

Growing research capability to meet the challenges faced by developing countries





Research Councils UK (RCUK) is the strategic partnership of the UK's seven Research Councils. Each year the Research Councils invest around £3 billion in research covering the full spectrum of academic disciplines from the medical and biological sciences to astronomy, physics, chemistry and engineering, social sciences, economics, environmental sciences and the arts and humanities.

The Research Councils have a variety of mechanisms through which they fund research with an international development focus, working in partnership with a broad range of local, national, international and multilateral organisations and agencies.



The Global Challenges Research Fund (GCRF) is a £1.5 billion fund, which supports cutting-edge research and innovation that addresses the global issues faced by developing countries. It harnesses the expertise of the UK's world-leading researchers, focusing on: funding challenge-led disciplinary and interdisciplinary research; strengthening capability for research, innovation and knowledge exchange; and providing an agile response to emergencies where there is an urgent research or on-the-ground need. It forms part of UK Government's Official Development Assistance (ODA) commitment and is overseen by the Department for Business, Energy and Industrial Strategy (BEIS), and delivered through 17 delivery partners including the Research Councils, the UK Academies, the UK Space Agency and funding bodies.

Poverty is dropping around the world – over a billion people have been lifted from it since 1990. Vaccines are saving more lives than ever; child mortality continues to fall; and an unprecedented number of children are in school.

Development works, but improving the lot of poor and disenfranchised people is getting harder. In 2016, nations agreed to pursue 17 Sustainable Development Goals that between them display the formidable challenges: population is growing, resources are under pressure, climate change is pressing, inequality is rising. All these challenges must be met while simultaneously delivering people from poverty.

Such an enterprise calls for well thought-out action, innovative insights, interventions that demonstrably work – and that's where research has a crucial role to play. The Global Challenges

Research Fund (GCRF) is a £1.5Bn fund announced by the UK Government in late 2015. It has been specially designed to stimulate research on the challenges faced by developing countries.

Over the next four years, through 17 delivery partners, including the Research Councils, this new challenge-led funding will be invested in innovative research that will strengthen capacity, provide an agile response to emergencies and ensure local communities' voices are heard in outlining the issues and shaping the solutions.

The Research Councils have a strong history of leveraging the UK's world-leading research-base to help provide long-term, sustainable solutions to improve the life-long health and wellbeing of the world's most vulnerable people and environments. Such research often brings direct and indirect benefit to the UK too.

Research resulting from these projects will not just find a place in a scientific journal, but will be deployed to address real-life challenges.

The projects outlined in the pages of this booklet form part of the Research Councils' GCRF *Growing Research Capability* call launched in 2016. The call was developed to grow research capacity around the globe and to strengthen and broaden skills and expertise to address specific challenges of developing regions and countries. This booklet gives a brief summary of the successful 37 projects, which will be carried out over the next four years.

Each project is a collaboration between institutions in developing countries and the UK. These collaborations will lead to partnerships, ideas and knowledge that will outlast the life of these four-year programmes.

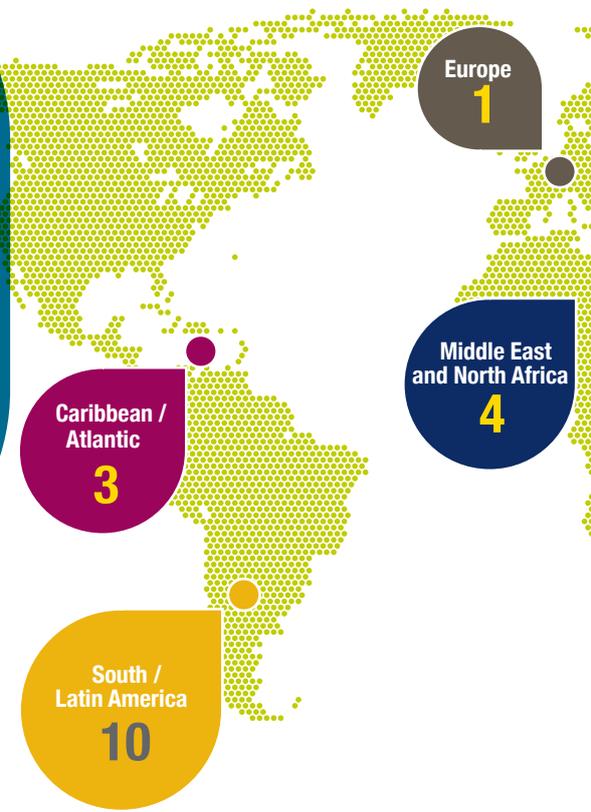
Key figures

37 projects

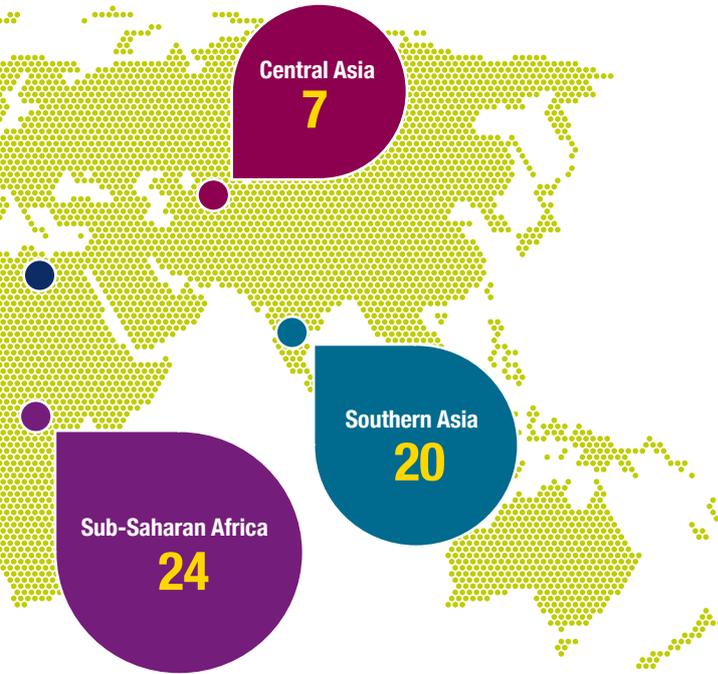
£225M invested
over 4 years

69 partner countries
across the globe

11 challenge
areas addressed



GCRF challenge areas



The GCRF delivery partners have developed a list of challenge areas, across three themes, in consultation with the UK Department for International Development, with reference to the UK Aid Strategy and the UN Global Goals for Sustainable Development (SDGs):

Equitable access to sustainable development

1. Secure and resilient food systems supported by sustainable marine resources and agriculture.
2. Sustainable health and well-being.
3. Inclusive and equitable quality education.
4. Clean air, water and sanitation.
5. Affordable, reliable, sustainable energy.

Sustainable economies and societies

6. Sustainable livelihoods supported by strong foundations for inclusive economic growth and innovation.

7. Resilience and action on short-term environmental shocks and long-term environmental change.
8. Sustainable cities and communities.
9. Sustainable production and consumption of materials and other resources.

Human rights, good governance and social justice

10. Understand and respond effectively to forced displacement and multiple refugee crises.
11. Reduce conflict and promote peace, justice and humanitarian action.
12. Reduce poverty and inequality, including gender inequalities.

Development Trade-offs

Social and environmental trade-offs in African agriculture

A major challenge with the Sustainable Development Goals is that they are all interconnected – so pursuing one without taking the others into account could do more harm than good overall. Nowhere is this more obvious than with the need to cut hunger rates to zero (goal 2) whilst also keeping our ecosystems healthy so that they maintain the clean water, healthy soils and biodiversity essential for humanity's long-term welfare (goal 15).

Social and Environmental Trade-offs in African Agriculture (SENTINEL) partners have identified these two goals, combined with a third – reducing social inequality (goal 10) – as particularly intractable.

A major issue is that there is a huge gap between researchers trying to understand the complex relationships between these goals, and governments, development agencies and private firms trying to implement plans on the ground.

The SENTINEL team plans to close this gap in three African countries and help key decision makers – as well as the civil groups that lobby them – understand the different ways of developing agriculture without impacting negatively on the natural environment and depriving people of the goods it has historically provided. Lessons learned will be useful for the entire sub-Saharan Africa region.

“

For the first time, a project will look realistically at the trade-offs intrinsic in many development policies and strategies.”

Dr Moses Osiru, RUFORUM, Uganda

“

The twin goals of food self-sufficiency and protecting the natural environment are on a collision course and we don't yet have the tools to effectively manage the trade-offs and synergies.”

Dr Phil Franks, IIED, UK

Forging new research networks

Capacity-building in Eastern Neighbourhood and Central Asia

Academics in some of the former Soviet states, such as Azerbaijan, Belarus, Tajikistan and Uzbekistan, can feel cut-off from the rest of the world.

The COMPASS project will open up communication with them by setting up hubs of excellence in research in these countries, helping them to link with UK researchers and the European research community as well as with each other.

The researchers have chosen three areas to work in: research integration, policy impact and training, and working with the general public. They want to work with the institutions to identify what

their unique strengths are so that they can create research and policy niches internationally.

The work will involve efforts to improve the education systems in these countries, for example by training staff and PhD students. UK academics will work with their counterparts to find out where they complement each other, research-wise, and how they could apply for grants together.

It is hoped that building these links will also foster other types of cooperation – economic, political and diplomatic.



“ This initiative allows us to venture into a new territory – underexplored states of Central Asia and the eastern region. So, it is going to be both fascinating and challenging.”

Prof Elena Korosteleva,
University of Kent

Making dams less damaging

Resilient and sustainable interventions in water-energy-food-environment mega-systems

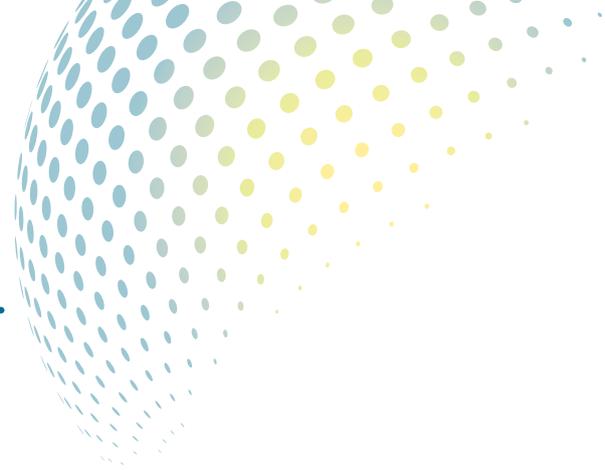
Large dams are often controversial, and with 3,700 of them planned or already under construction around the world, dam conflicts are likely to grow. Most new dams are in low and middle-income countries.

DAMS 2.0 is a project that hopes to improve the thinking around the construction of dams by considering them as disturbances of an interacting system of water, energy, food and the environment. A dam's effect on all of these – including the way it changes how they interact with each other – needs to be taken into account.

The programme will link leading UK research bodies and institutes

in Ethiopia, Ghana, India, Jordan and Myanmar, as well as some of the most influential international environmental organisations.

The main outcome should be a software system which can be used for dam design, training and operation management. It will be freely available online so that all countries are able to make use of it. By improving the approach to dam-building, it is hoped to minimise their impact on poor people and to avoid the environmental degradation and political instability that can accompany poorly thought-out dams.



“

Engineers and social scientists will be able to pool their expertise in an effort to ensure that the next generation of global dams do more to improve people's lives.”

Prof David Hulme - University of Manchester, UK

The science of the city

Building capacity for the future city in developing countries

As people across the globe move to build new lives in the metropolis, cities are emerging as complex organisms that can only be understood by considering them through many lenses. Mathematics, medicine, transport, engineering, anthropology, geography, law and history all have a role to play – and therefore the science of the city must bring together humanities, science and social science.

The PEAK programme plans to foster a generation of urban scholars who are comfortable with such interdisciplinary approaches. But they will also be educated to be versatile in another way – spanning the academic and the practical.

On the one hand they will work with the top institutions that form the heart of this network, in China, India, Colombia, South Africa and the UK. On the other, they will get involved hands-on with the people who develop and manage cities, since it is only through fundamental changes in our approach to cities that they will be able to fulfil the multiple demands being made of them.

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We aim to grow a new generation of interdisciplinary urbanists and a network of smarter cities working together across Africa, China, India, Colombia and the UK.”

**Prof Michael Keith,
University of Oxford**

Marine robots to the rescue

Sustainable oceans, livelihoods and food security in the Western Indian Ocean

When squid stocks collapsed in the valuable Chokka fishery in South Africa in 2013 around 5,000 fishermen were left bereft of their livelihoods. Some four years later, it's still not clear why the fish vanished – yet millions of people who inhabit the East African coast, and depend on fish, may face a similar disaster.

This sustainable oceans project aims to apply the high-tech world of UK marine science to the fishery problems of the Western Indian Ocean. The UK has expertise in marine robots, ocean modelling and the use of satellite data. Combined with skills from the region in marine economics, fisheries and regional policy, it's a formidable machine for

understanding the Chokka collapse – and how to avoid it elsewhere.

Expensive research vessels are not necessary if these cheaper technologies are made available. The results should help these nine coastal countries to implement a Strategic Action Plan they have signed up to for managing their ocean resources.

Following this regional plan is crucial – but it's hard to do this when scientific capacity is low, monitoring is inadequate and marine science and fishery policies don't interact. SOLSTICE hopes to change this, and thus safeguard the livelihoods of millions of coastal dwellers in East Africa.



Getting a clearer picture of poor health

Assisting Bangladesh in lifestyle and environmental risk reduction

Gathering a big group of people and studying their health in the long-term can uncover game-changing facts. The British Doctors' Study, for example, which began in 1951, revealed that smoking causes lung cancer. Imagine if the same could be done in a country facing a perfect storm of chronic health problems.

Bangladesh is admired worldwide for its success in cutting child mortality and fertility rate, yet it faces an onslaught of chronic diseases that arise from an interplay of factors ranging from arsenic-contaminated drinking water to iron-deficient foods and from air pollution to the rise of the western lifestyle.

CAPABLE (Cambridge Programme to Assist Bangladesh in Lifestyle and Environmental risk reduction) has the ambitious goal of recruiting 100,000 people from landscapes ranging from the green paddy fields of rural Bangladesh to the slums of the densest city in the world – Dhaka. From their data, engineers, sociologists, health researchers and a host of other disciplines will try to understand how the risk factors interact – and build a model that can be used to test interventions before they are implemented.

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We aim to help develop simple, scalable and effective solutions to control major environmental and lifestyle risk factors in Bangladesh.”

**Dr Rajiv Chowdhury,
University of Cambridge**

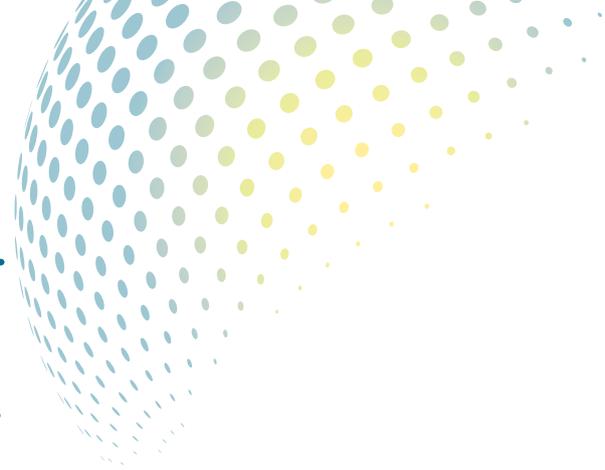
Making cities fairer

Knowledge in Action for Urban Equality

Cities are unequal places, home to immense prosperity but also extreme poverty that touches over a billion people. Many government and civil society networks have formed in recent years to try to do something about this – from the United Cities and Local Governments to the World Urban Campaign, and from Shack/Slum Dwellers International to WIEGO – Women in Informal Employment Globalizing and Organizing.

One challenge they all face in working towards more equal cities is to ensure that different kinds of disparities are recognised and measured, and then to develop locally-led strategies to address them.

Knowledge into Action for Urban Equality will launch a programme, working with academics and community organisations in countries as diverse as Peru, Uganda, Sierra Leone and Sri Lanka. All face urban problems – some they have in common and some are unique to the cities concerned. This research programme is structured to investigate these differences and similarities, and feed the findings in at various levels, from urban planners to community groups – all in the cause of achieving the ambitious goal of cities that “leave no-one behind”.



“
Jaipur is a remarkable historical city of three million people. We aim to understand what research capacity exists locally and then help build this capacity.”

Dr Aromar Revi, Indian Institute of Human Settlements, India

Dementia care where they can least afford it

Strengthening responses to dementia

It is easy to imagine that dementia is only present in rich countries with ageing populations but in reality it affects more people in low and middle income countries than it does in their high income counterparts. And numbers are growing, creating a challenge that these countries are ill-equipped to deal with. Dementia care often means a female family member giving up a much-needed job to be the unpaid carer, impoverishing herself and her relations as she does it.

Researchers from the UK and South Africa are collaborating with Alzheimer's organisations and researchers around the world to study this situation in seven countries.

They will assess the prevalence of dementia, its economic effects and the various options for dealing with it. They will build models to project future numbers – and the likely effects of potential interventions. Researchers want to understand what's working and what isn't, both on a mass scale and down at the level of individual families. All this work will support the creation of National Dementia Plans and, in the process, local researchers will learn the skills to continue this work into the future.

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Few low- or middle-income countries are very prepared for the challenges dementia poses. Our project is ambitious and timely.”

**Prof Martin Knapp,
London School of Economics, UK**

“
STRiDE will generate new evidence on the economic case for better dementia care in South Africa, where we have a rapidly ageing population – this is urgently needed.”

**Prof Crick Lund, University of
Cape Town, South Africa**

Tests to diagnose diabetic eye disease

Increasing eye research capacity and capabilities to tackle the burden of blindness in India

An eye expert Prof Sobha Sivaprasad, wants to trial some cheap new tests that could prevent blindness in India on a grand scale.

Some 69 million Indians suffer from diabetes, and the most common complication is a deterioration of the eye which, if it goes undetected, can lead to blindness. In India, where many still live in poverty and tests for diabetic retinopathy are expensive, millions go untested, many of them working-age people for whom blindness can plunge them into poverty.

Researchers from institutes and eye hospitals in the UK and India want to roll out a new handheld camera that

could massively reduce the costs of testing. A second approach to be trialled is a blood test that picks up signs that sight is threatened and can be performed at home.

The number of sufferers attending hospital for treatment is expected to surge, and building the capacity to deal with this is part of the research plan. If it is successful, the kits will be tested for use back in the UK and globally as a replacement for expensive hospital-based cameras.

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This funding has provided us with an unprecedented opportunity to revolutionise management of diabetic eye disease universally.”

**Prof Sobha Sivaprasad,
NIHR Moorfields Biomedical
Research Centre, UK**

“
A sensor to identify patients at risk of complications due to diabetes will make a huge global impact. Thanks to RCUK for such a great opportunity to explore this avenue.”

**Prof Uma Maheswari, SASTRA
University, India**

Protecting the land of poison frogs and orchids

Preserving, restoring and managing Colombian biodiversity

It has river dolphins and poison frogs; it has 4,000 different orchids and a chart-topping 1,821 species of bird. Colombia's biodiversity is not just to be wondered at – it needs to be understood, conserved and harnessed to benefit the country.

Colombia's notorious, decades-long guerrilla war has just come to an end and now is the moment to get out there and study the country's biodiversity. UK-based researchers will work with a network of scientists across Colombia to study the country's genetic diversity, documenting its distribution and the threats it faces. They will

also scrutinise the genetics of its agricultural crops with a view to making farming more efficient. Thirdly they will consider how biodiversity can be harnessed for social and economic good. The researchers will also help government agencies use the new information in guiding their plans.

“ We are so privileged to work with our partners in Colombia, the second most diverse country in the world, to understand much of their amazing biodiversity.”

**Prof Federica Di Palma,
Earlham Institute, UK**

Health roulette in sub-Saharan Africa

Ensure value for money health care - developing theory, changing practice

Rich countries spend thousands of dollars per capita on health – and deciding how to allocate those sums is often fraught. In a poor country like Malawi, however, that figure is under US\$50. There are numerous worthy ways of investing that small sum – and there are many voices arguing for how it should be spent. So how can a rational decision be made that takes account, for example, not just of what is gained by spending the money in one area but also what is lost by not spending it elsewhere?

Thanzi la Onse, which means ‘Health of All’ in a Malawian language, aims to guide such difficult decisions in sub-Saharan Africa by constructing a model of Malawi’s entire health

system, and then testing various interventions within it.

The model will map not just the health of Malawians but also the resources the country has and how the health system operates. If a vaccination campaign is proposed, this model will hopefully factor in the real costs, the likelihood of getting it done ... and the losses to health from not spending the money on something else. If this approach works in Malawi, there are plans to extend it to Uganda in the future.

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The UK has been at the forefront of developing ways of allocating scarce resources in the NHS. Now, with international partners, we can do the same in southern and eastern Africa.”

Prof Mark Sculpher,
University of York, UK

“

This programme has potentially transformative effects on the health of Malawians over the longer-term.”

Dr Benson Chilima,
Public Health Institute of Malawi

A drought in water research

Sustainable water and food security In drylands of sub-Saharan Africa

Relying on the rain to water crops is the reality for subsistence farmers across Africa – and these farmers are the mainstay of national economies. Rain is a fragile resource yet the availability of water underpins so much – including peace, health and prosperity.

Research institutes in Kenya, Ghana and Malawi want to do more work to understand how to improve water and food security in their countries. But they often can't do this because of a lack of funding, research capacity and links to the international research community.

BRECcIA (Building Research Capacity for sustainable water and

food security In drylands of sub-Saharan Africa) aims to connect scientists in these countries by linking them not just with UK researchers but also with each other, so that they can compare approaches across the three very different nations. The programme will target the weaknesses in the research pipeline and try to strengthen these areas; set in motion water and food research projects; and provide a route to commercialisation should new water technologies emerge.

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Hopefully this project will enhance the zeal of Kenyan researchers to grasp the concept of internationalising their ideas.”

Prof. John Obiri, Masinde Muliro University of Science and Technology (MMUST), Kenya

Creating cultures of equality

Using art, theatre and literature to support wellbeing

Stories, plays, songs and pictures are often the most powerful way of getting across sensitive messages about life's difficulties, or for exploring how life could be different.

The people behind GlobalGRACE will grow the capacity of the arts and humanities to address unequal relationships and enhance the wellbeing of marginalised groups in a variety of poorer countries. Through art, GlobalGRACE will support people to talk about their lives and present alternative visions of the future in which women and men have more equal relationships.

GlobalGRACE is a worldwide partnership of community groups

and scholars based in Bangladesh, Brazil, Mexico, the Philippines, South Africa and the UK. The group will explore how people use their creativity in dance, theatre, film, poetry and social media, to help people to share things about their lives that may be too sensitive and threatening to talk about directly. They want to find out whether such events could also become moments when inequality can be challenged.

In the process, the group will also work with museums and art galleries. These are places not only to reflect on past lives, but also to think about issues of development and equality in the present and the future.

“

I want to make sure that the younger generation to which I belong will be more open and accepting of Lesbian Gay Bisexual Transgender (LGBT) young people, and that's why I support this research partnership.”

Kate Alyzon Ramil, YMCA San Pablo City, Philippines

Keeping moisture in the soil

Environmental physics, hydrology and statistics for conservation agriculture research

Conservation Agriculture makes big promises: it claims to help farmers be more productive while reducing some challenges such as lack of water.

It's an attractive prospect for poor and drought-plagued regions of Africa, and is based on three principles – don't till the soil, which breaks up its precious structure and increases evaporation of water, add organic matter to the soil to boost its quality, and rotate the crops in a way that dodges patterns of pest infestation.

Yet the understanding of some aspects of this technique is poor. One big unanswered question is what happens to water in the soil under Conservation Agriculture?

Does the soil store more water, helping crops to thrive when rains are delayed, and are there any knock-on effects on the vital groundwater below?

That's what a network led by the British Geological Survey hopes to find out. Scientists at research centres in Zambia, Zimbabwe and Malawi already collaborate to study other aspects of Conservation Agriculture. This project will develop research capacity to examine soil hydrology as well, and thus refine a technique that holds promise for 16 million food-insecure people.

“ In many parts of Africa there is a fundamental lack of data and a dearth of groundwater monitoring and research activities. Any effort in that direction is an important contribution. ”

**Prof Daniel Nkhuwa,
University of Zambia**

Coastal competition and collaboration

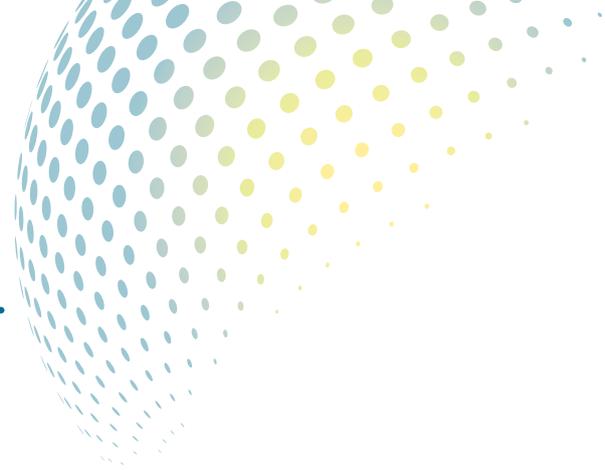
Sustainable interactions with marine ecosystems for health, wellbeing, food and livelihoods

Whether it is in fishing, aquaculture or tourism, in transport or renewable energy, coastal seas are delivering prosperity to human communities as never before. But as coastal resources deteriorate by the day, this cannot continue, and increasingly marine users are coming into conflict. Our coasts are gradually losing their capacity to provide services like storm mitigation, food security and climate regulation.

For the marine natural and human worlds to flourish together in the long term, there is a general realisation that marine planning is needed – and this applies most acutely in East and South-East Asia where population pressures and conflicts over marine

resources are increasing. Marine plans will try to reconcile competing demands, find ways of increasing prosperity, and always keep an eye on the long term.

Blue Communities will work with scientists and local communities in Indonesia, the Philippines, Vietnam and China, focussing on these countries' UNESCO Biosphere Reserves, and marine protected areas in Malaysia. Supporting these countries to expand their abilities to do research, and involving everyone so that the different communities have their say, it is hoped that marine areas will be protected and used to sustainably nourish human activity for generations to come.



“
A particularly valuable and core aspect of Blue Communities is listening to and learning from the South East Asian partners and genuinely integrating and sharing approaches for the benefit of all.”

Prof Mel Austen, Plymouth Marine Laboratory, UK

Encouraging sustainable growth

East African Growth Corridors and the China to Africa connection

In sub-Saharan Africa, a host of grand 'development corridors,' including roads, railroads, pipelines, and port facilities, are planned that will boost agricultural production, commodity exports, and economic integration. While the corridors have the potential to solve some of Africa's acute problems – such as food production – there are grave concerns that some will destroy wildlife corridors, release carbon from natural storage, and undermine biodiversity and ecosystems.

A consortium led by the UN Environment World Conservation Monitoring Centre, plans to take a detailed look at some of the proposed corridors – including

one running east to west through central Tanzania and others through Kenya Uganda, Ethiopia and Sudan. Researchers in East Africa, China and the UK will feed their findings through existing bodies and appropriate UN agencies to decision-makers working to plan and implement these corridor visions. One of the key goals will be to increase the ability of researchers in Kenya and Tanzania to get the business case for natural capital – the often undocumented wealth provided by keeping our ecosystems intact – taken into account in infrastructure projects.

“ This project provides fantastic opportunities to link Chinese research community with UK and African counterparts to address climate change as an emergent challenge for growth corridors in East Africa.”

Prof Xu Yinlong, Chinese Academy of Agricultural Sciences, China

How animal health affects humans

One Health Regional Network for the Horn of Africa

Human health and wellbeing are intimately entwined with those of wild animals, pets and livestock. Livestock sustain people by providing them with food, draft power and income. But they also pose risks because they can transmit infectious diseases.

An approach to research has emerged in recent years that focuses on the interfaces between the environment, animals and humans. It's called 'One Health', and in the part of the world that is the most heavily dependent on livestock – the Horn of Africa – it needs a boost.

The leaders of HORN want to create a One Health regional network in

Kenya, Ethiopia, Somalia and Eritrea – training local scientists, conducting research, and taking advantage of a state of the art biosciences hub in Nairobi (ILRI-BecA) that allows African researchers to access a technology hitherto only found in developed countries.

The hope is to understand better the health links between people, animals and the environment. This should lead to improved nutrition, less risk of new diseases emerging from animals, and more prosperity... as well as a strong system in place for conducting further research.

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This partnership supports the noble mission of overcoming the educational isolation of Somalia following years of conflict. This is excellent news for the region which has always had negative publicity.”

Dr Fred Wesonga, IGAD Sheikh Technical Veterinary School, Sheikh, Somalia

Smoking and inequalities

Reducing tobacco-related harm in low and middle income countries

As smoking dwindles to a minority activity in the UK, it's easy to forget that it's ballooning elsewhere. In fact, it already kills more people every year than HIV, tuberculosis and malaria combined. And by 2030, it's predicted that more than 80 per cent of tobacco-related deaths will occur in low and middle income countries.

Rich countries took decades to work out how to bring down smoking rates – doing the right research, lobbying, getting effective health messages out and dodging the machinations of the tobacco industry. Now a team from the UK Centre for Tobacco and Alcohol Studies, led by the University of Stirling, wants to work with less well-off countries to do the same.

Working with researchers in South Asia and Sub-Saharan Africa, and offering training and research support, UK-based researchers hope to partner with local academics to develop and implement approaches to tackling Asian and African nations' tobacco consumption. These will include finding ways to support tobacco taxation, tackling the illicit trade in tobacco; and targeting tobacco company interference in governments' attempts to reduce smoking.

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Smoking causes more preventable cancers worldwide than anything else. This award will help achieve a step change in research capacity to prevent cancer in countries where the need is greatest.”

Alison Cox, Cancer Research UK

“
This award will allow our team to conduct novel research on the affordability of smokeless tobacco products in particular, which are widely used in Bangladesh and overlooked in current policies.”

Prof Rumana Huque,
ARK Foundation, Bangladesh

Safe drinking water for all

Low cost technologies for developing regions

In the developed world, we take it for granted that our drinking water is safe, yet nearly 25% of the global population drink water that is not. Water that has been contaminated with faeces from animals and humans may contain pathogens which cause deadly diseases such as polio, typhoid, cholera and dysentery.

Clean water saves lives and it means that children, mothers and bread-winners can get on with their lives instead of falling sick.

We know how to make water safe to drink but the cost of doing this may be too high as nearly half the world's population live on less than £2 per day. Low-cost technologies do exist but the people don't readily adopt these.

The SAFEWATER project is a collaboration involving academics in South America and – crucially – NGOs that are already working in Colombia and Mexico, and are trusted by local people.

Through the NGOs, local people will be involved in the development of clean water solutions from the beginning of the project so the technologies will meet their needs. The researchers also aim to develop smart devices which will quickly tell if their water is safe to drink.

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Lack of investment in water infrastructure in Mexico has resulted in more than 20 million people drinking contaminated water. We are thrilled to collaborate for the development of low-cost water technologies.”

**Dr. Fermín Reygadas Robles Gil,
Fundacion Cantaro Azul,
Mexico**

Designing climate-smart policy for growth

Agricultural and food-system resilience

Extraordinary demands are being made of the people who grow our food. They are to feed 2.5 billion more of us by 2050 – and do this without exhausting the soil, depleting water supplies or robbing us of biodiversity. They are to cope with the extreme weather, heat and moisture changes brought by climate change and also, since agriculture turns out to be a major carbon-emitter, cut greenhouse gases too. In addition, in Africa at least, they are to propel the continent to economic development and prosperity.

To achieve this needs research done in countries that have few research resources, by a wide range of disciplines whose practitioners need

to understand how to do policy-related research. They also need strong channels to communicate their results to the decision-makers.

Learning from the ‘policy paralysis’ that prevented some African countries from achieving some of the Millennium Development Goals, AFRICAP will pull experts together from the UK and a variety of African countries. It will help four African countries to build their research capabilities. It will also tap into an existing network of policy experts across the continent so that research results really can lead to policy changes, and a better-fed continent.

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The ultimate objective is to increase the resilience of smallholder farmers in the face of changing climate and weather patterns.”

**Dr Lindiwe Majele Sibanda,
African Food, Agriculture and
Natural Resources Policy
Analysis Network**

“
This is about weather, climate, agriculture, economic growth, sustainability, livelihoods: with the end-game being how best to design policy for growth that is climate smart and sustainable.”

**Prof Tim Benton,
University of Leeds, UK**

The elusive second Green Revolution

Research and empowerment for sustainable food supplies

Talk of a second Green Revolution has been around for a while. The first – in India and other developing countries, in the 1960s – brought a massive increase in crop production that sustained the country's mushrooming population. But now there are new pressures – not just the need to produce even more food, but to reduce the damage done by excessive use of pesticides, fertiliser and water in the face of climate change.

TIGR²ESS, a collaboration between UK and Indian scientists, seeks to frame the big question – how to bring about a second Green revolution – in all its breadth and depth. India is developing fast-agriculture needs to take account of

urbanisation, for example, which has drawn so many away from the land. Smallholder farmers- particularly women- need smart technologies to sustain crop yields, and improve health and nutrition.

The TIGR²ESS programme will assess these options, as well as supporting basic research programmes, and providing advice to local communities. There will be many opportunities for academic exchanges, mentoring and career development for scientists from both countries. Links with the relevant government ministries in India, plus industrial connections built into the programme, will hopefully turn the best recommendations into reality.

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Agriculture is feminizing. We need to ensure that state resources and services, and knowledge resources, are equally accessible to women farmers.”

**Dr V. Selvam, M.S. Swaminathan
Research Foundation, India**

“

My Institution is eager to participate in the programme of academic exchanges, which will help to build research expertise and allow us to tackle important regional issues.”

**Prof AK Grover,
Panjab University, India**

Making the solar dream a reality

Combining solar expertise for communities and economies

Last year, India's Prime Minister, Narendra Modi, announced he was determined to leap-frog fossil fuels and harness global solar expertise to turn his nation green.

SUNRISE, a UK led collaborative project, will help deliver this challenge. Combining the best of British and Indian solar expertise from leading institutions in both countries, the project will develop printed photovoltaic (PV) cells and innovative manufacturing processes. This will allow local production, at scale, of affordable solar energy products, which will be integrated into buildings in five large, off-grid villages before the end of the project.

In addition, technologies that harness the sun to purify water and gasify crop waste will also be demonstrated.

In India, it's not just rural communities who will benefit: the aim is to kick-start local industries to manufacture affordable prefabricated buildings that generate, store and release energy. These will use both Indian and British technologies, aligning with the Government of India's ambitions for 'make in India'.

Technologies that prove to be successful will, it is hoped, then be rolled out in buildings not just in India but also across other regions including Africa, Asia, the Middle East and Europe.

“**SUNRISE is an incredible opportunity to deliver cheap, light-weight photovoltaics made in India. It will grow the talent to support Indo UK solar energy.”**

**Prof David Worsley,
Swansea University, UK**

Calling time on the kissing bugs

A Global Network for Neglected Tropical Diseases

They are known as 'kissing bugs' and they spread a disease that rarely makes the headlines but infects up to seven million people worldwide. It is Chagas Disease, which inflicts a huge burden in some of the poorest Latin American countries.

Now scientists are planning to set up a research network, spanning the developed and developing world, to work on finding new drugs for the disease. They will also target Leishmaniasis, a disease of the very poor, transmitted by sandfly bites with over 700,000 new cases per year.

Some 500 researchers at 14 institutes around the world want to improve on current drugs, some of

which are hard to administer and have side effects that can be fatal.

The researchers will work on new chemical and genetic technologies to help discover targets that new drugs could act upon – a crucial bit of basic science that is often a critical factor in encouraging drug companies to develop and manufacture a drug.

By the time the initiative ends there should be hundreds of skilled new researchers who can then push forward on research into other neglected tropical diseases.

“

By enhancing the capabilities of 14 world-wide partner institutes we are going to transform the way modern genetic and chemical technologies can be focused on neglected tropical diseases.”

**Prof Graham Sandford,
Durham University, UK**

“

This initiative will lead to an 'army' of highly trained young scientists to drive forward the search for alternatives to the drugs currently in use for Leishmaniasis and Chagas Disease.”

Prof Ariel Silber, University of São Paulo, Brazil

Latin American genomes

Capacity building for bioinformatics in Latin America

Although vast amounts of research have been done on the human genome there is a major gap in our knowledge, which arises from the fact that very few Latin American genomes have been studied. As a result, our understanding of the vulnerability of people from these regions to diseases is weaker than that of other ethnic groups. This inequality extends to other areas of genetics, too. Latin America may be home to magnificent biodiversity yet our understanding of organisms in this region lags behind.

This matters if we want to do important things like track diseases, safeguard health and find ways to balance the demands of agriculture against biodiversity.

The answer is a major boost for bioinformatics in Latin America. The region needs more scientists with the fundamental skills to generate, store, visualise, analyse and interpret huge amounts of biological data.

This ambitious project aims to train and mentor scientists in the region to build a bioinformatics infrastructure. Leading scientists in six Latin American countries will set about growing communities of data biologists, in collaboration with UK scientists. And work will be done to enthuse university students about bioinformatics, to ensure a long-term supply of researchers.

“
CABANA will support Latin American researchers to address some big challenges, from communicable diseases such as Zika, through sustainable food production, to protection of their rich and unique biodiversity.”

**Dr Cath Brooksbank,
EMBL-European Bioinformatics
Institute, UK**

Beyond the slums

Sustainable, healthy, and learning Cities



Films like *Slumdog Millionaire* and *Favela Rising* have brought vivid images of the slums of big, developing world cities into the public imagination. But what about the other communities – they may be slightly less poor but they, too, can have plenty of problems, lacking services and all the other ingredients of a productive urban life.

These neighbourhoods don't just get less publicity than slums: according to scholars, they receive much less research attention as well.

The Centre for Sustainable, Healthy, and Learning Cities and Neighbourhoods, which will spring out of the University of Glasgow with eight international partner

institutions, will strengthen research capacity through training and comparative studies of different neighbourhoods in 14 cities in Africa and Asia. The researchers want to consider what's going on, not just physically and environmentally, but also socially and economically. What makes a neighbourhood a sustainable and peaceful one whose residents have proper access to health and educational services, for example?

The Centre hopes that, through careful social and spatial analysis of changes in neighbourhoods in those cities, it can uncover insights that will inform urban planners, governments and NGOs, helping to turn cities into the drivers of sustainable development that they ought to be.

“

This will help us to make a significant contribution to the global debate, policy and practice about the development of sustainable cities and communities.”

**Prof Ya Ping Wang,
University of Glasgow, UK**

Research that locals want

Driving eco-innovation in Africa for a safe circular water economy

When it comes to issues such as water use in West Africa, it's especially important to talk to local people who have first-hand experience of water problems and ask them to get involved in framing the questions the researchers need to answer.

That is the view of Lancaster University, the first UK university to have a campus in sub-Saharan Africa. They are particularly keen to pursue eco-innovation – the concept that the right ideas can both support economic growth and help the environment at the same time. Lancaster has won prizes for its Centre for Global Eco-Innovation in the UK.

The RECIRCULATE project will introduce these research methods applied to questions about water – its use in sanitation, in food production and in energy generation. Working initially with universities and research organisations in Ghana and Nigeria, it is hoped that the research will have high impact built into it from the start – something that is not currently the case, they say.

“
The continent faces huge challenges around water, food, health and energy. RECIRCULATE provides a basis to start to deal with these challenges sustainably.”

**Dr Odon Akanimo, Envirofrol
Consulting, Lagos, Nigeria and
Accra, Ghana**

“
RECIRCULATE is an exciting and unique opportunity to address serious issues around water, food, health and energy that have been defined by our West African partners.”

**Prof Roger Pickup, Lancaster
University, UK**

Anti-violence computer games

Research and evaluation of prosocial games for the prevention of gender-based violence

The effects of violent video games are a contentious issue. In 2014 a 'study of studies' came to some firm conclusions: when children play aggressive computer games they behave more violently; but when they play more socially conscientious games, their behaviour correspondingly improves.

NONE IN THREE (Ni3) is a centre that wants to harness these findings to find new ways to address attitudes that fuel violence while they are being formed. Ni3 will create games that help children become more empathic and, crucially, change negative gender attitudes. The researchers want to support social scientists and game developers in low and middle income

countries, as well as in the UK, how to do this, and then promote them in communities and to governments.

Video games are unique because they are based around a narrative as well as audio and visual experiences, and have rules and objectives regulating players' behaviour. A recent study found that, if they are designed 'prosocially', so that they enhance children's moral reasoning and foster empathy, they reduce aggression.

Ni3 will work differently in each country because each has different problems in relation to gender-based violence. In Pakistan, for example, the priority may be to tackle child marriage and honour killings. In Uganda the researchers

may focus on female genital mutilation or inheritance of wives. In China the emphasis may be on sexual abuse, in Jamaica, commercial sexual exploitation and in the UK, violence within adolescent relationships.



My institution is eager to participate in the programme of academic exchanges, which will help to build research expertise and allow us to tackle important regional issues."

**Prof AK Grover,
Panjab University, India**

Nurturing top African scientists

GCRF-Crick African Network

Across Africa there are talented scientists who have achieved their PhDs and are poised to lead their countries into healthier places via their expertise and research into the infections that blight the continent. However that ambition is curtailed by lack of funding, poor research facilities and the absence of mentoring. This is what the Crick African Network will ameliorate.

The Francis Crick Institute in London, along with five leading African partner institutions, will seek out the best and brightest post-doctoral researchers and provide resource to reach the next level: training at the Crick in the UK, linked to help establishing research programmes back home in institutes to strengthen them as hubs of scientific excellence

for the Continent; and mentoring via an international network.

The scientists chosen for this “African Career Accelerator” will be those with ideas about how to tackle some of the big scourges of Africa – such as HIV, affecting an estimated 25 million people in the continent, TB and malaria. They will be empowered to come up with the insights and ideas to roll back these economically debilitating diseases.

“**This grant responds directly to a critical need for us. Our postdocs will have this fantastic opportunity to link up with top scientists at the Crick, and get access to some of the best research facilities in the World. The best part is that this fellowship will help keep our postdocs in Africa and move them towards the establishment of independent careers at leading research institutions in this Continent.**”

**Dr. Gordon Awandare,
University of Ghana**

Fighting the biters

Partnership for increasing the impact of vector control

Billions of tsetse flies, mosquitoes, sand flies and fleas bite humans every day, often depositing nasty diseases such as sleeping sickness, dengue, malaria or leishmaniasis in return for their feed. Tackling these diseases is always complicated. For a programme to work it needs to suit the setting, which might these days be a densely packed city; suit the humans who live there and fit the pockets of the governments deploying the programmes.

Liverpool School of Tropical Medicine believes that greater collaboration is essential to make a dent in these diseases, some of which have a debilitating effect on the health and economies of African countries.

For a start, anthropologists, economists and biologists need to pool their expertise. Then there's the fact that expensive programmes set up to eliminate one vector-borne disease could easily be tackling others at the same time.

Partnership for Increasing the Impact of Vector Control (PIIVeC) plans to train scientists in Bukina Faso, Cameroon Malawi and the UK; conduct research and invest in facilities; and bring different disciplines together into advisory groups that can help governments plan sustainable attacks on these diseases.

“

I am particularly excited about working with both control programmes and research institutes to strengthen the use of evidence in national policy decisions on vector-borne disease.”

**Prof Hilary Ranson,
Liverpool School of Tropical
Medicine, UK**

“

The programme will play an important role in improving and maximizing the impact of vector interventions for the control of the many vector-borne diseases in Cameroon.”

**Dr Charles Wondji,
OCEAC, Cameroon**

High tech drugs for Thailand

Biopharmaceutical and animal vaccine production in Thailand and beyond

A revolution in biotechnology is bringing us new types of drugs for diseases ranging from diabetes to cancer. Recombinant Protein Technology involves joining different pieces of DNA together in a cell such as a bacterium, inducing it to make particular proteins that can form the basis for advanced medicines and vaccines.

In Thailand it is thought that only two per cent of cancer sufferers have access to medicines derived from this technology, even though the WHO lists them as “minimum medicine needs for a basic health system”. The Thai government has recently set up a biopharmaceutical facility. The goal of this GCRF project

is to join UK and Thai experts to work towards state-of-the art protein production in Thailand. They will also work on the associated downstream activity, such as standards testing, with the goal of making cheap, widely available medicines.

Although the work will be in Thailand, there are structures built in to spread the expertise to other countries in South East Asia such as Vietnam and Myanmar. And biopharmaceutical companies in the UK should also be able to benefit from the insights learned from trying to drive production costs as low as possible.

“
Having worked with UK and European biotech industries for many years, we are very excited to be working with South-East Asian collaborators to enhance core biotech industries in that region.”

Prof Colin Robinson, University of Kent Consulting, Lagos, Nigeria and Accra, Ghana

“
Thanks to GCRF we'll be able to bring science to the people who really need it the most.”

Dr Panit Kitsubun, BIOTEC organisation, Thailand

Researching on the frontline

Supporting preparedness and response to humanitarian crises and epidemics

In the thick of natural disasters or war, aid groups work through the chaos to bring basic services – and dignity – to the victims. In such a tough environment it's hard to stand back and study what's going on, collect data and assess whether and how aid could be better delivered. Yet it's vital to find a way of examining it critically, if responses are to improve and the health of those caught up in crises is to be protected.

RECAP will create a network to tackle this research problem – and it has some of the big players in humanitarian aid on board. The network will include leading organisations in the UK, as well as the American University of Beirut, in

Lebanon, and the University of Sierra Leone. Working with Médecins sans Frontières, the International Rescue Committee, and the largest NGO in the world – Bangladesh's BRAC – they are going to build research skills and conduct studies in some of the world's hotspots.

The result should be better research methods and strong links between all the organisations, leading, in turn, to improved humanitarian policies – and, ultimately, the safeguarding of victims' health.

“

This project provides a unique opportunity to collaborate across regions and sectors to help improve how decisions are made in the heat of humanitarian responses”.

Prof Bayard Roberts, London School of Hygiene and Tropical Medicine, UK

Reaching out to reduce self-harm and suicide

South Asia self-harm research capability building initiative

The risk factors for deliberate self-harm and suicide in European and American populations are well-understood, but much less is known about these behaviours in South Asia, where rates are very high.

The SASHI project will focus on India and Pakistan, with a strong emphasis on equipping local researchers with the skills they need to develop long-term programmes to reduce death, disability and distress. The project will set up deliberate self-harm registers; conduct household surveys; and collect information from people whose lives have been affected by suicide and deliberate self-harm.

The key to the project is to develop methods of doing all this in rigorous, sensitive and safe ways, creating a platform of new methods and skills that are relevant to South Asia.

It will then be possible to address a range of important questions about social stress, help-seeking, and effective intervention. Armed with a greater understanding, the researchers hope to inform public health plans and health service development, setting out an agenda for future research – and using the findings to help high risk populations in the UK.

**“
Deliberate self-harm
and suicide remain punishable
offences in Pakistan ... Our
work will not only provide robust
evidence on their prevalence but
also on what encourages people to
seek help.”**

**Dr. Nasim Chaudhry,
Pakistan Institute of Living
and Learning, Pakistan**

Improving African weather forecasting

Building science for weather information and forecasting techniques (SWIFT)

We take for granted the increasingly accurate weather forecasts that enable us to plan our lives. In the tropics, the science and technology of weather-forecasting is far less developed, and all sorts of sectors suffer as a result, from farming to power generation and from fisheries to disaster preparedness.

African SWIFT plans to boost African weather forecasting by training meteorologists and giving them what they need to give both short-range forecasts and more long-term seasonal ones.

For this it's essential to improve fundamental scientific research in the physics of tropical weather systems;

enhance scientists' abilities to work with complex model and satellite data and explain it to others; and improve the communication and exploitation of forecasts. This includes building links with the sectors that need the forecasts – so the latter can let meteorologists know what they really need.

The UK will also benefit because by the end of the project it will have better skills at making tropical weather forecasts too.

“

The project will strongly support our capacity as a major training hub for meteorology and climate science.”

**Prof Jerome A. Omotosho,
Federal University of Technology,
Akure, Nigeria**

Remedies for sick seaweed

Safeguarding the future of seaweed aquaculture in developing countries

Seaweed farming has transformed the lives of millions of coastal people. Seaweed is grown to be eaten and to produce substances such as agar, which has many applications, from cooking to microbiology. But seaweed farming is under threat as diseases strike, threatening people's livelihoods and reducing output by 15 per cent globally.

GlobalSeaweed is a programme that wants to fight back against seaweed disease, primarily by strengthening seaweed science in three countries for whom it is of great economic significance – Indonesia, the Philippines and Tanzania – and possibly others.

Scientists there will learn from the UK's algal biologists and aquatic pathologists, building their skills in identifying diseases and pests. As a result it's hoped that these nations will be able to detect diseases better; develop early warning systems and draw up protocols that can prevent disease spreading, as well as recommending new legislation to prevent the spread of disease. Internationally the project will deliver a digital Atlas of Seaweed Diseases and Pests, and a rapid response network to deal with crises as soon as they emerge.



“
Fantastic to see seaweed, a much neglected marine resource, being given serious attention as a sustainable means of helping lift people out of poverty and hunger.”

**Malcolm Beveridge,
Food and Agriculture Organization
of the United Nations**

Protecting women and babies

Improving pregnancy care across sub-Saharan Africa

There are three complications of pregnancy that inflict a disproportionate burden in sub-Saharan Africa: high blood pressure, babies who are small before birth – and stillbirth. It is thought that about half of the 46,000 women and two-and-a-half million babies who die from these problems each year are in Africa. Millions more suffer damage to their health.

We know these complications are caused by problems with the placenta but in Sub-Saharan Africa, we know very little about how and why it happens. Is there a role for limited diet, chronic infection, the women not having much say in what happens to them? Do flooding or

drought have a role – does living far from health facilities?

The PRECISE project (PREgnancy Care Integrating translational Science, Everywhere) hopes to answer these questions by gathering information about 12,000 women in The Gambia and Senegal, Kenya and Mozambique. They will provide their life stories, pregnancy data and samples (which will remain in Africa). Junior investigators will be trained and mentored in how to do pregnancy research, which should provide a lasting skill set in these countries. The results will be shared with the networks PRECISE has built – local women and their families, policy-makers, health care workers and even infrastructure-planners.

“
I've been learning about high blood pressure and small babies for almost 30 years. This award provides an opportunity to study it where women and their babies are most at risk. Here we have an opportunity to build a team that will work together, learn together and stay together to reduce the burden of pregnancy complications in Africa, and beyond.”

**Prof Peter von Dadelszen,
St George's University of London**

Refugees get cancer too

Research for health in conflict

Across the Middle East, soaring numbers of refugees and displaced people carry with them problems one doesn't think to associate with conflict. Gone are the days when the only humanitarian needs flowing from a conflict related to clean water and vaccinations. These days the victims are suffering from non-communicable diseases too, such as cancer and mental health.

But how is cancer treatment to be provided in a refugee camp? How do medics give palliative care when their country is torn by violence? New ideas and new ways of working are called for... and these are what the Research For Health in Conflict (R4HC)–Middle East and North Africa (MENA) partnership wants to find.

By working with research organisations across MENA and using novel ways of gathering health intelligence in conflict, they hope to help countries like Jordan, Lebanon and the Occupied Palestinian Territories work out not just how to care for those within their borders but also how to research such issues in the first place.

“

This will enable us to advance various cancer care activities in Jordan and the Middle East especially in palliative care, psychosocial care and research.”

Prof Omar Shamieh, Department of Palliative Care & Home Care Services, King Hussein Cancer Centre, Jordan

“

This will give our team in occupied Palestine the benefit of comparison with other MENA countries, important to decrease our isolation and produce important knowledge.”

Prof Rita Giacaman, Institute of Community and Public Health, Birzeit University, Palestine

Drug wars and wars on drugs

Building sustainable peacetime economies in the aftermath of war

Wars on drugs have been declared by leaders across countries who are concerned about the impacts of illicit drugs on security, development and health. But fighting drugs production and trafficking can also inflict deep wounds – whether it's on the poor who were growing the drugs and lose their livelihoods or on public health campaigns to rehabilitate drug users.

These policies are particularly contentious in countries recovering from war. They can threaten an uneasy peace and may lead to renewed conflict, when the lives and livelihoods of so many are tied to the drug economy. Navigating a path that reconciles peace-building with tackling the illicit drugs trade is hard.

Researchers argue that a new approach is needed, that is based upon evidence about what works and what doesn't, that is defined by the drug producing countries themselves, and recognises what the trade-offs are and who bears the costs of such policies.

Working with researchers in Afghanistan, Colombia and Myanmar - three of the world's largest drug-producing countries – the collaboration aims to build a research base that can help us get better at transforming illicit economies.

“
War and drugs have been chronic problems with far-reaching impacts on the lives of the people in Northern Myanmar. This research project is an opportunity to find solutions based upon empirical data.”

Dan Seng Lawn,
Kachinland Research Centre
(KRC), Myanmar

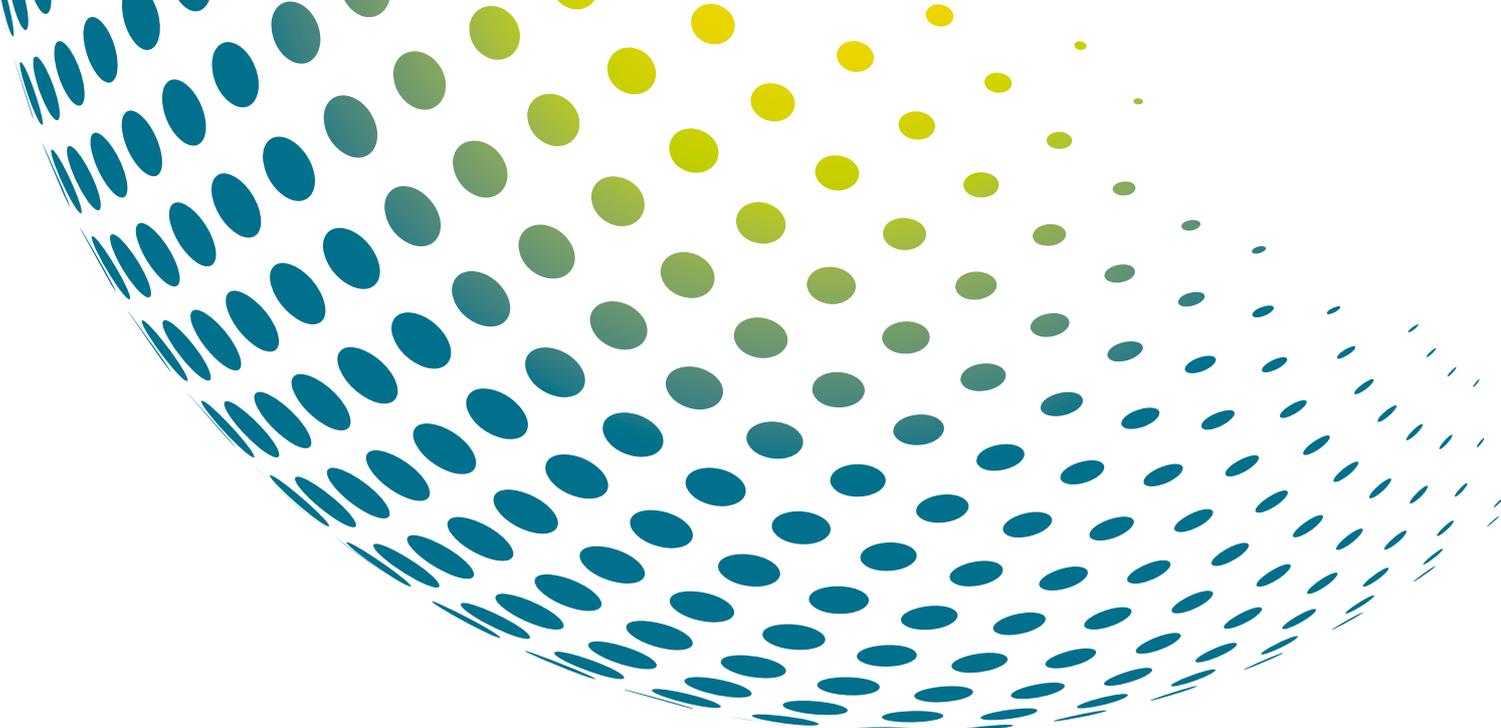
“
This research will build a new generation of Afghan researchers and an independent evidence base on illicit drugs. These are essential to develop a new approach to the challenges of drugs and development in Afghanistan.”

Orzala Nemat,
AREU, Afghanistan

GCRF and RCUK investment is contributing to realising the ambitions of the UK aid strategy and to progressing the global effort to address the UN Sustainable development goals.

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