



A European infrastructure dedicated to high precision monitoring of greenhouse gas fluxes

International Network Activity ICOS: Long-Term Observation System for Carbon Cycle and Greenhouse Gas Emissions

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- ICOS is a new European Research Infrastructure for quantifying and understanding the greenhouse balance of the European continent and of adjacent regions.
- Coordination: Philippe Ciais, CNRS, France
- Core Team:
 -  **Finland**, Timo Vesala, University of Helsinki
 -  **Germany**, Martin Heimann, Max-Planck-Gesellschaft & Ingeborg Levin, University of Heidelberg
 -  **Italy**, Riccardo Valentini, University of Tuscia
 -  **Netherlands**, Han Dolman, Vrije University
 -  **United Kingdom**, John Grace, University of Edinburgh
 -  **Belgium**, Reinhart Ceulemans, Universiteit Antwerpen & Ramon Garcia-Gallardo, SJ Berwin LLP
 -  **Czech Republic**, Michal Marek, Ústav systémové biologie a ekologie AV CR, v.v.i.
 -  **Ireland**, Frank McGovern and Philip O'Brien, Environmental Protection Agency EPA
 -  **Denmark**, Kim Pilgaard, Forskningscenter Risø, Danmarks Tekniske Universitet
 -  **Norway**, Daniel Rasse, Norwegian Institute for Agricultural and Environmental Research BIOFORSK
 -  **Portugal**, Joao S. Pereira, Instituto Superior de Agronomia, Universidade Técnica de Lisboa
 -  **Spain**, Maria José Sanz, Fundación Centro de Estudios Ambientales del Mediterraneo
 -  **Sweden**, Anders Lindroth, Lunds universitet
 -  **Switzerland**, Nina Buchmann, Eidgenoessische Technische Hochschule





- Collaborative European proposal and concerted research plan
- Support through ESFRI, the European Strategy Forum on Research Infrastructures (approved: Oct. 2006)



each participating group must seek funding from its own national research funding agencies



ICOS-D Germany:

- Martin Heimann (MPI, Jena): EU-Contact
- Ingeborg Levin (U. Göttingen): Atmosphere
- Arne Körtzinger (IFM-GEOMAR): Ocean
- Werner Kutsch (vTI): Ecosystems



Mission statement

- To provide the long-term observations required to understand the present state and predict future behavior of the global carbon cycle and greenhouse gas emissions.
- To monitor and assess the effectiveness of carbon sequestration and/or greenhouse gases emission reduction activities on global atmospheric composition levels, including attribution of sources and sinks by region and sector.

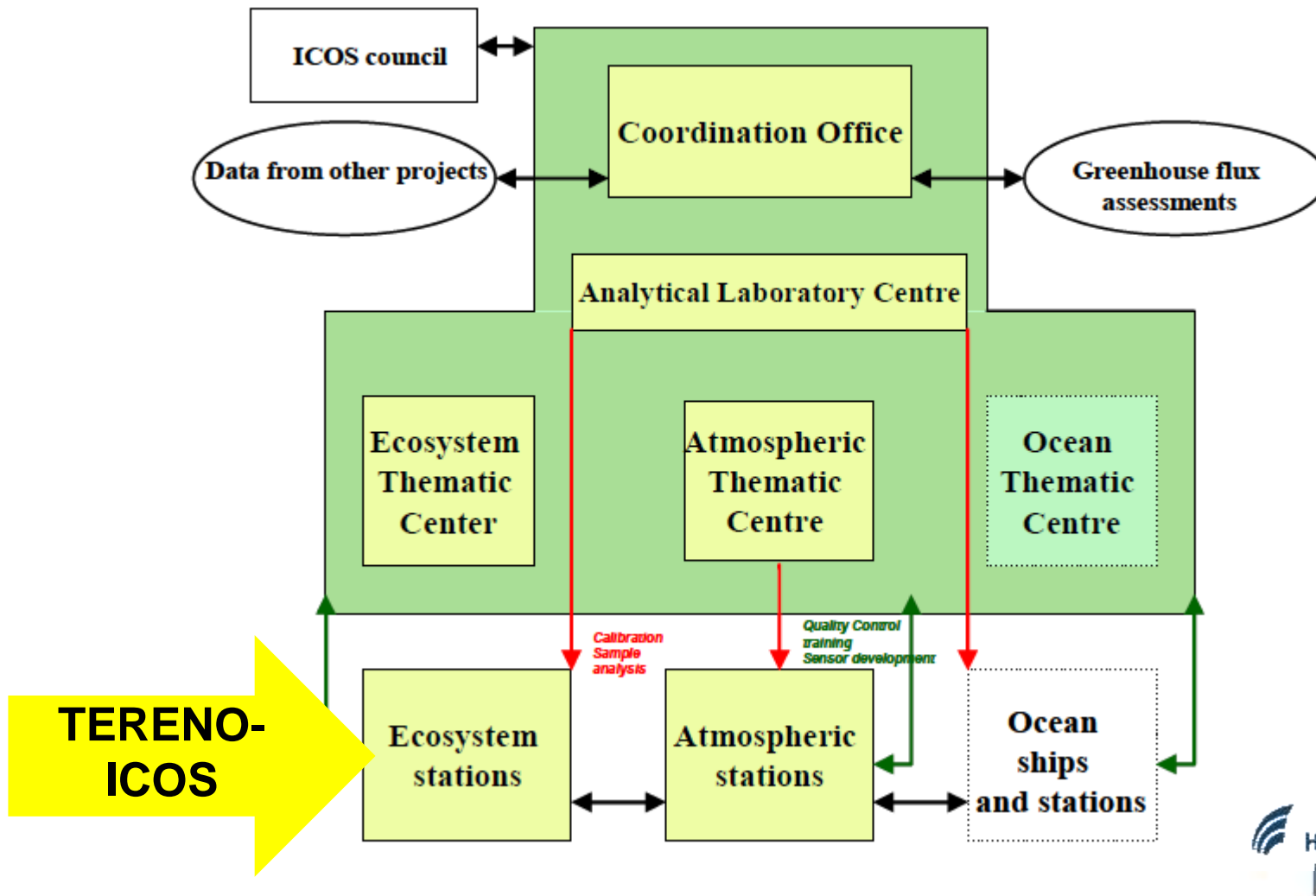


TERENO-ICOS Project (2008):

add EC Stations for CO₂, CH₄ & N₂O Fluxes to TERENO Clusters Eifel, Bode, Pre-Alpine

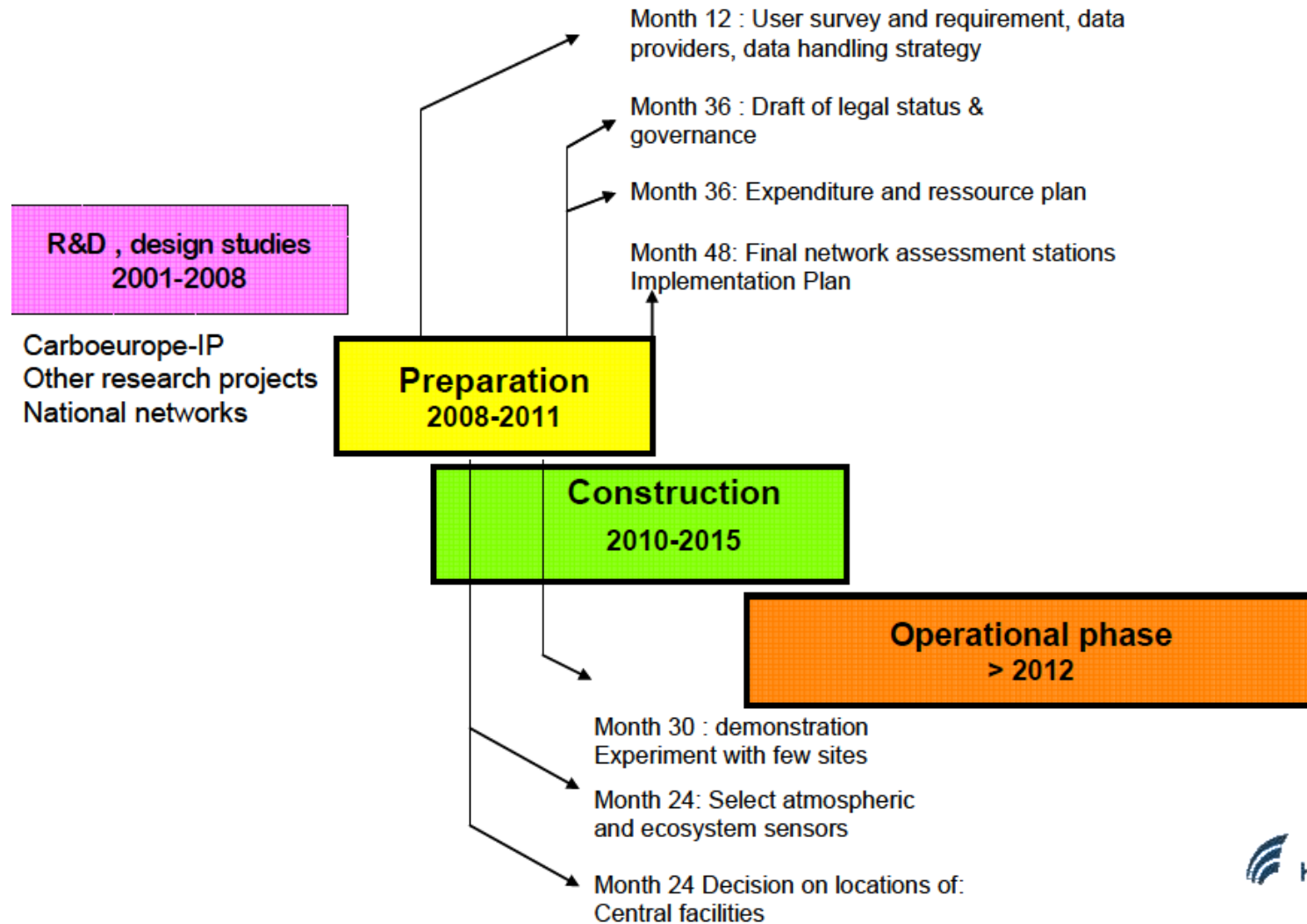


ICOS Building Blocks





ICOS-EU Time Line (original)





Status of ICOS-D

- **ICOS-EU:** F, SF, NL, PL, B, CH, (...) are confirmed participants
ICOS-D: sign-up "pending", in review
- **ICOS-D / Ecosystems:** long-term responsibility with vTI (Braunschweig), **KIT, FZJ, UFZ**
- **ICOS-D / Ecosystems:** Participation by Uni Göttingen (Knohl), Uni Dresden (Bernhofer), U. of Appl. Sc. Weihenstephan-Triesdorf (Drösler), Uni Trier (Drüe)

ICOS-D "Road Map":

- preparation phase: 2012-2013 (BMBF seed-funding, pending)
- development phase: 2014-2015 (BMBF funding, in review *)
- operational phase: 2016-2026+ (institutional funding)

* to be reviewed by Wissenschaftsrat



Objectives of ICOS "Ecosystems":

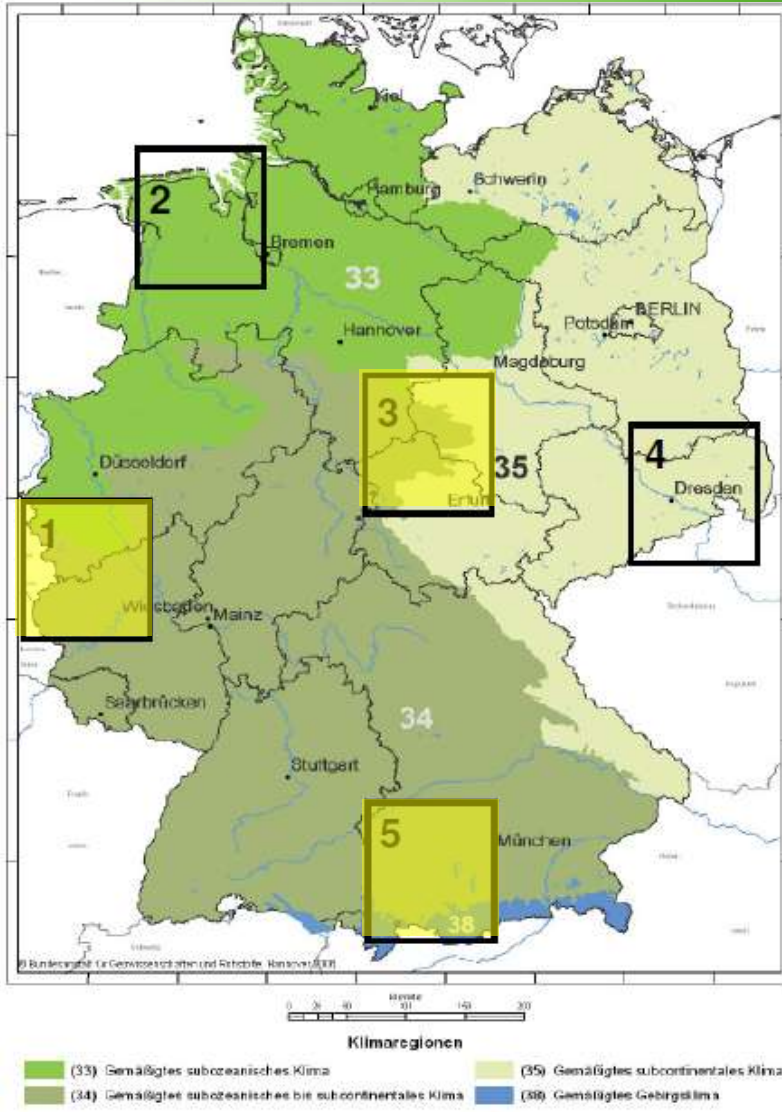
- establish long-term network of ecosystem-atmosphere exchange sites (eddy-covariance) for CO₂, N₂O, CH₄ (plus supporting data)
- establish network-wide protocols for data quality assurance, data analysis
- support research to estimate regional to continental-scale GHG budgets and functional role of ecosystems

Note:

ICOS-Ecosystems objectives =
subset of TERENO & ReKlim TP-4 objectives



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ICOS-D / Ecosystems Clusters:

3 of 5 = TERENO



Participation of TERENO Partner Centers:

- **KIT**
- **UFZ**
- **FZJ**



KIT Ecosystems Observatories

Grassland

- Fendt: Level 1 (EC + chambers + CO₂ soil profile)
- Graswang: Level 2 (EC)

Peat Bog

- Schechenfilz: Level 2 (EC; chambers with M. Drösler, Weihenstephan-Triesdorf)

Forest

- Höglwald: Level 2 (chambers)

Preparation Phase: minimal funding (100 k€/yr) for

- 1 engineer/technician
- some instrumentation



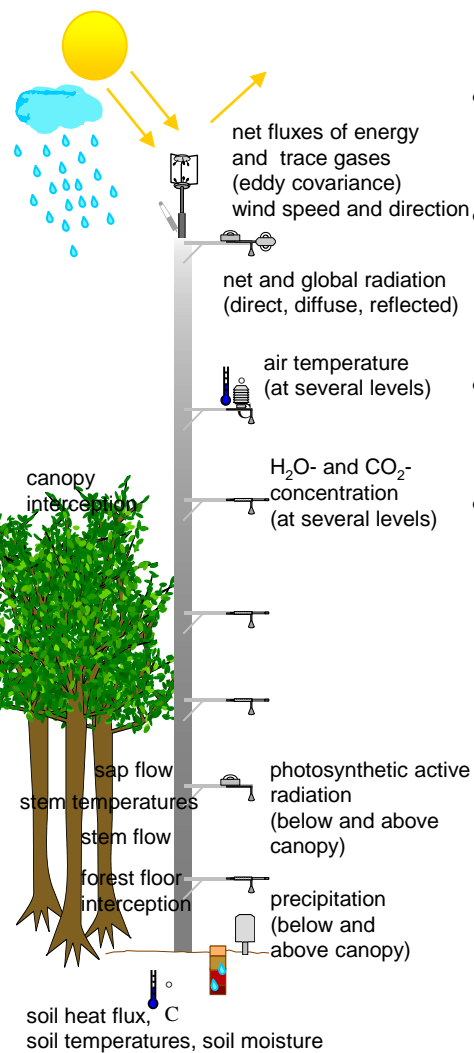
UFZ

ICOS preparation phase

February 2012 to December 2013

- 1 technician (responsible for carbon components in forest)
- 1 postdoc from additional third party funding
- Carbon budget measurements at forest ,Hohes Holz‘ (level 1), e.g. dendrometers, soil respiration, litter fall
- Methane flux measurements in moist grasland ,Großes Bruch‘ (level 2)

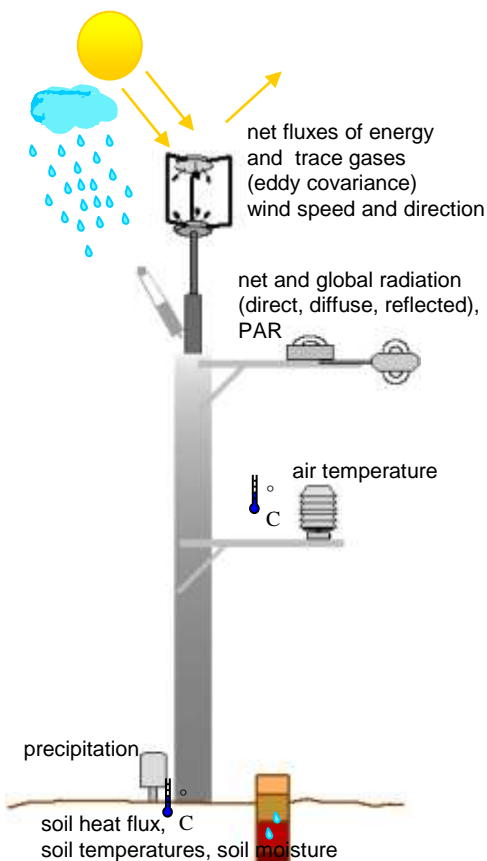
Eddy Covariance Sites: Forest (Hohes Holz, ICOS-Level 1)



- Foundation, anchors, fence, power supply ready
- Instrumentation prepared for energy & water balance, ecohydrology
- Additional ICOS-funding for carbon budget
- Tower?



Eddy Covariance Site: Grasland (Großes Bruch)

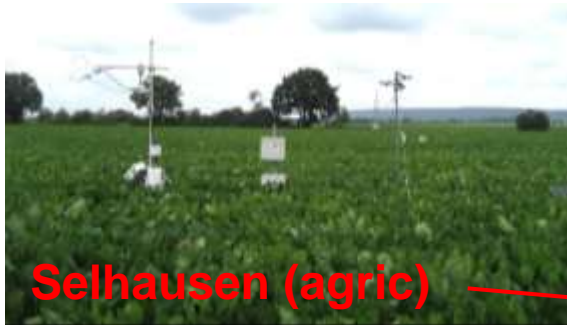


- planning finished, power supply, tower erection to be finished end of February 2012
- Instrumentation prepared, additionally: ground water level, ICOS funding for CH₄-fluxes
- precipitation
- incoming/reflected short and long wave radiation, PAR
- soil moisture (5 depths)
- soil temperature (5 depths)
- soil heat flux
- wind speed and direction
- air temperature and moisture
- snow depth

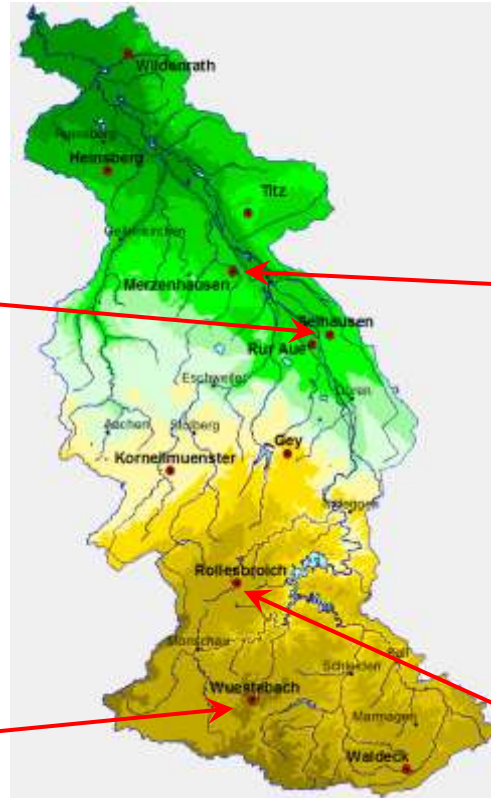


Das Grüne Band im Großen Bruch
(Foto: K. Leidorf)

Rur Obs: State of ICOS sites



Selhausen (agric)



Merzenhausen (agric)



Wüstebach (forest)



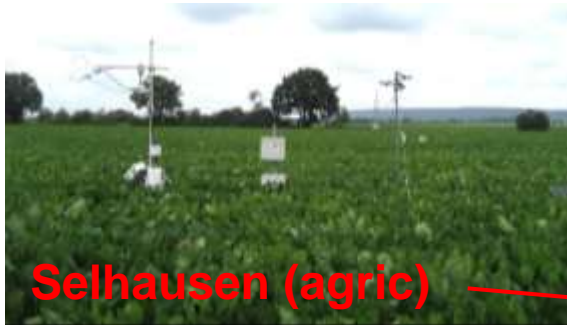
Rollesbroich (grassld)

Eddy Covariance operational since:		ancillary measurements partly incomplete
2012-05-24	Selhausen	FZ Jülich / TERENO-SOILCAN, not in winter (yet)
2012-05-10	Merzenhausen	University Köln, no official TERENO site (yet)
2012-05-13	Rollesbroich	FZ Jülich / TERENO-SOILCAN
2010-06-24	Wüstebach	University Trier / TERENO-ICOS

Rur Obs: State of ICOS sites



Universität Trier



Selhausen (agric)



Merzenhausen (agric)

Open Questions

Expected funding sufficient for long-term operation of 3 sites
(1 x ICOS level 1, 2 x ICOS level 2)

- Level 1: Agricultural site Selhausen or Merzenhausen
- Level 2: Grassland site Rollesbroich and forest site Wüstebach