



Climate change



The

newly launched African Climate and Development Initiative at UCT has a tough challenge ahead of it. The initiative is seeking to map a pathway for Africa that maintains economic growth, while switching to a much lower carbon emissions path than has been typical of other developing regions. All this is taking place against the backdrop of a steeply increasing African population and in one of the regions that will be most affected by climate change in the years ahead.

UCT launches a co-ordinated assault on climate change

Professor Mark New's office has a spectacular view from the top floor of the Geology Building on UCT's upper campus and is reached through a complex maze of corridors and discontinuous stairs. The new Pro Vice-Chancellor for Climate Change is the Director of the African Climate and Development Initiative (ACDI), UCT's new inter-disciplinary initiative for linking and developing the no less complex wealth of ongoing climate change-related research at the university.

Professor New is clear that climate change is not just another research area. It is an unprecedented challenge for humanity and a real threat to our civilisation, complicated by the uncomfortable reality that the 'enemy' is ourselves.

This sets a provocative challenge for the ACDI: how to map a pathway for Africa that protects economic development and improves the lives of an African population that is set to increase steeply, while switching to much lower carbon emissions than have been typical of other developing regions. What's more, this must be done in a part of the world that will likely be most affected by climate change.

The ACDI is developing collaborations across more than 20 departments at UCT, from the pure sciences to the social sciences and the humanities, including the Centre for Criminology, the Gordon Institute for Performing and Creative Arts (GIPCA), and the Energy Research Centre (ERC), a hub of expertise on energy scenarios for South Africa and a key player in the development of South Africa's Long Term Mitigation Scenarios, to explore the country's options for developing while cutting emissions.

Professor New points out that a systemic approach reveals substantial overlaps in these issues. Some possible mitigation choices – for instance, using more biofuels, would have significant implications for adaptation, putting more pressure on water and land resources already stressed by climate change.

"There's a series of PhD projects in the faculties of Law and Commerce, with the Department of Criminology's Professor Clifford Shearing," says Professor New. "He's interested in the role of fulcrum organisations; those that can be agents

that strongly influence how we respond to climate change. "They're working with the insurance company Santam and local authorities, looking at assessing natural disaster risk and reducing premiums in the context, for example, of good catchment management.

"We're very interested in bringing different disciplines together, to think systemically, in order to identify knowledge gaps from single or multiple disciplines that may need to be filled to improve our understanding of the systemic issues. Phase one of ACDI is about networking and enabling. We're also looking at setting up partnerships with entities like the Western Cape government, to clarify, for example, what a green economy might mean in the context of climate change, while creating processes for dealing with complex multi-stakeholder issues.

"Our master's degree in climate change and sustainable development takes a similar approach, combining courses from the engineering, commerce, humanities and science faculties with a range of electives, and this is helping to create a community of research-active teachers."

Much of the research being done under the auspices of ACDI is also characterised by this multi-stakeholder approach. Professor New is enthusiastic about the recent work by economics student Anthony Dane, for example. "He did a master's degree project on personal carbon trading. He did some really cool experiments where he got 60 or so students to work out their carbon budget and then set a cap for the total carbon that the group could emit."

Dane says he concluded that: "mitigation policy frightens people but it can be acceptable if adequately understood – participating in the design process improved acceptability significantly."

"Climate change is not just another research area. It is an unprecedented challenge for humanity and a real threat to our civilisation, complicated by the uncomfortable reality that the 'enemy' is ourselves."

"Then, within the ERC, there is innovative thinking about energy and poverty, trying to understand energy alternatives that do improve wellbeing, jobs and income," says Professor New. "The same solar technology can have very different social impacts, depending on whether



The Prince of Wales addressing an audience at UCT, shortly after the launch of the African Climate and Development Initiative in 2011.

it's located in Namaqualand or across the rooftops of Khayelitsha. The ERC's MAPS (Mitigation Action Plans and Scenarios) programme aims to share the expertise South Africa has created in developing our Long Term Mitigation Scenarios with other developing countries.

"In the Department of Botany's Plant Conservation Unit, Associate Professor Lindsey Gillson and Professor Timm Hoffman are working on a project called Benchmarks for the Future to understand how South African landscapes have varied in the past, as climate has varied. That informs how they might respond and must be managed in the future."

Climate and habitat shifts affecting a vital area of biodiversity – bird life – are being examined by the Percy FitzPatrick Institute of African Ornithology.

"Generally," says Professor New, "what we are trying to do is understand how climate change may impact on ecosystems and society. Then there's the mitigation side – trying to reduce the causes of climate change to reduce the worst impacts – and there is a strong group working on that in the Energy Research Centre, led by Professor Harald Winkler. In the Law Faculty, Professor Richard Calland is looking at the governance of climate

finance. There is also a lot of research under way around the politics of mitigation."

Knowledge that is usable

Further up on campus, Professor Bruce Hewitson is head of UCT's Climate System Analysis Group (CSAG) and holds the DST/NRF SARCHI Chair in Climate Change.

"CSAG leads the Africa co-ordination for CORDEX (the Co-Ordinated Regional Climate Downscaling EXperiment), which is an unprecedented initiative emanating from the World Meteorological Organisation (WMO). It has the goal of providing probabilistic regional climate change information for all terrestrial regions, and it recognises that Africa is the most vulnerable to climate change and has the weakest knowledge base from which to work. So Africa has been prioritised as a domain of focus and we lead the Africa group out of Cape Town."

CORDEX and the CSAG Climate Information Portal are the most important parts of CSAG's work in providing society with usable knowledge about climate change. CSAG's approach already exemplifies the teaching and outreach that will be an essential part of the ACDI's work.

Signature themes associated with this theme

■ The Marine Research (MA-RE) Institute

The MA-RE Institute, a multi-disciplinary institute based at UCT, is the leading marine research organisation in Africa, representing the interests of 40 permanent marine researchers. Its research underpins its teaching, training, capacity development, and consultancy activities. The institute's greatest strength is the intellectual depth and range of its academic staff. It has more than 40 tenured researchers from a range of faculties and research units undertaking research in the marine and other salty water arena. The institute's principal focus is research, hence it brings together active researchers in the field, who add value to, and benefit from this collaborative structure. At the institute, observation, measurement, and collection of samples and data are accomplished by ship cruises, field trips and remote sensing by satellite.

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■ The African Climate and Development Initiative

The African Climate and Development Initiative (ACDI) co-ordinates cutting-edge inter-disciplinary research and training on the twin issues of climate change and sustainable development. ACDI brings together natural scientists, engineers, social scientists, lawyers, economists, and urban planners, among others, from UCT and beyond, to provide an African perspective, grounded in strong science, addressing issues relating to climate variability and global change affecting the African continent. It actively creates opportunities for African researchers and young scholars to contribute their own perspectives to these issues. Through the establishment of strong partnerships throughout Africa, ACDI contributes towards developing the African leaders of the future, who have an intimate understanding of the physical and human needs of Africa, and who will contribute to addressing this all-important issue facing humankind.

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“We’ve put together a team of 30 young scientists from across Africa to analyse the CORDEX data together in regional teams and through that, build their skills.”

“What CORDEX lacks is activity to analyse and translate data,” says Professor Hewitson. “I gathered four international agencies together and we funded a two-year programme to do that translation activity and develop the regional products that are needed by society. We’ve put together a team of 30 young scientists from across Africa to analyse the CORDEX data together in regional teams and through that, build their skills. This is our ‘class of 2012’.

“One aspect of CORDEX is doing the actual climate modelling to produce the regional information data. But data is not information. We’re working to tailor our products to sectors that need specific forms of information, spanning the gap between science and society. Africa is such a vulnerable continent, so it’s knowledge that is desperately needed,” he adds.

What the sea can tell us

Also fitting seamlessly into the ACDI mission is the work of Associate Professor Astrid Jarre, a marine systems ecologist holding the DST/NRF SARCHI Chair in Marine Ecology and Fisheries, who speaks with great enthusiasm about MA-RE’s work, and with great interest in the work of her colleagues, noting with pride the accomplishment of colleague Dr Lynne Shannon, a co-author on two papers published in *Science* in a single year, 2011.

“The Marine Research (MA-RE) Institute facilitates marine research at UCT and makes connections between the various research groups on campus including zoologists, oceanographers, experts in marine law, geologists, molecular biologists. Over the last few years, we have created a structure that investigates the relationship between global climate change and the sea. So ACDI hits the ground running in terms of climate-related research in the marine realm, because there’s a lot going on at UCT.”

MA-RE is also host to the Nansen-Tutu Centre for Marine Environmental Research, which works on predicting marine ecosystem variability and convenes a scholarship exchange programme for young researchers.

Centre of excellence associated with this theme

■ DST/NRF Centre of Excellence at the Percy FitzPatrick Institute of African Ornithology, Birds as Key to Biodiversity Conservation



PhD student Jess Shaw attaching a transmitter to a Ludwig's Bustard in the Karoo (Photo: Ben Dilley).

The Centre of Excellence (CoE) at the Percy FitzPatrick Institute of African Ornithology (PFAIO) undertakes scientific studies involving birds that contribute to the theory and practice affecting the maintenance of biological diversity and the sustained use of biological resources. The centre continued to achieve its targeted number and quality of scientific publications, with 79 papers published in peer-reviewed journals in 2011, including 17 in journals with Science Citation impact factor ratings of 3,5 or higher. Five contributions to semi-technical books and 41 semi popular articles were also published.

During 2011, the centre supported 12 postdoctoral fellows, 21 PhD, 31 MSc and seven BSc Honours students, of which 25 percent were black and 46 percent were women. It was a record year with 26 postgraduate students graduating in 2011 (seven PhD, one MSc, 11 MSc Conservation Biology, and seven BSc Honours).

The fifth Biodiversity Conservation Academy, hosted by the national CoE for Invasion Biology and the PFAIO CoE, was held in De Hoop Nature Reserve during January 2011. The academy was attended by 11 students from seven South African universities, and three interns from the South African National Biodiversity Institute. All 14 students were black and nine were women. The aim

of the academy is to broaden the students' knowledge of the theory and practice of conservation in a South African context and to encourage them to pursue postgraduate studies in conservation biology.

A broad range of close collaborative working relationships with scientific peers and a variety of conservation NGOs and governmental organisations exists both nationally and internationally. The CoE continues to build much-needed African capacity in the broad arena of biodiversity conservation. The CoE has also been active in advising conservation organisations, government departments and industry on a variety of research projects. During 2011, CoE members served on 16 journal editorial boards, reviewed at least 97 papers for 50 peer-reviewed journals, and sat on 35 advisory boards.

A highlight of the year was the visit by Sir David Attenborough, who presented a Vice-Chancellor's Open Lecture during April as the final celebratory event of the Percy FitzPatrick Institute of African Ornithology's 50th anniversary.

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Research groupings associated with this theme

■ Energy Research Centre

The Energy Research Centre (ERC) conducts high quality, targeted and relevant research, as well as offering postgraduate opportunities at master's and doctoral levels. The four main research areas are: energy efficiency; energy, environment and climate change; energy, poverty and development; and energy systems analysis and planning. The staff of the ERC have qualifications in engineering, natural and environmental sciences, urban and regional planning, economics, law, politics, sociology, and anthropology.

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■ Animal Demography Unit

The mission of the Animal Demography Unit (ADU) is to contribute to the understanding of bird populations, especially bird population dynamics, and thus contribute to the conservation of avian biodiversity. The ADU achieves these goals through a variety of projects in which para-ornithologists throughout Southern Africa can participate. These projects range from identifying bird species, through undertaking census surveys, to making detailed observations on breeding productivity.

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■ Nansen-Tutu Centre For Marine Environmental Research

The Nansen-Tutu Centre for Marine Environmental Research, under the patronage of Nobel Laureate Archbishop Emeritus Desmond Tutu, was set up in 2010 to assist in the worldwide need to develop the capacity to understand, model and predict the state of the ocean and its ecosystems, in a similar way that the meteorological services do for weather and climate. The founding partners of the Nansen-Tutu Centre in Norway and South Africa have the necessary complementary expertise and knowledge to address these challenges in the three oceans around Southern Africa. A central theme for the centre will be to undertake research into the science underpinning operational oceanography, particularly in

numerical ocean modelling, as well as continuing to develop skilled African postgraduate marine scientists. The centre actively contributes to the OceanSAfrica initiative, with partners from the Department of Environmental Affairs' Ocean and Coasts branch, the South African Weather Service, the Council for Scientific and Industrial Research, and the South African Earth Observing Network.

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■ Plant Conservation Unit

The Plant Conservation Unit (PCU), located within the Botany Department, undertakes research and teaching directed at improving the conservation status of the vegetation of Southern Africa, with a particular focus on the winter rainfall region. Established in 1993, staff and students within the PCU investigate palaeoecological, historical, and current impacts on the vegetation of the region and work closely with land users to conserve and prevent further transformation of the region's biodiversity.

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■ Environmental Evaluation Unit

The Environmental Evaluation Unit (EEU) is an independent, self-funded research, consulting and training unit based at UCT. Founded in 1985, the EEU has established itself as a leader in the fields of integrated environmental and coastal management and sustainable development, responding to local, regional and global environmental challenges using an inter-disciplinary and participatory approach. The EEU has implemented a wide diversity of projects that have contributed to academic debates, and informed policy while having practical impacts on the ground. The EEU works in five main thematic areas: integrated environmental planning, management and assessment; integrated coastal and small-scale fisheries management; biodiversity use, trade, livelihoods and social justice; sustainable business and cross-sector collaboration; and public participation.

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National Research Foundation P-rated researchers Associate Professor Lindsey Gillson (top) and Dr Gina Ziervogel form part of the extensive network at UCT who are affiliated with the African Climate and Development Initiative. Associate Professor Gillson is Deputy Director of the Plant Conservation Unit in the Department of Botany. She is currently working on projects in South African biomes, focusing particularly on long-term vegetation dynamics at ecotones. Her research interests include applied palaeoecology, conservation and ecosystem management as well as linking ecological and social systems. Dr Ziervogel's research is on development in a context of climate change. Through this she has focused on a number of areas including municipal adaptation strategies, institutional barriers to adaptation, flood governance, water and food security. Dr Ziervogel is a senior lecturer in the Department of Environmental and Geographical Science.

DST/NRF SARCHI Chairs associated with this theme

■ Climate Change



Professor Bruce Hewitson heads the Climate Systems Analysis Group with foci on climate modelling, variability, change, and regional projections. He is extensively engaged with capacity-building in Africa and with the communication of regional climate information supporting responses to climate change. He plays numerous roles internationally, including co-ordinating lead author in the Intergovernmental Panel on Climate Change (IPCC), and currently co-chairs both the IPCC Task Group on Data and Scenario Support for Impact and Climate Analysis (TGICA) and the World Climate Research Programme (WCRP) working group on regional climates. He is a lead co-ordinator in the WCRP global CORDEX programme to develop regional climate projections. Professor Hewitson received his bachelor's degree (1988) from the University of Cape Town, and master's (1990) and PhD (1991) from Pennsylvania State University.

■ Marine Ecology and Fisheries



A marine systems ecologist by qualification, Associate Professor Astrid Jarre holds the SARCHI Chair in Marine Ecology and Fisheries at the Marine Research (MA-RE) Institute. Her keen interest in fisheries management allowed her to hold research positions at the International Centre for Living Aquatic Resources Management in Manila, Philippines (now World Fish Centre, Penang, Malaysia) and the Danish government laboratory for fisheries, before she moved to South Africa. Associate Professor Jarre served on the Scientific Steering Committee of the International Geosphere-Biosphere Programme/United Nations Intergovernmental Oceanographic Commission (IGBP/IOC) Global Oceans Ecosystems Dynamics Programme (GLOBEC), and was a member of its Working Group on Human Dimensions. Inspired by multi-disciplinary research into fisheries management in Denmark and the inter-disciplinary Canadian 'Coasts under Stress' programme, Associate Professor Jarre teamed up with colleagues in the humanities and social sciences to further inter-disciplinary research into marine social-ecological systems under global change in the Benguela current.

■ Animal Evolution and Systematics



Professor David Jacobs holds a PhD in zoology from the University of Hawaii, where he completed a thesis *Character release in the endangered Hawaiian hoary bat, *Lasiurus cinereus semotus**. He has been at the University of Cape Town since 1994, where his main research interests are focused on all aspects of evolutionary biology.

He has conducted research all around the world, including Australia, Costa Rica, Belize, Israel, Canada, Namibia, and Zambia. He has supervised more than 20 postgraduate degrees and many of his students have won prestigious awards, such as the Purcell Memorial Award for the best PhD thesis, and SA Association for the Advancement of Science – S2A3 Bronze Medal for the best master's degree thesis.



■ Modelling of the Coupled Ocean-Land-Atmosphere Phenomena Related to Climate

Professor George Philander, an expatriate South African, was recruited to this position in the Marine Research Institute from Princeton University, in the USA. This is a joint position between UCT and the Council for Scientific and Industrial Research (CSIR), and while Professor Philander is hosted by UCT, he also serves as the Director of the Africa Centre for Climate and Earth Stewardship Science.



Student and staff delegates attending the African Operational Oceanography Workshop, hosted by the Nansen-Tutu Centre in 2011.

Professor Frank Shillington, co-director of the Nansen-Tutu Centre, points out that the oceans comprise about 75% of the surface area of the Earth, so it's vital to understand how the ocean-atmosphere climate system interacts.

Professor Chris Reason, head of the Department of Oceanography, adds that although most media attention is focused on climate change, research on fundamental climate science and on climate variability is essential “because we do not understand these topics sufficiently well to have much confidence in the ability of models to make realistic projections, either for seasonal forecasting purposes or for climate change applications.” Professor Reason is a lead author on the upcoming Fifth Assessment of the Intergovernmental Panel on Climate Change.

“Our climate oriented research incorporates this type of approach,” says Professor Shillington. “And it is beginning to reveal how important the Agulhas Current System at the tip of Africa is to the global climate system. Indeed, the unique

setting of the tip of Africa into the three adjacent oceans, gives us a leading competitive edge.”

Breaking new ground

Professor New would agree with this assessment, which is why the multi-disciplinary and multi-stakeholder approach of the ACDI is seen as so important within the context of the university and the future of the African continent. In November 2011, shortly after the official launch of the ACDI, His Royal Highness The Prince of Wales, on a visit to South Africa, commended UCT on its bold decision to break new ground and create a role dedicated to taking on this global challenge holistically and that working together on this problem was the only likely path to success.

“I, for one, have been incredibly heartened by the University of Cape Town’s decision to appoint a Pro Vice-Chancellor for Climate Change – an idea that I can only hope will catch on elsewhere,” he says.