The effect of forest management on the European carbon sink

Background

Forests, of which globally 70% are managed, play an important role in the global carbon cycle. Forest management became a top priority on the agenda of the political negotiations to mitigate climate change because forests may remove atmospheric CO_2 and woody biomass can substitute fossil fuels. However, this political imperative is at present running well ahead of the science required to prove its effectiveness. Despite the key implications of forest management on: 1) the carbon-energy-water balance, and 2) production, recreation and environmental protection, there are no integrated studies of its overall effects on the Earth's climate.

The overall goal of project is to understand and quantify the role of forest management in mitigating climate change. Specifically, we want to challenge the current focus on the carbon cycle only, and replace it with an overall climate impact approach. Hence, the entire forest management spectrum, ranging from short rotation crops to old-growth forests will be analysed for its effects on the water, energy and carbon cycles of the forest ecosystem. Feedback response of forest management on climate will be quantified by means of changes in albedo, evapotranspiration, greenhouse gas sources and sinks. The PhD project is part of this larger effort, partly funded by the EU on climate impacts and possible mitigation strategies involving terrestrial ecosystems. The research team will deliver the first quantitative insights into how forest management strategies can be linked to climate change mitigation. These results will be used to lay the foundations for a portfolio of management strategies which sustain wood production while minimizing climate change impacts.

Research tasks of the PhD study

The PhD study contributes to the overall objectives of the research team through:

1. Quantifying and mapping the intensity of forest management for Europe and quantifying the management intensity for a spectrum of forest management strategies. Management intensity will be derived from European forest inventory data.

2. Perform forest age reconstruction for Europe between 1950 and 2000 by making use of the management intensity map. Age reconstruction will be validated against data from European countries with a long-term inventory program. Age reconstruction is the basis of derived products such as assessments of productivity and mortality, mapped at European scale, and will be used (not by the PhD student) to improve the capacity of inverse model approaches to estimate the European carbon balance.

3. Estimate the effects of forest management on carbon-sink between 1950 and 2000 making use of a comprehensive ecosystem model (ORCHIDEE).

4. Use scenarios for future wood demand to estimate possible portfolios of management strategies.

5. Estimate the effects of the possible management portfolios on the future carbon sink by means of ORCHIDEE.

Required skills and interest of the PhD candidate

The preferred candidate would have a background (MSc) in forestry, forest ecology, ecosystem modelling or a related scientific field. The candidate needs a strong interest in regional carbon cycling (i.e. Europe to globe) and quantitative analysis and modelling. The study touches different aspects of the carbon cycle i.e. harvest, growth, modelling, data assimilation and therefore a broad interest is required. The proposed age reconstruction makes use of an existing state-of-the-art ecosystem model (ORCHIDEE), hence the candidate needs a strong interest in modelling biogeochemical and biophysical processes. Experience with programming is not essential but a plus. Excellent writing skills are required, and willingness to travel between the institutions involved.

Universities and institutes involved in the study

University of Antwerp (Belgium), Ivan Janssens;
University of Wageningen (The Netherlands), Frits Mohren;

Alterra (The Netherlands), Mart-Jan Schelhaas and
LSCE (France), Sebastiaan Luyssaert.

The candidate is expected to spend a considerable amount of time in Belgium, France and The Netherlands. Mobility will be decided based on the home country and family situation of the candidate. The project is related to several ongoing European Research projects and networks. The results of the study will be exploited through peer review publications and presentations within these networks.

Practical
Starting in early 2011, the successful candidate will be appointed for 1-years. Following an evaluation in month 9 the contract will be extended by another year. Following an evaluation in month 24, the contract will be extended by 2 more years. The successful candidate is expected to submit his/her thesis by month 48 the latest. Salary of the candidate follows Belgian national regulations. Health care and social security is paid for by the employer.

If interested, send your cv, a motivation letter (in English) and the contact details of two references to Sebastiaan.Luyssaert@lsce.ipsl.fr before 22.12.2010