

OVERVIEW OF

GERMAN SUPPORTED PROJECTS AT KNUST

January 2016



A Message from the Vice Chancellor

The Kwame Nkrumah University of Science and Technology has over the past decade played a significant role as a trailblazer in the socio-economic and technological development especially of Ghana and of many other countries in Africa.

This role is made possible by the support we receive from the government of Ghana. However, we also receive support from several development partners. One of the key development partners that continue to support us in research and development is the Government and People of the Federal Republic of Germany. This brochure is intended to give a snapshop of the different projects currently being supported from Germany.

The German-supported projects in KNUST cover a wide range of thematic areas including water and sanitation, renewable energy, waste management, medical research and capacity building. Germany has also contributed significantly towards staff development in KNUST. The products of German Universities and research institutions are seen in almost all departments of KNUST. In this brochure we have attempted to capture as many of our staff members as possible who studied in Germany to give an overview of the different areas that Germany is impacting teaching and research in this University.

This brochure is a token of our appreciation to the Government and People of the Federal Republic of Germany for their support in our role of educating the next generation and acting as a catalyst for socio-economic development.

List of German Supported Projects

Title	Sponsor	Collaborator	Budget	Duration
Climate and Resource Protection for Sustainable Economic Development in Ghana	German State of North Rhine Westphalia (NRW)	College of Engineering(CoE) The Energy Centre (TEC)	€ 87,441	2013 - date
WASCAL-CCLU- Climate Change and Land USE	Germany Federal Ministry of Education and Research	CoE (Civil Engineering Department)	€ 1,900,000	2014 - 2016
aCar mobility	Bavarian Research Foundation (BFS) Technical University Munich(TUM)	Centre for Business Development/ Physics Department	-	2015 - 2018
DACCIWA	Karlsruhe institute of technology (KIT)	Physics Department	€ 100,000p.a	2014 - 2018
University- Business- Partnership Programme.	University of Paderborn/ DAAD	Physics Department	€ 120,000	2015 - 2018
ART-FU	Brauns – Foundation Hamburg	Kumasi Centre for Collaborative Research (KCCR)	€ 12,000	2014 - 2015
BAT II	German Research Council (DFG)	KCCR	€ 318,268	2014 - 2017
DOLF	German Ministry of Education and Research (BMBF)	KCCR	€ 590,590	2010 - 2014
eHISS	German Ministry of Education and Research (BMBF)	KCCR	€ 68,935	2013 - 2015
EOD	BNI Hamburg	KCCR	€ 192,000	2013 - 2015
ESTHER profile	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH	KCCR	€ 110,500	2013 - 2015

Title	Sponsor	Collaborator	Budget	Duration
DZIF	Funding: German Centre for Infection Diseases Research (DZIF)	KCCR	€ 407,625	2013 - 2015
TB 6	Deutsche Lepra-und Tuberkulosehilfe (DAHW)	KCCR	€ 200, 000	2011 - 2015
TWAS	German Centre for Infection Disease Research (DZIF)	KCCR	€ 10, 600	2013 - 2015
ARNTD	VW foundation	KCCR	€ 64,000	2015 - 2019
EBOLA Training	Federal Ministry of Foreign Affairs, Germany	KCCR	€ 280, 000	2015 - 2015
FWS	German Centre for Infection Diseasee Research (DZIF)	KCCR	€ 316,291	2013 - 2015
DITAM	Bernhard Nocht Institute for Tropical Medicine	KCCR	€ 10,340	2014 - 2016
TRANSMAL	German Research Foundation (DFG)	KCCR	€ 218,610	2015 - 2018

Project Description

Climate and Resource Protection for Sustainable Development in Ghana

This project is within the framework of the cooperation between the German State of North Rhine Westphalia (NRW) and Ghana, and it is aimed at supporting KNUST to become a centre of competence for climate and resource protection providing state of-the-art studies, advisory services to public and private bodies and serves as a showroom for environmental technologies. The Deusche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH is contracted by the State Chancellery of NRW to facilitate this project. The cooperation involving Westfälische Hochschule Gelsenkirchen and Technische Universität Dortmund focuses on Renewable Energy, Energy Efficiency, Waste management and Resource recovery.

An amount of €87,441 was released by GIZ for both the first and second phases of this cooperation which has just ended. This project has provided funds for state of the art biogas testing equipment, sensors and other equipment for monitoring energy consumption in selected buildings, biofuel generator, etc. In relation to this project, TEC is currently hosting Mr. Andreas Ahrenbog a bioenergy expert as a Research Fellow. Work is currently underway for phase 3 of the project to commence.

Dr. Gabriel Takyi, Project Director

Jatropha Plantation



Value chain assessment of Jatropha Curcas (JC) is key in unearthing the full utilization potential of JC. In the recent past, a lot of investment has gone into the production of JC in Ghana but there is no blue print available in the country on the characterization/properties of JC, the energy and greenhouse gas balance, and the environmental, land use and socio-economic impact of the JC cultivation system. Therefore, a KNUST led research is ongoing in collaboration with North Rhine-Westphalian Universities.

focusing on the value chain impacts of the JC - Bio-oil system in Ghana.

As part of the Climate and Resources protection for Economic Development project, funded by the State Chancellery of the North Rhine-Westphalia, a Jatropha farm is being established in KNUST. This is part of activities planned in the short term towards the production of straight Jatropha vegetable oil to feed the Multi-fuel 20kVA Perkins generator provided by NRW.

Environmental Education with schools in Kumasi in combination with tree-planting campaign



The role of trees in biodiversity and environmental conservation and the provision of environmental services have long been acknowledged. "Me and My Tree" in Basic Schools is a project being implemented by the Energy Center, Kwame Nkrumah University of Science and Technology (KNUST) and supported by German Federal State of North Rhine-Westphalia via GIZ. The broader project is an initiative of Kumasi Metro. The project which started in June, 2014 has planted more than five thousand (5,000) in sixty-four basic schools in the Ashanti regional capital of Kumasi.

The project is expected to contribute to minimizing the adverse effects of climate change, protect landscape resources, provide habitat for wildlife, improve air and water qualities and inculcate into the students the spirit of environmental conservation. In each school an environmental club with at least two teachers as patrons and fifty or more students as members has been formed. All the clubs were provided with souvenirs (caps, pens and t-shirts) as a source of motivation and branding. The planted trees are cared for by the club and the implementing team.

Smart Energy Efficiency Management System



This section Climate and Resource Protection for Economic Development project seeks to provide a smart energy efficiency and management solution for buildings. The system is designed to manage power supply from different sources (PV, Grid and bio-fuel generator) to meet the load requirements of the buildings (LT and Professorial blocks) to maximize reliability of supply. The system consists of smart meters, sensors, relays and switches which are controlled by an intelligent

algorithm which constantly optimizes the overall energy consumption within the buildings. It represents a model, which can be transferred to existing buildings in Ghana.

Biogas Laboratory in KNUST



A biogas laboratory has been installed for teaching and research purposes on KNUST campus with financial support from The North Rhine Westphalia (NRW) government through the facilitation of GIZ.

The installed facilities comprise of Biogas Reactor systems with realtime analysis of the concentration of percentage volume (% vol.) methane and the total volume of biogas produced from substrate(s). In addition

to this unit, provision of muffle furnace, drying oven, dessicator, digital stirrer, heating bungs for temperature controlling experiments and multi-parameter meter aids in the physical analysis of substrates towards biogas potential assessment. These equipment is valued at €9,705.00.

The provision of these laboratory equipment and training of two staff for the management and operation of the facility was part of the Technical Cooperation for Climate and Resource Protection in Ghana between Westphalian University of Applied Sciences (WH) in Gelsenkirchen and Kwame Nkrumah University of Science and Technology (KNUST).

Solar Thermal Training Center



At the College of Engineering, there is a great interest in renewable energy and the students are keen to learn more about it. Out of this, an idea to provide a Solar Training Center at the College was raised.

In collaboration with the Faculty of Architecture, a design of a small building was developed. The location of the building is at the central college square next to a bore hole and in front of the Petroleum Block. In order to

provide a comprehensive solar showcase at the training center the bore hole became a part of the project.

The Energy Center installed at the training center solar technologies as follow:

- Solar water pumping system which is feeding the Petroleum Building with potable water. The water is stored in Polytanks on the top of the roof.
- Solar thermal system which is fed with water from the solar water pumping system.

All parts of the solar technology are hosted on the ground at the new Solar Training Center hence the technology is completely visible and accessible.

The next step is to provide a curriculum for the training units. This includes information displays in the building about the solar technology and the economy. There will be a co-operation between the Universities of Dortmund, Gelsenkirchen and KNUST to develop suitable training units. The target groups for the training units will be Architects, Contractor, Plumber, Owners of Hotels and Students etc.

An additional outcome of the project is the supply of hygienic water to the Petroleum building of the college.

West Africa Science Service Centre on Climate Change and Adopted Land use (WASCAL)

WASCAL is a large-scale research-focused programme funded by the German Federal Ministry of Education and Research designed to develop effective adaptation and mitigation measures to climate change. Its overall objective is to enhance the resilience of human and environmental systems to climate change and increased climate variability. This initiative seeks to give support to West African universities to synergise their efforts on a regional basis and maximise their capabilities to improve the training in land use, climate change and geosciences for better overall results and increased benefit to West Africa. The programme ultimately aims at strengthening the research, educational and policy capacity and competency of West-African countries to deal with issues of climate change through adapted land use on a scientific basis in partnership with German institutions.

Prof. S. N. Odai, Project Director

Dynamics-Aerosol-Chemistry-Cloud Interactions in West Africa (DACCIWA)

This project is being undertaken by the department of physics in collaboration with the Karlsruhe Institute of Technology (KIT) and some European Universities. The broad aim of the project is to provide a comprehensive scientific assessment of the impact of the project rapid increase in anthropogenic emissions on air quality, human health, ecosystems, agricultural productivity, water availability, energy production and local to regional climate in southwestern Africa including Ghana. **Prof. S. K. Danuor**, *Project Director*

University-Business-Partnership Programme

The German Academic Exchange Service (DAAD) in Germany has come out with a University-Business-Partnership Programme between higher education institutions and business partners in Germany and developing countries that is aimed at enhancing the practical skills of students to enable them develop scientific products that are useful for the markets in the developing countries.

Within the framework of the collaboration, the Department of Physics and Paderborn University in Germany are jointly developing renewable energy systems where the emphasis is for students to have hands-on training and experience to produce marketable products.

Dr. R. Tamakloe, Project Director

"aCar" Mobility Project



The "aCar" is a project by the Technical University of Munich (TUM) in partnership with KNUST (Ghana), FUTO (Nigeria), DeKUT (Kenya) and Tanzania to develop a vehicle for every day mobility of low-income customers for transportation of people and goods in the developing countries of Sub-Sahara Africa. It is an interdisciplinary

research project supported by the Bavarian Research Foundation (Bayerische Forschungsstiftung, BFS).

The project is structured such that the German partners bring experience in vehicle concept, excellent equipment, industrial know-how on mass production, and process quality whilst the African partners bring knowledge of local customs, know-how on robust technologies, craftsmanship, experience in local materials and closeness to reality. Scientific partners, include Universität Bayreuth and Hochschule Rosenheim. Industrial Partners include African Health & Agricultural Foundation, Freescale GmbH, Hirschvogel Automotive Group, McKinsey & Company Inc., Otto Spanner GmbH and Schnupp GmbH & Co. Hydraulik AG. The first prototype is manufactured and will be exhibited in Stuttgart in May 2016. The project started in 2013 and will end in 2018. **Dr. Samuel Dodoo,** *Project Director*

ART-FU

Pathophysiology of delayed haemolysis after treatment with parenteral artesuante in serve malaria, a double centre observational study. Coordinators - Prof. Yaw Adu-Sarkodie, Dr. Jakob Cramer, Thierry Rolling

BAT II

"Virus biology, host ecology and human behavior as determinants for coronaviral zoonoses". A pilot study conducted in caves has indicated the presence of corona viruses in bats. Additionally, the presence of Henipavirus has also been demonstrated in the fruit eating bats in an urban setting in Ghana. Coordinators - Prof. Yaw Adu-Sarkodie, Dr. Olivia Agbenyega, Prof. Christian Drosten, Dr. Marco Tschapka, Prof. S. K. Oppong,

DFG Genetics

"Genetics of Lymphoedema and Hydrocele in Filariasis" looks at the genetic polymorphisms of Lymphatic Filariasis. The aim of this study is to analyze cytokine, cytokine receptor, VEGF and VEGF receptor single nucleotide polymorphisms in lymphoedema, hydrocele and infected patients without pathology as possible causes of the different disease manifestations in patients with LF. *Coordinators - Prof. Ohene Adjei, Dr. Alex Debrah, Prof. Achim Hoerauf, Dr. Kenneth*

DOLF

Pfarr

Death to Onchocerciasis and Lymphatic Filariasis. This study looks at the effect of single dose treatment versus double dose treatment of both diseases using lyermectin.

Coordinators - Dr. Alex Debrah, Prof. Ohene Adjei, Prof. Achim Hoerauf

A Mobile Phone-Based Electronic Health Information and Surveillance System (eHISS) for Africa: Concept and Pilot Study

In resource-poor settings, mobile phones can provide life-saving health information. Caretakers of sick children should have easy access to health information, especially if health care is not available or insufficient. Health information can readily be provided via mobile phones independent of time and geography, given mobile network access exists. For example, caretakers could call up a health hotline to describe the disease symptoms of their sick child in order to obtain information whether they should seek professional care or whether it is fine to treat their child at home. The aim of the study is to develop and evaluate a basic, symptom-oriented clinical algorithm for the provision of specific, personalized health information to the public within an Electronic Health

Information and Surveillance System (eHISS). A study is being conducted on children with fever, a hospital-based survey in children admitted to the paediatric ward at the Agogo Presbyterian Hospital, Asante Akim North District.

Coordinators - Prof. Juergen May, Prof. Ellis Owusu-Dabo

EOD - Medicine in the Tropics Research Group

The Bernhard Nocht Institute for Tropical Medicine (BNITM) in April 2013 introduced a Non-Communicable Disease (NCDs) epidemiology group (EOD). This group based at KCCR is mandated to explore non-communicable disease epidemiology in low resource setting. Sub-Sahara African countries are facing huge challenges regarding chronic diseases such as diabetes and obesity. Chronic conditions such as diabetes are therefore no longer syndromes of wealthy societies; they are becoming just as dominant in low and middle income countries, particularly in the context of globalization.

Non-communicable diseases (NCDs) contribute significantly to illness, disability and deaths in Ghana. The major NCDs in Ghana are cardiovascular diseases, cancers, diabetes, chronic respiratory diseases and sickle cell disease. About 48% of Ghanaian adults have hypertension and 9% have diabetes.

Coordinators - Prof. Owusu-Dabo

ESTHER profile

The study is on the Efficacy of first and second line ART in HIV patients treated at the Komfo Anokye Teaching Hospital, Ghana, Kumasi.

Coordinators - Dr. Kirsten Eberharddt, , Dr. Stephen Sarfo, Dr. Jakob Cramer , Dr. Torsten Feldt

D7IF

The main aim objective of the study is to identify the common causes of severe febrile illness among hospitalized children, understand the epidemiology of such febrile illness and to determine the causes of such organisms as well as provide diagnostic algorithm for the management of such cases. The study is being carried out at the Agogo Presbyterian Hospital.

Coordinators - Prof. Juergen May, Drs Owusu-Dabo and Nimako Sarpong

Map2Co

The main objective of this multinational and multicenter study is to determine the influence of M. perstans infection and their Wolbachia endosymbionts on host immunity against mycobacterial infection, BCG vaccination efficacy, and disease susceptibility in children and adolescents. Additionally, clinical and epidemiological aspects of the study will be studied. It is hoped that from this study will influence strong public health interventions for the control of M. perstans.

Coordinators - Prof. Achim Hoerauf, Prof. Owusu-Dabo, Drs Richard Philips and Alex Debrah

NTD-Genetics

"Analysis of genetic polymorphisms of cytokines, vascular endothelial growth factors (VEGFs) and VEGF receptors in disease manifestations in LF. This project aims at analyzing pro- and anti-inflammatory cytokine, VEGF and VEGF receptor polymorphisms as possible causes of the different disease manifestations in patients with LF.

Coordinators - Dr. Alex Debrah, Prof. Bernhard Fleischer, Prof. Achim Hoerauf

TB 6 - Improvement of Interferon gamma (IFN γ) Release Assay (IGRA)-Based Diagnostics of Tuberculosis in Children and Adolescents

Early detection of tuberculosis in children is critical to timely chemotherapy especially in a high incidence country. However, the current diagnostic tools available are inconsistent in accurate diagnostics especially samples from children. A study is being conducted "Improvement of IFN γ Release Assay (IGRA)-Based Diagnostics of Tuberculosis in Children and Adolescents". This study proposes to use Interluekin-7 (IL-7) to increase the efficacy of the Interferon gamma release assay to diagnose tuberculosis in children in TB endemic periurban Ghana. This study aims to determine the immunological strength of IL-7 to improve detection of QuantiFeron Antigens in children and adolescents and characterize the influence of tuberculosis disease stages on T-cell reactivity to IL-7. The study also hopes to compare IL-7 induction of IFN γ with different cytokines and cytokine expression profiles.

Coordinators - Prof. Marc Jacobsen, Prof. Ellis Owusu-Dabo

TWAS - Tropheryma Whipplei and Co-Infections in Children With Diarrhoea in Africa

Tropheryma whipplei (T. whipplei), known as the aetiologic pathogen of the rare Whipple's disease, might be responsible for a wide range of chronic infections, including gastroenteritis, endocarditis and septicaemia. T. whipplei is transmitted via fecal-oral and oral-oral routes and highly prevalent in poor hygienic settings. The aim of this case-control study on children with and without diarrhea is to i) obtain information on the role of T. whipplei in the development of diarrhoeal diseases in African children, ii) to investigate the mutual influence of T. whipplei and to iii) form the basis for further investigations on mid- and long-term consequences of T. whipplei – carriage, e.g. development of other chronic isolated infections or evolution of Whipple's disease.

Coordinators - Prof. Yaw Adu-Sarkodie, Dr. Jakob Cramer, Dr. Christof Vinnemeier

ARNTD

The African Research Network for Neglected Tropical Diseases (ARNTD) has come in to fill a critical gap in NTD control and elimination - that of multidisciplinary research involving Africans from a variety of disciplines across the health, social and management sciences. Members of the ARNTD work together to provide answers to urgent research questions aimed at moving NTD control and elimination goals to reality in Africa, with African research leadership. The network has a membership spread across Anglophone, Francophone and Lusophone countries. The ARNTD Secretariat is hosted at KCCR. Find out more about the ARNTD at: http://www.arntd.org

Coordinators - Dr Richard Odame Philips, Dr John Amuasi

EPIAF

This study assesses enhanced immune protection against the filarial worms and to conduct trials that looks at potential vaccines for Lymphatic Filariasis.

Coordinators - Dr. Alex Debrah, Prof. Bernhard Fleischer, Prof. Achim Hoerauf

EBOLA Training

During the outbreak of Ebola Virus Disease (EVD) and its consequential massive epidemic with very high mortality, many countries in the West African sub-region were feverishly preparing to prevent and control the disease outbreak. West African nations were on the high alert preparing to prevent and or control and manage cases in the event of an outbreak. A critical step to this is to build capacity in Ebola diagnostics. KCCR with BSL3 laboratory has the capacity to conduct EVD. KCCR has commenced accreditation for Ebola Virus Disease (EVD) diagnostics and is spearheading training of scientists in countries within West Africa.

Coordinators - Prof. Christian Meyer, Dr Michael Nagel

FWS – Fever Without Source

This is a study being conducted on fever without source, a hospital-based survey in children admitted at the paediatric ward at the Agogo Presbyterian Hospital, Asante Akim North District (Ashanti Region, Ghana, West Africa) to address two main study outcomes: (i) clinical epidemiology of infections and diseases associated with severe fever in children and (ii) development of diagnostic guidelines for an evidenced-based clinical diagnosis of febrile illnesses in hospitalized children. The objectives include: diagnosis and identification of causes of severe febrile illnesses in hospitalized children; the frequency and distribution of severe febrile illnesses in hospitalized children; collection of samples (blood, stool, urine, cerebrospinal fluid and pharyngeal fluid) from children with fever for molecular screening of potential pathogens, and to establish of a diagnostic algorithm for medical personnel for an evidenced-based clinical diagnosis of febrile illnesses in hospitalized children.

Children admitted to the children ward presenting with fever 38°C were recruited into the study. DNA/RNA was extracted from the throat swab where a panel of PCR done to detect different virus and bacteria that have colonized the throat. Molecular detection for pathogen is also done from blood and serum while molecular characterization is done for all isolated pathogenic bacteria.

Coordinators - Prof. Juergen May, Prof. Yaw Adu-Sarkodie, Prof. Ellis Owusu-Dabo

DITAM

This study assesses the development of Immunity and Tolerance against Malaria in children.

Coordinators - Dr. Maria Mackroth, Dr. Thomas Jacobs

TRANSMAL - Assessing The Effect of Neglected Tropical Diseases on Plasmodium Falciparum Transmission in an Area of Co-Endemicity

Schistosoma and microfilarial species, as well as intestinal helminths are helminth infections and Neglected Tropical Diseases (NTD) with an enormous impact on affected populations. They are highly prevalent in Africa where they share the same geographical distribution with *Plasmodium falciparum* and consequently affect the same population. Epidemiological and experimental evidence suggests that chronic helminthiasis can alter the host response to a concomitant *Plasmodium* infection. The proposed project will broaden our current knowledge on factors that can influence malaria transmission, which

is one of the top research priorities for malaria control. Besides immediate scientific and public health implications, such a study enables the participating African centres to perform further studies on transmission of malaria, including functional, immunological and entomological approaches. In the light of current control and malaria elimination efforts, this is a key competence and likely to provide significant knowledge in the coming years. The main objective of this project is to assess the effect of *S. haematobium* infection on malaria transmission.

Coordinators - Prof. Ellis Owusu-Dabo, Dr Ulysse Ateba Ngoa, Prof. Dr. Benjamin

German Units in Collaborations with KNUST

- 1. Bergische Universitaet Wuppertal
- 2. Catholic Academic Exchange Service (KAAD)
- 3. University of Flensburg
- 4. Technische Universitat Bergakadamie Freiberg
- 5. Universitaet Leipzig (Small Enterprise Promotion and Training)
- 6. University of Muenster
- 7. Technische Universitaet Dortmund
- 8. Deutsches Biomasseforschungs Zentrum (DBFZ)
- 9. BNI Hamburg
- 10. Technische Universitaet Muenchen
- 11. Westfälische Hochschule Gelsenkirchen

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Proposed Establishment of "KNUST DEUTSCHE ZENTRUM"



Establishment of "KNUST DEUTSCHE ZENTRUM". The centre is to promote German culture, strengthen the KNUST-GERMAN relationship through academic and social activities, provide information on educational and scholarship opportunities in Germany, coordinate or keep records of all German projects on campus, coordinate the German Alumni Network on campus etc. The Centre will

house a small library on German language, literature, politics, and economics. It will serve as a social hub where the numerous German guest on campus will hangout, interact and network with students and staff of KNUST. Finally the centre will provide basic courses in German language and assist students who are preparing for various German language tests.