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Flyer SusRES Conference

Renewable Energy Systems are, in times of climate change, a fundamental technology to reduce the usage of climate-damaging fossil energy sources with limited availability and replaces them width sustainable energy sources. Furthermore, regenerative energy sources can bring solutions to power hamlets as "off-the-grid electricity solution" in regions without power supply. Together with the increasing role of digitization and the development of smart applications, new technologies arise, which will play an ever-increasing role in future energy issues. This paradigm shift places new demands on research and education and stretches well beyond national borders. The Conference forms a platform for addressing these topics and for exchanging scientific expertise and pedagogical approaches within university teaching.

This flyer contains information about the schedule and content of the conference. The entire conference will be hosted on the "Webex" platform and takes place in four different "Webex" rooms/panels. If you have successfully registered as a participant, the link below the presentation information will take you to the corresponding "Webex" room.

All speakers and chairs will receive a separate e-mail including a different link. This link leads to the correct room/panel where you get the permission to speak.

Please note that the yellow marked timestamps are in Central European Summer Time (CEST)!

Begin: 11:00 (Togo 09:00) 01.07.2020 SusRES_plenary	**Word of welcome University of Kara** *Speaker: Prof. Dr. Komla SANDA*
Link to presentation:	https://th-wildau.webex.com/th-wildau-en/onstage/g.php?MTID=ef04fa2b5fafd04d74cce2ccd22d5e374

Begin: 11:20 (Togo 09:20) 01.07.2020 SusRES_plenary	**KI: Presentation of the University of Kara** *Speaker: Dr. Stephen MOUZOU*
Link to presentation:	https://th-wildau.webex.com/th-wildau-en/onstage/g.php?MTID=ef04fa2b5fafd04d74cce2ccd22d5e374

Steering Committee: Prof. Dr.-Ing Jörg Reiff-Stephan, Prof. Kou´santa AMOUZOU, Prof Dr. Assiongbon ADANLETE
Conference Organizing Committee: Ron van de Sand, Alexander Dietrich
Email: info@susres2020.org

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Begin: 11:40 (Togo 09:40) 01.07.2020 SusRES_plenary	**KII: Word of welcome and presentation of University of Applied Sciences Wildau** *Speaker: Prof. Jörg Reiff-Stephan*
Link to presentation:	https://th-wildau.webex.com/th-wildau-en/onstage/g.php?MTID=ef04fa2b5fafd04d74cce2ccd22d5e374

Start of the presentations in “SusRES_panel1” and “SusRES_panel2”.

Begin: 12:00 (Togo 10:00) 01.07.2020 SusRES_panel1	**SI-1a: Design, construction and experimental investigation of a linear Fresnel concentrator for sustainable energy services in Sub-Saharan Africa** *Speaker: Dr. Kokouvi Edem N’TSOUKPOE* Abstract: Concentrating solar power (CSP) is considered as one of the promising ways for future sustainable electricity generation, especially in the Sahel region, which is characterized by high direct solar irradiation, but also severe and acute energy poverty. Among the four main CSP technologies, central receiver system and linear Fresnel system technologies have received particular attention in our Institute through a prototype of each of them. These prototypes have been designed and built, taking into account as much as possible locally available materials and humankind, in order to reduce investment costs and make the technology affordable for local population. In this paper, we focus on the linear Fresnel system, which it is probably the simplest CSP technology and presents the lowest investment costs. However, it is the less investigated CSP technology and several authors expect significant cost reduction of this technology. Therefore, deeper knowledge on the technology is required. We aim at investigating the coupling of a linear Fresnel system with various energy processes in order to bring out its interests for the Sahel region and, hence, provide sustainable energy services such as electricity generation for rural areas, cooling and refrigeration via sorption cold production, hot water or steam supply for semi-industrial or industrial processes. We have built a linear Fresnel collector of 7.5 m². The receiver has been designed as a trapezoidal receiver with multi-tubular absorber; it has been experimentally investigated in order to determine its thermal performance, especially the heat loss coefficients. *Jatropha curcas* oil, a locally produced non-edible vegetable oil is used as heat transfer fluid. The concentrator has been characterised in order to find its optical, thermal and global efficiencies. Paths for the prototype performance improvement have been identified and examined.
Chair:	Prof. Jörg Reiff-Stephan
Link to presentation:	https://th-wildau.webex.com/th-wildau-en/onstage/g.php?MTID=e0280c34762db70c97a7f757aece434a3

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SI-1b: The contribution of solar energy to environmental protection and poverty reduction

Speaker: Dr. N'Detigma KATA

Begin: 12:25 (Togo 10:25)

01.07.2020

SusRES_panel1

Abstract:
In 1992, the Convention on Biological Diversity, hosted in Rio de Janeiro, encouraged countries to make provisions for the protection and the sustainability of ecosystems. Several African states, including Togo, have created natural reserves to protect its biological wealth.
Today, under the ever-increasing pressure of population growth combined with growing impoverishment of the population, local residents are constantly violating these protected areas in search of cuts for firewood (Figure 1). Not only do these activities contribute to the alarming degradation of the ecosystems of these protected areas, but they also contribute to deforestation which accelerates erosion and soil impoverishment. This pressure on those reserves reaches a summum during the dry season when the local residents are deprived of income-generating activities.
In this study, we propose a solar-powered water pumping system for gardening activities in order to eliminate the pressure of riparian women on protected areas. The study focuses two areas: the djamdè area and the area around the Kara River in the town of Kara. We first made a comparative study of the performances of different pumping and watering systems for market gardeners in the area around the Kara River in the city of Kara. Then, the most suitable system is proposed for the system to be set up in the Djamdè area.

Chair:	Prof. Jörg Reiff-Stephan
Link to presentation:	https://th-wildau.webex.com/th-wildau-en/onstage/g.php?MTID=e0280c34762db70c97a7f757aece434a3

SII-1a: Estimation of the global solar radiation received by an inclined surface on different sites in Benin

Speaker: Dr Gabin KOTO N'GOBI

Begin: 13:00 (Togo 11:00)

01.07.2020

SusRES_panel1

Abstract:
The design of solar energy systems requires knowledge of the global solar radiation received by solar panels on the ground. However, for many developing countries such as Benin, there is a serious lack of radiometric stations everywhere in the country. The unavailability of these data, therefore limits knowledge regarding the optimal functioning of solar installations. To cope with these difficulties a method for estimating the global irradiation of an inclined panel is developed in Benin. This model depends on meteorological and astronomical parameters. Meteorological data such as sunshine duration, relative humidity, and air temperature are collected from all the six (06) synoptic stations in Benin (Cotonou, Bohicon, Savè, Parakou, Kandi, and Natitingou). The results indicate that in the northern part of Benin (Parakou, Kandi, and Natitingou) global solar radiation is greater. The model was validated using radiation data measured at the Nalohou station. The error estimators of the mean square deviation and of the absolute value of the mean error indicate low values of the order of 10-2. This model can therefore, be used by operators of solar systems to optimize energy production.

Chair:	Prof. Lutz B. Giese
Link to presentation:	https://th-wildau.webex.com/th-wildau-en/onstage/g.php?MTID=e0280c34762db70c97a7f757aece434a3

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SII-1b: Solar power in product development

Speaker: Prof. Jörg Reiff-Stephan

Begin: 13:25 (Togo 11:25) 01.07.2020 SusRES_panel1	Abstract: A large part of the African continent suffers under the burden of poverty. The West African Republic of Togo suffers particularly heavily. Significant for the region is the very poorly developed energy grid. The lack of dependable power retards development in both economic and educational institutions. To promote development in the country, the University of Applied Sciences Wildau aims to support project work in the field of harnessing renewable energy, with the goal of "helping through self-help". In the article an analysis of the savanna region's climatic conditions is performed to identify potential renewable energy sources. The main topic of the paper is to identify the optimal decentralized, renewable energy system for the region. Following that, the possibility of meaningful utilization for conversion into mechanical power is demonstrated in a case study of a brick making machine. A calculation basis for the design of appropriate performance requirements is derived. With this, a sustainable improvement to the living conditions in West Africa can be made.
Chair:	Prof. Lutz B. Giese
Link to presentation:	https://th-wildau.webex.com/th-wildau-en/onstage/g.php?MTID=e0280c34762db70c97a7f757aece434a3

There will be a break from 14:00 to 15:00. The panel discussion will take place at 14:15 and lasts about 30 min.

Center - Renewable Energy Systems Panel Discussion

Panel participants: Prof. AMOUZOU Sabiba Kou'santa,

Associate Prof. ADANLETE ADJANOH Assiongbon,

Prof. Jörg Reiff-Stephan

and Dr. Elias Harakawa

Begin: 14:15 (Togo 12:15) 01.07.2020 SusRES_panel_discussion	Content: Discussing the necessity of a joint **"center for renewable energy systems"**
Link to presentation:	https://th-wildau.webex.com/th-wildau-en/onstage/g.php?MTID=e3acb51b20f706806548615c94009ff39

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SIII-1a: TURNAROUND IN ENERGY POLICY – MEASURES TO REDUCE THE CARBON DIOXIDE EMISSION FROM THE PRIVATE SECTOR

Speaker: Prof. Lutz B. Giese

Begin: 15:00
(Togo 13:00)

01.07.2020

SusRES_panel1

Abstract:
The greenhouse gases (GHG) carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) are considered mainly to be responsible for the additional anthropogenic greenhouse effect, the so-called "global warming". According to the former US Vise-President Al Gore, the scientific community consents that the global warming mainly derived from burning fossil fuels since more than 250 years. Thus, after Kyoto Protocol in 1997 and Paris Agreement in 2015, the policy of the European Community aimed and still aims at reducing the CO_2 emissions drastically. Since 1990, Germany was able to reduce the CO_2 emissions contemporary (see Table 1).
Respecting the energy statistics and opinions of experts, in several European member states such as Germany as well as in countries associated to the EU the greenhouse gas emissions could be reduced by means of
(i) increasing the energy efficiency (Rational Use of Energy, RUE) by
(i.i) applying more energy conservation and
(i.ii) expanding the field of cogeneration (Combined Heat and Power, CHP), and finally
(ii) implementing sustainable energy technologies (Renewable Energy Sources).

Chair:	Dr. ELOH Kodjo
Link to presentation:	https://th-wildau.webex.com/th-wildau-en/onstage/g.php?MTID=e0280c34762db70c97a7f757aece434a3

SIII-1b: Modelling And Design Of An Unmanned Aerial Vehicle With A Smart Control System For Measurement Of Air Quality

Speaker: Toni Duspara

Begin: 15:25
(Togo 13:25)

01.07.2020

SusRES_panel1

Abstract:
Recently, the topic of air pollution has become present. Large industrial plants as well as private fireboxes emit pollutants such as SO2, NO2, CO, etc. into the atmosphere. The emission of solid particles into the atmosphere has a major impact on this pollution. The particles are classified by their size on PM2.5 and PM10. This designation indicates the particle size in micrometers. Currently, air monitoring and control is largely done through stationary measuring stations. The idea of this project is to make a mobile measuring station in the form of an unmanned aerial vehicle with a suitable measuring instrument.

Chair:	Dr. ELOH Kodjo
Link to presentation:	https://th-wildau.webex.com/th-wildau-en/onstage/g.php?MTID=e0280c34762db70c97a7f757aece434a3

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SIV-1a: Construction of PV Systems for Elementary Schools in the Savannah of Togo

Speaker: Etienne Yawo Dable

Begin: 16:00
(Togo 14:00)

01.07.2020

SusRES_panel1

Abstract:
The savannah region is the poorest region in the country. In the villages, subsistence farming prevails. Surpluses are sold at village markets or nearby city markets with little profit, since raw products are rarely processed and certainly not processed and the purchasing power in the region is low. The sensitive savannah floors are overused. During the long dry season (October to May) there is a lack of artificial irrigation. The climate change affects the savannah region through shorter and irregular rainy seasons. Deforestation leads to further drying out of the soil. The population is increasing, becoming poorer and poorer and uses almost exclusively wood for cooking in the villages. This leads to further deterioration of the arable land. Harvest yields are falling because improved seeds and fertilisers are also lacking. The infrastructure in the region is at an extremely low level. There are no industrial enterprises in the savannah region. There is an almost complete lack of companies that process and refine agricultural products. There is a lack of storage facilities and cold chains for agricultural products. Only for wood and charcoal there are transport routes from the international highway to regions with better purchasing power. A major obstacle to the establishment of small businesses is the lack of electricity.

Chair:	Dr. ELOH Kodjo
Link to presentation:	https://th-wildau.webex.com/th-wildau-en/onstage/g.php?MTID=e0280c34762db70c97a7f757aece434a3

SIV-1b: Implementation approaches for distributed energy management systems in production

Speaker: Prof. Jörg Reiff-Stephan

Begin: 16:25
(Togo 14:25)

01.07.2020

SusRES_panel1

Abstract:
The energy management of manufacturing facilities must be taken increasing account for an efficient operation within a production process. Future efforts and solutions will focus on improvement of the process stability and on cost reduction to meet the needs of successfully compete in local and global markets especially for SME. The paper describes an approach for manufacturing facilities using an example for thermoprocessing equipment. For this purpose, the TPS-principle Jidōka is used, the mechanism of self-adapting limit setting as well as an implementation is presented prototypically.

Chair:	Dr. ELOH Kodjo
Link to presentation:	https://th-wildau.webex.com/th-wildau-en/onstage/g.php?MTID=e0280c34762db70c97a7f757aece434a3

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SI-2a: Review of Condition Based Maintenance approaches for vapor compression refrigeration systems

Speaker: Ron van de Sand

Begin: 12:00
(Togo 10:00)

01.07.2020

SusRES_panel2

Abstract:
Vapor compression refrigeration systems (VCRS) are an integral part of many industrial processes and are considered as large energy consumers. Depending on the respective application scenario, these systems can account for 20% - 40% of a facility's energy consumption. Consequently, this sector offers particularly high potential for optimisation in terms of energy savings and reliability considerations. As the overall system performance is often decreased due to the presence of faults, energy efficient systems should be equipped with a CM (Condition Monitoring)- system in order to enable the online system assessment of the respective appliance. Based on this measure, system faults may automatically be detected and diagnosed and thus prevent energy waste and high maintenance costs. Therefore, the application of Condition-Based Maintenance (CBM) techniques, in the field of VCRS, has attracted researchers for decades and many approaches are well described in the literature. Due to CBM, maintenance actions can be scheduled based on the actual system condition rather than predetermined time intervals and, thus, lead to lower operating costs. It is generally understood that four consecutive steps are to be taken into consideration in the development of CBM approaches namely, data filtering, feature extraction, fault detection and fault diagnosis. Although the data-filtering and feature extraction tasks have been widely investigated across the literature, most researchers focussed on the later two steps as they remain an ongoing field of research in the field of VCRS. Therefore, the work at hand reviews research contributions to the field of fault detection and diagnosis (FDD) for VCRS published within the last decade and points out promising results. Furthermore, this paper provides an overview of the most common mythologies applied and describes the current state of the art.

Chair:	Dr. DAM-BE L. DOUTI
Link to presentation:	https://th-wildau.webex.com/th-wildau-en/onstage/g.php?MTID=ef5762ddd6a1512450dc0b7f1cfacf69d

SI-2b: A SHORT APPROXIMATION METHOD TO PRE-ESTIMATE THE ELECTRIC YIELD OF WIND FARMS

Speaker: Prof. Lutz B. Giese

Begin: 12:25
(Togo 10:25)

01.07.2020

SusRES_panel2

Abstract:
Amongst the Renewable Energy Sources (RES) contributing to the worldwide electricity production, wind energy became very important. Germany and other Turkey own significant wind potentials. 2% of a country's area can be used for wind farms, thus Germany could produce up to 200 TWh_{el} yearly just onshore. However, often legal and especially financial aspects decide about the speed of development. Careful project preparation guaranteed by professional management is obligatory. Beside rights to the property and electric grid connection the sufficiency of the wind and peripheral conditions need to be known. A proper wind forecast and yield prognosis are important items to predict the feasibility of each project.
To solve these tasks, professional but often expensive computer programs are offered on the market. To offer a convenient alternative, authors will present an own software based on Excel named as WindCalc 1.5. It is still under development and does not yet include modules such as (i) economic analysis, (ii) ecological footprint or (iii) noise analysis. However, external modules are under development in the moment to be included in upcoming versions. The program is still not yet distributed, neither commercially nor as free-ware. WindCalc 1.5 is executing technical calculation routines in order to forecast annual average yields from wind farms. Several test calculations for running systems proved that WindCalc 1.5 works quite well and reliable to provide data input for the economic calculations. It consists of (i) freely programmable data base with selection mode, (ii) input data overview, (iii) machine parameters overview, (iv) power calculation, (v) wind farm parameters, (vi) location parameters, (vii) height correction, (viii) statistic calculation, (ix) yield calculation, and (x) summary of results.

Chair:	Dr. DAM-BE L. DOUTI
Link to presentation:	https://th-wildau.webex.com/th-wildau-en/onstage/g.php?MTID=ef5762ddd6a1512450dc0b7f1cfacf69d

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SII-2a: OPTICAL SIMULATION OF A PARABOLIC SOLAR CONCENTRATOR

Speaker: Serge Dzo Mawuefa AFENYIVEH

Begin: 13:00 (Togo 11:00)

01.07.2020

SusRES_panel2

Abstract:
This work presents a ray tracing approach of the optical simulation of a parabolic solar concentrator. The objective is to design a high performance parabolic solar concentrator for a thermo-magnetic motor (Curie motor) experiment.
A parabolic mirror is a technology for converging light radiation from the sun. This device makes it possible to concentrate the light rays collected at a point (focal point) for several applications such as the production of electricity, heating, cooking… For our application, the knowledge of the distribution of light energy in time and space near the focal plane is very important and constitute the aim of this work.
Several optical rays tracing techniques are presented in the literature. An approach based on Snell's laws of refraction and reflection (geometrical optics) in vector form [1] is used in this study. We consider the solid angle of radiation of the sun and also the movement of the sun during the day. Thus, we estimate the energy distribution of the radiation as a function of time and space.
This paper aims to design a 3D solar parabolic concentrator with the most suitable geometry and the efficient conversion of solar radiation into heat. The numerical model is developed in Python 3.8.2 environment.

Chair:	Dr. DAM-BE L. DOUTI
Link to presentation:	https://th-wildau.webex.com/th-wildau-en/onstage/g.php?MTID=ef5762ddd6a1512450dc0b7f1cfacf69d

SII-2b: Comparable numerical study on different working fluids for micro scale power cycle integrated into a pellet fired boiler

Speaker: Mario Nowitzki

Begin: 13:25 (Togo 11:25)

01.07.2020

SusRES_panel2

Abstract:
Small or micro scale domestic biomass fired co-generation units are rare. Due to the high ash and particle amount in the flue gas, the convective and radiative heat exchanging surfaces are affected with fouling and slagging accounting for heat and efficiency losses. The direct use of the flue gases like in a gas turbine is not possible. Thus, the power unit must be externalized. The power unit must be cost effective and therefore, only a friction turbine (known as Tesla turbine) is applicable. For the design of a friction turbine for domestic biomass co-generation units, comparable numerical simulations have been done to find a suitable working fluid. These fluids were Steam, Air, Helium, Argon and Xenon. Regarding the simulation, the study showed that all fluids are at par and the design choice should be based (with some limitations) on economic goals rather than technological reasons.

Chair:	Dr. DAM-BE L. DOUTI
Link to presentation:	https://th-wildau.webex.com/th-wildau-en/onstage/g.php?MTID=ef5762ddd6a1512450dc0b7f1cfacf69d

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SIII-2a: ENERGY RECOVERY FROM SEWAGE SLUDGE AND FERMENTABLE FRACTIONS OF SOLID WASTE FROM THE CITY OF SOKODE BY CO-DIGESTION

Speaker: Nitale M'Balikine KROU

Begin: 15:00
(Togo 13:00)

01.07.2020

SusRES_panel2

Abstract:
One of the consequences of the improvement of the living conditions of the populations is the strong demand in thermal energy for the households whereas in the developing countries, the cost of living is a brake with all the social layers to reach supply of butane gas for their energy needs.
This study takes place in the context of energy, environmental and sanitation challenges in the city of Sokodé. Indeed, we are witnessing more and more growing needs for butane gas, firewood or charcoal for cooking or lighting in the city of Sokodé as everywhere in other cities of the same size. Thus by the production of energy in situ, the condition of the populations will be able to improve significantly thanks to the recovery of sludge and fermentable fractions of solid waste into biogas. The objective of this work is to produce and recover methane from fermentable waste produced in the city of Sokodé. The methane or biogas recovered will be used as fuel to fuel kitchens in households. The resulting digestate will serve as an organic amendment to agricultural soils in the commune of Sokodé. Laboratory scale tests have been carried out to validate the value of co-digestion of sewage sludge with fermentable solid waste. The results obtained have shown that the methanogenic potential of sewage sludge is low compared to that of fermentable solid waste. The co-digestion of the two products allows a greater production of methane representing an energy gain compared to the methanisation of the sewage sludge alone.
This study shows that waste can be considered an appreciable energy resource. Their Co-treatment would, while reducing the nuisance associated with this waste, produce valuable energy.

Chair:	Dr. SOUHO Tiatou
Link to presentation:	https://th-wildau.webex.com/th-wildau-en/onstage/g.php?MTID=ef5762ddd6a1512450dc0b7f1cfacf69d

SIII-2b: Vegetation Insulation Screen as a Passive Cooling System in hot humid climate: heat and mass exchanges

Speaker: Dr. Hodo-Abalo Samah

Begin: 15:25
(Togo 13:25)

01.07.2020

SusRES_panel2

Abstract:
Planted roofs are passive cooling techniques that reduce the thermal load of buildings. In this paper, a dynamic mathematical model based on time average Navier-Stokes equations for a planted roof in hot humid climates has been developed for evaluating the cooling potential.Transfer equations are solved using a finite difference scheme and Thomas algorithm. The model was applied for the simulation of the planted roof in togolese climate conditions. Results showed that, evapotranspiration and Solar Heat gain Factor are functions of the Leaf Area Index which is the most important parameter when considering the foliage material. It is clearly proved that the foliage density and hence the vegetable canopy type selection greatly influence the thermal efficiency of the bioclimatic insulation screen. It was found that a larger Leaf Area Index reduces the solar flux penetration and increases evapotranspiration which is an important parameter when considering surrounding microclimate formation.

Chair:	Dr. SOUHO Tiatou
Link to presentation:	https://th-wildau.webex.com/th-wildau-en/onstage/g.php?MTID=ef5762ddd6a1512450dc0b7f1cfacf69d

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Begin: 17:00 (Togo 15:00) 01.07.2020 SusRES_plenary	**Closing session** *Speaker: Prof. Jörg Reiff-Stephan and* *Prof. AMOUZOU Sabiba Kou'santa* Content: - Awarding the best student paper - Concluding words
Link to presentation:	https://th-wildau.webex.com/th-wildau-en/onstage/g.php?MTID=ef04fa2b5fafd04d74cce2ccd22d5e374