# Results of a questionnaire on Climate Change Impacts (WG 1)

**Peter Spathelf**
**University for Sustainable Development Eberswalde**

**Ernst van der Maaten**
**University of Freiburg, Institute for Forest Growth**

# Outline

- Objectives and content of the questionnaire
- Feedback
- Results
- Conclusions

# Objectives of the questionnaire

- Identifying relevant climatic events and the most vulnerable forest sites, structures and tree species composition (➔ hot spots of CC)
- Revealing differences and similarities between (European) regions
- Deriving adaptation strategies

➢ *Q. focuses on observed and expected changes*
➢ *Scientific and expert knowledge used*

# Questions (1/3)

- Q1: Which **observed and expected changes** in climate are of major importance in your country, considering impact(s) on forest ecosystems?

- Q2: Describe the associated (obs. & exp.) impact(s) on forests

# Questions (2/3)

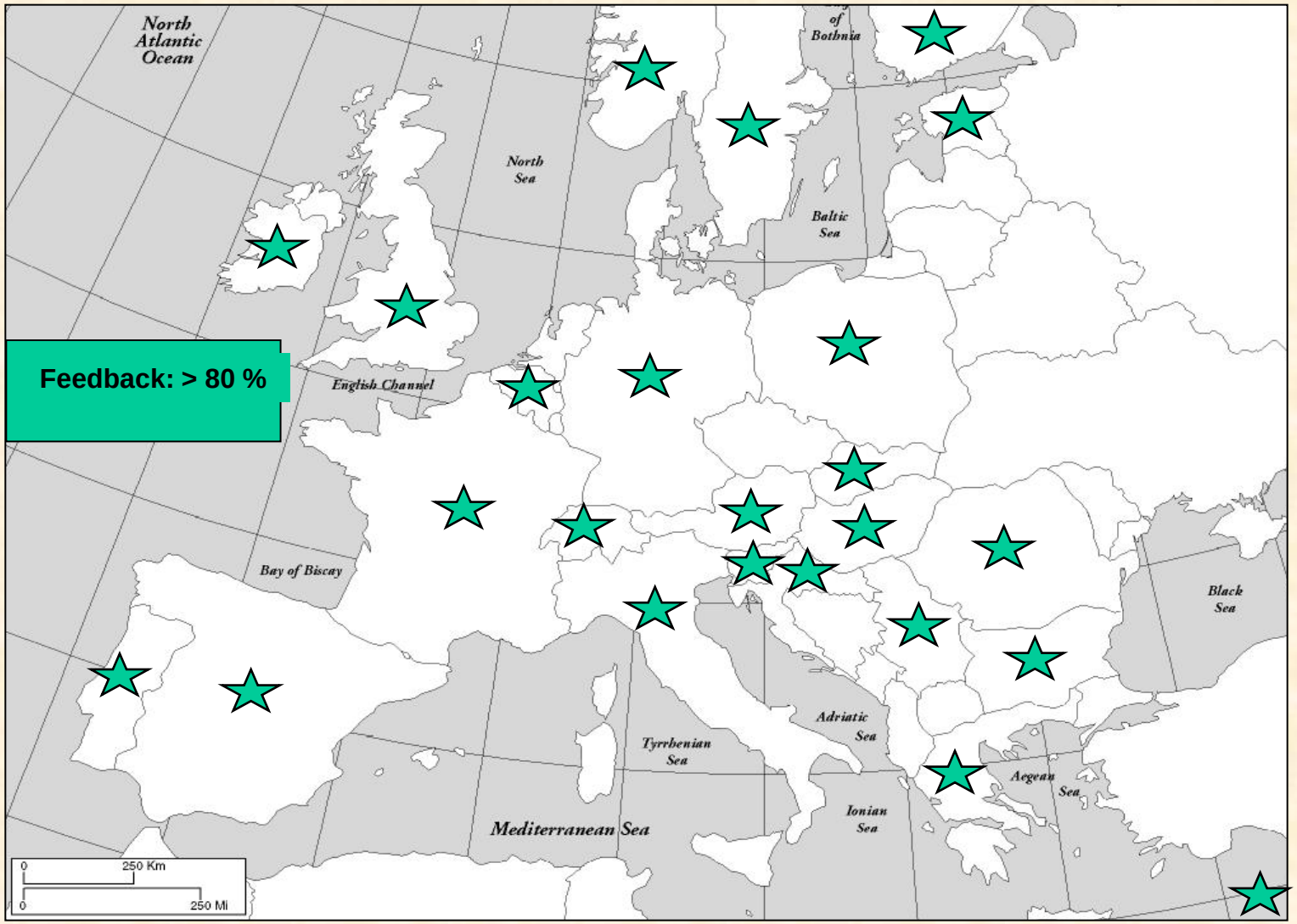
- Q3: Indicate the **impacted tree species/provenances**, and describe the most severely affected site conditions, forest structures and species compositions

- Q4: Identify and localize on the map, if possible, ‘hotspots’ of climate change induced forest vulnerability in your country

# Questions (3/3)

- Q5: Has **forest management** changed at the described hot spot(s), OR: does forest management need to be changed? If yes: how?

# Countries involved and feedback





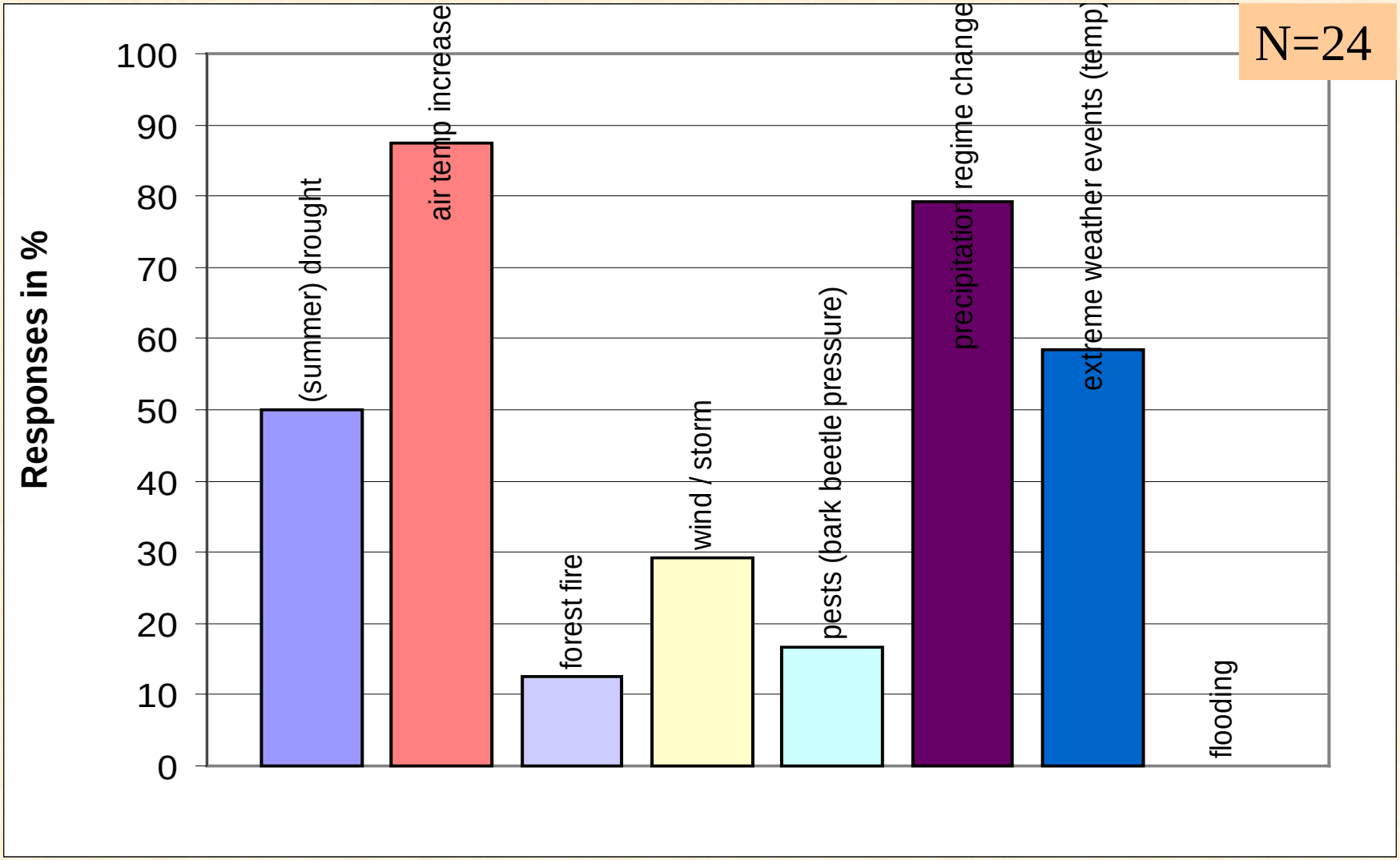

HNE Eberswalde
Hochschule für nachhaltige Entwicklung (FH)

# Quality of responses

- *E.g., Q5: Has forest management changed at the described hot spot(s), OR: does forest management need to be changed? If yes: how?*

- Significant percentage of answers: no change yet
- Most answers very differentiated
- Some answers: future change more towards SFM or CNFM, thus not very specified

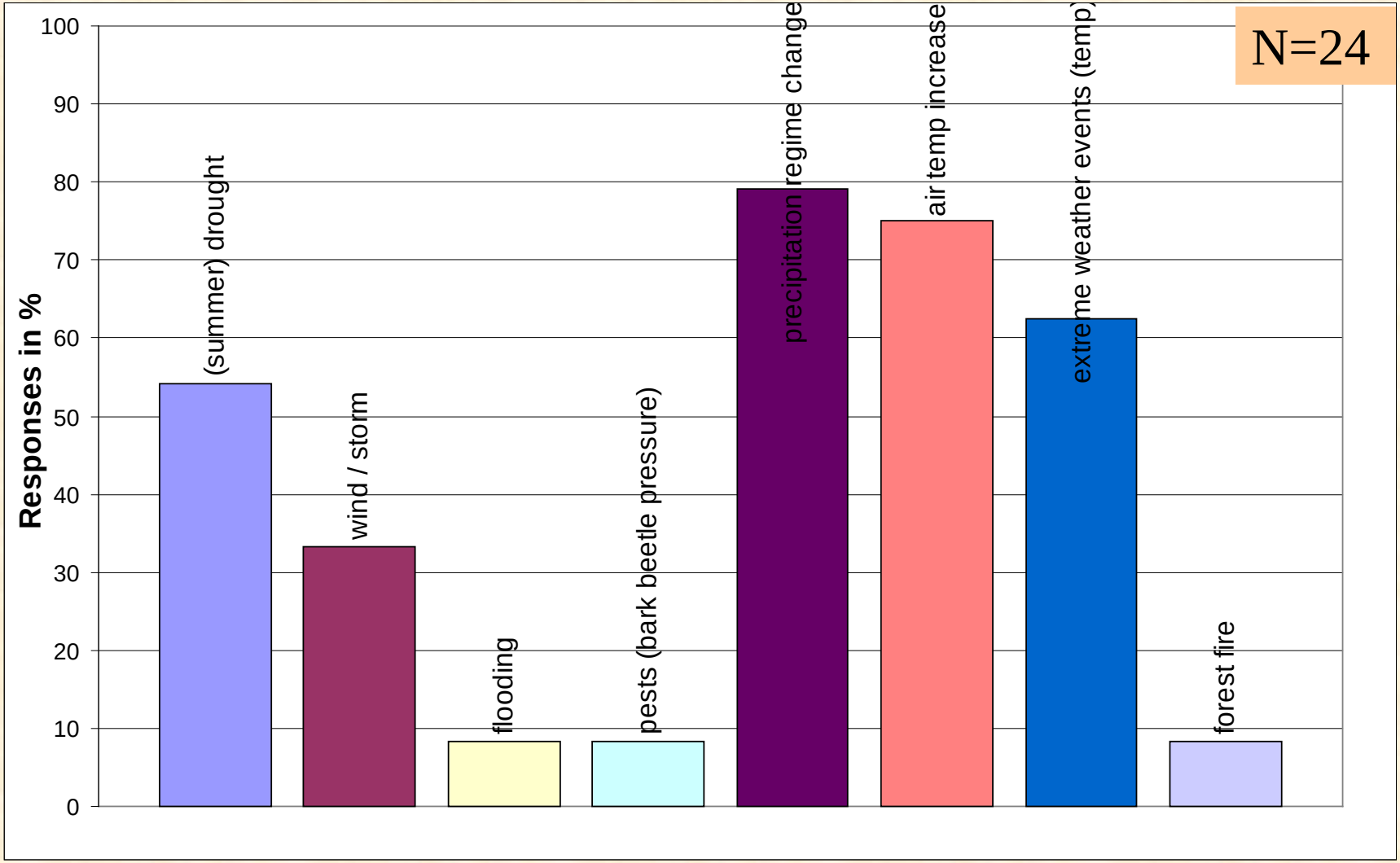
# Q1: Observed CC impact factors






HNE Eberswalde
Hochschule für nachhaltige Entwicklung (FH)

# Q1: Expected CC impact factors





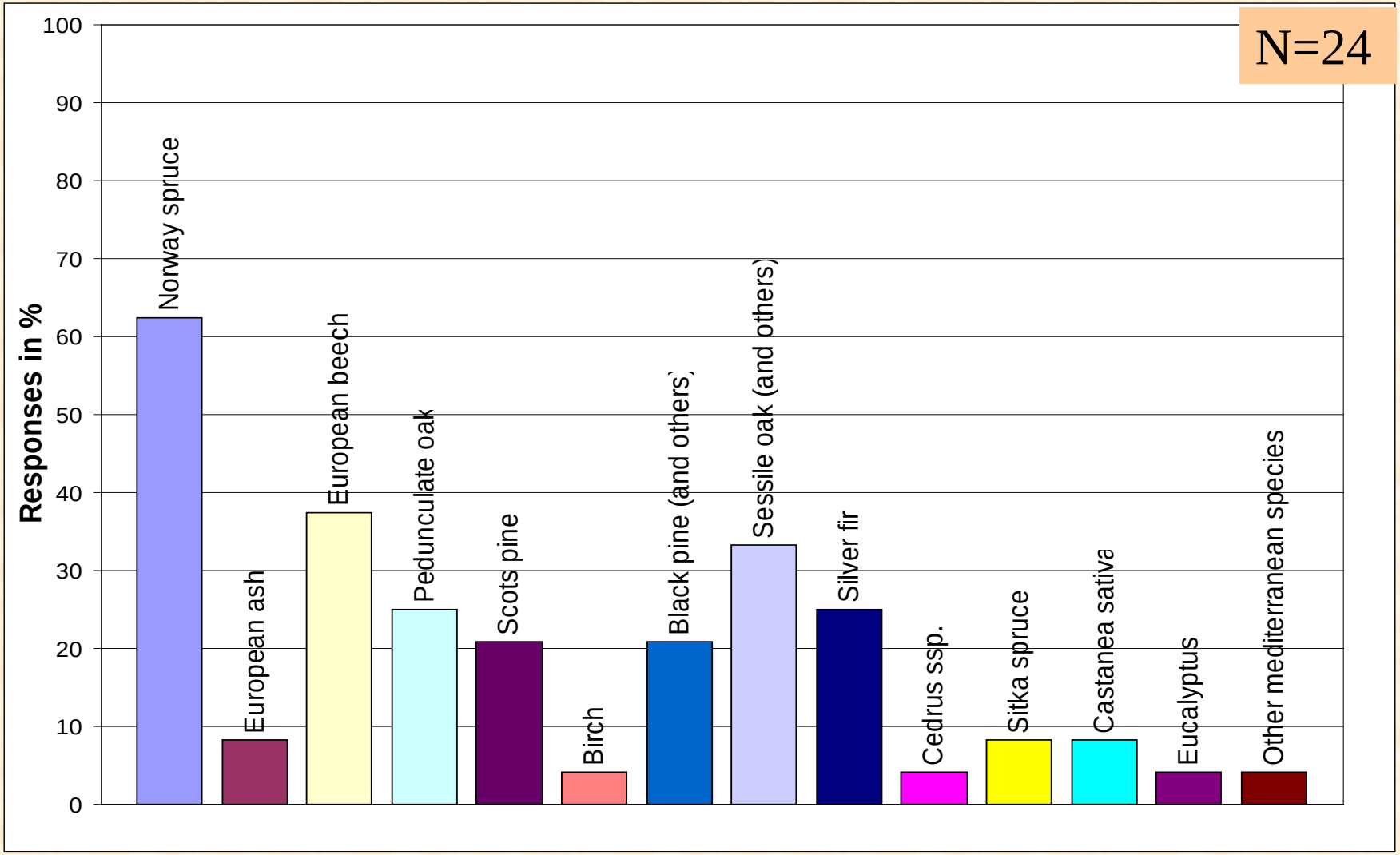

HNE Eberswalde
Hochschule für nachhaltige Entwicklung (FH)

# Q2: Description of impacts

- Example Germany

| Questions | *Impacts on productivity* | *Impacts on phenology* | *Impacts on vitality& mortality* |
|---|---|---|---|
| *2. Describe the associated (a) observed and (b) expected impact(s) on forests!*<br>*E.g. impacts on productivity, phenology, vitality & mortality, migrations/shifts.* | (a)<br>Temperature increases resulted in prolongation of growing seasons for major tree species (see: impacts on phenology) with positive impacts on **productivity** of German forests.<br><br>The 2003 summer drought negatively influenced forest productivity and vitality over several years, although this could not be substantiated for all species and in all studies. Wood formation in beech ceased for example, but, according to dendroecological studies, recovered quickly after the drought.<br><br>Increased Carbon sequestration is reported for the last decades, which was induced by environmental changes. | (a)<br>Historical phenological observations on bud burst and bud set (e.g. 1951-1999) reveal a pattern of increasing **growing season** lengths with 8 to 12 days for major tree species. | (a)<br>The devastating storm events like Lothar (1999) and Kyrill (2007) have caused an increased loss of standing wood volume in the last twenty years. It should be remarked that these storm damages were fuelled by historically high standing stocks (increasing the potential), and can therefore not be attributed to climatic changes only.<br><br>The 2003 summer drought was locally accompanied or directly followed by biotic disturbance regimes like pest outbreaks. Massive outbreaks of spruce bark beetle were observed. Increasing trends are observed for gypsy moth and oak processionary. |

# Q3: Impact tree species



# Q3: Most severely affected sites

- Example Finland:
  - Growth of major tree species is expected to increase, but…
  - High risk of Norway spruce decline, especially on sandy mineral soils with poor water holding capacity in southern Finland

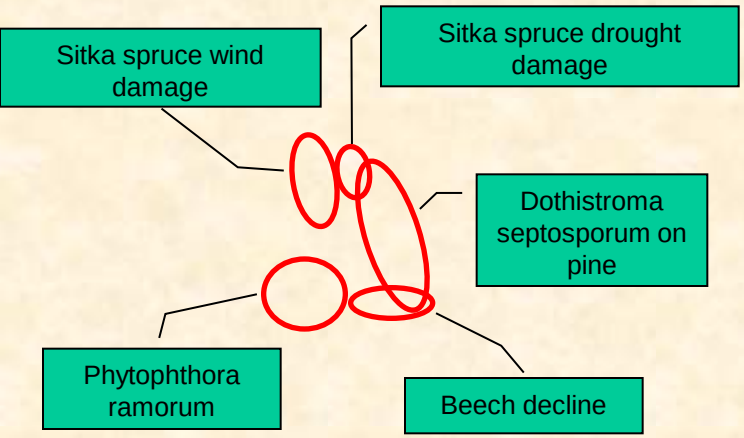
# Q3: Most severely affected sites

- Example Belgium:
  - Norway spruce, European beech and pedunculate oak all have a reduced vitality due to a.o. the dry summer of 2003
  - Most severely affected are trees on shallow and dry soils, particularly on south exposed sites

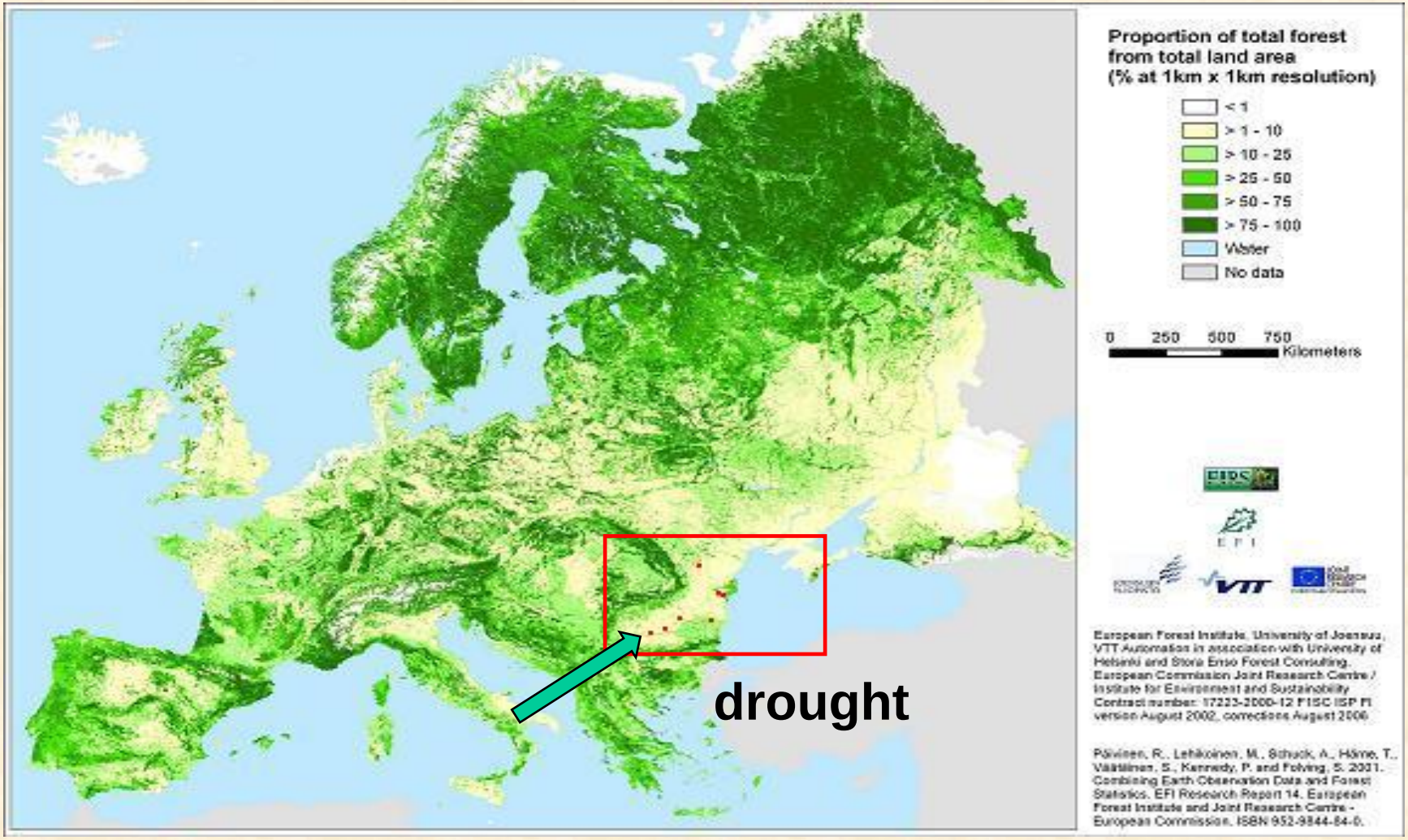
# Q3: Most severely affected sites

- Example Slovenia:
  - There is oak decline and dieback of European ash
  - Uneven-aged stands are found more stable against disturbances
  - The artificially widespread Norway spruce will be most vulnerable to insect outbreaks on sites with a high mineral content and sites outside its natural range

# Q4: Hotspots UK



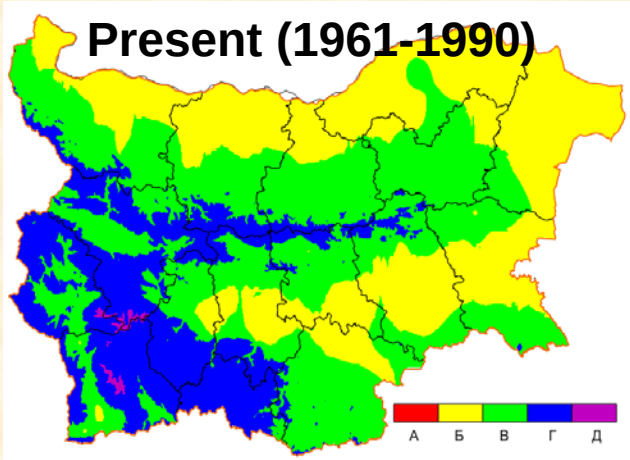
# Q4: Hotspots Romania

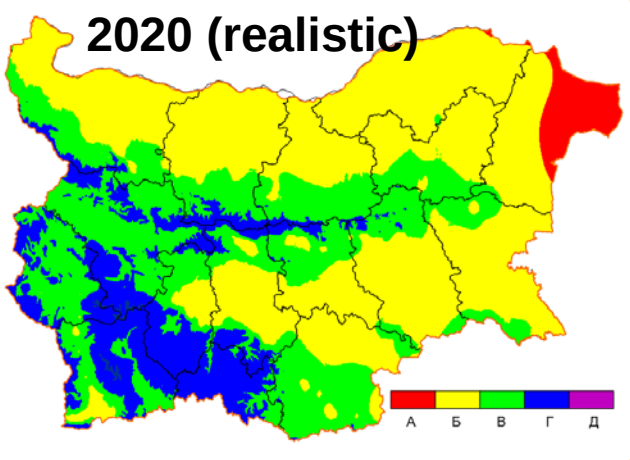


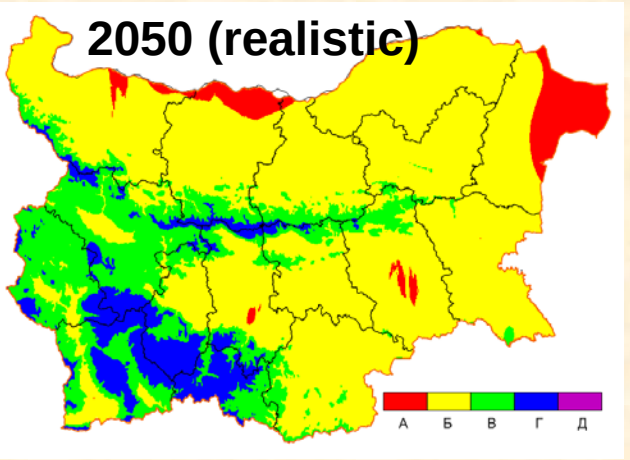


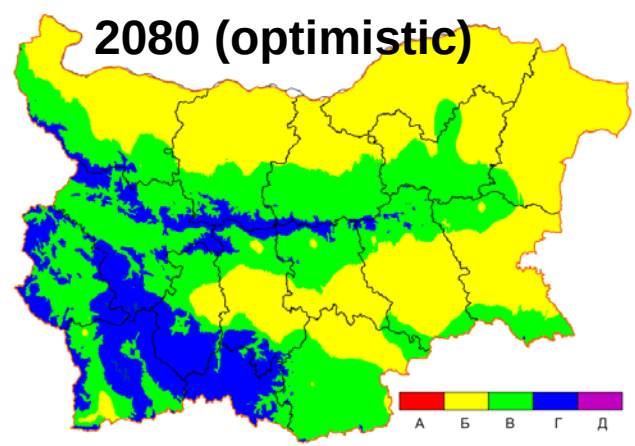

HNE Eberswalde
Hochschule für nachhaltige Entwicklung (FH)

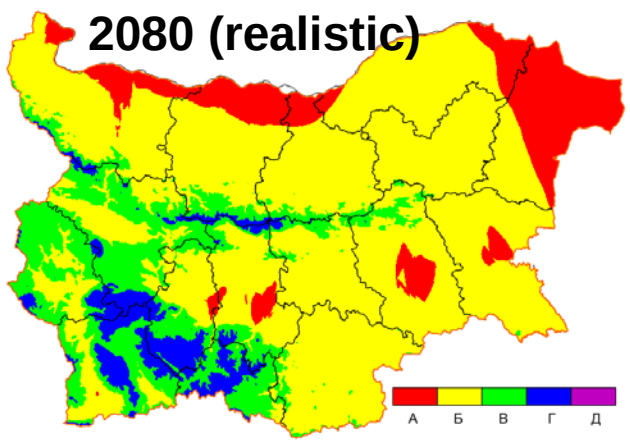
# Vulnerability scenario Bulgaria

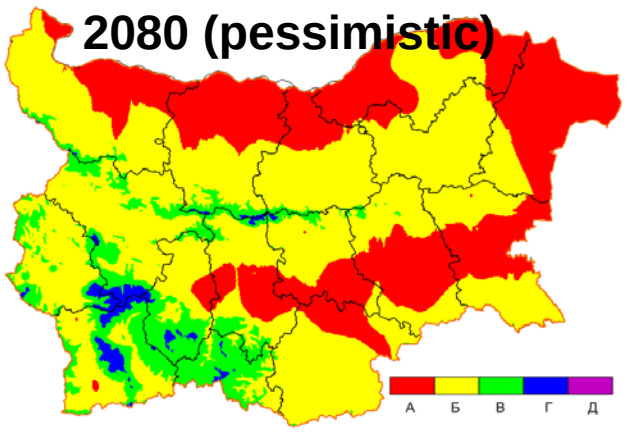


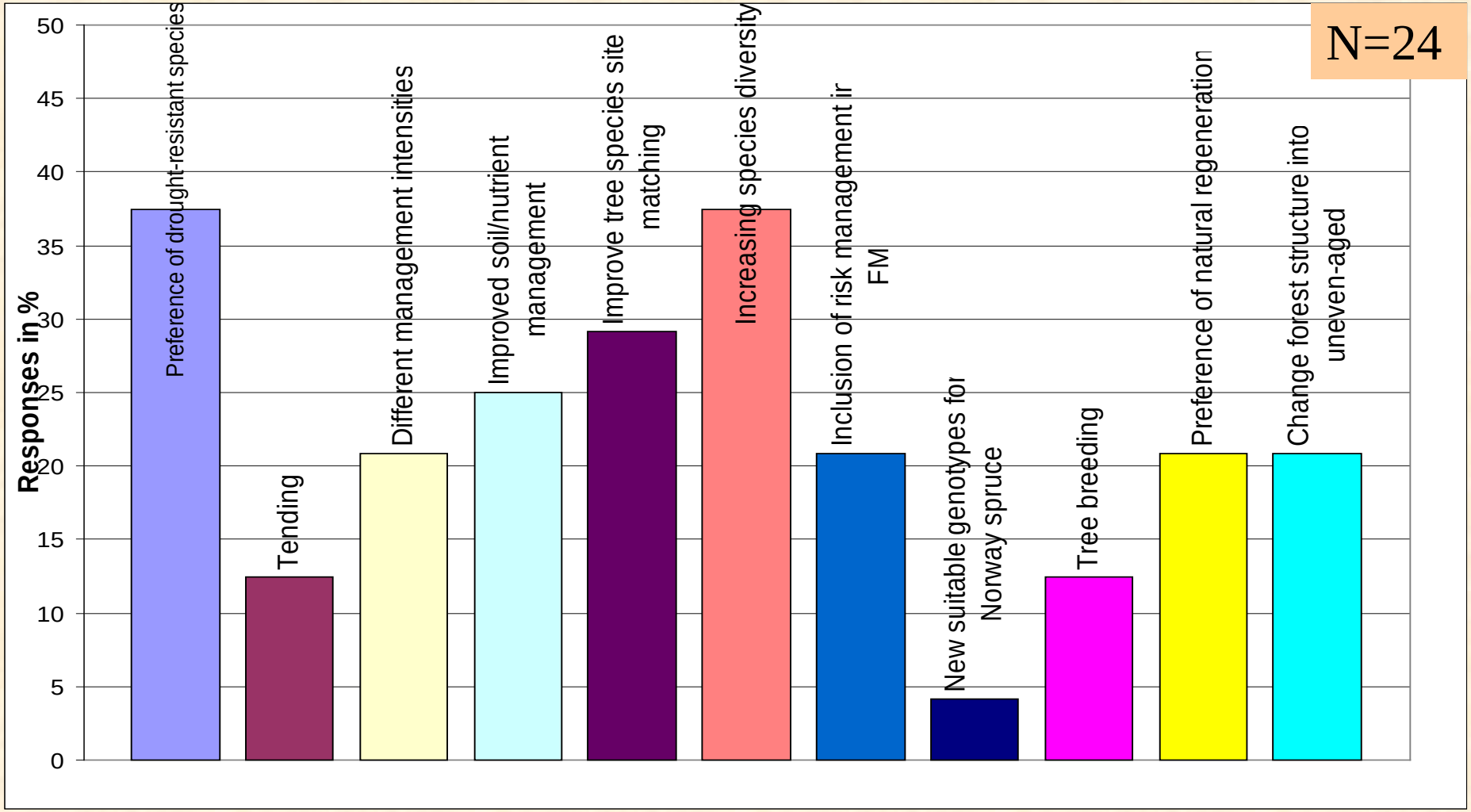




Zone А – very high vulnerability level, Zone Б – high vulnerability level, Zone В – average vulnerability level, Zone Г – low vulnerability level and Zone Д – very low vulnerability level



HNE Eberswalde
Hochschule für nachhaltige Entwicklung (FH)

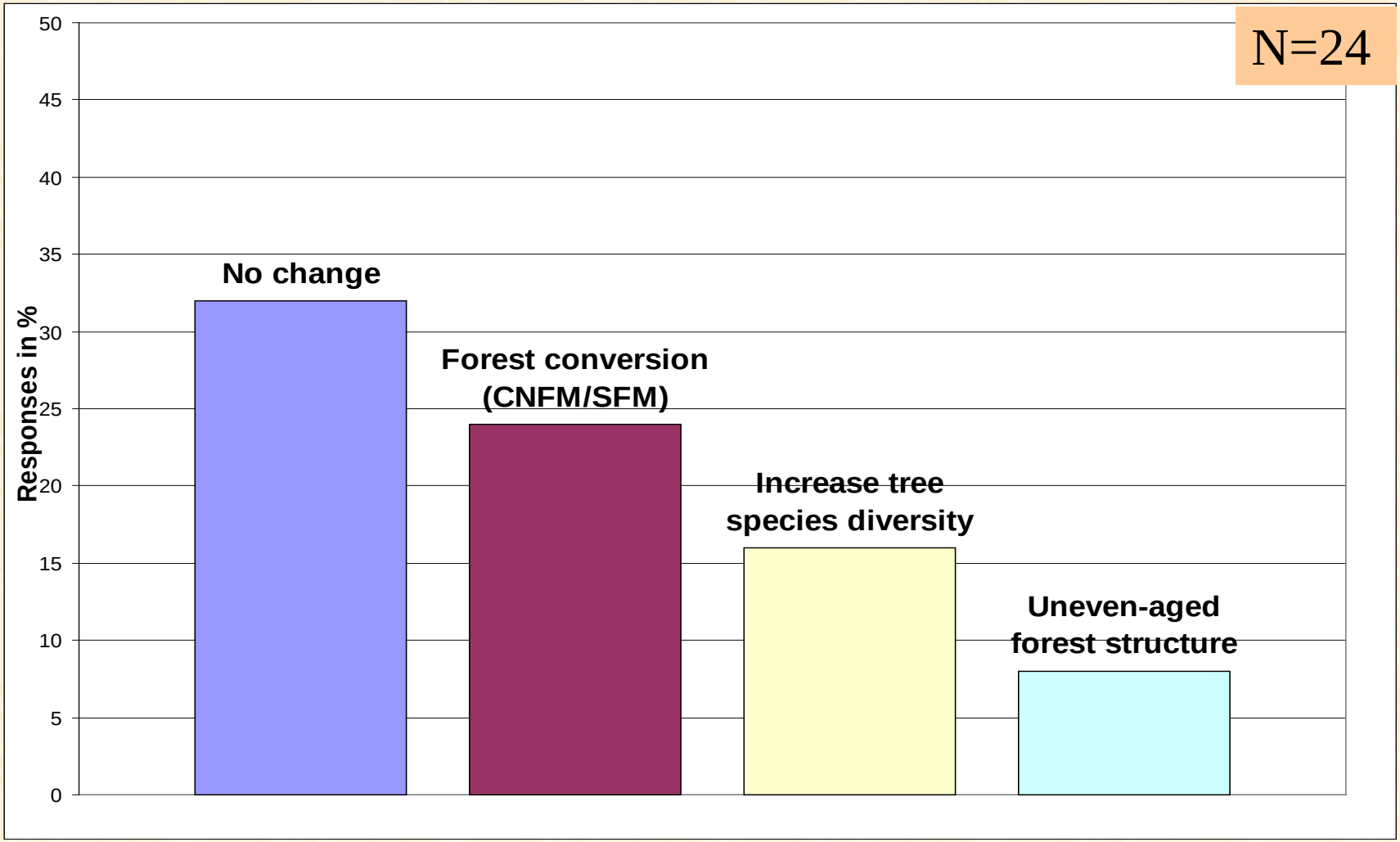
# Q5: Management to be changed (1/3)






HNE Eberswalde
Hochschule für nachhaltige Entwicklung (FH)

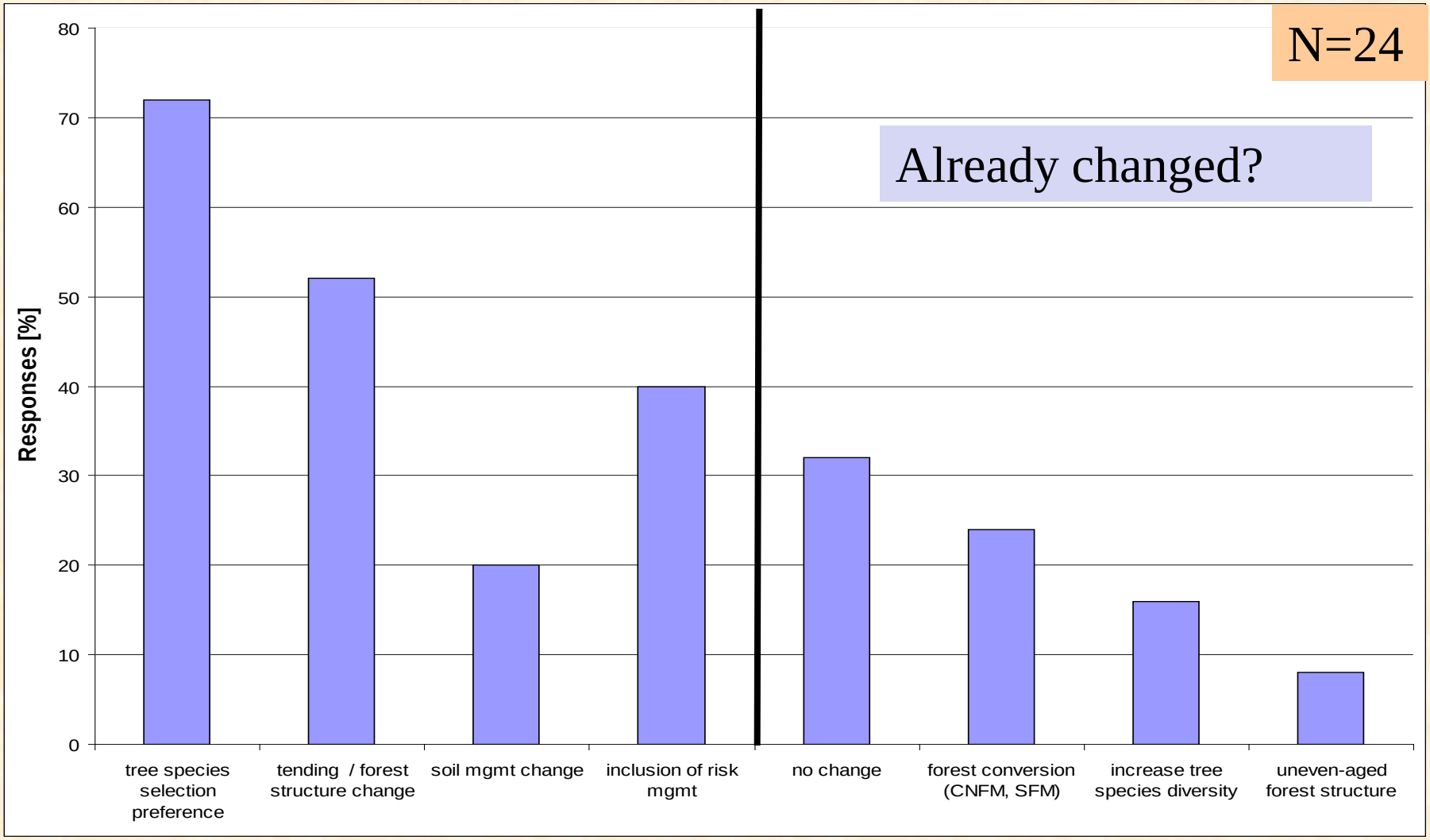
# Q5: Management to be changed (2/3)






HNE Eberswalde
Hochschule für nachhaltige Entwicklung (FH)

# Q5: Management to be changed (3/3)



# Conclusions

- Drought and temperature increase / precipitation regime change are the most important CC IF
- Increasing growth expectation in some countries, but likely compensation by higher hazard and pest risk
- Norway spruce = most severely affected tree species (> 60 %); less evidence with broadleaves (oak, beech, …)

# Conclusions

- Sites with soil moisture restrictions or other extreme traits most severely affected
- Tree species selection and the resp. preferences and tending changes is seen to be the most important field of future management changes in the face of CC
- Different intensity of hotspots identification