University of Natural Resources and Life Sciences - Vienna
Department of Forest and Soil Sciences

Adapting forest management to climate change in Austria

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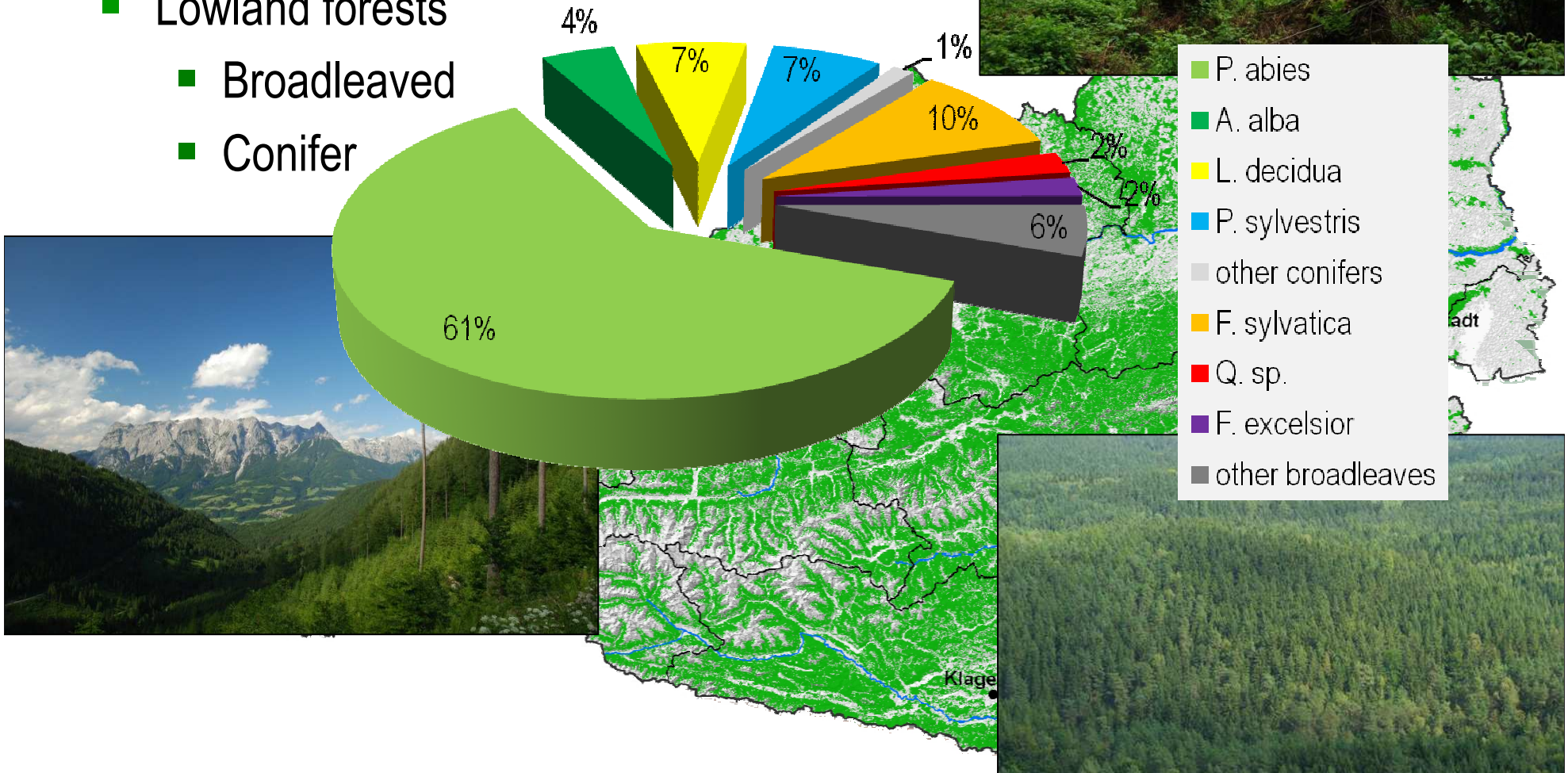
Paris, 4 February 2014

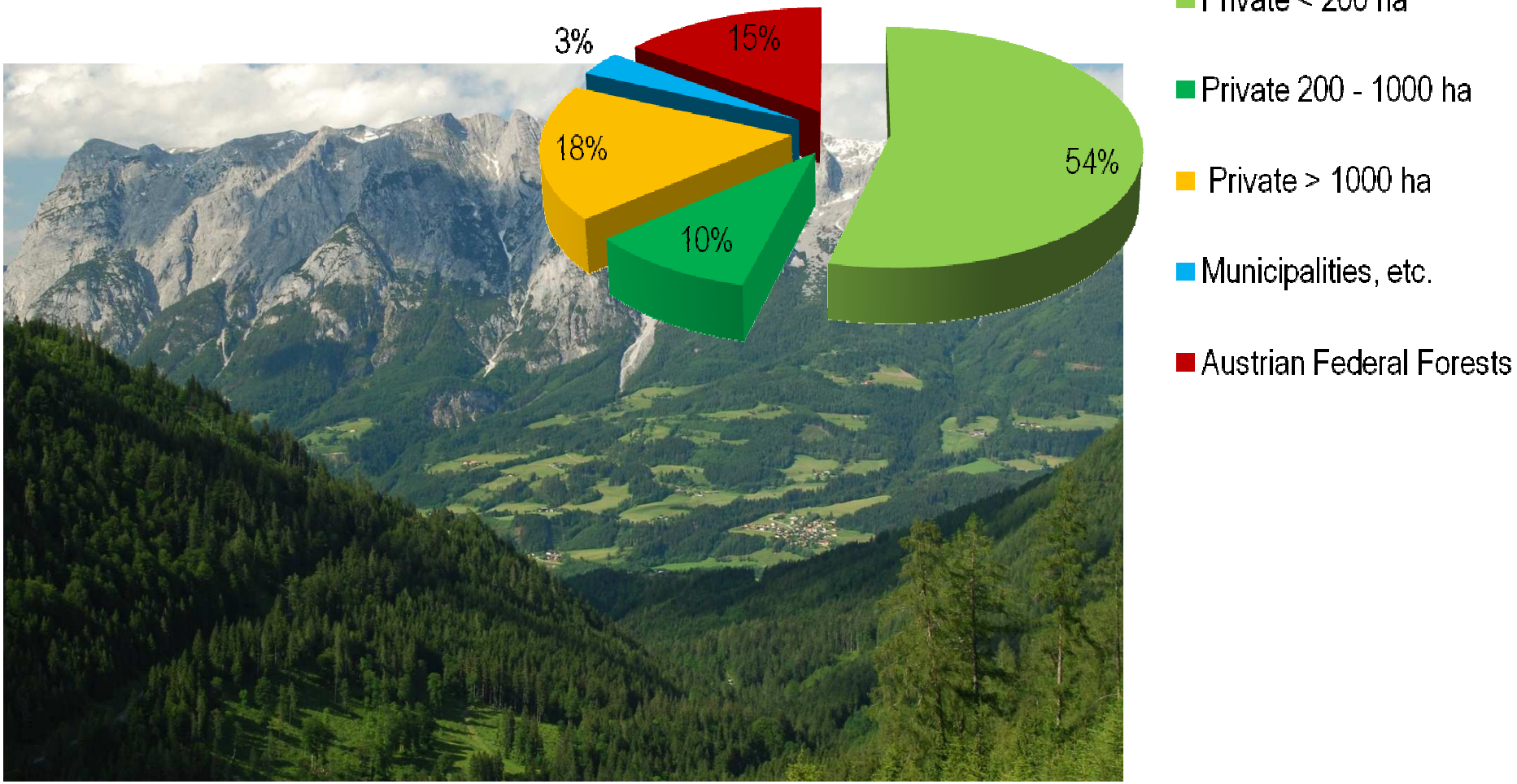
Austrian forests

- 47.6% of Austria is covered by forests
- Mountain forests
- Lowland forests
  - Broadleaved
  - Conifer



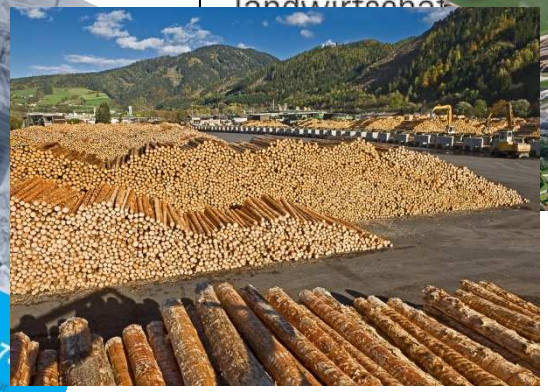
Forest ownership

- Dominated by small scale forest owners (<200 ha)
- Dominated by private forest owners



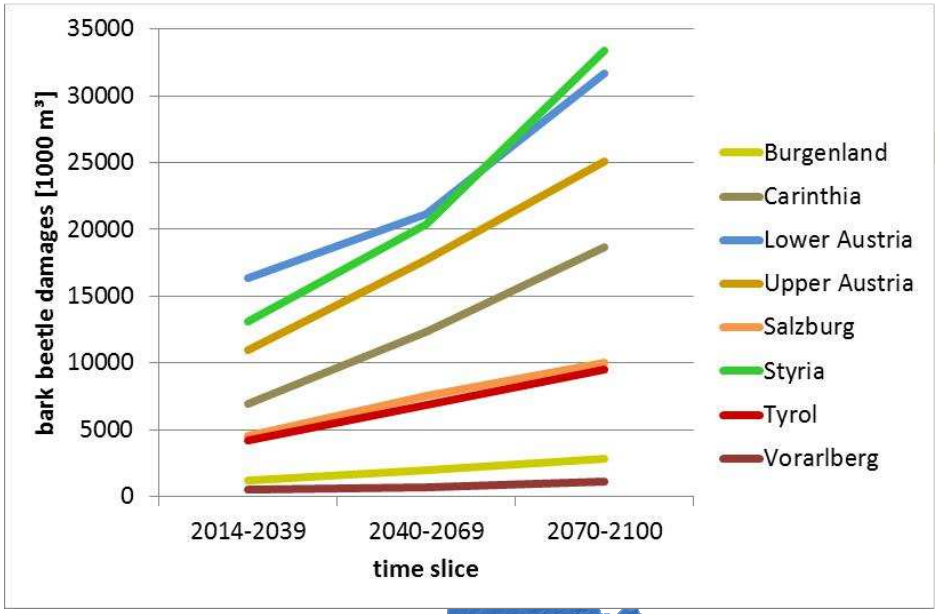
Stakeholders

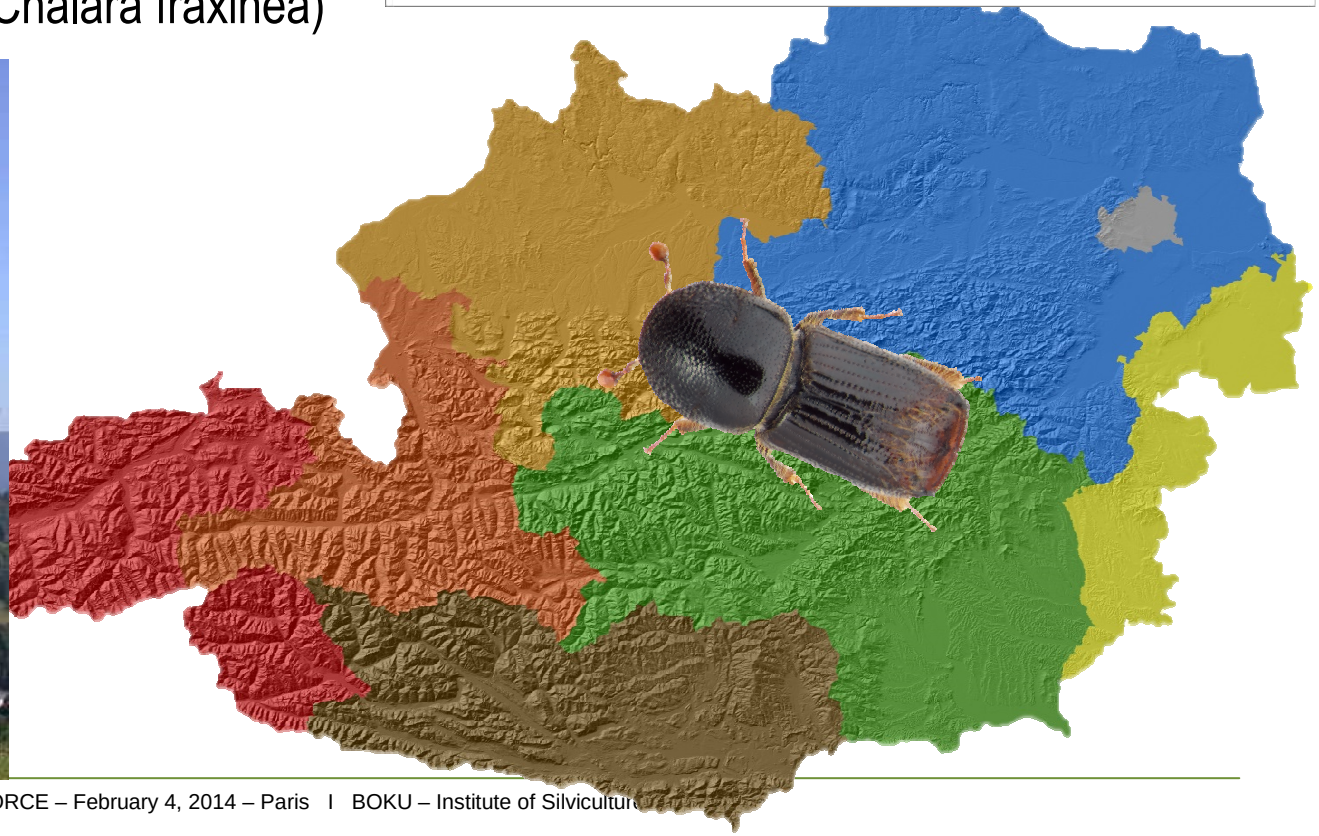
- Legal enforcement (forest administration)
- Extension and advisory services
- Biomass consumers
  - Sawmills
  - Pulp & paper
  - Panels
  - Energy
- Research
  - BOKU
  - BFW
- Owner associations



Climate change impacts

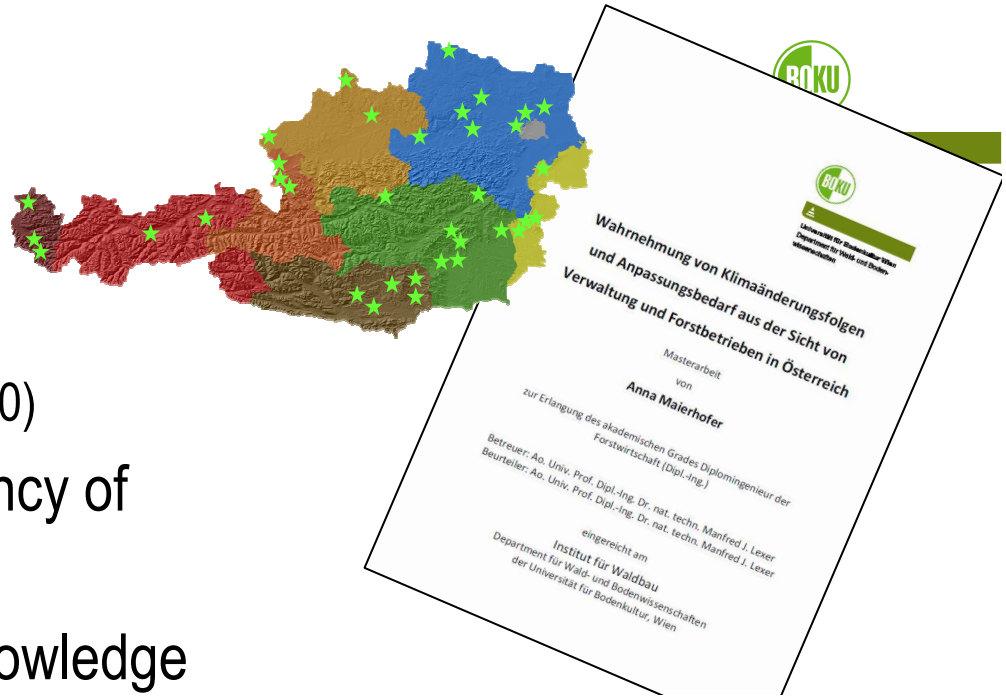
- Projected based on model runs under CC scenario A1B (+4°C, -10% precipitation)
- Growth
- Disturbances
  - Well known pests
  - New diseases (e.g. Chalara fraxinea)

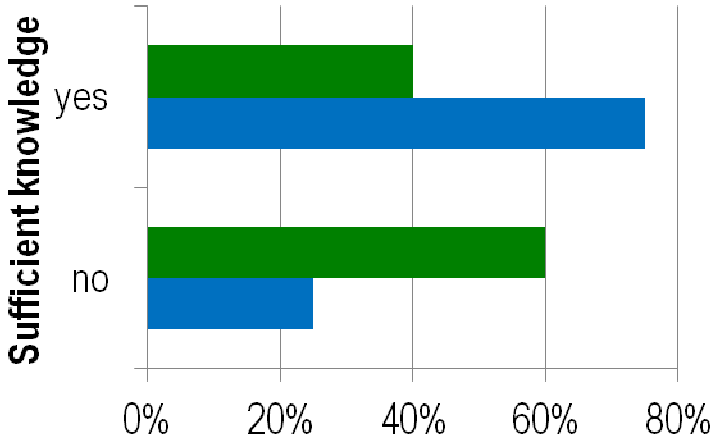


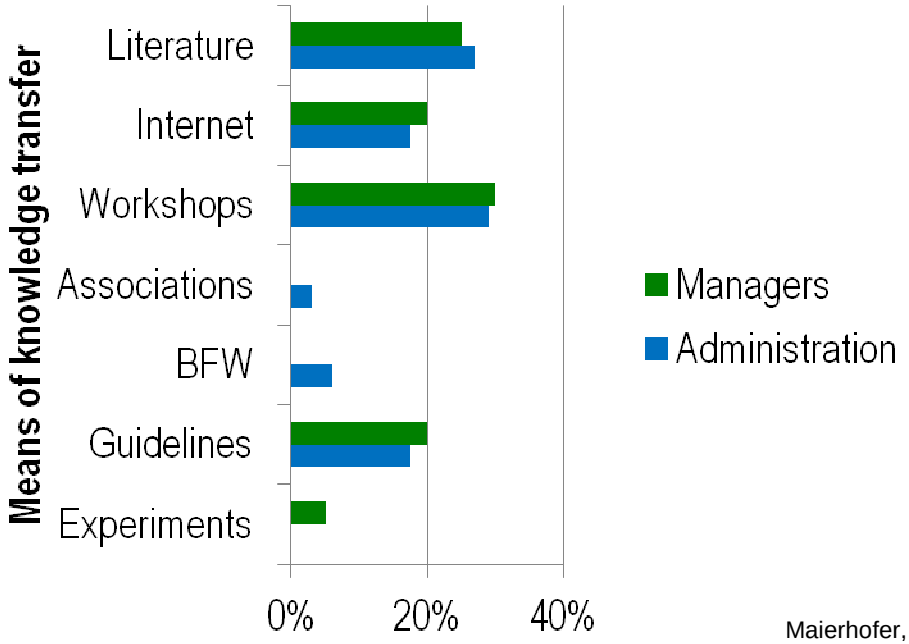


Climate change perception

- Interviews
  - forest managers (n=20)
  - administrative forest personnel (n=20)
- contrasting perception on sufficiency of available knowledge
- similar preferences in terms of knowledge transfer (+/-)







Maierhofer, 2009

National Adaptation Strategy

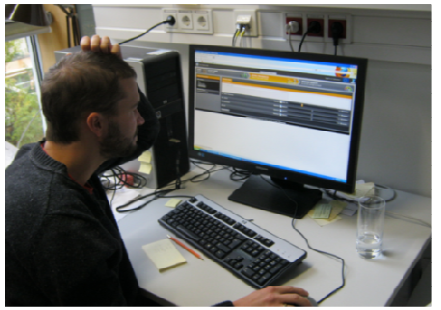
- Overview
- General approach
  - Agriculture
  - Forestry
  - Water management
  - Etc…
- Recommendations
  - Species choice
  - Soil protection
  - Game damage
  - Advisory concept for foresters
  - Crisis and calamity mgmt.
  - Forest fires
  - Pollution
  - Wood processing

Forestry

Nr.	Title	Objective	Key Actors
3.2.4.1	Modification in the selection of tree species and provenance, including targeted promotion of diversity through appropriate silvicultural management and rejuvenation of over aged stock	Increase of stability and reduction of vulnerability of forest ecosystems to pests and diseases; Increase in diversity at all levels (genetic, species-specific, structural, diversity of habitat, etc.) adapted to the respective site-specific conditions; Increase of stability and reduction of susceptibility to disturbances, e.g., through the timely introduction of rejuvenation measures.	Forest owners, interest groups, academic and non-academic research institutions, federal and state governments, EU (responsibility lies with all listed)
3.2.4.2	Soil-protective cultivation	Preservation of the physical functions of the soil, in particular in terms of water retention and nutrient supply.	Forest owners, felling companies, authorities, interest groups, research institutions, federal and state governments, EU, water management, foresters, municipalities, forest leaseholders
3.2.4.3	Reduction of damage caused by game animals	Reduced damages caused by game animals for safeguarding rejuvenation and stock stability.	Hunters, forest owners, state governments (hunting legislation), federal government, interest groups
3.2.4.4	Development of an advisory concept for foresters with regard to adaptation of forests to climate change	Improvements in consulting, training, and further education of forest owners taking into account latest research results.	Federal government, forest authorities, Chamber of Agriculture and other advisory institutions, academic and non-academic research institutions
3.2.4.5	Adjustment and improvement of crisis and calamity management	Mitigation of damage from harmful events such as windfalls or bark beetle calamities.	Federal and state governments, forest authorities, further authorities (e.g., water authorities), interest groups, forest owners, forestry unions (forest management collaborations (WWGs), forest associations), transport industry, wood and paper industries, EU
3.2.4.6	Establishment of preventative measures with regard to the potential increase in forest fires	Development of preventative measures and systems for forest-fire monitoring and early-warning in order to minimize the risk of forest fires; Elaboration or revision of emergency plans to combat forest fires.	Federal and state governments, municipalities, interest groups, forest owners, forest management collaborations (WWGs), forest associations, academic and non-academic research institutions, EU
3.2.4.7	Forest pollution control - Integrated forest inventory and pollutant monitoring	Nationwide inventory of Austrian forests through improving the forest inventory with remote sensing methods (laser scanning, multi-spectral satellite imagery) for enhanced system knowledge, and the establishment of a pollution monitoring system.	EU, federal and state governments, Federal Research and Training Centre for Forests, Natural Hazards, and Landscape (BFW), Environment Agency Austria
3.2.4.8	Development of modified and innovative techniques for wood processing taking into account potential changes in wood quality and tree species	Development of efficient, innovative techniques for wood processing in order to increase the value added in the wood use chain.	Researchers, wood-working and -processing industry, interest groups, Cooperation Platform Forestry-Wood-Paper (FHP), federal government, EU (Forest Technology Platform)

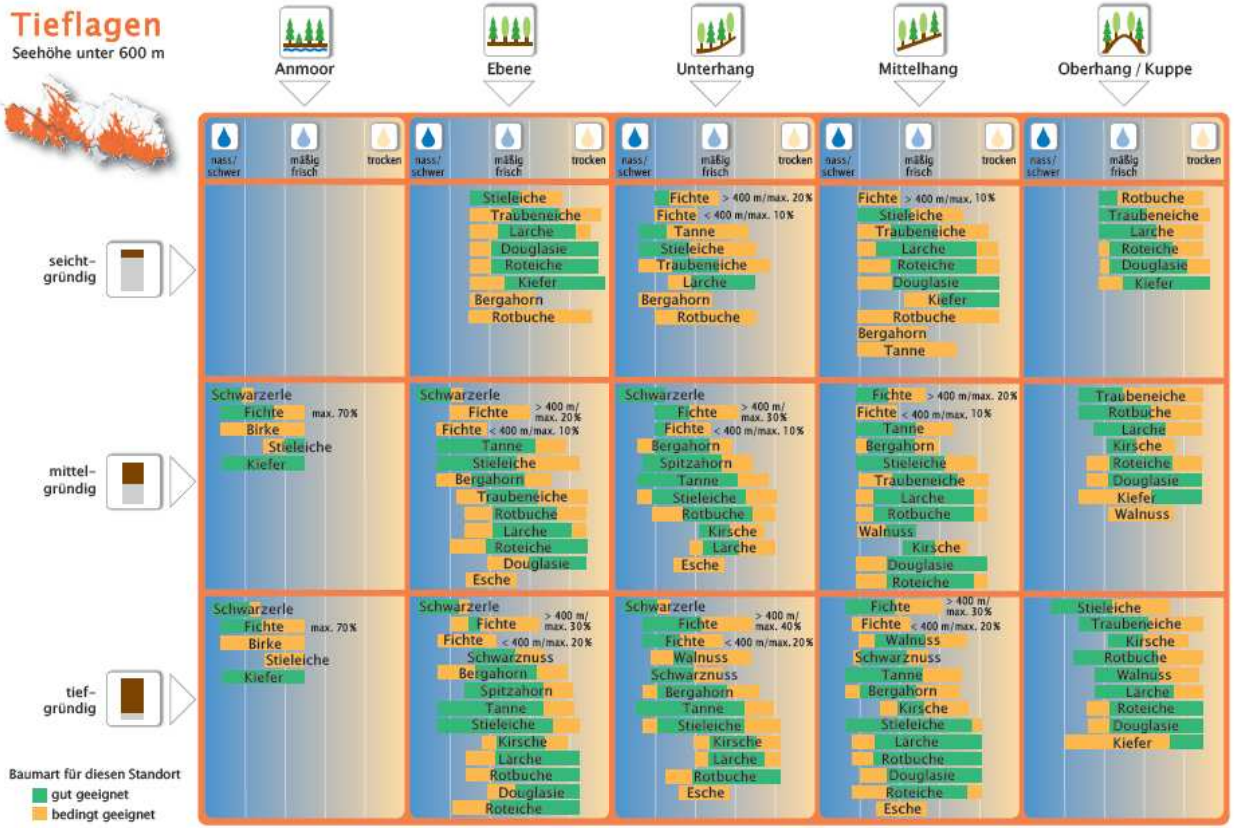
Tools to support adaptation

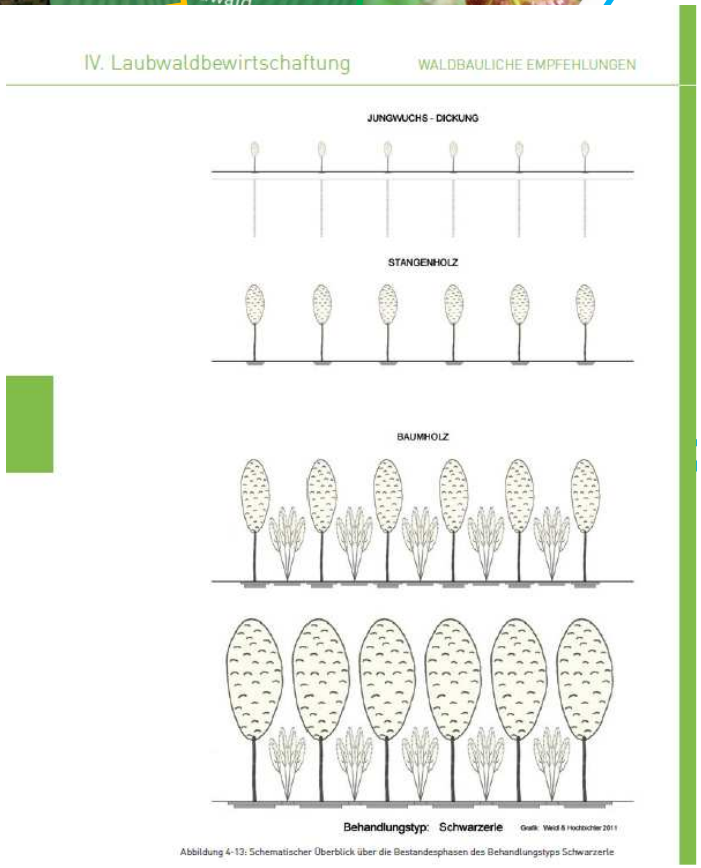
- Bilateral advice by extension services
  - Specific to individual situation
  - Requires well-trained staff
- Guidelines
  - Generalized (one-fits-all solutions)
  - Owner needs to translate to own situation
- Workshops
  - Interactive group situation
  - Mutual learning among participants
- Decision support tools
  - Became technically feasible recently
  - Difficult to handle complex problems
  - Not much experience available



Guidelines

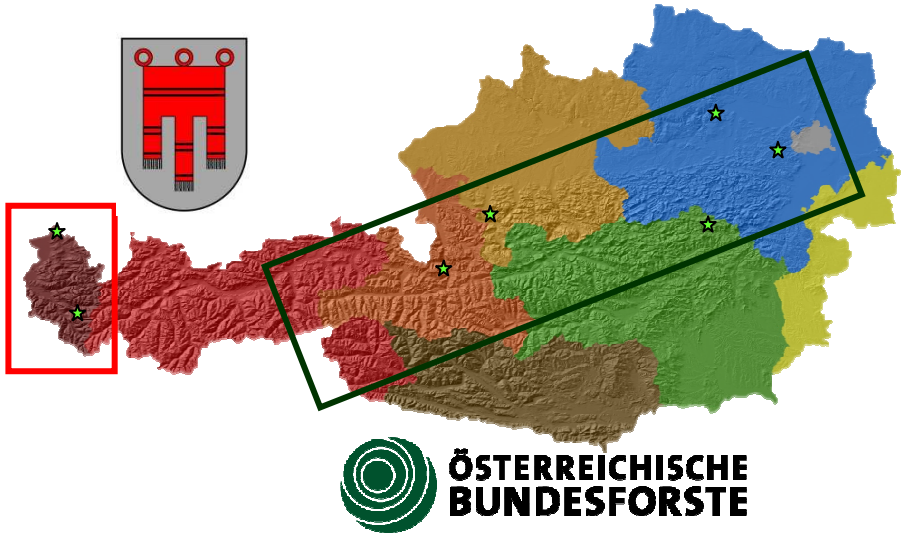
- Regional level (require identification of site types…)
- Species choice
- Management recommendations
- (small scale) forest owners and consultants
- implicit consideration of CC





Workshops

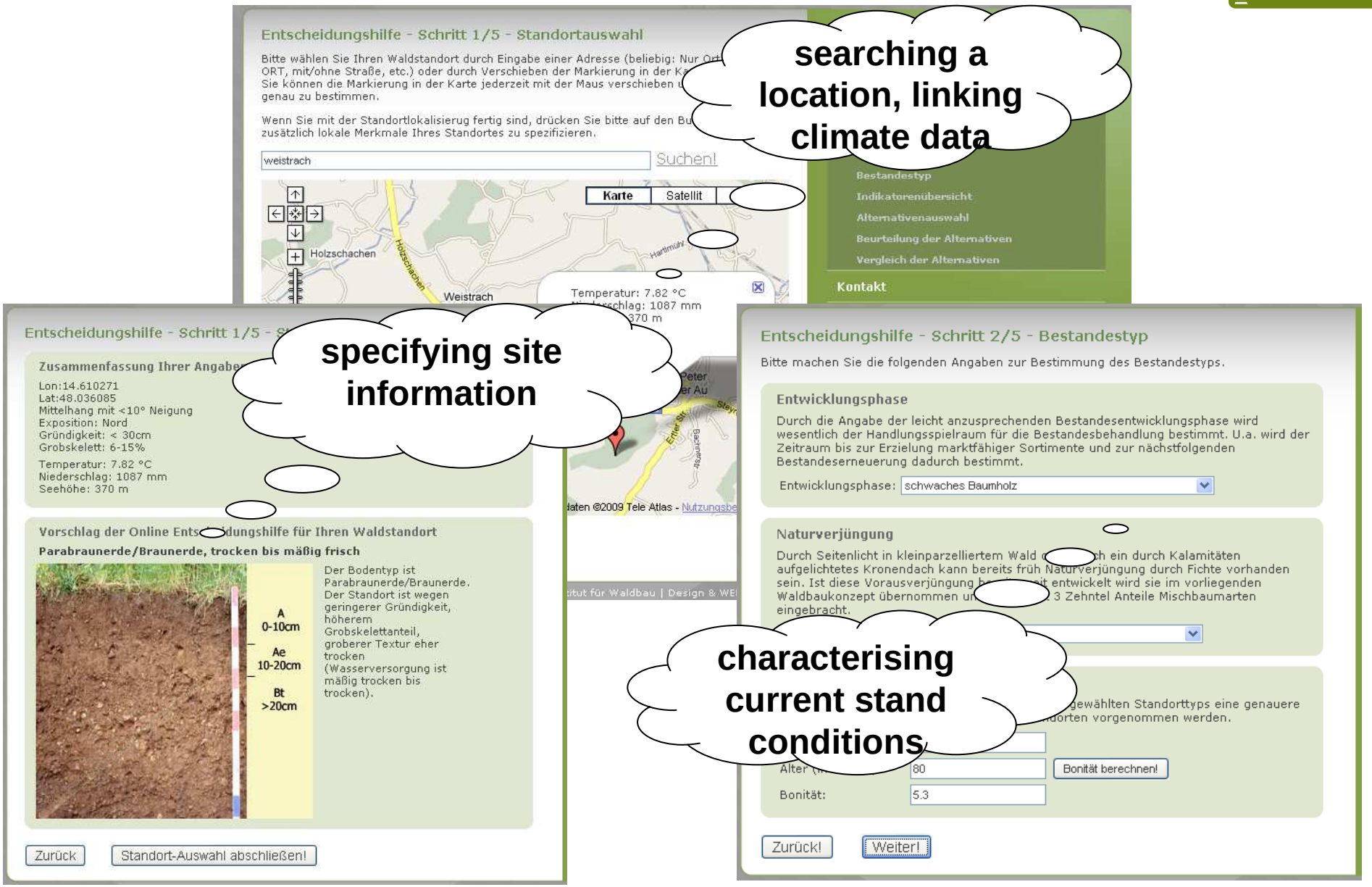
- Province of Vorarlberg (2 day workshops)
- Austrian Federal Forests (11 one day workshops)
- Indoor & outdoor component
- In total 15 events
- Ca. 375 participants from operational foresters to forest managers



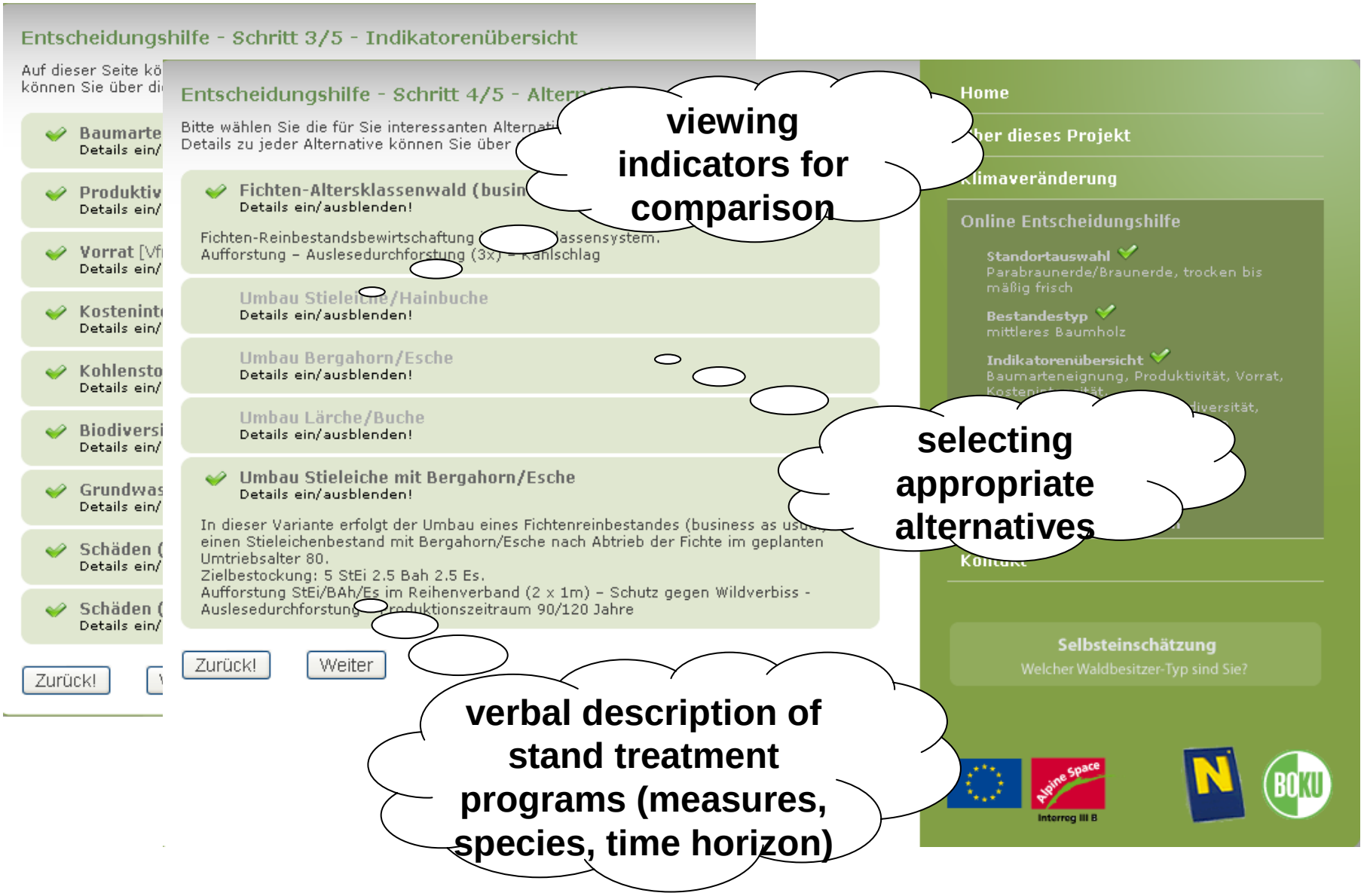
Decision support tools (i)

- ClimChalp DSS
  - Developed within the INTERREG funding framework
  - Geographically referenced (3 districts in Lower Austria)
  - For internal use with administrative authorities (intranet)
  - Guides through a decision making process
  - Local, stand level
  - No preference information for ES is used
  - Data-driven, limited number of options available

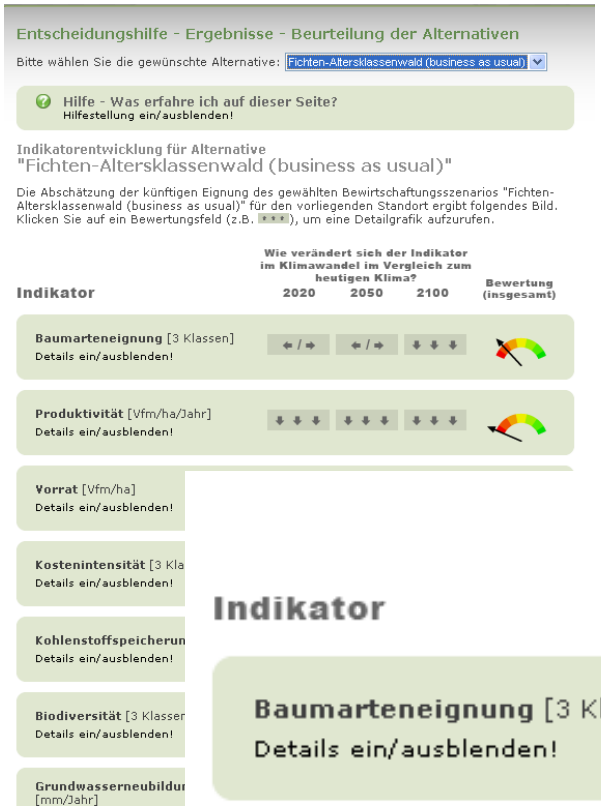
Demo – Identifying site and stand characteristics

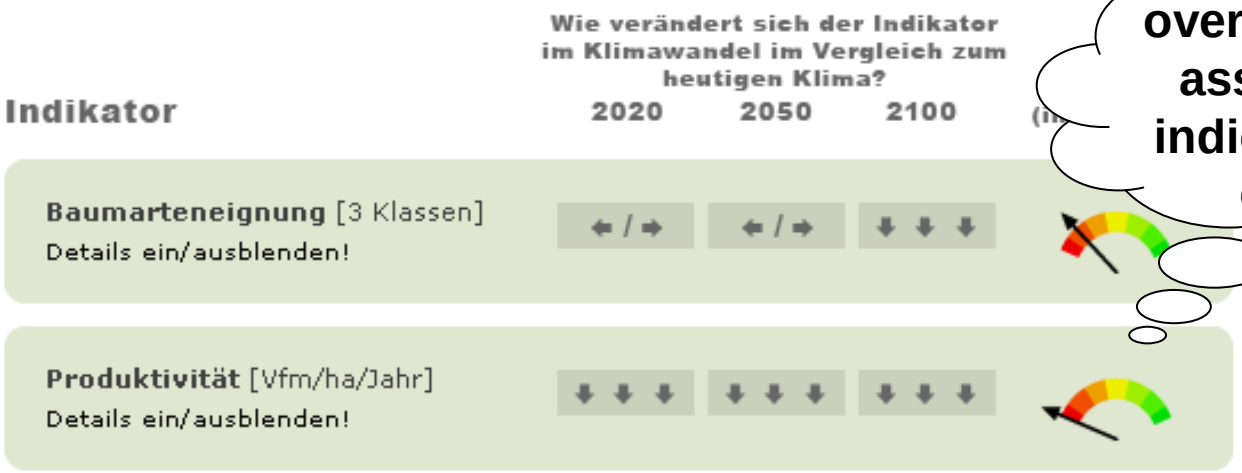


Demo – selecting treatment alternatives



Demo – performance of indicator values

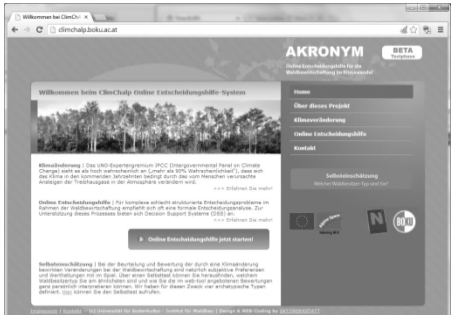


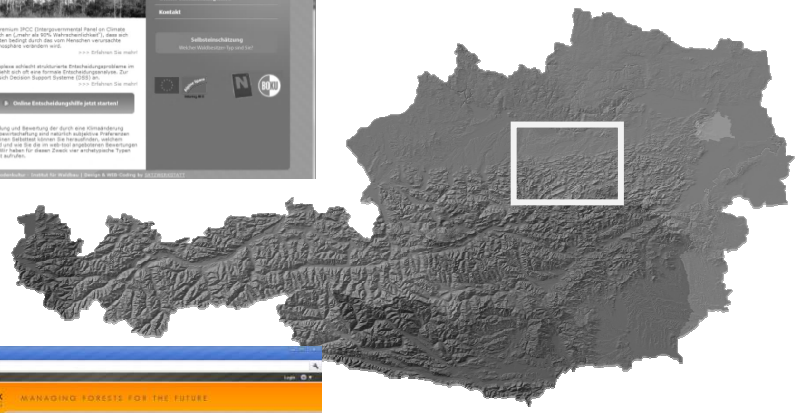


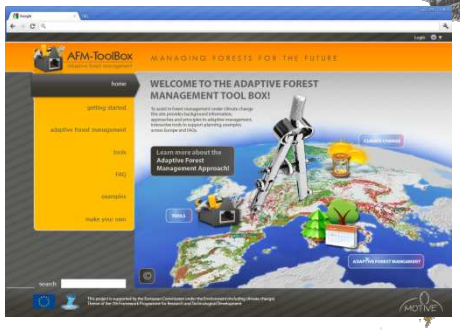
overall qualitative assessment of indicator change over time

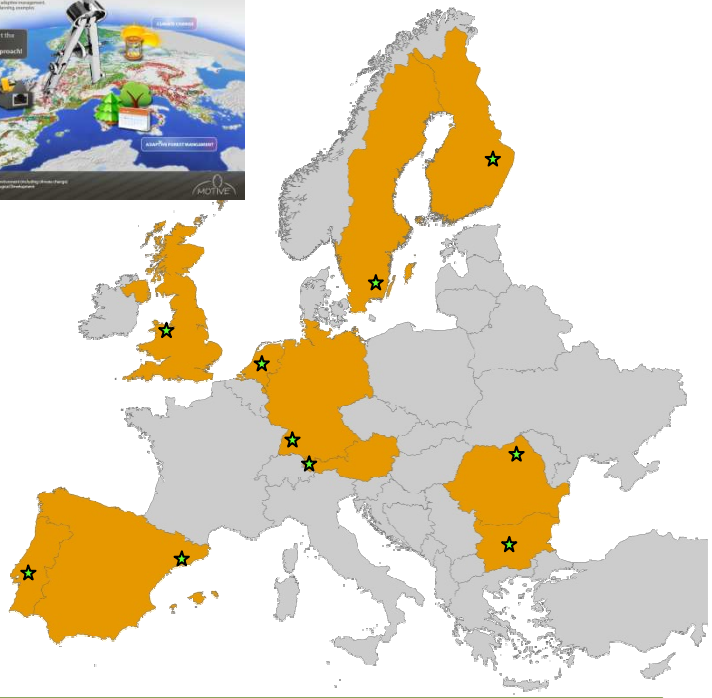
Decision support tools (ii)

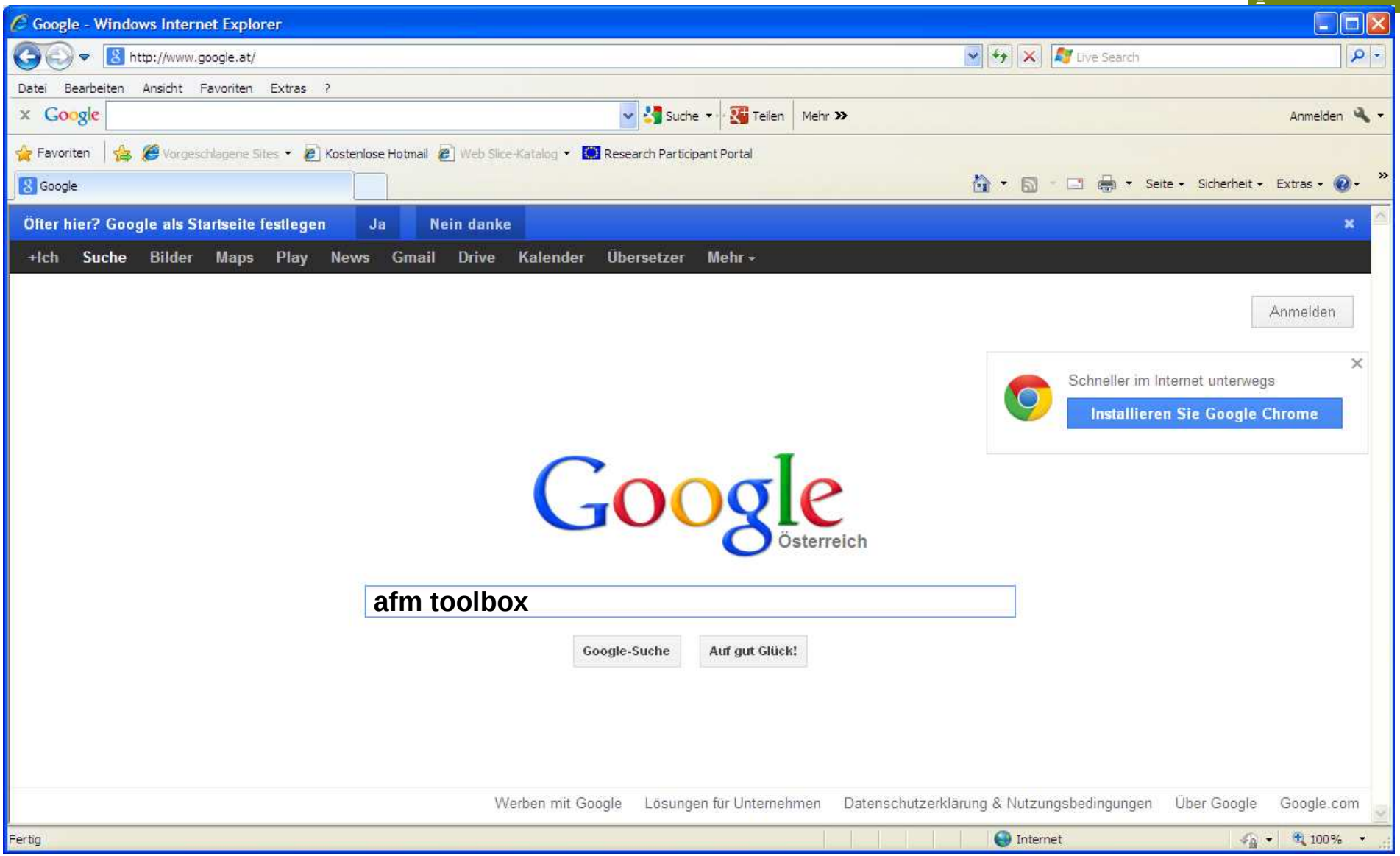
- ClimChalp DSS
  - Developed within the INTERREG framework
  - Geographically referenced
  - For internal use with administrative authorities
  - Guides through a decision making process
  - Local, stand level
  - No preference information is used
  - Data-driven, limited number of options available
- MOTIVE AFMToolBox
  - developed within FP7
  - Web based, public (no specified user)
  - Collection of tools, info, examples, data, …
  - Manager/analyst
  - Soft process as guidance
  - Individual preferences for ES
  - Group mode tools
  - Make your own







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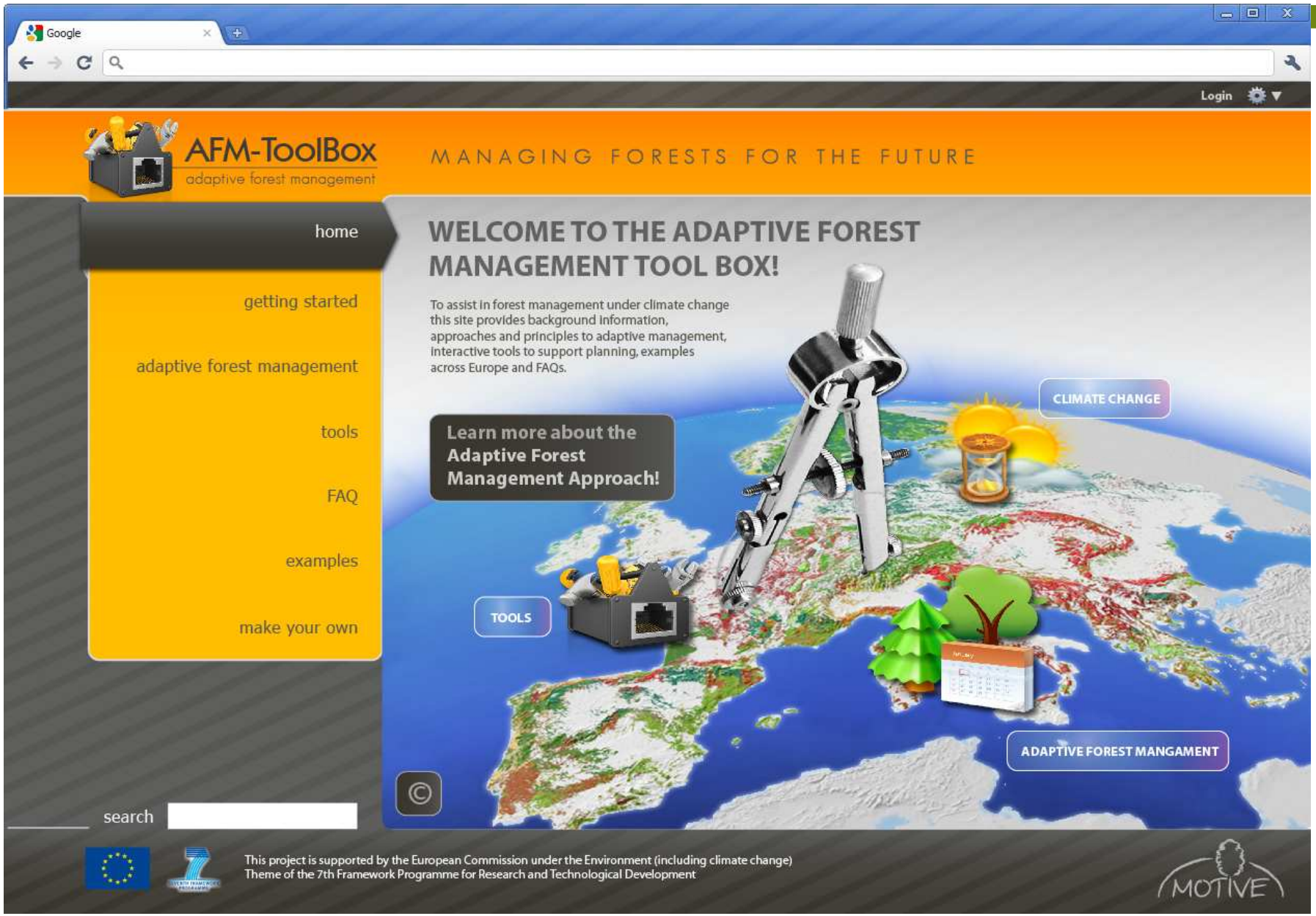
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To assist in forest management under climate change this site provides background information, approaches and principles to adaptive management, interactive tools to support planning, examples across Europe and FAQs.
Learn more about the Adaptive Forest Management Approach!
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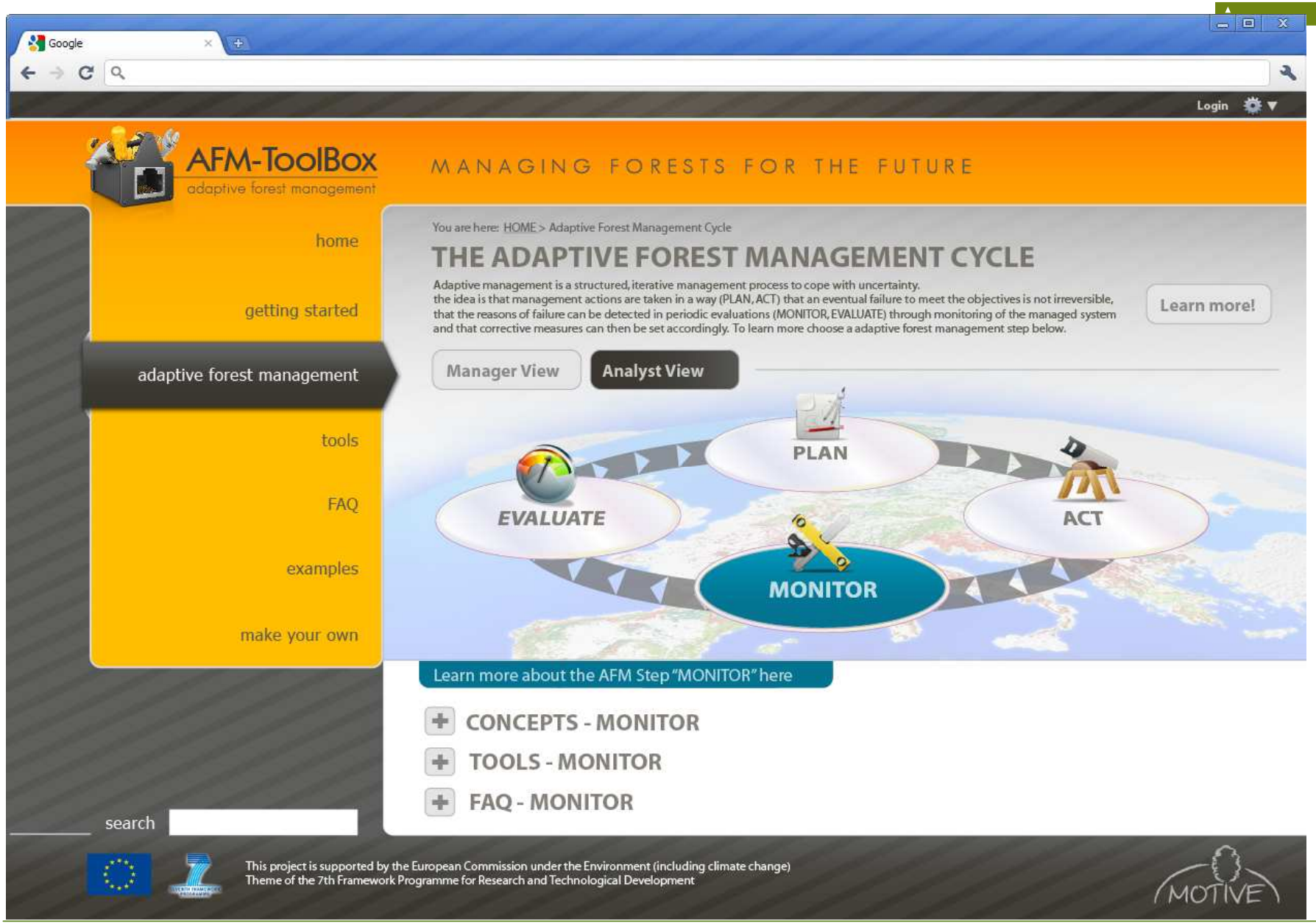
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THE ADAPTIVE FORMAN AGEMENT CYCLE
Adaptive management is a structured, iterative management process to cope with uncertainty.
the idea is that management actions are taken in a way (PLAN, ACT) that an eventual failure to meet the objectives is not irreversible, that the reasons of failure can be detected in periodic evaluations (MONITOR, EVALUATE) through monitoring of the managed system and that corrective measures can then be set accordingly. To learn more choose a adaptive forest management step below.
Learn more!
Manager View
Analyst View
PLAN
EVALUATE
ACT
MONITOR
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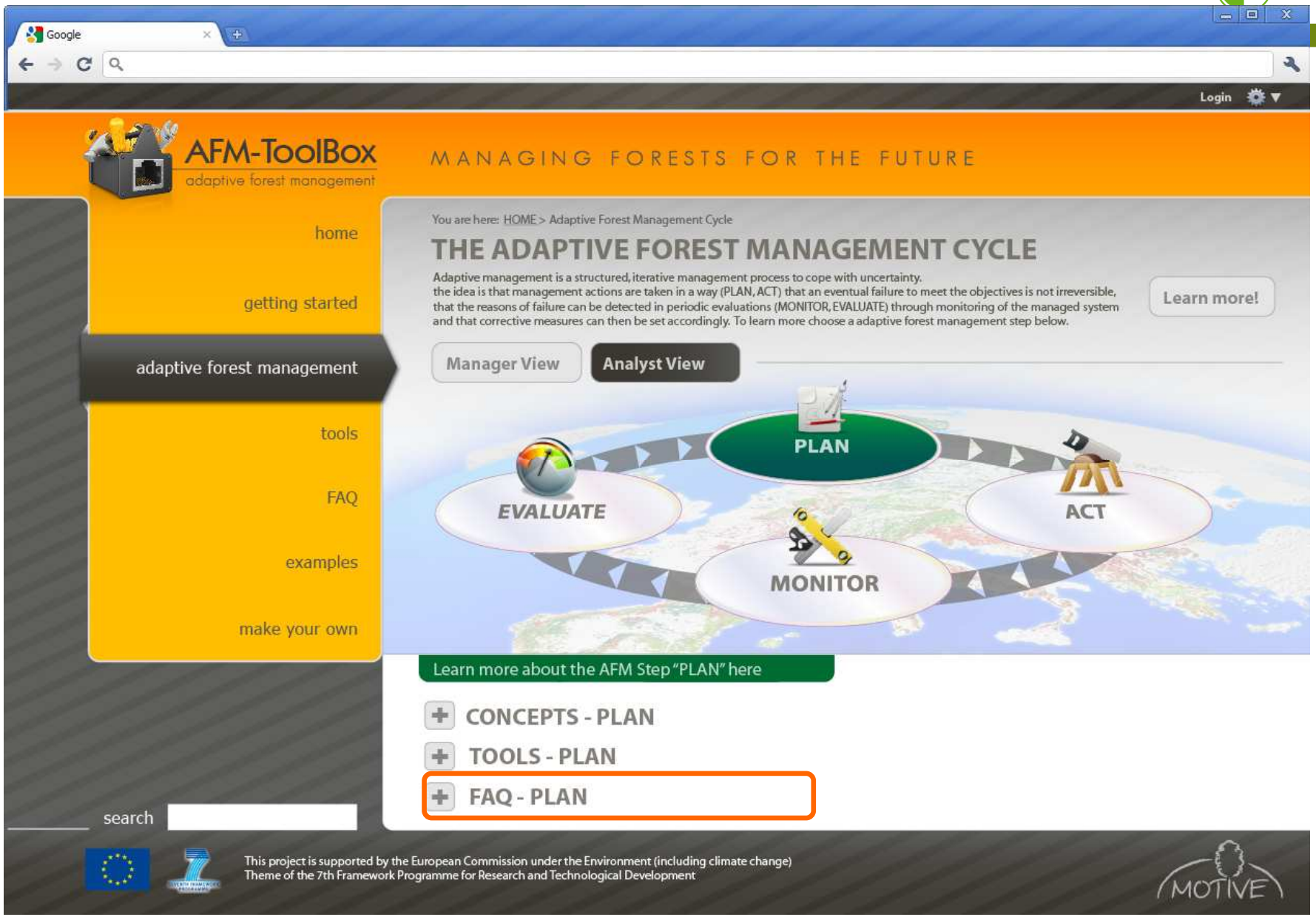
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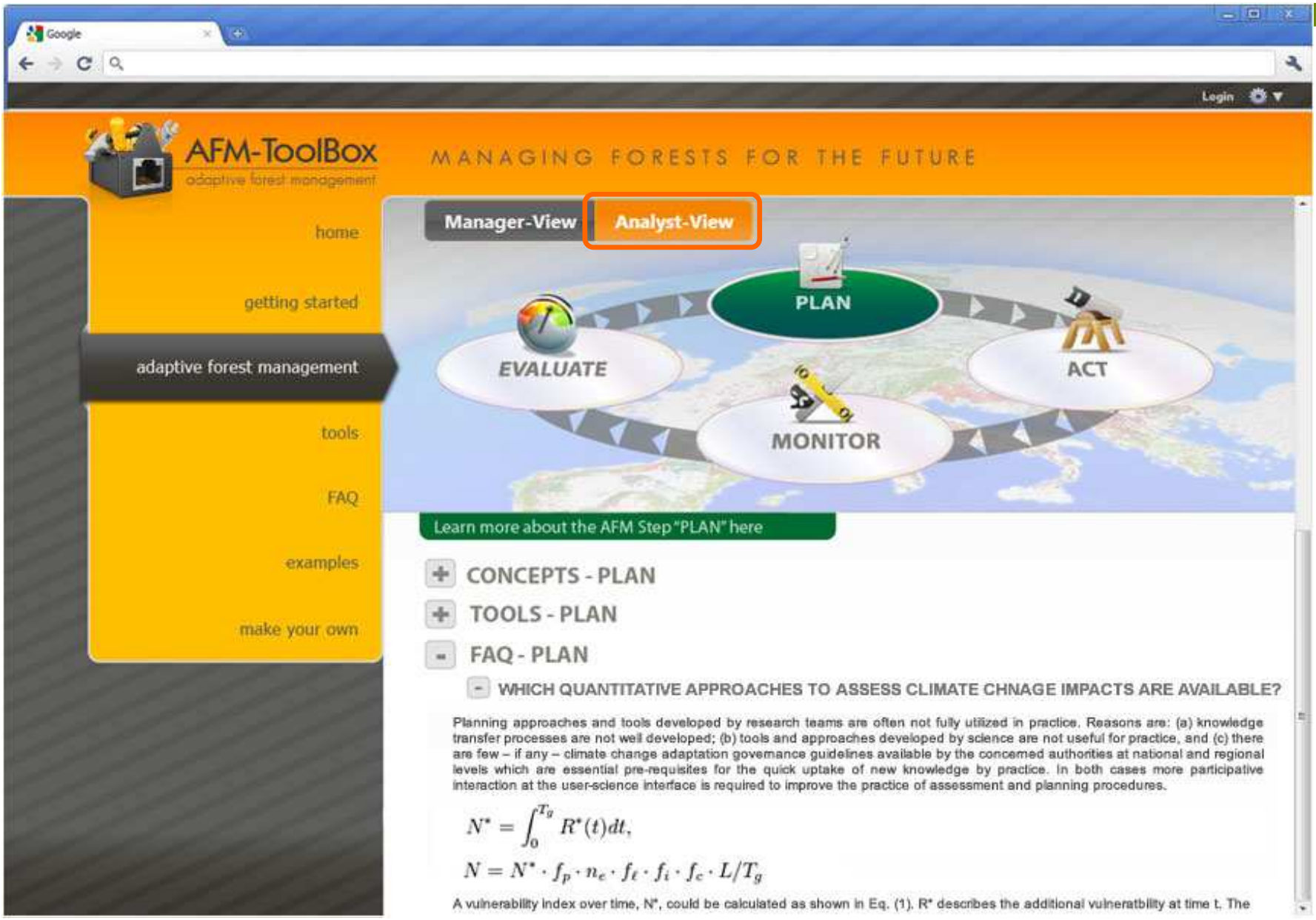
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WHICH QUANTITATIVE APPROACHES TO ASSESS CLIMATE CHNAGE IMPACTS ARE AVAILABLE?
Planning approaches and tools developed by research teams are often not fully utilized in practice. Reasons are: (a) knowledge transfer processes are not well developed; (b) tools and approaches developed by science are not useful for practice, and (c) there are few – if any – climate change adaptation governance guidelines available by the concerned authorities at national and regional levels which are essential pre-requisites for the quick uptake of new knowledge by practice. In both cases more participative interaction at the user-science interface is required to improve the practice of assessment and planning procedures.
$N^* = \int_0^{T_g} R^*(t)dt,$
$N = N^* \cdot f_p \cdot n_e \cdot f_\ell \cdot f_i \cdot f_c \cdot L/T_g$
A vulnerability index over time, N*, could be calculated as shown in Eq. (1). R* describes the additional vulneratbility at time t. The


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What is the predicted impact of climate change when applying alternative forest management?
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by 2050
by 2100
Scenarios:
all available alternate managements
Climate Change: A1B
Ecosystem-Service:
Timber Production
Zoom-in using the slider:
Mgmt: AM3 (53)
Mgmt: AM4 (53)
Mgmt: AM5 (53)
Mgmt: BAU2 (53)
TOTAL PERCEIVED IMPACT
(full scale view)
-1.00
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1.00
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The vulnerability assessment tool utilizes a multi-criteria technique to assess the effects of climate change and alternative management regimes on a variety of vulnerability indicators. In a group setting, a group of users can together elicit preference and interactively analyze the consequences of the groups' preference patterns.
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The Optimization Tool searches for an optimal management plan for a forest management unit. The Tool produces an optimized plan that assigns a treatment plan to each of the stands in a unit.
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Model B
by 2020
by 2050
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Scenarios:
all available alternate managements
Climate Change: A1B
Ecosystem-Service:
Timber Production
Mgmt: AM3 (53)
Mgmt: AM4 (53)
Mgmt: AM5 (53)
Mgmt: BAU2 (53)
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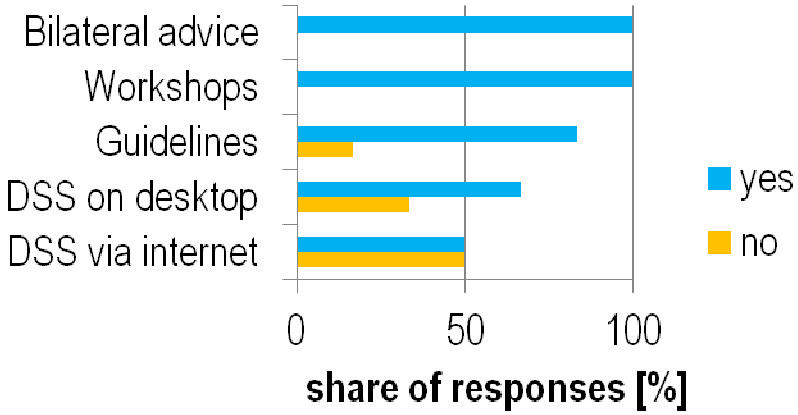
Comparative evaluation of tools

- SH acceptance of some tools depends on age and education level
- Different tools may serve different purposes
- No one fits all solution

Which tools would you consider to plan/ implement AM? (MOTIVE CS Montafon)



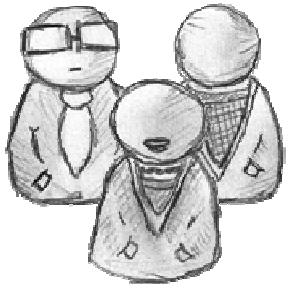
Tool	User	Guidance	Complexity handling	Acceptance by SH	Development costs	Maintenance effort	Up to date (CC, AM, …)
Bilateral advice	Single/ group	Y	+++	+++	+	+++	+++
Workshops	Group	Y	+++	+++	++	++	+++
Guidelines	Single	N	+	+++	++	++	+
ClimChalp DSS	Single	Y	+	+/++	+++	++	++
MOTIVE AFMToolBox	Single/ group	N	+++	+/+++	+++	+++	+++

+ low
++ medium
+++ high

beneficial
intermediate
not beneficial

Conclusions/ lessons learned

- **Knowledge transfer needs to target the right users**
  - different interests and background
  - different expertise in forest management
  - relatively easy for workshops/seminars and brochures
  - but difficult for web-based DSS tools



- **Hard to handle complexity of adaptive management in a changing climate**
  - „useful“ solutions will depend on owner´s preferences, initial conditions and timing
  - may be best to handle in workshop environment
  - huge challenge for web-based DSS tools (must be self-explanatory)

- **Each of the presented knowledge transfer means has benefits and limitations**
  - there is no single best solution for effective knowledge transfer

- **A combination of workshops and do-it-yourself via a web-based knowledge transfer platform** (including planning and decision making tools) appears as a promising approach

University of Natural Resources and Life Sciences - Vienna
Department of Forest and Soil Sciences

Thank you