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## **Concept note: TRECCAfrica II**

### ***Transdisciplinary Training for Resource Efficiency and Climate Change in Africa II***

#### **Project summary**

The project will address one of the world's greatest environmental challenges: food security in the face of climate change, resource depletion and loss of forests, wildlife and environmental services. Africa inherited inefficient and extractive resource regimes that led also to political exclusion and poverty. Promoting new governance configurations that are inclusive and decentralised can, by contrast, lead to a virtuous cycle in which we can produce more wealth from less environmental resources for more people, and in ways that are much better adapted to achieve food security in the face of climate change.

Globally, the challenges of food insecurity within the context of climate change are inhibiting economic growth and human wellbeing, and these problems are expected to accelerate. The food system is also changing as a result of complex and dynamic interactions of a range of socio-economic and environmental factors, including among others, urbanisation, concentration of production, vertical integration, deregulation and economic liberalisation. As demand for food is expected to double in the next 25-50 years, food systems will be forced to adapt to mounting challenges that current research and global institutions, especially those in Africa are only starting to grasp.

This project intends to promote this adaptation by involving and educating young Africans proactively in the process of developing, understanding and scaling new approaches through 'transdisciplinary' research. The project proposes to award 86 Masters and Doctoral scholarships and exchange opportunities to some of Africa's brightest young minds, and a further 14 staff exchange opportunities to consortium members to enhance learning and joint research on this theme. In total, 100 individual mobility opportunities are therefore foreseen.

Ultimately TRECCAfrica's impact will be transformation in our societies through social and institutional innovation that stems from the application of problem-solving knowledge generation and insight.

#### **Introduction: Higher Education in Africa**

It is a well-known fact that African universities have since decolonisation established international linkages mainly along a north-south axis, predominantly with their former colonial rulers and narrowly focused on development cooperation and financial aid as opposed to bilateral and multilateral academic exchange.

However, since the turn of the millennium this course of events is changing rapidly. There is a new wave of optimism sweeping across Africa as growth rates climb, consumer spending rises and returns on investment escalate. By 2008 Africa's collective GDP was \$1.6 trillion, roughly equal to Brazil's and Russia's. Real GDP has increased by 4.9% per year since 2000, more than twice what it was in the 1980s and 1990s. Although these levels of growth are not uniform across all of Africa's sub-regions, at current growth rates, GDP by 2020 is projected to be \$2.6 trillion underpinned by a rapidly urbanising youthful and increasingly educated population with over 128 million households moving into the middle class to become vibrant consumer spenders.



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This optimism is shared across various civil and social sectors. Increasingly Africa's image is defined from within, rather than from abroad, whether in history, politics, literature or popular culture. Similarly, in African higher education there is a new eagerness among researchers and lecturers to engage with their counterparts elsewhere in the continent. Where collaboration has served mainly as a feeder of aid money into the continent from international partners and their donors, African academics are increasingly realizing the value of intra-African collaboration and mobility for the sake of addressing Africa's development challenges and harnessing its opportunities.

Universities are unique organisations – simultaneously frail and resilient under conditions of social and political change. They serve as the institutional memory of societies, providing knowledge conservation and stability, which at the same time explains why they are difficult to change from within.

The multifaceted challenge for African universities amidst rapid social and political change includes meeting the increasing demand for access to higher education, including postgraduate training and access to research facilities and material (libraries, laboratories, ICT), while finding innovative ways to ensure that Africa's growing opportunities reach those yet excluded from development and education: poor communities, persons with disabilities, and other population groups previously excluded from political power, wealth and basic services, including women and children.

To address these needs, this project will provide high quality postgraduate training to 86 master's and doctoral students from across Africa, to become the academics and professionals who will have the necessary transdisciplinary skills required to train greater numbers of students thus increasing access to higher education, to influence policy and to lead technological and social innovations for Africa's sustainable development. In addition 14 staff exchange opportunities for academic and administrative staff will serve to increase management skills in information services, supervisory skills, and transdisciplinary competency.

Importantly, this will be done in a partnership where African institutions are the lead agents. This implies a simple, but fundamental, mind shift, namely acceptance and affirmation of the idea that Africans can take the lead; that they too are valued contributors - not only recipients - in partnerships, and that they can harness their assets and capabilities in pursuit of a common goal.

The need that this partnership will address is of global concern, but with particular relevance to Africa. The world's greatest environmental challenges are food security in the face of climate change, resource depletion and loss of forests, wildlife and environmental services. The implications of these challenges, however, are not uniform across regions. Compared to other regions, Africa's response to these challenges will be fundamentally different from others primarily because it is a continent dominated by poverty, contributes relatively little to total greenhouse gasses, and in recent years has become the focus of a new global scramble for primary resources as new players like China have entered the game. It is generally accepted that Africa might well experience the most severe impacts of food security and climate change challenges, and yet, it is the continent that is least prepared to handle these impacts. The logic of this proposal is that Africa inherited inefficient and extractive resource regimes that led also to political exclusion and poverty. Promoting new governance configurations that are inclusive and decentralised can, by contrast, lead to a virtuous cycle in which we can produce more wealth from less environmental resources for more people, and in ways that are much better adapted to achieve food security in the face of climate change. We intend to promote this transformation by involving and educating young Africans proactively in the process of developing, understanding and scaling new approaches through 'transdisciplinary' research. Transformation requires, inter alia, social and institutional innovation that stems from the application of problem-solving knowledge generation and insight.



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## **A Food Systems approach to food security in the face of climate change**

Globally, the challenges of food insecurity within the context of climate change are inhibiting economic growth and human wellbeing, and these problems are expected to accelerate (Nelson et al., 2011). The food system is also changing as a result of complex and dynamic interactions of a range of socio-economic and environmental factors, including among others, urbanisation, concentration of production, vertical integration, deregulation and economic liberalisation. As demand for food is expected to double in the next 25-50 years, food systems will be forced to adapt to mounting challenges that current research and global institutions, especially those in Africa are only starting to grasp.

The poorest population in the world, the majority of which are in rural areas, continually depend on subsistence agriculture or local food and their local economy, and these are not well integrated into regional, national and global markets. According to FAO (2009), close to one billion people in the world have inadequate food, and UNICEF (2009) estimates that 10.9 million children under 5 years die every year due to hunger-related causes. Food insecurity will obviously be experienced differently around the world, and Africa will be the hardest hit and yet, has a limited capacity to adapt.

Achieving food security in the face of climate change is currently recognised as an increasing challenge for many developing countries, and this will require not only supporting the small- to medium-scale farmers, but also the associated stakeholders within the 'food system' that supply food to poor households / consumers (Vermeulen et al., 2012). A food system perspective will not be limited to food production, food processing, packaging and distribution. It will also need to address the retail sector and consumption, as well as institutional arrangements (regulatory, financial) and other wider dynamics such as climate change and resource scarcities. Furthermore, a large amount of waste is produced during production, processing and distribution, retailing and consumption; thus, food and packaging waste activities such as reducing, re-using and recycling, composting and disposal also form part of the food system (see Figure 1). The different activities within the food system may result in a number of outcomes, many of which may contribute to food security while others relate to social and environmental welfare (see figure 1).

Trade (referred to as "Exchange" in Figure 1) is also an integral part of the food systems which come into play in the climate change-food security-resources nexus. This happens at different levels, namely, international, national, regional and local. Within the context of economies highly dependent on agriculture, like Africa, both trade and climate change factors may impact on food security in many ways, for instance: (i) as a direct consequence, trade policies at the national and international levels can exert measurable impact on food security (e.g., enhancing trade liberalization initiatives may stimulate exports, thus generating economic growth and increased incomes, and giving households greater capacity to access food. The inclusive nature of this access can be analysed via multidisciplinary approaches; (ii) climate change impacts on agriculture is getting progressively dynamic (e.g., increased weather variability are predicted to take place in the future, which may result in some areas having less food available and others may open up opportunities for more and different types of food production. This in turn may unlock new markets with different trade opportunities; and (iii) these dynamic inter-linkages between trade and climate change calls for the need to develop responsive national and international policies (e.g., climate change affecting global food availability will affect food prices, potentially triggering the adoption of restrictive trade policies).

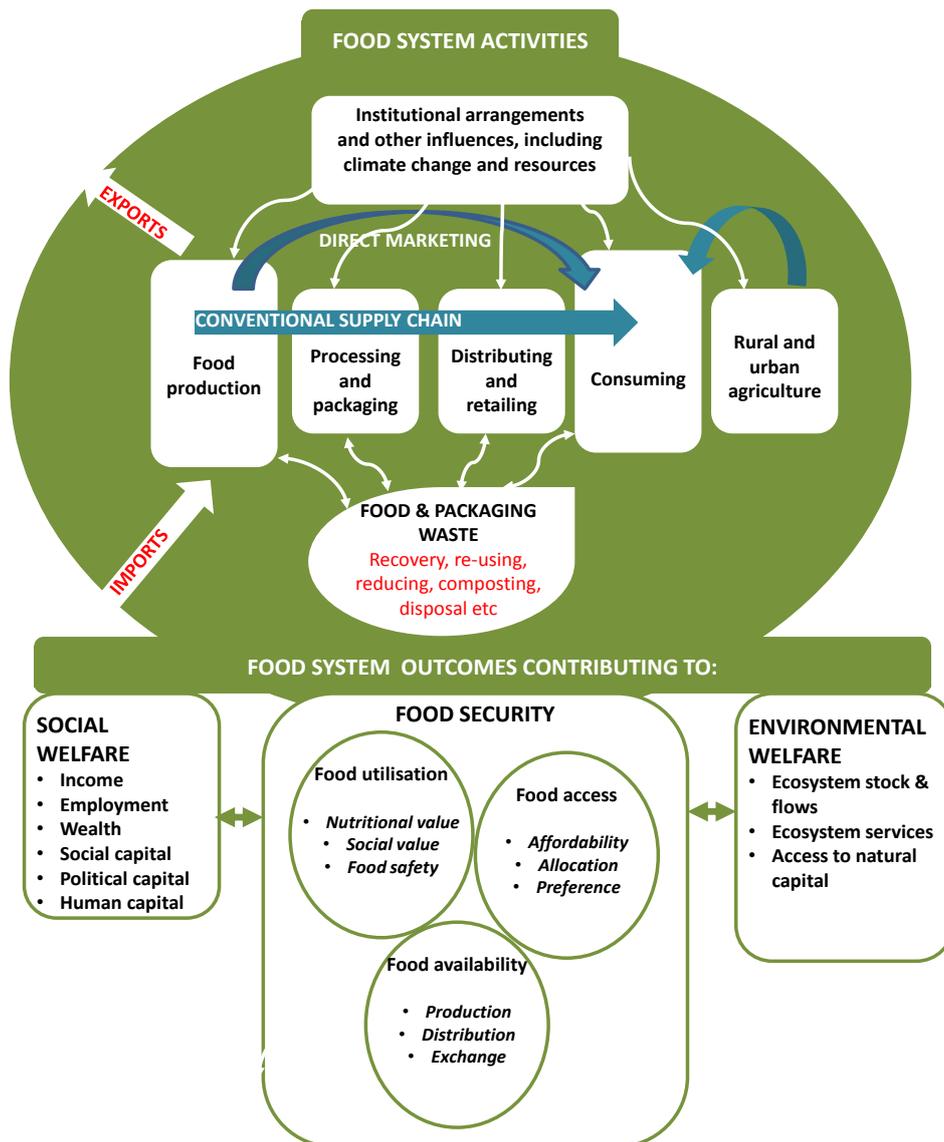


Figure 1: Conceptual framework: Food systems, their drivers and feedback, modified from Ericksen et al (2009)

Working towards identifying innovative and transformative solutions for achieving food security in the face of climate change in Africa, particularly for the marginalised and most vulnerable population, will require transdisciplinary approaches that allow attaining socially robust solutions and new knowledge production. It also requires identification, testing and validation of available best practices that help improve agricultural productivity in the face of changing climate change. Here it is necessary to study what are the conditions at which the best practices are performing well. For successful best practices up-scaling strategies have to be developed. This implies building African capacity that can address food security concerns in local contexts, and developing a shared understanding of the ways of enhancing adaptation capacity of local food systems. This kind of training recognises that knowledge building need not only happen at the university but also at all different phases with the food system (e.g. production, processing and packaging, distribution, retailing and consumption); that the focus in dealing with food insecurity need not be limited to providing technological solutions but in strengthening the understanding of agricultural food systems from farm to table; and that raising the level of influence that will result in reform or establishment of new policies and strategies is essential.

### Climate Change Adaptation



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The IPCC 4th Assessment Report concluded that climate change could have the following implications for Africa:

- By 2020, between 75 and 250 million people are projected to be exposed to increased water stress due to climate change;
- By 2020, in some countries, yields from rain-fed agriculture could be reduced by up to 50%. Agricultural production, including access to food, in many African countries is projected to be severely compromised. This would further adversely affect food security and exacerbate malnutrition.
- Towards the end of the 21st century, projected sea-level rise will affect low-lying coastal areas with large populations. The cost of adaptation could amount to at least 5-10% of GDP.
- By 2080, an increase of 5-8% of arid and semi-arid areas in Africa is projected under a range of climate scenarios.

Empirical evidence on temperature rise and declining rainfall confirms these predictions.

It follows that Africans will need to invest in a vast range of innovative and adaptation strategies to build the resilience of natural and social systems, including food systems. Adaptation, however, is in essence about innovations that are appropriate for the African context. This will only be possible if Africans themselves imagine, co-create and implement these innovations at the socio-economic, institutional, informational and technological levels.

Unfortunately, the knowledge base within Africa for anticipating the future implications of climate change and appropriate adaptation responses are uncoordinated and at its initial stages. Unless this is remedied, the capacity for innovation will not match up to the challenges that lay ahead, in particular the food security challenge.

As argued by the Stern Report on Climate Change, the poor will “suffer earliest and most” even though they have “contributed least” to climate change. This prediction will surely come true in Africa if the innovation capacity for adapting to climate change remains limited. Large scale investments in post-graduate research that builds this capacity for innovation in African institutions is clearly, therefore, a top priority.

### **Resource Depletion**

Global resource depletion translates into higher resource prices which, in turn, results in economic policy decisions aimed at substituting resource and energy intensive production and consumption systems. This is clearly reflected in oil prices but also in the price of coal, metals, building materials, wood, food and derivatives such as plastic (from oil), key strategic materials (e.g. aluminium) and clothing (made from cotton or synthetics derived from oil).

In response to rising resource prices, many governments and private companies are investing in alternative technologies that deliver goods and services at lower prices. The best example is renewable energy. For the first time ever, renewable energy accounted for almost 50% of global new installed capacity in 2011 (208 GW), and it is estimated that the renewable capacity makes 25% of total global electric capacity installed (REN21, 2012).

Many other examples exist in the building, transport, agricultural, water and waste sectors. Those economies that invest early in new technologies that massively improve resource efficiency (i.e. ‘doing more with less’) will become the future leaders of the unfolding ‘green industrial revolution’ –



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more commonly known as the transition to a 'green economy'. Those that strive to develop by relying on the old 'resource and energy intensive' technologies will get left behind. They will be forced to import technology developed by others and thus remain dependent on external economic forces.

Africa has a major advantage. GDP is growing fast and massive new infrastructures must still get built. Africa's leading economies are diversifying through the manufacturing, construction, services and agricultural sectors. It is now faced with a choice: will it invest in carbon and resource intensive infrastructures and industrial systems, or will it develop the capacity for imagining, co-creating and implementing resource efficient and more sustainable and renewable technologies for producing key services like housing, water supplies, transport, waste recycling and food production and processing. This is not just about money and capital infrastructure, it is also about 'know how', innovation and technological change in a fast changing global economy where knowledge has become the most valuable commodity.

Once again, like climate change adaptation, everything depends on whether Africa can develop the innovation capacity for resource efficiency. Africa is currently the most resource inefficient continent. You need 6 tons of resources to produce \$1000 of value in Africa, compared to 0.8 tons to produce \$1000 of value in Western Europe, or 3.8 tons to produce \$1000 of value in Latin America. Unless this changes, Africa will never generate the financial resources it needs to invest in poverty eradication and climate change adaptation. It will forever be dependent on external funds that will flow into Africa tied to externally developed technologies that may not be appropriate technologies and hence may raise sustainability questions.

It follows that research is needed that will make it possible for Africans to develop the innovation capacities required to rapidly eradicate poverty through increased consumption without a rapid rise in the total quantity of resources required to achieve this. Put differently, Africa needs to generate a lot more economic value and well-being from its resources than is currently the case.

Like research-based innovations for food security in the face of climate change and climate change adaptation, research-based innovations for resource efficiency boil down to very practical issues. Some illustration based on the food system perspective include soil restoration techniques that boost food production, ensuring equitable access to markets or creating new local markets, how to treat sewage in order to capture bio-gas for energy generation and H<sub>2</sub>O for re-use in the food processing and packaging, how to manage natural and plantation forests sustainably over time, and how to de-congest cities by investing in the kind of bus rapid transport (BRT) systems introduced in Lagos and Johannesburg.

### **Governance and Environmental Services**

Africa inherited a dual economy in which resources from rural areas are extracted to support a 'modern' urban sector. However, 70% of Africa's poor are rural. With climate change, the extent of drylands will expand significantly, and resources like water, carbon and wildlife are likely to become ever more valuable. Perhaps the greatest challenge facing human-kind, and even more so Africa, is that wild resources and ecosystem services are priceless but have little or no value to the people who live with them. This presents a number of challenges: how do we translate the true value of these resources into sustainable land use incentives, and how do we ensure that they leverage a massive reduction in multi-dimensional poverty? How do we ensure the marginalised and vulnerable societies become and remain food secure in the face of changing climate and declining resources?



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This presents the challenge of re-empowering the majority of Africans with rights over the valuable resources with which they live, and on the basis of this building the individual and collective capacities of millions of Africans to manage resources sustainably from which they have been disenfranchised for over a century. Globally, African scholars and practitioners have been at the leading edge of this movement to re-entrust Africans with their own resources, particularly through southern Africa's iconic community-based natural resource management projects; indeed, Africans can claim to have changed the global perception of the relationship between rural people and biodiversity. However, as Africa transforms from basket case to economic tiger, threats to resources like elephants, rhinos, forests, freshwaters, grazing and soil have never been stronger.

Working directly with local people, academics need to contribute proactively to the development and analysis of new forms of economic and political resource governance at all levels – international, national, regional and especially local. For instance, how do we overcome the historic challenge of elite capture to promote equitable benefit sharing and participatory governance?; how do we develop new markets for wildlife, carbon and ecosystem services so that Africans get the true value of their resources?; indeed, how do we promote new modes of doing research in which scholars work with local people, civil society and policy makers to develop new forms of knowledge that promote inclusive economic growth and sustainable natural resource use?

In southern Africa, we have established large landscapes in which progress towards political and economic inclusiveness, and towards a bio-experience economy, are beginning to occur. These complex social-ecological systems are currently locked in a vicious cycle of poverty, inequity and environmental degradation. However, if research on ecosystem services, resource economics and livelihoods, micro-governance and democratization, and the management of poverty landscapes through inclusive stakeholder process, is structured carefully but boldly, it can tip these systems towards a virtuous cycle of inclusive, evidence-based governance, self-driven poverty reduction and environmental sustainability. The signs for this are good; Africa has excellent human resources within its younger people. Empowering this talent through research that bridges scholarship and practice and which is transdisciplinary, may be the catalyst for major change in Africa's potentially powerful natural resource sector.

### **Promoting a virtuous circle: ecosystem services, food security in the face of climate change, climate change adaptation, and resource use efficiency through (social and institutional) innovation and inclusive governance**

It is therefore clear that developing innovative and transformative food systems in the face of climate change, climate change adaptation and resource efficiency will entail significant long-term investments in the building of an African knowledge base for sustainability-oriented innovation. What is interesting about the African context is that research into food security in the face of climate change, climate change adaptation and resource efficiency can in many cases overlap. The following examples are worth noting:

- Food insecurity in Africa will affect the most marginalised and poor population that are dependent on small to medium-scale agriculture for their well-being. This will be aggravated by other socio-economic and environmental factors such as urbanisation, climate change and climate variability and resource availability and access. Research in Africa that takes into account a 'food systems' perspective is urgently needed to address food security concerns and identify robust and transformative solutions for specific local contexts;
- Climate change/climate variability will affect water supplies which in turn influences food production: research is needed to anticipate the impacts and possible responses, with one



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key response being the need to find innovative ways of using water far more efficiently in both urban systems and in agriculture;

- Climate change/climate variability will affect food production: research is needed to anticipate these impacts and responses, including how to rebuild degraded soils so that they can be more resilient to changes in temperature and rainfall – this resource efficiency approach will address the fact that 65% of Africa’s agricultural soils are estimated to be degraded;
- Fast growing African economies that require massive investments in energy infrastructures (e.g. South Africa, Nigeria, Egypt, Kenya and even Ethiopia) will face a choice of either opting for carbon-intensive investments using old fossil-fuel technologies, or opting for a resource efficiency approach that deploys Africa’s vast solar, hydro and geothermal resources using technologies developed by Africans financed via Clean Development Mechanism (CDM) funds (as the Chinese now do, or as Europe is doing by investing in DESERTEC which is the largest solar power station in the world and will be built in the Sahara desert to supply Europe, not Africa). Going for resource efficiency will imply producing more with less (e.g. more food production with less resources) which in turn reduces their greenhouse gas emission;
- 27 of the fastest growing cities in the world are in Africa, with Lagos estimated to be one of the 3 largest cities in the world by 2015 – over the next 4 decades; 800 million more Africans will be living in cities. High population in the cities will imply increase in food requirements. The question here is whether cities can continue to be run as they are now run, or should they find new ways of doing things that will allow citizens to become and remain food secure and use resources efficiently, e.g. new forms of mobility that reverse congestion, or ways of upgrading the sprawling slums to facilitate a more decent quality of life, or ways of managing waste that reverse current levels of pollution?
- Biodiversity and eco-system services will be affected by climate change/climate variability in ways that threaten rural livelihoods including food security: obviously research is needed that provides rural dwellers with access to information about what could happen and possible responses (i.e. food security in the face of climate change/climate variability and climate change adaptation research), but this will also entail research that addresses the interface between communities, eco-systems, institutions and knowledge about innovation (i.e. resource efficiency research).

All these examples show how food security research overlaps with climate change, resource efficiency and environmental services research in the African context with major benefits for the rural and urban poor whose consumption levels need to go up if poverty is to be eradicated. Mature fossil-fuel based technologies will not build an African knowledge and technology movement that is appropriate for the green industrial revolution that is now underway.

### **Broad Guiding Research Questions for Transdisciplinary Research categorized by theme**

#### *1. Food security theme research questions:*

- What are the current local food system structures and how can they be governed in the face of climate change/climate variability, to address food security concerns?
- What are the pro-poor adaptation practices, technologies and policies for food systems, that is, from production (farm level), packaging, distribution (retailing) and consumption (table)?
- What local food systems investments and institutional capacity are required to improve adaptation capacity for rural and urban poor as well as managing environmental change?
- What is the political economy of food systems and its implications in exacerbating food insecurity in the face of climate change?



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- How can African agriculture transform from subsistence to market driven production?
- What role has and will mechanization and use of fertilisers play in achieving the goals of agriculture production and food security as for example, the East Africa Community Development Strategy?
- What role can urban agriculture play in achieving food security in fast growing urban areas, particularly for the urban poor?
- What is the impact of climate variability and trade on food security in the African context?

### *2. Climate change theme research questions*

- What are the direct and indirect consequences of climate change/climate variability in Africa?
- What best practices are available in Africa, and what are the drivers for change?
- What innovations are required to adapt to the consequences of climate change/climate variability in ways that help to eradicate poverty? What conditions need to be in place to stimulate, foster and support these innovations?

### *3. Resource efficiency theme research questions*

- Why is resource efficiency in Africa so low?
- What are the key resources in Africa that could be managed in more equitable and resource efficient ways (e.g. water, soils, waste, wood, food – including indigenous crops / wildlife -, fossil fuels, solar power, geo-thermal power etc.)?
- What new technologies in construction, materials, infrastructure and communication can help to decouple growth from resource depletion.
- How can economic production be expanded, while delinking it from its environmental impact, by utilizing Africa's comparative advantage in wild resources and creating wealth through global markets?
- How can resource management increase mitigation to greenhouse gases emissions?

### *4. Governance and environmental services theme research questions*

- How can greater accountability for deployment of resource rents be developed and institutionalised over time?
- How can local communities be re-empowered with property rights, and what innovations in governance regimes are necessary to manage these rights?
- Under what conditions is there a virtuous cycle between developed governance, resource valorisation, poverty reduction and environmental sustainability?
- What forms of micro-governance are most effective for sustaining natural resources, equitable benefit sharing, and inclusive governance?
- Can evidence based management systems be used to enhance climate adaptation, especially at the local level, and to unlock the social constructed inequities of parallel 'modern' and institutionally weak unproductive economies?
- Are there new ways of doing research in which scholars, practitioners and civil society can co-create new systems of governance and theoretical logic to promote positive change?

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