# The UGent Congo Basin forest Centre of Excellence: Integrated ecosystem research in the heart of the Congo basin

## Pascal Boeckx

(Isotope Bioscience Laboratory–ISOFYS, Department of Green Chemistry, Ghent University, Ghent, Belgium – Pascal.Boeckx@UGent.be)

#### Hans Verbeeck

(Q-forestlab, Laboratory of Quantitative Forest Ecosystem Science, Department of Environment, Ghent University, Ghent, Belgium – Hans.Verbeeck@UGent.be)

## Wannes Hubau

(UGent-Woodlab, Laboratory of Wood Technology, Department of Environment, Ghent University, Ghent, Belgium; Service of Wood Biology, Royal Museum for Central Africa, Tervuren, Belgium – Wannes.Hubau@UGent.be)

## **Marijn Bauters**

(Q-forestlab, Laboratory of Quantitative Forest Ecosystem Science, Department of Environment, Ghent University, Ghent, Belgium – Marijn.Bauters@UGent.be)

#### **Roxanne Daelman**

(Isotope Bioscience Laboratory–ISOFYS, Department of Green Chemistry, Ghent University, Ghent, Belgium; Q-forestlab, Laboratory of Quantitative Forest Ecosystem Science, Department of Environment, Ghent University, Ghent, Belgium)

#### Emmanuel Bulonza

(Isotope Bioscience Laboratory–ISOFYS, Department of Green Chemistry, Ghent University, Ghent, Belgium; Ecole Régionale d'Aménagement et Gestion Intégrés des Forêts et Territoires tropicaux (ERAIFT), Kinshasa, DRC)

## **Pauline Hicter**

(Service of Wood Biology, Royal Museum for Central Africa, Tervuren, Belgium; UGent-Woodlab, Laboratory of Wood Technology, Department of Environment, Ghent University, Ghent, Belgium)

## **Thomas Sibret**

(Isotope Bioscience Laboratory–ISOFYS, Department of Green Chemistry, Ghent University, Ghent, Belgium; Q-forestlab, Laboratory of Quantitative Forest Ecosystem Science, Department of Environment, Ghent University, Ghent, Belgium)

## Alexandra Ntea Lagki

(Isotope Bioscience Laboratory–ISOFYS, Department of Green Chemistry, Ghent University, Ghent, Belgium; Q-forestlab, Laboratory of Quantitative Forest Ecosystem Science, Department of Environment, Ghent University, Ghent, Belgium)

## Nsimba Ngembo Elie

(Isotope Bioscience Laboratory–ISOFYS, Department of Green Chemistry, Ghent University, Ghent, Belgium; Q-forestlab, Laboratory of Quantitative Forest Ecosystem Science, Department of Environment, Ghent University, Ghent, Belgium; Département de Gestion des Ressources Naturelles, Faculté des Sciences Agronomiques, Université de Kinshasa, DRC)

#### Ines dos Santos Vieira

(Q-forestlab, Laboratory of Quantitative Forest Ecosystem Science, Department of Environment, Ghent University, Ghent, Belgium)

## **Nadine Bahizire**

(Earth and Life Institute, Faculty of Science, Université Catholique de Louvain, Louvain-la-Neuve, Belgium; Q-forestlab, Laboratory of Quantitative Forest Ecosystem Science, Department of Environment, Ghent University, Ghent, Belgium)

## Merveille Wombe

(Q-forestlab, Laboratory of Quantitative Forest Ecosystem Science, Department of Environment, Ghent University, Ghent, Belgium)

#### Joseph Mande

(Q-forestlab, Laboratory of Quantitative Forest Ecosystem Science, Department of Environment, Ghent University, Ghent, Belgium)

## Alain Katayi

(Isotope Bioscience Laboratory–ISOFYS, Department of Green Chemistry, Ghent University, Ghent, Belgium; Ecole Régionale d'Aménagement et Gestion Intégrés des Forêts et Territoires tropicaux (ERAIFT), Kinshasa, DRC)

## Serge Alebadwa

(Institute for Meteorology and Climate Research, Karlsruhe Institute of Technology, Karlsruhe, Germany; Q-forestlab, Laboratory of Quantitative Forest Ecosystem Science, Department of Environment, Ghent University, Ghent, Belgium)

## William Verbiest

(UGent-Woodlab, Laboratory of Wood Technology, Department of Environment, Ghent University, Ghent, Belgium; Q-forestlab, Laboratory of Quantitative Forest Ecosystem Science, Department of Environment, Ghent University, Ghent, Belgium)

## Sara Motte

(UGent-Woodlab, Laboratory of Wood Technology, Department of Environment, Ghent University, Ghent, Belgium; Q-forestlab, Laboratory of Quantitative Forest Ecosystem Science, Department of Environment, Ghent University, Ghent, Belgium)

#### Blanca Vanhoutte-Alonso

(Service of Wood Biology, Royal Museum for Central Africa, Tervuren, Belgium; UGent-Woodlab, Laboratory of Wood Technology, Department of Environment, Ghent University, Ghent, Belgium)

#### Viktor Van de Velde

(Isotope Bioscience Laboratory–ISOFYS, Department of Green Chemistry, Ghent University, Ghent, Belgium; Q-forestlab, Laboratory of Quantitative Forest Ecosystem Science, Department of Environment, Ghent University, Ghent, Belgium)

#### Gabriel Teteka

(Department of Geography and Environmental Sciences, University of Lubumbashi, DRC; Q-forestlab, Laboratory of Quantitative Forest Ecosystem Science, Department of Environment, Ghent University, Ghent, Belgium)

#### **Nestor Luambua**

(UGent-Woodlab, Laboratory of Wood Technology, Department of Environment, Ghent University, Ghent, Belgium; Service of Wood Biology, Royal Museum for Central Africa, Tervuren, Belgium)

## **Brice Djiofack**

(UGent-Woodlab, Laboratory of Wood Technology, Department of Environment, Ghent University, Ghent, Belgium; Service of Wood Biology, Royal Museum for Central Africa, Tervuren, Belgium)

## Basil Luse Belanganay

(Forest is Life, TERRA Teaching and Research Centre, Gembloux Agro BioTech, University of Liège, Gembloux, Belgium; Service of Wood Biology, Royal Museum for Central Africa, Tervuren, Belgium)

## Alain Kadorho

(UGent-Woodlab, Laboratory of Wood Technology, Department of Environment, Ghent University, Ghent, Belgium; University of Kisangani, DRC; Ecole Régionale d'Aménagement et Gestion Intégrés des Forêts et Territoires tropicaux (ERAIFT), Kinshasa, DRC)

#### Modestine Kompanyi

(Forest is Life, TERRA Teaching and Research Centre, Gembloux Agro BioTech, University of Liège, Gembloux, Belgium; UGent-Woodlab, Laboratory of Wood Technology, Department of Environment, Ghent University, Ghent, Belgium)

#### Lisette Mangaza

(Forest is Life, TERRA Teaching and Research Centre, Gembloux Agro BioTech, University of Liège, Gembloux, Belgium; UGent-Woodlab, Laboratory of Wood Technology, Department of Environment, Ghent University, Ghent, Belgium)

## Emmanuel Kasongo

(UGent-Woodlab, Laboratory of Wood Technology, Department of Environment, Ghent University, Ghent, Belgium; Service of Wood Biology, Royal Museum for Central Africa, Tervuren, Belgium)

## Félix Laurent

(UGent-Woodlab, Laboratory of Wood Technology, Department of Environment, Ghent University, Ghent, Belgium; Service of Wood Biology, Royal Museum for Central Africa, Tervuren, Belgium)

## Lodewijk Lefevre

(Isotope Bioscience Laboratory–ISOFYS, Department of Green Chemistry, Ghent University, Ghent, Belgium; Q-forestlab, Laboratory of Quantitative Forest Ecosystem Science, Department of Environment, Ghent University, Ghent, Belgium)

## Fabrice Kimbesa

(Isotope Bioscience Laboratory–ISOFYS, Department of Green Chemistry, Ghent University, Ghent, Belgium)

## David Ekili

(Isotope Bioscience Laboratory–ISOFYS, Department of Green Chemistry, Ghent University, Ghent, Belgium)

## Heritier Fundji

(Isotope Bioscience Laboratory–ISOFYS, Department of Green Chemistry, Ghent University, Ghent, Belgium)

## José Mbifo

(Institut national d'études et Recherche agronomiques (INERA)/Centre de Recherches de Yangambi, Yangambi, DRC; Isotope Bioscience Laboratory–ISOFYS, Department of Green Chemistry, Ghent University, Ghent, Belgium)

#### Freke Van Damme

(Isotope Bioscience Laboratory–ISOFYS, Department of Green Chemistry, Ghent University, Ghent, Belgium; Q-forestlab, Laboratory of Quantitative Forest Ecosystem Science, Department of Environment, Ghent University, Ghent, Belgium)

## Steven De Hertog

(Q-forestlab, Laboratory of Quantitative Forest Ecosystem Science, Department of Environment, Ghent University, Ghent, Belgium)

#### Félicien Meunier

(Isotope Bioscience Laboratory–ISOFYS, Department of Green Chemistry, Ghent University, Ghent, Belgium; Q-forestlab, Laboratory of Quantitative Forest Ecosystem Science, Department of Environment, Ghent University, Ghent, Belgium)

## **Dries Landuyt**

(Q-forestlab, Laboratory of Quantitative Forest Ecosystem Science, Department of Environment, Ghent University, Ghent, Belgium; Forest & Nature Lab (ForNaLab), Belgium)

#### Tom De Mil

(Forest is Life, TERRA Teaching and Research Centre, Gembloux Agro BioTech, University of Liège, Gembloux, Belgium)

The Congo Basin is home to the world's second-largest tropical forest. However, due to a lack of comprehensive research and in situ observations, our understanding of the forest area's climate is limited, impeding accurate climate change predictions. To address this gap, Ghent University established the UG-CBC (Congo Basin Centre of Excellence) and is currently playing a leading role in ecosystem research in this region. This centre consolidates expertise on the Congo Basin and the forests of the DRC, focusing on field-based ecological and biogeochemical research in pristine forests, secondary forests, and sustainable agriculture through permanent forest inventory plots, eddy covariance and atmospheric measurements, modelling, and remote sensing. Central to several of the research sites lies the CongoFlux site, located in the Yangambi UNESCO biosphere reserve (0°48'52.0 N, 24°30'08.9" E). This site features the region's first Eddy Covariance (EC) tower, accompanied by the region's first wood biology laboratory. The tower is part of the ICOS network, which ensures high-quality data on land-atmosphere exchanges of GHGs such as CO., N.O, CH., and H.O. Additional measurements at the site enhance our understanding of the tropical forest ecosystem, including assessments of  $O_s$  and black carbon, soil greenhouse gas exchange, vegetation photosynthesis and water use efficiency, lateral carbon loss, xylogenesis, woody decay rates, and ancillary data collection from permanent plots. These efforts collectively create a rich data hub within the Congo Basin. By addressing this significant research void, the initiative aims to pave the way for better understanding of these crucial forest ecosystems.

#### Keywords

Congo Basin, Tropical forest, Flux tower, Biogeochemical cycles, Plant ecology