



TAITA TAVETA UNIVERSITY

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

Centre of Excellence for Mining, Environmental Engineering and Resource Management (CEMEREM)



www.african-excellence.de

CEMEREM Project



In April 2016 a new project entitled "Development of a Centre of Excellence for Mining, Environmental Engineering and Resource Management (CEMEREM) started up. It is a joint project of Taita Taveta University (TTU), Voi, Kenya, the University of Applied Sciences Dresden (HTWD) and TU Bergakademie Freiberg. The purpose is to develop CEMEREM at TTU in the next five years. CEMEREM has four main objectives:

- Education and training of students and staff of TTU and of members of stakeholder organi-

sations of CEMEREM

- Promotion of research
- Development and operation of specific laboratories for issues of the natural resources sector
- Community outreach

The project also aims to foster scientific and cultural exchange between the project partners, industrial and governmental institutions in Kenya and Germany. Until the end of 2020, the financing of the project is secured by the Ministry of foreign affairs of the Federal Republic of Germany through DAAD.



TTU Campus

CEMEREM Building

The government of Kenya spends a considerable sum of money on the construction of a new CEMEREM building on TTU's campus.

The construction of Phase 1 (first floor) has been completed, Phase 2 (2nd and 3rd floor) have been started. The building will be fully functional by 2018.



CEMEREM Building

CEMEREM Laboratories

In CEMEREM phase I, the geotechnical and water analysis laboratories are equipped for teaching and research.

In phase II, the focus will be on the establishment of the following laboratories:

- Mining Engineering Laboratory,
- Processing Engineering Laboratory,
- Physics Laboratory,
- Geology Laboratory.

Geotechnical and water laboratories



Water disinfection system—Sun Meets Water (SuMeWa)



CEMEREM Activities

1 – 7 March 2016: Meeting of the DAAD Africa Centers of Excellence in Accra, Ghana



16 – 19 May 2016: kick-off meeting at TTU: setting the pace, designing the matrix of responsibilities, financial arrangements, visit of the CEMEREM building under construction



16 June 2016: participation in “Business meets Africa” at Industrie- und Handelskammer in Chemnitz

1 – 10 July 2016: Visit of a delegation from TTU to participate in the IMWA (international Mine Water Association) conference in Leipzig and meetings with HTW Dresden and TU Bergakademie Freiberg project teams



2 – 17 September 2016: Visit of two laboratory heads of TTU to HTW Dresden and TU Bergakademie Freiberg for training in various laboratories and for excursions to Solarworld and a biogas factory at Agrargenossenschaft Clausnitz



September – November 2016: Exchange students from HTWD to TTU for a project on the improvement of water quality and water management at TTU and one TU Bergakademie Freiberg student for conducting a study on “Artisanal and small scale mining organisation and gemstone market in Taita Taveta county”



December 2016: Two PhD Students of TTU, Nashon Adero and William Baya registered at TU Bergakademie Freiberg for their doctoral research on mining engineering and materials science respectively.



2 – 17 February 2017: Visit of two laboratory heads of HTW, Carsten Lauer and Jakob Ebermann, to TTU for installation of the water and geotechnical laboratories and for teaching at TTU



27 March 2017: Meeting in Berlin – A delegation of HTWD and TU Bergakademie Freiberg was received by Hon. Joseph Magutt, Ambassador of the Republic of Kenya to the Federal Republic of Germany for an informal meeting during which the CEMEREM project was presented to him. The delegation also took part in “Business meets Africa” at German Bundestag. The event was dedicated to “Water supply in Sub-Sahara Africa”. The event provided an excellent opportunity for networking.



2 June 2017: Ana Munguia Castrillo presented her Master's Thesis dealing with "An evaluation of local opportunities for CEMEREM – Case of study on the application of the Analytical Hierarchy Process". The purpose of the work consisted in the establishment of a priority list of services of CEMEREM to be marketed to local communities.



13 June 2017: participation at "Business meet Africa" in Chemnitz, Germany - This annual event, convened by Frank Heinrich, Member of Bundestag for Chemnitz and the Chamber of Industry and Commerce, is a must for all Africa interested business people from the region, as it is visited by delegations of many embassies of African Nations in Berlin. HTWD and TU Bergakademie Freiberg were present with a delegation in cooperation with NAF, the newly founded network of Africans in Freiberg. A keynote speech was given by Gerd Müller, Federal Minister for Economic Co-operation. As usual, this event provided a good opportunity for networking and handing out leaflets on the CEMEREM project to interested attendants.



16 June 2017: a survey was conducted on the occasion of the Night of Sciences with the help of the Network of Africans in Freiberg to query the opinions of Freiberg community on the current and future partnerships with Africa.



6 - 7 July 2017: Prof. Bongaerts participated in the Fourth MOTA Conference (Mining On Top in Africa) as an invited speaker. The conference was attended by leaders and government officials of several African Mining countries and by members of mining associations, mining companies, mining equipment suppliers and geology and mining technology consultants. His presentation was on education for mining in Africa with CEMEREM as an innovative example.



2 - 3 October 2017: Participation at "the 2nd International Conferences on GIS and Remote Sensing" in Vienna, Austria – Nashon Adero, the exchange Phd candidate of TTU, presented his paper entitled "Enhancing mine planning in Kenya – Developing a spatial decision support system using a systems approach".



September - November 2017: Exchange student from TU Bergakademie Freiberg for the project on establishing Smart Biogas plant in the Taita Hills region. Joshua Holland, an IMRE student of TU Bergakademie Freiberg, conducts a survey about potentials for introducing a smart biogas plant in the Taita Hills surroundings of the region of TTU's SAEES Campus and in the Taita region. The biogas plant was developed and designed by Niazi Azim Khan, an IMRE Alumnus from Pakistan in co-operation with the Institute of Heat Technology and Thermodynamics of TU Bergakademie Freiberg.



Visit to Taita Taveta University (TTU), Voi, Kenya

17 September – 2 October 2016: A delegation of three (CEMEREM Project Director Prof. Ulrike Feistel and Prorektor Prof. Schmidtke from HTWD, Prof. Jan Bongaerts and Dr. Jiangxue Liu from TU Bergakademie Freiberg) travelled from Dresden to TTU in Voi, Kenya. Several meetings took place with the CEMEREM team of TTU, the new water analysis laboratory was installed, all equipment for the soil mechanics laboratory arrived from Germany and was inspected and inventorised. Prof. Feistel, with the assistance of her student on his internship at TTU, gave a public lecture on safe drinking water on

TTU's campus attended by hundreds of TTU students. With Prof Schmidtke, an expert on organic farming, a visit was made to the School of Agricultural, Earth and Environmental Sciences (SAEES) up in the Taita Hills for a tour of the farm grounds guided by SAEES Dean Marianne Maghenda. After the return of the HTWD members, Prof. Bongaerts and Dr. Jiangxue Liu stayed on for another week and made a second visit to SAEES. They gave a public lecture on "Forests: a walk through landscape painting and forest economics" to staff and students.



Meeting on 19th September, Exchange Students from HTWD and TU Bergakademie Freiberg, Prof. Feistel in Teaching

Visit of an official Government Delegation to Berlin, Dresden and Freiberg

17 – 22 October 2016: The Cabinet Secretary for Mining, Hon Dan Kazungu, led the delegation. Visits were made in Berlin to BMZ (Ministry of Economic Cooperation), BDI (Confederation of German Industry), DAAD Berlin Office, FAB (German Federation of International Mining and Mineral Resources) and members of Bundestag Frank Heinrich MdB and Veronika Bellmann MdB. On their way to Dresden, they were taken on guided tours to an opencast lignite

mine and a mining rehabilitation site in Welzow-Süd. They visited SMWK (Free State Ministry of Higher Education and Arts) and HTW in Dresden. In Freiberg, they visited an industrial laboratory for minerals processing and TU Bergakademie Freiberg's underground research mine. A complimentary meeting took place with Prorektor Prof. Merkel. The tour has been generally regarded as very successful.



Visits to BMZ, Members of Bundestag Frank Heinrich MdB and Veronika Bellmann MdB, BDI



Visits to DAAD Office Berlin, SMWK in Dresden, TU Bergakademie Freiberg

Visit to Nairobi and Taita Taveta University (TTU), Voi, Kenya

14 – 20 December 2016: A delegation of five (Erik Ferchau, biogas researcher of TU Bergakademie Freiberg, Niazi Khan, IMRE 2012, Prof. Bongaerts, Dr. Jiangxue Liu and Gloria Njagah, IMRE 2013) travelled to Nairobi and TTU in Voi.

During the first part of the travel, on 14 December, a meeting took place with Helmut Blumbach, Head of the DAAD East Africa Regional Office in Nairobi. The next day, Prof. Bongaerts and Dr. Jiangxue Liu were received by Hon Dan Kazungu, Cabinet Secretary for Mining in his personal office. On 16

December, all five members participated in a workshop entitled: "Mining Education and Rare Earth Minerals in Kenya" with representatives from TTU, government offices, industry associations and Base Titanium Mining attending. Dr. Jiangxue Liu gave a presentation on her PhD work entitled: „The Economics of Rare Earths Minerals". Kenya has an untapped deposit of these strategic minerals even larger than in China. Prof. Bongaerts gave an overview of financing instruments especially for mining projects.



Visit to the DAAD office Nairobi, Participation of the Workshop „Mining Education on the Rare Earth Minerals in Kenya“

During the second part of the travel, a visit was made to SAEES in the Taita Hills for the purpose of inspecting two biogas plants. One of them is installed at the dairy unit of SAEES and another plant is operated by a High School in close vicinity. Both plants have a traditional design which allows for a reliable yield of biogas but with a low level of effectivity. Whilst some improvements can be achieved with operational measures, the so called smart biogas plant proposed by the Freiberg experts, Niazi Khan and Erik Ferchau, has a much higher effectivity with a much lower input. Above all, the smart biogas plant has a high variety of organic input matter. This was explained in a presentation by Niazi Khan to members of the local community at SAEES, who showed a great interest in the smart biogas plant and in business models for practical implementation and use.



Visit to the Biogas Plant in the SAEES

Another issue of importance relates to macadamia nuts which grow at the SAEES farm. The difficulty consists in cracking the very hard shells without damaging the nuts inside. Current practices in use in Kenya factories generate a substantial share of broken nuts which capture low prices in the market. Since TU Bergakademie Freiberg has Prof. Mathias Kröger of the Institute of mechanical engineering, who calls himself a nut cracker expert, attempts will be made in the future to develop a better technological solution.

President Kenyatta Inaugurates the National Mining Institute

11 March 2017: the official inauguration of the NATIONAL MINING INSTITUTE by the President of the Republic of Kenya, His Excellency Hon. Uhuru Kenyatta, at Taita Taveta University took place.

The Head of State was accompanied by Deputy President Hon. William Ruto, Cabinet Secretary, Ministry of Mining Hon. Dan Kazungu, Principal Secretary, State Department of University Education Prof. Collette Suda, Principal Secretary, Ministry of Public Service, Youth and Gender Affairs Mrs. Lillian Mbogo and other leaders.

The National Mining Institute was founded by the Government as a training institution for the extractive sector with the aim of increasing the number of Mining Engineers not only in the Country but in the Eastern Africa region. Subjects include Process Engineering, Metallurgy, Material Science, Mineral Economics and Geotechnical Engineering.



His Excellency Hon. Uhuru Kenyatta officially inaugurating the National Mining Institute

“The University sits in a region that is endowed with deposits, Gemstones, rare earth minerals and other natural resources. Some of which have been discovered but whose exploitation has the potential to significantly contribute to GDP of this country. We as leaders in Government in recognizing this, not only created an independent Ministry of Mining and has designated Taita Taveta University as the seat of the National Mining Institute” said President Kenyatta.

The president called on the University to develop research and engage in training that will enable sustainable exploitation while ensuring environmental protection and sustainable livelihood for the benefit of the country. He assured the University Management of government support as they work to help the Country in the extractive sector, especially for equipment and staff training. He expects TTU to become a centre of excellence for Kenya and the East and Central region attracting students worldwide.

The president welcomed the start-up of a Mentorship and Internship programme for students on Management in Government which he promised soon to roll out beginning with TTU students.



The president being taken through the Mining stand by the Cabinet Secretary Ministry of Mining Hon. Dan Kazungu



Dean of the School of Mines Arthur Ndegwa explaining to the president the soil testing process

CEMEREM Opening Ceremony

6 April 2017: The official opening ceremony of the new CEMEREM Centre took place at the main campus of Taita Taveta University in Voi. The new DAAD Centre of African Excellence will be hosted in the CEMEREM building with lecture and seminar rooms and laboratories for academic education, professional training and continuous education, research and services to stakeholders and communities.

The ceremony was honored by the presence of John Mruttu, Taita Taveta County Governor, John Mruttu and Jutta Frascher, Ambassador of the Federal Republic of Germany.

TU Bergakademie Freiberg representatives were Prof. Dr. Jan C. Bongaerts, Prof. Dr. Carsten Drebenstedt and Dr. Jiangxue Liu. HTW Dresden was represented by Prof. Dr. Knut Schmidtke, Vice Rector and Prof. Dr. Ulrike Feistel. The German Industry and Commerce Delegation in Kenya was headed by Country Director Maren Diale-Schellschmidt. Representatives of all other DAAD Centers of African Excellence were also present to take part in the annual meeting of the Centres which coincided with the CEMEREM opening ceremony.



CEMEREM Opening Ceremony at TTU

Prof. Dr. Hamadi Boga, the vice chancellor of TTU, placed emphasis on the new Centre as “a dream come true” for TTU. He praised the strong, determined partnership of the three participating universities which were able to demonstrate remarkable successes in the first year of the center’s operation. Ambassador Frascher shared an overview of the activities of the Federal Republic of Germany in Kenya in the field of education. Governor Mruttu explained that the Taita Taveta county and region would give rise to special development opportunities with the presence of the TTU, the potential of which is strengthened by CEMEREM.

A panel discussion was then conducted with representatives from



Prof. Dr. Hamadi Boga

the universities as well as the business community. All participants unanimously concluded that CEMEREM is a fundamental step in the right direction for its novel opportunities in students’ education and training for the various roles needed in Kenya’s growing raw material sector.



CEMEREM Opening Ceremony at TTU

Brainstorming at TU Bergakademie Freiberg

15th May 2017: a brainstorming workshop took place at TU Bergakademie Freiberg. 27 participants comprising researchers, industry experts and students were in attendance. Prof. Hamadi Boga of TTU explicitly travelled from Kenya for the strategic session. The purpose of the brainstorming workshop was to raise and collect innovative ideas for continuation of the CEMEREM project for the years 2018 – 2020. A so called “Metaplan” - a well-known procedure for collecting and processing ideas as well as a decision-making method, was used to generate topics. All participants were sub-

divided into working groups consisting of 3 to 4 members. Each group was required to contribute topics and associated measures they thought were important for the development of the Centre. In total, 78 topics were generated. Next, the participants identified their preferred topics and assigned different levels of priority to each topic. The 78 topics were sorted into nine categories. The most preferred category was ‘Teaching and professional training’. Many topics generated from the workshop have been used as input in the CEMEREM II proposal.



Brain Storming Workshop at TU Bergakademie Freiberg

The first CEMEREM Summer School in Germany

9th - 16th July 2017 The first CEMEREM summer school took place at HTW Dresden and TU Bergakademie Freiberg. The participants comprised 18 students and staff selected by TTU. They were conducted through a dense program comprised of various lectures and visits to Dresden, Welzow and Freiberg.

The program started with a lecture session given by Prof. Grischek, Prof. Bongaerts, Prof. Feistel, Dr. Jiangxue Liu and Nashon Adero. Topics covered included Post-mining water issues, Financing related to Mining Projects, Climate Change and Renewable energy po-

tential in Kenya. Participants then presented their research work and results in the poster session.

In Dresden, visits were made to DREWAG power (Combined Heat and Power) station at Nossener Brücke. The group were given an insight into electricity generation and heat recovery technologies with an overall efficiency of close to 90%. The power generator’s business model was also explained to showcase the optimal cash flow generation. A visit to the Hosterwitz Waterworks revealed the general concept of treating bank filtrate to provide drinking water.



CEMEREM Summer School at HTWD

A visit to Welzow-Süd opencast lignite mine and its post-mining rehabilitation site gave participants an overview of the technical, economic and ecological aspects of current lignite mining in Germany, including the legal framework for mine closure, land reclamation and re-cultivation.

In Freiberg, beside visits to the laboratory in the Institute of Thermal Engineering and Thermodynamics and the laboratory in the mining institute at TU Bergakademie, participants toured the underground mine at "Reiche Zeche". They descended 145 meters underground following the traces of the miners of the 16th to 19th century. The geology of the silver deposits, the mineralogy of the actual veins, as well as the development of mine

technology was covered. A visit to Agrargenossenschaft in Clausnitz provided the opportunity to practically observe energy production from biogas. The farm co-operative operates a unique natural resources cyclical management concept growing its own fuel sources for use in machinery, generating electricity with PV panels, windmills and biogas plants. Heat from the power stations is used on-site and in the village housing units while sludge output is recycled on agricultural land.

The last day of the seminar was devoted to closing remarks, handing out awards for the best posters and a discussion about the overall evaluation of the seminar in view of similar future events.



Visits to Welzow open pit mine, TU Bergakademie Freiberg, Agrargenossenschaft Clausnitz

Administrators Training

9th - 16th July 2017 The administrators training took place parallel to the Summer school. Two staff of TTU, Prof. Arap Too and Mr. Habib Mruttu travelled to Germany for a training week at HTWD Hochschule Zittau/Görlitz (HSZG) and TU Bergakademie Freiberg with a special focus on administrative frameworks, arrangements and procedures of university management at the German Partner Universities.

In Dresden, they were welcomed by Prof. Stenzel, Rector of HTWD. After the official opening of administrators training and the Summer School, the delegates had meetings with staffs of HTWD. Mr. Prautzsch, head of the Financial Department of HTWD, introduced the responsibilities and activities of his department and he explained the financial procedures of HTWD, including third party funding and its administration. Mr. Ifland and Mr. Schuster from HTWD's Procurement Department briefed the delegation on HTWD's procurement framework and procedures.

Together with Summer School participants, the delegates visited the



Administrators Training at HTWD

Welzow-Süd opencast lignite mine and its post-mining rehabilitation site.

In Zittau, the delegates had a meeting with Prof. Schoenherr, Head of iTN Research Institute and his staff. After an introduction into iTN's current research, Dr. Clemens Schneider gave an overview of the work of the Institute of Process Technology, Process Automation and Measuring Technology (IPM).



Visits to Welzow open pit mine

After the visit to the Power Plant Simulation Laboratory and the Physics and Chemistry Basics Education Laboratories, the delegates also met with Prof. Heidger, Prorektor for Academic and International Affairs and with Prof. Fuchs, Dean of the Natural and Environmental Science Faculty. As an analogy to the meetings at HTWD, they received a briefing from Dipl.-Jur. Hollstein, HSZG's Administration Head, on administrative frameworks, procedures and approaches at TTU and HSZG.

In Freiberg, the delegates were received by Ms. Ingrid Lange, Head of the International University Centre for a meeting about TU Bergakademie's international activities, both for incoming and outgoing students and staff. Dr. Wopat of GraFa, the University's PhD Administration and Counselling Centre, explained the procedures for PhD students and she highlighted the various educational offers and support activities available for PhD students in order to improve their research efforts and productivity. Ms. Cindy Wolf of the International Admission Office showed the administrative procedures for the acceptance of international applications, the re-



Administrators Training at HSZG

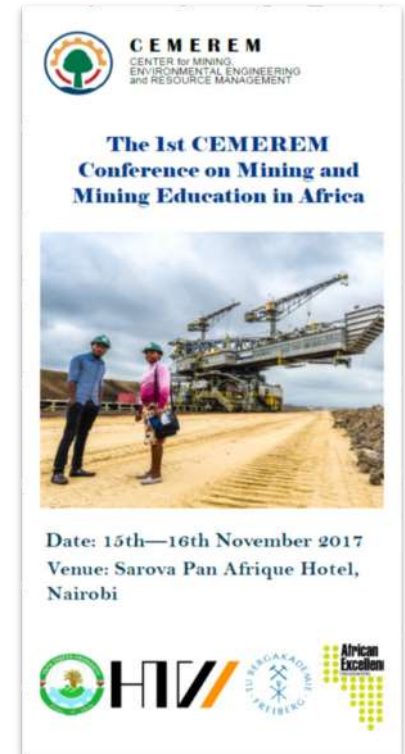
gistration of accepted international applicants, the documentation and monitoring of their academic records, the finalization of their graduate certificates and the repository of archives. Both administrators were also given an exclusive workshop by Dr. Rocco Haustein and his assistant of SAXEED, the University's Consultancy for spin-off company creation. During their workshop, they showed how they train, assist and empower students and staff to set up their own business based on study results and knowledge inputs experienced in their university careers. As a result of that workshop, SAXEED representatives plan to spend a week at TTU for similar workshops at TTU's main campus and at the campus of SAEES in late November 2017.

The first CEMEREM Conference

In order to bring together academia, government and industry to discuss education and applied research in mining the natural resource sectors, CEMEREM organized its 1st international CEMEREM conference on Mining and Mining Education in Africa. The conference was held in Nairobi on 15th and 16th November at Sarova Panafric Hotel.

Representatives from the three partner universities, Taita Taveta University (TTU), University of Applied Sciences Dresden (HTWD), TU Bergakademie Freiberg as well as experts from Kenya, Germany, Ghana, Namibia, South Africa and Zambia attended. DAAD was represented by its Regional Office Nairobi Director Dr. Blumbach.

Prof. Hamadi Boga, Vice Chancellor of TTU, expressed his delight about the establishment and the development of CEMEREM since the start-up of the project. CEMEREM Team Leader Prof. Ulrike Feistel (HTWD) gave an overview of the main objectives of the CEMEREM project, its history, its first achievements and the activities of CEMEREM II in the coming years 2018 to 2020. She



also highlighted a future perspective of CEMEREM in 2030 within the context of the Kenya Vision 2030. Dr. Helmut Blumbach took the opportunity to present the plan for a German-East Africa University of Applied Sciences. He also announced that DAAD funding of CEMEREM Phase 2 for the time period of 2018 to 2020 is now confirmed.

Participants were briefed on education for mining by representatives of the University of Zambia, Namibia University of Science and Technology, University of Mining and Technology, Ghana and Nairobi University. Speakers highlighted the importance of establishing links between universities and industry as a crucial prerequisite for education.

Prof. Jan C. Bongaerts explained the role of mineral resource education, especially within the CEMEREM project, to avoid the so-called Resource Curse and to move towards a sustainable wealth creation in resource-rich countries, in particular in Africa. Colin Forbes, (the Kwale Mineral Sands Project), gave a lively overview of approaches and instruments of his company

to ensure a sustainable community development and stakeholder management.

Other presentations highlighted current practices in education, including vocational training, for mining, minerals process engineering and resources management in various African countries. A special session was devoted to young scientists presenting their recent research. Participating students were encouraged to ask questions and present their remarks to highly qualified and experienced panelists.

All in all, organizers and attendants considered this event to be successful, expressing their desires to have similar conferences in the future.



The Frist CEMEREM Conference in Nairobi, Kenya

Outlook for the near Future

- **Establishment of new study programmes**
 - MBA Natural Resource Management
 - MSc Process Engineering
 - BSc Environmental Engineering
 - MSc Environmental Engineering
 - PhD Mining Engineering
 - PhD Process Engineering
- **Pilot plant for biogas at TTU School of Agricultural, Earth and Environmental Sciences**
- **Summer school for TTU students and staff at TTU**
- **Teaching at TTU by HTWD and TU Bergakademie Freiberg members**
- **Trilateral student exchanges**
- **Bi-annual conference on education for mining and sustainable resource management of CEMEREM in 2019**
- **Networking and capacity building with government and industry**
 - Training of engineers and resource managers
 - Short courses for practitioners in the extractive sector
 - Networking with industry in research and training
 - Support for young entrepreneurs

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