Forest Storm Damage and Insurance Losses

A Decision Support System

Presentation Outline

- Introduction – CoreLogic®
- RQE® - EuroWind™
- Insurance Industry & Forestry
- Forest Module
  - Model components
  - Validation
  - Scenario
    - Single plot - monoculture
    - Single plot - mixed culture
    - Multiple plots
    - Market Portfolio Study
- Conclusion
- Q/A

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Introduction

CoreLogic®

- Flood unit serves 16 of the 20 top firms in the U.S.
- Integrated provider of credit reports to over 50 auto dealership systems
- Integrated to most mortgage loan origination systems
- Tax Services partners with 17 of 20 largest mortgage servicers
- Approximately 70% of U.S. real estate agents access CoreLogic data
- Government Sponsored Enterprises and Federal Financial Regulators
- 80 years of ITV data

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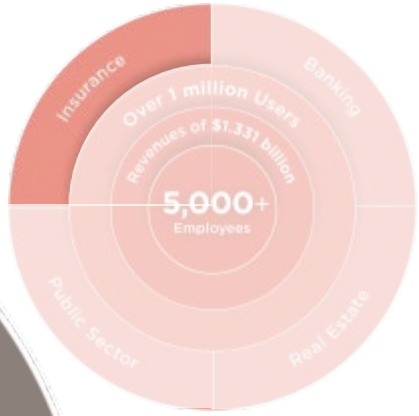
Introduction

Insurance

Hail Scope™

RiskMeter Online™

RQE®



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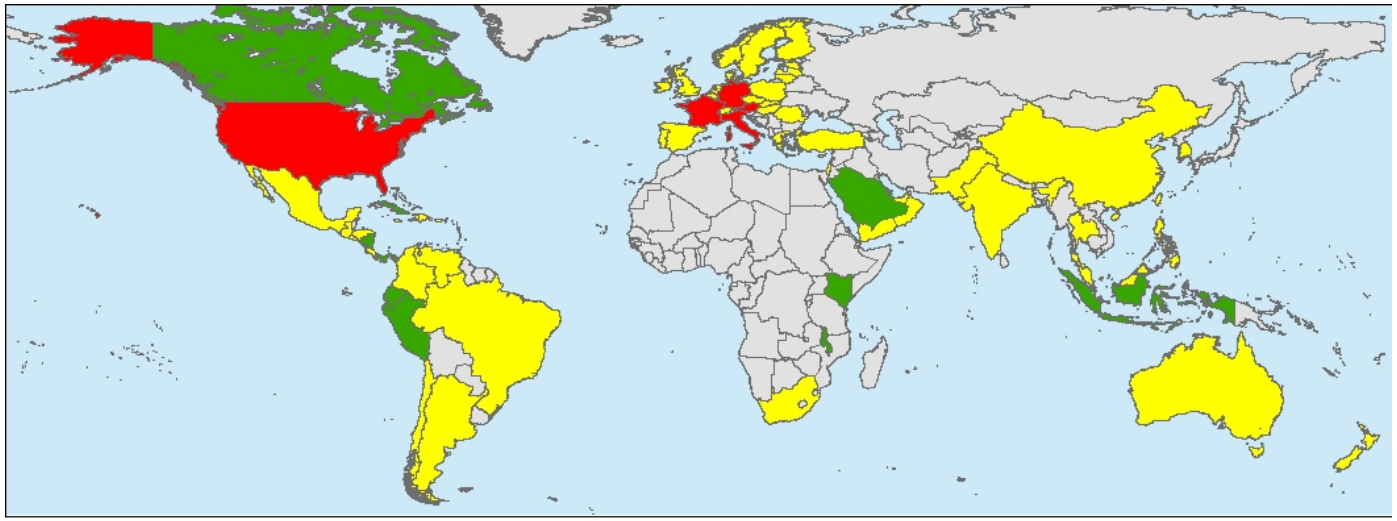
RQE® & European Winter Storm Model (EuroWind™)

RQE® v.16.0



Peril & Country

Coverage

- One Model
- Two Models
- Three or more Models

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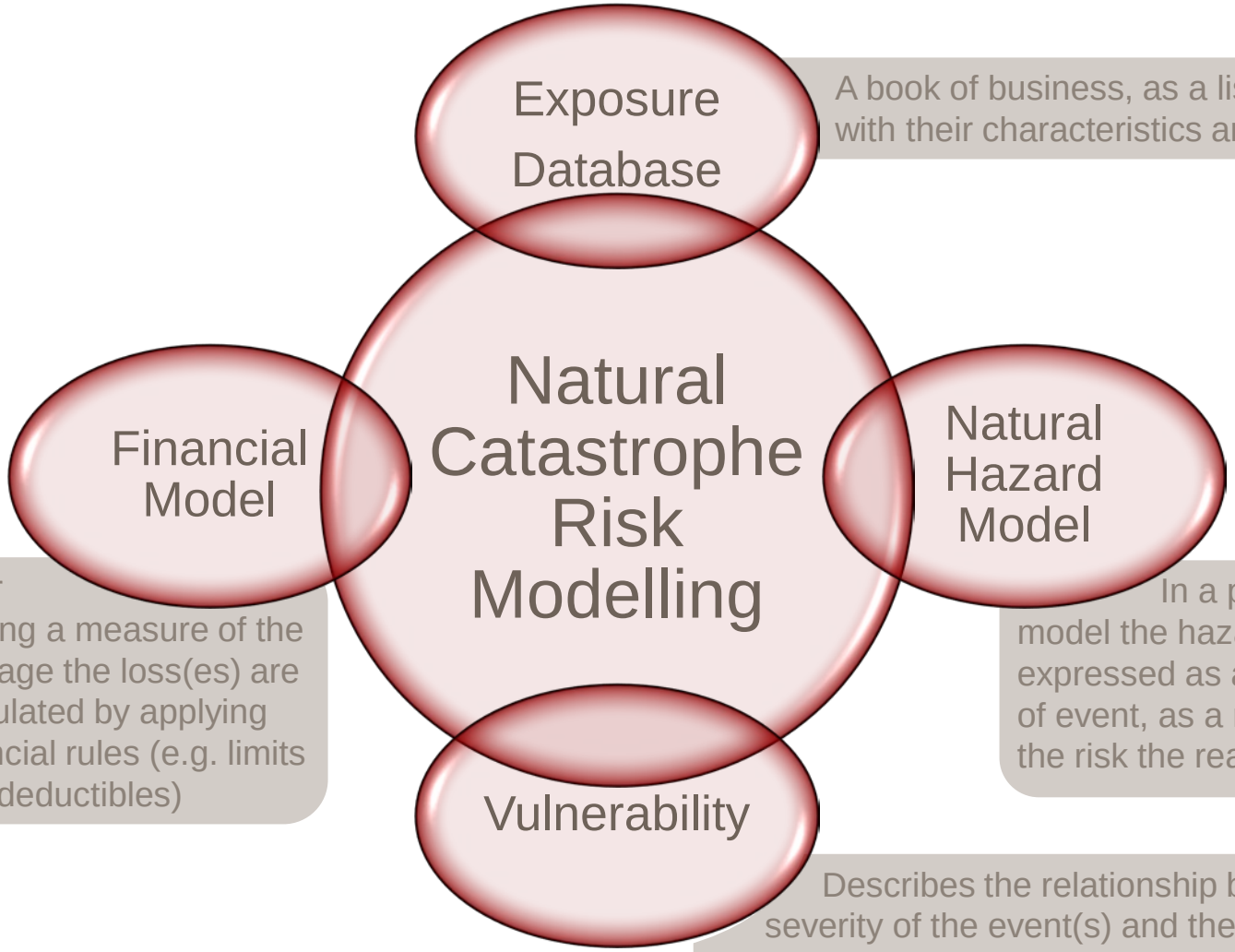
Components of a Probabilistic Model



A book of business, as a list of properties with their characteristics and (market) value

After
Having a measure of the damage the loss(es) are calculated by applying financial rules (e.g. limits and deductibles)

In a probabilistic model the hazard will be expressed as a stochastic set of event, as a representation of the risk the real world

Describes the relationship between the severity of the event(s) and the probable damage of this event(s)

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Exposure

Insurance & Forest Industry

Windstorm Damage is devastating to the forest industry, because it causes:

- Disruption in the grow programs
- Additional clearing costs
- Unrecoverable production

Erwin Storm Facts:

- Most devastation storm in 65 years
- 75 million m3 of production forest was lost
- Total damage 2–3 billion Euro

Photo: Areca (2009)

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RQE & European Winter Storm Model (EuroWind™)

What is EuroWind 2014™ ?

- A probabilistic model, and
- Covers 24 countries, has
- A database of 361 Historical Storms, and the hazard
- Consists of 23,000 synthetic events, which is
- Build on the latest research findings, and has
- Two additional components:
  - North Europe Offshore
  - Forest Damage

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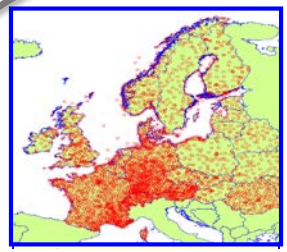
RQE & European Winter Storm Model (EuroWind ™)

What are the components in EuroWind ™ 2014 - Hybrid Hazard ?

Historical Event Set
361 storms
1960-2013 period

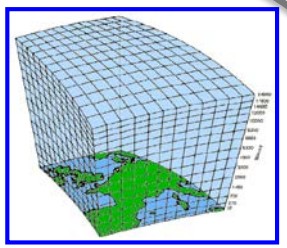
Met. Station density and accuracy "Ground Truth"



Measurements

HYBRID HAZARD

<- complemented with->



AOGCM

Characteristics of
~25,000 simulated
storms 800-2000 period

Stochastic Event Set
~23,000 storms

Centuries long global simulation

Event Set

Ensemble of Historical "proxies"

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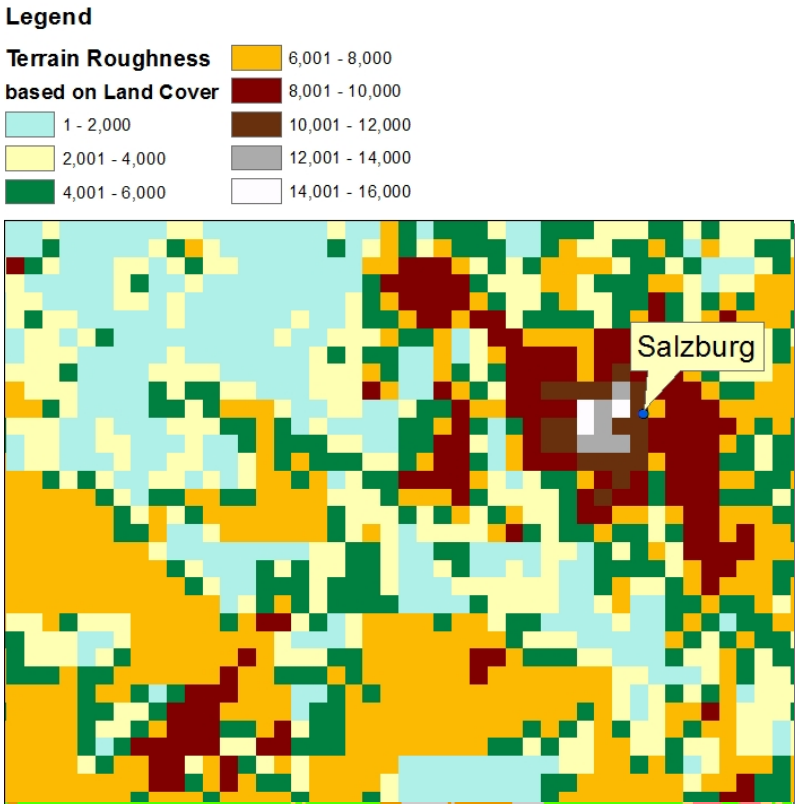
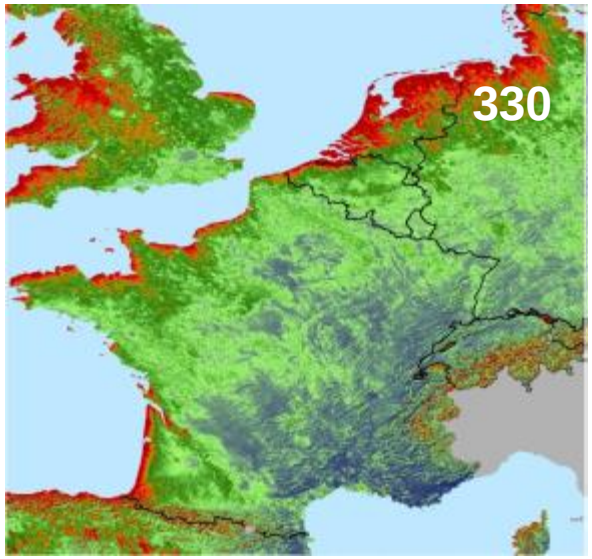
RQE & European Winter Storm Model (EuroWind™)

EuroWind™ 2014 – Local Adjustments for wind speed



DEM (SRTM resampled to 250m)
LAND USE (Corine 2012, 100m)
GUSTINESS (10mins vs 3 sec)
DIRECTION (9 + Fetch)



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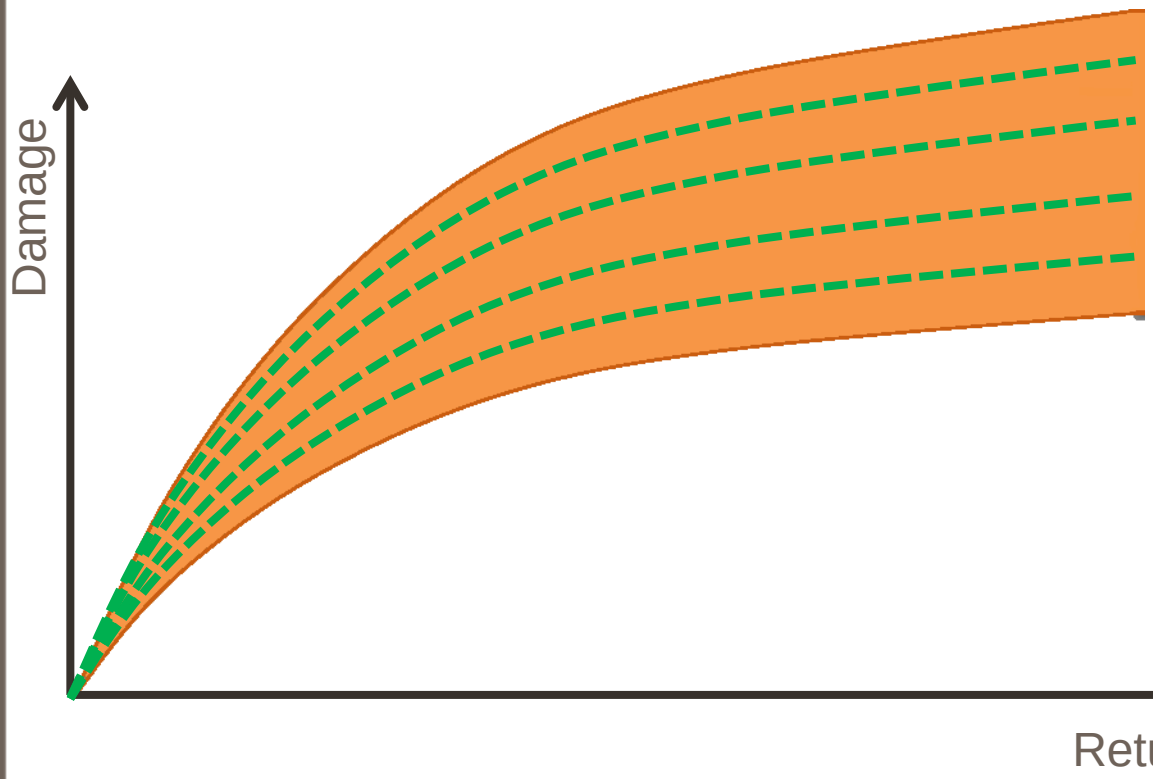
Forest Module

Model Components

- Based on the EuroWind ™ 2014 Hazard
- Six Vulnerability Curves for Forest



Most vulnerable – Coniferous - High

Other types are:
Coniferous – Low
Mixed – High/Low
Deciduous – High

Least vulnerable – Deciduous - Low

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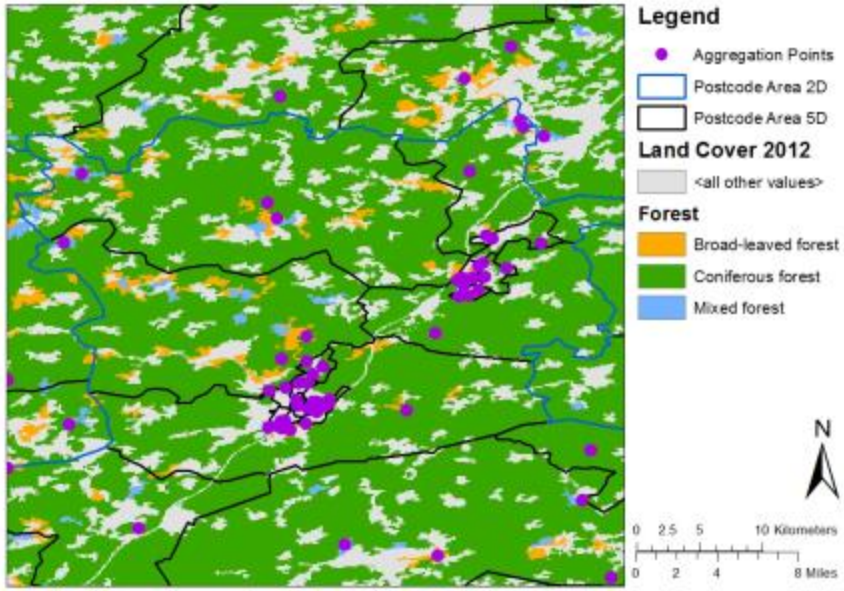
Forest Module

Model Components

- Based on the EuroWind ™ 2014 Hazard
- Six Vulnerability Curves for Forest
- Three Risk Locations for the spatial distribution of produced wood (in volume), and Forest Types



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Forest Module

Model Components

- Based on the EuroWind ™ 2014 Hazard
- Six Vulnerability Curves for Forest
- Three Risk Locations for the spatial distribution of produced wood (in volume), and Forest Types
- Exposure database for Insurable Forest (in cubic meters), based on:
  - CORINE 2012 digital land use database
  - Statistical data from:
    - Skogsstyrelsen - The Swedish Forest Agency (SFA)
    - Finnish Forest Research Institute – (METLA)

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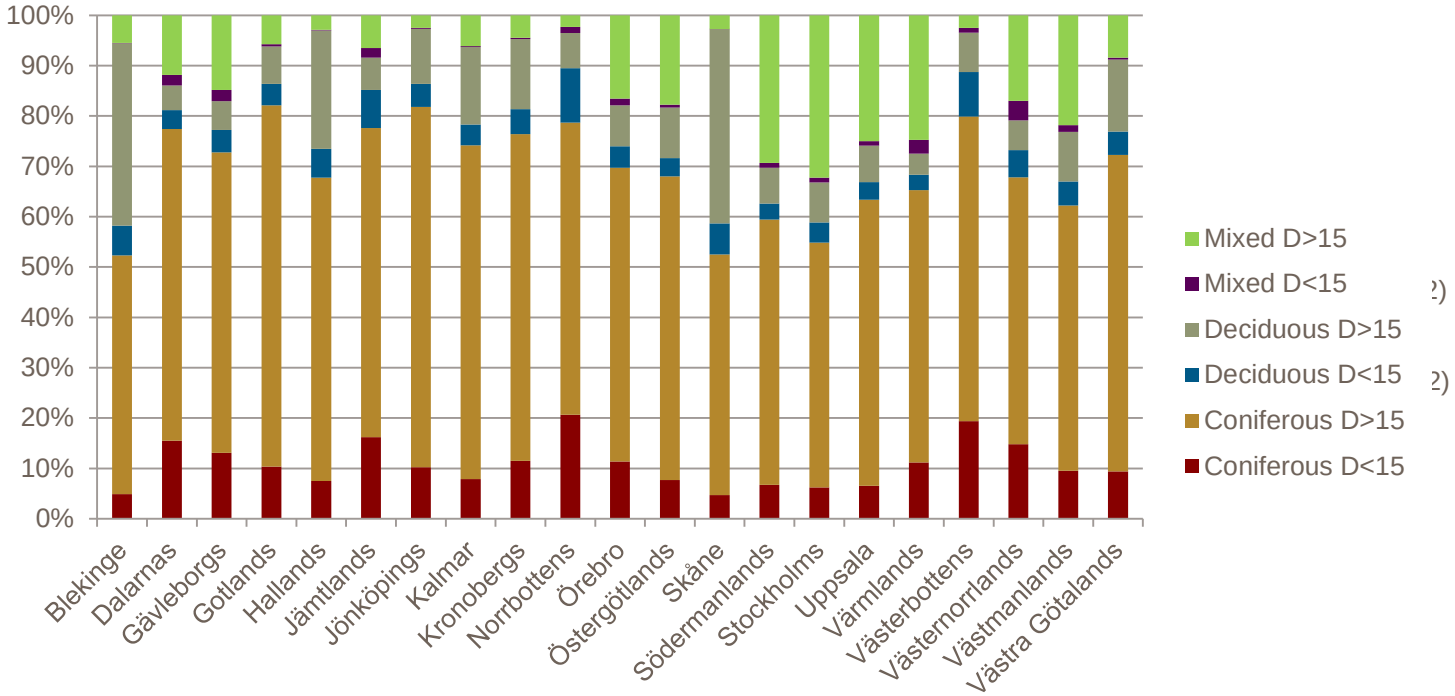
Forest Module

Validation – Exposure Database for Standing Stock (in cubic meters)

The Swedish Forest Agency (SFA)
Corine Land Cover 2012

Distribution of Volume



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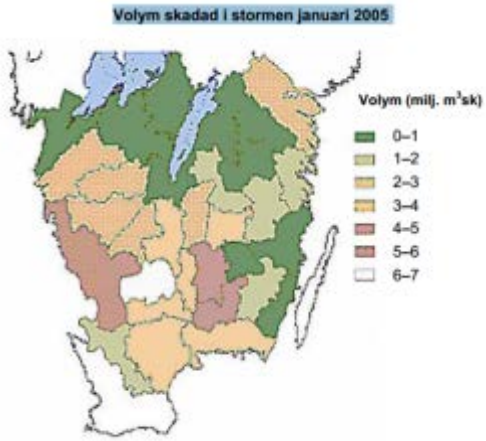
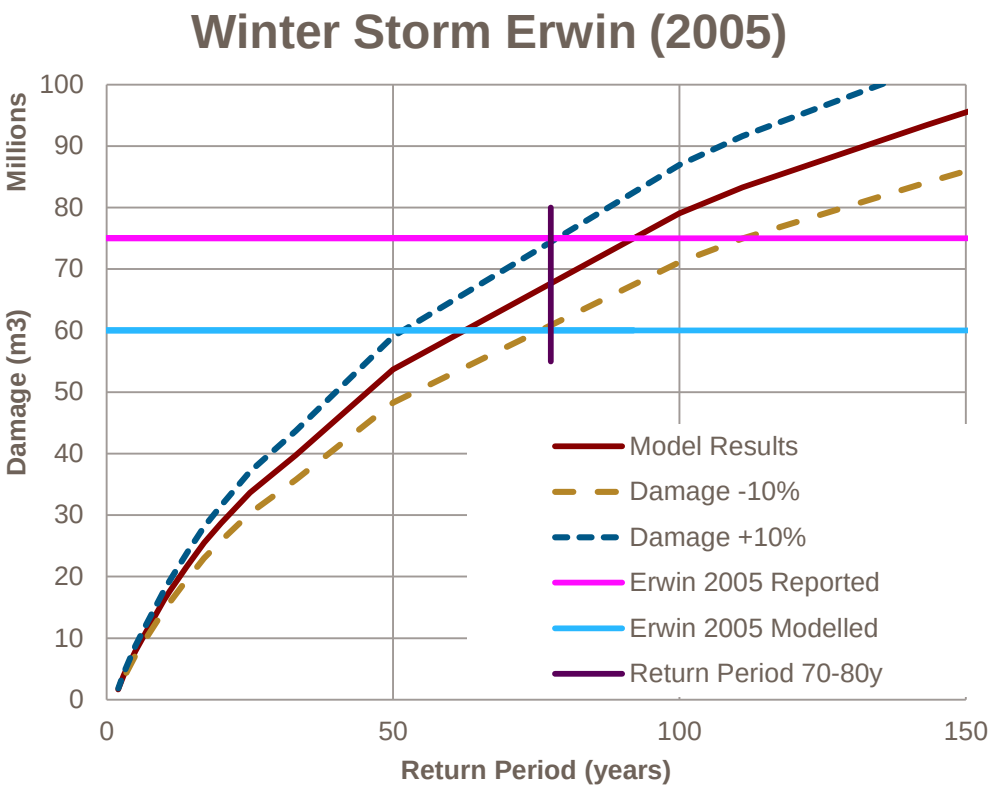
Forest Module

Validation – Erwin

Storms have occurred before…

Date	Worst-affected area in Sweden	Storm felled forest (cubic metres)
1 Mar 1943	Northeast Götaland	5 million
3 Jan 1954	Eastern Svealand	18 million
17–18 Oct 1967	Southeast Götaland	10 million
22 Sept 1969	Northwest Götaland	25 million
1 Nov 1969	Eastern Svealand	10 million
17 Nov 1995	Nothern Götaland	5 million
8–9 Jan 2005	**Southwest Götaland**	**75 million**





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Scenario 1

Single plot - monoculture

Wood production for Spruce on a 5km2 plot

Account	Volume (m3)
Spruce 10	39,000
Spruce 15	109,800
Spruce 20	175,300
Spruce 25	228,500
Spruce 30	271,000
Spruce 35	302,800
Spruce 40	329,400

Adapted from: Forest Research Notes ,Volume 8, Number 2 ,Second Quarter, 2011

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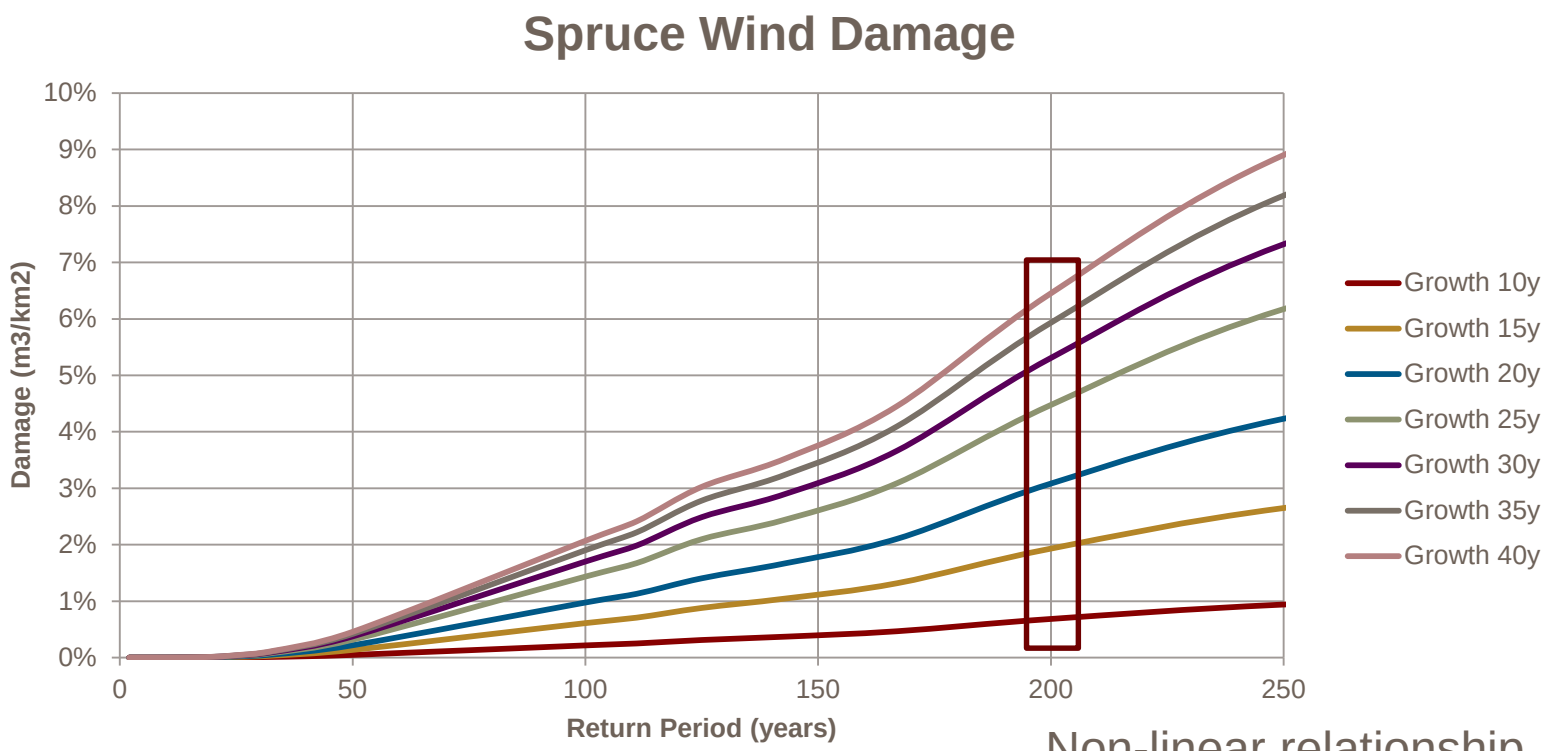
Scenario 1 – Forest Growth and Damage

Single plot – Monoculture – Results



Non-linear relationship between forest growth and damage

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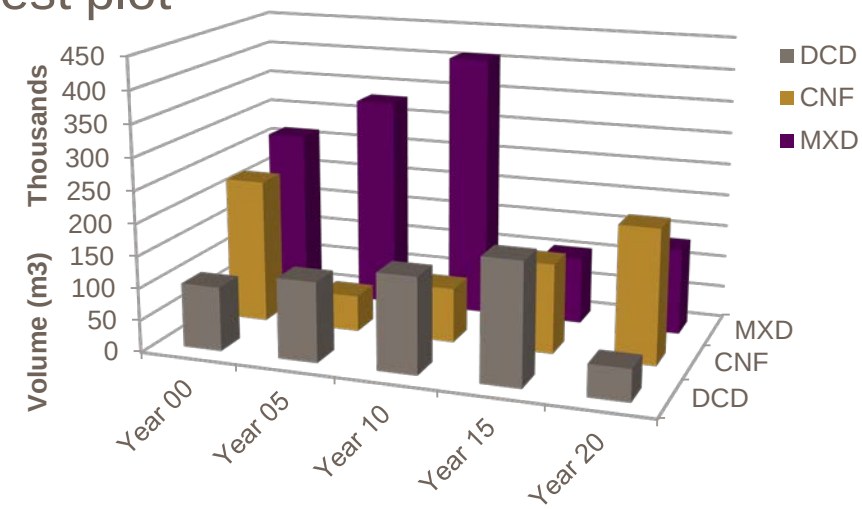
Scenario 2 – Production Cycle Simulation

Single plot - mixed culture on a forest plot

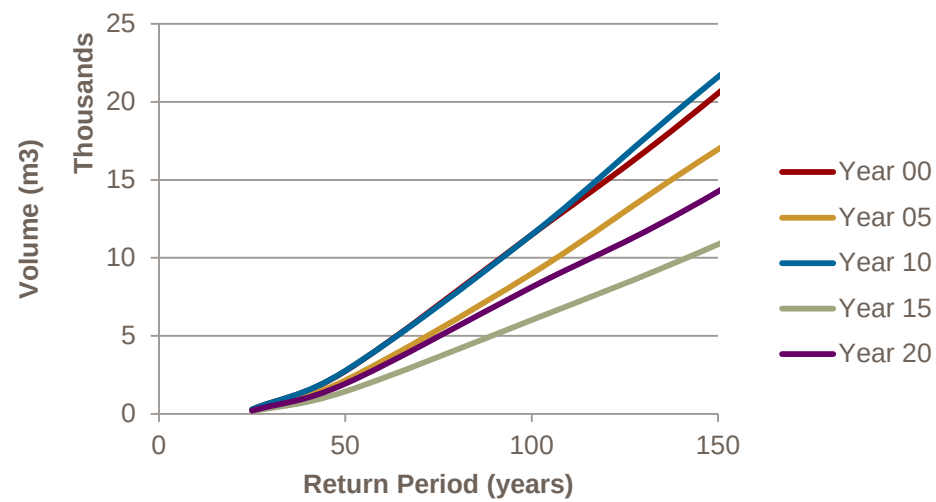
Total Volume (m3)

Time	Total Volume (m3)
Year 00	590,000
Year 05	512,500
Year 10	645,000
Year 15	435,000
Year 20	395,000



Height	Time	CNF	DCD	MXD
Low	Year 00	25,000	60,000	40,000
	Year 05	60,000	75,000	50,000
	Year 10	10,000	90,000	60,000
	Year 15	15,000	120,000	15,000
	Year 20	22,500	30,000	20,000
High	Year 00	200,000	40,000	225,000
	Year 05	50,000	50,000	281,000
	Year 10	75,000	60,000	350,000
	Year 15	125,000	70,000	90,000
	Year 20	187,500	20,000	115,000

Distribution of Volume (m3) by tree types and height



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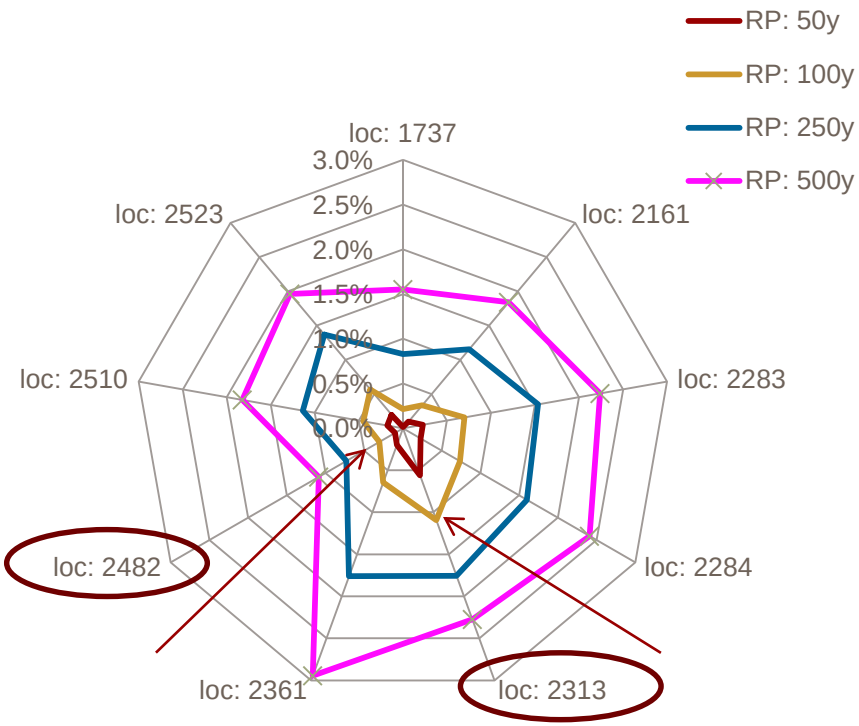
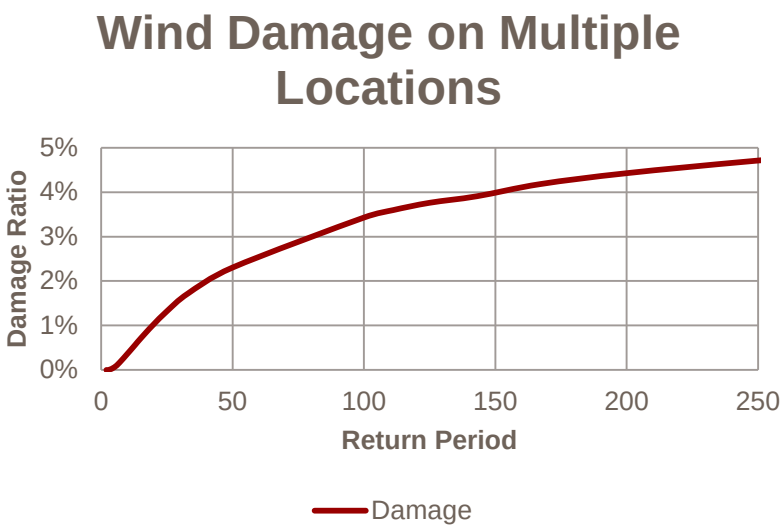
Scenario 3

Multiple plots - Single culture - Spruce

Location	Volume (m3)
1737	21,000,000
2161	26,700,000
2283	23,700,000
2284	28,500,000
2313	24,800,000
2361	30,000,000
2482	21,300,000
2510	26,800,000
2523	25,100,000





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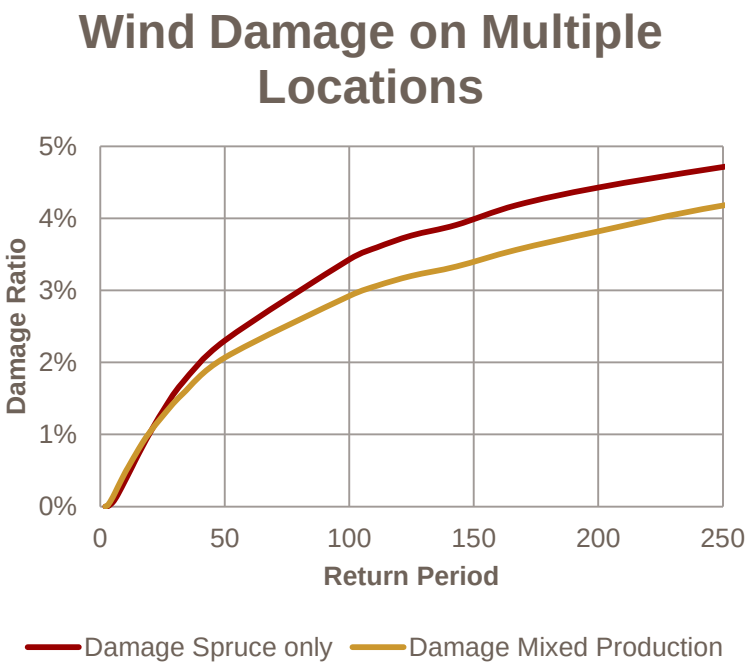
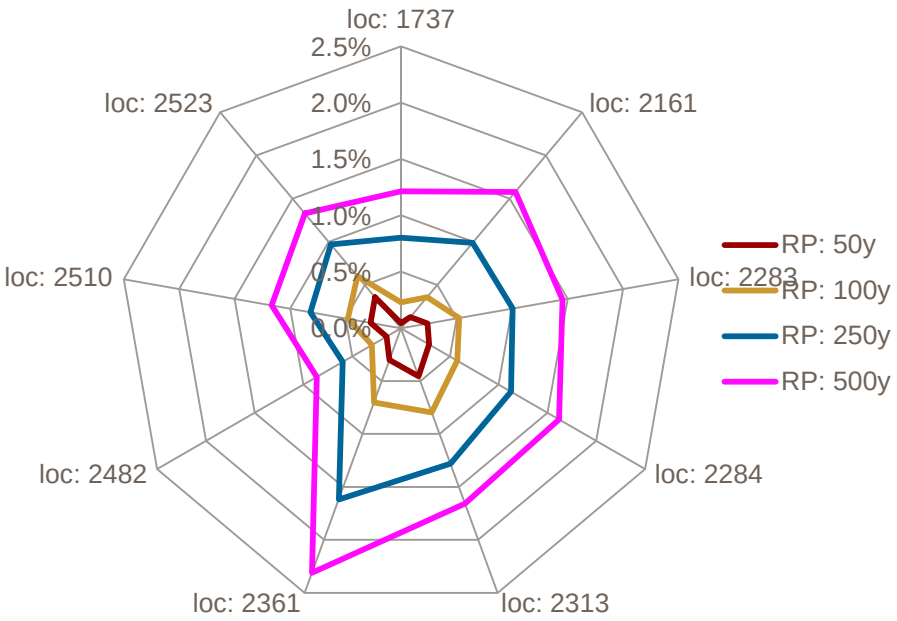
Scenario 4

Multiple plots - mixed culture

Tree Type	% Production
CNF - Low	10%
CNF - High	37%
DCD - Low	9%
DCD - High	10%
MXD - Low	8%
MXD - High	25%





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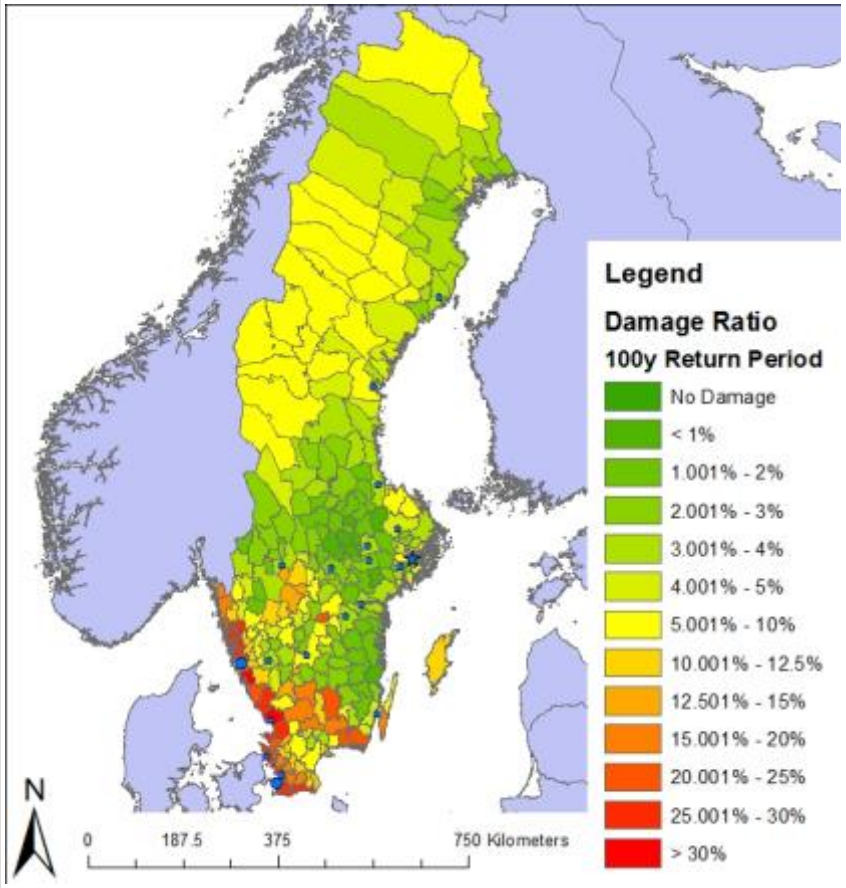
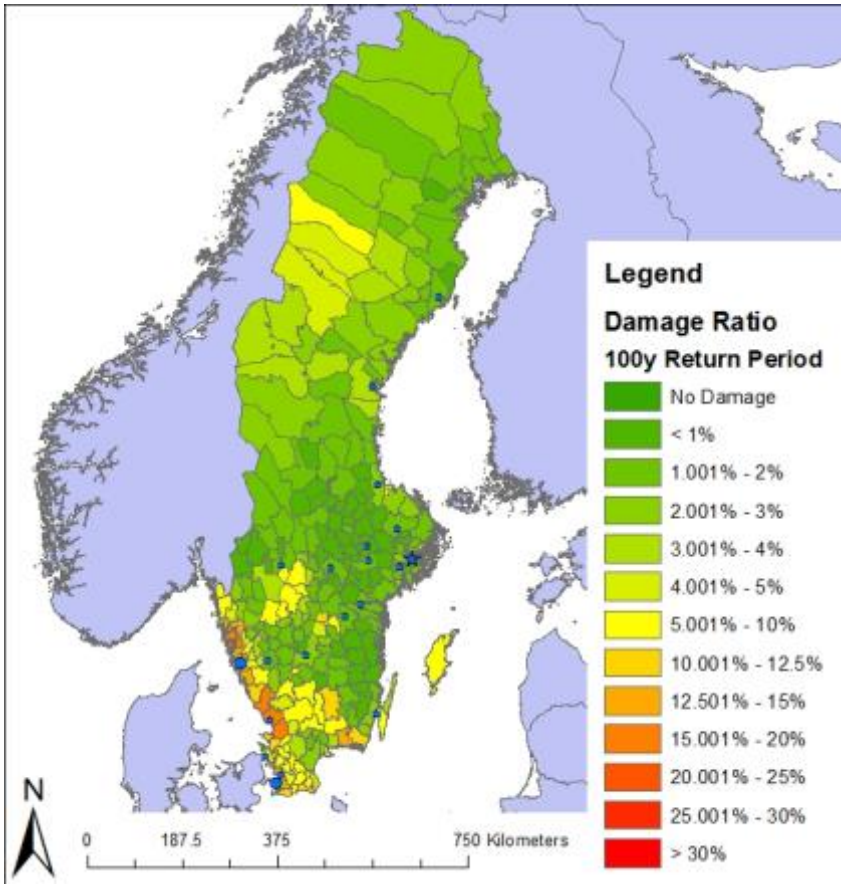
Use Cases

National Exposure Study



Total Damage to Forest



Contributing part of Coniferous Forest

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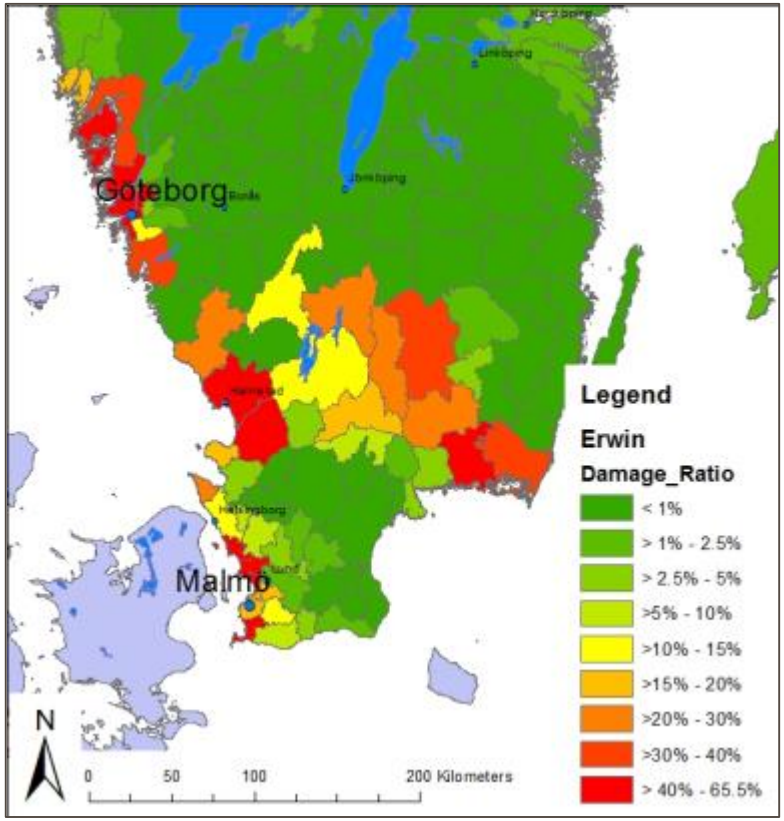
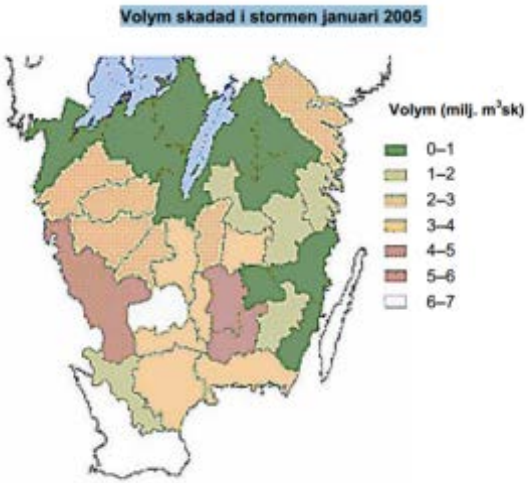
Exposure Study

Damage of a Storm like Erwin 2005



Damage Ratio based on CoreLogic®'s Exposure Database 2014



Difference due to:

- Exposure / Inventory dates
- Modelled results vs Estimates on the Ground

Useful for:

- Quick indication of probable risks
- Assisting in guiding the relieve work (harvesting losses, repairing electricity poles, emergency response)

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Conclusion

- Modelling forest damage is not a straight forward process, there are many aspects involved, like:
  - Measurements (e.g. wind speed observations / failing stations)
  - Statistical data (forest inventories)
  - Land Use data
  - Climate change (increasing storm severity)

- All this information is not static, but highly dynamic, and can change rapidly

- Modelling forest damage from Winter Storm Damage is needed, because the there are too many unknowns, and using a Decision Support System to model Damages is one solution to get an understanding on the damage, and therefore the industry losses

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Thank you for your attention