



## BOOK OF ABSTRACT

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### I. SESSION DESCRIPTION

**ID: T6d**

Uncertainties in ecosystem service measurement and valuation

**Hosts:**

	Title	Name	Organisation
<b>Host:</b>	Mr.	Anne Nobel	Hasselt University
<b>Co-host:</b>		Silvie Daniels Nele Witters	

**Abstract:**

Ecosystem service valuations support decision on the design and management of ecosystems. However, ecosystem service valuations are often uncertain, leaving room for interpretation by practitioners and decision-makers. The question is how valuation experts can best communicate these uncertainties, so that their valuations are most useful to decision-makers.

**Goals and objectives of the session:**

This sessions aims to identify best practices for uncertainty communication surrounding ecosystem service valuations by evaluating selected cases.

**Planned output / Deliverables:**

This session will lead to two deliverables:

1. Presentations on best practices of uncertainty communication
2. Case material for a paper

**Related to ESP Working Group/National Network:**

[Thematic Working Groups: T6 – Integrated valuation of ES](#)



## II. SESSION PROGRAM

**Date of session:** Tuesday, 16 October 2018

**Time of session:** 14:30 - 16:00

### Timetable speakers

Time	First name	Surname	Organization	Title of presentation
14:30–14:45	Anne	Nobel	Hasselt University, Belgium	<ul style="list-style-type: none"> <li>– Introduction: uncertainties in ecosystem service measurement and valuation</li> <li>– The example of climate change impact on carbon sequestration in European heathlands</li> </ul>
14:45–15:00	Océane	Bartholomé	Laboratoire d'Ecologie Alpine, France	Methodological uncertainties in estimating carbon storage in temperate forests and grasslands
15:00–15:15	Pelayo	Menéndez Fernández	IH Cantabria, Spain	Assessing the benefits of using high resolution data and models in valuing flood protection services: a case study in the Philippines
15:15–15:30	Marc	Cotter	University of Hohenheim, Germany	Spatially explicit modelling of ecosystem service supply in rubber dominated landscapes of South–East Asia – and how stakeholder feedback influences its weighting
15:30–16:00	Anne	Nobel	Hasselt University, Belgium	Discussion, Questions and Recommendations



### III. ABSTRACTS

*The abstracts appear in alphabetic order based on the last name of the first author. The first author is the presenting author unless indicated otherwise.*

#### 1. Type of submission: **Abstract**

T. Thematic Working Group sessions: T6d Uncertainties in ecosystem service measurement and valuation

#### **Methodological uncertainties in estimating carbon storage in temperate forests and grasslands**

*First author:* Océane Bartholomé

*Other author(s):* Karl Grigulis, Marie-Pascale Colace, Cindy Arnoldi, Sandra Lavorel

*Affiliation, Country:* Laboratoire d'Ecologie Alpine (LECA, CNRS), France

Carbon sequestration is an essential ecosystem service for climate change mitigation. For simplicity this ES is often quantified considering carbon storage in four carbon pools: aboveground biomass, belowground biomass, dead organic matter and soil organic carbon. Indicators of these four pools are estimated by modelling, reference values, or field methods and data processing of different complexity levels. To facilitate the assessment of carbon pools, e.g. in environmental impact assessment, a fast, reliable and easily applicable method is required. First, using a systematic literature review we identified frequently used methods for estimating carbon pools for forests and grasslands, both playing a key role in global climate regulation. Second, from this review we developed field methods for indicators of each carbon pool in both ecosystem types. We applied these methods in a set of forest and grassland plots in the Grenoble region (France) and asked i) how comparable and consistent are alternative methods for each carbon pool?, ii) what is the variability of estimates between these methods?, and iii) which level of simplicity has an acceptable level of uncertainty? We based our method comparisons on the quality of the linear relationships between methods and their level of accuracy relatively to the reference methods (the method assumed to be the closest to the actual carbon stock). For most carbon pools, alternative methods were comparable and consistent with the reference method. However, not all simplified methods had an acceptable level of accuracy (i.e.  $< 20\%$  variance). Third, we built on these results to suggest easy and quick field methods for each carbon pool in each ecosystem type with accuracy levels between 10 and 20%. Thereby we provide guidelines with associated uncertainty levels to scientists and practitioners aiming to estimate the ecosystem service of global climate regulation from carbon stocks in terrestrial ecosystems.



**Keywords:** Global climate regulation service, carbon storage, field indicators, uncertainty, method simplification

2. *Type of submission:* **Abstract**

T. **Thematic Working Group sessions:** T6d **Uncertainties in ecosystem service measurement and valuation**

### **Spatially explicit modelling of ecosystem service supply in rubber dominated landscapes of South-East Asia – and how stakeholder feedback influences its weighting**

*First author:* Marc Cotter, Kevin Thellmann

*Other author(s):* Georg Cadisch, Folkard Asch

*Affiliation, Country:* University of Hohenheim, Germany, Gabon

Integrating ecosystem services (ESS) into environmental decision-making processes and land use planning has been increasingly recognized for its potential by both science and policy. The recent decades in our study area, the Nabanhe Reserve in Xishuangbanna Prefecture (Yunnan Province, PR China), have been characterized by an extensive expansion of rubber plantations and the loss of semi-natural forest areas. To date, only few interdisciplinary projects aimed to integrate multi-faceted research on ESS for rubber production systems. We developed future land use scenarios in collaboration with regional stakeholders and assessed their impact on the supply of multiple ESS including potential rubber yields, water yield, sediment retention, carbon sequestration and habitat quality as a proxy for biodiversity. Using InVEST (Integrated Valuation of Ecosystem Services and Trade-Offs) in annual time steps, we modelled and investigated the percentage deviations of integrated ESS supply for each scenario, as compared to the initial state of 2015. Furthermore, we used statistical weighting methods to integrate rankings for the preference of ESS from three contrasting stakeholder groups (Prefecture administration, local tourists, off-site citizens). The Business-As-Usual scenario (BAU, in which rubber expansion is continued based on past expansion rates) showed an increase in rubber yields trading off against the regulating ESS and habitat quality. The conservation measures introduced in the Balanced-Trade-Offs scenario (BTO, reforestation on steep slopes, reduced herbicide application in rubber plantations, riparian buffer zones) reduced the total amount of rubber yield but enhanced habitat quality and regulating ESS in comparison to the results of the BAU scenario. The stakeholder-weighted modelling results revealed that the integrated indices for the supply of ESS would be overestimated without the evaluation of the stakeholder groups. We conclude that the ex-ante assessment of land use plans for Nabanhe Reserve have the



potential to buffer the typical trade-off between agricultural intensification and environmental protection.

**Keywords:** South-East Asia, ecosystem service assessment, scenario modelling, stakeholder validation, rubber cultivation

3. *Type of submission:* **Abstract**

T. **Thematic Working Group sessions:** T6d **Uncertainties in ecosystem service measurement and valuation**

**Assessing the benefits of using high resolution data and models in valuing flood protection services: a case study in the Philippines**

*First author:* Pelayo Menéndez Fernández, Iñigo Losada Rodríguez

*Other author(s):* Iñigo J. Losada, Michael W. Beck, Borja G. Reguero

*Affiliation, Country:* IH Cantabria, Spain

There is a critical need to assess the growing risks of floods and effectiveness of solutions to reduce these risks. In this regard, coastal ecosystems provide a critical service in protecting coastal communities. This service should be explicitly valued to inform policies, sustainable development, disaster risk reduction and environmental conservation. However, most of coastal management plans lack quantification and economic valuations of ecosystem services. Data and models availability is very limited, which is limiting rigorous and precise valuations, particularly in developing countries and in places where natural systems, in particular reefs and mangroves, can play an important role in addressing climate risks and adapt to climate change. Here, we describe how to quantify flood risk reduction benefits provided by mangroves and present a case study in the municipality of Pagbilao (Philippines). We first quantify damages and assess the mangrove's benefits as the averted flooding impact to people and property and then investigate the sensitivity of these results to the resolution of flooding models and data (storms, coastlines, topography, social and economic assets). We compare two approaches that use high and low-resolution data and models. We assess which factors are more critical for assessing risk and the risk reduction benefits. We find that the most critical data requirement is high resolution elevation data, finding over 60% improvement of risk and benefits estimation on average, while long-term hazard data yields a 23% improvement in risk reduction valuation. This study thereby highlights where data and model development efforts should focus at the local, regional and global scales, in order to inform policy and coastal management plans.



**Keywords:** Flood risk, uncertainty, Pagbilao, flood protection, mangroves

4. *Type of submission:* **Abstract**

T. [Thematic Working Group sessions: T6d Uncertainties in ecosystem service measurement and valuation](#)

**Climate change impacts on the value of climate regulation by European dry heathland**

*First author:* Anne Nobel

*Affiliation, Country:* Hasselt University, Netherlands

The provision of ecosystem services by heathland may decrease in the future because heathland surfaces are expected to decline in favor of more resilient grasses as a result of longer and more frequent summer droughts. This may lead to changes in economic value. Specifically, a shift of heathland to grassland may affect climate regulation, because it decreases soil carbon pools and increases surface albedo. However, the climatic conditions under which heathland shifts into grassland is unknown. We will perform the first integrated analysis in which the changes in carbon sequestration and surface albedo as a consequence of land cover change are consistent with the global climate scenarios used for the computation of the respective economic value of changes in climate regulation. This is done by identifying the tipping point at which land cover change occurs by means of primary data from the Ecotron Facility. This facility is located in the National Park Hoge Kempen and consists of 12 climate chambers in which increasingly extreme climate scenarios will be simulated on samples of heathland. I will use twelve months of measurement data from the Ecotron Facility to determine the ‘tipping point’ climate conditions under which soil variables move away from values characteristic to heathland toward values characteristic to grassland. Subsequently, I will investigate how the tipping point influences the economic value of climate regulation by dry heathland in Europe. This will be done in three steps. First, we calibrate a soil carbon model (ECOSSE) for heathland based on Ecotron data. Second, we run the soil carbon model for dry heathland in Europe to simulate the carbon pools until 2100, and introduce land cover change into the model at the moment that tipping point conditions are reached. The model will be run for four climate scenarios, so the tipping point conditions are reached at four different points in time. Third, we estimate the economic impact of land cover change by means of APMT, which is an Integrated Assessment Model that simulates the social welfare function of additional CO<sub>2</sub>-impulses. The economic damages from changes in climate regulation are dependent on the climate scenario itself, because the higher the surface temperature of a climate scenario is, the higher the marginal economic value of carbon sequestration and surface albedo changes will be, and the higher the



atmospheric CO<sub>2</sub>-concentration of a climate scenario, the longer the atmospheric CO<sub>2</sub>-concentration is affected by an additional CO<sub>2</sub>-impulse. Hence, only an integrated analysis that takes into account that both the time of land cover change and the resulting economic impact depend on climatic conditions can provide reliable estimates. Our analysis will show how uncertainty about future climate conditions will influence estimates of climate regulation. The results will inform decision-makers about climate adaptive heathland management in Europe.

**Keywords:** heathland, climate regulation, carbon, climate uncertainty