FINAL INSEA MEETING
Further Procedure and Meeting Minutes
21-22 June 2006
Brussels, Belgium

<u>Further procedure to achieve the Final INSEA Report (due by mid July):</u>

Task 1:
Deliverables produced so far:

- **Revising**
- **Modifying**
- **Updating**

The task leaders for the finalizing procedure are identified in following table:

Parts	Agri Task Leader	For Task Leader	Deliverable	Deliverable Task Leader
Biophysical				
EU 25	Erwin/Juraj	Oskar/Rupert	D8 +	
Global	IIASA	IIASA	D14 +	
Economic				
EU 25	Stephane/Daniel	Uwe/Dax	D9 +	
Global	IIASA	IIASA	D14 +	
Policy	Bernhard/Ewald	Bernhard/Ewald	D5, D6, D15 +	Bernhard/Ewald
Special			D2, D3, D4 +	IIASA, all
Data Mgmt			D7, D13 +	Vladimir, JRC
			D16 +	EFI
Biomass conversion technology			Special Report	LTU

Task 2:
Executive summary
Should focus on the linkage on the thematic field (e.g. biophysical agriculture – as identified in the table); max 5 pages!

Structure should be as follows:

- **Topic area/title**
- **Contributors**
- **Short abstract - a 3-sentence synopsis**

- **Core Executive summaries:**
    - **State of the art (1 sentence) + literature review**
    - **Objectives**
    - **Methods**
    - **Results**
    - **Discussion**
- **Internal/external linkage**

Task 3: Based on the input from task 2 a multi-authored paper will be produced at IIASA – hence PLEASE CITE PROPERLY!!

Minutes from the discussion after presentations:

Bernhard Schlamadinger:
- Missing linkage to the modeling (especially on the global scale)
- Greenhousegas offsets are not always cheap
- In Future better using of Bernhards network (follow –up)

Juraj Balkovic 1:
- Future: Close the loop by linking back the economic results to practices in their geography

Rainer Baritz:
- Contact and send your maps so that it can be included to the global product of IFPRI – global crop map

Juraj Balkovic 2:
- Link the improved SOC to other EU projects, CarboEurope, Nofretete, etc

Vladimir Stolbovoi:
- We did not consider the transaction costs as much as maybe necessary in the economic analysis

Michael Fuchs
- Bravo! - definitely over-performed within INSEA
- EPIC can go global now!!

Erwin Schmid:
- More validation for the future (using the established networks)

Oskar Franklin:
- Off-side effects (more or less bio fuel to use)
- Data in forestry much poorer than in agriculture - much improvement but still a lot to be done (further input by EFI, JRC etc, clean-up mistakes)

Rupert Seidl:
- Showed high correspondence!
- Should find out why to small for Northern Countries (FASOM) and too big for Austria (PICUS)

Florian Kraxner:
- Where do the prices come from, eventually contact ZALF (Mr. Sommer)

Daniel Blank:
- Further Simulations by EPIC on straw etc needed!
- Have a closer look into tillage/conservation tillage (cost problems..)

Stephane De Cara:
- Get bioenergy component into AROPAj

Dagmar Schwab:

- Is there a wood chain behind (smaller forest owners or is it national forest owners) or is it pure physical forest modelling - or is there an allocation by forest owner: in Fasom – profit maximizer or not profit maximizer!
- No information on industry structure in Europe
- Implicitly included because of possibility to derive it from the cost numbers and so estimating the ownership size structure

Uwe Schneider:

- Analysis of major FASOM results still needed (million things in – million things out)
- Enormous flexibility proven – results still needed
- Downscaling
- Gains/Message link

FINAL INSEA MEETING AGENDA
21-22 June 2006
European Commission
21, rue du Champ de Mars
Meeting room SDR3 - 00/164
Brussels, Belgium

Program, Wednesday, 21st June 2006 (PART 1)

13.00-13.10 Welcome, Overview and Intro to the Workshop
Daniel Deybe (INSEA Scientific Officer, EC)

13.10-13.45 Introduction to the INSEA Approach
Michael Obersteiner, Florian Kraxner (INSEA Coordinators, IIASA)

AFOLU Sector and Climate Policy

13.45 – 14.15 INSEA and the AFOLU Sector
Bernhard Schlamadinger (JR, Austria)

- Review of AFOLU policies under Kyoto Protocol
- Options of the AFOLU sector for Post-2012 regimes

Input Database & Data Preparation for Biophysical Agriculture and Forestry Models

EU 25

14.15 – 14.45 INSEA data processing for EU25 biophysical modeling
Juraj Balkovic / Rastislav Skalsky (SSCRI, Slovakia)

- List of databases for biophysical modeling
- Concept of Homogeneous Response Units (HRU)
- EPIC Input List (physical data, land-cover and land-use data)
- Database Logic
- Publishing the indicators

14.45 – 15.15 Spatial delineation of cropping systems / Tool for the selection of test areas
Rainer Baritz / Michael Fuchs (BGR, Germany)

15.15 – 15.45 Coffee Break

15.45 – 16.15 Validation of SOC initial values for EPIC modeling through comparing European and regional datasets
Juraj Balkovic / Rastislav Skalsky (SSCRI, Slovakia)

- Validate initial SOC contents for biophysical modeling for EU25
- Identify the effects of different tillage management modeled with data of different quality

16.15 – 16.45 European soil database and verification of the changes of the organic carbon stock in mineral soils
Vladimir Stolbovoj (JRC)

- European Soil Database
- Verification of the changes of the organic carbon in mineral soils

Global

16.30 – 17.00 Preparation and Generation of Climatic Input Data Sets for the Biophysical Process Modelling – EPIC / The Availability of Input Data on the global level for Biophysical Process Modelling - Global EPIC

Michael Fuchs / Rainer Baritz (BGR, Germany)

- INSEA Global Weather/Climate Scenarios Data base,
- Crop maps,
- New Global Soil Map,
- Land cover products

Biophysical Modeling & Engineering Costing

17.00 – 17.30 Bio-physical impacts of agricultural land use management systems in EU25

Erwin Schmid (IIASA/BOKU)

- Presentation of the geographically explicit modeling concept;
- The biophysical process model EPIC;
- Selected Model Results on bio-physical impacts of agricultural land-uses and management practices.
  - Impacts on food and non-food crop yields,
  - Environmental Impacts (e.g. SOC, N2O)

17.30 – 18.00 Forest production and carbon storage - potentials of European forestry

Oskar Franklin (IIASA)

- Introduction to the Regional Forestry OSKAR Model
- Presentation of Results for Management Options
  - Whole tree harvesting
  - Change of Rotation Age
  - Old forest protection
  - Thinning

18.00 – 18.30 Evaluation of the INSEA forest scenario model by means of plot level simulations over a wide ecological gradient

Rupert Seidl / Manfred Lexer (BOKU, Austria)

- Introduction to the Stand level Model PICUS
- Forest Management Scenarios of individual stands
- Validation with OSKAR model

18.30 – 19.00 Spatially Explicit Analysis of Bioenergy Systems

Sylvain Leduc (LUT, Sweden) / Florian Kraxner (IIASA)

20.00 Joint Dinner IL PASTICCIO

Program, Thursday, 22nd June 2006 (PART 2)

Economic Modeling

EU25

09.00 – 09.20 Economic and Ecological Effects of Agricultural Policies

Daniel Blank (UHOH, Germany)

- Introduction of the EFEM farm level model

- Results of Farm response to GHG Policies

09.20 – 09.40 Mitigation in EU agriculture - GHG abatement and carbon sequestration costs

Stephane De Cara / Pierre-Alain Jayet (INRA, France)

- Presentation of the AROPAj model
- Heterogeneity of GHG abatement costs among European Farmers
- Mitigation options vs carbon sequestration through alternative tillage practices in European agriculture

09.40 – 10.00 EU FASOM Forestry Sector

Dagmar Schwab (IIASA)

- forestry input parameter
- constraints, structure
- forestry variables/results

10.00 – 10.20 Carbon Sinks and Land Use Competition

Uwe Schneider (IIASA/UH)

- Introduction to the EU-FASOM model
- Results focus on Land Use and Land-use Change of the Combined Forestry and Agriculture Sector
- Competitive Mitigation Potentials

Global

10.20 – 10.40 Global Long-Term Scenarios

Michael Obersteiner (IIASA)

- Introduction to the DIMA model
- Global results of AFOLU strategies
    - Sinks
    - Bioenergy
    - Land-use Implications
    - Avoided Deforestation

10.40 – 11.00 Coffee Break

11.00 – 13.00 Wrap-up in Session with Participants from DG AGRI, ENV and RTD

13.00 Closing of the Meeting

FINAL INSEA MEETING ABSTRACTS
21-22 June 2006
European Commission
21, rue du Champ de Mars
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AFOLU Sector and Climate Policy

INSEA and the AFOLU Sector
Bernhard Schlamadinger (JR, Austria)

Agriculture, Forestry and Other Land Use (AFOLU in the 2006 IPCC Guidelines - so far referred to as LULUCF) played an important role in the negotiations leading to the Marrakech Accords. This presentation will review the latest experience with implementing LULUCF activities in Annex I countries and in the CDM. This will include a review of actual incentives "on the ground" for LULUCF activities, and the choices that countries have to make by the end of 2006 under Kyoto Protocol Articles 3.3 and 3.4, regarding forest definitions and additional human-induced activities (forest management, cropland management, grazing land management, revegetation).
In the second part the presentation will summarize the IPCC 2006 Guidelines which were adopted by the IPCC Plenary a few weeks ago and are likely to form the basis for a post 2012 international climate agreement. This will be followed by a brief overview of discussions at two international INSEA sponsored workshops on 1) options for AFOLU post 2012 in general, and 2) options for including emissions from deforestation in developing countries in a future climate agreement. The key outcomes of both workshops were presented at COP / SBSTA side events which were attended by a large number of country negotiators (Montreal, December 2005; Bonn, May 2006).

Input Database & Data Preparation for Biophysical Agriculture and Forestry Models

EU 25

INSEA data processing for EU25 biophysical modeling
Juraj Balkovic / Rastislav Skalsky (SSCRI, Slovakia)

The modeling of environmental indicators to evaluate the GHG emission/sequestration involves a geographically explicit framework, to which various physical and management information needs to be integrated. The concept of homogeneous response units (HRU) was designed over European databases to provide an alternative, how data with different character, scales and aggregation levels could be consistently passed to the EPIC-GIS workspace. Homogeneous response units respect homogeneity in soil and topographical properties (in 1:1,000,000 scale), which are relatively stable in landscape (elevation, slope, soil texture, soil depth and soil stoniness). The simulation entities were obtained by a geographical merging of HRUs with land cover, irrigation and NUTS2 information. Initial inputs for the simulation units were derived by a processing toolkit being developed within INSEA. Crop rotation systems and the management schedules were constructed at the HRU base in a way to approximate existing national statistics, such as crop shares or yields (base-run scenario of land use).

Spatial delineation of cropping systems
Rainer Baritz, Michael Fuchs (BGR, Germany)

A method to derive generic crop combinations for EU15 is presented. The LUCAS (Land Use and Cover Area statistical Survey) survey was evaluated to assess the regional distribution of crops in Europe in a spatially explicit way. From the spatial overlay of the major crops, regional combinations of crops are found. Together with the input of expert knowledge, the approach is used to approximate to crop like rotations as an input of biophysical modelling.

Tool for the selection of test areas
Rainer Baritz, Michael Fuchs (BGR, Germany)

Recent developments in environmental and soil protection policy require improved soil information at various national and continental (Europe-wide) overview scales. Because the density of available inventory or monitoring data differs, it is common to first compile testing data for typical regions, to develop proper methods, and test these. The approach presented offers a tool for test area selection using land cover and soil maps as the basic map information. Applying the Shannon diversity index, the heterogeneity of landscape has been determined. Test areas are those where diverse and representative structures are found within a limited unit area.

Validation of SOC initial values for EPIC modelling through comparing European and regional datasets
Juraj Balkovic / Rastislav Skalsky (SSCRI, Slovakia)

Since initial values of soil organic carbon content (SOC) was derived from „The map of organic carbon in topsoils in Europe", we focus on validity of the information for the modelling. The initial values of SOC in INSEA database, which result from a GIS-based workspace of homogeneous response units, were compares with SOC content being processed the same way from national database of Slovakia (approximately 12,000 plots with measures SOC). The raster based pixel-by-pixel-comparison of both sources was used, and additionally the effect of HRU-based processing was tested through a comparison of mentioned datasets. It seems, that initial values of SOC gathered from EU sources might be over-estimated, at least as it was for Slovakia, but it matches the gradient in OC stocks well. We tested the effects of EPIC pre-run optimisation to balance overestimated values of SOC with conventional tillage practices (20 yr. simulation), and improve the SOC initials for the modelling. It appeared that pre run parameterization of SOC can significantly improve its initial content in most of the study area. However, sites with naturally high SOC content are strongly sensitive to long-term simulations due to smoothed and unified character of EU data.

European soil database and verification of the changes of the organic carbon stock in mineral soils
Vladimir Stolbovoj, Montanarella Luca (JRC)

The European Soil Database meets demand of the very detailed biophysical models. The integration with other biophysical and socioeconomic data (INSPIRE), better soil characterization (European Soil Data Center) contribute to the DB performance in the future.
A new area-frame randomized soil sampling makes verification simple, transparent and low cost. The method allows easy programming and computation of the sampling procedure. Reproducibility of the method allows establishing minimum detectable amount of the carbon change and selecting relevant to this amount carbon management practices. The uncertainty of the detection declines with the increase of the carbon stock in soil, which supports soil implementation for the carbon sequestration.

Global

Preparation and Generation of Climatic Input Data Sets for the Biophysical Process Modelling – EPIC
Elena Moltchanova, Michael Fuchs (IIASA, BGR, Germany)

Agricultural modeling requires the availability of high resolution climatic data for specific input parameters such as minimum and maximum daily temperatures, amount of precipitation and radiation. Here we describe the procedure by which we intend to disaggregate the averages supplied by the monthly East Anglia climate data into daily information with the help of the MARS records. Additionally, methods were developed to generate missing parameters, such as radiation and wet days in the future (referring to climate scenarios). A data processing tool has been developed to allow the processing the generation and storage of the huge climatic data sets including the storage of supplemental data.

The Availability of Input Data on the global level for Biophysical Process Modelling - Global EPIC
Michael Fuchs, Rainer Baritz (BGR, Germany)

Before the development of a global model input data base, the availability of the relevant information was assessed. Here, we provide an overview is of the information available (Climate, Soil, Topography and Land Cover/Land Management), and the possible processing needs and gaps. Principally we can conclude that an impressive amount of global data is already exists for biophysical modelling. The building of homogeneous areas on global level as EPIC input seems to be possible.

Biophysical Modeling & Engineering Costing

Bio-physical impacts of agricultural land use management systems in EU25
Erwin Schmid (IIASA/BOKU)

Bio-physical impacts of land use management and change are usually discontinuous outcomes of stochastic natural processes under certain local conditions. A tool that integrates the concept of Homogenous Response Units (HRU) and the bio-physical process model EPIC (Environmental Policy Integrated Climate) has been developed to sufficiently account for the heterogeneous agricultural land use management systems in EU25. The tool allows comparative dynamic impact analyses and consistent integration of bio-physical impacts into economic land use decision models at various scales.

Forest production and carbon storage - potentials of European forestry
Oskar Franklin (IIASA)

The forest simulation model OSKAR has been developed to predict carbon accumulation, forestry production and management costs in response to forest management (thinning, species selection, rotation) and climate change. It is based on globally applicable biophysical principles and species characteristics and is easily integrated with global models of climate change effects (LPJ) and land use economic optimization models (FASOM model), which is done in INSEA. Simulations results show that with "normal" management and current forest area, the future forest biomass and harvests can be increased initially, but over the next 100 years will not be much different from current levels. One way to increases carbon storage without strongly reducing harvest potentials is to protect current old growth forest.

Evaluation of the INSEA forest scenario model by means of plot level simulations over a wide ecological gradient
Rupert Seidl, Werner Rammer and Manfred J. Lexer (BOKU, Austria), Oskar Franklin, Florian Kraxner (IIASA)

In the nested model framework of the INSEA project the applied large scale scenarios models are evaluated via detailed plot level model simulations. In this context the spatially explicit hybrid forest patch model PICUS v1.42 is applied to evaluate both productivity and management response of the large scale forest scenario model over a wide ecological gradient from the colline to the subalpine vegetation belt in the Eastern Alps.
The presentation describes in brief the PICUS v1.42 model used for evaluation and presents the design of the evaluation study. Simulation results of the INSEA forest scenario model are compared to both observed data and plot level simulations of productivity for major European tree species at plot level. Furthermore, the management response to different stand treatment programmes is evaluated by comparing the structurally detailed plot level model PICUS v1.42 to the aggregated INSEA forest scenario model.

Methanol production by gasification: a virtual model in Baden-Württemberg
Sylvain Leduc (LUT, Sweden), Michael Obersteiner, Keywan Riahi (IIASA)

Methanol mixed with 15% gasoline appears to be an alternative to fossil fuels for the transport sector. Produced from the gasification of wood, its production is considered as sustainable. The bioenergy chain -harvesting, biomass transportation, methanol production by gasification, methanol transportation and methanol distribution to the costumer- is described and for each part of the chain costs are estimated. One virtual application is studied in the county of Baden-Württemberg in Germany, where given a position of the power plant, one can determine where the biomass can be harvested, both from agriculture and forestry, and to which gas stations the biofuel can be supplied regarding transport minimization. A sensitivity analysis of the model is as well analyzed.
For a 200 $MW_{biomass}$ power plant, 153,200 ha of poplar is needed, which represents an area with a radius of 52 km around the power plant, and 62 gas stations would be supplied. The model appears to be very sensible. The most important parameters are the power plant characteristics, the biomass cost, and power plant location. High differences in the efficiency of the plant may double the price of methanol. Then the geographical position of the plant together with the ratio of agriculture saved for energy fuels can influence the transport costs by a factor 3. Focus should then be stressed on the geographical position of the power plant and its technology.

Economic Modeling

EU25

Economic and Ecological Effects of Agricultural Policies
Daniel Blank (UHOH, Germany)
Current and potential future agricultural policies are analysed in the light of their effects on farm margins and ecological side effects. A comprehensive picture is produced by integrating the Economic Farm Emission Model (EFEM) into an extensive model compound. On farm management options as reaction on GHG-policies are depicted including environmental and income effects. The synthesis of both effects provides the means for mitigation costing which again is crucial for the comparison of agriculture with other sectors.

Mitigation in EU agriculture / GHG abatement and carbon sequestration costs
Stephane De Cara / Pierre-Alain Jayet (INRA, France)
This work investigates the costs of reducing emissions from agricultural activities in the EU-15 and the economic trade-offs between GHG reduction and carbon sequestration from alternative tillage practices. The modeling approach is based on a farm-type, supply-side oriented, linear-programming model of the European agriculture. Reduction of non-CO2 emissions and marginal abatement costs are assessed for a range of CO2-equivalent prices. We highlight the importance of heterogeneity of marginal abatement costs (both accross and within regions) for the design of optimal economic instruments. We then analyze the costs for European farmers to adopt alternative tillage practices (reduced or minimum tillage). The model is updated to account for the changes in yields and in variable costs resulting from the adoption of more carbon-friendly tillage systems. The contribution of the resulting additional carbon sequestration in total abatement is assessed and discussed.

EU FASOM Forestry Sector
Dagmar Schwab (IIASA)
EUFASOM models two sectors explicitly, the forestry sector and the agricultural sector. The forestry sector represents the standing forest , forest product industry and forest product trade in all EU countries. The Oskar Model and the FAOSTAT provide input data for the forest sector .The output of the Oskar Model supplies current forest inventory, forest growth, carbon sequestration and release and data for the production of primary forest products.The FAOSTAT provides aggregate observations on supply and demand for secondary forest products. These (and other) input data serve as initial data (first period) and as exogenous parameters for the constraints in EUFASOM. Exogenous data, constraints and the objective function define this partial equilibrium optimization model. The optimal level of the endogenous variables show the optimal processes and product flows.

Carbon Sinks and Land Use Competition
Uwe Schneider (IIASA/UH)

Carbon sink activities restrict land management. These restrictions may be costly and therefore limit the potential to employ sinks. The European Agricultural and Forest Sector Optimization Model (EU FASOM) examines the interactions between demand for carbon sinks and demand for alternative land uses taking into account resource scarcity, heterogeneous production conditions, market price changes, trade adjustments, technical progress, and policies.

Global

Attainability of Low-Concentration Targets
Michael Obersteiner (IIASA)
The United Nations Framework Convention on Climate Change (*1*) calls for stabilization of atmospheric greenhouse gas (GHG) concentrations at a level that would prevent dangerous anthropogenic interference with the climate system. We use three global energy system models to demonstrate the technological and economic attainability of meeting CO2 concentration targets near pre-industrial levels. Our scenario studies reveal that energy portfolios from a broad range of energy technologies, are needed to attain low concentrations. In particular, biomass energy with carbon capture and storage – a negative emission technology – could play an important role in meeting low concentration targets. Reaching such low concentration targets would imply fundamental changes of global land-use.

Geographically explicit global modeling of land-use change, carbon sequestration, and biomass supply

Dmitry Rokityanskiy, Florian Kraxner, Ian McCallum, Michael Obersteiner, Ewald Rametsteiner (IIASA), Pablo C. Benitez (University of Victoria, Canada), Yoshiki Yamagat (NIES, Japan)

This study aims to determine whether carbon sequestration policies—such as those that promote afforestation and discourage deforestation (i.e., avoided deforestation)—could present a significant contribution to the global portfolio of climate change mitigation options, as well as their likely spatial effects on land use. The objective is to model the effects of policies designed to induce landowners to change land use and management patterns with a view to sequester carbon or to reduce deforestation. The approach uses the spatially explicit Dynamic Integrated Model of Forestry and Alternative Land Use (DIMA) to quantify the economic potential of global forests, explicitly modeling the interactions and feedbacks between ecosystems and anthropogenic land-use activities. The model chooses which of the land-use processes (afforestation, reforestation, deforestation, or conservation and management options) would be applied in a specific location, based on land prices, cost of forest production and harvesting, site productivity, population density, and estimates of economic growth. The approach is relevant in that it (1) couples a revised and updated version of the Special Report on Emissions Scenarios with the dynamic development of climate policy implications (including carbon and bioenergy prices) through integration with the Model for Energy Supply Strategy Alternatives and their General Environmental Impact (MESSAGE); (2) is spatially explicit on a 0.5 degree grid; and (3) is constrained by guaranteeing food security and land for urban development. As outputs, DIMA produces 100-year forecasts of land-use change, carbon sequestration, impacts of carbon incentives (i.e., avoided deforestation), biomass for bioenergy, and climate policy impacts. The modeling results indicate that carbon sequestration policies—such as those that promote afforestation and discourage deforestation—could contribute to a significant part of the global portfolio of efficient climate mitigation policies, dependent upon carbon prices. Results from DIMA show that in one of the scenarios considered (A2r) the share of globally avoided deforestation grows exponentially with the carbon price, from 5% to 75% of the predicted deforestation.

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Participant List

Juraj Balkovič
Department of Soil Information Systems
Soil Science and Conservation Research Institute
Gagarinova 10
82713 Bratislava
SLOVAKIA
Tel. +421-2-48206923
Fax. +421-2-43295487
Email: balkovic@vupu.sk

Rainer Baritz
Federal Institute for Geosciences and Natural Resources (BGR)
B4.24 Spatial Information in Soil and Environmental Protection
Stilleweg 2
D-30566 Hannover
GERMANY
Phone: +49 511 643 2409
Fax: +49 511 643 3662
Mobile: +49 171 3150 266
Email: Rainer.Baritz@bgr.de

Daniel Blank
University of Hohenheim
Schloss-Osthof-Sued
D-70593 Stuttgart
GERMANY
Phone: +49 711 459 2573
Email: blank@uni-hohenheim.de

Radoslav Bujnovský
Soil Science and Conservation Research Institute
Gagarinova 10
82713 Bratislava
SLOVAKIA
Tel: +421 2 43338640
Fax: +421 2 43295487
Email: bujnovsky@vupu.sk

Stéphane De Cara
UMR Economie Publique INRA-INAPG (INRA-210)
Institut National de la Recherche Agronomique
BP01
78850 Thiverval-Grignon
FRANCE
Tel: +33-(0)-1 30 81 53 48
Fax: +33-(0)-1 30 81 53 68
Email: stdecara@grignon.inra.fr
Stephane.Decara@grignon.inra.fr

Daniel Deybe
Commission Europeenne - DG RDT
Unite "Aspects politiques de la recherche et developpement durable"
(CDMA 3/179)
B - 1049 Bruxelles,
BELGIQUE
Tel.: +32 2 298 66 56
Fax: +32 2 295 06 56
E-mail: Daniel.DEYBE@cec.eu.int

Oskar Franklin
Forestry Program
International Institute for Applied Systems Analysis
Schlossplatz 1
A-2361 Laxenburg
AUSTRIA
Tel. +43-2236-807-251
Fax: + 43-2236-807-599
Email: franklin@iiasa.ac.at

Michael Fuchs
Bundesanstalt für Geowissenschaften und Rohstoffe
Wilhelmstrasse 25-30
Referat B 4.24
Informationsgrundlagen im Umwelt- und Bodenschutz
13593 Berlin
GERMANY
Tel. +49 (030) 36993270
Email: M.Fuchs@bgr.de

Pierre-Alain Jayet
UMR Economie Publique INRA-INAPG (INRA-210)
Institut National de la Recherche Agronomique
BP01

78850 Thiverval-Grignon
FRANCE
Tel: +33-(0)-1 30 81 53 49
Fax: +33-(0)-1 30 81 53 68
Email: jayet@grignon.inra.fr

Florian Kraxner
Forestry Program
International Institute for Applied Systems Analysis
Schlossplatz 1
A-2361 Laxenburg
AUSTRIA
Tel. +43-2236-807-233
Fax: + 43-2236-807-599
Email: kraxner@iiasa.ac.at

Alexander Moiseyev
European Forest Institute
Torikatu 34, Joensuu 80100
FINLAND
Tel: +358 (0)13 252 0228
Mobile: +358 (0)41 435 1888
Email: moiseyev@efi.fi

Michael Obersteiner
Forestry Program
International Institute for Applied Systems Analysis
Schlossplatz 1
A-2361 Laxenburg
AUSTRIA
Tel: +43-2236-807-460
Fax: + 43-2236-807-599
Email: oberstei@iiasa.ac.at

C. Ivie Ramos
Research unit Sustainability and Global Change Departments of Geosciences and Economics
Hamburg University
ZMK, Troplowitzstrasse 7
22529 Hamburg
GERMANY
Tel: +49-40-42838-4830
Fax: +49-40-42838-7009
Email: ramos@dkrz.de

Erwin Schmid
Forestry Program (IIASA) and
Department of Economics and Social Sciences
Institute for Sustainable Economic Development
University of Natural Resources and Applied Life Sciences Vienna
Feistmantelstrasse 4
A-1180 Vienna
AUSTRIA
Tel.: +43 1 47654 3653
Email: erwin.schmid@boku.ac.at

Uwe A. Schneider
Forestry Program (IIASA) and
Research unit Sustainability and Global Change Departments of Geosciences and Economics
Hamburg University
ZMK, Troplowitzstrasse 7
22529 Hamburg
GERMANY
Tel: +49-40-42838-6593
Fax: +49-40-42838-7009
Email: Schneider@dkrz.de

Dagmar Schwab
Forestry Program
International Institute for Applied Systems Analysis
Schlossplatz 1
A-2361 Laxenburg
AUSTRIA
Tel. +43-2236-807-218
Fax: + 43-2236-807-599
Email: schwab@iiasa.ac.at

Rupert Seidl
Institute of Silviculture
University of Natural Resources (BOKU)
Peter-Jordan-Strasse 70
A-1190 Vienna
AUSTRIA
Tel.: +43-1-47654-4069
Email: rupert.seidl@boku.ac.at

Vladimir Stolbovoi
Soil and Waste Unit,
JRC-IES. TP 280,
I-21020 Ispra (Va)
ITALY
Tel.: +39 0332 78 63 30
Fax: +39 0332 78 53 49
Email: vladimir.stolbovoy@jrc.it

Pierre Valette
Commission Europeenne - DG RDT
Directorate I - Environment
B - 1049 Bruxelles,
BELGIQUE
Tel: +32 2 29 56356
E-mail: Pierre.VALETTE@cec.eu.int