

## Forest monitoring in Europe

International Co-operative Programme  
on Assessment and Monitoring  
of Air Pollution Effects on Forests (ICP Forests)

- ✿ of the Convention on Long-range Transboundary Air Pollution (CLRTAP)
- ✿ under the United Nations Economic Commission for Europe (UNECE)

25th Anniversary Brochure

- ✿ laid out in the meeting room

Aim

- ✿ Provide scientific information for clean air policies under UNECE

UNECE , Geneva

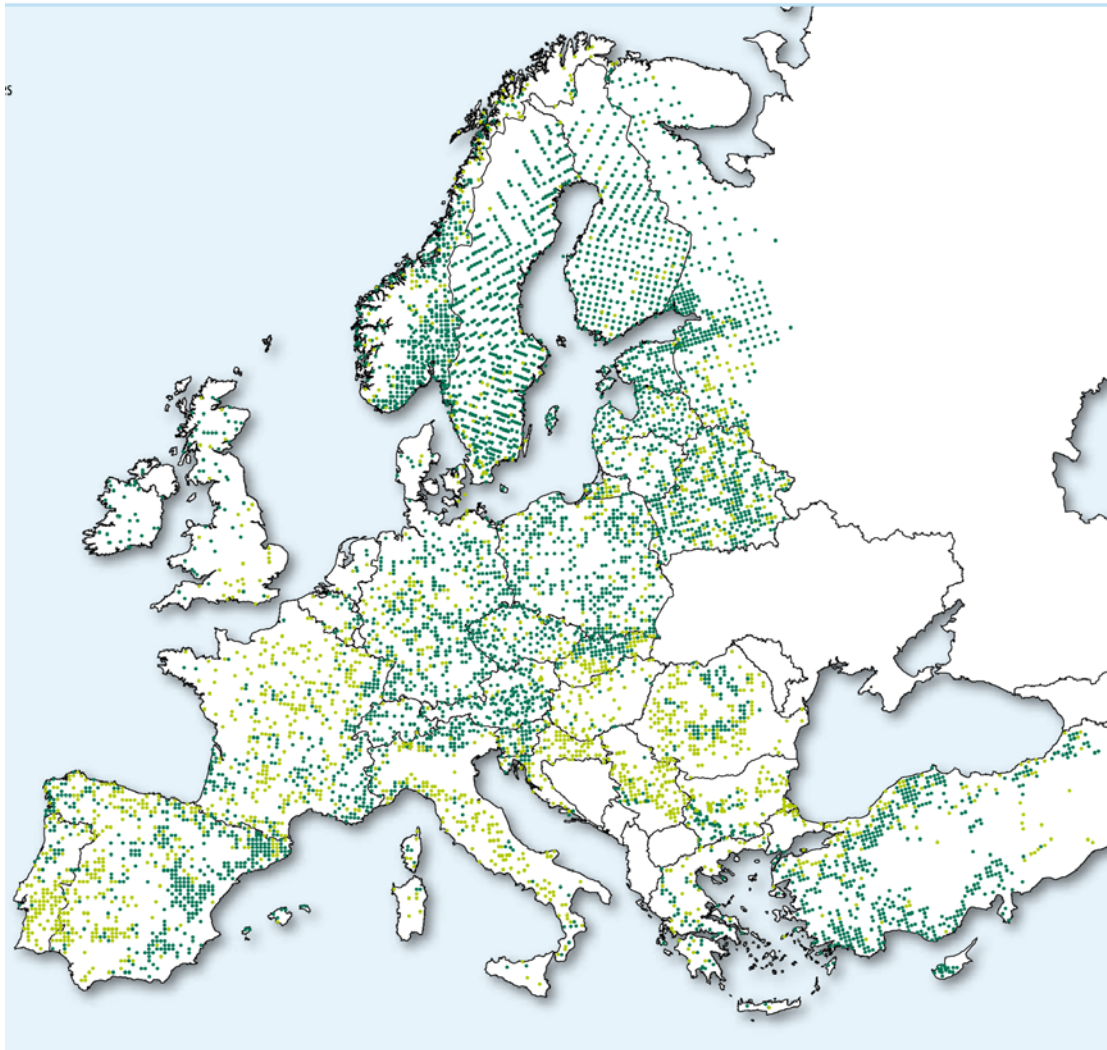


 Albania	 Andorra	 Austria	 Belarus	 Belgium	 Bulgaria	 Canada
 Croatia	 Cyprus	 Czech Republic	 Denmark	 Estonia	 Finland	 France
 Germany	 Greece	 Hungary	 Ireland	 Italy	 Latvia	 Liechtenstein
 Lithuania	 Luxembourg	 Republic of Macedonia	 Moldova	 Netherlands	 Norway	 Poland
 Portugal	 Romania	 Russian Federation	 Republic of Serbia	 Slovak Republic	 Slovenia	 Spain
 Sweden	 Switzerland	 Turkey	 Ukraine	 United Kingdom	 USA	

## ICP Forests

pursues forest monitoring

- ✿ under coordination by the Institute for World Forestry in Hamburg, Germany
- ✿ in
  - ✿ 39 countries of Europe
  - ✿ Canada and USA
  - ✿ close co-operation with the European Commission (EC)
- ✿ at
  - ✿ European-wide scale (Level I)
  - ✿ forest ecosystem scale (Level II)



## Level I

About 6800 plots

• arranged in 16x16 km grid

Low monitoring intensity

• annual surveys of crown condition (all plots)

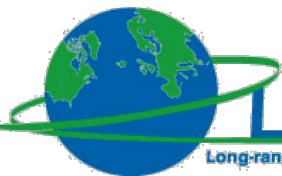
• soil condition (partly)

• foliar chemistry (partly)

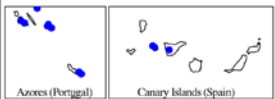
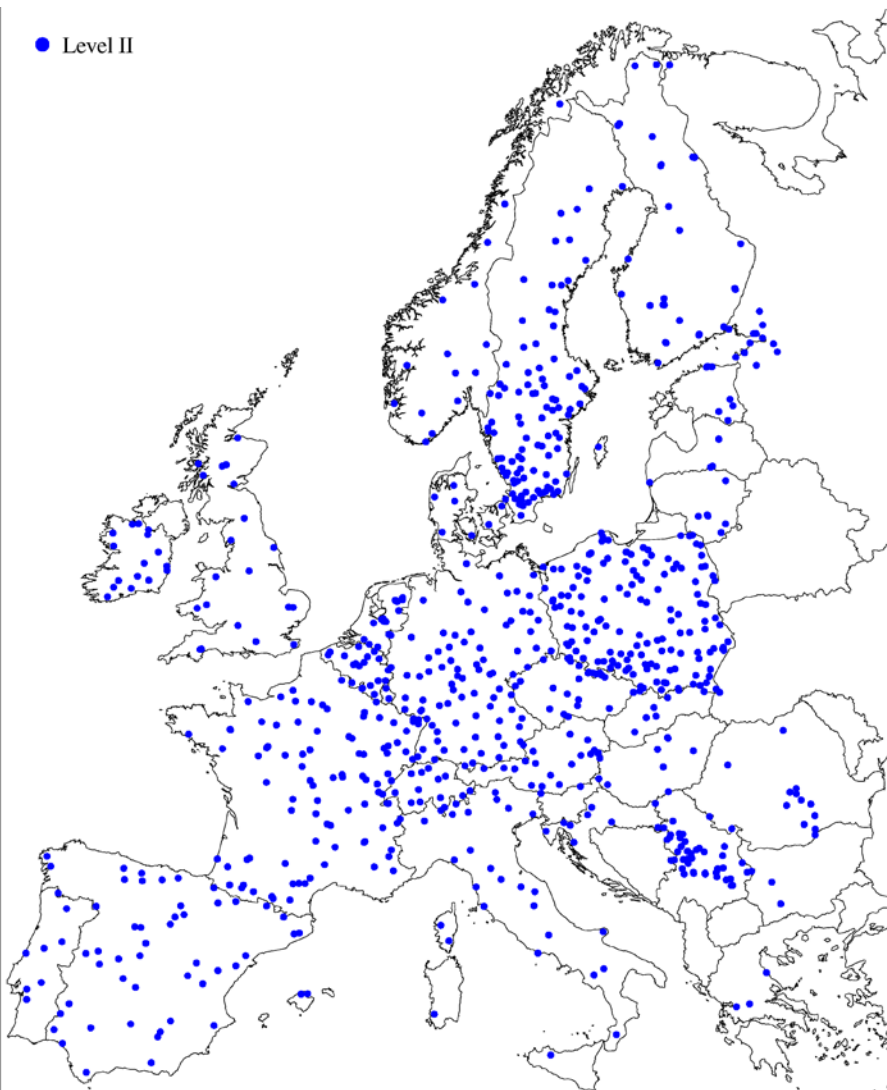
System still growing

• Turkey

• Russia



● Level II



## Level II plots

About 860 plots

- selected by countries
- representing important forest ecosystems

High monitoring intensity

- Crown condition
- Tree phenology
- Foliar chemistry
- Ground vegetation
- Soil condition
- Soil solution chemistry
- Forest growth
- Meteorology
- Ambient air quality
- Atmospheric deposition



## Monitoring system

Used by ICP Forests:

Assessments

- spatial and temporal variation of forest health (Level I)
- relationships between forest health and air pollution (Level II)

Further developed:

- Assessments of interactions between
  - Air pollution
  - Climate change
  - Carbon sequestration
  - Biodiversity

Further development

- Two years' project „FutMon“
- under co-financing by EU LIFE

## Further development and implementation of an EU-level Forest Monitoring System (FutMon)

Project coordinated

- ✿ Institute for World Forestry

- ✿ 35 Partners

from 22 EU-Member States

- ✿ Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, Germany, Greece, Hungary, Ireland, Italy, Latvia, The Netherlands, Poland, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom

## How is forest monitoring further developed?

### Large scale (Level I)

- ✿ Merging of Level I and NFI plots
- ➔ Possibility to assess on the same plots
  - ✿ Crown condition, soil condition, tree growth, ground vegetation
  - ✿ Carbon pools and biodiversity

### Ecosystem scale (Level II)

- ✿ Reduction of the number of plots
- ✿ Higher monitoring intensity per plot
- ➔ Possibility to assess on the same plots
  - ✿ meteorology, tree phenology, tree health, growth (climate change)
  - ✿ stand volume and growth, forest soil chemistry (carbon budgets)
  - ✿ ground vegetation (biodiversity)

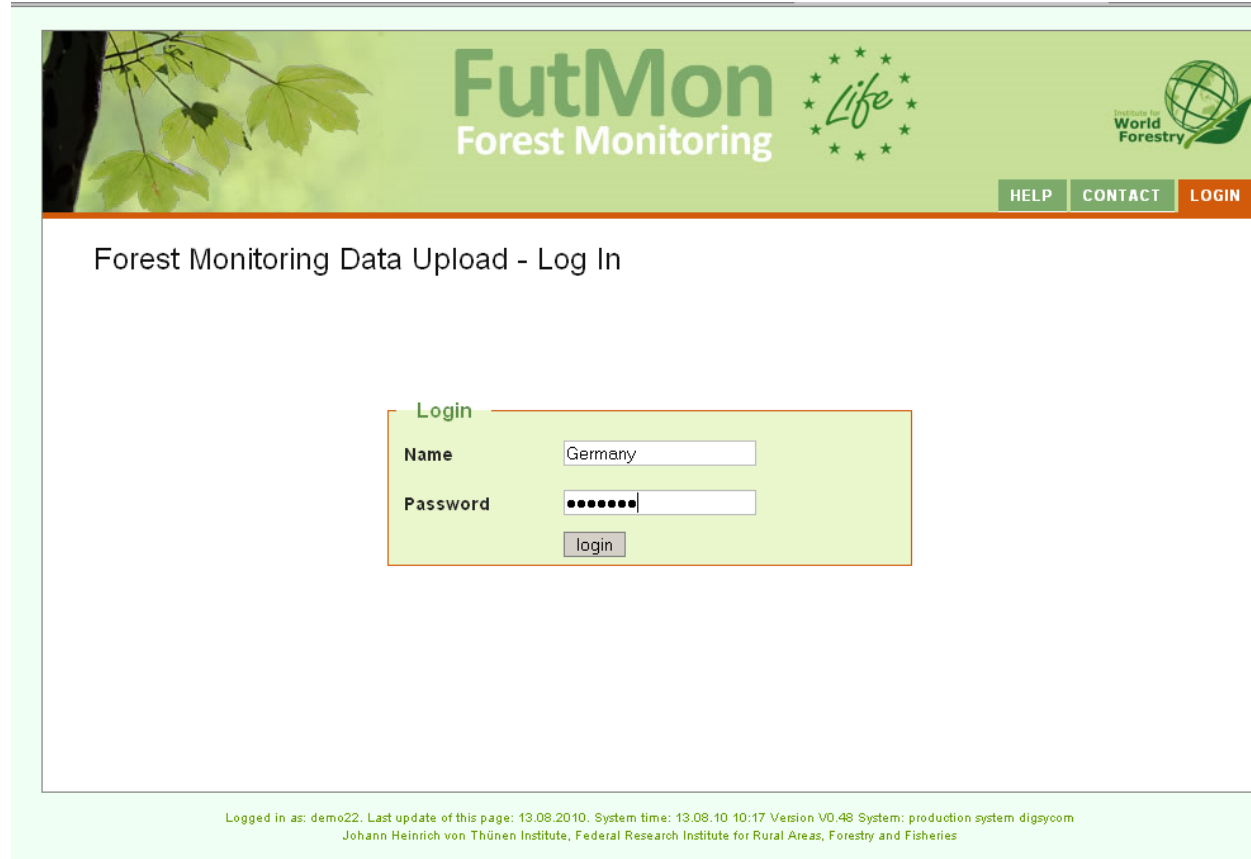
## How is forest monitoring further developed ?

### Database management

- online data submission
- automated
  - data validation
  - validation reports
- Data dissemination
  - authorised users

### Data analyses

- few examples



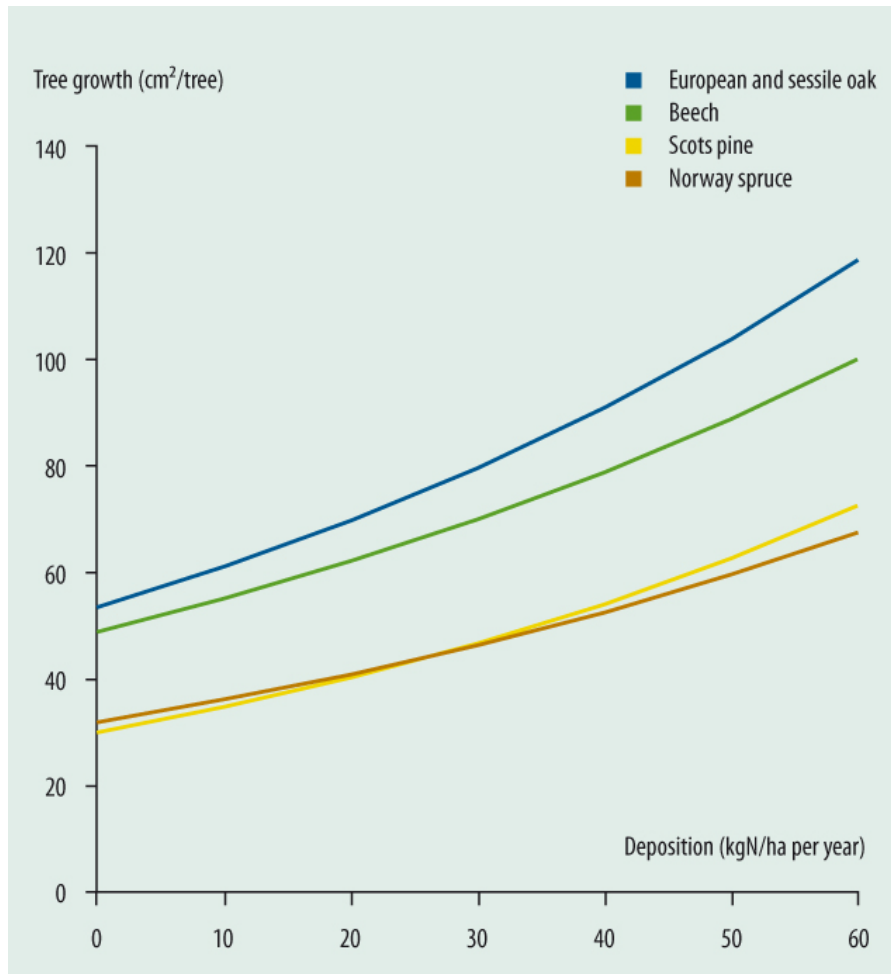
The screenshot shows the FutMon Forest Monitoring website interface. The header features the FutMon logo, the Life logo, and the Institute for World Forestry logo. Navigation buttons for HELP, CONTACT, and LOGIN are visible. The main content area is titled "Forest Monitoring Data Upload - Log In" and contains a login form with fields for Name (pre-filled with "Germany") and Password (masked with dots), and a "login" button. The footer contains technical information: "Logged in as: demo22. Last update of this page: 13.08.2010. System time: 13.08.10 10:17 Version V0.48 System: production system digsyscom Johann Heinrich von Thünen Institute, Federal Research Institute for Rural Areas, Forestry and Fisheries".

## Laubhann et al. (2009)

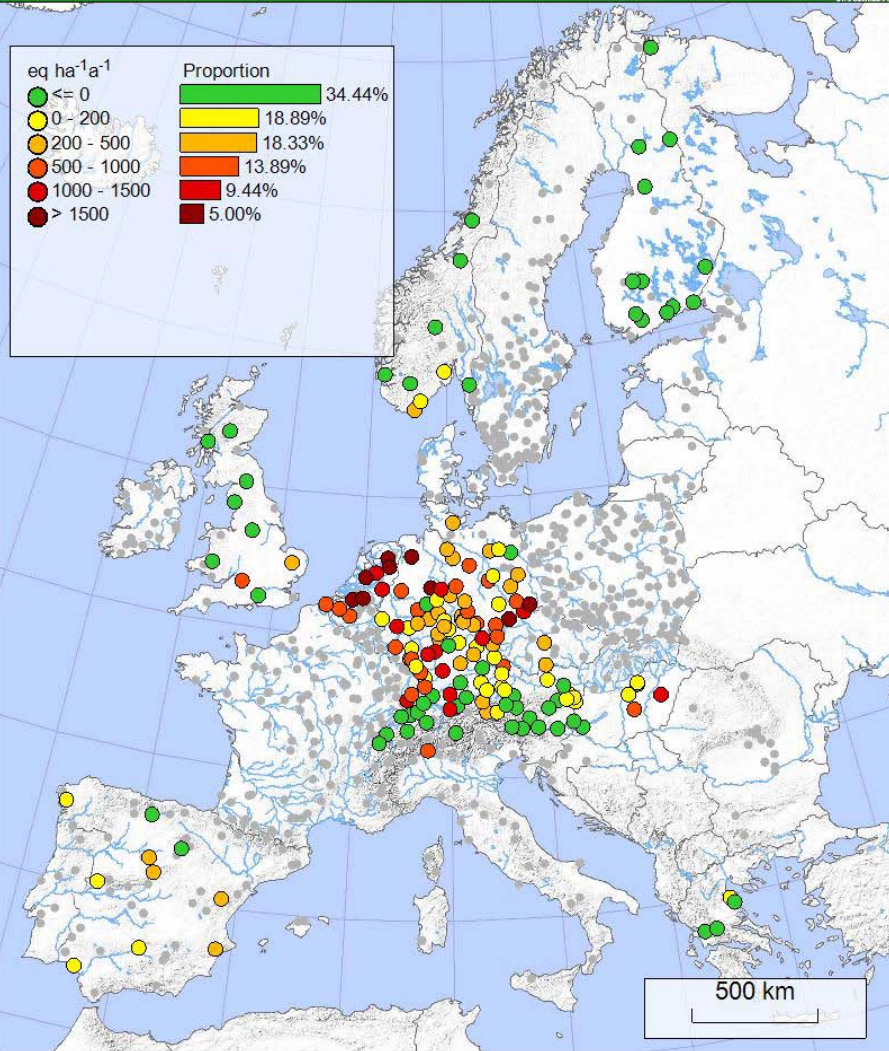
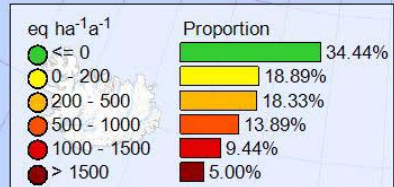
### Correlations

- ✿ Deposition of nitrogen
- ✿ Tree growth
- ✿ Tree species
  - ✿ European and sessile oak
  - ✿ Beech
  - ✿ Scots pine
  - ✿ Norway spruce

➔ Not necessarily good sign



Exceedance of  $CL_{nut}(N)$



**Nagel et al. (2007)**

Exceedances of critical loads

Comparison between

- critical loads (simple mass balance)
- throughfall (measured)

For nutrient nitrogen

- Exceedances on 2/3 of the plots
- No exceedance in
  - Scandinavia
  - Alps

In the Alps

- critical loads high because:
- precipitation high
- high N leaching

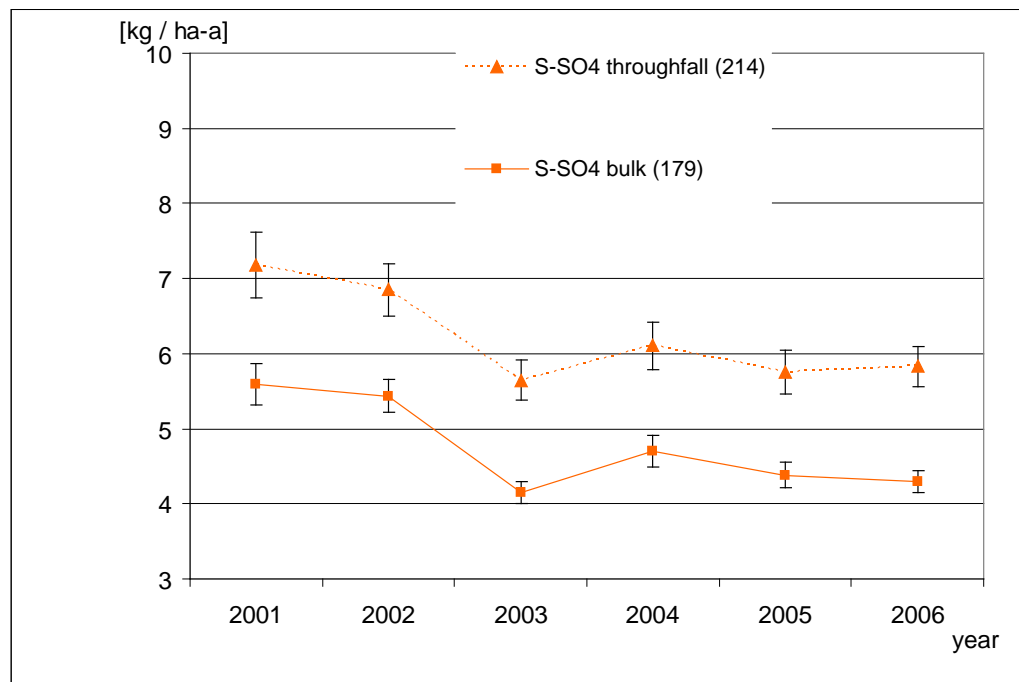
## Lorenz et al. (2008)

### Sulfate-sulfur

- ✿ Bulk and throughfall
  - ✿ higher than N deposition
  - ✿ decrease clearly

### Success

- ✿ Clean air policies
- ✿ Forest monitoring
- ✿ Forest damage research



Mean annual bulk deposition and throughfall  
(2001-2006)