Durham University

The Durham University Global Challenges Centre for Doctoral Training

Introduction

The Durham University Global Challenges Centre for Doctoral Training consists of a cohort of 25 international PhD students, all citizens of a developing nation.

Dr Douglas Halliday

Director of the Durham University Global Challenges Centre for Doctoral Training

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THE GLOBAL GOALS
For Sustainable Development

Each doctoral candidate is undertaking a three year fully funded PhD programme designed to identify steps towards a solution to a specific global challenge aligned with one or more of the United Nations Sustainable Development Goals.

The researchers are all supervised by a multidisciplinary team of academic staff reflecting the complex and wide ranging nature of these global challenges. The centre members benefit from a bespoke programme of events designed for this cohort and will undertake a funded placement at a partner university in a developing nation to give them greater insight into the context of the challenge they are researching.

This exciting initiative is one of a small number of Global Challenges training centres in the UK. The university believes that this Centre will act as a model for others to adopt in future. We are training leaders of the future who will learn from their research, learn from their experiences and learn from each other how to make a real, substantive and lasting different to the world in which we all live.

Over the following pages, we'll present each of the Cohort's case studies and the long term aims.

Victor S. Agostino

Enhancing treatment of Leishmaniasis

@victoragostino_

#Leishmania #Leishmaniasis
#ChemicalBiology
#MedicinalChemistry
#DrugDiscovery
#NeglectedDiseases

Leishmaniasis is a complex group of devastating diseases with 2 million new cases every year around the globe. The treatment available is inefficient and presents severe side effects that could lead to death. My research aims to enhance the treatment of leishmaniasis by improving the activity of compounds with known efficacy. These improvements will allow new molecules that might target the disease more effectively.
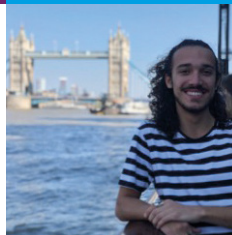
I was born and raised in Sao Bernardo do Campo, a city placed in the state of Sao Paulo, Brazil. I am the son of two brave people who have always sacrificed themselves to give us, my brother and I, a life that was as fair as possible. I studied Biomedical Sciences as an undergrad at the University of Sao Paulo. When I am not working on my research, I like to spend time with friends, gaming (or watching people game) and also explore new places in the world.

Describe your project

This project can be generally divided into two phases; in the first phase, we are working on chemical modifications of new compounds, which could provide insights on the drug development process for leishmaniasis, potentially contributing to new treatments for the disease. In the second phase, we will investigate how exactly these compounds interact with the pathogen.

By examining the parasite and its biological processes more closely, we are able to identify which ones are essential for parasite survival.

In an ideal scenario, a good drug could be discovered during the research, which could further revolutionise the leishmaniasis treatment worldwide.

Which of the UN Sustainable Development Goals does your project address?

3 GOOD HEALTH AND WELL-BEING

Akanksha Agrawal

The development and characterisation of green ionic liquid solvents for algal biofuel extraction

#Energy
#Fuel
#Biofuel

I am working on biofuel (bioethanol) production. It is going to provide society a sustainable and ecofriendly energy fuel.

I am from the central part of India. I did my graduation with botany, chemistry and biotechnology. After qualifying JNU-CEEB, I got a master's in biotechnology from the University of Jammu, India. I also successfully completed training in different Indian institutes: Institute of Genomics and Integrative Biology, New Delhi and National institute of Biologicals, Noida. Science and research has always been my passion more than anything else and perhaps this is the reason I really love my field and enjoy my work. I am also interested in painting, cooking, listening to soft songs, dancing, playing chess and interacting with people of different areas.

Describe your project

> Due to steady increases in global energy demand and the subsequent depletion of fossil fuel reserves, there is a pressing need for a sustainable, eco-friendly and renewable energy resources.

Among the various alternatives, energy from biomass is a promising candidate to meet future energy requirements, particularly for transport and heating. The two most common biofuels generated from biomass are bioethanol and biodiesel, which have the potential to replace petrol and diesel respectively. Several feedstocks, such as edible crops, lignocellulosic biomass and seaweeds can be used for bioethanol production. Algal biofuels are attractive renewable fuels for developing nations such as India. I am using the green seaweed, Ulva spp., as biomass. Enzymatic hydrolysis and fermentation are very well established and optimised processes but research is still going on for pretreatment. I will be using 'ionic liquids' as the pretreatment agent because these are environmentally benign solvents and can decrystallize complex carbohydrate structures to fermentable sugars. I will also be focussing on identifying ionic liquid stable enzymes for hydrolysis to carry out 'one-pot consolidated bioprocessing'. I believe that my research will definitely contribute to a cost-effective and sustainable biofuel production for developing countries like India.

Which of the UN Sustainable Development Goals does your project address?

7 AFFORDABLE AND CLEAN ENERGY

14 LIFE BELOW WATER

Majo Carrasco-Tenezaca

Malaria Vector Ecology and Housing in sub-Saharan Africa

@BovaNetwork

#InfrastructureForHealth
#EndMalaria #TropicalDiseases
#HousingForHealth

Most malaria transmissions occur indoors and at night. Developing elements and strategies that protect people from vectors is a crucial step in the fight against malaria. The project will look at where and how we can improve households to make them cool while preventing mosquitoes getting in.

I am an architect and an international development practitioner from Ecuador. I have worked in collaboration with biologists, communicators and health professionals for the last 8 years, specifically in housing to prevent Chagas disease. This experience make it clear for me the importance of a multidisciplinary team and of a trans-disciplinary approach.

Aside from my main research I am interested in feminisms from the (global) south, their theories and the platforms that can be used for communication. During my last field experience in The Gambia I have been reassured of the importance of storytelling, which is among my passions.

Describe your project

Affordable houses that take into consideration culture and context, while implementing technological innovations are an asset when it comes to disease prevention. It is not new that approaches to vector control start in the household. Even with this idea in mind, it is not common to talk about infrastructure improvements for health.

Having a safe house does not only mean reduced probability of getting sick, but also an improvement in general comfort and an increase in living standards. Implementing new technologies can reduce the time spent in household activities, which translates in time for activities that mean economic income or more time for school related activities.

Which of the UN Sustainable Development Goals does your project address?

3 GOOD HEALTH AND WELL-BEING

11 SUSTAINABLE CITIES AND COMMUNITIES

Raymond Christianto

Surface science for water harvesting in Indonesia

#WaterHarvesting #Biomimetic #SmartSurface

In this project, I am using surface science and computer modelling to optimise a surface which can harvest rainfall, which will be utilised in Indonesia to resolve water scarcity.

Raymond comes from Surakarta, Indonesia. His family consists of his father, mother, and little brother - all of them are in Surakarta. Raymond finished his Bachelor of Engineering in 2018 at Universitas Gadjah Mada, Yogyakarta. His first love is computing, while his second love is Physics. In his free time, he likes to play video games and read fiction and nonfiction books. Also, he is a fan of Japanese pop-culture.

Describe your project

The aim is to design and optimise bioinspired surfaces to help solve the challenges of clean water and water scarcity in Indonesia. Currently, we are working with a mesh structure inspired by *Thuja plicata* (Pacific red cedar), which shows a very good rainfall collecting ability.

We are also a part of the Global Biomimetic Water Harvesting project, where we are going to engage local communities whose access to water remains difficult. Supported by Indonesia's rich biodiversities, we are looking for other bioinspiration for more efficient water harvesting surface structures.

Which of the UN Sustainable Development Goals does your project address?

3 GOOD HEALTH AND WELL-BEING

6 CLEAN WATER AND SANITATION

11 SUSTAINABLE CITIES AND COMMUNITIES

Raquel Chun

Real time monitoring of weather, ethnographic interviews and soil sampling of swidden agriculture farms in southern Belize

#FoodSecurity
#SmallHolderFarmers
#MayaSubsistenceFarming
#ClimateVariability

Real time monitoring of weather, ethnographic interviews and soil sampling of swidden agriculture farms in southern Belize will contribute to understanding the impact of climate change on decision making of smallholder Maya farmers.

Raquel Chun is an indigenous Mopan Maya of Belize who has a varied background in natural resource management, wildlife studies, climate change and project development. She completed her undergraduate degree in Natural Resource Management at the University of Belize followed by a Master's Degree in Wildlife Health and Population Management at the University of Sydney, Australia. She has always pursued her interest in conservation, environmental sustainability and subsistence agriculture. She has worked in various capacities with regional organizations and small grassroot conservation organizations in Belize. She is a very family-oriented person who enjoys reading and traveling and loves to share information about her home country.

Describe your project

This study will contribute to increasing knowledge of how climate variability and extremes impact the agricultural productivity and decision-making of Maya subsistence farmers in Belize (with implications for subsistence farming across Central America).

With millions of smallholder Maya farmers in Central America depending on subsistence agriculture for food and economic security, it is imperative to gain knowledge on how climate change can affect these vulnerable populations. Understanding the impacts of climate change on subsistence farmers can help with the development of adaptive measures to offset the extreme impacts of this worldwide issue as well as inform policy makers at the national and international level of the threats to and needs of smallholder farmers.

Which of the UN Sustainable Development Goals does your project address?

2 ZERO HUNGER

13 CLIMATE ACTION

Bruno Gabriel Costelini

Global governance and regulatory processes of deep sea mining

facebook.com/bgcostelini

@bgcostelini

@bgcostelini

#DeepSea #SeabedMining
#OceanGovernance #LawOfTheSea

The project looks at how science feeds into the regulation and global governance of deep sea mining. Research uses ethnographic methods to determine the actors, networks and discourses that surround knowledge at the International Seabed Authority negotiations in Jamaica.

I'm from Curitiba, Brazil, where I received my degree in Oceanography, and am now pursuing a PhD in Law dealing with global governance, international relations and environmental conservation. I have always been fascinated with narratives and books, and the power and centrality of knowledge in our society.
When not doing research at the library I can be found hanging out in cafes, at the movies, or just travelling around the world in search of exciting cultural experiences.

Describe your project

By understanding the various ways that science and scientific discourses are used and translated into regulations for deep seabed mining, we will help to ensure that those regulations, particularly those related to environmental protection and conservation, follow the principles of the precautionary approach, inscribed in the United Nations Convention for the Law of the Sea.

By casting a critical eye on the workings of the institutions and processes involved in shaping the future of our oceans and the exploration of its resources, the research aims to propose new frameworks for its effective regulation and management, making use of the best available knowledge and expert advice, so that if/when mining activity in the deep sea takes place, it doesn't cause any serious harm to the marine environment.

Which of the UN Sustainable Development Goals does your project address?

14 LIFE BELOW WATER

Burag Gurden

Governance of the energy-water nexus/ frontier in Turkey

@BuragGurden

#Energy #Water #Nexus #Governance #Geothermal #Turkey

This transdisciplinary research investigates the governance of the water-energy nexus in Turkey by focusing empirically on the socio-ecological and hence developmental implications of geothermal energy on local regional and national levels.

This is Burag from Turkey. I have a bachelor's degree in Economics from Bogazici University in Istanbul. After a short year of banking experience in the private sector I went on to Lund University in Sweden to study in a master's programme of International Development and Management (LUMID). I have always been engaged with questions about development, environment and good life. It is very difficult to distance myself from reading, thinking and contemplating about these, but when I do, you can find me in the nature chilling, jogging, observing my environment or at home cooking or watching movies.

Describe your project

As energy and water demand globally rises, geographies of water and energy become increasingly conflict-prone. This sadly comes with the depletion of surface- and groundwater (eco)systems and surely of the hydro-social life around them. Hence, the need for advancing resource governance and sustainability at the water-energy nexus grows, and so does the load of critics toward top-down resource developmentalism and hegemonic status-quos in resource governance.

This research will involve a range of stakeholders across energy systems, including state institutions, private companies, civil society organisations (CSOs) and local communities.
The outcome of this research will contribute to sustainable geothermal energy governance in Turkey, and thereby further the debate around the water-energy nexus, both as an unfolding development discourse and an emerging integrated resource management concept.

Which of the UN Sustainable Development Goals does your project address?

| 6 CLEAN WATER AND SANITATION | 7 AFFORDABLE AND CLEAN ENERGY | 12 RESPONSIBLE CONSUMPTION AND PRODUCTION | 15 LIFE ON LAND | 16 PEACE, JUSTICE AND STRONG INSTITUTIONS |

Tariro Gwandu

Soil health improvement technologies to enhance drought and nutrient resilience in urban agroecosystems

facebook.com/tariro.gwandu

@TeeGiz

#FoodSecurity #CropNutrition
#BuildingResilienceToClimateChange
#ClimateChangeAdaptation
#PromotingCircularEconomyConcept
#GlobalChallenges

The project seeks to optimise options for using water treatment residual in urban crop production amidst combined challenges of land pollution, soil degradation, and climate change.

Tariro Gwandu studied Soil Science both at undergraduate and master's levels at the University of Zimbabwe. She has worked as a research scientist at the Chemistry and Soils Research Institute in Zimbabwe before taking up a PhD in Environmental Engineering. Her research interests are in plant nutrition, food systems, environmental management and climate change adaptation. Tariro enjoys travelling, meeting new people & learning about different cultures and reading novels.

Describe your project

The research seeks to enhance soil health through sustainable use of a by-product of municipal clean water treatment works, Water Treatment Residual (WTR). Sub Saharan Africa (SSA) is currently facing rapid human population growth and urbanisation, increased demand for potable water, with an inevitable increase in municipal WTR production, and the associated environmental challenges of its disposal.

On the other hand, the increasing population and high rates of unemployment in SSA has forced many urban dwellers to rely on farming to boost family nutrition, albeit on marginal soils, demanding immediate research into alternative soil improvement technologies to halt land degradation and enhance crop yields. Many urban farmers are struggling to access fertilisers and other organic nutrient resources such as manure for crop production due to lack of financial resources. Therefore, sustainable use of WTR can restore soil productivity and improve ecosystem functions and build their resilience to global environmental changes. This work takes cognisance that WTR waste, which is normally disposed to landfill, is a global challenge but could also be a valuable resource that can be reused and integrated into the circular economy and help achieve SDG 12 which relates to responsible production and consumption. This work will leverage other related initiatives to achieve the United Nations soil health related sustainable development goals and potentially impact on 40% of SSA households currently practicing urban agriculture.

Which of the UN Sustainable Development Goals does your project address?

1 NO POVERTY

2 ZERO HUNGER

11 SUSTAINABLE CITIES AND COMMUNITIES

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

Mohammad Daud Hamidi

Low cost household water purification in Kabul

facebook.com/hamidi7474

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@daudhamidi

#Water #WaterQuality #Health #WaterInSecurity #SDG3 #SDG6

The project will look into utilizing local materials for household water purification. Moreover, through the project an intervention will be designed and implemented for sustainable use of local materials for household water purification in Kabul.

Born and raised in Herat, Afghanistan. I hold a Master's degree in Integrated Water Resource Management (IWRM) from the German-Kazakh University, Kazakhstan and a BSc in Civil Engineering from Jami University, Afghanistan.

I joined Durham University in June 2019; prior to PhD, I worked with the Regional Environmental Centre for Central Asia (CAREC) in the Smart Waters Project (in Kabul) funded by USAID. I got more than 5 years of work experience working in water sector with national and international organizations, such as the UNESCO Chair on Water Management in Central Asia, ADB and SIPRI.

I developed an integrated surface and underground model for Kabul City Region using DHI MIKE SHE as a research consultant for project supported by USAID-PEER and cooperated with an USDA scientist in running the same model for a controlled watershed located in South Carolina, US. I undertook short term consultations on flood modelling and hydrological modelling for the School of Engineering, Nazarbayev University and Kazhydromet supported by UNDP.

My interests in free time are reading and walking.

Describe your project

The intention is to introduce locally produced household water purification filters, design and implement an intervention on sustainable use of local materials to address poor water quality in Kabul. In the local context, the water quality of Kabul is deteriorating on a daily basis.

It has been estimated that in Afghanistan around 30–40% of all reported diseases and deaths are due to poor water quality. The results of this research will enable local communities in Kabul to access clean water using local, low cost materials for household water purification.

Which of the UN Sustainable Development Goals does your project address?

3 GOOD HEALTH AND WELL-BEING

6 CLEAN WATER AND SANITATION

Divya Jain

A whole lifecycle approach to solar PV in India

Solar Photovoltaic technology is one of the principal ways in which humankind can produce electrical energy in a sustainable manner which does not adversely impact on carbon dioxide emissions. This project will look at developing strategies for managing the significant volume of solar PV waste in developing countries when PV systems reach their end of life.

I grew up in the beautiful valley of Uttarakhand, India. I completed my undergraduate degree in B.Sc Physics (Hons) from Delhi University, Delhi, India followed by a master's degree in Physics with specialisation in Experimental Condensed Matter Physics from Banasthali University, India. Currently, I am a postgraduate researcher in the Department of Physics, Durham University. My interest is all about studying nature and getting inspiration from it, to innovate for the betterment of humanity and social development without damaging the planet's ecosystem.

Describe your project

Communities in Nepal and India will benefit directly from this project. The research will provide a novel recycling approach that is cost-effective and eco-friendly to manage the waste disposal from the end of life of PV systems. The focus will be on finding a recycling process using organic and non-toxic chemicals, which will minimize the impact on water contamination and environmental stresses. This approach is particularly suited to developing countries.

PV technology will continue to be introduced and adopted on a widespread and increasing scale, but in the long run will only be truly sustainable if effective mechanisms and approaches for the disposal of used PV systems are developed. Technological and innovative scientific solutions are required along with policy frameworks and community involvement, training and support. There are opportunities for the development of start-ups/entrepreneurship, businesses and employment related to the reuse and recycling of PV systems in India and other developing countries.

In general for environmental consideration at national level it is policy makers together with local companies that are responsible for the life cycle impacts of manufactured products. They should be encouraged to develop new materials, process tests and design products which can be readily recycled. The area of PV recycling lacks a robust policy framework at local, national and international level. Outputs from this project will be used to formulate an initial policy framework contextualised for India. It will be the responsibility of all involved in this project to ensure that solar PV does not become similar to the massive plastic waste problem for future generations.

Which of the UN Sustainable Development Goals does your project address?

7 AFFORDABLE AND CLEAN ENERGY

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

13 CLIMATE ACTION

Martin S. Kandeh

Understanding the way rural people interact and manage their contact with animals

facebook.com/MartinsKandeh

#ThinkHuman-AnimalforGlobalHealth
#Human-AnimalEntanglement
#HumanAnimalandEnvironment

With the emergence and re-emergence of Zoonotic infections that continue to threaten human health security, achieving global health requires an understanding of the way humans, especially those people in rural communities, interact with animals and the native strategies they use to manage their contact with animals.

I am a Sierra Leonean, I studied sociology for my undergraduate and master's degrees and worked at the Njala University Sierra Leone as part-time tutor. I developed interest and became actively engaged in researching human-animal interaction during the 2014-2016 Ebola outbreak in West Africa, with my country being one of the countries that was badly hit with over 3000 deaths. I realised during that outbreak that socio-cultural and behavioural factors were key drivers that propelled the spread of the disease. This triggered my interest and gave me the urge to start thinking about human-animal entanglement.

Alongside my academic and research work, I am also a renowned reggae musician and have used music as a potent tool to communicate my research outcomes, and to advocate and raise awareness on a wide range of social issues such as gender and sexual based violence, children's rights and youth unemployment. In fact during the 2014-2016 Ebola epidemic, my song (Ebola is real) was widely used especially in the Southern region of Sierra Leone to create awareness about the disease and its precautionary measures.

Describe your project

Acknowledging the native perspective and traditional knowledge of rural people in policy formulation is very significant for successful intervention approaches. Many policies have failed to meet their desired goals because they do not resonate with existing practices and perceptions of the people for which they are designed and implemented. A typical example was the bush meat ban in Sierra Leone during the 2014-2016 Ebola Epidemic. Most rural people could not conform to the laws restricting bush meat consumption despite efforts by government and international organisations. This was because the laws were perceived as not being in conformity with the behavioural patterns and beliefs of the people.

I consider rural dwellers as crucial in the control of zoonotic diseases because of their significant role in rural-urban food supply and because many of the zoonotic pathogens are believed to be from wild animal hosts which are often in close proximity with rural settlements. In sub-Saharan Africa humans and animals usually share the same domestic spaces.

This project will provide a model in formulating policies and interventions in dealing with animal related infections and diseases such as Ebola, Lassa fever and the novel Covid-19 infection. The study will also reinforce the 'One Health' agenda, which emphasizes that the health of humans and animals are interconnected.

Which of the UN Sustainable Development Goals does your project address?

3 GOOD HEALTH AND WELL-BEING

Hamza Lakhal

The Role of the Arts in Climate Change Mitigation: Environmental Philosophies of Saharawi Refugee-Citizens

@hamzalakhal14

#Energy #Petroculture
#EnergyJustice #WesternSahara

This project explores Saharawi indigenous ethnoecological knowledge and environmental philosophies for providing positive ways to address ecological disaster and queries the role of culture and the arts as primordial vehicles for promoting environmentally-aware ways-of-living.

I am Hamza, I'm a poet and activist from El Aaiun city, Western Sahara. My first poetry collection was published by L'Harmattan, Paris, in 2013. In 2002 I led the first campaign for a university to be built in Western Sahara (there is no university until now). For this, Moroccan authorities barred me from all secondary schools for 12 years (2002-2014). During this period, I established a cultural club called "The Last Wave," taught myself English and progressed with my poetry. In my spare time, I enjoy trips to the countryside and camping, music and reading.

Describe your project

My project will show how the arts and cultural production can be harnessed to achieve environmental citizenship, even in a context of very limited financial resources and incredibly harsh climatic conditions as found in the refugee camps in the driest part of the Sahara desert.

Countries of the Global South, above all indigenous communities within these, are the first to face the direct consequences of climate change. Yet within the environmental humanities, the little work has focused on indigenous engagements with ecological disaster. Previous studies have been preoccupied with indigenous resistance to fossil fuel developments, and the negative impact of the latter on indigenous communities. My project will make clear the potential of indigenous ethnoecological knowledge and environmental philosophies for providing positive ways to address ecological disaster. It will capture knowledge from a community (the Saharawi) that already have ways-of-life that offer an alternative to oil-fuelled, consumerist lifestyles 'petroculture', which can help us avoid planetary catastrophe. Saharawi models of environmental citizenship, to be explored in the project, have the potential to significantly inform policy in other DAC countries (and elsewhere) facing the dramatic consequences of climate disaster and simultaneously holding enormous potential for solar and other renewable energy roll out.

Which of the UN Sustainable Development Goals does your project address?

7 AFFORDABLE AND CLEAN ENERGY

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

13 CLIMATE ACTION

Atreyee Mishra

Development of copper-dependent antimicrobial resistance breakers

@AtreyeeMishra

#Chemistry
#KeepAntibioticsWorking
#FightAgainstBacteria
#CancerResearch
#Wellbeing #HealthForAll
#GlobalChallenges #GCRF

The project goal is to keep away cancer, a global challenge for the human race. I am aiming to stop bacterial resistance in cancer treatments, using copper-metal chemistry.

#KeepAntibioticsWorking

Before being chosen to participate in finding solution for global challenges, I did my Bachelor's and Master's degree at the Indian Institute of Science Education and Research, Bhopal. Being born and brought up in West Bengal, a state of Eastern India, I have immense interest in Bengali literature and music. My leisure time is usually invested in playing violin, gardening and cooking. Being a believer in the beauty of life in this world, my holidays are devoted towards travelling. I also broaden my thoughts and knowledge through volunteering in different events, which gives me great pleasure.

Describe your project

> Changing the world is all about every human contributing a stone to build the road towards it. This research is about taking a step forward towards the treatment of cancer, the most lethal disease in today's world.

Antibiotics are life-savers. However, overuse leads to their deactivation as counter resistance develops in bacteria. Carbapenem, a major cancer treating drug, is also facing a similar crisis.

The bacterial enzyme (NDM-1) being the reason behind this resistance, can be dealt with using copper-containing compounds. This metal is commonly found in drug molecules and is known to be toxic against bacteria. First found in India, emergence of NDM-1-based bacterial resistance has become a world-wide threat for the human race, the death-rate being higher every passing day. My research will help to put a brick in this wall of the fight against bacteria, keeping antibiotics functional.

Which of the UN Sustainable Development Goals does your project address?

3 GOOD HEALTH AND WELL-BEING

Vidayshree Diana Natasha Misir

Understanding the impact of climate and climate change on water and food security in Guyana

An interdisciplinary approach (hydro-climate, water resources, agriculture, food production, economics) to research the impacts of climate and climate change on water and food security in Guyana, also addressing a new Government policy to enhance agricultural activities inland.

I was raised in the hinterland town of Bartica, Guyana on the banks of the Essequibo River. At age eleven I began high school in the capital Georgetown, later graduating from the University of Guyana with a B.Eng Civil Engineering. Growing up surrounded by the beauty of the Essequibo River and watching the rain race across the water to our town, only fueled a fascination with water. This led to my M.Tech Hydrology at IITRoorkee, India. Water in all forms is beautiful, terrifying and essential. I just love learning about its vagaries and effects on people and landscapes.

Describe your project

This research is challenge-led and will address identified developmental hurdles due to DAC nations' vulnerability to the effects of a lack of planning and infrastructure to deal with water availability and climate change.

The project will take an interdisciplinary approach, incorporating hydrology, climate, water resources, agriculture and food production, and economics to develop innovative solutions to intractable development issues in order to identify practicable pathways to healthier and safer lives, sustainable development for all and stable institutions.

In particular, the study will enable a clearer understanding of the impacts of extreme weather events on the agricultural sector. By applying climate change scenarios of rainfall, temperature and other variables to a hydrological and crop growth model we hope to understand possible future changes to agricultural production and yield on the coast and savannahs. The main agricultural area is the coast which is under constant flood hazard. The Rupununi Savannah is being looked at for large scale agriculture. However, it is seasonally flooded and experiences water drying of the surface and most wells during the year.

To date, investigating the groundwater availability has begun through citizen science in the Rupununi Savannahs. We have enlisted the help of villagers throughout the Savannahs to monitor the water levels in their hand dug wells and collect information for use in SHETRAN model of the area to investigate the groundwater regime. Additionally, farmers from the villages have provided their perception of the changes to the seasons and weather patterns through questionnaires.

The findings can be used to inform the policy to address the related developmental challenges in similar DAC countries.

Which of the UN Sustainable Development Goals does your project address?

2 ZERO HUNGER

13 CLIMATE ACTION

Thuli Montana

Exploring the politics and ethics of water security in Cape Town, South Africa

@thulimontana

#WaterSecurity #WaterResilience #GoodWaterGovernance #SDG6

The project will explore the politics and ethics of water security in Cape Town, South Africa following the #DayZero events. It aims to contribute towards policy and practice for good water governance in order to build water resilient cities in Sub-Saharan Africa.

I was born and raised in Pretoria, South Africa. I did my undergraduate studies at the University of the Western Cape in Environmental and Water Sciences and my Masters in Environment and Development at the University of Leeds. Tackling global development challenges through good governance has always been a key interest of mine that I hope to continue working on in my future career pathway. Outside my research, I enjoy exploring new cities and spaces; discovering and learning new things in unfamiliar environments. I am intrigued by how Africa is portrayed and discussed across the world and I am always delighted to learn about new cultures and ways of living, whilst also sharing about my African identity. The sound of the saxophone, rainbows, a cup of tea and being an elder sister to my siblings are some of my favourite things.

Describe your project

This study provides a novel contribution to our understanding of water crises and responses to them, following the events of the water crisis in Cape Town, South Africa where the city underwent a severe drought affecting all citizens. It contributes to the ongoing need to develop water policies that improve sustainable access to safe drinking water through an exploration of the dynamics of water governance. As an essential resource enabling life, water has an all-encompassing cultural, social, economic and environmental pertinence.

The primary social impact of this research is situated in its exploration of the sites of social inequality related to water access and security in Cape Town. While water is regarded as a basic human right in South Africa, providing equal access to water remains a critical challenge. Issues of race, gender and class are strongly associated with access to water and how citizens experience water crises. The way in which water is valued reflects socio-cultural, economic and political dynamics that affect how societies function. The City of Cape Town acknowledges the complex relationships between water, people, the economy and the environment. As such, there remains a need to provide evidence based research which contributes towards resolving this complexity.

Which of the UN Sustainable Development Goals does your project address?

6 CLEAN WATER AND SANITATION

10 REDUCED INEQUALITIES

11 SUSTAINABLE CITIES AND COMMUNITIES

13 CLIMATE ACTION

**17 PARTNERSHIPS FOR THE GOALS**

Vaishnavi Mukkawar

Mitigating Flood Risks in Rice production in the Indian Subcontinent

@Vaishnavimukka1

#FoodSecurity

The project aims to produce new versions of the rice gene SUB1A (alleles) that are more stable during prolonged flooding and therefore generate enhanced submergence tolerance in rice grown in the Indian Subcontinent.
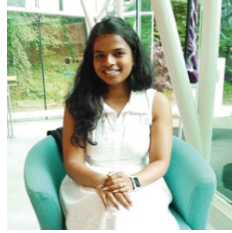
I grew up in Delhi, India. I pursued Bachelor's in science in Biochemistry from Delhi University and Master's in Science in Biotechnology from Jamia Millia Islamia. Besides a love for science, I have a keen interest in reading books, writing poems sometimes and shopping.

Describe your project

Rice is a staple food across the globe and is by far the most important food crop compared to wheat and maize for populations in low and lower-middle income countries. Rice provides 20% of dietary energy supply all over the world while wheat supplies 19% and maize 5%. But Rice production is susceptible to climatic changes. In Kerala, floods affected 25,000 hectares of rice production.

The project aims at understanding the impact of environmental stress (flooding, phosphorus and tolerance in poor soil) on rice productivity. Revealing the identity of signaling pathways that boost crop productivity under stress will be crucial for classical breeding and biotechnology programs for increasing crop productivity. Specifically, it aims to understand how protein modification is involved in flood and phosphorus tolerance which can be exploited to mitigate crop losses.

Which of the UN Sustainable Development Goals does your project address?

| 1 NO POVERTY | 2 ZERO HUNGER | 12 RESPONSIBLE CONSUMPTION AND PRODUCTION | 13 CLIMATE ACTION | 15 LIFE ON LAND |

Nyaboke Omwega

Transport as Gendered Employment Practice in Sub-Saharan Africa

#WomenInTransport
#GenderEquality

Worldwide, the transport sector is performing poorly in terms of gender parity in employment and skills acquisition. My research interrogates key factors impacting opportunities for women's employment and career development in the Sub-Saharan Africa's transport sector.

Boke grew up in Nairobi, Kenya and enjoyed the opportunity to study in Mississippi in the USA and work across East Africa, including Rwanda prior to joining Durham University in 2019. She worked in International Development in East Africa in the areas of HIV, Maternal and Child Health as well as gender mainstreaming since 2011. Her work had a strong focus on behaviour change program development and implementation.

Boke holds a Bachelor of Arts in Psychology from Millsaps College, USA and a Master of Public Health from Jackson State University, USA. She enjoys reading, single player video games and music.

Describe your project

An ethnographic approach to studying female leadership in the transport sector could lead to significant insights into the sociocultural barriers to gender equality in this sector.

• How much can we attribute the lack of visible leadership in the transport sector to the issues of gender mainstreaming in said sector?

• What are the key socio-cultural issues around women's mobility and engagement in the transport sector?

Exploring the male-dominated transport sector's impact on women's engagement with the sector can help develop better and more sustainable interventions to ensure that women can be a part of this sector and benefit in tandem with men from having their voices heard in it.

Which of the UN Sustainable Development Goals does your project address?

5 GENDER EQUALITY

8 DECENT WORK AND ECONOMIC GROWTH

11 SUSTAINABLE CITIES AND COMMUNITIES

Hirunika Perera

The development of peptidomimetics (peptoids) as therapeutics for treatment of Chagas disease and Leishmaniasis

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perera.902

#Health #DrugDevelopment
#NeglectedTropicalDiseases

Neglected tropical diseases (NTDs) are a significant global health burden, affecting approximately one-sixth of the world's population. This project is in the area of Leishmaniasis and Chagas diseases to adopt both chemical and biological tools to develop therapeutics and elucidate their mode of action to validate new drug targets.

I'm Hirunika Perera and I'm from Sri Lanka. I've completed my BSc (Special) Degree majoring in Microbiology from University of Kelaniya, Sri Lanka and then I worked there as a teaching assistant in the Faculty of Science and Faculty of Medicine. While I was working there, I worked on a project related to Leishmaniasis and it motivated me to find other projects related to these infectious diseases. Fortunately, I got this opportunity to enrol in a world ranked university, like Durham University, to fulfil my dream of achieving a postgraduate degree in the field of my research interest. Apart from my academic work, when I have a free time, I would like to read, watch TV and spend some quality time with my family.

Describe your project

The illnesses classified as NTDs by the World Health Organization (WHO) include conditions that have historically been overlooked by international public health efforts, leading to insufficient prevention and treatment options. These diseases are typically endemic in resource-poor, developing countries where populations have limited access to healthcare, and a lack of resources to tackle the disease. This project will reduce the cost of drug development making it affordable to all the people.

NTDs such as Leishmaniasis and Chagas disease are infections caused by insect vector-borne protozoan parasites. Combined, these vector-borne diseases affect some of the world's poorest communities, particularly in tropical and subtropical regions. In addition to the mortality of these diseases, they can cause severe disfigurement or long-term disability leading to significant social and economic consequences. Developing a drug from the beginning takes 10-17 years and it is a highly expensive process. By repurposing already approved drugs we can make the process shorter. We are trying to modify drug molecules to make compound libraries with anti-leishmanial activities with the purpose of developing them into a safe treatment method.

Which of the UN Sustainable Development Goals does your project address?

3 GOOD HEALTH AND WELL-BEING

Laksmi Rachmawati

Developing best practice to protect children from air pollution in Indonesia: Exploring carers' risk perceptions

#AirPollution
#LimitAirPollution
#HealthProtection
#Children

By exploring carers' risk perceptions of air pollution and the practices to protect their children, it is expected to understand the carers' behaviour based on their perception of the effectiveness of their approach and the safety impact to their children.

Laksmi Rachmawati got bachelor's degree from Gadjah Mada University, Yogyakarta and master's degree from Australian National University, Canberra; both in Economics of Development. As a researcher in the Research Centre for population, Indonesia Institute of Sciences (LIPI), Laksmi had extensive research experiences in many parts of Indonesia related to coastal-small islands management and fisheries management, climate change adaptation (small islands and urban areas) and disaster risk reduction. Laksmi started her studies on risk perception on volcanic activity (2012), earthquakes/tsunamis (2013) and floods (2014) in Indonesia. In 2015-2017 she was involved in HIVE (Health Intervention in Volcanic Eruption) Durham University, to investigate people's perception of risk due to volcanic ash exposure and the use of respiratory protections. In her work Laksmi also has had the opportunity to explore a lot about different cultures and local traditional cuisines.

Describe your project

Air pollution gives a severe threat to children's health and well-being. As children are in their growth phase and are part of a vulnerable group, they face higher risk caused by air pollution. There is no particular protection for children that can limit adverse health impacts. This complicated situation makes carers face a dilemma in the choice of best protection for their children in polluted environments.

This project aims to explore the variations of carers' risk perception and the practices of protection for limiting the air pollution exposure in order to minimising adverse health impacts to the children. This will help to find new strategies for protecting the children from air pollution.

Which of the UN Sustainable Development Goals does your project address?

3 GOOD HEALTH AND WELL-BEING

11 SUSTAINABLE CITIES AND COMMUNITIES

Rahmawati Rahayu

Regionalisation Rainfall – Runoff model for flood forecasting in Indonesia

#HydrologyModelling
#RegionalisationModel
#FloodModelling

The development of a rainfall-runoff model can be used to improve flood prediction and warning to build resilience through flood management information systems.

Ayu is a lecturer at Faculty of Earth Sciences and Technology in one of the best universities in Indonesia, Institute Technology Bandung (ITB). She is Javanese who grew up in Sunda land, Bandung city, and never left the city until she took a doctorate program in Durham University UK. Her love of research led her to have a career in academics. After finished undergraduate from Meteorology Department ITB, she work at Indonesian Institute of Science (LIPI) as a research assistant and at the same time she also continued her master's degree in Groundwater Engineering. After 5 years' experience in research at institute LIPI she moved to work in university as a lecturer. Apart from study and research, she loves traveling and enjoying the beauty of nature.

Describe your project

From this research, the aim is to develop a regionalisation rainfall runoff model in extremely data scarcity tropical settings that will be effective to be used for flood prediction in Indonesia.

Regionalisation is a technique that is transferring parameter values of hydrological model determined from reference gauged catchments to ungauged catchments. This research seeks to contribute to understanding of regionalisation method that can be applied to tropical developing countries with limited hydrological properties for flood forecasting analysis.

The objective of this project is to create social and economic benefits by improving existing flood forecasting tools by providing more reliable rainfall runoff models and regionalisation relationships built on river flow observations from hundreds of catchments across Indonesia. Improved solutions to this problem would have a significant economic and social impact in the region.

Which of the UN Sustainable Development Goals does your project address?

3 GOOD HEALTH AND WELL-BEING

6 CLEAN WATER AND SANITATION

11 SUSTAINABLE CITIES AND COMMUNITIES

Anza Shakeel

Machine learning for earthquake prediction

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#MachineLearning
#DeepLearning
#Earthquakes #InSAR
#Sentinel-1 #AseismicSlip

The project will use machine learning techniques on InSAR data to train a generalised model that understands and predicts the anomalous behaviour in case of an earthquake.

I am from Pakistan and I did my master's in computer sciences from Information Technology University, Lahore. I have been using deep learning for the past 3 years in projects involved with the IT board of Punjab government of Pakistan (PITB) that focused on localising and counting buildings using satellite imagery (**sciencedirect.com/science/article/pii/S0924271619300838**).

As an engineer and a computer scientist I am very much interested in designing compact and intelligent network architectures that can be used in solving real world problems. Apart from my research I love to travel and learn about different cultures, hike, read books and watch non-fiction movies.

Describe your project

Faults may slip slowly over time, releasing stress without radiating seismic waves, so these aseismic and silent earthquakes are undetected. To accurately estimate seismic hazard and improve the understanding of fault mechanics, it is important to characterise when and where such events occur. Large streams of InSAR data have opened ways to the applications of deep learning, which itself is data hungry. InSAR images contain the change in phase that is captured by the satellite between two time acquisitions. These interferograms are processed by Sentinel 1 and are available on the LiCS database.

Learning patterns of earth deformation from the InSAR is an unsupervised learning problem. So, without labelling of known example events, we will design an anomaly detector that automatically identifies anomalous events in noisy time-series of InSAR images. Anomalies correspond to patterns that deviate from the 'normal' pattern of phase change.

The aim is to train an unsupervised, event agnostic deep learning based model that identifies anomalous movements across time. This will provide a more efficient method of detecting anomalous earthquake behaviour.

Which of the UN Sustainable Development Goals does your project address?

3 GOOD HEALTH AND WELL-BEING

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

11 SUSTAINABLE CITIES AND COMMUNITIES

Ramesh Shrestha

Interconnections between culture and landslide risks in landslide prone mountainous regions of Nepal

@RameshS60528611

#Landslides #Culture #PoliticalEcology #ParticipatoryActionResearch #Co-production #CitizenScience

The research focuses on exploring the interconnections between culture and landslide risks in landslide prone mountainous regions of Nepal to help communities deal with, and recover from landslides.

I come from a beautiful mountainous country, Nepal. Kathmandu, my hometown, is quite famous for its tangible and intangible cultural heritages. Kathmandu valley has seven cultural sites listed in the UNESCO's world heritage sites. Many others are also equally beautiful and culturally important for the local citizens. Besides there are many local festivals—at least one happening every month, music and musical instruments played during those festivals, local *Newari* food and the hike routes through the hills surrounding Kathmandu valley that I cherish about Kathmandu.

Before joining Durham University for my PhD, I had done my Master's in Environmental Science from the oldest University of Nepal called the *Tribhuvan University*. I had also worked for seven years in different international humanitarian and development organisations including the British Red Cross in community based disaster risk reduction projects. In those organisations, I got the opportunity to work with different communities from different parts of Nepal. My childhood experiences, academic background and work experiences amplified my hunger to explore further on multiple dimensions of disaster risks, vulnerabilities and risk reduction efforts. Hence, I started exploring opportunities and joined Durham University for my further studies.

Describe your project

The aim is to facilitate the process of co-producing a sustainable landslide risk reduction model by working with disaster vulnerable groups, relevant stakeholders, academics and policy makers in Nepal.

Efforts will be given to explore the interface between traditional knowledge and more technocratic efforts of landslide risk reduction that often claim to be participatory and synchronous with traditional knowledge, yet rarely seem to succeed in actually reducing risks. By blending ethnographic research to explore in detail the traditional knowledge with a scientific perspective on novel ways of reducing landslide risks, such as citizen science, my research seeks to identify opportunities which may present openings for science and traditional knowledge to work more effectively and sustainably in tandem. This includes, for example, the synergies between regular rituals and the possibilities of systematic observation of hazards as a means of enabling citizen-led monitoring for community awareness raising. Ultimately the project aims to provide the evidence to support the development of a new set of culturally based landslide risk reduction techniques for use by communities to reduce the risks that they face. Research findings and recommendations will be shared with communities, stakeholders and wider audiences for improving the disaster risk reduction efforts of Nepal and world.

Which of the UN Sustainable Development Goals does your project address?

2 ZERO HUNGER

5 GENDER EQUALITY

13 CLIMATE ACTION

Sufia Singlee

Law's Dynamic Effects: The Case of South Africa

@sufiasinglee
@UnacceptableFoW

#DecentWork #MinimumWages
#LabourRegulation #Poverty
#Inequality #InformalEconomy
#InformalWork #ILO

The project on *'Law's Dynamic Effects: The Case of South Africa'* centres on the 2018 introduction of a national minimum wage in South Africa. The aim is to investigate the reception and influence of the minimum wage in informal settings, including through the strategies of representative bodies of workers and employers.

Sufia hails from Cape Town, South Africa. She has an LLB and LLM (Labour Law) from the University of Cape Town, in addition to an LLM (Human rights & social justice) from the University of New South Wales, Australia. Before commencing her PhD studies at Durham Law School in February 2019, she taught labour and business law at the University of Cape Town. In her spare time, Sufia enjoys baking, gardening, and long beach walks.

Describe your project

Despite advances over the last century in regulatory frameworks that protect human and labour rights, unacceptable forms of work have not been eradicated. Among the central challenges is expanding the reach and influence of labour laws. Formal legal standards do not reach all workers and may only influence a small percentage of the working population in countries with large informal economies. Recent research has made a crucial contribution by highlighting institutional dynamism (ID): the capacity of labour regulations to extend beyond their formal parameters, including to informal settings (external dynamism); and interact with other institutions and regulations

(internal dynamism). Research on minimum wage laws suggests that institutional dynamism is a potential gateway to improved protective outcomes. More specifically, studies have demonstrated that the minimum wage influences the informal economy in lower-income countries. ID therefore has the potential to extend the reach of legislated standards without costly investments in labour inspection and enforcement. Yet the operation of ID is not well-understood or widely integrated into decent work policies.

The project will thus contribute significantly to the literature on upgrading working conditions through labour regulation and on cost-effective regulatory mechanisms that are suited to low-income countries.

Which of the UN Sustainable Development Goals does your project address?

1 NO POVERTY

8 DECENT WORK AND ECONOMIC GROWTH

10 REDUCED INEQUALITIES

Robert Ssewanyana

Art and creativity in HIV/AIDS awareness, prevention and empowerment among young

#AppliedSculpture #HIV/AIDS #Awareness #Prevention #YoungPeople #Co-production #Empowerment

The research seeks to engage young artisans in the informal settings of industrial areas of Kampala in Uganda by using applied sculptural practices for participatory co-production to generate knowledge about their everyday experiences and built works in the context of HIV/AIDS. It is envisaged that establishing partnerships will enable them to develop and harness their creative talents that will lead to economic and social transformation while tackling barriers that perpetuate the spread of HIV/AIDS in their communities.

I am an applied sculptor and a Lecturer at the College of Engineering, Art, Design and Technology, School of Fine Art, Makerere University, Kampala, Uganda. I grew up in a small village Ssumbwe near Kampala city, Uganda. I Joined Makerere University in 1995 for a Bachelors' degree in Industrial and Fine Arts. In 2002, I enrolled for a master's degree in applied sculpture at the School of Fine Art, Makerere University and received the award in 2004. I have worked in collaboration with local artisans in Uganda on projects ranging from designing Igongo museum in S.W. Uganda to television studio sets (e.g. NTV and Spark Television studios in Uganda).

Aside from my main research I am interested in sculpture, watching Football and tourism.

Describe your project

The project aims to create a platform for social change among young people, a change in perceptions and attitudes toward inclusive participation and the elimination of social and cultural barriers such as taboos about sexuality, poverty, urban masculinities and raucous behaviours that perpetuate the spread of the HIV/AIDS epidemic, reducing stigma and discrimination.

It will encourage partnership building through co-production with young people which could lead to economic empowerment and better livelihoods. The project will foster interdisciplinary approaches to problem solving and solution-based research primed for HIV/AIDS awareness, prevention and activism grounded in culture and reality for policy makers and providers of health services in the country and globally. The research seeks to use applied sculpture as a social practice to facilitate social change by way of stimulating and sustaining conversation about everyday experiences of young artisans within the informal economy of Kampala. This is envisaged to harness local skills and creative talents of these young people through co-production of forms that might impact efforts to tackle HIV/AIDS in the marginalised informal sector particularly industrial areas of Kampala.

Which of the UN Sustainable Development Goals does your project address?

1 NO POVERTY

3 GOOD HEALTH AND WELL-BEING

8 DECENT WORK AND ECONOMIC GROWTH

17 PARTNERSHIPS FOR THE GOALS

Kai Weise

An evaluation of the post-earthquake rehabilitation of the Kasthamandap, Nepal

An evaluation of the post-earthquake rehabilitation of the Kasthamandap, an iconic monument in Hanuman Dhoka Durbar Square in the historic centre of Kathmandu, with particular focus on the participation of the various related community groups.

Kai Weise is a Nepali national of Swiss origin. He completed his Masters in Architecture from the Swiss Federal Institute of Technology, Zurich in 1992 and is presently a doctoral researcher in the Department of Archaeology, Durham University. He has been working as a planner and architect in the Himalayan Region. As a UNESCO consultant, he has facilitated the establishment of management systems for World Heritage properties in Nepal, Uzbekistan, India and Myanmar. Kai Weise has lectured in various universities in Asia and Europe. He regularly contributes to publications and has a weekly column in *The Himalayan Times.*

Describe your project

The Gorkha Earthquake that struck central Nepal on 25 April 2015 caused extensive damage. The Kasthamandap collapsed killing dozens of people. The monument is now being reconstructed and research on the Kasthamandap is being carried out to assess the technical process as well as to better understand the related community groups.

The legacy of this research will be the understanding that traditional knowledge can be used parallel to scientific approaches and in many cases will provide answers where modern approaches might not be appropriate.

To be able to ensure a means of collaboration and communication is critical so that the contemporary building requirements are fulfilled while respecting traditional knowledge. The research will further investigate this in respect to resilience of a community and its means to ensure cultural continuity.

The research has the explicit aim of improving community consultation and engagement in Nepal's rehabilitation procedures as well as evidencing positive and negative examples for dissemination amongst other disaster-prone regions. These discussions can be extrapolated to rehabilitation after disasters and conflicts throughout the world.

Which of the UN Sustainable Development Goals does your project address?

4 QUALITY EDUCATION

8 DECENT WORK AND ECONOMIC GROWTH

11 SUSTAINABLE CITIES AND COMMUNITIES

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

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