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2024/2025

Internationales Klimaschutzstipendium

Survival at Thresholds: Resilience Pathways of Smallholder Farmers to Climate Extremes in Eastern Uganda



Triphine Ainembabazi

Degree: Master of Science | **Field:** Climatology

Home Institution: Makerere University, Kampala, Uganda | **Host Institution in Germany:** Institute of Hydrology and Meteorology, Technische Universität Dresden | **Host:** Prof. Dr Matthias Mauder

Triphine Ainembabazi wants to investigate the nature and pattern of climate extreme tipping points, project their dynamics and probe into available resilience pathways for smallholder farmers in Uganda.

Food systems in Sub-Saharan Africa are increasingly burdened by a growing population, dwindling natural resources, and the impact of climate change. These changes have led to severe food insecurities in recent years and the situation is likely to be worsened. About 25 million people are at risk of undernourishment by 2050. Eastern Uganda has undergone frequent episodes of droughts, floods, and landslides. The frequency and intensity of these hazards are likely to increase. Although food systems have proven to be resilient over the years, their thresholds have recently come under new pressures that could potentially undermine their ability and efficiency to bounce back to normal levels following shocks. Such thresholds, however, are not known and the coping strategies when such limits are exceeded have not yet been documented. When it comes to designing resilient programs and policies, knowledge of climate extreme thresholds, their projections and coping strategies during extremes are crucial.

Hence, Triphine Ainembabazi wants to investigate the nature and pattern of climate extreme tipping points, project the dynamics of such tipping points and probe into available resilience pathways for smallholder farmers. Once these tipping points are known, it will be possible to support practices that improve the resilience and sustainability of food systems and the environment at large. Triphine's research aims to identify technologies from Germany that could be adopted to monitor and predict climate extremes, to manage climate risks, and boost the resilience of smallholder farmers. She is being supported by the Institute of Hydrology and Meteorology at the Technische Universität Dresden.

A Water-Energy-Food Nexus Approach to Dam Development under changing climate in the White Volta Basin, Ghana



Andrew Asaviansa

Degree: Master of Science | **Field:** Water Resources Management

Home Institution: Water Resources Commission, Accra, Ghana | **Host Institution in Germany:** Institute of Geography of Osnabrück University, Osnabrück | **Host:** Prof. Dr Britta Höllermann

Andrew Asaviansa aims to understand how the development of the Pwalugu Multipurpose dam in Ghana will affect socio-ecological relations in the area under a changing climate.

Development of water storage infrastructures promises huge benefits, but it is a challenge to balance the needs under changing hydro-climatic conditions. When it comes to climate change and increasing awareness of the impact on river systems, approaches need to be adapted. Also, the consideration of climate change must be more closely integrated into the development of water resources and the planning of water storage. The Pwalugu Multi-Purpose Dam is to be built on the White Volta River in Northern Ghana. It will primarily be used for irrigation and flood control and will also improve Ghana's power system with a coupled Photovoltaic plant. Multipurpose dams have the potential to deliver energy, ensure food security and provide water, as well as improve the relationship between these different components.

Andrew Asaviansa aims to understand how the development of the Pwalugu Multipurpose dam will affect socio-ecological relations and how these are aggravated by the impacts of climate change. In his study, he examines planning and execution of water-related projects in developing countries, shifting the focus from the traditional emphasis on economic and technical feasibility to a more holistic Water-Energy-Food nexus approach. The study critiques the predominant trend in multipurpose dam discussions, which have primarily highlighted benefits in energy, food, and water provision, while often overlooking socio-ecological impacts and human rights concerns. Andrew advocates for the inclusion of environmental flows to sustain ecosystems, especially under changing hydro-climatic conditions. He seeks to increase awareness and provide scientific based information to policy makers, practitioners and communities for making decisions about water-energy-food infrastructure development. Andrew is supported by the Institute of Geography of Osnabrück University.

Protecting persons displaced by climate change through existing human rights frameworks in South Asia



Prof. Chhaya Bhardwaj

Degree: LL.M. | **Field:** International Public Law

Home Institution: O.P. Jindal Global University, Jindal Global Law School, Sonipat, India | **Host Institution in Germany:** Hertie School of Governance, Centre for Fundamental Rights, Berlin | **Host:** Prof. Dr Basak Cali

Chhaya Bhardwaj aims to fill the gap by examining the existing regional and national frameworks used and applied to protect persons displaced by climate change – both internally and cross-border.

Extreme weather events caused by climate change are leading to the massive displacement of people, both within countries and across borders. Catastrophes such as the 2022 Pakistan Floods are increasing in South Asian countries and cause a vicious cycle of climate-related injustices to the people affected. The South Asian Association for Regional Cooperation (SAARC) has sought to develop effective mechanisms to respond to such disasters through a regional treaty. The aim of the treaty is for participating states to jointly respond to disasters by pooling their national efforts to protect those displaced by climate change internally and across borders. However, the treaty has not been implemented in this context, although all SAARC nations have human rights-related frameworks within their national systems, that can be brought in line with the treaty. There is still a lack of research on the interrelation between human rights and the protection of persons displaced in South Asia.

Chhaya Bhardwaj aims to fill this gap by examining the existing regional and national frameworks used and applied to the target groups under threat. She will undertake a comprehensive mapping of regional treaty provisions that establish a link between human rights and the protection of climate change migrants. By better understanding these interlinkages in SAARC states, she will be able to make a stronger case and recommendations for practical regional implementations of these interlinkages. Chhaya Bhardwaj will be supported by the Centre for Fundamental Rights at the Hertie School of Governance in Berlin.

Climate Change Narratives in Muslim Countries



Dr Amel El Mejri

Degree: PhD | **Field:** International Public Law, Constitutional Law

Home Institution: International Institute for Democracy and Electoral Assistance, Africa and West Asia Division, Ariana, Tunisia | **Host Institution in Germany:** Max Planck Foundation for International Peace and the Rule of Law, Heidelberg | **Host:** Prof. Dr Dr h.c. Rüdiger Wolfrum

Amel El Mejri wants to investigate climate change narratives in Muslim countries and aims to introduce a sociological dimension to the positive law under study.

Climate change has become an important term in legal studies and it is hard to imagine a more pressing research topic, as it threatens to undermine the very existence of human societies as we know it. It is a global problem. However, developing countries in particular, more specifically Arab and Muslim countries, remain skeptical of the phenomenon, even as they are affected by its scourges. Accused of being a Western invention, the concept struggles to fit into national policies in these countries. Despite this ideological mistrust, international law tends to universalize the concept. Moreover, developing countries tend to focus on development and industrialization issues rather than environmental issues. A faith-based approach to both the environment and climate change might encourage them to introduce the concepts into their legal systems. In Islam, for example, there are rules such as the prohibition of cutting down trees or the prohibition of pollution, but no systematic research has been conducted on this topic.

Dr Amel El Mejri aims to create an ideological mapping of the concept of climate change in the domestic laws of Muslim countries before attempting to justify its social acceptance through Islamic Fiqh. However, law is not only an observable and actionable phenomenon in a positive sense. Referring to formal resources, it is also a social construction. Rather than focusing on legal techniques, Amel's critical approach aims to introduce a sociological dimension to the positive law under study: The historical, religious, cultural, and geographical vision of the concept of climate change will be taken into account. Amel is being supported by the Max Planck Foundation for International Peace and the Rule of Law in Heidelberg.

Carbon offsetting opportunities for cattle ranching in the South American dry woodlands



Pedro David Fernandez

Degree: Graduate Engineer | **Field:** Ecology of Land Use

Home Institution: Instituto Nacional de Tecnología Agropecuaria, Instituto de Investigacion Animal del Chaco Semiarido, Leales, Argentina | **Host Institution in Germany:** Humboldt-Universität, Berlin | **Host:** Prof. Dr Tobias Kümmerle

Pedro David Fernandez wants to provide a pathway to understand the influence of different livestock systems on climate to help develop concrete management options for making the sector more climate-smart.

South America's dry forests are hotspots of deforestation and biodiversity loss but are neglected by research and policy-making alike. Livestock farming is the main driver of deforestation in South American systems, with impact on climate change through considerable greenhouse gas emissions. Livestock farming is an economically important activity in these regions. Therefore, there is a great need to transform ranching systems to make them more climate-smart. Possible practices and their impact on production and the environment are currently unexplored. Pedro David Fernandez wants to address this knowledge gap and focus on the 'dry diagonal'. This area encompasses the Caatinga Cerrado, Chiquitania and Dry Chaco ecoregions, for which detailed livestock breeding data is available.

Pedro will systematically review the available information on the climate impact and the mitigation potential of different livestock farming systems in the dry diagonal to reconstruct the spatial and temporal dynamics of cattle breeding systems over the last three decades. This will then make it possible for the first time to reconstruct the overall carbon impact of the dynamics of these livestock systems. Pedro's study will provide a pathway to understanding the intensification and expansion of livestock systems and the associated climate impact in two of the world's most deforested regions. His main goal is to translate scientific information into concrete management options that will enable policy makers and breeders to make the transition to a more climate-smart livestock sector. Pedro is being supported by the Department of Geography at the Humboldt-Universität in Berlin.

European Union regulation on deforestation-free products: how implementing the law will help fight deforestation and climate change in Brazil



Ana Paula Gouveia Valdiones

Degree: Master of Science | **Field:** Agricultural Economics, Agricultural Policy, Agricultural Sociology

Home Institution: Instituto Centro de Vida, Mato Grosso, Brazil | **Host Institution in Germany:** Deutsche Umwelthilfe e.V., Berlin | **Host:** Peer Cyriacks

Ana Paula Gouveia Valdiones will focus on how implementing EU legislation on deforestation will have an impact on soy and cattle production in Brazil to develop recommendations for further reduction of deforestation.

Brazil is the world's 5th largest emitter of greenhouse gases, mainly due to the high emissions of agricultural land use. The deforestation, which is mainly due to illegal practices, jeopardizes the achievement of the climate goals set by Brazil in the Paris Agreement. Brazilian forests are approaching a tipping point, turning from a climate sink into a net emitter of greenhouse gases. Regulatory proposals and due diligence frameworks to tackle imports linked to deforestation are seen as key to reducing greenhouse gas emissions, especially EU regulations to prevent such products from entering the EU market. Many lessons have been learned from the implementation of traceability and information transparency agreements such as the Soy Moratorium and the Voluntary Beef Agreement, which can and should be used to develop mechanisms to prevent deforestation in the context of commodity trade. There is a growing demand for open environmental and animal health data from non-governmental organizations and coalitions to ensure full traceability of supply chains.

Ana Paula Gouveia Valdiones's research will focus on the influence of the implementation of EU legislation on deforestation and how it influences soy and cattle production in Brazilian forest areas towards deforestation-free production, as well as the impact on transparency and traceability in Brazil. The goal is to produce recommendations for governments, companies, civil organizations, and other stakeholders engaged in reducing commodity-driven deforestation. Ana will be supported by the Deutsche Umwelthilfe e.V. in Berlin.

Earth Observation Data for Monitoring of Agricultural and Meteorological Drought under Climate Change in Ethiopia



Dr Aster Tesfaye Hordofa

Degree: PhD | **Field:** Remote Sensing

Home Institution: Arba Minch University, Water Technology Institute, Arba Minch, Ethiopia | **Host Institution in Germany:** German Aerospace Center Oberpfaffenhofen (DLR), Weßling | **Host:** Prof. Dr Claudia Künzer

Aster Tesfaye Hordofa wants to monitor agricultural and meteorological drought using earth observation data to figure out to what extent it can be used to detect those droughts in Ethiopia and how the results can be used to adapt to climate change.

Drought is a major threat to water and food security as well as economic development, especially in developing economies like Ethiopia. Since much of Ethiopia's economy relies on rainfed agriculture, agricultural drought has a direct impact on the country's food security and sustainable development. Consequently, effective monitoring of agricultural and meteorological drought in Ethiopia is very important. However, this is severely limited by the availability of nationwide information. In the absence of such data, the use of earth observation data can be a powerful tool to inform policy makers, water resource managers, and agricultural sectors. Previous studies conducted in Ethiopia have not considered the impact of different types of droughts, especially agricultural and meteorological droughts on cropland and were mainly limited to local and basin scale.

Aster Tesfaye Hordofa's research objective is to monitor agricultural and meteorological drought using earth observation data with respect to climate change impacts. Her study will utilize various datasets such as Moderate-Resolution Imaging Spectroradiometer, Landsat and Sentinel-2, the Climate Hazards Group InfraRed Precipitation with Station data, and other geospatial available through the Google Earth Engine Platform. Her study aims to figure out to what extent earth observation data can be used to detect agricultural and meteorological drought in Ethiopia, as well as the spatiotemporal manifestations of these droughts, how they are affecting agricultural cropland in Ethiopia and how monitoring it can contribute to climate change adaption. Aster's study is being supported by experts of the German Aerospace Center Oberpfaffenhofen (DLR) in Weßling.

What's the Best Case for Mumbai? Aligning the Mega City's Climate and Development Goals



Sukanya Janardhanan

Degree: Bachelor of Arts | **Field:** Government, Political Systems

Home Institution: Air Pollution Action Group, Delhi, India | **Host Institution in Germany:** Institute of Political Science, Technical University of Darmstadt, Darmstadt | **Host:** Prof. Dr Markus Lederer

Sukanya Janardhanan wants to analyze Mumbai's Climate and Development plans from a multi-level perspective and compare them to other global cities' plans to make helpful recommendations for future Climate Action Plans.

Mumbai's population has doubled in 20 years. Climate change mitigation can no longer be framed as opposed to development. Given the critical gaps in the provision of housing, transportation, sanitation, security, jobs, water, and energy infrastructure and high climate vulnerability, cities need to prioritize development alongside climate action. Mumbai is the most densely populated city in India and accounts for 6% of India's Gross Domestic Product. Mumbai has recently started to see itself as a leader in climate action, a concept that is unusual for Indian cities due to the Indian governance structure. Mumbai was the first city in South Asia to release a Climate Action Plan in 2022.

Sukanya Janardhanan's research will analyze Mumbai's Climate and Development plans from a multi-level governance perspective to identify gaps and provide recommendations to maximize the potential for development and climate action. She will illustrate how sustainable development can be achieved in a complex city like Mumbai by conducting a policy review of Mumbai's Climate Action Plan and Development Plan, identifying synergies and contradictions. She will also compare Mumbai's plans with other global cities with similar geographical and socio-political features for a horizontal perspective, and with India's national policies for a vertical perspective. Based on this research, Sukanya will make policy recommendations and develop implementation guidelines to synergize the goals of Mumbai's Climate and Development plans. Finally, she will develop a blueprint for administrators of Climate Action Plans in other Indian cities such as Kolkata and Chennai to help them design and implement their plans effectively. She will be supported by the Institute of Political Science at the Technical University of Darmstadt.

How to use Machine Learning to build reliable climate resilience information in Sierra Leone



Gabriel Kpaka

Degree: Master of Science | **Field:** Atmospheric Science, Atmospheric Chemistry

Home Institution: Sierra Leone Meteorological Agency, Freetown, Sierra Leone | **Host Institution in Germany:** Forschungszentrum Jülich, Institute of Energy and Climate Research, Stratosphere, Jülich | **Host:** Prof. Dr Michaela Imelda Hegglin

Gabriel Kpaka seeks to devise a machine learning model for the prediction of extreme weather events to ease public's decision-making.

Climate change poses a major global threat and is a common concern for humankind. The rise of extreme weather events result more and more in severe, pervasive and irreversible negative impacts for Sierra Leone's people, economy, ecosystems and regenerative capacity, as well as having profound implications for human rights. Sierra Leone is considered to be especially vulnerable and hence expected to be particularly hard-hit – climate action needs to happen fast, but also to be participatory and fair. Machine Learning methods have been gaining prominence recently as interest in Artificial Intelligence has risen. These methods are being used in weather forecasting and a whole other spectrum of applications in a wide range of fields.

Gabriel Kpaka's research aims to use Machine Learning to develop a forecast model for Sierra Leone. The research will be conducted specifically using data of several weather observation stations in Freetown, Bo, Kenema, Kailahun, Kenema, Kabala and Makeni. Gabriel will evaluate extreme events such as floods, heatwave, sea level rise from the machine learning approach. Historical records will be used to test how well the model developed with machine learning predicts these events. A positive outcome of the validation of such historical extreme events will pave the way for the prediction of such events in the future.

Gabriel will then focus on the development of an application that will be used to improve decision making. The goal is to develop forecasting results that are easy to understand and can be used by the public for decision making. Gabriel's work is being supported by the Institute of Energy and Climate Research, Stratosphere of Forschungszentrum Jülich.

How an integrated modeling framework can help to reintroduce species in the midst of anthropogenic and climate change

Ashish Kumar

Degree: Master of Science | **Field:** Ecology and Biodiversity of Animals and Ecosystems, Organismic Interactions

Home Institution: Salim Ali Centre for Ornithology and Natural History, Division of Conservation Ecology, Coimbatore, India | **Host Institution in Germany:** Department of Biometry & Environmental System Analysis, University of Freiburg, Freiburg | **Host:** Prof. Dr Carsten F. Dormann



Ashish Kumar aims to use simulated models to identify the most suitable area to reintroduce species, that are being endangered by anthropogenic and climate change.

Climate change is a threat to global biodiversity and has led to a range shift for many species and even to extinction of some species. The population of striped hyaena (*Hyaena hyaena*) is highly vulnerable to extinction due to its confined distribution and exposure to climate change and human activities. Reintroducing species and supporting migration can help secure the future for this endangered animals.

Therefore, Ashish Kumar is conducting a habitat suitability analysis to identify a suitable area to address climate change and anthropogenic threats. Ashish's study focus is on the major last remaining population of Southern India, situated in the Mudumalaisathyamangalam landscape of Tamil Nadu. The region has large spatial variation in climatic conditions and is also highly vulnerable to climate change. Ashish aims to determine the current distribution pattern of the hyaena and to assess the role of different geo-climatic and ecological variables, interspecific competition, and anthropogenic factors. Using 194 camera traps, he has already collected field data on the predators, prey, human-induced disturbance, and habitat parameters in his study area. Simulated models with differently weighted scenarios will help to determine the hyaena's response to anthropogenic threats and factors such as grazing pressure, deforestation, human-mediated land use and intolerance to the hyaena. In this way, The goal is to identify the most suitable and sustainable habitat for the reintroduction of striped hyaena. Ashish's research is being supported by the Department of Biometry & Environmental System Analysis at the Albert-Ludwigs-University in Freiburg.

Climate justice strategic litigation in the African Court of Human and People's Rights and European Court of Human Rights



Prof. Adam Kyomuhendo

Degree: LL.M. | **Field:** International Public Law
Home Institution: Uganda Management Institute, Kampala, Uganda | **Host Institution in Germany:** University of Cologne, Köln | **Host:** Prof. Dr Kirk Junker

Adam Kyomuhendo wants to compare climate justice strategic litigation in the Global South and the Global North.

Climate change and unmitigated environmental damage present existential threats to the entire human family. In the Global South, climate change is brought about by population growth and the exploitation of fossil fuels. In the Global North, climate change has been exacerbated by carbon emissions from industries and technological complexes of human mobility. There is an urgent global need for climate resilience strategies.

The pressing imperatives for climate action have also been articulated through regional treaty instruments like the African Charter on Human and Peoples' Rights (ACtHPR) for Africa; and the European Convention on Human Rights (ECtHR) – among others, for Europe. These imperatives have been enforced in a number of ways by civil organizations and climate justice activists. One way has been through the use of strategic litigation in the regionally established judicial architectures.

Adam Kyomuhendo aims at a comparative study of climate justice attitudes and practices in both ACtHPR and ECtHR, paying particular attention to imperatives that intersect climate justice and human rights. Given the jurisprudential output of ECtHR, the study will concentrate on the most significant and emblematic cases decided between 2010 and 2022. Regarding ACtHPR, all cases decided on climate justice will be reviewed. The research proposes to adopt a constructivist approach on the symbiotic relationship between law and society and focuses on how court judgments in both contexts translate into social benefit to the parties involved. Adam's research is being supported by the Environmental Law Center at the University of Cologne.

Influence of Climate induced heat stress on milk production in South Africa and Germany



Hermela Lakew

Degree: Master of Science | **Field:** Agricultural Economics, Agricultural Policy, Agricultural Sociology
Home Institution: University of the Free State, Bloemfontein, South Africa | **Host Institution in Germany:** Leibniz Centre for Agricultural Landscape Research, Müncheberg | **Host:** PD Dr Stefan Sieber

Hermela Lakew studies the influence of climate-induced heat on milk production in the past and future and how farmers will adapt.

Climate change is a global phenomenon which poses a challenge to almost all sectors of a country's economy. The dairy sector is no exception and producers are likely to suffer in the future. Hence, farmers around the world are now adapting to new strategies and techniques to maintain productivity and keep revenues constant or rising. It is thought that climate change has already posed a threat to farmers in South Africa. Dairy cows' milk production, reproductive system, and feed intake are all affected by heat stress.

Hermela Lakew's research will build on her work in South Africa, where she conducted research regarding the financial effects of heat stress on small-scale milk producers. She will focus on determining how cold or heat stress affects dairy production by small-scale farmers. Her study will also examine the farmers' perceptions of climate change, as well as their strategies for adaptation. Her focus areas are South Africa's semi-arid Free State regions of Bloemfontein, Bothaville, and Bethlehem. Temperature Humidity Index thresholds of 70 and 65 were used to estimate the impact of heat stress on milk production from 1950 to 1999 and 2040 to 2070, respectively. Milk loss doubled in the middle of the century when no adaptation strategy was used, but moderate heat-mitigation strategies like forced ventilation and wetting were linked to increases in milk production and farm incomes. Hermela's research is being supported by the Leibniz Centre for Agricultural Landscape Research in Müncheberg.

Could Cycling Provide Economic Sustainability for Cities in Indonesia?



Sukma Larastiti

Degree: Bachelor of Science | **Field:** Urban Planning and Development, Landscape, Traffic, and Infrastructure Planning

Home Institution: Deutsche Gesellschaft für Internationale Zusammenarbeit, Jakarta, Indonesia |

Host Institution in Germany: University of Kassel, Kassel | **Host:** Prof. Dr Angela Francke

Sukma Larastiti explores the cycling policy and economical benefits of cycling in Germany and how it can be adopted in Indonesia.

The transport sector was the sixth biggest producer of greenhouse gas emissions in Indonesia in 2019 and it is expected to increase by 7.17% per year. Currently, Indonesian strategies to reduce those emissions are focused on public transport. Although cycling is one of the important shift strategies to reduce emissions and serve as the first and last mile for public transport, this development in Indonesia is lagging behind. Indonesian cities are facing problems expanding their bicycle networks: There is little evidence that this measure brings economic benefits, and the cities are subject to financial limitations. Governmental transport policy focuses more on private motorized vehicles, as the automotive industry is of great importance for the national economy and taxes from motorized vehicles make up a large part of the provinces' annual tax revenues. Hence, it is difficult to prioritize more sustainable transport policies, such as cycling. Economic sustainability is crucial to supporting sustainable transport policies.

The development of cycling policy in Germany has demonstrated the economic benefits of cycling: a seamless cycling network and high-quality infrastructure can not only improve the quality of life, health, and environmental conditions but also contribute to the economic growth of the bike industry and tourism. Therefore, Sukma Larastiti's study aims to analyze German cycling policies and their economic and environmental benefits and also to explore possibilities, what could be adopted in the Indonesian context as well as possible economic benefits. The study aims to encourage a discourse about the development and reformulation of cycling policy in Indonesia by keeping economic sustainability at its center. Sukma is being supported by the Faculty Civil and Environmental Engineering at the University of Kassel.

Optimization of Eswatini Power Grid for Efficient and Sustainable Integration of Variable Renewable Energy



Nonhlelo Mathunjwa

Degree: Master of Science | **Field:** Electrical Energy Production, Transmission, Distribution, Application

Home Institution: Eswatini Energy Regulatory Authority, Mbabane, Eswatini | **Host Institution in Germany:** Hitachi Energy, Mannheim | **Host:** Dr Kevin Schöleber

Nonhlelo Mathunjwa wants to study Germany's and the EU's power systems and how they deal with integrating renewable electricity.

Current power grids create enormous environmental impacts and global warming due to the utilization of fossil fuels. Thus, higher percentages of renewable electricity should be brought into the energy mix as these sources are climate-friendly and unlimited. One of the problems in Eswatini is integrating variable renewable electricity into the power system. The intermittent nature of power output from renewable energy sources, in particular wind and solar, introduces potential technical impacts that affect quality of power availability including voltage, frequency and power flow fluctuations, forecasting, demand response, and harmonics injection into the network. Optimization techniques to further mitigate and manage these challenges are required.

Nonhlelo Mathunjwa wants to study Germany's and the EU's power systems to understand the overall operation in electricity markets. Variable renewable energy (VRE) grid integration, optimization and control, power quality, automation and technical system constraint violations will all be part of the investigation. With the help of simulations and designs of model power systems, Nonhlelo will undertake various technical analysis to observe the power flow capability and reliability of the system at various VRE grid integration levels. Also, potential solutions and optimization techniques will be investigated and tested at several connection points in medium to high voltage networks. Grid performance models will be designed and further tested to maintain reliability through critical periods of VRE integration and high penetration without the need for building and strengthening grid assets. Nonhlelo will be supported by Hitachi Energy in Mannheim.

Solar energy forecasts for an optimized sustainable energy production in Sub-Saharan Africa



Aissatou Ndiaye

Degree: Master of Science | **Field:** Meteorology

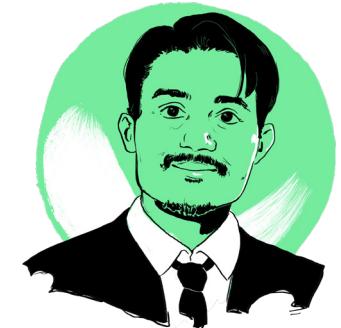
Home Institution: Université Abdou Moumouni, Niamey, Niger | **Host Institution in Germany:** University of Augsburg | **Host:** Prof. Dr Harald Kunstmann

Aissatou Ndiaye aims to devise an energy-meteorological forecast system to provide optimized irradiance forecasts for two power plants in Senegal helping to ensure a stable reliable and sustainable power supply.

The energy sector is highly sensitive to climate and weather variability, due to their significant impact on renewable energy. Cloud cover, temperature and precipitation can reduce solar energy output. The energy sector is rapidly emerging in Sub-Saharan Africa and its transition and decarbonization is needed to reduce greenhouse gas emissions. There is a strong demand for accurate forecasts of solar energy and other renewable energies in all Sub-Saharan African countries. The provision of tailor-made meteorological forecasts will play a crucial role in climate protection because they allow a better integration of solar energy into the electricity grid. This will help to ensure a stable and reliable power supply, which is essential for reducing the need for fossil fuel power generation. Solar energy forecasting can also help to identify locations where solar energy is most likely to be abundant and cost-effective. This is urgently needed to guide the development of solar energy projects and further promote the use of renewable energy.

This is why Aissatou Ndiaye's work aims to develop an energy-meteorological forecast system, specifically designed to provide optimized global horizontal irradiance forecasts for two solar power plants in Senegal for up to 72 hours. This will be achieved using the latest version of the weather research and forecasting-solar model in combination with high-resolution time-varying aerosol data. The aerosol data are crucial as dust plays a major role in West Africa and can significantly impact weather and therefore solar energy production in this region. To provide tailored forecasts for the energy sector in Senegal for the first time, Aissatou will be supported by the Chair of Regional Climate and Hydrology at the University of Augsburg.

Unlocking soil carbon dynamics of degrading Himalayan permafrost-peatland



Dr Sarwar Nizam

Degree: PhD | **Field:** Organic and Inorganic Geochemistry, Biogeochemistry, Mineralogy, Petrology, Crystallography, Mineral Deposits

Home Institution: Physical Research Laboratory Geosciences Division, Ahmedabad, India | **Host Institution in Germany:** Helmholtz Centre Potsdam, German Research Centre for Geosciences, Potsdam | **Host:** Dr Dirk Sachse

Sarwar Nizam investigates soil organic carbon stocks to assess their stability as well as the future role of Himalayan permafrost-peatland in respect to climate change.

Climate change is threatening the Himalayas and as such the billions of people dependent on its resources and water: warming leads to melting glaciers, rising lake levels, expanding growing seasons, and degrading permafrost. Permafrost and peatland contain more than half of the global soil organic carbon reserves. However, the rate of soil organic carbon degradation caused by recent temperature rise, its drivers, processes, and regional and potential global consequences are virtually unknown.

Sarwar Nizam aims at exploring factors controlling degradation, stability, and carbon release potential of the soil organic carbon under variable hydro-meteorological conditions. Such data will help to understand better how soil carbon fluxes in glacierized Himalayan soils will respond to the more vigorous hydrologic cycle in a 1.5 °C warmer world that is predicted for the latter part of this century. Sarwar seeks to investigate the soil organic carbon stocks of recently exposed permafrost in deglaciated Himalayan catchments and to assess the stability of soil organic carbon from degrading Alpine permafrost-peatland. Sarwar's endeavor to evaluate the role of Himalayan permafrost-peatland in global carbon-climate feedback is being supported by the Geomorphology of German Research Centre for Geosciences at the Helmholtz Centre Potsdam.

The Protection of Lake Chad as a Peace and Conflict Resolution Pathway



Adenike Titilope Oladosu

Degree: Bachelor of Science | **Field:** Social Sciences
Home Institution: I Lead Climate Action Initiative, Abuja, Nigeria | **Host Institution in Germany:** Justus Liebig University, Gießen | **Host:** Prof. Dr Claus Leggewie

Adenike Titilope Oladosu wants to map out conflict affected and safe areas around Lake Chad and develop a series of resolution procedures to achieve a peaceful transition in the area without military involvement.

The Lake Chad Basin is one of the places where climate change has been identified as a significant driver of armed conflict. The loss of traditional livelihoods stretches the coping capacities of communities and increases their propensity to explore alternative means of existence, including violent extremism. By undermining already fragile economies and livelihoods, climate change compounds this security risk. According to the United Nations Environment Program, half of the shrinkage of Lake Chad can be ascribed to the impact of climate change and climate variability. The other half is due to increased demand for water from Lake Chad's tributaries for irrigation and the needs of growing populations.

Empirical evidence suggests that the lake's changing hydrograph provides violent extremists e.g. Boko Haram with strategic opportunities to increase their foothold in the water-scarce Lake Chad Basin. Therefore, successfully implementing re-watering measures for Lake Chad should drastically reduce the number of conflicts. Adenike Oladosu seeks to develop a series of resolution procedures for tackling the interlinked crisis that does without military involvement and aims at a peaceful transition in the Lake Chad region. To generate data, Adenike will map out conflict affected regions and safe areas around Lake Chad. Through remote sensing, the current size of Lake Chad will be monitored. A conflict analysis trend will give insights on how livelihood and water correlate from the data generated from the mapping process. Finally, Adenike intends to set up a data-based observation unit from 2009 until today on peace and conflict resolution. Adenike will be supported by the Panel on Planetary Thinking at Justus Liebig University in Gießen.

Can revenues from emission trading systems enable a just transition in developing economies?



Fatima Analia Quinones Ayala

Degree: Bachelor of Science | **Field:** Government, Political Systems
Home Institution: Ecosecurities Buenos Aires Office, Buenos Aires, Argentina | **Host Institution in Germany:** International Carbon Action Partnership, Berlin | **Host:** Stefano De Clara

Fatima Analia Quinones Ayala wants to investigate if revenues from Emissions Trading Systems and other mechanisms can help to achieve technology transfer and climate finance for developing countries.

The main driver of deforestation and forest degradation is the expansion of agricultural land, associated with the production of soy, beef, palm oil, wood, cocoa, and coffee. As a major economic area and the main consumer of these commodities, the European Union is partly responsible for this problem. After the Amazon and the Cerrado ecosystems, the Gran Chaco region in Paraguay is well on its way to becoming the next deforestation zone due to a lack of protection and international awareness. There are various measures to counter these issues. An emission trading system functions market-based and sets a cap on Green House Gas emissions for a specific sector, e.g. energy or transport, to reduce emissions overall. The European Union's Carbon Border Adjustment Mechanism puts a price on carbon emissions from the production of goods imported into the EU to support the decarbonization of EU industry. It initially applies to the import of certain goods where the risk of carbon leakage is at the highest level. Also, a new EU regulation on deforestation-free supply chains aims to ensure that a number of key goods placed on the market no longer contribute to forest deforestation.

Fatima Analia Quinones Ayala aims to contribute to the question, whether Emissions Trading Systems and revenues from the Carbon Border Adjustment Mechanism are an endogenous solution to distributional issues. Her research is to improve the social acceptability of climate policies proposing to use revenues from these systems and mechanisms to achieve technology transfer, capacity building and climate finance in the framework of just transition for developing countries. Fatima is supported by the International Carbon Action Partnership in Berlin.

Food production challenges upon climate change: does the positive yield effect of diverse plant production systems persist under future elevated CO₂ concentrations?



Dr Juan Manuel Romero

Degree: PhD | **Field:** Plant Production, Plant Nutrition, Agricultural Engineering

Home Institution: National Scientific and Technical Research Council, Buenos Aires, Argentina | **Host Institution in Germany:** Forschungszentrum Jülich, Jülich | **Host:** Prof. Dr Uwe Rascher

Juan Manuel Romero compares the performance of intercrop systems to monocrops and investigates if positive yield effects of intercrop systems may be expected under elevated CO₂ conditions in the future.

Rising global temperatures and droughts are already affecting crop production yields and are increasing the global risk of hunger and poor nutrition. Increasing levels of atmospheric CO₂ are initially expected to increase biomass production due to enhanced photosynthesis. However, the photosynthetic rate under elevated CO₂ conditions is mainly limited by nitrogen availability, which impairs the positive effect of elevated CO₂. The ancient practice of intercropping, i.e. mixing two or more species that grow together, seems to be promising: leguminous intercropping could take advantage of future increasing CO₂ concentrations, given their symbiosis with Rhizobium bacteria and, thus, its high capacity for nitrogen fixation.

Juan Manuel Romero plans to analyze the performance of intercrop systems in comparison to monocrops and how plant-plant interactions affect crop traits. Plants emit sun-induced fluorescence, which can show how much photosynthesis is taking place. Fluorescence can be measured at different scales, from leaf level to canopy level. Juan intends to link information from proximal and remote sensing techniques with physiological traits determined by standard methodologies. Airborne measurements will be performed with the HyPlant sensor developed by Forschungszentrum Jülich, whose Institute of Bio- and Geosciences will be supporting Juan's research. He aims to contribute to the development of models that allow linking radiometric data retrieved at airborne levels with those retrieved at canopy and leaf levels. In the long run, Juan hopes to be able to include these developments in the HyPlant data processing chain and in the future in the FLEX processing chain, a project by the European Space Association that aims to measure sun-induced fluorescence from space.

How indigenous knowledge and the empowerment of women in agriculture can help selected agroecological zones in Cameroon adapt to climate change

Dr Boris Dinictri Soh Wenda

Degree: PhD | **Field:** Agricultural Economics, Agricultural Policy, Agricultural Sociology

Home Institution: Université de Dschang, Cameroon | **Host Institution in Germany:** Leibniz Centre for Agricultural Landscape Research, Müncheberg | **Host:** Dr Katharina Löhr



Boris Dinictri Soh Wenda explores the effectiveness of indigenous knowledge practices in Cameroon when it comes to climate change adaption and how women's empowerment in agriculture could favor their adoption.

Climate change poses a serious threat to food and nutrition security, livelihoods, and overall wellbeing, especially for poor and vulnerable people worldwide. Cameroon is no exception as all the agroecological zones of the country are affected as are all sectors. This endangers communities' ecosystems and the services they provide. African communities rely heavily on indigenous and local knowledge for climate adaptation. These provide an important basis for current efforts toward climate change adaptation and mitigation, but little is known about how effective they are. The choice of appropriate climate change policies and strategies should consider gender norms, because in most parts of Sub-Saharan Africa including Cameroon, the bulk of the production processes are carried out by women. They produce 80-90% of household food. There is existing evidence that women's empowerment in agriculture favors the adoption of climate change adaptation strategies. It is therefore important to understand the role of women's empowerment in agriculture in reinforcing the adoption of indigenous climate change adaptation and mitigation strategies in selected agroecological zones of Cameroon.

Boris Dinictri Soh Wenda seeks to explore effectiveness and efficiency of indigenous knowledge practices for climate change adaptation and mitigation in selected agroecological zones of Cameroon. He will test the effect of women's empowerment in agriculture on the adoption of indigenous strategies for said challenges. Boris will be supported by the Leibniz Centre for Agricultural Landscape Research in Müncheberg.

Pathways of soil organic carbon stabilization in restored blue carbon ecosystems



Dr Hao Tang

Degree: PhD | **Field:** Ecology and Biodiversity of Plants and Ecosystems

Home Institution: Sichuan Normal University, China | **Host Institution in Germany:** University of Münster, Münster | **Host:** Prof. Dr Peter Müller

Hao Tang investigates soil organic carbon stocks and their stability in salt marshes and coastal blue carbon ecosystems with different hydrological management and restoration history.

Salt marshes and related coastal blue carbon ecosystems have been recognized as the strongest natural long-term carbon sinks of the biosphere. Salt marshes have a long history of land use and are often degraded in many parts of the world, including Germany and China. Salt marshes in Germany, located along the Wadden sea coast, are almost exclusively semi-natural, anthropogenically created ecosystems. Large parts of the Wadden Sea marsh area have been embanked and drained for agricultural use in the past; however, many of these ecologically and hydrologically degraded areas are currently being restored.

To improve understanding of restoration effects on coastal carbon sequestration, Hao Tang will investigate and compare the process of soil carbon stabilization in drained vs. hydrologically restored marsh areas along the German Wadden Sea coast. The formation of soil organic carbon, i.e. soil carbon stabilization, can be divided into pathways that yield different soil organic fractions based on their chemical quality and size. One of these fractions is mineral-associated organic carbon, which is generally regarded as the more stable fraction in terrestrial soils. For wetland soils, however, the stabilization of labile organic matter into mineral-associated organic carbon is still poorly understood. Hence, Hao wants to assess soil organic carbon stocks and their stability in sites with different hydrological management and restoration history. His observational field study will be accompanied by a lab experiment in order to gain deeper mechanistic insight into the differences in soil organic carbon stabilization pathways between degraded, restored and natural marsh soils. Hao's endeavor will be supported by the Institute of Landscape Ecology at the University of Münster.

Imprint:

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Responsible for the content: Dr Judith Schildt and Int'l Climate Protection Fellows
Typesetting and printing: Kulturidee GmbH