
SLU
SCIENCE AND EDUCATION FOR SUSTAINABLE LIFE

Experiences from the Gudrun storm in Sweden and opportunities for evidence-based communications on climate change and forests

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The Vaia storm: taking stock and looking ahead, Padova, Italy, 30 October 2019


Storm ’Gudrun’
8 January 2005
75 Mm³
Foto: Kristina Blennow

Damage per tree species

Norway spruce

approx. 80% (49% of the total stocking in Götaland before the storm)

Scots pine

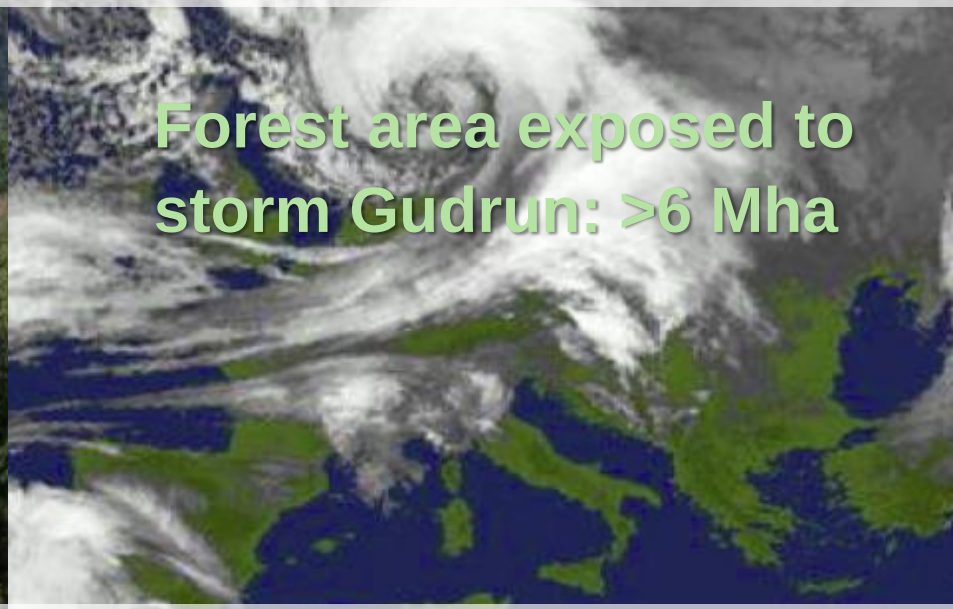
18% (29% of the total stocking in Götaland before the storm)

Skogsstyrelsen (2006) Stormen 2005: en skoglig analys. Meddelande No. 1 Skogsstyrelsen, Jönköping. ISSN 1100-0295

Storm Gudrun (8 Januari 2005)

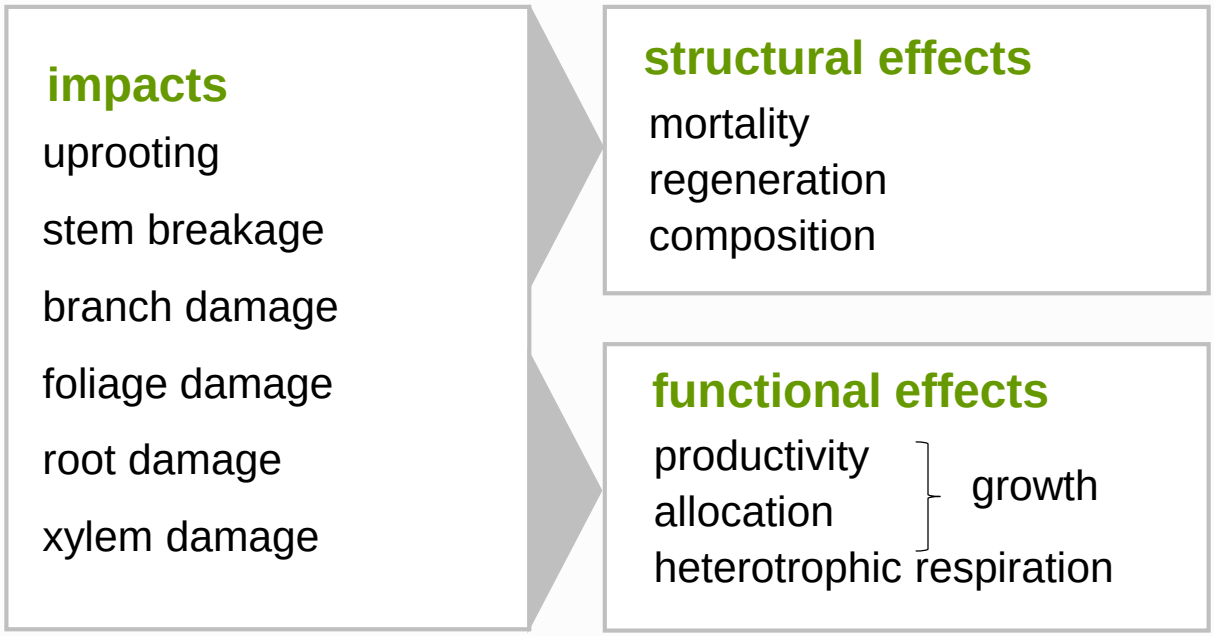
Effects on ecosystem structure

Effects on ecosystem function

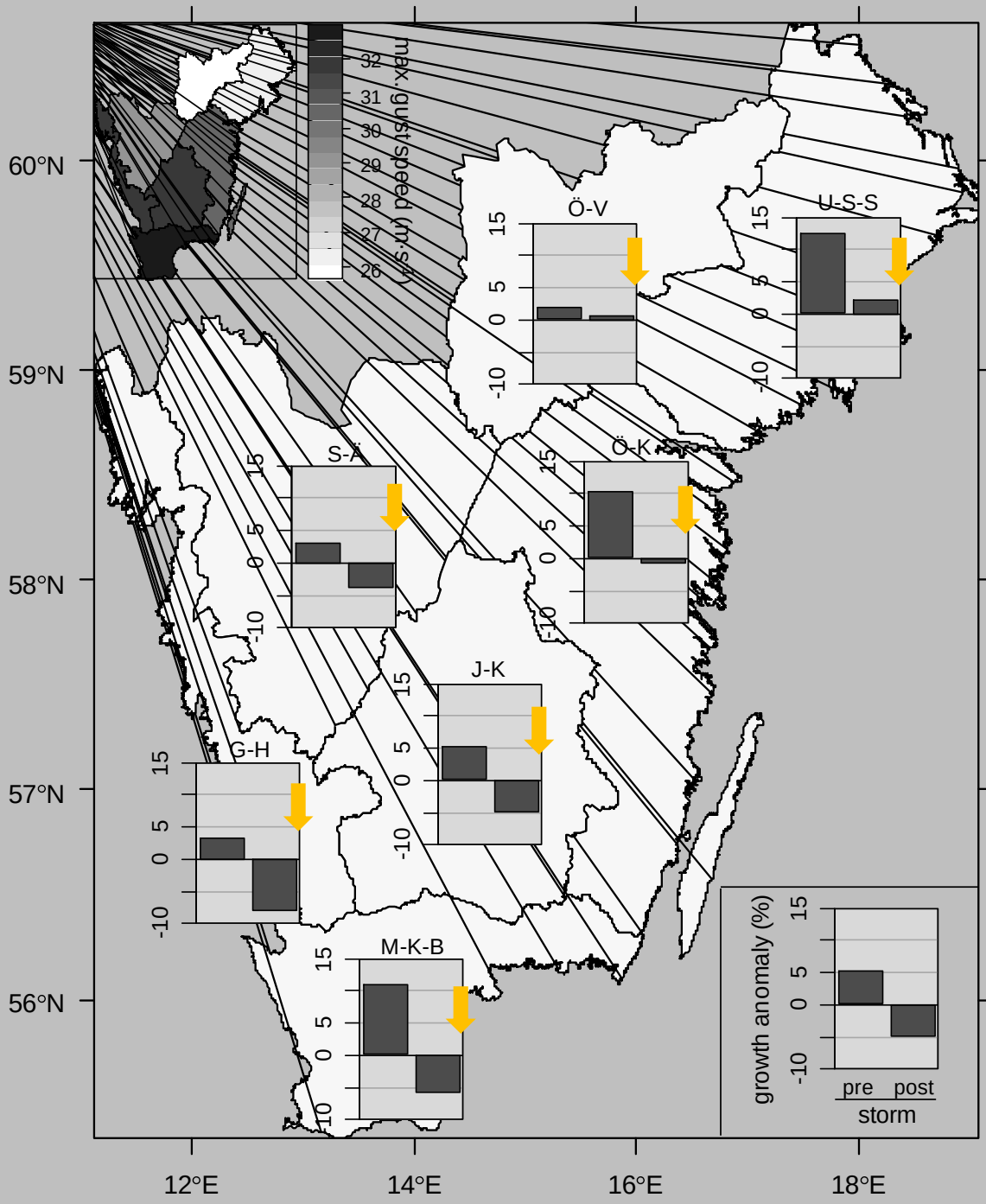


Skogsstyrelsen (2006) Stormen 2005: en skoglig analys. Meddelande No. 1 Skogsstyrelsen, Jönköping. ISSN 1100-0295
Valinger and Fridman (2011) Factors affecting the probability of windthrow at stand level as a result of Gudrun winter storm in southern Sweden. Forest Ecology and Management, 262:398-403.

Forest effects of exposure to strong wind



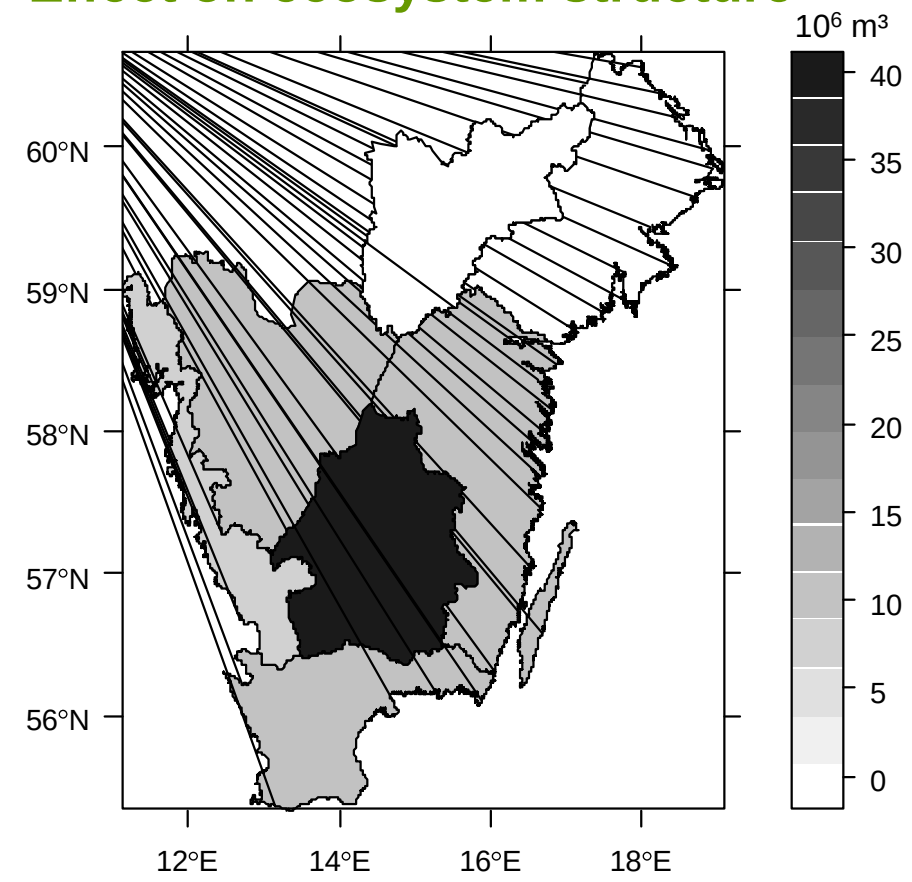
Seidl R & Blennow K 2012 Pervasive Growth Reduction in Norway Spruce Forests Following Wind Disturbance. PLoS ONE , 7(3):1-8 http://dx.plos.org/10.1371/journal.pone.0033301



Seidl R & Blennow K 2012 Pervasive Growth Reduction in Norway Spruce Forests Following Wind Disturbance. PLoS ONE , 7(3):1-8 http://dx.plos.org/10.1371/journal.pone.0033301

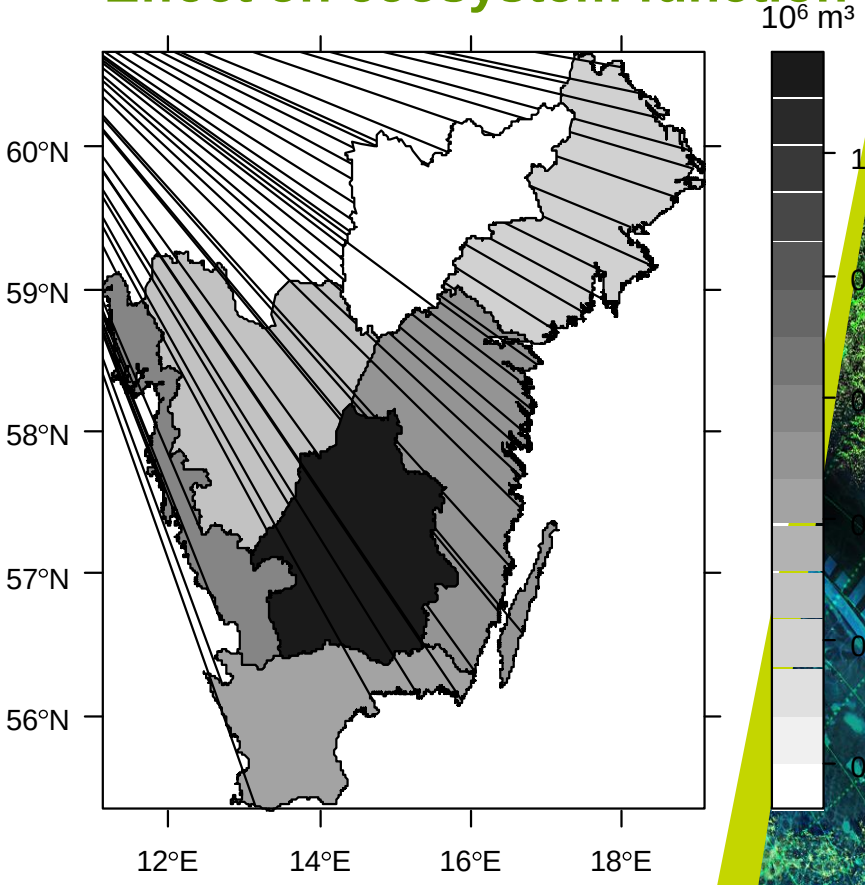
Upscaling

Effect on ecosystem structure



Total: 75 Mm³
(all tree species)

Effect on ecosystem function



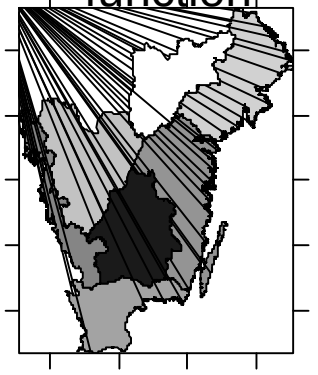
Total: 3.0 Mm³
(*P. abies*, 3 first yrs following the storm)

Seidl R & Blennow K 2012 Pervasive Growth Reduction in Norway Spruce Forests Following Wind Disturbance. PLoS ONE , 7(3):1-8 http://dx.plos.org/10.1371/journal.pone.0033301

Spruce bark beetle damage

– In Sweden after the Gudrun storm (2005-2007): **3.6 Mm³**

Gudrun effect on ecosystem function



3.0 Mm³

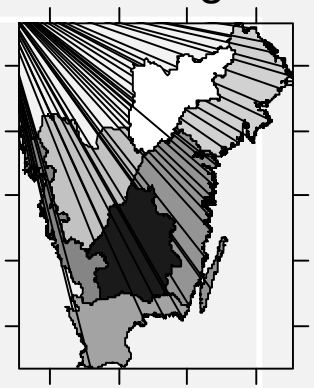
Seidl R & Blennow K 2012 Pervasive Growth Reduction in Norway Spruce Forests Following Wind Disturbance. PLoS ONE , 7(3):1-8 http://dx.plos.org/10.1371/journal.pone.0033301

Possible link to spruce bark beetle damage

- Vitality (and thereby growth) has been identified as an indicator of resistance
- Reduced vitiality (by eg. root damages) can facilitate infestation from spruce bark beetle

se Christiansen et al. (1987)

Gudrun funct. damage

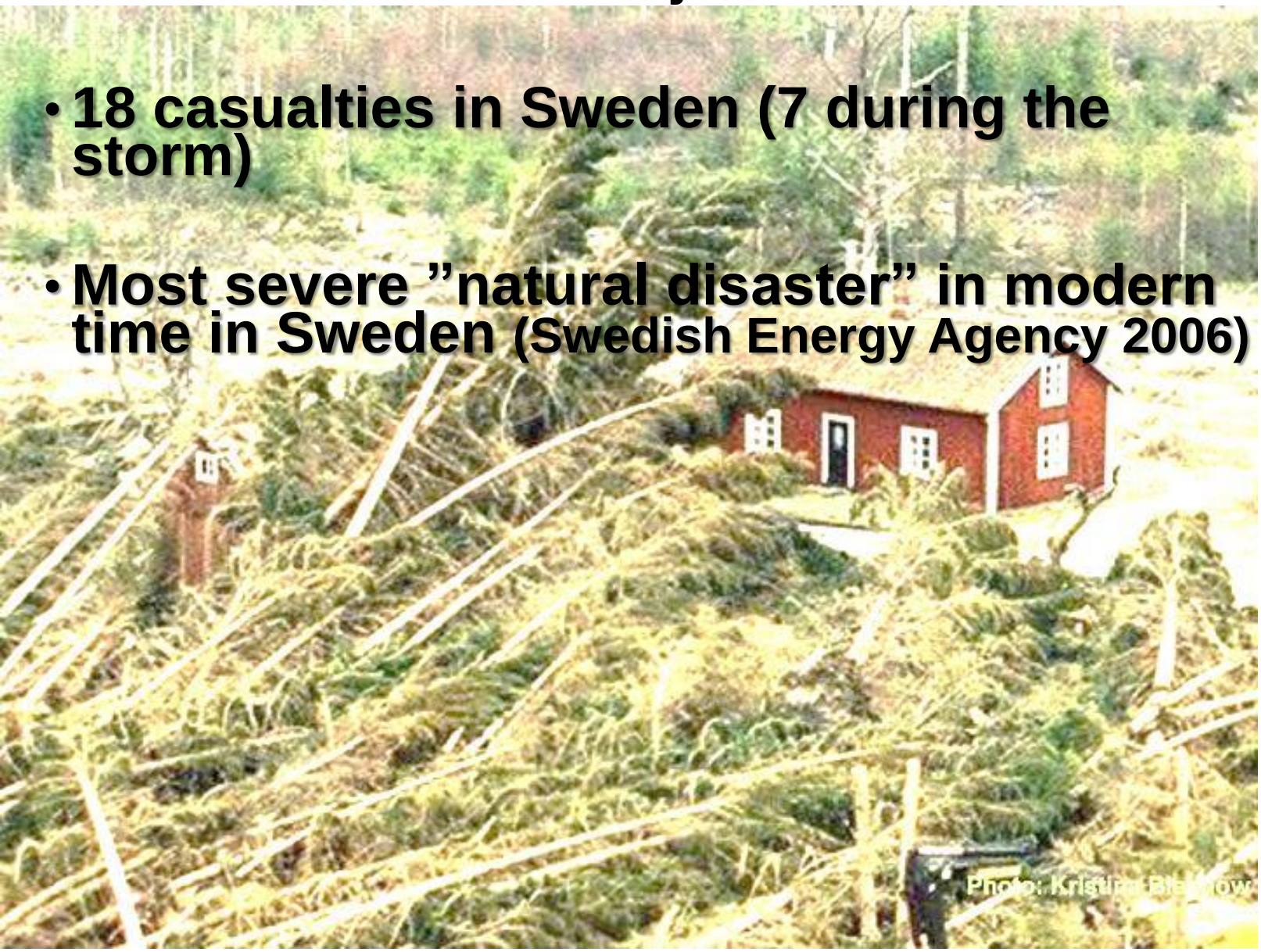


3.0 Mill. m^3

Seidl R & Blennow K 2012 Pervasive Growth Reduction in Norway Spruce Forests Following Wind Disturbance. PLoS ONE , 7(3):1-8 http://dx.plos.org/10.1371/journal.pone.0033301

Storm Gudrun 8 januari 2005

- 18 casualties in Sweden (7 during the storm)
- Most severe ”natural disaster” in modern time in Sweden (Swedish Energy Agency 2006)



Extremely dangerous work to clear the damaged forest

Work accidents after storm Gudrun on January 8 during year 2005

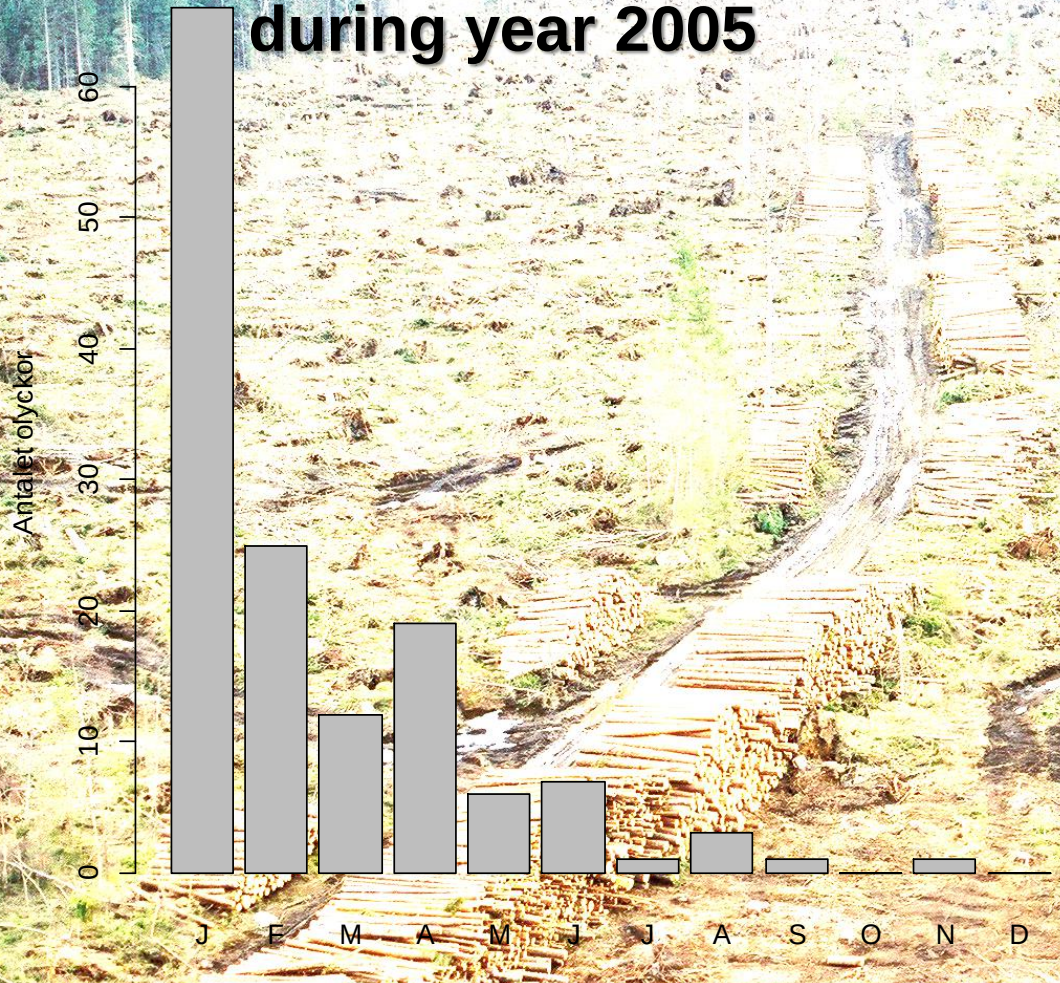


Photo: Kristina Blennow

Roads and railways

- Main roads were cleared during the first day
- Some roads remained uncleared 6 months after the storm
- Very high pressure on the roads
- Trains back to normal after 34 days

www.krisberedskapsmyndigheten.se

Power and telecommunications

- 730 000 subscribers without power (after 21 days still 12 600 subscribers without power)
- 300 000 subscribers in ground based tele-com affected, often for more than 2 months

www.fmv.se

Civil contingencies services at its very limit after the storm Gudrun

Had the weather after the storm not been favourable the consequences would have been much worse

www.krisberedskapsmyndigheten.se

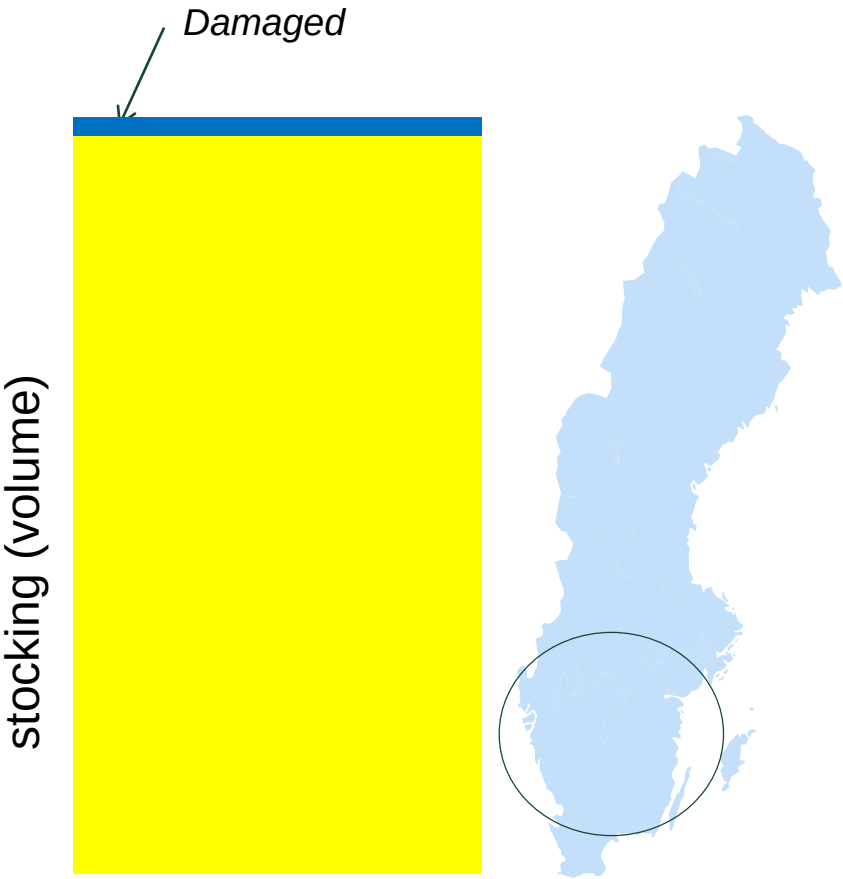
Economic loss

Sector	Amount applied for (MEuro)
Forestry	1 580
Power companies	175
Agriculture	75
Municipalities	30
Railway company	18
Road	18

Who is vulnerable?

What values are at stake?

The distribution of risk



Blennow K & Persson E (2013) Societal Impacts of Storm Damage in Living with storm damage (eds. Gardiner et al.) EFI.
Blennow K, Persson J, Wallin A, Vareman N, Persson E (2014) Understanding risk in forest ecosystem services: implications for effective risk management, communication and planning. Forestry, 87:219-228

Before the storm private forest owners said:

- Storm damage is one of the worst risk factors from an economic perspective

- Among the threats I would be prepared to pay (time/money) the most to reduce

Blennow, K., 2008. Risk management in Swedish forestry – policy formation and fulfilment of goals. *Journal of Risk Research*, 11(1–2):237–254

Self-reported rate of activity to reduce the risk of wind damage among south Swedish forest owners

Year	Yes (%)	n
1999	33	149
2004	29	361
2005 after ”Gudrun”	33	721
2005 planned after ”Gudrun”	56	698

40% had bought insurance

Blennow, K., 2008. Risk management in Swedish forestry – policy formation and fulfilment of goals. *Journal of Risk Research*, 11(1–2):237–254

6 months before the storm Gudrun:

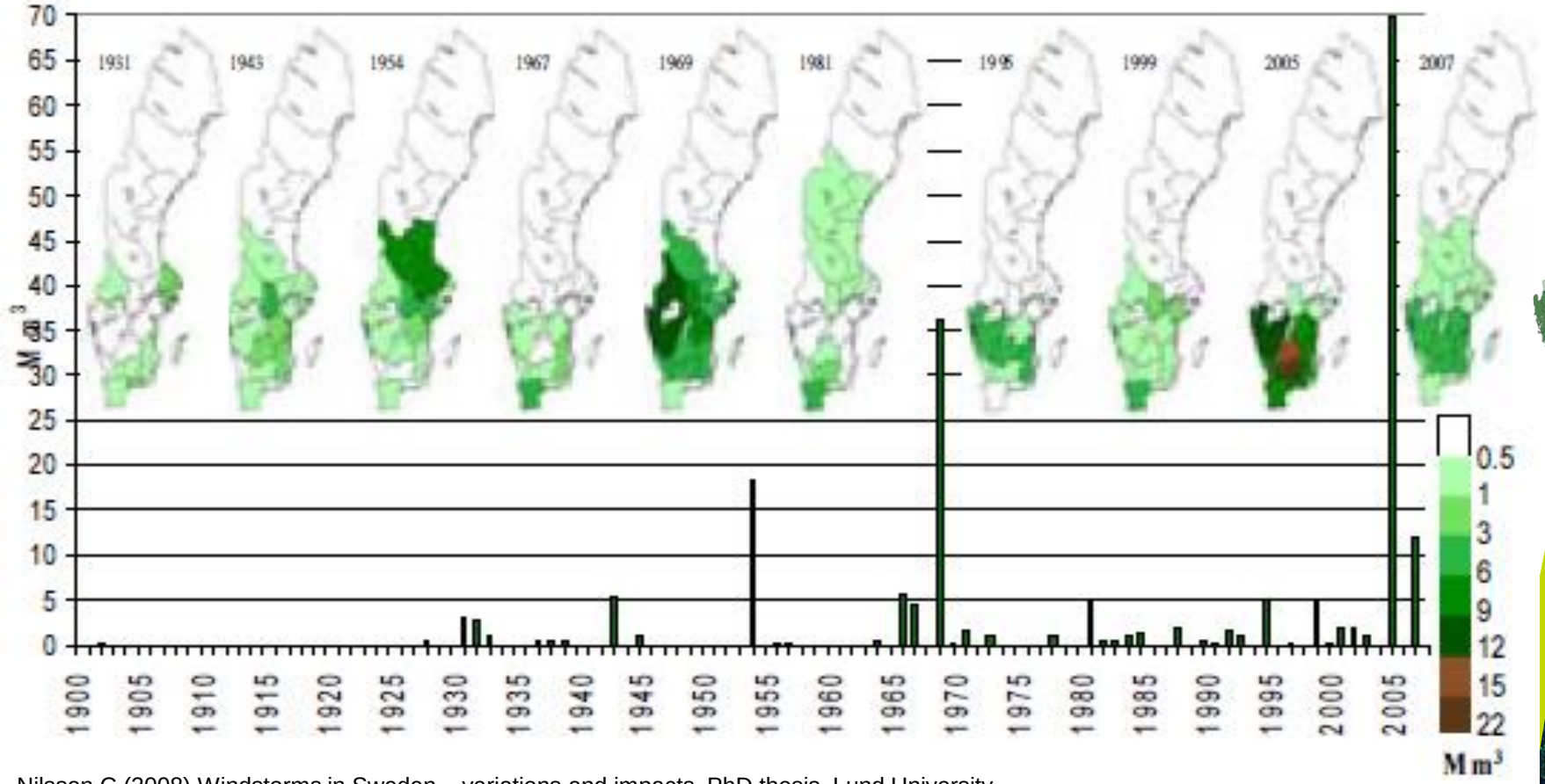
What would you do if your spruce forest was severely damaged by wind?

Answer	Fraction (%) (n=380)
Plant Norway spruce again	83
Convert to deciduous tree species	14
Convert to other conifer tree species	4
Other alternative	12

Blennow, K., 2008. Risk management in Swedish forestry – policy formation and fulfilment of goals. *Journal of Risk Research*, 11(1–2):237–254

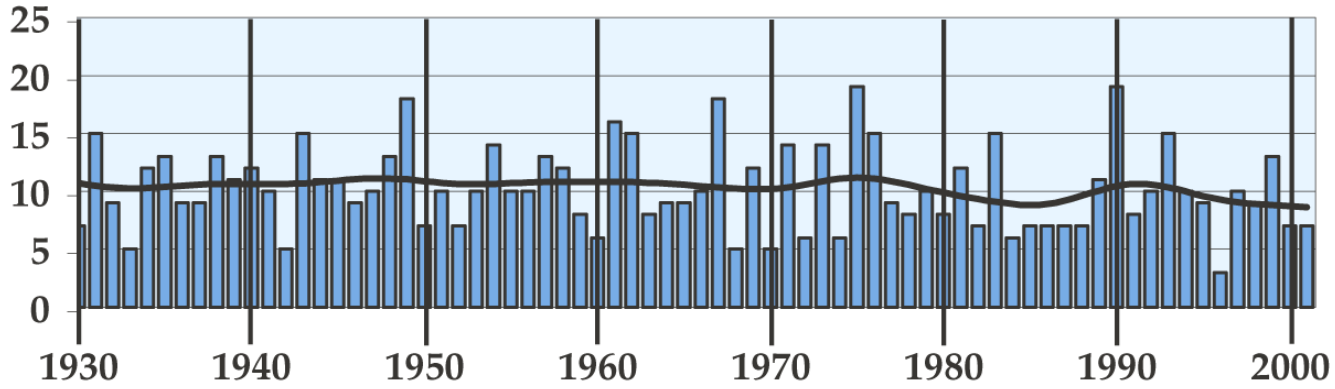
237–254

Wind damage in Sweden



Nilsson C (2008) Windstorms in Sweden – variations and impacts. PhD thesis, Lund University.

Number of storms per year



Alexandersson H and Vedin H (2002) Stormar det mera nu? SMHI Väder och Vatten, 10:18. (In Swedish)

The forest is more sensitive to wind

Photo: Kristina Blennow

It is possible to modulate the sensitivity

Blennow, K. & Olofsson, E., 2004. Kan man undvika stormskador? In K. Blennow (ed.). Osäkerhet och aktiv riskhantering – aspekter på osäkerhet och risk i sydsvenskt skogsbruk. ISBN 91-576-6643-1 SUFOR www.sufor.nu 96 pages. pp. 38–43. (IN Swedish)

How to communicate adequately in democratic landscape management and planning?

Was Gudrun a consequence of climate change?


Wikimedia: Public domain

Did he take measures to adapt to climate change?

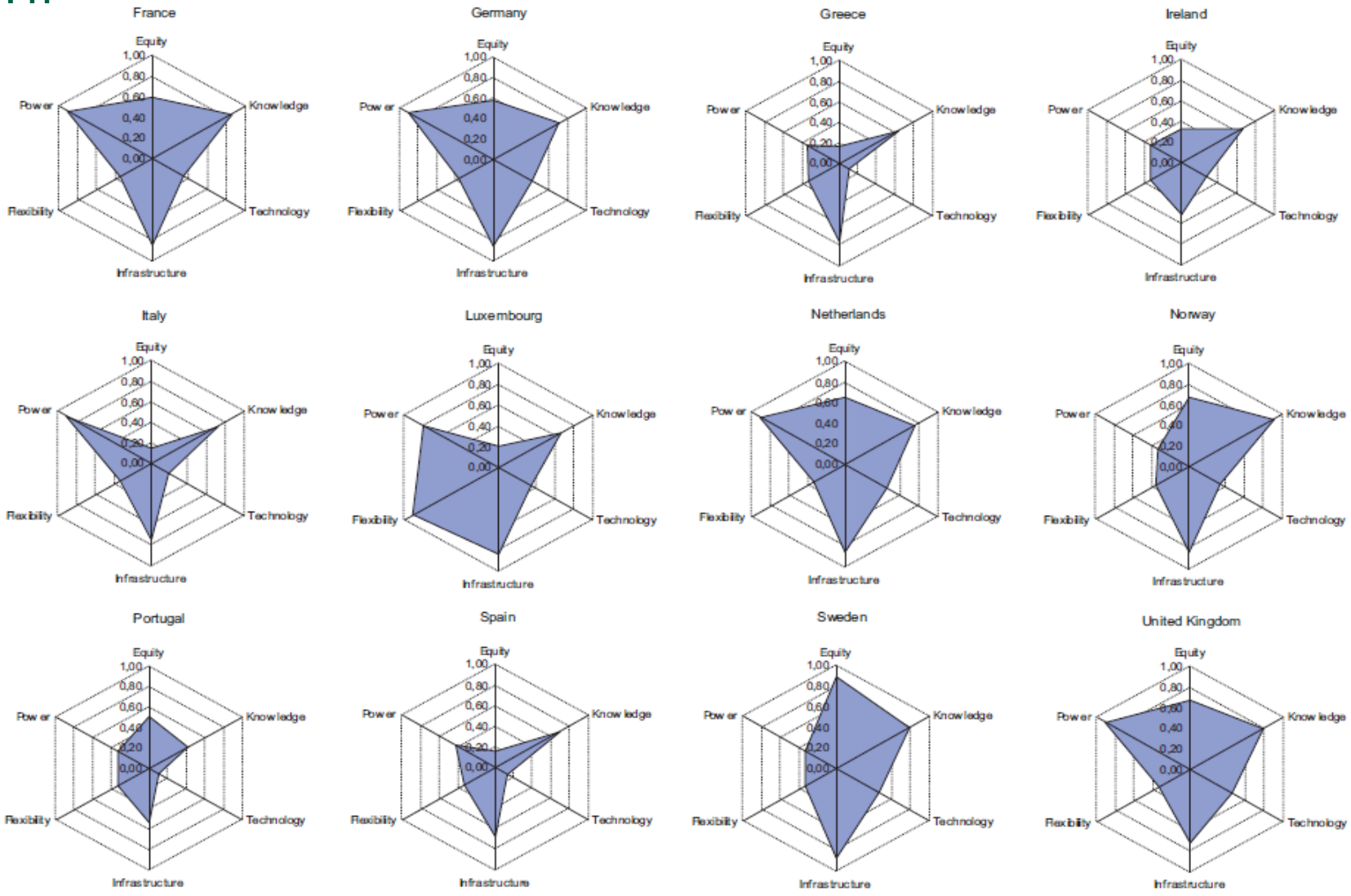
The adaptive capacity in this study is seen as the inherent adaptive capacity of trees and forest ecosystems and of socio-economic factors determining the capability to implement planned adaptation.

According to Lindner et al. (2010):

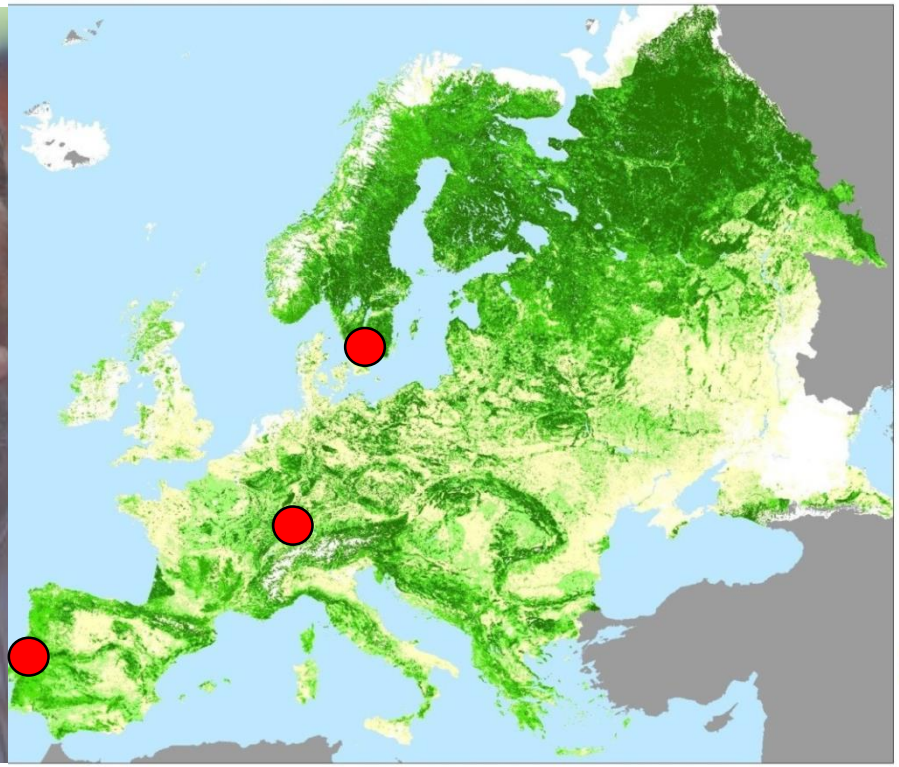
The adaptive capacity in the forest sector is

- relatively large in the Boreal and the Temperate Oceanic regions
- more constrained by socio-economic factors in the Temperate Continental, and
- most limited in the Mediterranean region where large forest areas are only extensively managed or unmanaged.

Lindner, M., Maroschek, M., Netherer, S., Kremer, A., Barbati, A., Garcia-Gonzalo, J., Seidl, R., Delzon, S., Corona, P., Kolström, M., Lexer, M.J., & Marchetti, M. (2010) Climate change impacts, adaptive capacity, and vulnerability of European forest ecosystems. Forest Ecology and Management ,259:698–709.



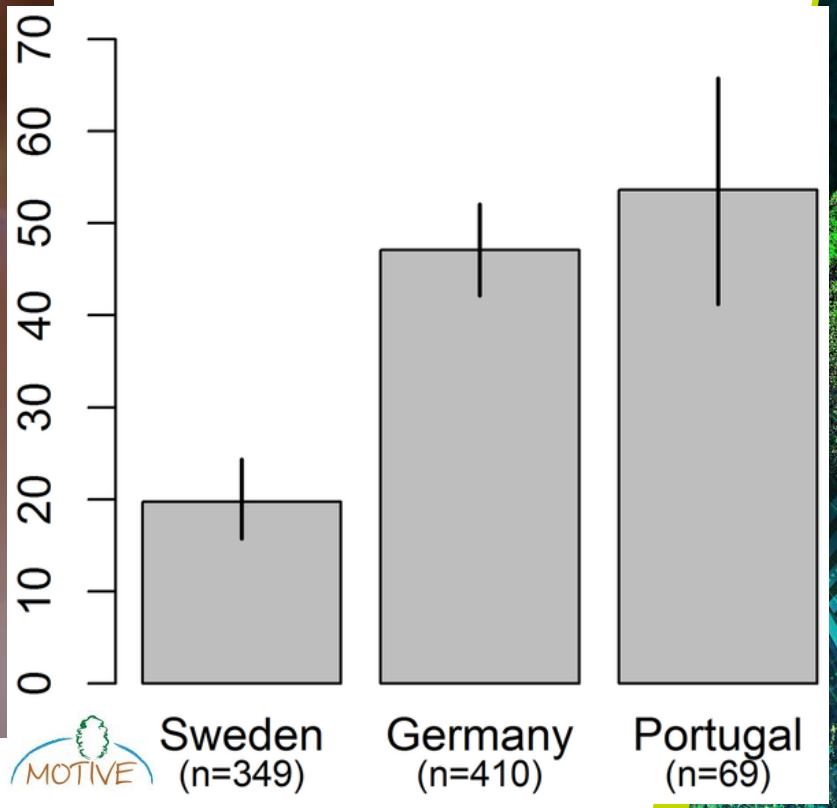
Acosta et al. (2013) A spatially explicit scenario-driven model of adaptive capacity to global change in Europe. Glob. Env. Change, 23:1211-1224.



MOTIVE

Blennow K, Persson J, Tomé M, Hanewinkel M (2012) Climate Change: Believing and Seeing Implies Adapting. PLoS ONE 7(11): e50182. doi:10.1371/journal.pone.0050182 http://www.plosone.org/article/info:doi/10.1371/journal.pone.0050182

Percentage of respondents having adapted forest management to climate change



Blennow K, Persson J, Tomé M, Hanewinkel M (2012) Climate Change: Believing and Seeing Implies Adapting. PLoS ONE 7(11): e50182. doi:10.1371/journal.pone.0050182 http://www.plosone.org/article/info:doi/10.1371/journal.pone.0050182

Personal factors – Crucial for explaining and predicting forest management decisions!

- Strength of belief in local effects of climate change
- Strength of belief in having experienced the effects of climate change

Blennow K, Persson J, Tomé M, Hanewinkel M (2012) Climate Change: Believing and Seeing Implies Adapting. PLoS ONE 7(11): e50182. doi:10.1371/journal.pone.0050182 http://www.plosone.org/article/info:doi/10.1371/journal.pone.0050182

Adequate communications – communications that can be comprehended, accessed and that meet the needs of the receiver

Fischhoff et al. (2011) Communicating Risks and Benefits: An Evidence-Based User's Guide. US Food and Drug Admin.

Adequate communications – communications that can be comprehended, accessed and that meet the needs of the receiver

What for?

- Boost adaptive capacity of the decision-making agents
- Provide for flexible decision-making which is crucial for successful decision-making in a changing world
- Help to design effective climate change policies in addition to communications
- Contribute to sustainable and democratic development of the society

Blennow K, Persson J, Wallin A, Vareman N, Persson E (2014) Understanding risk in forest ecosystem services: implications for effective risk management, communication and planning. *Forestry*, 87:219-228

How can we help experts to communicate adequately?


Wikimedia: Public domain

Integrate knowledge on individuals' understanding and perception of the effects on and what works in the local environment AND evidence-based communications

Blennow K, Persson J, Tomé M, Hanewinkel M (2012) Climate Change: Believing and Seeing Implies Adapting. PLoS ONE 7(11): e50182 doi:10.1371/journal.pone.0050182 http://www.plosone.org/article/info:doi/10.1371/journal.pone.0050182

Science and proven experience
”Vetenskap och beprövad erfarenhet” (old Swedish concept)

- Important addition to evidence based communication

Persson J, Vareman N, Wallin A et al. (2017) Science and proven experience: a Swedish variety of evidence based medicine and a way to better risk analysis? *J Risk Res*: 1-11.

What about values, then?

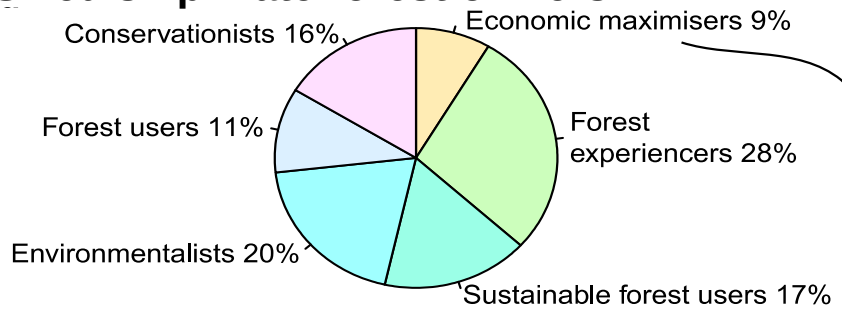
When forest owners believe in and see the effects of climate change they are more likely to take measures to adapt to climate change

Blennow K, Persson J, Tomé M, Hanewinkel M (2012) Climate Change: Believing and Seeing Implies Adapting. PLoS ONE 7(11): e50182. doi:10.1371/journal.pone.0050182 http://www.plosone.org/article/info:doi/10.1371/journal.pone.0050182

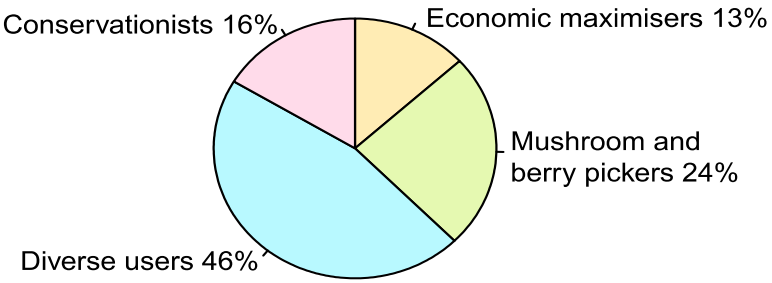
Values uncorrelated to believing and seeing climate change!

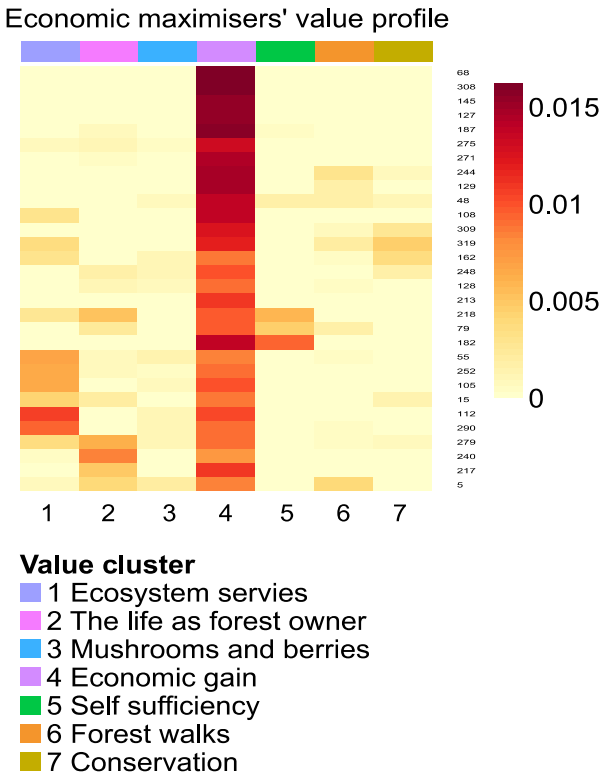
What about values?

Swedish private forest owners



German private forest owners



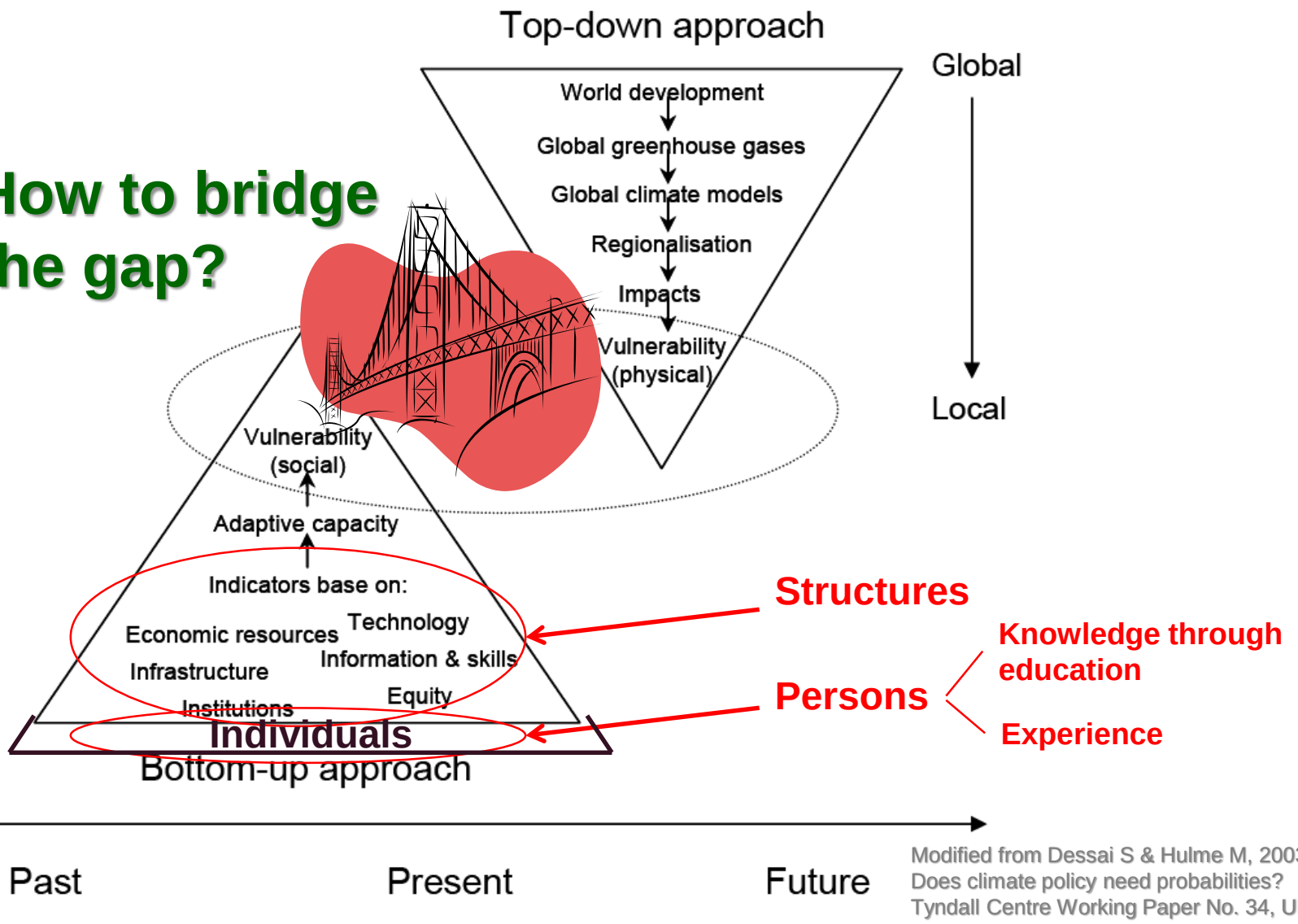


Blennow K, Persson J, Persson E, Hanewinkel M (2016) Forest Owners' Response to Climate Change: University Education Trumps Value Profile. *PLOS ONE*, 11(5): e0155137. doi: http://dx.doi.org/10.1371/journal.pone.0155137

COST Action
Towards robust projections of European forests under climate change (PROFOUND)

Johannes Persson, Kristina Blennow, Luisa M.S. Gonçalves, Alexander Borys, Ioan Dutca, Jari Hynynen, Emilia Janeczko, Mariyana Lyubenova, Simon Martel, Jan Merganic, Katarina Merganicova, Mikko Peltoniemi, Michal Petr, Fernando Reboredo, Giorgio Vacchiano, Christopher P.O. Reyer

How to bridge the gap?



Modified from Dessai S & Hulme M, 2003
Does climate policy need probabilities?
Tyndall Centre Working Paper No. 34, UK

Adaptive capacity – personal motivation to take measure to adapt is often not taken into consideration

Landscape approach
- individuals' oriented approach
to sustainable land-use management and planning

When forest owners believe in and see the effects of climate change they are more likely to take measures to adapt to climate change

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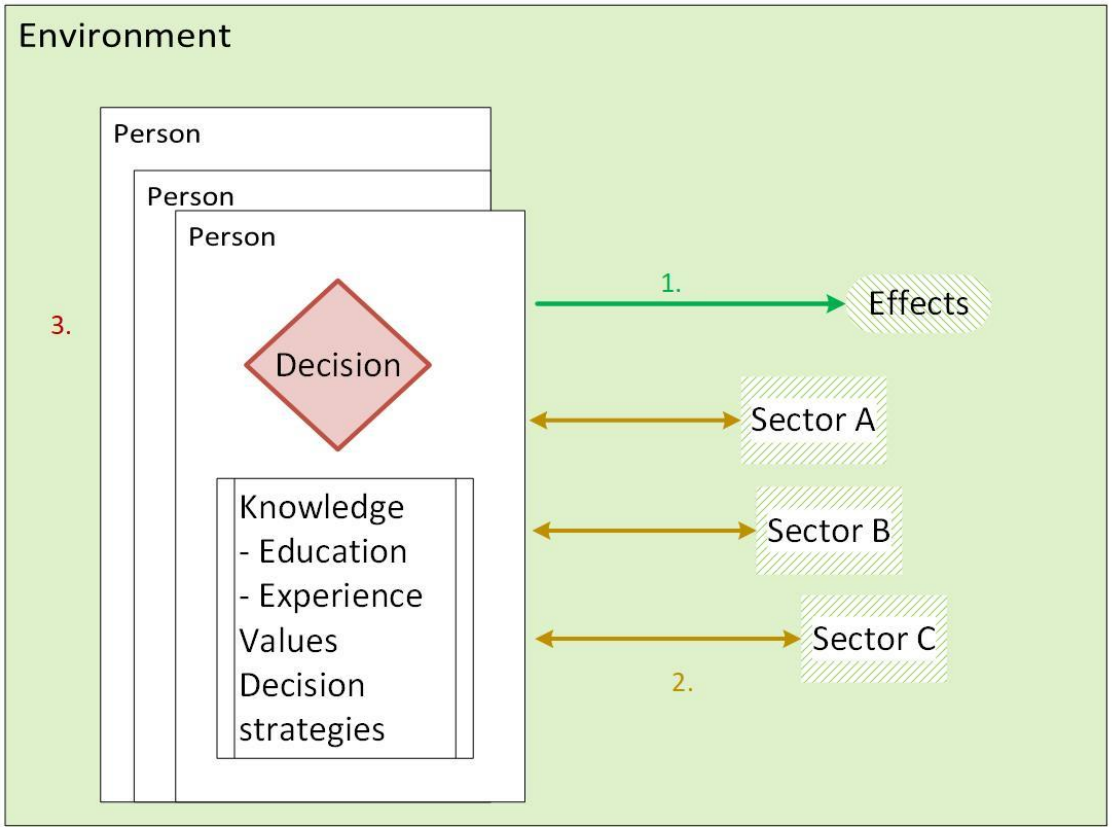
LANDSCAPE APPROACH
- individuals' oriented approach
to sustainable land-use management and planning



1. Classical environmental science

2. Natural resource science and technology

3. Democratic Landscape management and planning

In conclusion

Communication in a landscape approach (seen as an individuals' oriented approach) provides

people with facts in a credible, comprehensive form, and judges the decisions by the decision making agents' own goals to allow the decision-making agents to gain control over themselves and their environment

opportunities for reducing environmental problems with flexible decision-making while concurrently strengthening democracy and thereby contributing to sustainable development in multiple ways.

From Data to Decisions

Sensible Decisions in the Landscape

Guidelines for the adequacy of communications

Risk analysis

Data and Scientific findings

Thank you!

Experiences from the Gudrun storm in Sweden and opportunities for evidence-based communications on climate change and forests

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