



Rwanda's Biodiversity Heritage

Center of Excellence in Biodiversity and Natural Resource Management (CoEB) Newsletter



Director's note:

Well, 2020 has been a busy year for advancing biodiversity and climate resilience at the Center of Excellence in Biodiversity and Natural Resource Management, despite the many challenges our families & communities have faced. We received 11 new grants in 2020, and continued 7 externally funded projects. We hosted 17 academic interns from Univ of Rwanda (CST, CAVM ad CASS), as well as African Leadership University and Protestant Inst for Arts and Social Sciences. We raised funds to support the research of 27 MSc & PhD students studying topics in biodiversity, agroforestry, erosion control, freshwater ecosystems, & primate conservation. We hosted weekly seminars with 30-50 people attending.

We have a unique collaboration with Rwanda Environment Management Authority to provide evaluations of landscape restoration and ecosystem-based adaptation projects, and building research capacity among our postgrad students at the same time.

We raised funds to improve management of the **National Herbarium of Rwanda**; it is now on a daily work flow that includes digitizing ~300 specimens/ day & mounting ~150/day, thanks to funding from SEP2D/IRD.

We inventoried specimens dating back to 1970 and curated >17,000 specimens which are now in proper herbarium management protocols.

We are developing the **Rwanda Biodiversity Information System** with a multidisciplinary team. We have created a *community of practice* in data management, so that a large group of people will understand why we share data & best data management practices. See my blog at <http://blog.rbis.ur.ac.rw/building-community-practice-biodiversity-data-management/>. We are also developing a zoological collection starting with specimens kept in scattered locations, many ill-kept, to support research and teaching, ultimately available digitally.

I cannot end without acknowledging the critically important role of the Center's nodes & partners; without them we could not achieve our goals. These include DFGFI/ Karisoke Research Center, IGCP, ARCOS, ICRAF, RDB Conservation Dept, REMA, RWB, and many others. Explore the following pages to learn more about some of the activities we have been engaging during the past year.

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All my best,
Beth Kaplan

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National Herbarium of Rwanda Upgrading and Digitizing Project

The National Herbarium of Rwanda (NHR) was officially established in 1933. The collection is now home to more than 17,000 plant samples. Additionally, 53,000 specimens are stored in other Herbaria worldwide. Historically, the NHR was first hosted by the former Institut de Recherche Scientifique en Afrique Centrale (IRSAC), which later became the Institute of Scientific and Technological Research (IRST) and subsequently the National Industrial Research and Development Agency (NIRDA).

Currently, the NHR is hosted by the University of Rwanda and is being managed by the Center of Excellence in Biodiversity and Natural Resource Management (CoEB) at the College of Science and Technology (CST).

In August 2018, the CoEB received a grant for a project aimed at revitalizing the herbarium to make the data available in a computerized data management system within a web portal, making the data open and accessible worldwide. The CoEB received funding totaling 28,563,298 FRW over 3 years (2018-2020) from The Institut de Recherche pour le Développement/Sud Expert Plantes Développement Durable (IRD/SEP2D) for this upgrading and digitizing project. The goal of the project is to stimulate botanical research and plant conservation in Rwanda and the Albertine Rift region.

We aim for this herbarium to become a well-used and renowned botanical resource used by institutions in Rwanda and internationally. To date, all species have been taxonomically updated from the original dataset.



Symbiota software training was provided and a draft data portal was installed. Our web portal now contains 17,885 specimens, which includes 15,000 that had remained unmounted in the herbarium since the 1970s. Additionally, the portal contains Rwandan checklists for lichens, fungi, seed collections from Ruhunde Arboretum, and 53,000 repatriated data from the top five herbaria worldwide. We have photographed 5,763 of the 15,000 specimens, averaging a working rate of ~300 photographs per day. We have also mounted 1,365 specimens within the NHR, averaging ~70 per day. Before the end of the project in December 2020, a team visited Karongi to collect additional specimens to improve and enrich the existing NHR collection.

The NHR has received visitors from around the world, including researchers and students from the University of Rwanda, Yale University (USA), Dr. Folaranmi D. Babalola, visiting researcher from Ibadan University, Nigeria, Prof. Philip Cotton the former Vice Chancellor of the University of Rwanda, Ms. Patricia Campbell, Chancellor of the University of Rwanda, and the Honorable Ambassador of Israel. Lecturers from Food Science, Chemistry and Pharmacy also brought their students to the herbarium.



Dr. Michael Thomas training the NHR staff and showing how digitalization process is conducted at the National Herbarium of Rwanda in Huye, Rwanda. Photo by CoEB

In March 2020 Dr. Michael Thomas, an expert in ethnobotany, biocultural studies, and museum collections management, began assisting in the collection, preserving, and digitizing of plant specimens in the NHR. He helped set up the Symbiota software and shifted the herbarium arrangement from Hutchison to historical and Angiosperm Phylogeny Group IV. In 2021, Dr. Michael Thomas will return to work with us as a visiting professor through a grant from The World Academy of Science (TWAS), to continue building capacity in the NHR.

CoEB Provides Technical Assistance to the Rwanda Environment Management Authority on Wetland Catchment and Water Quality Management

Rwanda's water catchment and wetland ecosystems provide a wide range of ecosystem services, such as water provisioning and regulation, and flood mitigation. These systems provide a significant contribution to the resilience of local communities, especially in the face of climate change. However, freshwater ecosystems are at risk from unsustainable use of wetlands and catchments that has led to degradation and has reduced their capacity to provide ecosystem benefits.

Rwanda implemented a pilot project on the Least Developed Countries Fund 2nd phase (LDCF II) "Building resilience of communities living in degraded forests, savannahs and wetlands of Rwanda through an Ecosystem-based Adaptation (EbA) approach". The main objective of this project was to increase the capacity of Rwandan authorities and local communities to adapt to climate change by implementing an Ecosystem Based Adaptation (EbA) intervention for degraded forest, savannah and wetland ecosystems.

The Rwanda Environment Management Authority (REMA) requested the assistance of CoEB in conducting research aimed at developing wetland, water quality, and catchment management frameworks and guidelines that can be used to improve management and restoration activities under the LDCF II Project.

The CoEB established an interdisciplinary team of experts in environmental engineering, biology, wetland ecology, water chemistry, GIS and ICT from University of Rwanda to implement the project.

This study collated knowledge on the current status and health of wetland and catchment ecosystems in Rwanda, with a focus on the Nile-Akagera upper and the Nile-Nyabarongo lower and upper catchments, including the Nyiramuhondi watershed. This project was funded by the Global Environment Facility of the United National Environment Programme and ended in December 2020 with a total budget of 198,358 USD. A monitoring and evaluation system was developed with stakeholder input and we aim to connect this to the Rwanda Biodiversity Information System we are also developing..

Creating a Zoological Collection for Research and Education

The CoEB received a Volkswagen Foundation grant totaling 245,082 euros towards the development of zoological collections to be used by field schools and training courses.

Through a partnership with Mr. Sebuliba Solomon and Dr. Viola Clausnitzer (project lead) from the Senckenberg Research Institute in Goerlitz, Germany, this project will provide biodiversity and collections management courses from 2021-2023. Up to 15 qualified students (MSc., PhD and Postdocs) from East African universities, including the University of Rwanda, and at least five students (MSc & PhD) from German universities are expected to attend the course yearly.

A zoological specimen collection was first started in 1963 at the "Université Nationale du Rwanda". Later, students from the biology department continued to collect specimens as part of class activities. Unfortunately, student specimens suffered due to minimal oversight and proper specimen storage. However, today, the CoEB oversees the care and maintenance of the zoological collection dating back to the original specimens.

The CoEB's main goal is to digitally store the collection using an open access internet portal, making them available for research, teaching, and policy purposes within Rwanda and the region.

To date, approximately 1,150 zoological specimens have been recorded by the CoEB. They include a variety of phyla from Annelida, Arthropoda, Chordata, Platyhelminthes, Echinodermata, Mollusca, Cnidaria, Porifera, and Nematoda. As part of the CoEB's initiative to develop and promote zoological collections at the University of Rwanda for education and conservation, the CoEB continues to seek funds to support project activities. From 2021 to 2023, the CoEB will collaborate with partners in Germany to host three consecutive summer schools to introduce core instruction in taxonomy, systematics, and the management of biological collections and databases (e.g., museums, university collections and herbaria) towards biodiversity research and education.

Evaluating the Landscape Approach to Forest Restoration and Conservation (LAFREC)

A landscape approach brings together sectors that deal with different land uses to enhance sustainable land use and effective climate change mitigation measures. Rwanda Environmental Management Authority (REMA) and the University of Rwanda (UR) signed a collaborative agreement on 1 May 2018 to provide financial support to UR postgraduate students destined to carry out their research theses. The aim of this project is to evaluate landscape restoration interventions through the development of student projects that assess interventions conducted by the LAFREC project. The CoEB coordinated this project which includes 16 students, 15 MSc and one Ph.D. student. These students are from four programs and two colleges at UR, the College of Agriculture, Animal Science and Veterinary Medicine and the College of Science and Technology. Grantees were selected through a rigorous proposal review process conducted by the Oversight Board, a team of experts in conservation and environment established by REMA and the CoEB for this purpose. Several trainings were conducted to boost the students' knowledge of proposal writing, presentation delivery, academic writing, spatial analysis through Geographical Information Systems, and statistics.

All the students successfully completed their research and produced theses and manuscripts. Results demonstrate best practices in agroforestry, co-management of natural resources, buffer zone management, biodiversity

conservation, forest ecosystem restoration, riparian zone management, and flood and erosion control.

The CoEB is grateful to REMA for supporting the student research and offers thanks to student supervisors and the Oversight Board for their efforts towards capacity building.



Students and Supervisors in the field at Gishwati-Mukura landscape. Photo by CoEB

Planet Birdsong Project

Planet Birdsong is a new United Kingdom-based charity devoted to engaging citizens with bird songs and calls, transcending international boundaries. This multi-disciplinary initiative involves scientists, conservationists, musicians, educators, and technology professionals. Planet Birdsong want this project to be a partnership with Rwanda whose citizens take the lead in carrying forward the knowledge and experience they gain from this project into their personal, professional, and community activities. The project platform uses sound to increase people's knowledge and appreciation of bird life for the purposes of avifauna and biodiversity conservation. The project's goals are multifaceted and include fostering interest in using the scientific approach to interact with the natural world, expanding the role of birds for measuring biodiversity, and enhancing the interface between conservation and sustainable development within education, forestry, agriculture, water management, tourism and urban development in the hopes that it will enable people to improve their livelihoods. The project will start with a target of 50 relatively common bird species, and continue to add species' sounds in advanced editions. Rwandan birders and ornithologists will then move the

project forward by recording additional species with the goal of completing the entire list of ~709 species in Rwanda over 3 -5 years.

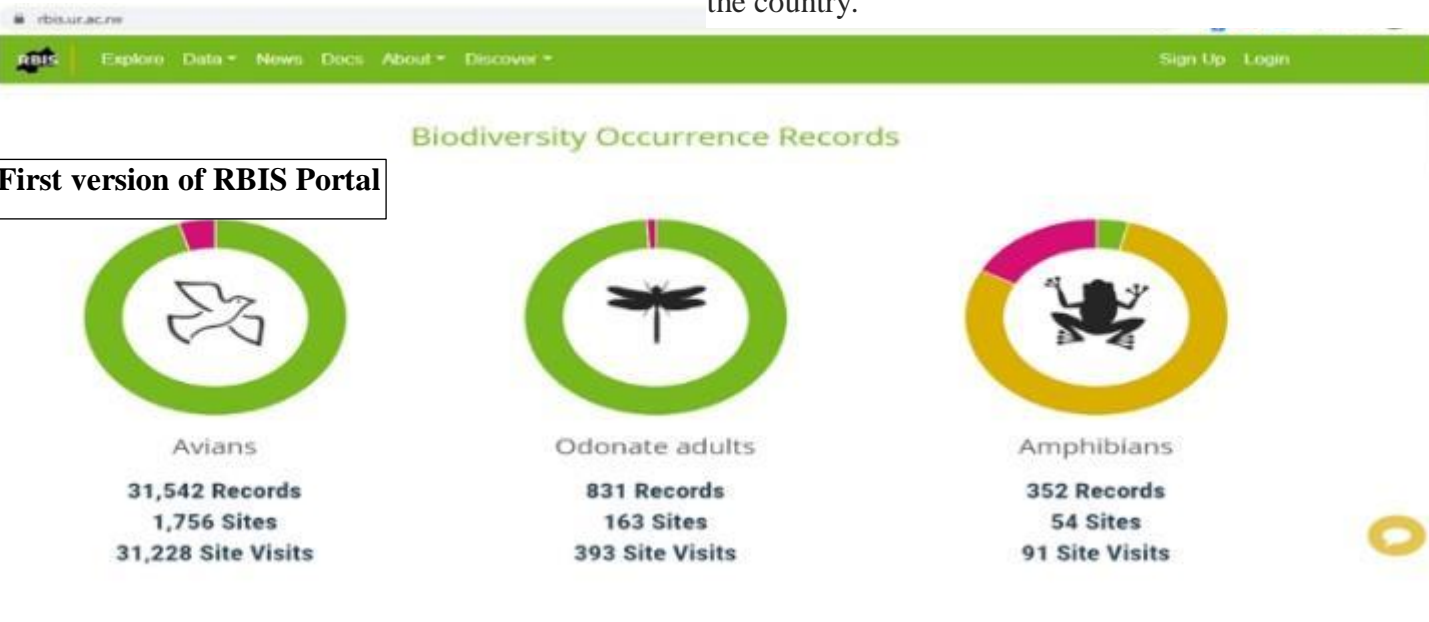
The partnership between Planet Birdsong and the University of Rwanda's CoEB allows the center to expand its acoustic data collection and enhance its technological expertise for game development. The data will also be added to the CoEB's biodiversity data portal that houses both historic and new data on Rwanda's flora and fauna.

We hope this project will engage bird enthusiasts and academics, as well as some of the most active ornithologists in the country like Gael Van de Weghe. The project includes an on-going mentoring and training relationship with several bird tourism guides and clubs like the Rwanda Bird Guides Club, Rwanda Youth Birders, and Women's Bird Club. Community groups and children involved with Rwanda Wildlife Conservation Association are invited to benefit from access to the games. Games will be accessible through the Mobile Environmental Materials Laboratory planned by Rwanda Wildlife Conservation Association (RWCA) at their facility in Umusambi Village, Kigali.

The Rwanda Biodiversity Information System to support evidence-based decision making

The CoEB received a JRS Biodiversity Foundation grant to develop a national biodiversity information platform for Rwanda starting with Mukungwa catchment. The grant totaling 344,000 USD spans three years from November 2019. The objective of this project is to develop an open access system of biodiversity data and spatial layers to inform policy that will be actively used by managers, researchers, policy makers, conservation biologists and other interested stakeholders. We are collaborating with ARCOS and REMA in developing this system, as well as other stakeholders.

The Rwanda Biodiversity Information System (RBIS) includes biodiversity data collections and spatial layers, and links to data resources and the Global Biodiversity Information Facility (GIBF) for data sharing worldwide. The RBIS is an online resource with key information and analytical capabilities using GIS to display interactive maps of Rwanda's ecosystems and priority taxa including plants, macro-invertebrates, and birds. To date, the CoEB has uploaded 32,725 data points in addition to repatriating 311,476 from other sources. The existing collection includes data on amphibians, birds, odonates (dragonflies), fish, macroinvertebrates, plants and algae. We will scale up the system to include all ecosystems in the country.



Grant awarded from the African Research University Alliance (ARUA)

As a node of the ARUA Institute of Water Resources Management, the CoEB won a grant totaling 137,819,867 Rwf to research the Biodiversity, Natural Resource Management, and Water-Food Nexus. This will be part of a bigger project across eight African universities entitled, "Enhancing Resilience Benefits in African Water Resources", where each university will work on a specific subproject. The universities involved include Addis Ababa University in Tanzania, University of Cheikh Anta Diop in Senegal, Dar es Salaam University in Tanzania, University of Lagos in Nigeria, Makerere University in Uganda, University of Cape Town and University of KwaZulu Natal in South Africa, and the University of Rwanda. The project supports one masters and one PhD student within the Biodiversity Conservation and Natural Resource Management tract.



ARUA project grantees during a workshop in Addis Ababa, Ethiopia. Photo by CoEB

Evaluating Ecosystem-Based Adaptation Projects for REMA

The CoEB is collaborating with REMA to evaluate interventions implemented under the “Building resilience of communities living in degraded forests, savannas and wetlands of Rwanda through an ecosystem-based adaptation approach”. This project provided research grants to eight master’s students from different programs in CAVM and CST. The grant awarded 1,860,000 FRW to each student participant, totaling 14,880,000 FRW. In addition, the CoEB provided trainings for these students and their supervisors on ecosystem-based adaptation.



CoEB and REMA staff during the handover of research equipment. Photo by CoEB

Africa Biodiversity Challenge Phase II (ABC2)

Phase II of the Africa Biodiversity Challenge was funded by South African National Biodiversity Institute (SANBI) through a JRS Biodiversity Foundation grant geared towards establishing a long-term strategy for freshwater biodiversity data mobilization, sharing, processing, and reporting in Rwanda. Teams from around the African continent competed for this challenge and the Rwandan team led by the CoEB won was one of four teams selected. CoEB was awarded 10,000 USD for their achievements during the project’s first phase that took place in January 2019. The CoEB is now working on Phase II, which is focused on creating data products from the mobilized data accomplished during Phase I and is scheduled for completion by September 2022. The award for the winners of Phase II varies between 10,000 and 30,000 USD. Under this project, the CoEB team received training on E-learning data management and essential biodiversity variables & ecosystem functioning. We also hosted an exercise to map Rwanda’s ecosystems under this project with key experts, hosted in December 2020. ABS2 project also supports the Biodiversity Information Management Forum or BIMF in collaboration with CoEB and the Ministry of Environment.



Matthew Child from SANBI presenting on mainstreaming biodiversity data in policy, experiences from South Africa. Photo by CoEB

Biodiversity Information Management Forum (BIMF)

The BIMF is one of the key instruments for achieving a dynamic Biodiversity Information Facility where partnerships between data holders and end users can evolve from once-off transactions to long-term strategic relationships. The CoEB worked with the Ministry of Environment to host the first two BIMF’s in Rwanda in 2018 and 2019.

Unfortunately, the 2020 forum could not take place because of the Covid-19 pandemic. The CoEB is working with the MoE to identify an appropriate date to host the next BIMF with the African Biodiversity Challenge partners.

Sampling some new projects in CoEB

1. *Climate Change & COVID-19 (CCC19): Achieving a Sustainable and Equitable Recovery in Malawi and Rwanda*

This new project is funded by UK Research and Innovation (UKRI) and managed in a multi-national partnership between Rwanda, Malawi and Scotland. This multidisciplinary project is led by Glasgow Caledonian University's Centre for Climate Justice in Scotland, in partnership with University of Rwanda/CoEB, Mzuzu University (Malawi), University of Livingstonia (Malawi), Life Concern NGO (Malawi), Rwanda Village Community Promoters NGO (Rwanda), Ministry of Environment (Rwanda), Ministry of Health (Malawi), and Ministry of Natural Resources, Energy and Environment (Malawi). The Rwanda team members are coordinated by CoEB and are from College of Science and Technology (CST), College of Agriculture (CAVEM), and College of Medicine and Health Sciences (CMHS) at UR, as well as CoEB Research Fellows, and the local NGO. Our team range from experts in social science, natural science, public health, and gender. We will use novel research techniques that include participatory approaches, storytelling, and video-making. This project has been awarded a grant of £182,559 (approx. 238 million Rwf).

2. *Children's Exposure to Ambient Air Pollution*

This project will be conducted by a CoEB Research Associate (Dr Egide Kalisa) and is aimed at educating and equipping primary students with skills to protect themselves from air pollution. The project is funded by The World Academy of Science (TWAS) in collaboration with UNESCO and has been awarded 15,600 USD.

3. *Timber and Indigenous Trees in Rwanda*

This project was developed collaboratively among CoEB staff, Research Associates, and Research Fellows. It is aimed at promoting the use of indigenous tree species by the timber industry and supporting biodiversity conservation and community participation in Rwanda's forestry sector. We are partnering with S.E.A.L. timber company in Rwanda. The project is funded by the Rwanda National Commission for Science and Technology (NCST) under the academia-industry partnership grants with a total budget of 90,000,000 Rwf (including partner contributions).

4. *Course on Ant Species in Rwanda*

This project is aimed at developing a taxonomic course focusing on ants as a stepping stone for studied of ant community composition in relation to forest types in the Arboretum of Ruhunde and Rubona Research Centre. It was developed by Dr Venuste Nsengimana and funded by the Capacities for Biodiversity and Sustainable Development (CEBioS), Belgium. The total amount received is 13,331 Euros.

5. *Use of Soil-Litter Arthropods as Biological Indicators of Soil Quality in Rwanda*

This project was also developed by Dr Venuste Nsengimana and is funded by Royal Belgian Institute of Natural Sciences (1998 euros).

6. *What's in Air Rwanda*

This project developed by Dr Egide Kalisa, CoEB Research Associate is funded by the University of Toronto. The total grant is 3,000 C\$.

7. *Indoor and Outdoor Air Pollution*

This project was also developed by the CoEB Research Associate and funded by the University of Toronto with funding at 47,000 C\$.

8. *Relationship Between Rural Women and Mining Practices in Rwanda*

This project was developed by a CoEB Research Fellow, Dr Laine Munir, who studies women and natural resource management. This project was recently awarded a 2021 Harry Frank Guggenheim Research Grant equaling 22,000 USD.

Rwanda in the battle against climate change

Rwanda is among the countries which are most vulnerable to climate change. Its land particularly is vulnerable to heavy rainfall associated with soil erosion and landslides resulting in the loss of infrastructure, life and soil fertility in Northern, Western, and Southern provinces, while the Eastern Province is often vulnerable to drought. In response to the growing climate change challenges in the country, Rwanda has put in place a legal, policy, and strategic framework to deal with climate change and climate variability-induced risks and economic losses through (among other approaches) reducing vulnerability and building resilience to the impacts of climate change.

At the international and regional levels, Rwanda has ratified the United Nations Framework Convention on Climate Change (UNFCCC) in 1995 and later the Kyoto Protocol. Rwanda has also ratified the Paris Agreement 2015, which deals primarily with greenhouse emissions mitigation, adaptation, and financing. As part of the Paris Agreement implementation, Rwanda submitted a revision of the Nationally Determined Contribution (NDC) in May 2020 through the Ministry of Environment. The revised NDC included a clear results framework and resource mobilization targets. It was the first among Least Developed Countries to submit its updated NDC in 2020.

Even though the emission level of greenhouse gases in Rwanda is still relatively small (0.01%), mitigation measures are important to reduce emission level now. Rwanda is committed to reduce its emission by 16% by 2030. The adaptation component in Rwanda's updated NDC involves quantified targets for adaptation and resilience, criteria-based evaluation of priority interventions, and development of a monitoring and evaluation framework for adaptation actions to strengthen national capacity for resource mobilization that will be instrumental to supporting climate action.

Rwanda's updated NDC sheds light on mitigation measures taken in energy, industry, agriculture, and waste management sectors. The adaptation component presents 24 adaptation interventions, with cross-sectoral and sector specific performance indicators and targets, including water, agriculture, land, forestry, human settlement, health, transport, and mining sectors. Interventions in agriculture sector are aimed at sustainable land-use management and climate-resilient crops, resilient livestock, and value addition facilities and technologies. Other interventions involve improvement of forest management and promotion of afforestation and reforestation; in the area of national water security, wetlands restoration, water storage and efficient water use, and conservation practices.

CoEB joined the Least Developed Countries Universities Consortium on Climate Change

In 2020, the CoEB joined the Least Developed Countries (LDCs) Universities Consortium on Climate Change (LUCCC). The LUCCC is a South-South long-term capacity-building platform comprised of 10 founding LDC universities, but more LDC universities are gradually joining the group. Under this network of universities, faculty members and students share experiences and knowledge on climate change to build capacity through education, training, research, and communication.

The LUCCC as an LDC-wide initiative was endorsed by the LDC Ministerial in Addis Ababa, Ethiopia on October 2018. LUCCC aims to support all the 47 LDCs to adapt effectively to the adverse impacts of climate change, as well as to explore win-win options for mitigation. It aspires to develop a South-South and South-South-North knowledge sharing and capacity building network, focusing on adaptation. All the universities, research and training institutes in the LDCs will be included over time in the LUCCC network. LUCCC at the moment is a thirteen-year initiative established on the 1st of July 2017 and is expected to run until the 31st of December 2030 when all LDCs are expected to graduate out of their current status. Thanks to Grace Ineza from Green Fighters for connecting us to the LUCCC.

See <http://www.luccc.org/> for more information about this consortium.

University of Rwanda joined African Institute for Indigenous Knowledge Systems

On 31 August 2020, the UR joined the African Institute for Indigenous Knowledge Systems (AIIKS) with CoEB as the focal point. The AIIKS is established at the University of KwaZulu-Natal (UKZN), South Africa. AIIKS is established based on the Hub and Spokes model. The institute will develop and drive strategies for the systematization of African indigenous knowledge as a knowledge domain in its own merit. This is part of the Africa We Want (AU Agenda 2063) agenda to enable Africa to contribute to the global pool of knowledge on its own terms rather than those dictated by others. The University of Rwanda, as a prominent institution within the continent, has expressed interest and a commitment towards the advancement of AIIKS. The involvement from UR will be through the following channels: CoEB, Huye Biotechnology Laboratory, and The Center for Conflict Management (CCM). The CoEB's area of focus will be on traditional knowledge systems, biocultural diversity, and bio-prospecting. We are thrilled to invite anyone interested to join the CoEB and get involved in the AIIKS consortium. Dr Nathan Taremwa is the lead contact for the AIIKS activities at CoEB.

New Research Fellows Appointed to the CoEB in 2020

The Center is multidisciplinary – we intentionally bring together different disciplines and academic fields to put our minds and passion to addressing problems in the environment and climate change. We benefit greatly by working with experts from a variety of fields, and also by integrating youth into our activities. We were able to have a number of Research Fellows appointed to the CoEB, who represent expertise in fields from gender equality, freshwater ecosystem ecology, elephant ecology and conservation, wildlife crimes, environmental policy, primatology, GIS and spatial analysis, both young and old, who are not part of the academic staff at University of Rwanda – this is a wonderfully mutually beneficial relationship for us and our Fellows, and we are grateful for their contributions to our work. Below is a list of the current Fellows; we are in the process of requesting a new batch of Research Fellow appointments.

No	Names	Area of interest	Occupation
1	Prosper Umuntunundi	Land snails & slugs, taxonomy, wildlife ecology	Independent Researcher
2	Jeannette Batamuriza	Conservation education	Independent Researcher and Conservationist
3	Erasme Uyizeye	Benthic macroinvertebrates and wetland ecosystem health	Adjunct Professor at Keene State College
4	Daniel Igirimbabazi	Data management and analysis	Biodiversity Data Manager at CoEB
5	Venant Nzibaza	Climate change, riparian zone & water quality	Project Manager at CoEB
6	Deborah Cyuzuzo	Data management and analysis	Project Manager at CoEB
7	Thacien Hagenimana	Data management and analysis	Biodiversity Data Manager at CoEB
8	Raymond Umazekabiri	Plant ecology and conservation	Assistant Herbarium Coordinator & MSc student, Technische Universität Dresden, Germany
9	Dr. Tammie Matson	Elephant conservation	CEO at Matson and Ridley Safaris
10	Dr. Ian Gordon	Butterfly ecology and conservation biology	Independent Researcher
11	Dr. Laine Munir	Gender dimensions of conservation, political anthropology	Independent Researcher and Global Challenge Pgm, ALM
12	Dr. Lisa Dale	Climate change policy and governance	The Earth Institute, Columbia University, USA
13	Dr. Michael Renner	Animal behavior & primatology	Professor at Drake University, USA
14	Dr. Apollinaire William	Gis and spatial analysis	Deputy Director of ARCOS
15	Chystelle Sauvis Iradukunda	Entomology	Independent Researcher & ARCOS staff
16	Dr. Michael Thomas	Plant taxonomy	Biocultural Diversity International, Hawaii, USA
17	Dr. Elaine Hsiao	Wildlife crimes and conflicts in conservation areas	Postdoc Researcher, Sheffield University UK & CoEB. UR

Let's Beat Air Pollution

The Let's Beat Air Pollution Project is organized by Yves Rugira, the CEO and Founder of Ibinkikije nkunda ltd and a Radio Salus environmental presenter. The project aims to raise awareness of biodiversity conservation in secondary schools through a student poem and song competition. Ten schools participated in this competition from three sectors in the Huye district (Ngoma, Tumba, and Mukura). Representatives at the district level were selected to compete in final event. CoEB was among the numerous partners in this project and student winners had the opportunity to visit the National Herbarium of Rwanda and the Arboretum at the University of Rwanda, Huye Campus.

In October 2019, we visited participating schools and identified talented students to compete at the district level. The final event took place at Ecole Notre Dame de la Providence Karubanda (ENDP-Karubanda). Among the eight schools who made it to the final, six schools attended the final at ENDP-Karubanda. All students were well prepared for the day. Students in every category were awarded bags, notebooks, reusable bottles, and 20,000 FRW.

The Education and Awareness Raising Officer at the CoEB gave a talk during this event on how to beat air pollution and promote good health. Students expressed an eagerness for continued competitions and collaborations in order to conserve the environment while they are still young.



Let's Beat Air Pollution competition winners.
Photo by CoEB

CoEB Celebration of World Tree Planting Day

The celebration of the 44th anniversary of Tree Planting Day was held on Saturday, 9 November 2019. Staff from the CoEB at the University of Rwanda, CoEB Research Associates and lecturers from various departments including Forestry and Nature Conservation at UR-Huye campus, and students from social science and conservation programs at UR Huye campus organized a tree planting day in Akakanyamanza village, in the Tumba sector, on Friday, November 15, 2019.

The theme of the tree planting day was “Forestry for community livelihood”. More than 600 seedlings from agroforestry trees were planted in collaboration with the local community and were taught about the importance of trees, especially agroforestry trees. Thanks to the Tree Seed Center in Huye for donating the seedlings.

On 23 October 2020, Rwanda celebrated the 45th Anniversary of Tree Planting Day. At the national level, this event was celebrated in Nyanza District with the Ministry of Environment. The CoEB celebrated in Akakanyamanza village and Research Associates and Fellows from the CoEB assessed tree growth of trees planted in 2019 at this site. New agroforestry seedlings were also planted and local people were encouraged to participate in the planting, care, and conservation of trees as a great way of ensuring the sustainability of forest resources. CoEB staff also took the opportunity to inform and engage with people about human-wildlife conflict and what can be done to minimize conflicts and protect the biodiversity.



The CoEB Research Associates and Research Fellows participating in the tree planting and monitoring activity with Akakanyamanza village community. Photos by CoEB

Meet Mr. Raymond Umazekabiri: Inspiring Youth to Pursue Research!



Raymond Umazekabiri received his BSc in Botany and Conservation from Biology Department, College of Science and Technology, University of Rwanda in 2018. While still a BSc student, Raymond assisted a project in CoEB entitled “Ozone monitoring and its impact on crop yields in rural area of Rwanda” gathering the data and sending it to the partner, the Centre of Ecology and Hydrology in UK. Since graduating, he has been working at the CoEB and he continued work on his undergraduate senior research project on mistletoes after receiving funding.

Raymond is passionate about the botanical field, especially plant taxonomy and systematics, ecology, ecosystem services, and plant collections management. In August 2019 Raymond became a National Geographic Explorer through an Early Career Grant awarded by the National Geographic Society (NGS). This award allows him to explore the diversity, abundance, and host relationships of mistletoe species along an elevation gradient in Nyungwe National Park (NNP), Rwanda. This is a follow up to his senior research project, supervised by Prof Beth Kaplin.

Since its inception, Raymond has coordinated the Upgrading and Digitizing Project at the National Herbarium of Rwanda funded by the Institut de Recherche pour le Développement/ Sud Expert Plantes Développement Durable in France. He successfully interviewed for the Herbarium Assistant position and worked with specimens, data entry, and digitizing and data portal management full time until he left for his MSc studies in Germany.

Raymond has also found time to assist scientists from Emory University, USA, in measuring trace soil gases in maize plantations and conducting participatory surveys with farmers to assess the challenges they face as a result of climate change. Raymond is involved in various research project proposals for the CoEB, and also mentors interns and undergraduate students who come to work in the herbarium. He recently entered a Master’s Degree program at Technische Universität Dresden, Germany, in Biodiversity and Collection Management.

Raymond’s current research project, “*Diversity, Abundance, Host Relationship of Mistletoe Along Elevational Gradient in Nyungwe National Park, Rwanda*” aims to assess mistletoe diversity, abundance, distribution, and interaction with host plant species, and to determine infection intensity of mistletoe species in Nyungwe National Park along an elevational gradient. This is an extension of the senior research project he conducted for his BSc program.

Meet Post Doc Dr. Elaine Hsiao



Dr. Elaine Hsiao during a presentation on her postdoctoral research. Photo by CoEB

Dr. Elaine Hsiao is a Global Challenge Fellow at the Sheffield Institute for International Development (SIID) and an Honorary Research Fellow with the CoEB. Her research is primarily socio-legal, integrating peace and conflict studies with transboundary conservation and protected areas, indigenous and community conservation, human rights and rights of nature, and environment governance/sovereignty. Much of her work seeks to address conflicts in conservation (e.g. human-protected area conflicts, human-wildlife conflicts), conservation in places of conflict (e.g. conflict-sensitive and conflict-resilient conservation), and conflict resolution through conservation (environmental peace building). Last year, she published an article titled “*Protecting Protected Areas in Bello: Learning from Institutional Design and Conflict Resilience in the Greater Virunga and Kidepo Landscapes*” (https://www.gojil.eu/issues/101/101_article_hsiao.pdf).

Dr. Hsiao’s current research in Rwanda explores the disruption of environmental governance and revitalization of areas and territories conserved by Indigenous peoples and local communities. Her work particularly focuses on strengthening socio-ecological connectivity, resilience, and peace in the broader transboundary landscapes of the Albertine Rift.

Spotlight on CoEB interns



Interns working on digitizing plant specimens in the National Herbarium of Rwanda, Huye

The Department of education, awareness raising, and capacity building at the CoEB works with academic and professional interns from the University of Rwanda and other higher learning institutions across the world. As the mission of CoEB is to enhance the knowledge of biodiversity and natural resource management for sustainable development, we capacitate our interns with quality professional experiences required at the job market. The interns gain a variety of skills necessary for their career through mentorship from CoEB staff and Research associates, affiliates and fellows. Since 2020, we have hosted 19 interns (10 women and nine men) who work either remotely or on site, at the National Herbarium of Rwanda. The CoEB hosts interns from around the world, and current we have interns from the University of Rwanda, African Leadership University (ALU), Protestant Institute of Arts and Social Science (PIASS), and Institut Catholique de Kabgayi (ICK).



Meet **Jean de Dieu Brave Yambabariye**, a Bachelor's degree holder in Botany and Conservation from the University of Rwanda. He started his professional internship at National Herbarium of Rwanda in May 2020 where his primary responsibilities are mounting, digitizing, and photographing collection specimens. *"This internship helps me to increase knowledge and interests in Rwandan plant diversity, their collections, mounting, and identification,"* Jean de Dieu Brave Yambabariye said. Jean also stated, *"It also makes me familiarize with web-portal use, digital image captions, online research seminar, and project writing. I enjoy working in the environment of NHR."*



Diane Akundwe is a Bachelor's degree holder in Botany and Conservation from the University of Rwanda-Huye campus. She held a professional internship at the National Herbarium of Rwanda from April 2020 to November 2020. Her primary responsibility was specimen mounting, but also assisted with digitization and photography after receiving training. *"This internship helped me increase the knowledge about plant diversity of Rwanda; their collections, mounting, and identification,"* Diane said. Diane Akundwe also stated, *"I encourage botanist and environmental students to come in the Herbarium as they will acquire great knowledge, and I recommend the management of CoEB to give much training to interns."*

Even COVID-19 lockdowns could not stop the CoEB Weekly Seminar Series

The CoEB organizes a weekly seminar series that highlights a different researcher, student or practitioner and their work. Researchers and practitioners give talks on a variety of topics that span biodiversity, ecophysiology, agroecology, primatology, policy issues, education, and climate change adaptation. The CoEB initially hosted the seminar series in-person at the CoEB main hub, however, because of restrictions associated with COVID-19 the series has shifted to a virtual platform via Google Meet since June 2020.

Holding these seminars online has yielded unexpected benefits as the number of participants increased due to the accessibility of the online format that permits attendees worldwide. CoEB nodes and national and international partners are invited to present. Attendees have included government staff, university staff, students, academics from institutions around the world, business owners, and professionals with backgrounds in biodiversity conservation, policy, natural resource management, climate change, etc. On average, 30-50 people attend each seminar. From January 2020, a total of 25 talks were hosted by the CoEB and recordings can be accessed via our YouTube channel.

Meet Aloysie Manishimwe: PhD Student & CoEB Research Associate



CoEB conducted an interview with Aloysie Manishimwe, a Rwandan PhD student pursuing a double degree PhD in Plant Eco-Physiology at both the University of Rwanda and University of Gothenburg, Sweden.

What is your background?

My names are Aloysie Manishimwe, assistant lecturer at the University of Rwanda, College of Science and Technology (UR-CST) and a research associate to the Center of Excellence in Biodiversity and natural resources management (CoEB). I hold a MSc. degree in Ecology and Environmental Law from “Université de Rennes 1, France” and a BSc. degree in Plant Ecology and Environment from “Université Mouloud Mammeri de Tizi-Ouzou, Algeria”. I am currently pursuing my PhD studies by research in plant eco-physiology under a double degree program between the University of Rwanda and the University of Gothenburg in Sweden.

What are your areas of interest?

I am interested in ecology, biodiversity conservation, environmental issues and environmental protection related topics. Currently, I am affiliated with a project called “Tropical Montane Forests in a warming world”

(<https://www.youtube.com/watch?v=EkDvbwisqIQ>).

This project is being implemented by the University of Gothenburg, Sweden, in collaboration with the University of Rwanda and the Rwanda Agriculture Board. It is funded by Formas (the Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning) and Vetenskapsrådet (the Swedish Research Council). My PhD research is being conducted under this project and it aims at investigating “Biomass allocation in tropical montane tree species in response to temperature, water and nutrients” (<https://airoplant.com/associated-staff/>).

Under this project, we will assess if tropical tree species will acclimate and/or adapt to the predicted global warming and climate change.

As someone who is working on Tropical Plant Eco-Physiology in a warming world, what is your message to the public about climate change and its impact on Rwanda’s biodiversity in general?

Climate change is not a myth; it is a reality around us. Various climate-oriented research revealed that climate change is ongoing due to past and present emissions of greenhouse gases that enhanced the greenhouse effect and caused global warming. Also, various conservation and environmental protection related research revealed that some species have gone extinct, others migrated and others changed their eco-physiological behaviors due to environmental condition changes. Therefore, we all have to be aware that our uncontrolled activities are harming our common home as humans live together with plants and animals.

In which area do you think we need more efforts for sustainable conservation of our biological diversity?

For sustainable conservation of our biodiversity in Rwanda, we need to put more efforts in education, training, public awareness and make nonconfidential information more available and accessible to the public.

As a woman who pursues STEM studies, what motivated you to choose that area and what are the challenges that you face? How do you overcome those challenges?

In the beginning when I was at secondary school, I did biochemistry because I wanted to do medicine at the university. At the end of secondary school, I earned a government scholarship to do Biology in Algeria. Once there, we had a course called ecology and legislation in second year, which inspired me to choose the option of plant ecology and environment. I tried my best to perform well and applied for a master in France where I did Ecology and environmental law because I felt like I am responsible about the care for our common home, our environment, our Earth. I did not face challenges related to performance in class because I was the major of my promotion (Major de la promotion) in Algeria and in France I performed well. However, I met challenges related to gender and skin-based violence. After this journey, I was recruited at the University of Rwanda and encouraged to pursue my PhD by research at the University of Rwanda and the University of Gothenburg under a double degree program. I was motivated by my fellow Doctors, men and women who are contributing to the development of our country. My dream is also to become a doctor and contribute more to the development of my country. The challenges that I face are common to all African women and to overcome them is to try to work hard to fulfill all responsibilities.

What do you think can be done to encourage more women to be interested in science and research?

To encourage more women to be interested in STEM and research, there is a need to tell them that they can do what their brothers do; women that already made it should be the mentors of others. That is about bringing equity and equality between women and men who are doing STEM and research.

Rwanda's population is dominated by youth, what do you think can be done to engage Rwandan youth in biodiversity conservation?

Already, a good number of youth is involved in activities that seek to protect and manage our environment. They include for instance the Rwanda University Club for Conservation of the Biodiversity (RUCCB), the Young Volunteers for the Environment (YVE) Rwanda; the Catholic Youth Network for Environmental Sustainability in Africa (CYNESIA), the Nature Rwanda, the Green Fighter, etc. However, we need to multiply our efforts to reach every single youth at all levels in our society. For this to be achieved, more community outreach activities are needed.

What is your last message on biodiversity conservation and natural resource management to everyone concerned?

My last message on biodiversity conservation and natural resource management to everyone concerned is that whoever you are, wherever you are, you can do something to care about our common home, our environment, our earth. We have to be aware and understand that if we do not wisely use our biodiversity and natural resources, we are the ones who will suffer the most than what we have destroyed. COVID19 pandemic outbreak should leave us with a message that everything on earth is connected, no borders exist and humans, we are the ones to take the lead and be careful on how we manage our biodiversity and natural resources.

Even COVID-19 lockdown could not stop CoEB from celebrating Earth Day



The CoEB celebrates international events related to its mission through public lecture, social media posts, videos, and radio show every year. In honor of Earth Day, the CoEB created a video on April 22nd, 2020. The video is a compilation of Research Associates and Fellows from CoEB, as well as UR academic staff, who delivered recorded video messages related to earth protection and fighting climate change through various thematic areas.

Prof Elias Bizuru from UR College of Science and Technology talked about climate change and diversity with an emphasis on species and ecosystem threatened by climate change with extremely limited options. For species that are unable to adapt to climate change through behavioral or genetic changes, he noted that species will likely shift their range and migrate in order to remain at equilibrium with the climate.

He added that the impact of climate change will also affect nutrition as some areas in the world will likely become hotspots of food insecurity and face serious under nutrition. According to Prof. Bizuru if nothing is done in Rwanda, the country could experience food insecurity for its people.

Prof Bizuru also explained that in some areas, climate change is a source of conflict and fierce wars as seen in Darfur. He therefore called for investing in mitigation and adaptation strategies for climate change security will be at stake in addition to the country's rich natural resources.

Aloysie Manishimwe is assistant lecturer at the UR College of Science and Technology. She argues that women can contribute in climate change mitigation in various ways as they are responsible for many activities in their household such as greening and cleaning their homes.

Dr Laine Munir a senior research fellow at the CoEB, focused her talk on the relationship between gender and environmental change. According to Munir, climate change primarily affects farmers on the African continent as 70% of the population relies on agriculture for their livelihood. In the face of environmental changes from climate change, she noted that women and men in rural areas are particularly vulnerable because they are statistically less likely to have savings and liquid assets that can support them in the event of a financial shock.

Munir said, "Our research indicates that men and women in Africa are less likely to engage in meaningful decision making about how land is used and overall women tend to have less financial resources than men which would help them to avoid economic vulnerability due to climate change reasons".

Check out our YouTube channel where you can find the recording of this Earth Day 2020 celebration: <https://www.youtube.com/channel/UCdr8ykoxB00DI7ywxpvBuWA>

Upcoming global events (2021)

Date	Name
2 Feb Tuesday	World Wetlands Day
3 Mar Wednesday	World Wildlife Day
8 Mar Monday	International Women's Day
21 Mar Sunday	International Day of Forests
22 Mar Monday	World Water Day
23 Mar Tuesday	World Meteorological Day
6 Apr Tuesday	International Day of Sport for Development and Peace
22 Apr Thursday	Earth Day
26 Apr Monday	World Intellectual Property Day
8 May Saturday	World Migratory Bird Day
22 May Saturday	International Day for Biological Diversity
4 Jun Friday	International Day of Innocent Children Victims of Aggression
5 Jun Saturday	World Environment Day
8 Jun Tuesday	World Oceans Day
17 Jun Thursday	World Day to Combat Desertification and Drought
16 Sep Thursday	International Day for the Preservation of the Ozone Layer
27 Sep Monday	World Tourism Day
13 Oct Wednesday	International Day for Natural Disaster Reduction
16 Oct Saturday	World Food Day
6 Nov Saturday	International Day for Preventing the Exploitation of the Environment in War and Armed Conflict
10 Nov Wednesday	World Science Day for Peace and Development
5 Dec Sunday	World Soil Day

Recent Publications by CoEB Research Associates and Fellows

1. Egide Kalisa 2020. Health co-benefits of NDC mitigation actions in Rwanda. Policy Brief, Rwanda Ministry of Environment.
2. R Subramanian, Abdou Safari Kagabo, Valérien Baharane, Sandrine Guhirwa, Claver Sindayigaya, Carl Malings, Nathan J Williams, Haofan Li, Peter Adams, Egide Kalisa, Allen L Robinson, H. Langley DeWitt, Jimmy Gasore and Paulina Jaramillo. Spatial and temporal variability, source contributions, and the impact of car-free Sundays. Accepted for publication 2020, Clean Air Journal.
3. Andrew Sudmant, Egide Kalisa, Jonathan Bower. The impact of scaling up electric motorbikes in Rwanda. Policy Brief, International Growth Centre, 2020.
4. B.A. Kaplin. 2020. Biodiversity and ecosystem services in tropical forests: recent findings and implications for sustainable forest management (SFM), chapter 15 in Achieving Sustainable Management of Tropical Forests. J. Blaser and P.D. Hardcastle, editors. Burleigh Dodds Science Publishing.
5. Eckardt, W., D. Tuysingize, Y. van der Hoek, S. Tolbert, T.S. Stoinski, F. Ndagijimana, B.A. Kaplin, A. Mudakikwa, K. Lukas. 2020. A partnership to build scientific capacity of Rwanda's future conservationists: The Memoirs Program" American Journal of Primatology. Published online DOI: 10.1002/ajp.23200.
6. Miller, A.D., Uddin, S., Judge, B.A. Kaplin, D. Ndayishimiye, G. Uwingeneye, and C.C. Grueter. 2020. Spatiotemporal association patterns in a supergroup of Rwenzori black-and-white colobus (*Colobus angolensis ruwenzorii*) are consistent with a multilevel society. American Journal of Primatology. <https://doi.org/10.1002/ajp.23127>

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The Government of Rwanda is committed to Centers of Excellence that will ensure research is available to meet national data needs for evidence-based decision making. University of Rwanda hosts several Centers which drive academic research and innovation in support of policy and management. The CoEB was established in 2016 at University of Rwanda and works across Colleges, Schools and departments. It engages with environmental scientists, biologists, social scientists, policy scientists, gender experts, ecological economists, anthropologists, chemists, pharmacists, molecular biologists, foresters, agronomists, climate scientists, and many others. We work with youth and seniors, with government and private sector, communities and international partners to meet our mission.

We are developing opportunities for youth and junior staff to gain experience, and provide data for decision-makers, creating an academic/research culture, and making it pleasurable. We are creating a dynamic and welcoming atmosphere for academics and practitioners, we want science and research to be enjoyable and rewarding, and we are driven to contribute to sustainable development goals and achieving climate resiliency.