



A web-based tool box approach to support adaptive forest management

afm-toolbox.net

Harald Vacik, Werner Rammer, Christian Schauflinger, João H.N. Palma, Jordi Garcia-Gonzalo, José G. Borges & Manfred J. Lexer



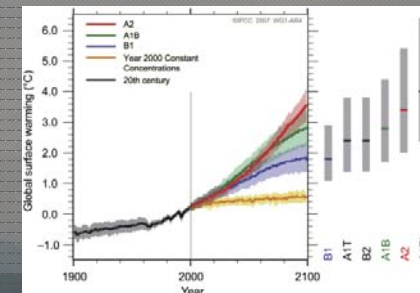
background

Manager/
decision maker



Stakeholder interaction

External drivers



climate change

landuse change

socio-economic conditions



biomass



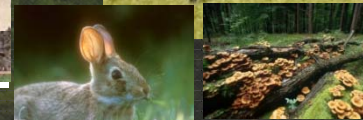
protection



habitat



recreation



Ecosystem services

vision

■ knowledge transfer

- Background **information** on climate change and related impacts.
- How to address climate change vulnerability and adaptation?
- **Options** to respond in forest management to climate change.
- Learn from **examples** from across Europe.

■ decision support

- provide **access** to tools and functionalities otherwise not available
- **explore** how your preferences & interests affect judgements on vulnerability and the selection of adaptive management actions.
- **optimize** your management plan.



Challenges when designing decision support tools (...)



Hard to target the right users

Foresters? Forest owners? Policy maker? Particularly difficult within EU projects!



Hard to handle complexity

... in knowledge transfer processes

How to simplify vast amount of data & multiple problem dimensions (space, time, ...)



Hard to produce software

... at high quality standards

multi-project timeframe may allow continuous development

the ToolBox approach



Web-based
low-barrier access



different types
of knowledge

information, examples, FAQs



collection of
different tools

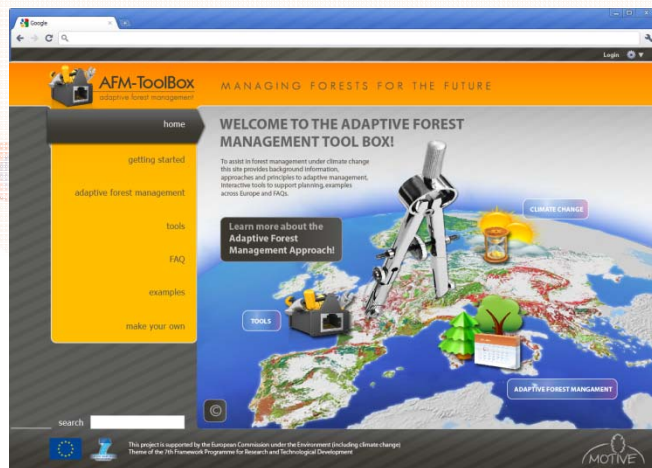
vulnerability assessment, MIP
optimization, niche models, ...



targets different users
useful knowledge for managers (DIY)
and analysts (consultants)



the ToolBox approach

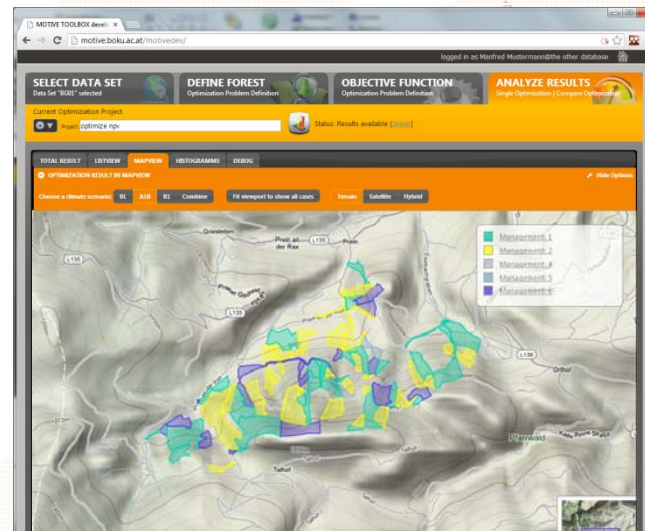


AFM ToolBox web site

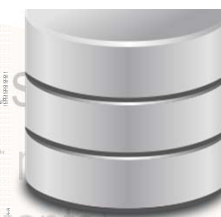
- General information
- „case study“ examples

Interactive tools

- Data driven




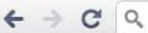
ToolBox Database





Example data/make your own



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WELCOME TO THE ADAPTIVE FOREST MANAGEMENT TOOL BOX!


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!



TOOLS

CLIMATE CHANGE


ADAPTIVE FOREST MANGAMENT



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THE ADAPTIVE FOREST MANAGEMENT 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.

Manager View

Analyst View

[Learn more!](#)

[Learn more about the AFM Step "MONITOR" here](#)

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Manager View

Analyst View



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[Learn more about the AFM Step "PLAN" here](#)

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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.


$$N^* = \int_0^{T_g} R^*(t) dt,$$



$$N = N^* \cdot f_p \cdot n_e \cdot f_t \cdot f_i \cdot f_c \cdot L / T_g$$


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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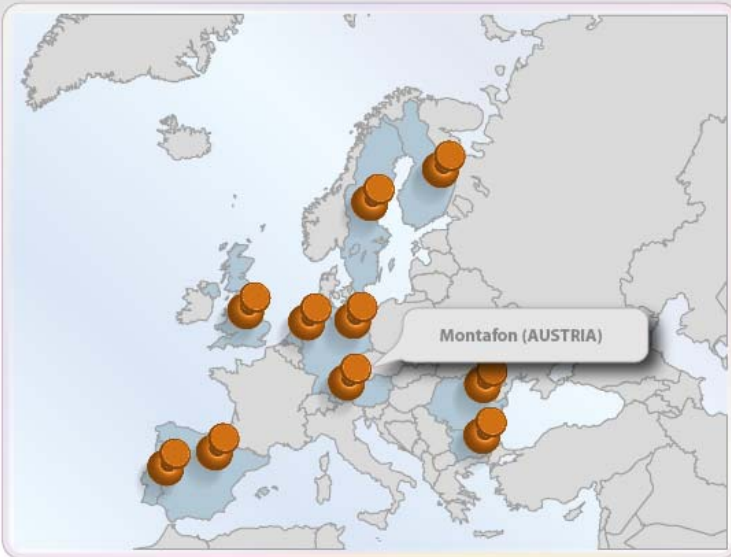
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REGIONAL EXAMPLES

Click on one of the casestudy regions in the map below, to show more details for each casestudy region!
An in-depth coverage of each casestudy can be found on following the link "Learn more!"



Montafon (AUSTRIA)






The Montafon case study is located in Austria in the western Province of Vorarlberg at the border to Switzerland. The case study is part of the Montafon Valley, situated in an alpine landscape in the Eastern Alps. The valley floor is densely populated.

Regional economy is based on tourism (skiing in winter, hiking and mountaineering in summer) dairy farming on grasslands and mountain pastures, and forestry.

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MONTAFON (AUSTRIA)

- FORESTS

More than two thirds of the valley is forested. The case study focuses on the forests of the Stand Montafon, a forest management unit with 6470 ha of forest. The forests are dominated by Norway spruce (96% of growing stock) and European silver fir (3%) with some admixed European beech, Scots pine and European larch (see the major forest types in Figure 1). The largest part of the forest is located above 1200 m.a.s.l. on steep slopes which makes management difficult and requires skyline based logging techniques. Timber production is a relevant business supporting regional sawmills with rawmaterial and local residents regarding to historic timber rights. Most of the forests serve also protective functions against gravitational natural hazards, like snow avalanche, rock fall, landslide, debris flows, erosion, and flooding.

Figure 1

+ FORESTS IN THE MONTAFON


+ CURRENT CLIMATE AND CLIMATE CHANGE SCENARIOS

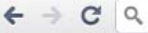
+ WILL THE RISK PROFILE OF TREE SPECIES CHANGE UNDER CLIMATE CHANGE?


+ ARE TREE SPECIES IN THE FOREST SENSITIVE TO CLIMATE CHANGE?


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TOOLS INSIDE THE AFM TOOL BOX

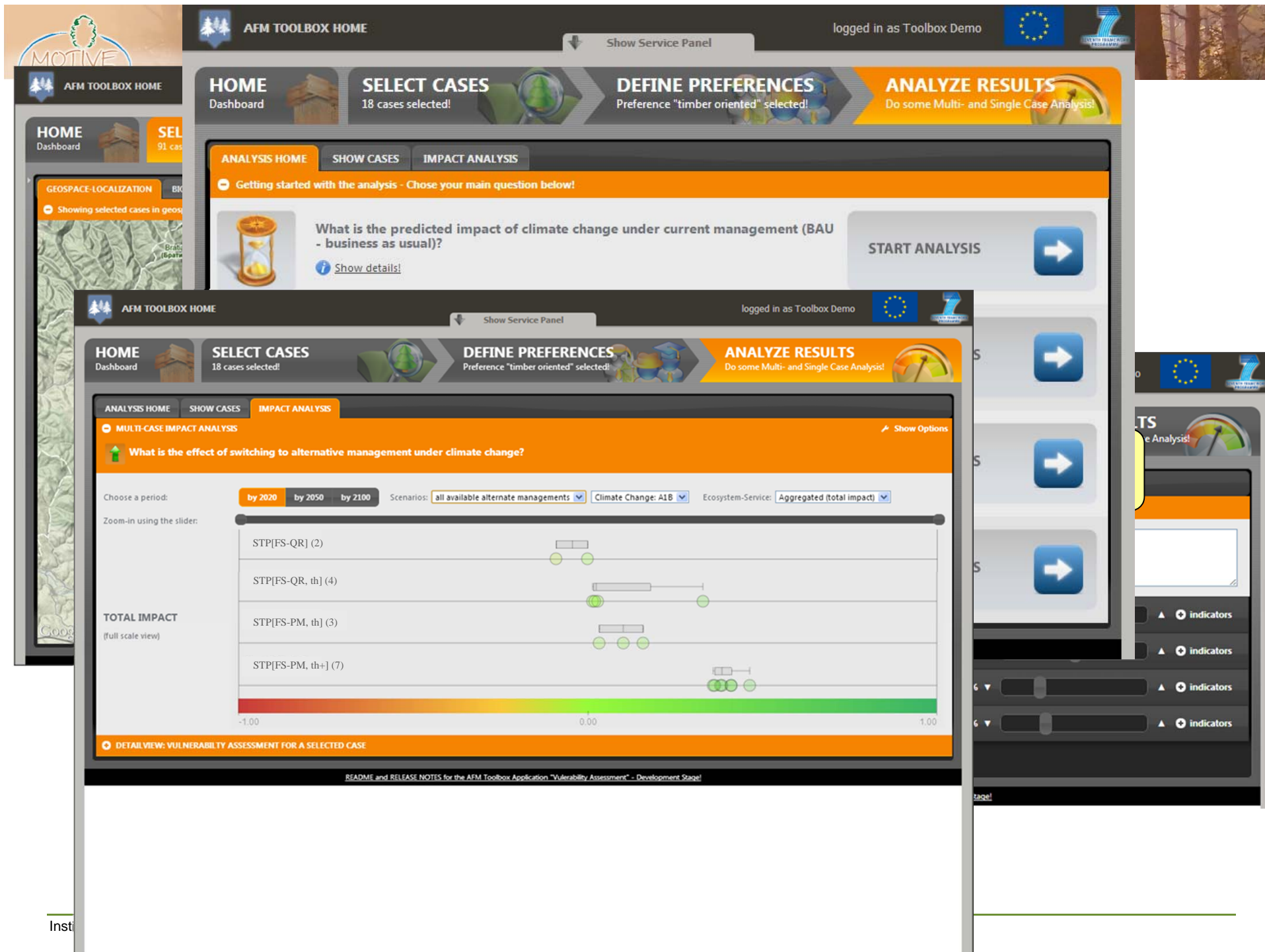
Learn more about the tools provided by the toolbox by clicking on the "Learn more"-Button in the overview below. To directly start a specific tool use the "Start the Tool"-Button.

**VULNERABILITY-ASSESSMENT (BASIC)**
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. These indicators are weighed and aggregated to the level ecosystem services based on user preferences.


**VU**
The v
regio


**VU**
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regio
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**OP**
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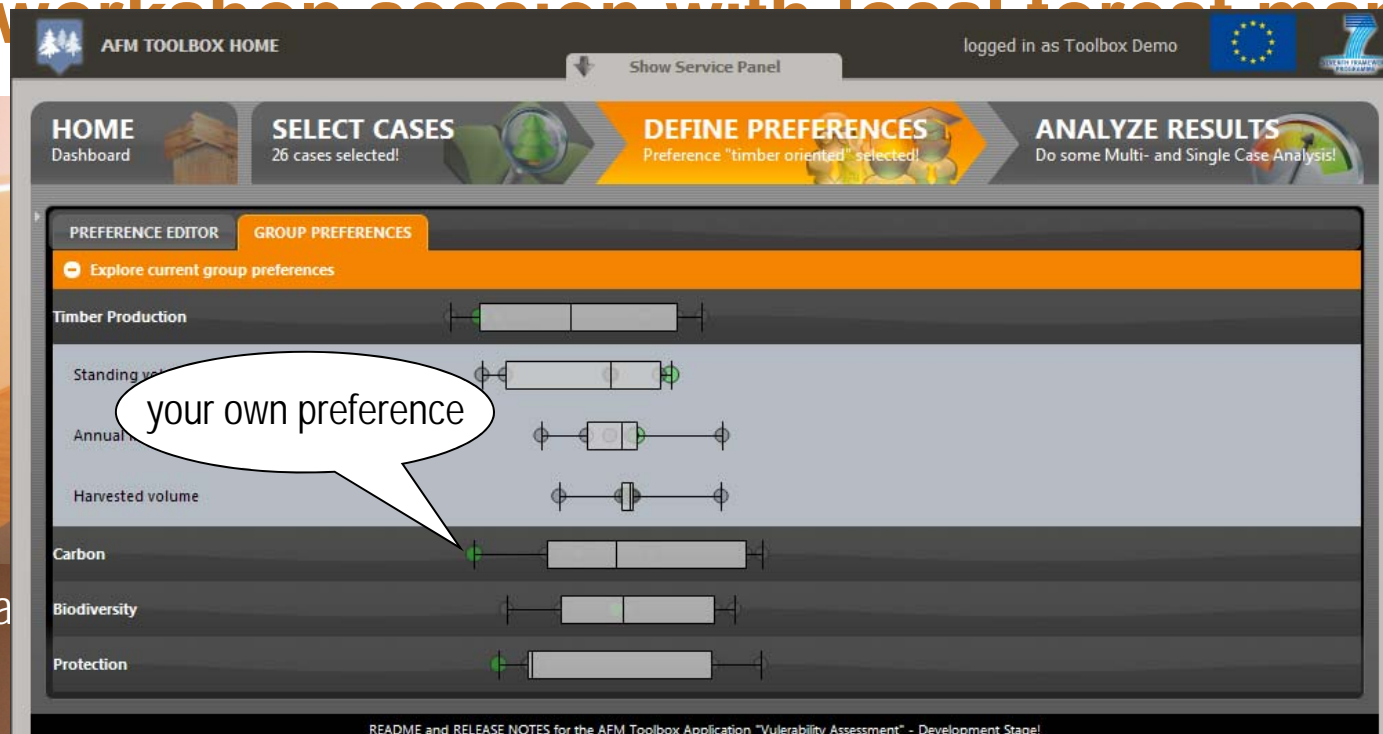
**VULNERABILITY-ASSESSMENT (ADVANCED)**
The vulnerability assessment tool utilizes a multi-criteria technique to assess the effects of climate change and alternative management regimes on a variety of vulnerability indicators. The user can select specific objects for and can control many aspects of the analysis process.
[Learn more!](#) [Start the Tool!](#)

**VULNERABILITY-ASSESSMENT (GROUPMODE)**
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.
[Learn more!](#) [Start the Tool!](#)

**OPTIMIZED MANAGEMENT PLAN**
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.
[Learn more!](#) [Start the Tool!](#)




workshop session with local forest managers





interact






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MOTIVE TOOLBOX develop x

motive.boku.ac.at/motivedev/

logged in as Manfred Mustermann@the other database

SELECT DATA SET

Data Set "BG01" selected

Current Optimization Project

Project optimize npv

FOREST DEFINITION EDITOR

LISTVIEW OF CASES AVAILABLE IN THE

Show 10 entries

Actions	Dom. Spec.	Silvicultural System
<input checked="" type="checkbox"/>	sessile oak, durmast oak	Even-aged
<input checked="" type="checkbox"/>	sessile oak, durmast oak	Even-aged
<input checked="" type="checkbox"/>	sessile oak, durmast oak	Even-aged
<input checked="" type="checkbox"/>	sessile oak, durmast oak, turkey oak, hungarian oak	Even-aged
<input checked="" type="checkbox"/>	sessile oak, durmast oak, turkey oak, hungarian oak	Even-aged
<input checked="" type="checkbox"/>	sessile oak, durmast oak, turkey oak, hungarian oak	Even-aged
<input checked="" type="checkbox"/>	sessile oak, durmast oak, turkey oak, hungarian oak	Even-aged
<input checked="" type="checkbox"/>	sessile oak, durmast oak, turkey oak, hungarian oak	Even-aged

MOTIVE TOOLBOX develop x

motive.boku.ac.at/motivedev/

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SELECT DATA SET

Data Set "BG01" selected

DEFINE FOREST

Optimization Problem Definition

OBJECTIVE FUNCTION

Optimization Problem Definition

ANALYZE RESULTS

Single Optimization | Compare Optimization

Current Optimization Project

Project optimize npv

Status: Ready to optimize [Start now!]

OPTIONSET EDITOR

OBJECTIVE FUNCTION

Choose direction

Choose variable to optimize

period length (years)

count of periods to optimize

Maximize

Net Present Value

10

8

FLOW CONSTRAINTS

constraint variable	reference period	min. value	max. value
Standing Volume Avg.	previous	1000	2000
Biomass	previous	20000	20000
Net Present Value (SUM)	previous		

TARGET CONSTRAINTS

constraint variable	reference period	constraint function
Standing Volume	5	>
Net Present Value (SUM)		greater than (>)

ECONOMIC ASSUMPTIONS

species	price / m3 [€]	costs / m3 [€]
ALL OTHER SPECIES (AVG)	70	30

Interest rate: 5 %

SAVE OPTIONSET AS TEMPLATE

Template Title

comments for this template

Actions

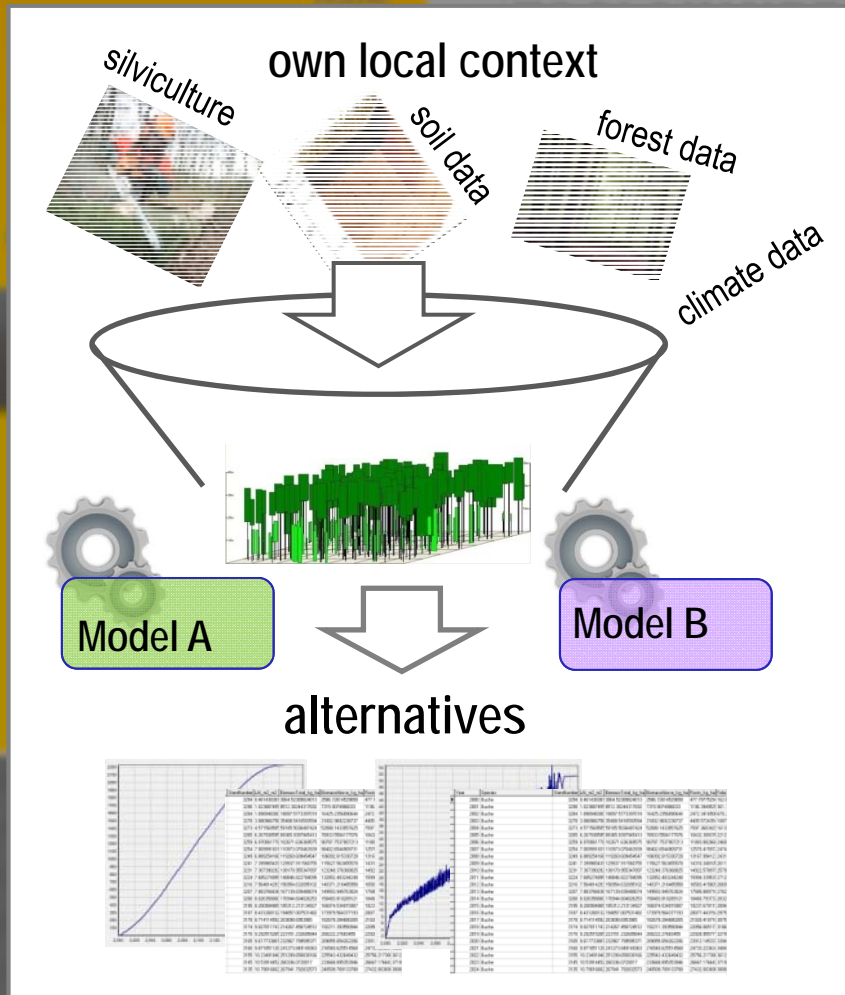
untitled Optionset

Save Optionset as template

Define objective function and constraints

OPTIMIZED MANAGEMENT PLAN TOOL (OLD DASHBOARD FOR DEV/TEST)

„make your own (...)“ - customizing the AFM ToolBox



your data

upload into
database

AFM ToolBox

ToolBox Database





Thank you!
online since June 2013
afm-toolbox.net



**University of Natural Resources
and Applied Life Sciences, Vienna**
Department of Forest and Soil
Sciences

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