Science, 1 April 2016, Vol. 352, Issue 6281*

Scientific evidence (3)

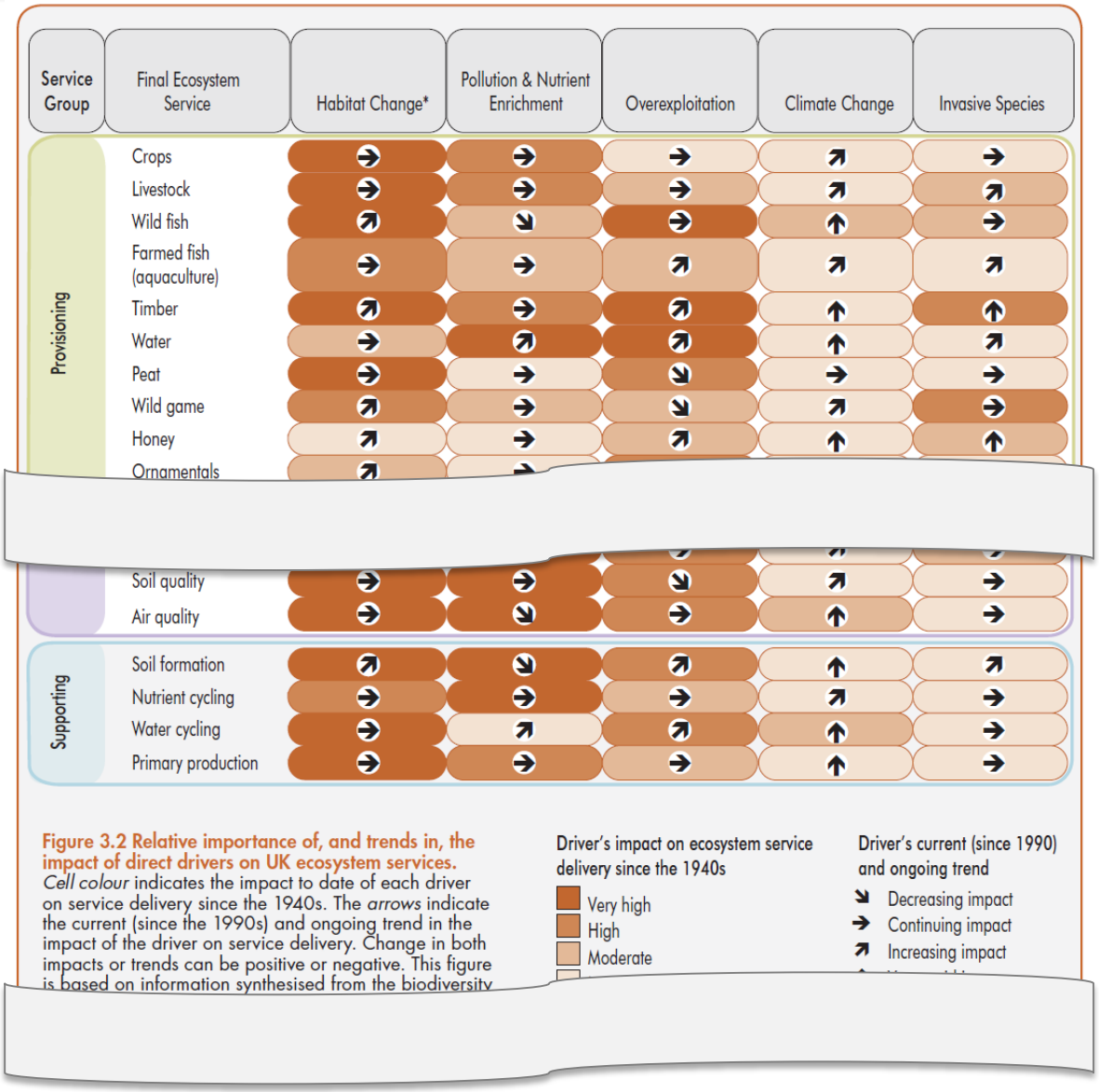
Two different food webs in the Baltic (from: Andersson, 2014). Green numbers and arrows show the classical food web, where phytoplankton (1) are eaten by zooplankton (2) which are food for fish (3). Brown numbers and arrows show the bacterial food web (1-5). Figure from *Lennart Nyman. Climate change in the Baltic Sea region: A 1.5 target is needed to save the Baltic Sea. Effects of global temperature increases on the biodiversity of the Baltic Sea.*



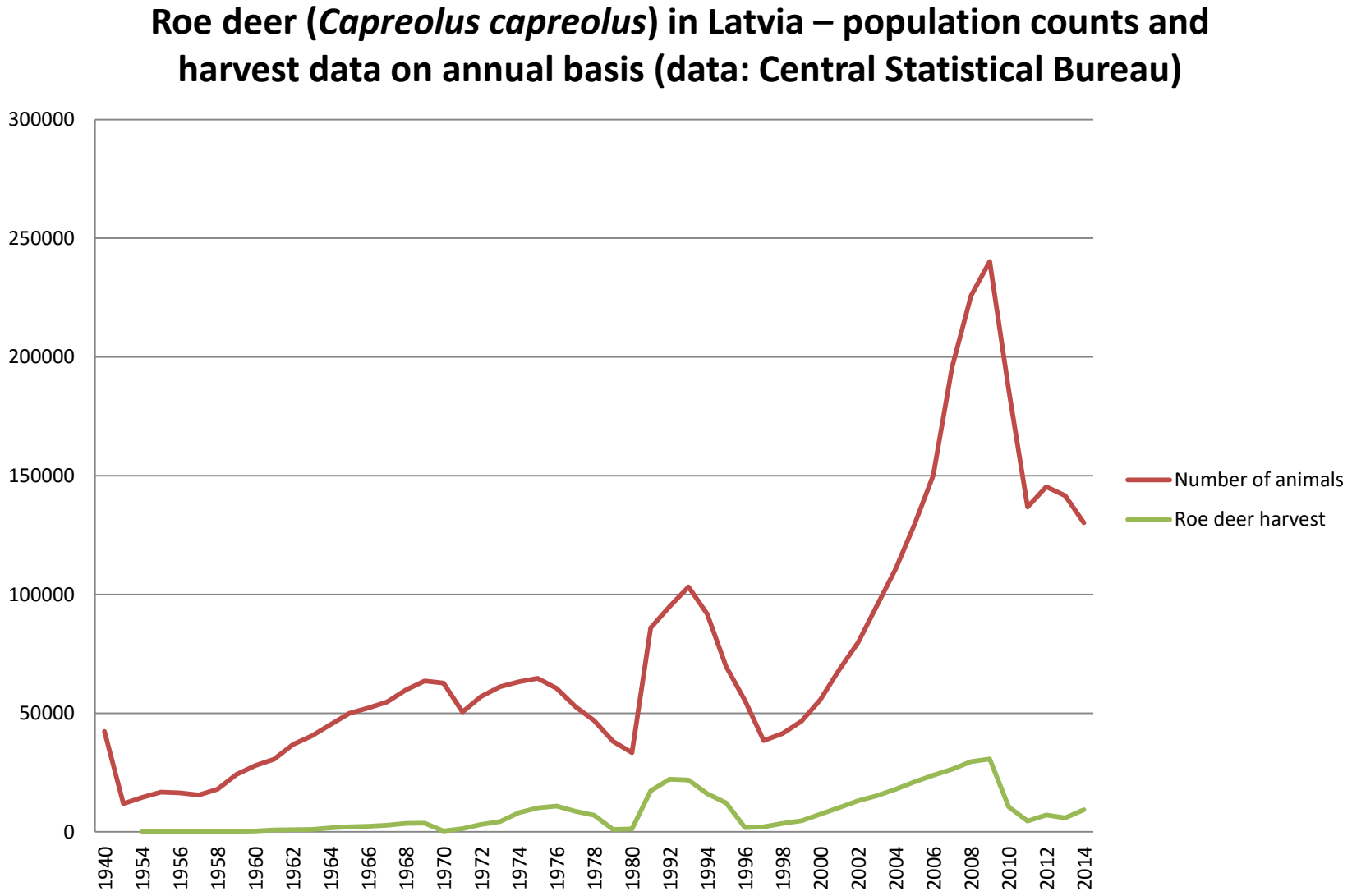
How comparatively significant is this impact?

Climate change impact on biological diversity is less significant, than direct impacts, caused by human activities

(Figure from UK National Ecosystem Assessment Follow-on, 2014)

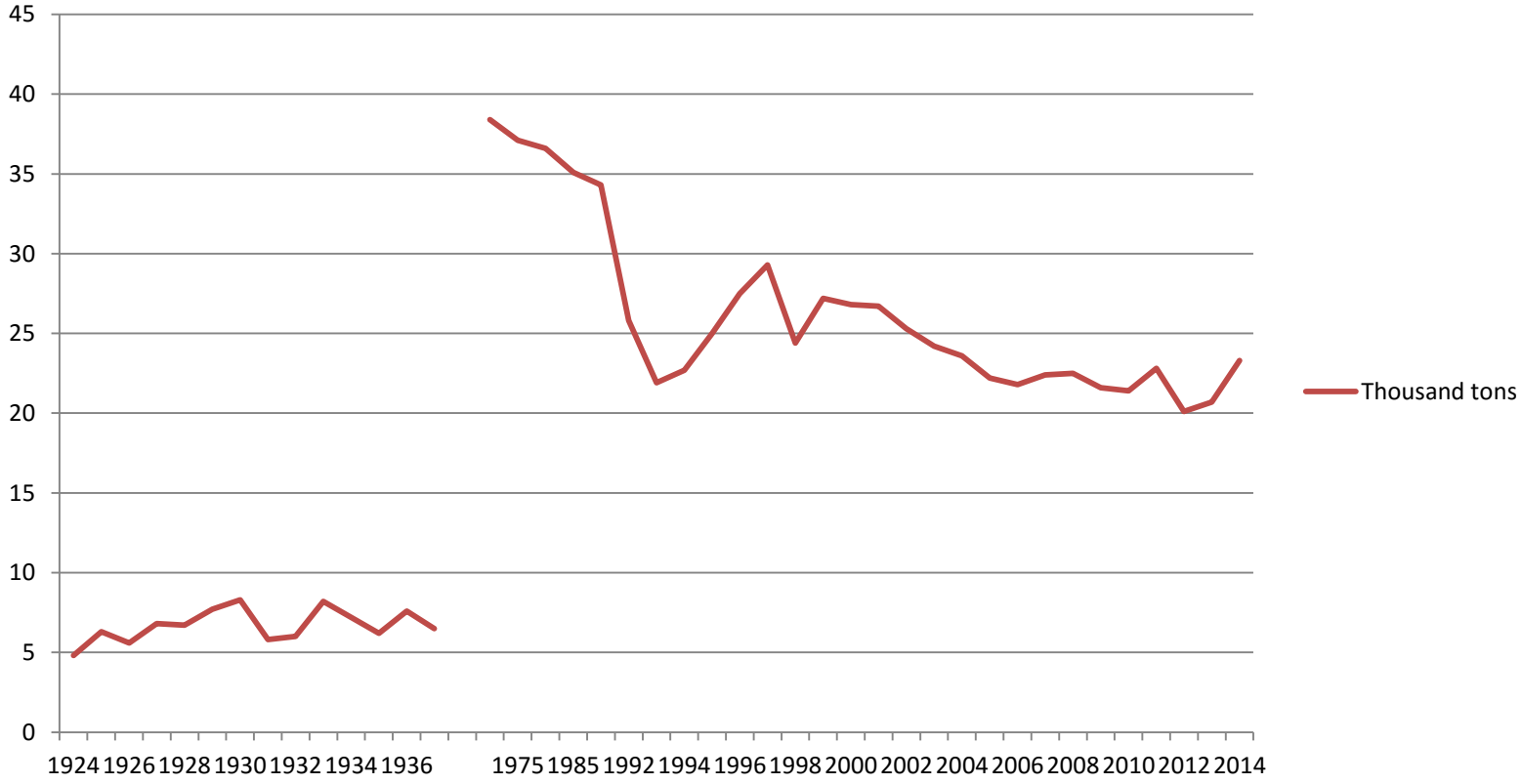


Statistical basis – example 1



Statistical basis – example 2

Baltic herring (Clupea harengus membras) catches along Latvian sea coast, thousand tons (data: Central Statistical Bureau)

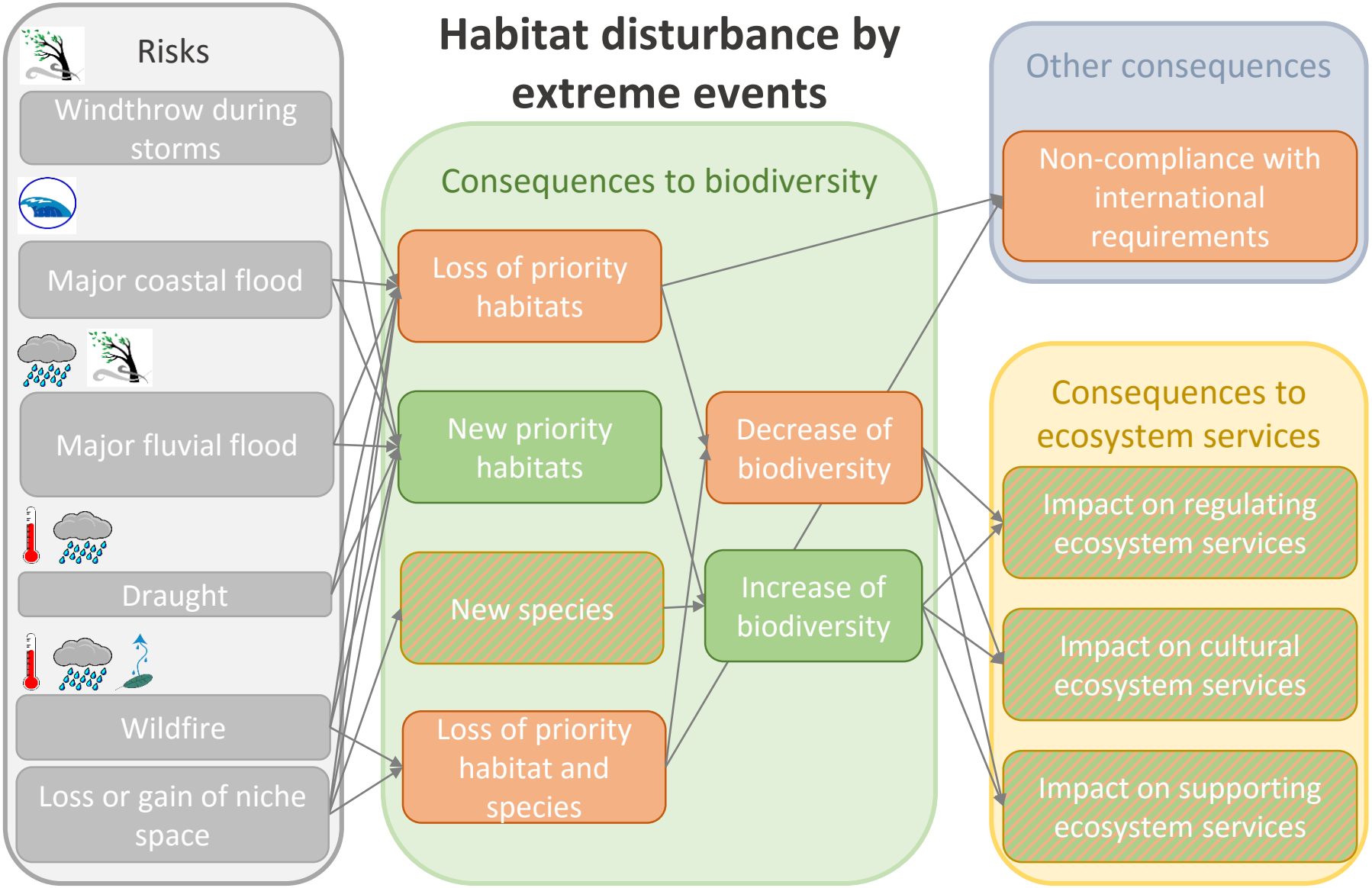


Data

- Historical meteorological data by LEGMC
- Climate projections (currently – LEGMC, EEA, project-based projections, e.g. on coastal erosion in Latvia)
- Statistics:
  - → Very few parameters are being recorded
  - → Cover very recent history (except for two parameters)
  - → No direct relationships between the recorded parameters and climate change

No statistical analysis, expert opinion only. All experts receive the same set of data, collected by the project

Cause – effect chains (example)



Groups of risks

- Range shifts
- Seasonal shifts and changes in phenology
- Changes in pests, diseases and invasive non-native species
- Changes in interactions and community structure
- Geomorphological and hydroecological habitat change
- Habitat disturbance by extreme events
- Changes to ecosystem processes/functioning
- Indirect effects

Based on UK 2012 Climate Change Rist Assessment: Climate Change Risk Assessment for the Biodiversity and Ecosystem Services Sector. January 2012

Identification of priority risks (shortlisting)

- From the long list of risks (Tier 1) to the short list (priority, or Tier 2 risks)
- 3 selection criteria, each evaluated on a 3-point scale:
  - ✓ impact on ecosystem services (socio-economic impact) and on biological diversity (environmental impact),
  - ✓ likelyhood and scientific evidence,
  - ✓ urgency of adaptation measures
- From 38 to 7 risks
- Methodology was adapted from UK 2012 Climate Change Rist Assessment: Climate Change Risk Assessment for the Biodiversity and Ecosystem Services Sector

Shortlisted risks

- Increased water pollution risk and eutrophication
- Generalist species favoured over specialist species
- Increased risk from diseases, new to Latvia
- New species arrive to Latvia (both priority species and invasive non-native species)
- Increased risk from pests (range shifts and increased survival rates)
- Major coastal floods/reconfiguration
- Increased water temperature and stratification of water bodies; low content of oxygen in water at low flow

Project chart – further steps

Selection of risks for further analysis applying multicriteria approach

1. Risks (long list)

2. Risk analysis

Risk matrix

	Nozīmīgs risks	Vidējs risks	Augsts risks	Ļoti augsts risks
5	10	15	20	25
4	8	12	16	20
3	6	9	12	15
2	4	6	8	10
1	2	3	4	5

3. Risk evaluation

Cost-benefit analysis

Ranking of risks and selection of measures based on certain criteria

4. Risk treatment

4.1. Adaptation measures

4.2. Cost effectiveness analysis

4.3. Indicators

Thank you!

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