



TAITA TAVETA UNIVERSITY

A Premier Institution in Education, Training, Research, Innovation
And Community Outreach

**Centre of Excellence for Mining,
Environmental Engineering and Re-
source Management
(CEMEREM)**

**Biennial Report
2021 - 2022**

www.african-excellence.de

**Centre of Excellence for Mining,
Environmental Engineering and
Resource Management**



Compiled and edited by: Prof. Dr. Jan C. Bongaerts
Prof. Dr. Ulrike Feistel
Prof. Maurice Juma Ogada
Dr. Jiangxue Liu

Designed by: Dr. Jiangxue Liu
Printed by: TU Bergakademie Freiberg Media Centre

Table of Contents

I	CEMEREM	1
II	Education	3
III	Research	11
IV	Networking and Outreach	15
V	Outlook into the future	28



CEMEREM

The CEMEREM project, established as a consortium of Taita Taveta University (TTU) in Kenya, University of Applied Sciences Dresden (Hochschule für Technik und Wirtschaft Dresden (HTWD)) and TU Bergakademie Freiberg, was launched in May of 2016. The project seeks to establish a DAAD African Centre of Excellence for Education in Mining, Environmental Engineering and Resources Management. CEMEREM's overarching objective is to contribute to a sustainable development of the natural resources sector in Kenya and East Africa.

After 6 years development, the following goals of CEMEREM have been achieved:

- Three study programmes have been established with the assistance of the German partners.
- The infrastructure and research capacity at CEMEREM has significantly improved.
- Capacity building is in progress, and most CEMEREM programmes are now taught by TTU lecturers.
- Contacts with government and industry have been enhanced.
- Academic Quality Assurance directorate has been established.
- A sustainability concept has been developed.



Main Campus of Taita Taveta University

CEMEREM III

DAAD gave its consent to continue its support for the CEMEREM Project until 2025. Some of the planned activities include:

- Integration of Taita Taveta University as a new partner University in the Triple Degree Study Programme for Mining Engineers already operating between TU Bergakademie Freiberg and Mon-

tanuniversität Leoben

- Establishment of a Doctoral Studies Academy at Taita Taveta University
- Continuation of Summer School – hopefully this coming year in Germany
- More research activities
- Internationalization within Africa

Condolence Nicholas Muthama

Sunrise: 5 December 1977 - Sunset: 30 March 2021

With great sadness all of CEMEREM team have received the news about the sudden demise of Dr. Nicholas Muthama, the previous CEMEREM Coordinator at TTU, a senior lecturer in the School of Science & Informatics at Taita Taveta University. We are shocked by this unexpected event. We have come to appreciate and value Dr. Muthama as a competent, accurate, reliable and trustworthy colleague in our Kenyan-German CEMEREM project. He delivered an original, innovative and substantial contribution to our joint endeavour and to the education of many Kenyan



Dr. Nicholas Muthama

and East-African students at your university through his responsibilities in the CEMEREM project.

We have lost a diligent colleague with whom we collaborated. He was a person full of mutual respect, dignity, honesty and friendliness. We will miss him and keep him in our memories.

Enrolment of CEMEREM in 2021 - 2022

Enrolment in CEMEREM study programs: As a contribution to project outcomes related to education in the fields of mining, environmental engineering, process engineering, and natural resource management, 43 students were enrolled in CEMEREM study programmes in 2021, and 13

were enrolled in 2022. Overall, 71 students have been enrolled in CEMEREM study programmes since 2017. Most of these students have been awarded either full or partial scholarships. Eight students from the first cohort graduated.

Teaching Activities of German Partners

In 2021, research stay activities for lecturers and postgraduate students were suspended due to travel restrictions. Guest lectures have been taking place in a virtual form.

April – July 2021 Prof. Bongaerts gave lectures on “mineral economics” and “valuation of mineral deposits”.

March – May 2021 Dr. Sandhu gave lectures on “Waste Management” and “Material Flow Analysis”.

July – August 2021 Dr. Jiangxue Liu gave training course on “Life Cycle Assessment (LCA)” with UMBERTO.

January – April 2022 Dr. Weyer of the underground mining institute of TU Bergakademie Freiberg gave lectures on “Mine Ventilation”.

January – April 2022 Prof. Bongaerts taught a course on “mineral economics” and another course on “mineral reserve estimation and financial valuation”.

July 2022 Online Training workshop on “Life Cycle Assessment (LCA)” for staff and post-graduate was conducted.

Research Stay of CEMEREM Students

1 – 30 June 2022 A group of five students from TTU travelled to Germany for a one month research stay. The purpose of the visit was to refine their Master’s thesis concepts. During the research stay, the students worked closely with their dedicated supervisors at TU BAF and HTWD.

An highlight of their visit was their participation in the Young Research Forum within the frame of EURECA-PRO - the European University for Responsible Consumption and Production. The forum brought together a cohort of eighteen PhD students from various EURECA-PRO partner universities.

The forum consisted of lecture and excursion focused on the Generation

and Utilization of Renewable Energy, as well as Circular Economy in Agriculture. Beyond the classroom, participants took part in a geocaching tour through the city of Freiberg. In this interactive tour, they gained a better understanding of the concept of responsible consumption and its practical application.

At the last part of the colloquium, the students presented their ongoing research projects and received comments from a distinguished Scientific Committee. The five students had an opportunity to engage with other students of EURECA-PRO partner universities. This experience has undoubtedly contributed to their academic and personal growth.



*Students were solving tasks in the Geocaching tour (left)
The five exchange students from TTU (right)*

5th CEMEREM Summer School 2021

31 October – 07 November 2021 The 5th CEMEREM summer school was held in Voi, Kenya. Taking place amid COVID-19, the Summer School reviewed the eventful and rich history of the previous Summer Schools before the COVID-19 which had traditionally been held in Germany, from 2017 to 2019. The theme chosen resonated with the compelling moment of history that COVID-19 has introduced to a changing world: **Innovative technologies, systems, and processes for resilient natural resources sector in the post-COVID-19 era.**

Thirty-eight TTU students and staff attended the Summer School. The

events began with presentations by lecturers, students, and officers from the County Government of Taita Taveta. Four presentations came from external experts, drawn from Germany, Finland, and the County Government of Taita Taveta.

On 5th and 6th November, participants visited the artisanal mining in Ghawia, Taita Taveta and Malindi Salt Mining site in Kilifi County. They also travelled to the Haller Park in Mombasa, a nature park reclaimed from a quarry wasteland where limestone was mined over the period 1959 – 1970.



Visit to the artisanal mining in Chawia, Taita Taveta (left)

Visit to the Lake Chala to compare positional accuracy changes with environmental conditions and altitude (right)

6th CEMEREM Summer School 2022

17 – 24 July 2022 After two years restriction of COVID-19 pandemic, the 6th CEMEREM Summer School was held again in Germany. Twenty teachers and students of TTU attended the Summer School on **Sustainable natural resource management under the changing climate.** The Summer School began with the introductory lectures on “Climate Change”, “Low-carbon effort in the mining industry” and “reducing the carbon footprint at the expenses of mineral footprint” gave by Prof. Ulrike Feistel, Prof. Bongaerts and Oscar Choque, a promotor of Natural Resource Policy, Development and Migration of Sachsen.

In the following days, participants visited laboratories of HTWD, mine rehabilitation site of “Cottbuser Ostsee”,

water dam at “Klingenberg”. They have learned about the Water management in climate change conditions in Saxony.

In Freiberg, they visited the “Geo-Kompetenzzentrum Freiberg (GKZ)”. Dr. Reimer, the manager of GKZ, presented the networking activities of GKZ and emphasised the important role African countries are playing for the achievement of climate goals, since African is providing many key raw materials for the development of green energy.

Participants also visited Agragenossenschaft Bergland Clausnitz, there they have learned the circular economy concept of generation and use renewable energy in agriculture.



Visit to the mine rehabilitation site of “Cottbuser Ostsee” (left)

Visit to Agragenossenschaft Bergland Clausnitz (right)

Staff Training

To enhance the teaching and research capabilities of CEMEREM lecturers, a series of training courses focused on digital teaching, innovative teaching methodology and innovative research tools have been offered. In 2021 and 2022, the following training courses were organized:

June 2021	Training on Moodle learning management system and remote teaching platform
July - August 2021	Training of two TTU staff (training of trainers) on "Life Cycle Assessment (LCA) with UMBERTO"
October - November 2021	Training courses "e-teaching course" – coach assistance tutorial for CEMEREM digitalization
December 2021	Training workshop "Project-based learning"
December 2021	Training workshop "Business modelling for start-ups"
December 2021	Training workshop "How to write fundable grant proposal"
July 2022	Capacity building training in Life Cycle Analysis (LCA) and its relevance for research
September 2022	DIGI-FACE Training course on "Financial sustainability, working with digiface.org on wordpress, Managing Moodle and disseminating knowledge"

Research Stay of CEMEREM Staff in Germany

06 – 17 September 2022 Two CEMEREM researchers from TTU, Dr. James Wanjiku and Dr. Justin Maganga, travelled to HTWD for a research stay.

Dr. Wanjiku is currently involved in the Agri-Photovoltaic (PV) pilot project at TTU. During his research stay at HTWD, he visited various Agri-PV plants in Saxony, ground-mounted PV systems and Agri-PV research plants at HTWD. He has gained valuable insights into the operation of Agri-PV systems. He had the opportunity to explore Agri-PV related equipment to maximize solar output while implementing canopy and water conservation methods. Collaborating with German partners, new ideas for the joint research in this field and a concept of the to expand the CEMEREM Agri-PV project were developed.

Dr. Maganga is specialized in Removal of Fluorides from water by absorption. With the support of a Professor of General and Inorganic Chemistry at HTWD, he conducted various laboratory analysis in his area of expertise. This experience not only expanded his

research skills but also enriched his teaching capabilities.

During his stay, Dr. Maganga visited a lysimeter site where the monitoring of pollutant movement in soil was under investigation. He was granted access to the water lab, where all necessary resources were made available. One of the highlights of his stay was the opportunity to work closely with Prof. Feller in both the Ion Chromatography (IC) and Inductively Coupled Plasma (ICP) Laboratories. This collaboration facilitated knowledge transfer and practical experience in advanced analytical techniques.



Agri-PV in Dresden Pillnitz
@HTW Dresden

Field Excursions

In 2021, the School of Mines and Engineering (SME) organized two significant field excursions aimed at providing students with hands-on experience in their chosen fields of study.

The 1st SME Field Excursion (**29 November – 02 December 2021**) focused on major gemstone mines in Taita Taveta County - Chawia CBO and Rockland/Classic mines and Kishushe Iron Mines. All SME students, a total of 213 participants from diverse programs participated. They gained profound insights into the challenges encountered by both small-scale miners and established mining companies.

The 2nd SME Field Excursion (**06 – 09 December 2021**) focused on gold

mining. Seven postgraduate students were selected to participate in this enriching experience, visiting Kilimapesa Gold Mines and Ikolomani Gold Mines. These mines are located within the underexplored greenstone Archean Busia-Kakamega Gold Belt in Western Kenya.

Beyond geological knowledge of the area, participants were sensitized to the negative environmental impacts of gold mining, including the effects of heavy metals used in the extraction process. This excursion underscored the need for further biological and environmental research in these mining sites.



Visit to the artisanal mining in Chawia and Kilimapesa Gold Mines

In 2022, SME organized educational visits to Aristocrat Concrete Limited and Tata Chemicals Magadi. Aristocrat Concrete Limited, located in Syokimau, Machakos County, is a leading manufacturer of construction materials. Tata Chemicals Magadi, in Magadi, Kajiado County, is Africa's largest soda ash manufacturer.

3 October – 08 October 2022 twelve postgraduate students from MSc Environmental Engineering and Mining Engineering programs, along with two staff members, visited these companies. The visit provided invaluable insights into the operation of large-scale open-pit mines and their environmental impacts.

All excursions not only enriched students' academic knowledge but also broadened their perspectives. Exposure to the challenges faced by small-scale mining and large scale mining encouraged critical thinking and problem-solving skills among the students. Importantly, these experiences provided a platform for students to identify potential solutions and project ideas that could contribute to mitigating these challenges in their final year projects.



Visit to Aristocrat Concrete Limited and Tata Chemicals Magadi

CEMEREM Pilot Projects

Smart Biogas project

The biogas project's aim is to foster scientific exchange between the project partners and transfer technology to the local communities. Kenyans must be enabled to reduce the impact of energy costs by using renewable energy technologies with own resources for a sustainable energy supply with protection of the environment as required under the laws of local and federal government. In 2018, four plants were installed at the TTU main campus and at the campus of the School of Agricultural, Earth and Environmental Science (SAEES) in



nearby Ngerenyi. One of them is used in the chemistry laboratory for training students and research. Another one is used in the kitchen for the processing of kitchen waste and other biomass.

Macadamia Nut Cracker Project

As a result of initial request from SAEES, a project was started up at TU Bergakademie Freiberg with the intention to develop a nut cracking machine, especially for macadamia nuts which are characterized by a very hard shell which cannot be opened with existing devices. In Freiberg several tests with different principles were made before one promising principle was selected. This was again tested in a pilot scheme and, finally, a pilot machine has been built which meets all requirements: high availability, little damages to the nuts, easy



operation and robust engineering. Professor Kröger, who developed the machine, visited TTU and a Nut treatment factory in Kenya to identify potentials for manufacturing the machine on a commercial basis.

Agri-Photovoltaics (PV)

The Agri-PV project was started up at SAEES (School of Agriculture, Earth and Environmental Sciences) for investigation of different climatic and soil conditions for plant cultivation under solar panels. Since February 2019, twelve solar panels have been installed above arable land to generate electricity and to modify cultivation conditions for crops through soil improvements, better water management and less evaporation. In addition, a weather station has been built for the measurement of the air temperature and humidity,



the radiation intensity and the precipitation. Three undergraduate students and a research fellow of the SAEES were trained to maintain the measurement system and set up a database.

Gemstone project

This new project aims at the design and implementation of a web-based platform for the trading of locally mined gemstones which enables artisanal miners to enter in direct contact with their ultimate clients, i.e., cutters and polishers anywhere in the world. The platform is embedded in a virtual sales platform. It operates with a cloud and a blockchain technology, as follows:

1. Every individual mined raw gemstone is documented in the cloud.
2. Interested buyers can place bids



3. Agreements on sales are equally individualized and uniquely documented and traceable with the blockchain technology.

First analytical steps were taken to design the internet platform and select appropriate software.

Water Supply and Wastewater Treatment

TTU's campus currently lacks a connection to a centralized drinking water supply system and wastewater collection system. To address this, CEMEREM has implemented a specialized technology within the campus to purify locally sourced rainwater using solar energy. This innovative system utilizes electricity to extract chlorine from the naturally occurring salts in raw water, serving as a chemical for sterilization.

In terms of waste water treatment, a dedicated research project has been



initiated. It focuses on utilizing common plants native to the region for absorbing nutrients present in TTU's wastewater. This sustainable approach aligns with our commitment to environmentally friendly practices.

Other Research Projects

There are several research projects undertaken in the frame of students' master thesis:

- Optimisation of Ore Dressing Plant Using Response Surface Methodology
- Mineralogical characterization and design of beneficiation process of low grade manganese ore
- A 3-D simulation of underground mine ventilation using computational fluid dynamics (CFD)
- Underground mine ventilation de-

sign modelling and optimization

- Developing a Monitoring and Control System for Chemical Reactions in Environmental Remediation Processes
- Influence of eco design practices on the performance of manufacturing firms in Nairobi
- Estimation of run-off for river Namw rhodo using ArchGIS and Hechms
- Modelling of open-pit lakes environmental changes

Publications (selected)

Khadija, O. 2021 *Prediction of Spontaneous Combustion Liability of Coal Using Soft Computing Techniques and Regression Analysis*

Mutinda, E.K. 2021 *A Comparative Study of Rock Fragmentation Models: Case Study of Kajiado County Quarries, Kenya.*

Wachira, D. 2021 *Evaluation of In-Pit Crushing and Conveying (IPCC) Systems Productivity in Open Pit Mines*

Gitau, F. 2021 *Environmental impact of iron ore mining and processing on soil in Kishushe, Taita Taveta University*

Ogada, M.J., Ochieng, J., Guthiga, P.M., Sikei, G.O., Adero, N.J., Taracha, E., Hassan, A. 2022 *Impact of COVID-19 pandemic on African indigenous vegetables value chain in Kenya*

Omar, K. 2022 *Prediction of Spontaneous Combustion Liability of Coal Using Soft Computing Techniques and Regression Analysis*

Ndung'u, C., Ogada, M. J., & Mwakio, S. 2022 *Carbon Credit Trade Management and Community Livelihood Improvement in Taita Taveta County*

Okwaro, J., Adero, N., & Feistel, U. 2022 *Modelling Changes in Carbon (IV) Oxide Concentrations Due to COVID-19: A Case Study of the Nairobi Metropolitan Region*

Tesfaye, A., Radeny, M., Ogada, M.J., Recha, J.W., Ambaw, G., Chanana, N., Huyer, S., Demeke, G., and Dawit, S. 2022 *Gender empowerment and parity in East Africa: evidence from climate-smart agriculture in Ethiopia and Kenya*

Radeny, M., Rao, E.O., Ogada, M.J., Recha, J.W., and Dawit, S. 2022 *Impacts of climate smart crop varieties and livestock breeds on the food security of smallholder farmers in Kenya*

3rd Biennial CEMEREM Conference

16 – 17 September 2021 The 3rd Biennial International CEMEREM Conference on “Sustainable Mining and Natural Resource Management in Africa” took place at the Taita Hills Safari Resort in Taita Taveta, Kenya. Due to travel constraints caused by the COVID-19 pandemic, the conference was held in a hybrid mode with both physical and virtual participation. In total, more than 120 participants attended the conference. While some speakers from outside Kenya including from Ghana, Namibia, Zambia, and Finland attended physically, German partners and speakers from the UK joined virtually. The Vice-Chancellor of the University of Mines

and Technology (UMaT) in Ghana accepted the invitation to appear as a guest speaker in Kenya.

The conference was structured into the following six thematic sessions in which speakers provided profound insights into mining and natural resource management:

1. State of mining and natural resource management in Africa: past, present and future
2. Perspectives on natural capital and resource economics for sustainable development in Africa
3. Policy and technology implications for mining and natural resource management in the post-COVID-19 Africa

4. Revitalising agriculture for enhanced urban and rural livelihoods in the post-COVID-19 Africa
5. Decision support systems for sustainable mining and agricultural communities in the post-COVID-19 Africa
6. Education 4.0 and Mining 4.0: Post-pandemic frontiers for sustainable

mining and natural resource management

The presentations generated active discussions and engagement from the audience on both days, attesting to the high interest in the sub-themes.

DAAD Centres of African Excellence - Research Fair

28 – 30 September 2021 Members of the 12 DAAD Centres of African Excellence, experts from related institutions as well as colleagues from the DAAD joined an Online Research Fair called ‘Past and Future Research for Inclusive and Sustainable Development’, organized by the Centre for Development Research ZEF, Bonn University, and the DAAD West African Centre for Sustainable Rural Transformation.

Overall, about 80 participants joined for the exchange and discussions of research and scientific projects taking place at the different Centres in order to explore potential synergies, particularly with a focus on opportunities

within the new „Round Table Africa“ initiative of the German Government. Participants enjoyed a rich and inspiring programme with lots of opportunities to get into discussion with colleagues about cross-cutting themes and developed bases for further joint projects.

CEMEREM participated with contributions about Life Cycle Analysis in mining, research on Agro-Photovoltaics, Carbon Credit Trade Management and community livelihood improvement in Taita Taveta County and Prediction and measurement of blast induced rock fragmentation in Kajiado County Quarries.



Group photo of participants of the CEMEREM Conference

Visit of TTU Delegation to Germany

13 – 17 October 2022 A delegation consisting of Prof. Fred Barasa, Prof. Christine Onyango, and Prof. Maurice Ogada, visited the two German Partner Universities: Hochschule für Technik und Wirtschaft Dresden (HTWD) and TU Bergakademie Freiberg. The visit focused on the following key objectives:

1. Discussion and Agreement on CEMEREM Project: The foremost purpose of this visit was to discuss and agree on further steps to be taken within the last stage of the CEMEREM project.

2. Insights into Research Activities: During the visit, the delegation had the opportunity to gain valuable insights into the ongoing research activities of the two partner universities. HTWD Dresden presented a noteworthy demonstration project related to Agri-PV plants on its agricultural campus located at Dresden Pillnitz. Prof. Christine Onyango, representing the delegation, conveyed a warm greeting from TTU, further strengthening the ties between the institutions. TU Bergakademie Freiberg also presented its virtual mining lab, providing a

glimpse into its cutting-edge research endeavors.

3. Signing of the Triple Degree Agreement: One of the most significant achievements during this visit was the official signing of the Triple Degree Agreement. This milestone agreement solidifies the academic collaboration between TTU, TU Bergakademie Freiberg, and Montanuniversität Leoben. The signing ceremony took place in the presence of Rektor Prof. Klaus-Dieter Barbknecht and Vice Chancellor Prof. Fred Barasa. Notably, Prof. Peter Moser, Vize-Rektor of Montanuniversität Leoben, participated remotely.



Signing Ceremony of the Triple Degree Agreement. Prof. Babknecht, Rector of TU Bergakademie Freiberg (left), Prof. Fred Barasa, Vice Chancellor of TTU (right)

Visit of German Delegation to TTU

13 – 18 November 2022 CEMEREM German Coordinators Susanna Kettner of HTWD and Dr. Jiangxue Liu of TU BAF, along with Geologist Martina Schöpe, an expert of gemstone, visited TTU.

During their visit to TTU, several meetings took place with the CEMEREM TTU team. The focus of the meeting was the project management of CEMEREM, the status of CEMEREM pilot projects, the new procedures for exchanges of students and staff, and the development of new pilot projects, including the rainwater harvesting system on the TTU campus. Given TTU's water shortages, this project can significantly improve the capture, storage and usage of rainwater.

The delegation also travelled to the School of Agriculture, Earth and Environmental Sciences (SAEES) in the Taita Hills to assess the operational status of one of the Biogas Plants and the Agri-PV plant.

Together with Martina Schöpe, several visits to artisanal gemstone mines were conducted. Additionally, the delegation held a meeting with the staff of Kenya Gemstone Centre. As one of the pilot projects of CEMEREM, TTU is closely collaborating with the Centre as a part of a pilot project within CEMEREM. The goal is to establish a local association of artisanal gemstone miners and establish a virtual sales platform.



*Assess the Biogas Plants on the TTU Campus (left)
Visit to Gemstone mines in the Taita Taveta Region (middle and right)*

International DAAD Alumni Seminar 2021



29 September – 8 October 2021 Several CEMEREM students and staff attended the International DAAD Alumni Seminar in conjunction with an online conference and trade fair entitled West African Clean Energy & Environment ([WACEE](#)) on September 29 to 30 organized by the Delegation of German Industry in Ghana with various partners.

The five-day seminar from 5 to 8 October was organised by TU Bergakademie Freiberg. Participants coming from Germany, Ghana, Kenya, Pakistan and Tanzania. Topics discussed centred on clean water and clean energy, with a training workshop on business models and new digital business strategies. Life Cycle Assessment of renewable energy technologies was also widely discussed.

A focus-group discussion on energy in Africa was one of the highlights of the seminar, with participants examining how the myriad challenges of access, infrastructure, connectivity and investments in renewable energy could be tackled through scenario planning of the determined drivers. Other discussion points were on affordability and inclusion, reliability, business

plan, poverty alleviation and economic development.

A panel discussion on “Water in Africa: Status-quo, challenges and future” was led by Jonathan Gador, (Managing Director of TBL Resources Limited, Ghana) Dr. Asare Asante-Anor (University of Mines and Technology, UMaT, Ghana), and Dr. Justin Maghanga (Taita Taveta University, Kenya). The panelists talked about water pollution in Africa from mineral exploitation, industry and agriculture. Other themes included increasing population pressure on water resources, paucity of water resource information, and conflicts and disputes emanating from cross-boundary water resources.



Group Photos of Participants of International DAAD Alumni Seminar 2021

1st CEMEREM Alumni Seminar 2021

13 – 18 December 2021 The 1st CEMEREM Alumni Seminar was held in Voi, Kenya with financial support by DAAD. The event was attended by CEMEREM Alumni and other African Alumni from various countries. Because of the COVID 19 pandemic, the seminar took place in hybrid form. It was dedicated to the theme of An environmental management system for Taita Taveta County as a pilot project for East Africa.

The participants were welcomed by Prof. Fred Barasa, VC of Taita Taveta University, Prof. Dr. Jan C. Bongaerts and Prof. Dr. Ulrike Feistel as convenors. Participants attended introductory lectures about integrated regional planning in Germany, the state of the

Environment in Taita Taveta County, Life cycle analysis of Agri-PV, use of GIS for regional environmental management systems, water resources, soil and forest management in Taita Taveta County and more related subjects. Prof. Henning Zeidler of TU Bergakademie Freiberg introduced the use of renewable raw materials for 3D printing and surface smoothing of complex metallic components. Alumni presented their research work in several sessions. Participants also visited the laboratories which were installed within the CEMEREM project with support by DAAD. A large part of the seminar was dedicated to several excursions to mines and other natural resources projects.



*Group Photo of Participants of CEMEREM Alumni Seminar (left)
Visit to CEMEREM laboratories (right)*

Alumni Seminar Ghana 2022

12 – 17 November 2022 Several CEMEREM Alumni attended the Alumni Seminar in Ghana. Recognising that attaining sustainable growth requires careful raw material extraction, stakeholders' involvement, and utilisation. TU Bergakademie Freiberg with support from the DAAD organised an Alumni conference in Tarkwa, Ghana on "sustainable mining, natural resources awareness, and social acceptance of mining". The seminar brought together global professionals in mining engineering, environmental management, research, resource governance, industry players and policymakers at the premises of the University of Mines and Technology (UMaT) in Ghana. Participants came from different institutions in Germany, Kenya, Columbia, Spain, South Africa and largely Ghana. The con-

ference aimed at increasing awareness, knowledge sharing and understanding of sustainable resource extraction.

The seminar composed of several expert presentations on topics such as the role of UMaT in ensuring education, research and industrial practice for sustainable mining, corporate social responsibility, and environment social governance (ESG) in mining in Africa, and minerals policies in Africa. Areas of discussion focused on the environmental and health impacts associated with mercury use in artisanal gold extraction. and small-scale gold mining sites. Participants visited of different artisanal gold mining sites and two large-scale mining sites: Goldfields Ghana Limited and AngloGold Ashanti Iduapriem Mine.



Group Photo of participants of Alumni Seminar Ghana

TTU Alumni Annual Meeting

10 – 11 December 2022 The TTU Alumni Annual Meeting held in Voi, Six of the 8 CEMEREM graduates of 2022 attended the meeting and shared their experiences with the other alumni.

The aim of the meeting was to welcome new members into the Alumni

Association and plan the alumni activities and engagement in the coming year. CEMEREM took advantage of the occasion to inform the participants of the opportunities available through CEMEREM and DAAD, and how the Alumni could give back to CEMEREM and TTU for sustainability.

Visit of the DAAD regional director to TTU

9 March 2022 Beate Schindler-Kovats, the Director DAAD Regional Office for Africa, Nairobi, visited TTU on March 7, 2022. The much-awaited visit was a key moment after the planned visit had been put off several times due to the ravaging COVID-19 pandemic. At 10 am, she was received by her host, Prof. Fred Simiyu Barasa, the Vice-Chancellor of Taita Taveta University. The DAAD Director proceeded to meet the University Management and lecturers. Among the core activities of the day was a visit to the CEMEREM facilities, which are laboratories and equipment acquired and established at TTU through the DAAD support. In the afternoon, she



*Beate Schindler-Kovats (left)
Prof. Fred Barasa (middle)*

met university staff and students in the TTU Auditorium for a highly informative session on how DAAD supports studies and research in German universities and research institutes as well as across African universities.

Training for the Mine Site Supervisors

6 October 2021 In collaboration with the School of Mines and Engineering (SME), the School of Business, Economics, and Social Sciences (SBESS) organized a comprehensive training program for mine site managers in Taita Taveta County.

The training aimed to enhance the managerial and supervisory skills of individuals responsible for overseeing mining operations within the region. Participants included site supervisors, mine owners, and members of Community-Based Organizations' (CBO) management committees. A total of twenty-two (22) participants attended the training, among them, 32% were female.

The overarching objective of the training program was to empower mine site supervisors in Taita Taveta County with the necessary knowledge and skills to excel in their roles. Specific focus areas included:

- Production and Optimization of Mining Operations
- Supervisory Skills Enhancement
- Labour Relations Management

- The Interplay Between Mining and the Local Community

At the end of the training, the participants gave very positive feedback. The newly acquired skills are expected to contribute to improved mining practices, stronger community relations, and enhanced productivity within the region's mining industry.

This training program exemplifies the university's commitment to fostering local capacity building and supporting sustainable development in the mining sector.



Mr. Mwakio Mwangandi presenting on Supervisory skills

Blasting Sensitization Workshop for Artisanal Mining

11 May 2022 The workshop on the "Blasting of Rocks and Gemstones" for the artisanal miners. It brought together government representatives, mining experts, and academia to address the crucial issue of explosives handling in the extractive industry.

Blasting plays a pivotal role in size reduction and the liberation of valuable minerals from their gangue mineral matrix, making it a cornerstone of mining operations. Despite its significance, challenges in handling explosives, especially among small-scale miners, have persisted, leading to fatal injuries, equipment damage, and conflicts with neighbouring communities.

The sensitization workshop aimed to find sustainable solutions to these challenges, with a focus on artisanal miners in Taita Taveta County and beyond. It featured various discussions and presentations, each shedding light on different aspects of the blasting and explosives handling issue:

- Blasting from Government Per-

spective

- The Legal Framework Governing the Use of Explosives and Challenges Encountered in Implementing the Laws
- Blasting Challenges Facing Miners in Taita Taveta County
- Blasting and Use of Explosives, County Government Perspective
- The Security Aspect on the use of Blasting Explosives
- Role of Academia in Bridging Training and Certification Gaps in the Extractive Industry

The sensitization workshop provided a platform for stakeholders to collectively address the challenges faced by miners, particularly in the context of artisanal and small-scale mining.

Outlook into the Future

- **Establishment of PhD programmes**
 - PhD Mining Engineering
 - PhD Process Engineering
 - PhD Natural Resource Management
- **Further development of research projects**
- **Promotion of scientific publications**
- **Summer school for TTU students and staff at HTWD and TU BAF**
- **Trilateral student exchanges**
- **Further development of Alumni Network**
- **Development of digitalisation at CEMEREM**
- **Networking and capacity building with government and industry, including:**
 - 4th CEMEREM Biannual Conference
 - Training for artisanal miners
 - Networking with industry in research and training
 - Supporting the young entrepreneurs through business incubation

CEMEREM TEAM

Project Partners

University of Applied Sciences Dresden, Germany

Project Leader: Prof. Dr. Ulrike Feistel

Email: feistel@htw-dresden.de

Co-ordinator: Dipl.-Hydrol. Susanna Kettner

Email: susanna.kettner@htw-dresden.de

TU Bergakademie Freiberg, Germany

Prof. Dr. Jan C. Bongaerts

Email: J-C.Bongaerts@ioez.tu-freiberg.de

Prof. Prof. e.h. Dr. Dr. h.c. mult. Carsten Drebenstedt

Email: Carsten.Drebenstedt@mabb.tu-freiberg.de

Co-ordinator: Dr. Jiangxue Liu

Email: jiangxue.liu@mabb.tu-freiberg.de

The Hosting African Institution

Taita Taveta University, Voi, Kenya

Prof. Dr. Fred Simiyu Barasa

Vice-Chancellor

Email: vc@ttu.ac.ke

Co-ordinator: Prof. Ogada Maurice Juma

nicholasmuthama@ttu.ac.ke

Funded by

The Federal Ministry of Foreign Affairs through DAAD –

German Academic Exchange Service

Centres of African Excellence

Kennedyallee 50, 53175 Bonn, Germany

www.african-excellence.de