



UNIVERSITY OF CAPE TOWN
IYUNIVESITHI YASEKAPA - UNIVERSITEIT VAN KAAPSTAD

UNIVERSITY OF CAPE TOWN
SUSTAINABILITY
AND THE
SDGS
2021



SUSTAINABLE DEVELOPMENT GOALS



1 No poverty



2 Zero hunger



3 Good health and well-being



4 Quality education



5 Gender equality



6 Clean water and sanitation



7 Affordable and clean energy



8 Decent work and economic growth



9 Industry, innovation and infrastructure



10 Reduced inequalities



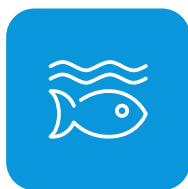
11 Sustainable cities and communities



12 Responsible consumption and production



13 Climate action



14 Life below water



15 Life on land



16 Peace, justice and strong institutions



17 Partnerships for the goals

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To make this report engaging and accessible, the performance data is provided at a high level. For more detailed information, please contact ResearchVisibility@uct.ac.za.

Cover The UCT Graduate School of Business Solution Space at Philippi Village brings the university's resources directly to the local communities of Philippi, Nyanga, Gugulethu, Mitchells Plain and Khayelitsha. The Solution Space provides an enabling environment in which South Africa's entrepreneurial talent can work towards building innovation-led, scalable and sustainable enterprises that have a positive impact across the country and beyond. **Photo** Lerato Maduna

Introduction

UCT's mission statement has evolved over the years to address the ever-changing context within which we operate, but the core of our mission statement has never wavered. We developed UCT's Vision 2030 to give expression to our new massive transformative purpose, which commits our staff and students to "unleash human potential for a fair and just society". We are - and have always been - committed to being part of the solution to the many challenges faced by our extraordinary continent and our world.

Social justice and the world's grand challenges are at the heart of both the United Nations Sustainable Development Goals (SDGs) and the African Union's Agenda 2063, and our research and teaching have long focused on supporting and responding to these pressing issues. As the world and the continent face increasingly existential challenges, from rising inequality to climate change, our university is committed to addressing these with renewed drive and focus.

Neither the COVID-19 pandemic nor the wildfires that destroyed parts of UCT's Upper Campus in 2021 have swayed us from fulfilling our mission, and this report is a tribute to the many students, academics and support staff who made it possible.

Professor Mamokgethi Phakeng
VICE-CHANCELLOR



UCT's Vision 2030 has ambitious goals that are driving us to be an inclusive, research-intensive African university with global reach that addresses the grand challenges of our time with cutting-edge teaching and learning and research facilities. We are working to enhance and, where necessary, transition UCT's research portfolio to champion knowledge from Africa, to generate new knowledge in Africa, to contribute to global knowledge and to ensure that our research has tangible social impact in Africa and further afield.

Our researchers have increasingly formed cross-cutting and integrated research teams that have a clear focus on responding to the grand challenges. Identifying strategic focal areas for research towards Vision 2030 allows us to both consolidate our existing areas of research expertise and identify emerging areas of importance. These new research themes tie in very closely with the SDGs and the African Union's Agenda 2063.

UCT's commitment to accelerating the pace and scale of delivering the SDGs in Africa, with an Africa-centred approach, was clearly demonstrated at the International Summit on the SDGs in Africa. Hosted by UCT and supported by global university networks and partners in 2021, the event gathered key thought leaders from Africa and beyond to frame the core requirements for achieving delivery of the SDGs in Africa. It also helped to shape our collaborative research agenda with African partners and beyond, which contributes to building the Africa we want, as well as cementing our alignment with the SDGs and the African Union's Agenda 2063.

While this report covers a large swathe of the SDG-focused research, innovation and knowledge translation happening at UCT, it is by no means comprehensive. In compiling this report, we have reaffirmed how much of our work covers not just one but many SDGs, and the multi-, inter- and transdisciplinary work that has enabled us to achieve success in both new knowledge and its translation. And it is this that has allowed us to make a tangible impact in so many critical areas, both locally and globally.

Professor Sue Harrison
DEPUTY VICE-CHANCELLOR: RESEARCH AND INTERNATIONALISATION

A snapshot of UCT in 2021

UCT aspires to become a premier academic meeting point between South Africa, the rest of Africa and the rest of the world. Taking advantage of expanding global networks and our distinct vantage point in Africa, UCT is committed, through innovative research and scholarship, to grappling with the key issues of our natural and social worlds.

UCT's faculties









- ▶ Commerce (including the UCT Graduate School of Business)
- ▶ Engineering & the Built Environment
- ▶ Health Sciences
- ▶ Humanities
- ▶ Law
- ▶ Science
- ▶ The Centre for Higher Education Development



Vision 2030

Vision 2030 was developed to give expression to UCT's massive transformative purpose - "to unleash human potential to create a fair and just society" - in the core academic functions of research and teaching and learning and the nexus between them, the cross-cutting responsibilities of transformation and social responsiveness, and the systems that support UCT's excellence and transformation for sustainability - the three pillars underpinning Vision 2030.

Sustainability on campus in 2021

 Electricity consumption: 54 873 MWh (a 21% reduction since 2013*)	 Scope 1, 2 and 3 carbon emissions: 78 899 tons (an 8.5% reduction since 2013*)	 Water consumption: 149 994 kl (a 50% reduction since 2013*)	 Four low-energy buildings built	 Waste to landfill: 1 062 tons	 Waste recycled: 213 tons (17% of total)	 Organic waste from student housing sent to fly/pig farm: 169 tons	 New recycling bins installed: 80
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* Note that 2021 was a COVID-19 year, with the university not operating at 100%.

Our students

29 444 students

15 858 females
13 550 males
36 undisclosed

54% of UCT's students are women.

8 759 African	3 744 Coloured	1 575 Indian	4 862 White	3 663 International	6 841 Other
4 788 females 3 963 males 8 undisclosed	2 262 females 1 479 males 3 undisclosed	816 females 757 males 2 undisclosed	2 535 females 2 318 males 9 undisclosed	1 718 females 1 945 males 0 undisclosed	3 739 females 3 088 males 14 undisclosed

Our staff

	Female	Male	Grand total
African	1 234	853	2 087
Coloured	1 639	791	2 430
Indian	185	108	293
White	693	490	1 183
International	260	345	605
Undisclosed	32	28	60
Grand total	4 043	2 615	6 658

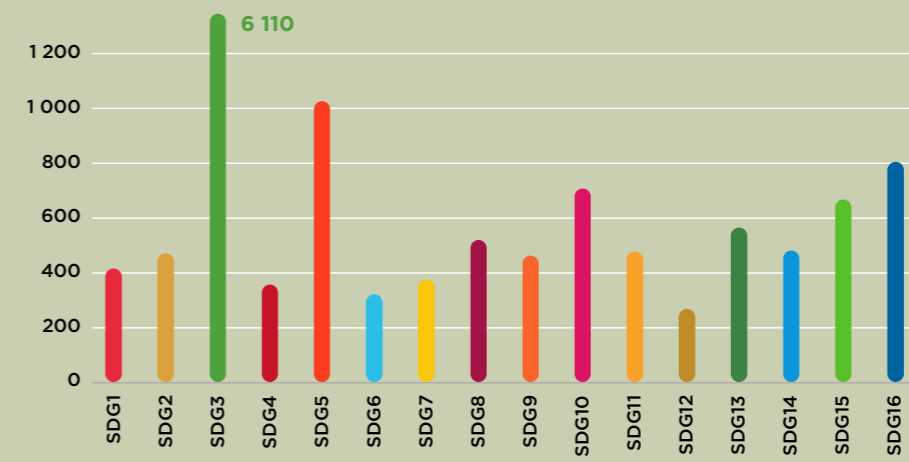
Women at UCT

61% of permanent full-time UCT staff are women.

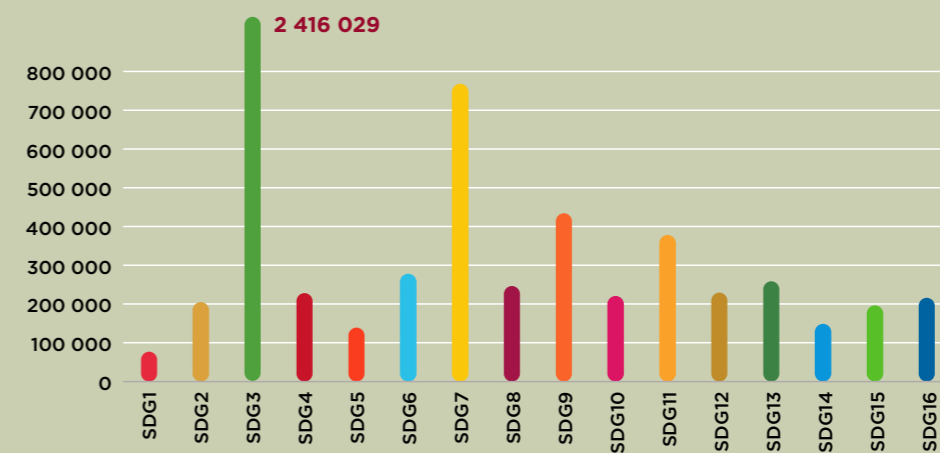
Women in leadership positions:

- 1
chancellor
- 1
vice-chancellor
- 3
deputy vice-chancellors (out of three)
- 5
deans (out of eight)
- 21
heads of department (out of 62)

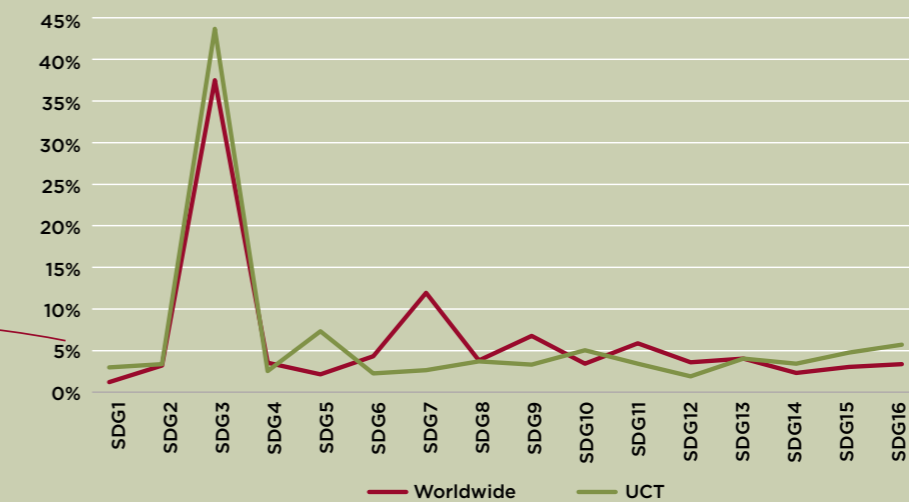
Publications by SDG



UCT publications 2017-2021 by SDG



Worldwide publications 2017-2021 by SDG



UCT vs worldwide ratio of publications 2017-2021 by SDG

Times Higher Education Impact Rankings 2022

101-200
Overall ranking

201-300
SDG 3 Good health and well-being

31st
SDG 1 No poverty

95th
SDG 16 Peace, justice and strong institutions

37th
SDG 5 Gender equality

55th
SDG 17 Partnerships for the goals

101-200
SDG 10 Reduced inequalities



World university rankings 2021

UCT is first in Africa and held the following places in world university academic rankings:

109 US News & World Report Best Global Universities Rankings	183 Times Higher Education World University Rankings	269 Center for World University Rankings	201-300 ShanghaiRanking's Academic Ranking of World Universities	226 Quacquarelli Symonds World University Rankings
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World university subject rankings 2021

Quacquarelli Symonds World University Rankings by Subject	US News & World Report Best Global Universities	ShanghaiRanking Global Ranking of Academic Subjects	ShanghaiRanking Global Ranking of Sport Science Schools and Departments
10th Development studies	13th Infectious diseases	23rd Environmental science and engineering	41st Sport Science Schools and Departments
	39th Public, environmental and occupational health	48th Oceanography	
	47th Immunology		

CHAPTER 1

The SDGs on campus

UCT aims to be a global leading green campus across its seven campuses, which are nestled in the Cape Town suburbs of Rondebosch, Mowbray, Devil's Peak, Observatory, Gardens, the Waterfront and Philippi. UCT's [Environmental Sustainability Strategy](#) directs the various works and projects highlighted below, all of which are driving UCT to become a net-zero carbon, net-zero energy, net-zero water and net-zero waste-to-landfill campus by 2050.

Carbon footprint

Prepared in accordance with the Global Greenhouse Gas Protocol, UCT's most recent carbon footprint report (for the year 2019) showed a reduction of 2.8% in the university's overall carbon emissions compared with the previous year. The 2020 and 2021 carbon footprint reports are currently being prepared and show promising emissions reductions.

The university is currently running a detailed feasibility study to determine the cost-optimal pathway to become a net-zero carbon campus by 2050. A detailed technical and financial feasibility study is also under way to inform the possible transition from a diesel to a fully green electric UCT shuttle fleet to further reduce emissions.

¹ Note that 2021 was a COVID-19 year, with the university not operating at 100%. In 2013 UCT had 4 719 permanent staff and 26 111 students; in 2021 this had risen to 5 942 permanent staff and 29 444 students.

Carbon emissions in 2021 (not yet peer reviewed):

Scope 1 and 2 emissions:
59 975 tons of CO₂e

Scope 1, 2 and 3 emissions:
78 899 tons of CO₂e

This is an 8.5% reduction when compared with the 2013 baseline year.¹

Energy 

UCT is reducing energy consumption and adding renewable energy on campus by:

- replacing light fittings around campus with LED light fittings
- undertaking energy audits and condition assessments of UCT's largest buildings
- installing 40 additional electrical meters so that all buildings above 2 000 m² are individually metered and linked to UCT's online metering dashboard
- procuring a service provider to issue energy performance certificates for all buildings above 2 000 m²
- installing three solar photovoltaic (PV) systems on campus (6 kWp, 13 kWp, 63 kWp) and tendering for five larger PV systems (totalling 500 kWp)
- installing three electric vehicle chargers as a pilot project exploring the replacement of UCT's petrol/diesel fleet
- building low-energy buildings (at least 50% more efficient than the national standard), including:
 - [Avenue House Residence](#) (4-star Green Star rating²)
 - School of Education (4-star Green Star rating)
 - [Hasso Plattner School of Design Thinking Afrika](#) (targeting a 6-star Green Star rating)
 - [Chris Hani lecture theatre](#) (refurbishment, no Green Star rating, but low-energy design)

Two other exciting projects - in the planning stage - are targeting net-zero carbon:

- The Digital Polar Lab, Upper Campus
- The Nelson Mandela School of Governance, Upper Campus.

Electricity consumption in 2021:

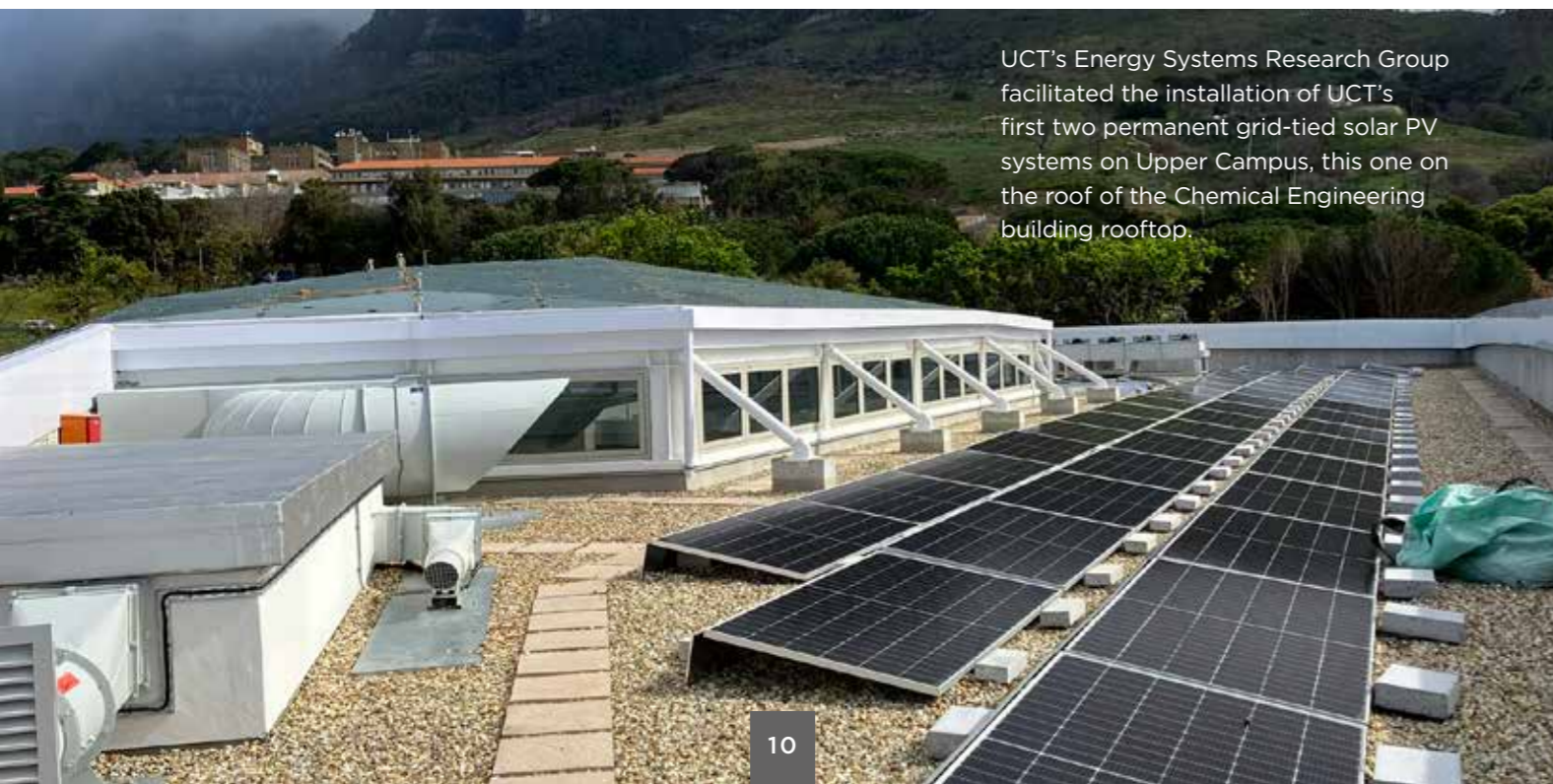


54 873 MWh

This is a 21% reduction when compared with the 2013 baseline year.³

² The Green Building Council South Africa developed the Green Star rating tool to provide an objective measurement for green buildings in South Africa and Africa.

³ Note that 2021 was a COVID-19 year, with the university not operating at 100%. In 2013 UCT had 4 719 permanent staff and 26 111 students; in 2021 this had risen to 5 942 permanent staff and 29 444 students.



UCT's Energy Systems Research Group facilitated the installation of UCT's first two permanent grid-tied solar PV systems on Upper Campus, this one on the roof of the Chemical Engineering building rooftop.

Water 

UCT is committed to sustainable water management and aspires to create a net-zero water campus by 2050. The UCT [Sustainable Water Management Strategy](#) is evidence of this commitment. The primary objectives of the strategy are to:

- reduce UCT's overall dependence on the municipal water supply
- improve waste-water treatment
- reduce the overall spend on water through appropriate investments
- provide a diverse, resilient and sustainable combination of fit-for-purpose water resources
- mitigate the overall impact of run-off on downstream water quality
- use stormwater more effectively.

UCT has started to meet these objectives in 2021 by:

- drilling five test boreholes to serve as back water supply or to supplement water recycling initiatives
- scanning and mapping all underground pipes on campus for maintenance purposes and leak detection.

Waste 

New and additional waste-recycling infrastructure was installed on campus in 2021, with branded messaging to drive community participation. UCT also employed additional Properties & Services staff to support waste-collection services.

Waste created in 2021:

- Waste to landfill: 1 062 tons
- Waste recycled: 213 tons (17% of total)
- Organic waste: 169 tons
- [New recycling bins](#) installed: 80.

Organic waste from all the student housing facilities goes to a fly farm (the maggots serve as food for the fish-farming industry) or to a pig farm, depending on demand.

Garden waste is composted on campus and used in the campus gardens.

⁴ Note that 2021 was a COVID-19 year, with the university not operating at 100%. In 2013 UCT had 4 719 permanent staff and 26 111 students; in 2021 this had risen to 5 942 permanent staff and 29 444 students.

Water consumption in 2021:



149 994 kl

This is a 50% reduction when compared with the 2013 baseline year.⁴



Indoor environments



Thanks to extensive investigation and interventions, all UCT lecture venues now have either full fresh air delivery, filtered recirculated air or natural ventilation with sufficient cross ventilation. This ensures that safe air quality levels are achieved in these venues, improving the teaching and learning experience. UCT's [smoking policy](#) further ensures the well-being of members of the campus community.

In all new buildings or refurbishments there is a strong emphasis on creating spaces with ample daylight, minimal glare, maximum fresh air and connection to the outdoors. Recently completed building projects, such as the School of Education, the Hasso Plattner School of Design Thinking Afrika and the Chris Hani lecture theatre, all demonstrate this.

The Chemical Engineering building and the [New Lecture Theatre](#) were early examples in which sustainability informed building design.

Grounds and gardens



UCT's green infrastructure enhances the campus teaching environment, providing outdoor spaces where staff and students can immerse themselves in nature, improving thinking and learning and promoting student and staff well-being.

UCT's new indigenous planting projects and landscape developments focus on environmental transformation and building ecological resilience. Low-maintenance indigenous vegetation adds colour and texture; planting, terracing and damming slows and captures water run-off; and using resin stone aggregate technology improves the water permeability of hard surfaces, reducing run-off and augmenting aquifer recharge.

Vegetative residue from landscape maintenance is processed through an eco-composter and used for mulching and composting. Wood-chip mulch suppresses weed growth (UCT has been pesticide free for 20 years) and enhances water retention, soil health and resilience.

The campus has a strong emphasis on biodiversity, replacing alien vegetation with indigenous vegetation. A recent project digitally mapped and identified every single tree on campus, which will help in the ongoing maintenance and protection of the university's trees.

An active programme on campus is removing invasive alien plants. The non-indigenous stone pines damaged in [the fire of 2021](#) are being replaced with indigenous Outeniqua yellowwoods (*Afrocarpus falcatus*) and milkwoods (*Sideroxylon inerme*). These additions to UCT's urban forest will help alleviate problems associated with urbanisation by reducing water run-off and sequestering carbon, while supporting biodiversity through a natural connection between the campus and Table Mountain nature reserve.

Case study

Khusela Ikamva



[Khusela Ikamva](#) (*Secure the Future*) is a five-year collaborative, transdisciplinary initiative established at UCT in 2020 to fund an integrated sustainable-campus project, bringing together teams working on the implementation of new ways of handling water, energy and waste on campus, underpinned by both the UCT campus experience and our research.

The initiative aims to support UCT's [Environmental Sustainability Strategy 2021](#) by determining both the principles and the feasibility of these new approaches, developing them into proofs of concept, and testing them in targeted areas on campus using a [Living Lab](#) approach. Their integrated assessment allows them to become key enablers to transforming UCT, helping the university to reduce its ecological footprint and encourage staff and students to be active citizens in protecting their environment. A special feature of Khusela Ikamva is the joint involvement of professional and administrative staff, researchers and students, working together.

Living Labs research projects in 2021

- Through its participation in the newly established Transnational Centre for Just Transitions in Energy, Climate and Sustainability, UCT's Energy Systems Research Group has facilitated the installation of UCT's first two permanent grid-tied solar PV systems.
- Technical research into the installation of [fertiliser-producing urinals](#), led by Associate Professor Dyllon Randall from the Department of Civil Engineering, continues to demonstrate alternative sanitation solutions for the university.
- Continuing work started by Dillon Barends in 2020, civil engineering student Farai Mlambo looked at options for implementing sustainable urban drainage systems on campus in 2021, identifying sites and technologies to improve the university's rainwater and stormwater harvesting capacity.
- Economics honours student Refilwe Mofokeng's research project focused on recycling at UCT, resulting in a [research paper](#) co-authored by a multidisciplinary team of academic and administrative colleagues.
- Chemical engineering students Jared Pillay and Sonam Maharaj investigated the best plant selection for living green walls at UCT. Their results showed that, over the course of a year, a 1 m² green wall can cut down electricity usage for cooling, CO₂ emissions and electricity costs by 0.92%.

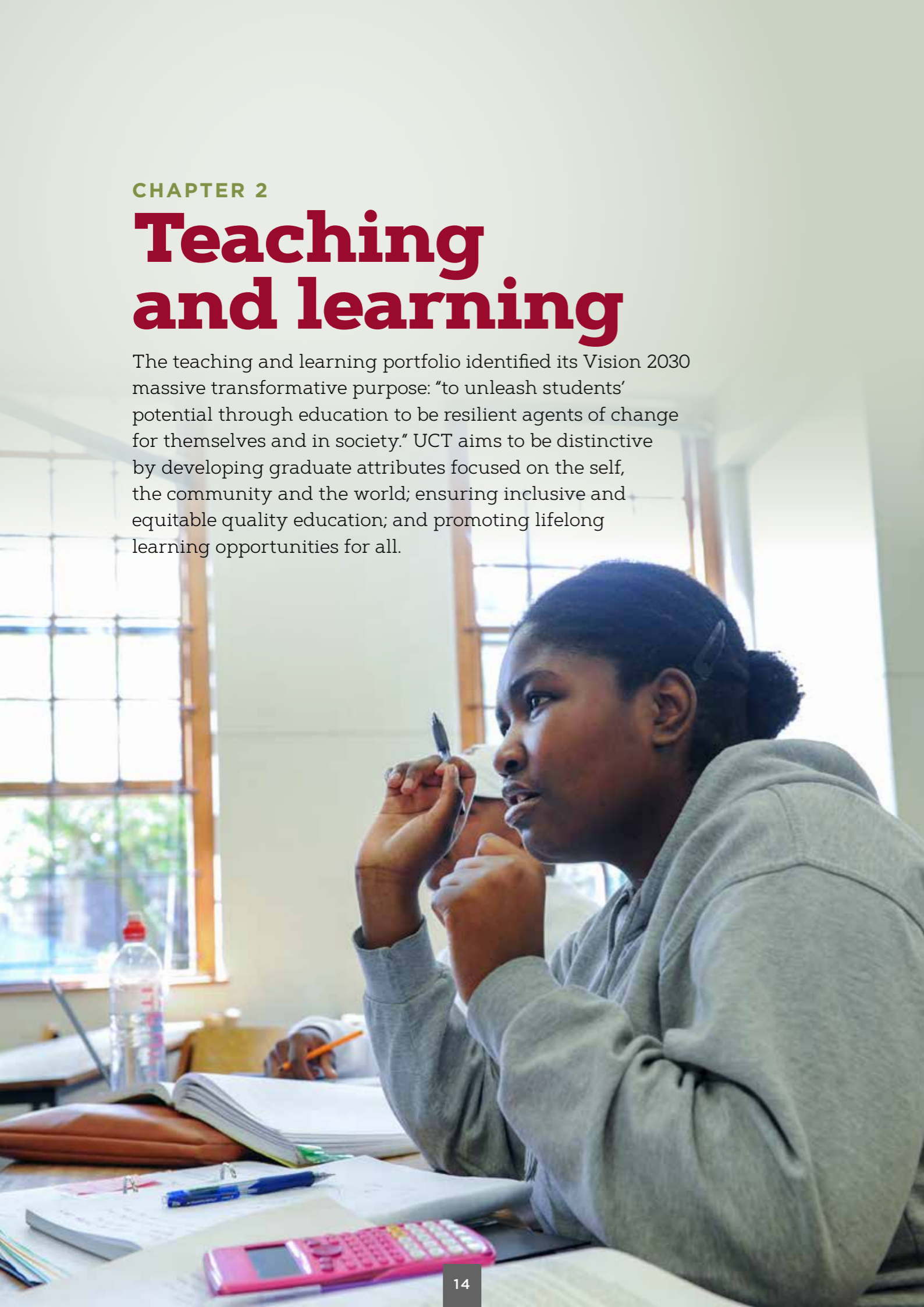
"A key component of UCT's environmental sustainability strategy is enabling the campus to become a Living Lab for our students and staff as we work towards our transformative goals."

– **Manfred Braune, Director: Environmental Sustainability**

CHAPTER 2

Teaching and learning

The teaching and learning portfolio identified its Vision 2030 massive transformative purpose: “to unleash students’ potential through education to be resilient agents of change for themselves and in society.” UCT aims to be distinctive by developing graduate attributes focused on the self, the community and the world; ensuring inclusive and equitable quality education; and promoting lifelong learning opportunities for all.



Teaching and Learning Encounters 2021

The effects of the COVID-19 pandemic were often most tangible in the teaching and learning experience. While the UCT community showed impressive resilience, both staff and students felt the lack of engagement and personal interaction keenly, and concerns were raised about the effectiveness of online and hybrid models of teaching.

Painful though it was, the crisis brought several benefits, including:

- compassionate approaches to teaching and learning at individual and institutional levels
- building sustainable systems to support teaching and learning in unequal conditions
- developing innovations that can become part of normal teaching and learning practices.

[Teaching and Learning Encounters \(TLE\) 2021](#) was hosted from 26 November to 2 December 2021 to encourage colleagues across UCT to share their insights, reflect on their experiences and plan together for a post-pandemic future.

Centre for Higher Education Development

The [Centre for Higher Education Development \(CHED\)](#) at UCT has a mission to work with academic departments across the university to facilitate the transformation of inequalities in student success through the promotion of equity of access and facilitating the delivery of high-quality, effective teaching and contributing towards a decolonised curriculum across UCT. CHED aims to nurture capacity across the university to ensure that UCT’s graduates are globally competitive, locally relevant, socially responsive and fully representative of South Africa’s diverse population. Through its departments, CHED offers students:

- extended degree programmes, supported by CHED and run with the faculties
- literacies and multilingualism support
- assessments to enable alternative access routes to courses
- specialised support services and educational design expertise for digitally enabled education
- career support
- personal and professional development opportunities
- programmes of critical debate.

The Academic Staff and Professional Development (ASPD) unit, established in 2021, offers professional development programmes to academic staff in various stages of their academic careers. The ASPD programmes have a strong social justice framing and are focused on contextualising and transforming teaching, learning, curriculum, assessment and evaluation practices in the context of transformation, decolonisation, equity and social justice.

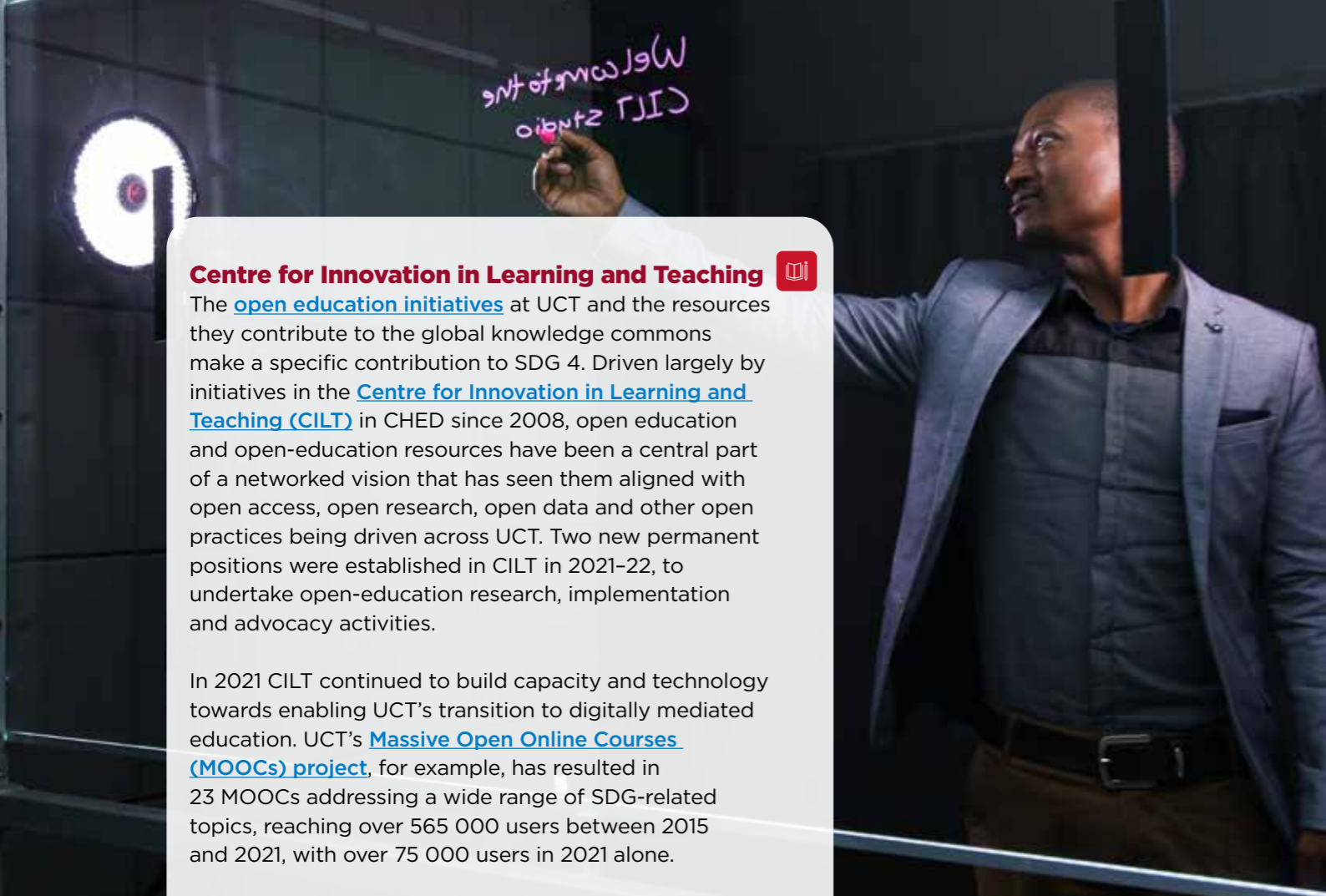
“TLE2021 adopted an open-space methodology to support participant-initiated conversations, supporting online experiences of human connection and authentic shared presence.”

– Associate Professor
Lis Lange, Deputy Vice-Chancellor for Teaching and Learning 2021



CHED also supports academics in all faculties in their roles as teachers, researchers and members of the UCT academic community.





Centre for Innovation in Learning and Teaching 

The [open education initiatives](#) at UCT and the resources they contribute to the global knowledge commons make a specific contribution to SDG 4. Driven largely by initiatives in the [Centre for Innovation in Learning and Teaching \(CILT\)](#) in CHED since 2008, open education and open-education resources have been a central part of a networked vision that has seen them aligned with open access, open research, open data and other open practices being driven across UCT. Two new permanent positions were established in CILT in 2021-22, to undertake open-education research, implementation and advocacy activities.

In 2021 CILT continued to build capacity and technology towards enabling UCT's transition to digitally mediated education. UCT's [Massive Open Online Courses \(MOOCs\) project](#), for example, has resulted in 23 MOOCs addressing a wide range of SDG-related topics, reaching over 565 000 users between 2015 and 2021, with over 75 000 users in 2021 alone.

CILT's [One Button Studio](#), a self-service automated video and recording studio, helps lecturers to enhance blended and online teaching and learning offerings. Despite the studio being demolished and rebuilt in 2021, the facility saw the creation of 920 videos by 96 presenters by the end of 2021.

UCT Online High School  

Launched by the Valenture Institute, in partnership with UCT, the [UCT Online High School](#) is an expression of the transformative purpose the university has committed to as part of Vision 2030 "to unleash human potential for a fair and just society". Through this partnership, the university is playing its part in contributing to the systemic challenges facing the country's basic education system. This is also where the academic excellence of UCT can be extended, through outreach, to high school learners across all communities in South Africa.

As part of UCT's agreement with the Valenture Institute, the full curriculum of the UCT Online High School is available as an open-education resource throughout South Africa, which means that learners have free access to a curriculum they can work through at their own pace.

Towards an African pedagogy for the SDGs and Agenda 2063  

At the International Summit on the SDGs in Africa in September 2021, a workshop organised by Environmental Humanities South researchers Lesley Green and Nikiwe Solomon focused on pedagogies for teaching the SDGs in Africa. Aiming to build a network of African thought leaders on the SDGs and Agenda 2063, the workshop took inspiration from the Kenyan scholarly publisher Daraja Press to "nurture reflection, shelter hope and inspire audacity".

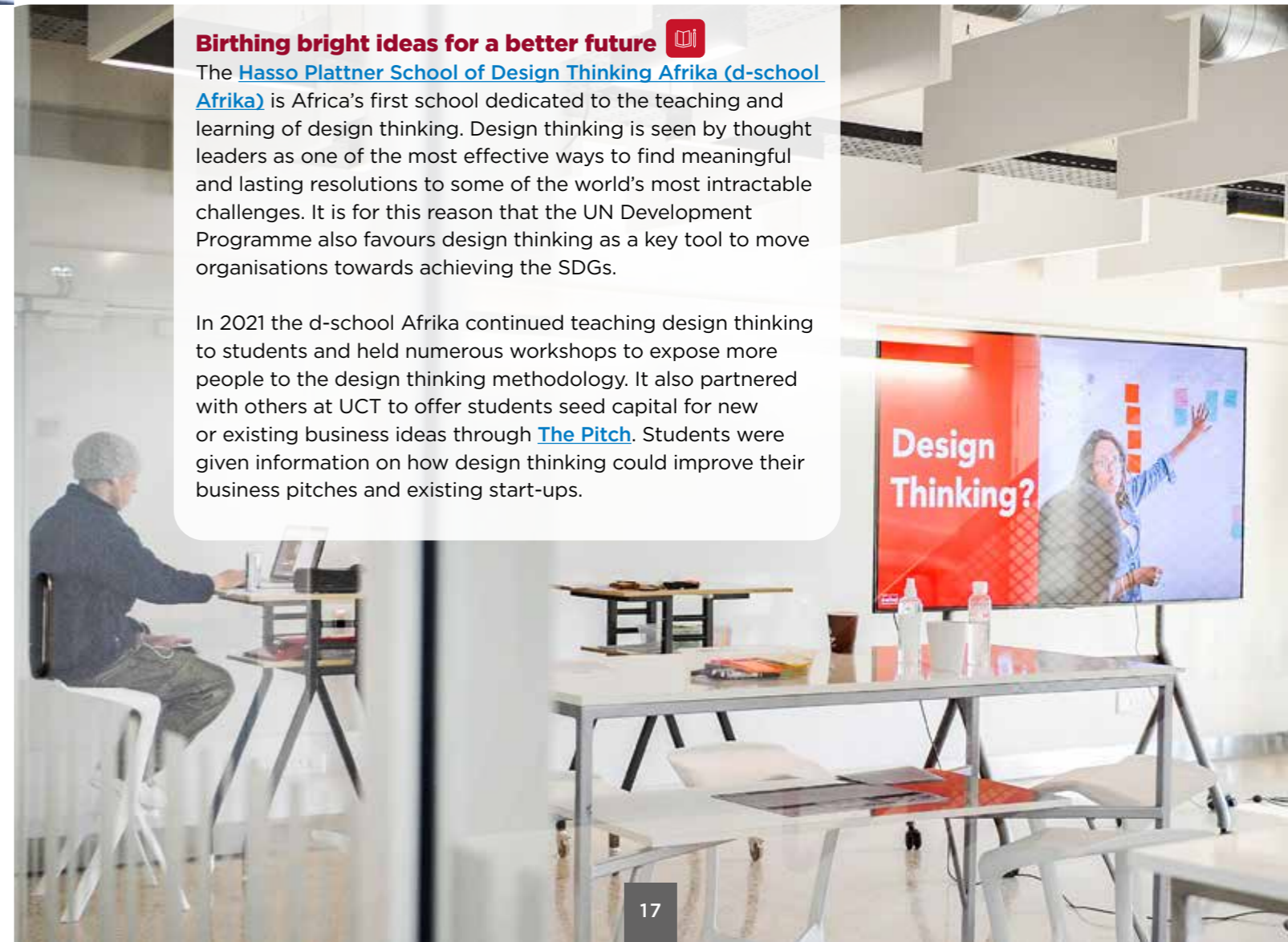
Working with Dean of Humanities Shose Kessi, Dean of CHED Kasturi Behari-Leak and then Deputy Vice-Chancellor for Teaching and Learning Lis Lange, the workshop asked what would characterise an effective pedagogy of sustainability in African universities. Beginning with a site study in the southern Cape Flats of Cape Town, eight approaches to teaching the SDGs emerged in a series of workshops. Environmental Humanities South is committed to implementing these in transdisciplinary curriculum design at UCT, in partnership with a range of African universities.

"With a fast-growing conversation in the Global South on climate apartheid, African tertiary education institutions cannot afford to ignore difficult questions about climate negotiations, sustainable development and the shape of African environmentalism."
 – **Professor Lesley Green**, director of Environmental Humanities South

Birthing bright ideas for a better future 

The [Hasso Plattner School of Design Thinking Afrika \(d-school Afrika\)](#) is Africa's first school dedicated to the teaching and learning of design thinking. Design thinking is seen by thought leaders as one of the most effective ways to find meaningful and lasting resolutions to some of the world's most intractable challenges. It is for this reason that the UN Development Programme also favours design thinking as a key tool to move organisations towards achieving the SDGs.

In 2021 the d-school Afrika continued teaching design thinking to students and held numerous workshops to expose more people to the design thinking methodology. It also partnered with others at UCT to offer students seed capital for new or existing business ideas through [The Pitch](#). Students were given information on how design thinking could improve their business pitches and existing start-ups.



Case study

SEAmester: South Africa's floating university

SEAmester is a unique shipboard programme for South African students that integrates interdisciplinary coursework, hands-on ship-based experiences and interaction with leading South African marine researchers. By aligning with core peer-reviewed scientific objectives, SEAmester allows students to collect data in an oceanic region of global importance and to be part of an international programme with data standards and protocols. Greater awareness of the ocean's physical, biogeochemical and ecological response to climate change, highlighted through ship-board experiences, has already started to inspire and attract students into the marine sciences.

Most importantly, SEAmester has already created opportunities for students from all social backgrounds to experience working life at sea. By 2021, 176 students (79 male and 97 female) from 23 South African institutions had taken part in the SEAmester programme.

A long-term vision is to develop SEAmester into an international educational flagship programme incorporating a wider participant and scientist list with the involvement of other countries from the Southern African Development Community.

Next Generation Professoriate

Established in 2015, the **Next Generation Professoriate (NGP)** is a mid-career academic staff development and support programme. Funded by the Vice-Chancellor's Strategic Funds, the NGP addresses demographic inequalities in the academic hierarchy. The goal is to nurture and mentor members to become associate and full professors. By the end of 2021, 34 members of the NGP had been promoted – seven to full professor and 27 to associate professor. This from a cohort of 35 in 2015, which grew to a cohort of 43 in 2021.

Accelerated Transformation of the Academic Programme

As part of UCT's drive to build a pipeline of black South African academic staff, the **Accelerated Transformation of the Academic Programme** was launched in 2021. The programme aims to select top postgraduate students at both the master's and doctoral levels, as well as postdoctoral fellows, from across UCT's six faculties and to position them on a track towards an academic career while undertaking their research. The first cohort in 2021 were mentored by Emeritus Professor Hugh Corder in a programme run through UCT's Research Office and funded through its transformation budget.

The International Summit on the SDGs in Africa

The International Summit on the SDGs in Africa: Shaping the Africa we Want presented a unique opportunity to actively engage in, influence and be part of stepping up the pace and scale of change towards achieving the United Nations 2030 Agenda for Sustainable Development and the African Union's Agenda 2063. Hosted by UCT, it was held virtually from 13 to 15 September 2021. Its objective was to mobilise and accelerate African-led activities in support of a common development agenda and to foster opportunities for collaboration across universities, national and local government, non-governmental organisations (NGOs) and civil society in relation to the SDGs, in Africa and beyond.

The summit brought together 1 085 participants from 84 countries across the globe, including 40 countries on the continent, with 52 high-profile speakers from 12 countries, the majority of which were from Africa: Rwanda, Ethiopia, South Africa, Ghana, Tunisia, Nigeria, Zambia and Zimbabwe. These stakeholders came together to explore key needs, accelerators and barriers to accelerating change in Africa and, more generally, in the Global South and to create innovative solutions to Africa's grand challenges. They focused on the need to accelerate an Africa-centric approach to moving towards sustainable development in Africa and achieving the SDGs and the African Union Agenda 2063.

The summit was distinguished from a traditional academic conference by its distinctive aim of seeding and creating collaborative work and actions to continue beyond the event itself. It was designed as an incubator – a platform for generating progress and optimising engagement and reach through keynote speeches, panel discussions, leadership insights and breakout workshops on **seven thematic tracks**. These tracks are viewed as key to delivering the Africa we want and in focusing our actions as a global, Africa-focused, Africa-centred and Africa-led team. Positioning papers from each of the thematic tracks provided focus for the ongoing interactive work in these focal areas across 2022 and beyond.

UCT launched an **online portal dedicated to research relevant to the SDGs** at the summit, and added **SDGs Africa Summit 2021** to the university's YouTube channel.

"UCT is committed to 'unleashing knowledge in and for Africa'. So, these established synergies between UCT's work, the SDGs and Agenda 2063 are significant, because they are critical to solving the continent's challenges with an understanding of local contexts, and in developing capacity, which will enable Africa to solve its own problems."
– Dr Linda Mtwisha, Executive Director: Research

SDGs
AFRICA
SUMMIT
2021



CHAPTER 3

Research

Our research vision is based on our disciplinary research excellence; a focus on people and their potential, especially the people in our country and on our continent; and an emerging common agenda that is increasingly guided by the SDGs and the African Union's Agenda 2063.

UCT's research themes were established by identifying both our research strengths and emerging areas of strategic research importance. We did so by taking into account our 87 accredited research groupings, our substantive research in the health sciences, our well-recognised expertise in policy development, our highly cited researchers, our holders of South African Research Chairs Initiative chairs, our African Research University Alliance and National Research Foundation (NRF) centres of excellence, our NRF-rated academics, our subject rankings in the global university rankings and our representation in the prominence analysis through SciVal.

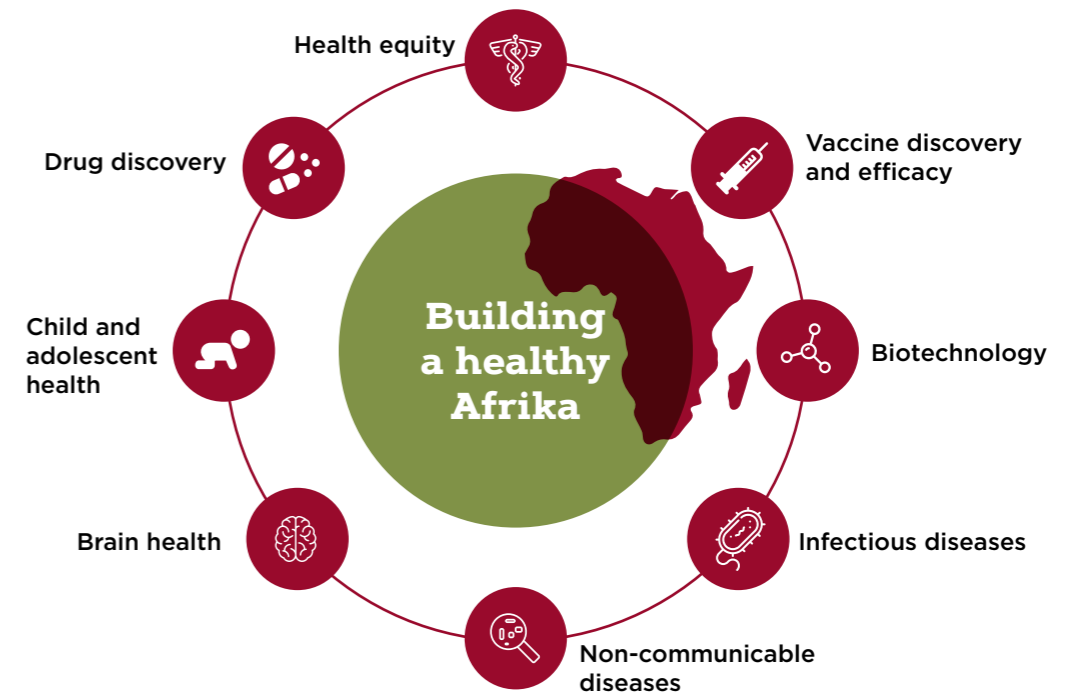
Considering our strengths and emerging foci together with the nature of the grand challenges faced by South Africa, Africa and the world, we established five over-arching focal areas:

- Building a healthy Afrika
- Resource efficiency and nature-based solutions for sustainable development
- On being human
- Advancing Afrika
- Our southern location.

These are further meshed into a more granular set of themes, with the ever-important cross-cutters of big data, bioinformatics, 4IR, governance and ethics clearly identified.

These strategic research areas provide focus for our research and its integration with social responsiveness in meeting UCT's Vision 2030.

3.1 Building a healthy Afrika⁵



Tackling Afrika's disease burden

Addressing infectious disease in Afrika

The [Institute of Infectious Disease and Molecular Medicine \(IDM\)](#) is a cross-faculty research institute that tackles diseases of major importance in Afrika, such as tuberculosis (TB), HIV/AIDS and COVID-19, as well as non-communicable diseases prevalent in Afrika.

The IDM conducts research at the laboratory-clinic-community interface by engaging a wide range of scientific and clinical disciplines. Collaborative research is an important focus for the IDM, with collaborators across South Afrika, Afrika and the globe. The IDM also has links to other institutions through 35 research consortia and 26 industrial partners.

"In 2021 researchers in the IDM made key contributions to [COVID-19] vaccine rollout through [the Sisonke trial](#), to defining the immune response to infection with SARS-CoV-2 and/or vaccination, and to tracking the evolution and spread of variants of concern. This research had immediate impact on the national as well as global response to the pandemic."
- Professor Valerie Mizrahi, Director of the IDM



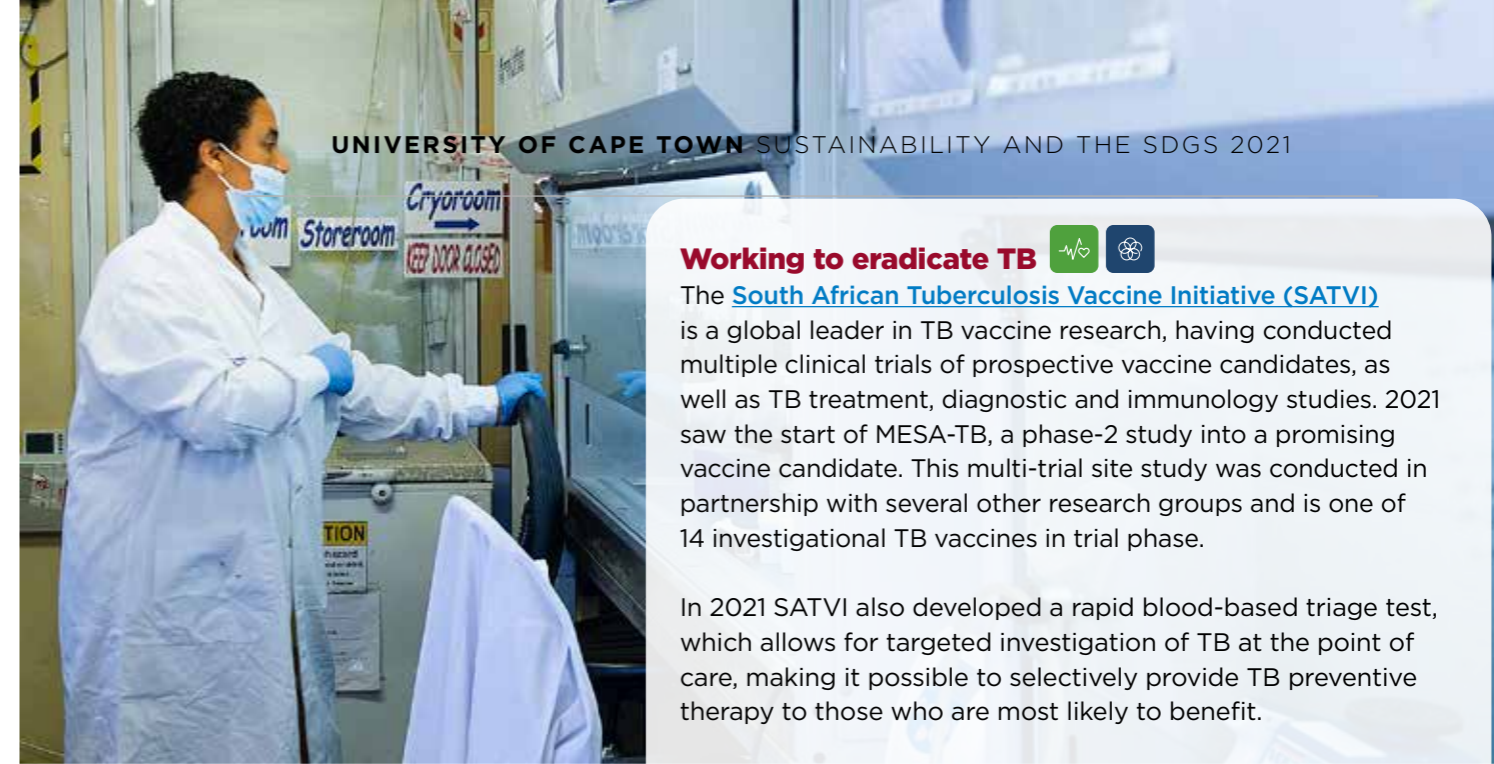
⁵ UCT's choice to spell Afrika with a k is an invitation to reclaim Afrika's agency and use it to validate the global character of the local in the 21st century.

Evaluating the impact of health policies  

“At UCT’s [Modelling and Simulation Hub, Africa \(MASHA\)](#), we aim to develop user-friendly computer applications to allow policymakers to run mathematical models and navigate the output of millions of simulations of more complex models with the aid of interactive graphs. In this way, mathematical disease modelling can become an invaluable tool in shaping health policy and saving lives.”

– Associate Professor Sheetal Silal, Director of MASHA

One [key MASHA project from 2021](#) was to develop computer-based model applications that can predict the impact of malaria policy on the population to aid the design of effective policies. These tools will be made available to the national malaria control programmes of South Africa, Ghana and Cameroon. The disease models developed by MASHA were used in 2021 to support COVID-19 planning by the South African government.



Working to eradicate TB  

The [South African Tuberculosis Vaccine Initiative \(SATVI\)](#) is a global leader in TB vaccine research, having conducted multiple clinical trials of prospective vaccine candidates, as well as TB treatment, diagnostic and immunology studies. 2021 saw the start of MESA-TB, a phase-2 study into a promising vaccine candidate. This multi-trial site study was conducted in partnership with several other research groups and is one of 14 investigational TB vaccines in trial phase.

In 2021 SATVI also developed a rapid blood-based triage test, which allows for targeted investigation of TB at the point of care, making it possible to selectively provide TB preventive therapy to those who are most likely to benefit.

Cardiovascular disease in Africa  

The [African Cardiomyopathy and Myocarditis Registry Program \(IMHOTEP\)](#) is a pan-African, multi-centre, hospital-based cohort study whose primary aim is to describe the clinical characteristics, genetic causes, prevalence, management and outcome of cardiomyopathy and myocarditis in children and adults. The study’s secondary aim is to identify barriers to the implementation of evidence-based care and provide a platform for trials and other intervention studies to reduce morbidity and mortality in cardiomyopathy.

In 2021 the IMHOTEP study recruited 800 individuals living with cardiomyopathy, and the rationale and design manuscript was published in the [International Journal of Cardiology](#). Analysis of the 12-month follow-up data began in 2021 and will be published soon.

Reducing the demand for tobacco products 

Smoking is a major cause of non-communicable disease, including cancers and heart disease. Work in the [Research Unit on the Economics of Excisable Products \(REEP\)](#) focuses primarily on the use of excise taxes to reduce the demand for tobacco products.

In 2021 REEP researchers published [a paper](#) that considered various aspects of the 20-week tobacco sales ban implemented in South Africa in 2020 in response to the COVID-19 pandemic. REEP conducted several surveys during this period, concluding that the sales ban did not cause many people to quit and entrenched the illicit market.

They also conducted an online workshop on tobacco-tax modelling that was attended by hundreds of government officials globally, in which they indicated that an excise tax increase is a particularly effective way to reduce tobacco consumption.



Combatting infection  

Based in the IDM, the [Wellcome Centre for Infectious Diseases Research in Africa \(CIDRI-Africa\)](#) is focused on combatting infection, with a particular focus on understanding the challenges of antiretroviral therapy, such as metabolic complications and drug interactions, which contribute to the burden of non-communicable diseases in Africa. CIDRI-Africa actively contributed to building health infrastructure in South Africa in 2021, including:

- a [Basic Science Platform](#) that provides laboratory infrastructure, technical support and advanced analytical equipment to ensure the safe handling and analysis of infectious materials
- a [Biomedical Data Integration Platform](#) that advances data collection, integration, analysis and interpretation to enable systems approaches to understanding pathogenesis and designing novel interventions.
- a [Clinical Research Platform](#) in which researchers partner with local government and NGOs to undertake observational cohort studies, evaluation of novel diagnostics and clinical trials.

Screening for cervical cancer in Khayelitsha



Over 85% of cases and deaths from cervical cancer occur in low- and middle-income countries (LMICs), particularly in Sub-Saharan Africa. The [Khayelitsha Cervical Cancer Screening Project \(KCCSP\)](#) was initiated in 1995 with the aim of developing tests, protocols and algorithms for the prevention of cervical cancer.

By 2021 the project had screened over 50 000 women living in Khayelitsha (a densely populated, under-resourced area in Cape Town) to evaluate evidence-based alternatives to Pap-smear-based programmes. The KCCSP has provided strong evidence that screening women with modern tests and providing them with on-site, same-day treatment is safe, effective and feasible.

“Our work seeks to provide evidence-based interventions to prevent and treat cervical cancer in women in LMICs by using approaches that empower women, preserve their dignity and ensure they are able to live healthy, productive lives.”

– Professor Lynette Denny,
Director of the KCCSP

Effective COVID-19 prevention and treatment solutions



In conjunction with the [Desmond Tutu Health Foundation](#), the Desmond Tutu HIV Centre (DTHC), hosted within the IDM, conducts a range of basic, clinical, operational and socio-behavioural research into the treatment and prevention of HIV, TB and related infections in Southern Africa. The [rapid development of effective COVID-19 prevention and treatment solutions](#), particularly within the South African context, became a major goal in 2021.

DTHC sites conducted several vaccine trials in 2021, including Sisonke 1 and 2 (Janssen vaccine), which gave almost 500 000 frontline healthcare workers early access to vaccination; CROWN Coronation (therapeutic agents among essential workers); ENSEMBLE I (Janssen vaccine); and the Ubuntu Trial (Moderna vaccine in people living with HIV).

From a therapeutic perspective, the DTHC participated in AGILE (assessment of a COVID-19 treatment option), evaluated MK-4482 (a novel agent for the treatment of COVID-19), received funding for BUDDY (an innovative study to courier HIV medication to youth during lockdowns) and helped combat COVID-19 vaccine misinformation.

Drug Discovery

Discovering and developing innovative medicines



UCT's [Holistic Drug Discovery and Development \(H3D\) Centre](#) is dedicated to discovering and developing innovative medicines to treat communicable diseases that predominantly affect African patients, building Africa-specific preclinical research tools to improve treatment outcomes in African patients and educating African scientists in drug-discovery-related sciences.

In 2021 the H3D team partnered with the [Ersilia Open Source Initiative](#) to build artificial intelligence and machine-learning models to accelerate the H3D's drug discovery projects. H3D was also named as a Johnson & Johnson Satellite Center for Global Health Discovery as part of a five-year partnership to accelerate the discovery of antibiotic therapeutics to tackle multidrug-resistant bacteria.

Brain health

Realising potential through brain health



Early development of the brain, so critical to enabling people to achieve their full potential, is determined by a range of genetic and environmental factors. In Sub-Saharan Africa these include a higher incidence of infections, higher exposure to toxins and poor nutrition, and greater exposure to trauma and violence. In this unique context the [Neuroscience Institute](#) works to develop interventions to promote brain health and well-being on the continent.

The Showcasing African Neuroscience meetings and workshops were held from November 2021 to January 2022. They highlighted the best examples of research in basic and clinical African neuroscience and the significant potential for new discoveries from the populations and health challenges within the continent, demonstrating the potential for health impact through growing investment in neuroscience in Africa. This culminated in the publication: “[Science Forum: What is next in African neuroscience?](#)”

“It is vital for Africans to build drug discovery and development capacity in close proximity to African patient populations to understand and meet the pressing health needs of the continent and its people.”

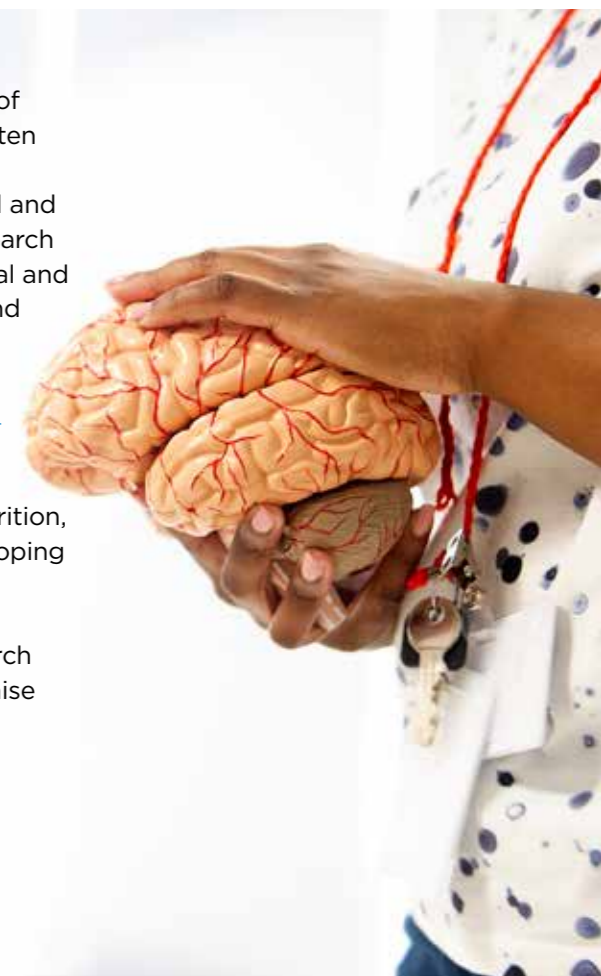
– Professor Kelly Chibale,
Director of H3D

Child neurodevelopment



The neurodevelopmental journey is a significant determinant of a child's future cognitive health and well-being. Professor Kirsten Donald is a senior specialist in the Division of Developmental Paediatrics at the Red Cross War Memorial Children's Hospital and deputy director of the Neuroscience Institute at UCT. Her research focuses on optimising child neurodevelopment using structural and functional neuroimaging tools, developmental assessments and genetic and genomic approaches.

In 2021 Donald was awarded [a multimillion US dollar contract](#) to investigate the development of brain networks underlying executive function development in the first 1 000 days of life. This research explores how environmental factors such as nutrition, sleep, parental attention and trauma influence the early developing brain. Many of these projects are multi-country, facilitating international collaborations, and showcase the importance of advancing neuroscience in Africa. The outcomes of this research will be invaluable in informing intervention strategies to optimise child health, particularly in Sub-Saharan Africa.



Case study

“Curiosity-driven sustainable and appropriate innovations addressing unmet needs are essential for achieving the SDGs by 2030 and Agenda 2063.”
– Professor Sudesh Sivasaru,
Director of the Biomedical Engineering Research Centre

Medical device innovation for a sustainable future

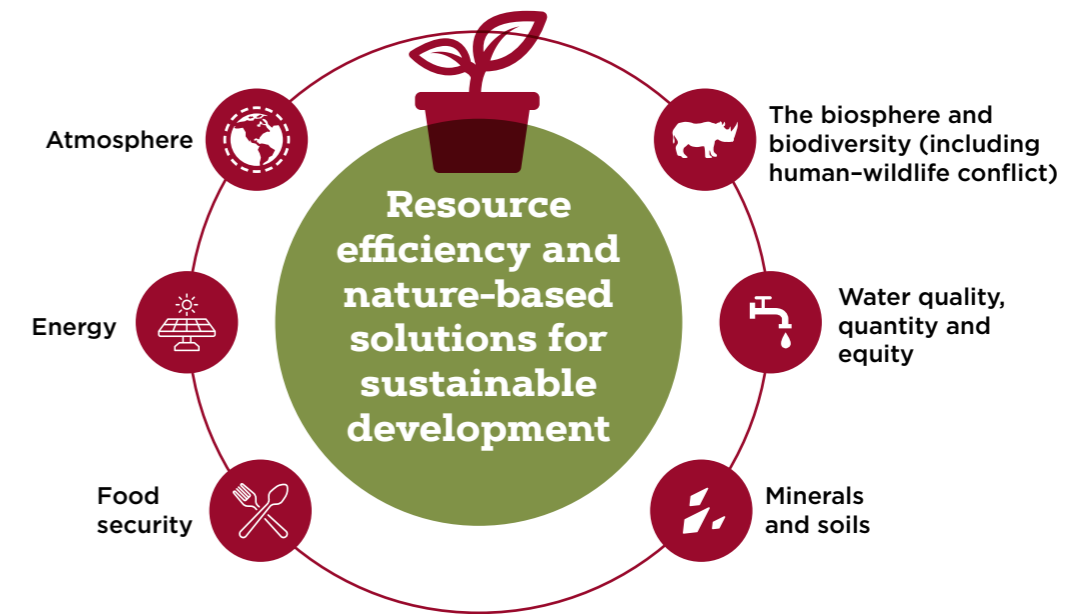


Innovation is key to overcoming the current health challenges faced in South Africa and abroad. The UCT MedTech laboratory, led by Professor Sudesh Sivasaru, is an interdisciplinary team comprising the Medical Device Laboratory and the Orthopaedic Biomechanics Laboratory. The overarching principle of both laboratories is innovation conversion using the [frugal biodesign process](#), turning innovation into downstream value. This approach ensures that all research and technologies developed are aimed at improving access and ensuring better healthcare delivery.

These are a few of the innovative projects currently being undertaken by the UCT MedTech laboratory:

- **The high-flow nasal oxygen medical device** allows for continuous, real-time patient monitoring, reducing the burden on medical professionals and allowing for more informed prognosis of treatments.
- **A device to diagnose and treat obstructive sleep apnea (OSA)** allows the diagnosis and treatment of OSA with the same equipment, mitigating the need for expensive polysomnography tests.
- **An adjustable adrenaline auto-injector** ensures that more patients, particularly women and infants, use injectors with an appropriate needle length.
- **An automated metered dose inhaler (MDI) delivery system** automatically causes an MDI canister to operate when inhalation is detected. MDIs are commonly used to relieve symptoms of asthma and chronic obstructive pulmonary disease. This device reduces intensive-care unit admissions, frees up nurses and improves the effectiveness of medication delivery.
- **The UCvenT bilevel positive airway pressure ventilator** addresses many of the problems plaguing life-support devices in an African context. As a software-defined ventilator, UCvenT will allow academic advancements to be implemented in African hospitals while at the same time enabling challenges in the healthcare environment to feed back to academic objectives.

3.2 Resource efficiency and nature-based solutions for sustainable development



Protecting our biodiversity

A past-present-future perspective



A rapidly changing climate, combined with escalating human impact, makes decision-making around the sustainable use of ecosystem services particularly complex. UCT's [Plant Conservation Unit \(PCU\)](#) integrates a range of methods to reconstruct past environmental change and understand how these processes have shaped today's landscapes.

Despite the UCT fire of April 2021, which destroyed their laboratories and greenhouses, PCU director Professor Timm Hoffman and his team expanded their novel research on land degradation and landscape archetypes into the Northern and Western Cape of South Africa.

This mapping of the extent of land degradation speaks to the core activities of the UN Convention to Combat Desertification and is an important first step in understanding this process.

“Lessons learnt in this region have universal significance, particularly in the context of global change research and the development of sustainable land use practices.”
– Professor Timm Hoffman,
Director of the PCU



Conserving human-honeyguide cooperation  

In parts of Africa, people cooperate with wax-eating birds called greater honeyguides to gain access to bees' nests, yielding honey for the humans and wax for the birds. This remarkable interspecies interaction is a rare example of active cooperation between people and wildlife.

Led by Claire Spottiswoode at the [FitzPatrick Institute of African Ornithology](#), the [Honeyguide Research Project](#) collaborates closely with a community of Yao honey-hunters in the Niassa Special Reserve in northern Mozambique. Together, they study how human-honeyguide cooperation sustains birds, rural communities and their ecosystems, and how it can be most effectively conserved.

In 2021 the team hosted a multidisciplinary workshop on human-wildlife cooperation, together with anthropologists, linguists, conservation practitioners and honey hunters who cooperate with honeyguides. This generated a review paper that yielded new insights into the [ecology, evolution and conservation of these unique interactions](#), including recommendations for [safeguarding them into the future](#).

Managing human-wildlife conflict in Africa     

The [Institute for Communities and Wildlife in Africa \(iCWILD\)](#) has, over the past decade, initiated a series of projects to both understand and mitigate the drivers of negative interactions between people and wildlife across a range of terrestrial and aquatic systems. The primary goal of this work is to balance the needs of communities with those of wildlife and the natural systems they rely on.

In 2021 one of their main projects was understanding [how baboons adjust their behaviour, diet and social interactions when entering urban areas](#), enabling researchers to forecast likely responses of wildlife globally to the increased impacts of anthropogenic activities and a rapidly urbanising global population.

Honeyguides are wild birds, not tame. This male Greater Honeyguide, held by honey-hunter Orlando Yassene, was briefly captured for research.

Sustainable wastewater solutions

The Water Hub   

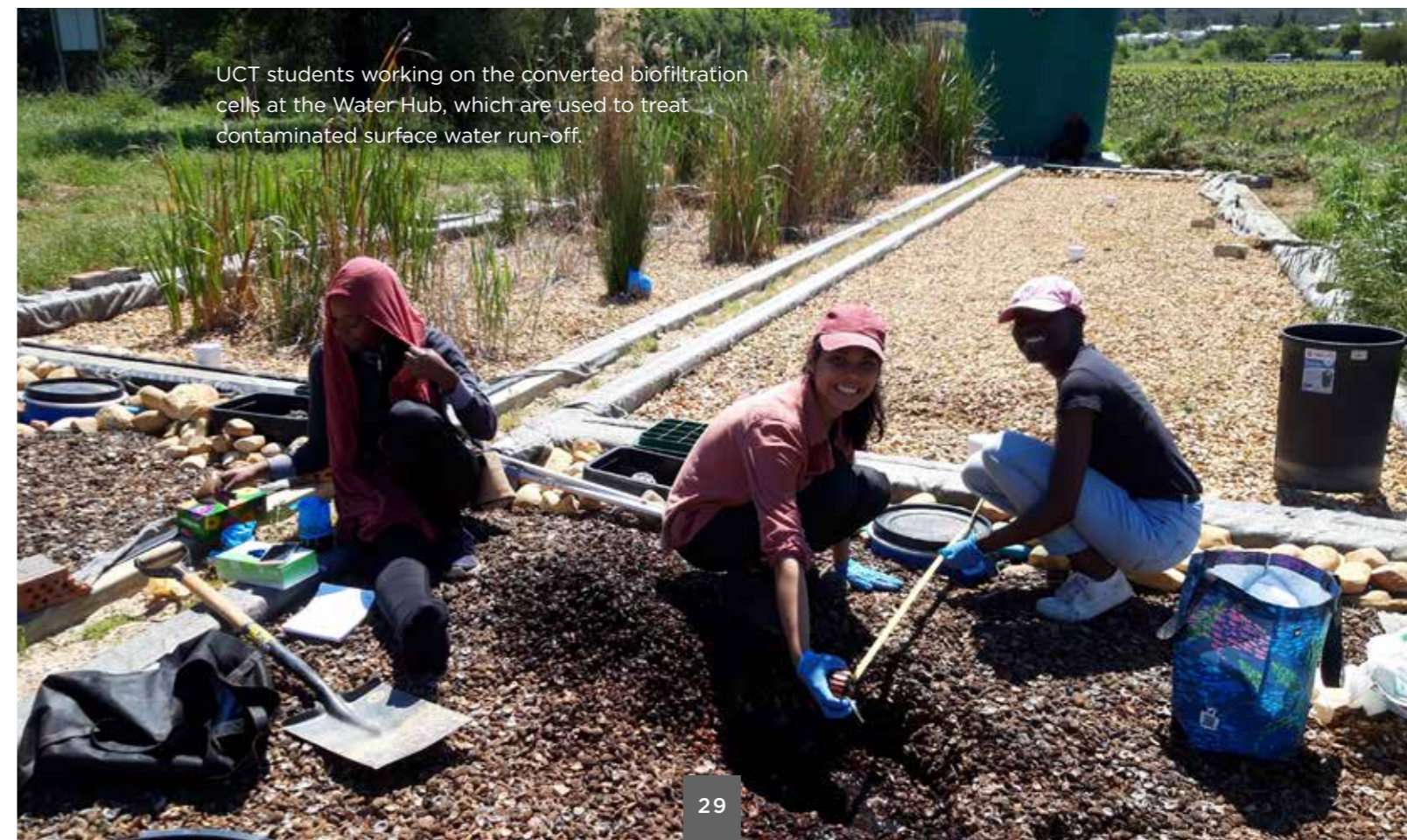
Future Water is a transdisciplinary research institute that conducts engaged research on water-sensitive approaches to sustain society's current and future water needs. [The Water Hub](#), a partnership between Future Water, the Stellenbosch municipality and the Western Cape Government, is a demonstration and research site based in an abandoned wastewater treatment facility.

The old drying beds were converted into biofiltration cells to treat contaminated surface water run-off from a nearby informal settlement, which is reused for growing plants for riverine restoration, reintroducing clean water to the river, rearing freshwater fish and irrigating experimental food gardens.

Vegetables irrigated with this water comply with general health and safety guidelines and the results are confirmed with regular crop and soil analytical tests. No appreciable soil degradation from the use of nature-based water treatment processes has been detected.

The project's findings since 2018 show how biofiltration systems filled with various natural media treat highly contaminated water without the addition of chemicals in a low-cost, low-energy and low-maintenance system.

- In 2021, 2.4 million litres of water were treated (between 80 000 and 100 000 litres per week).
- Bacterial levels of 200 000 colony-forming units per millilitre (cfu/ml) of water were reduced to less than 10 cfu/ml.
- Nutrients, such as phosphates, were typically reduced from 25 mg/l to 0.5 mg/l, and ammonia from 40 mg/l to 1 mg/l.



UCT students working on the converted biofiltration cells at the Water Hub, which are used to treat contaminated surface water run-off.

Wastewater biorefineries

South Africa is a water-scarce environment, so access to water is key whether considering urban, mining or industrial use. In the industrial sector it forms part of the licence to operate. Added to this, many wastewater streams carry valuable resources that can be recovered and repurposed. Together, these present a major incentive for new approaches to wastewater.

The [Centre for Bioprocess Engineering Research \(CeBER\)](#), led by Professor Sue Harrison, has developed the wastewater biorefinery proof of concept, which is focused on domestic wastewater and sanitation, industrial wastewater and mine water.

In Future Water, Associate Professor Dyllon Randall has extended this to the production of fertiliser from urine. Using a multi-component flowsheet, organic-containing wastewaters can be processed to produce industrial polymers, biomass and biogas, while elemental sulphur is recovered from sulphate-containing mine waters for fertiliser production – through robust bioprocesses. In all cases, fit-for-purpose water streams are reused.

“Wastewater biorefineries allow us to exploit this untapped resource and open up new avenues to innovation and job creation, while simultaneously recovering one of our scarcest resources.”

– **Dr Thanos Kotsiopoulos, Deputy Director of CeBER**

Access to water

Addressing inequality of water access

Associate Professor Gina Ziervogel focuses her research on how climate change is likely to impact urban communities, particularly through the lens of water with a focus on flooding, drought and access to water services.

In 2021 Ziervogel, together with a group of academics, worked on a multisectoral project – including community activist groups such as the Western Cape Water Caucus and the Environmental Management Group – to gather stories and data about water access. The Community Resilience in Cape Town (CoReCT) project then engaged with City of Cape Town officials on the research project outcome. Outcomes from this project include a documentary, a comic, a map of the gathered stories and a research paper: [“Supporting transformative climate adaptation: Community-level capacity building and knowledge co-creation in South Africa”](#).

“To create sustainable cities and communities, we need to consider how they adapt to climate hazards. My work addresses this with a focus on how local communities and city governments might better collaborate to reduce risk and improve environmental and social outcomes.”

– **Associate Professor Gina Ziervogel**



Water-sensitive cities

The mission of the [Future Water](#) institute is to conduct engaged research on water-sensitive approaches that sustain society’s current and future water needs. Climate change and rapid urbanisation contribute to water scarcity, flooding and environmental degradation, highlighting concerns about the resilience of conventional water infrastructure.

The [Pathways to water resilient South African cities \(PaWS\)](#) project is a collaboration between the Future Water institute and the University of Copenhagen, to see what can be done to make South African cities more resilient to drought and to consider opportunities for a transition to water-sensitive cities. One aspect of the project involves investigating whether better use can be made of stormwater by infiltrating it into the ground in existing detention ponds for possible later abstraction via boreholes, i.e. managed aquifer recharge. This has the additional benefits of reducing flood and pollution levels downstream.

Energy

Supporting the transition to renewable energy

The proliferation of renewable energy sources in South Africa will rely on the provision of base-load electricity supply (the minimum amount of electrical power required in the electrical grid at any given time) for several years to come, possibly even beyond 2030. In South Africa the base load is mainly supplied by ageing fossil fuel power plants that in many cases have passed their original design life. This increases the vulnerability of components and the risk of plant failure, which leads to unplanned downtime and load-shedding.

2021 research conducted by Professor Robert Knutsen and Ms Soraya Allies in the Department of Mechanical Engineering is aimed at reducing the risk of failure of components that operate at high temperature and high pressure in power generation.

“In so doing, we will be able to inform the risk management of aged power plants to maintain reliable base load during the transition to renewable energy sources.”

– **Soraya Allies, PhD candidate in mechanical engineering**



Soraya Allies, PhD researcher in 2021, performing heat treatment simulations of power plant steels in the laboratory

Case studies

Helping to produce clean and bird-safe renewable energy  

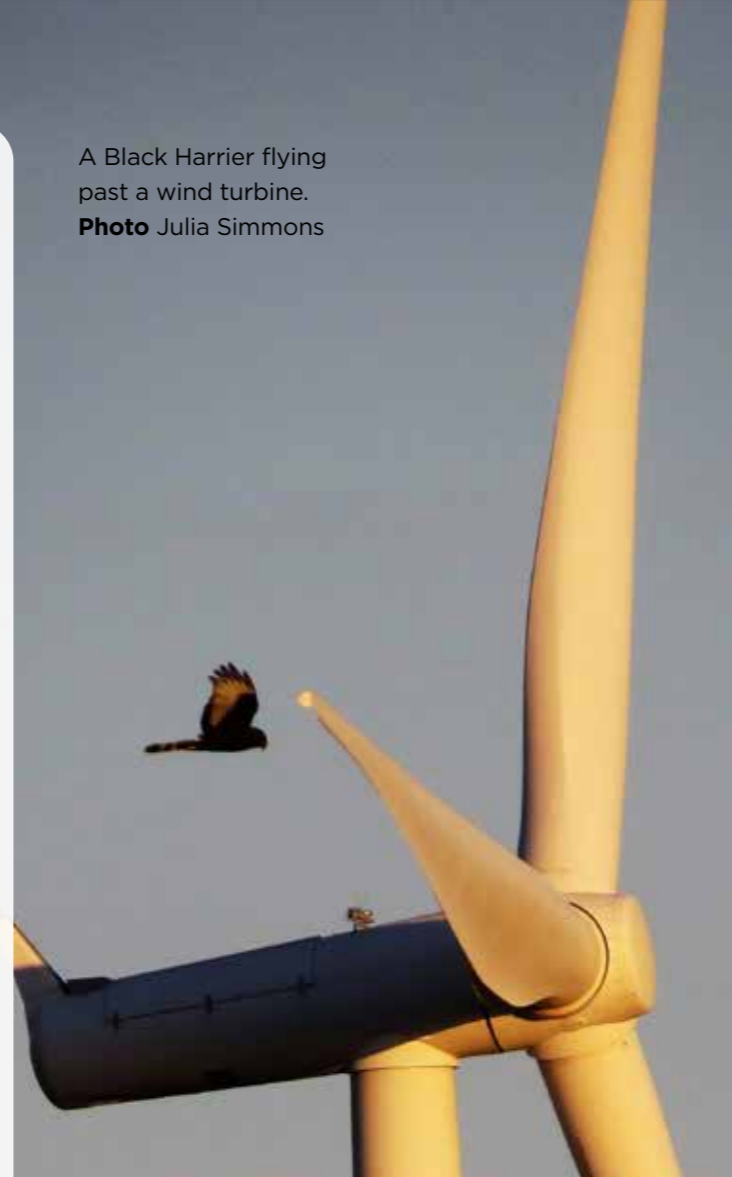
Renewable energy is touted as the green solution to the world's energy crisis, but the toll on bird life from wind turbines raises questions over how green this solution really is. Research conducted by the [FitzPatrick Institute of African Ornithology](#) in 2021 revealed that one of South Africa's rarest bird species, the Black Harrier, is likely to go extinct within 70 years should the present rate of mortality double.

To reduce this threat, researchers at the FitzPatrick Institute have used modelling to predict where the birds fly and are at greatest risk, and they have implemented a set of guidelines, in collaboration with Birdlife South Africa, to provide tangible mitigation measures to reduce the impact on Black Harriers.

"All such research increases the chances of South African renewable energy becoming environmentally acceptable and truly green, and thus meeting SDG 7, for clean and renewable energy, without undermining SDG 15, life on land."

- Dr Rob Simmons, Fitzpatrick Institute of African Ornithology

A Black Harrier flying past a wind turbine.
Photo Julia Simmons



Sustainable food production

Integrated marine aquaculture      

In the Department of Biological Sciences, Emeritus Professor John Bolton's research focuses on land-based aquaculture systems that integrate seaweeds with abalone. The seaweed grows using waste nutrients from the abalone and is then fed to the abalone, recycling nutrients in the system and removing otherwise toxic ammonia from the water. This also enables 50% of the water to be recirculated, saving 40% of water pumping costs.

Bolton and the team are currently working on the possibility of increasing recirculation rates with abalone, as well as the potential for integrated aquaculture of a new economic species of sea urchin, which is highly valued in the sushi market.

Collaborating with the Department of Forestry, Fisheries and the Environment and industry, UCT is a partner in the 2020-2024 EU-funded [All Atlantic Sustainable, Profitable and Resilient Aquaculture](#) project, which focuses on the blue economy, sustainability, integrated aquaculture, circularity and the move towards zero waste.

Innovation for sustainable energy

The Pedal n Spin washing machine    

The [Pedal n Spin washing machine](#), developed by master's student Kai Goodall under the supervision of Dr David Oyedokun, is a durable, low-cost, foot-cranked washing machine that brings innovation to the renewable energy space.

Goodall's project won the RS Components International People. Planet.Product Student Design Challenge in 2021.

Decentralised solar energy in informal settlements        

Many residents in informal housing settlements in South Africa depend on paraffin, wood and informal electricity connections for lighting and cooking. Refrigeration is a key need in these settlements, and fridges are highly desired by businesses in the community. Decentralised solutions like solar micro-grids can offer a cleaner and safer energy alternative.

The [UMBANE project](#), co-led by UCT and the University of Exeter (in partnership with Story Room, Zonke Energy and Thrie Energy Collective), delivers innovative business solutions through solar-powered refrigeration to informal settlements in South Africa. A pilot project conducted in 2021 in Qandu-Qandu in Khayelitsha, Cape Town, saw seven solar towers installed, with sufficient energy storage to enable the stable functioning of local fridge businesses.

"Our research and development imply that sustainable, low-cost and environmentally friendly innovations allow rapid societal evolution and solve daily problems faced by society."
- Dr David Oyedokun



Photo Candice Lowin

3.3 On being human



Citizenship, migrants and refugees

Understanding humane migration policies in Africa

In 2018 the African Union agreed to a protocol on the free movement of persons in Africa, which entailed moving towards frictionless travel, residence, employment and business establishment of foreign African nationals in other African countries. However, when it came to ratifying the protocol, only four countries completed the process.

Since 2019 no other countries have signed on, and none of the larger or richer countries in Africa were among the ratifiers. Professor Emeritus Alan Hirsch, in UCT's [Nelson Mandela School of Public Governance](#), is conducting research to uncover the real and imaginary obstacles to humane migration policies in Africa. In his 2021 paper "[The African Union's Free Movement of Persons Protocol: Why has it faltered and how can its objectives be achieved?](#)", he outlines possible paths forward and key issues to be addressed, including improving systems for civil registration and the exchange of civil and criminal data between states.

"My research is inspired by the commitment in SDG 10.7 to 'orderly, safe, regular and responsible migration and mobility of people, including through the implementation of planned and well-managed migration policies.'"
 – Professor Alan Hirsch

Migration for development and equality

UCT forms part of the [South-South Migration, Inequality and Development Hub \(MIDEQ\)](#). The hub's work examines the relationships between migration and inequality in the context of the Global South, focusing on 12 countries in Africa, Asia, South America and the Caribbean. Part of MIDEQ's vision is to deepen knowledge and understanding of the relationships between South-South migration, inequality and delivery of the SDGs. The UCT team focuses on the Ethiopia-South Africa migration corridor.

In 2021 UCT researchers conducted extensive field work with Ethiopian communities in South Africa to understand the impact of COVID-19 and closed borders on migration patterns; child migration patterns from Ethiopia to South Africa, and the impacts of migration on children; growing violence and extortion against Ethiopian informal businesses in South Africa; patterns and the nature of remittances and resources between South Africa and Ethiopia; and how the types and layers of inequality in Ethiopian migration to South Africa extends, shortens and changes both within host and home communities.

Addressing statelessness through the SDGs

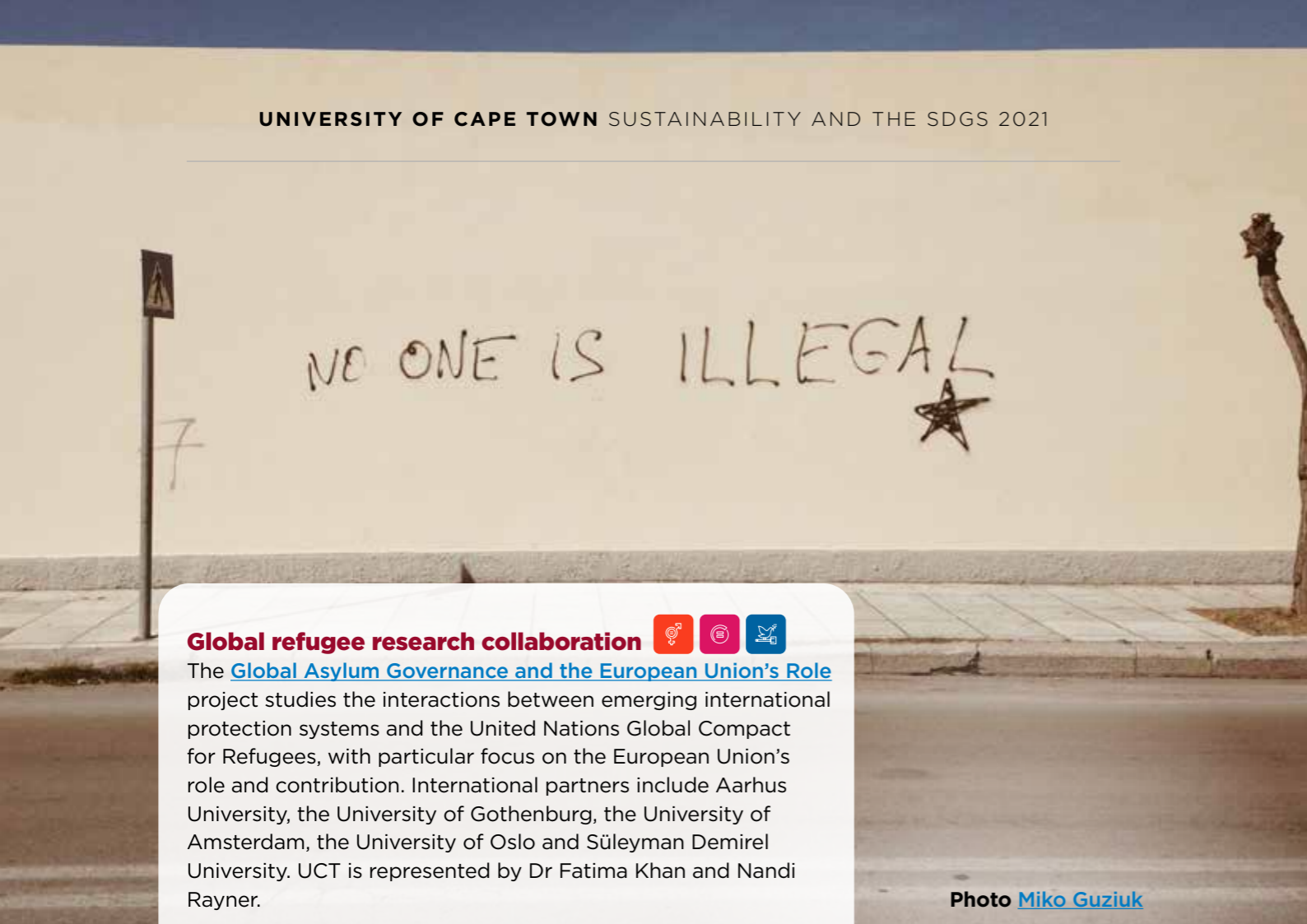
The 2030 Agenda for Sustainable Development and its pledge to leave no one behind provides for a cross-sectoral complementary framework to end statelessness. In 2021 Associate Professor Fatima Khan, Director of the [Refugee Rights Unit](#), continued work that focuses on several issues around [statelessness and refugee rights](#), particularly universal birth registration for refugee and migrant babies. Her research also considers the rights of refugee women and addresses inequality in the distribution of the burden and responsibility for hosting refugees, which falls disproportionately on LMICs.

The unit provides direct legal services to thousands of refugees and asylum seekers each year and publishes freely available resources to support the rights of refugees in South Africa, including the [Status Determination Manual](#) (2021), the [Detention Manual](#) (2021) and the [Children's Rights Manual](#) (2021).

Scholarships for postgraduate study at UCT are available to refugees, renewable for up to three years in the case of doctoral study.



Associate Professor Fatima Khan,
 Director of UCT's Refugee Rights Unit



Global refugee research collaboration



The [Global Asylum Governance and the European Union's Role](#) project studies the interactions between emerging international protection systems and the United Nations Global Compact for Refugees, with particular focus on the European Union's role and contribution. International partners include Aarhus University, the University of Gothenburg, the University of Amsterdam, the University of Oslo and Süleyman Demirel University. UCT is represented by Dr Fatima Khan and Nandi Rayner.

Photo [Miko Guziuk](#)

Patriarchy, identity and the scourge of gender-based violence

Job precarity and constructions of gender in South Africa



Dr Mandisa Malinga of the Department of Psychology is seeking to understand the impact of South Africa's high unemployment rate, precarious work and unemployment on constructions of gender, exploring the ways in which men construct masculinity and fatherhood. Her research shows that in the absence of 'relevant' social currency, such as work and social status, men find alternative ways to gain control and exert power over those close to them, often through varying forms of violence against women, other men, and children. This highlights the link between unemployment, poverty and inequitable gender relations, and the harmfulness of existing societal expectations on both men and women.

In 2021 Malinga examined this link through her contribution to the second instalment of the [State of South Africa's Fathers report \(SOSAF 2021\)](#) as well as her contribution to an edited volume, [Engaged Fatherhood for Men, Families and Gender Equality](#), published by Springer.

"The aim of this work is to challenge harmful forms of masculinity and to promote alternative positive forms of masculinity and fatherhood that are beneficial to men and women, as well as the well-being and development of children."

- Dr Mandisa Malinga

Gender, Health and Justice Research Unit



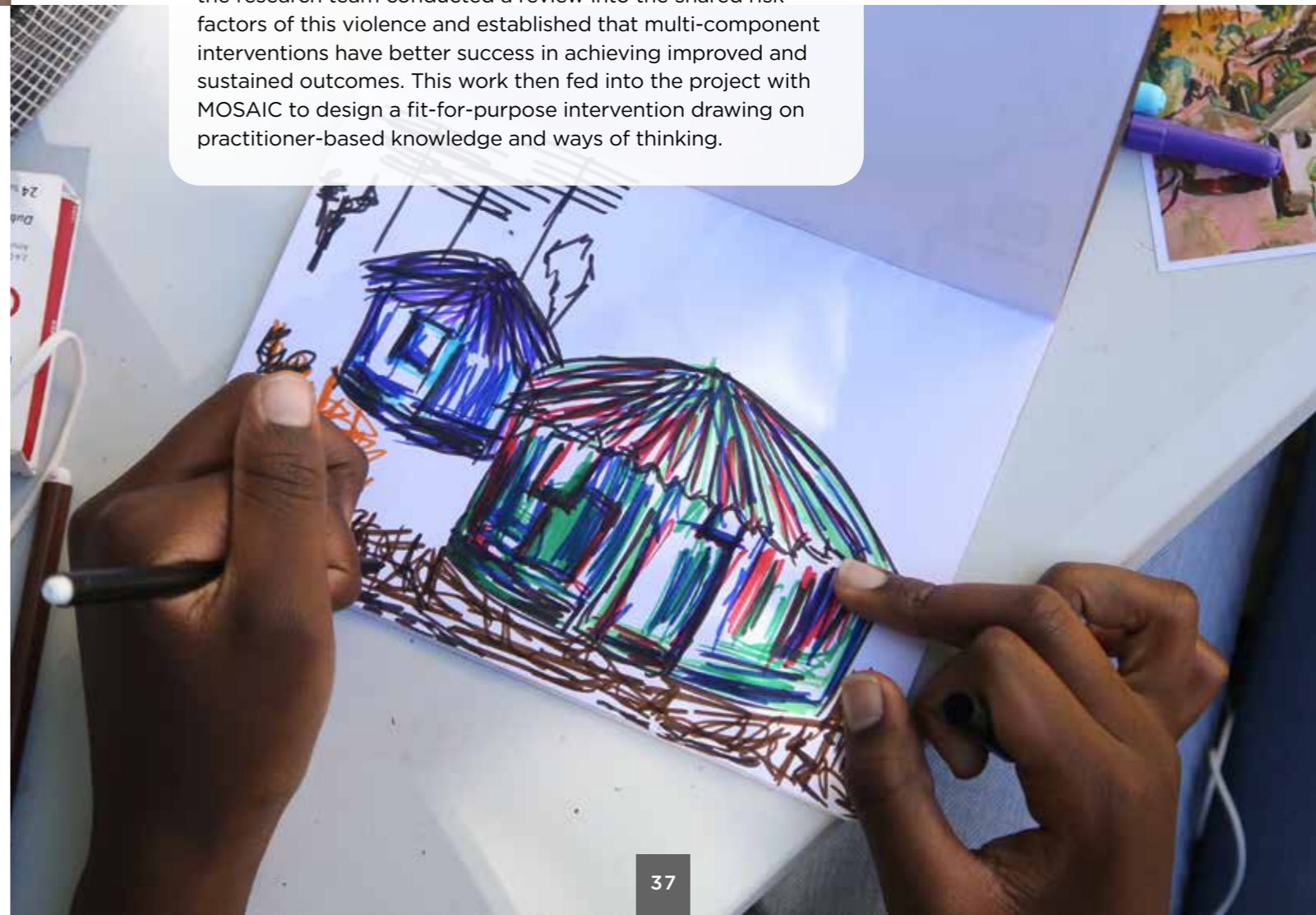
The [Gender, Health and Justice Research Unit \(GHJRU\)](#) is an interdisciplinary research unit that works to develop and implement innovative, interdisciplinary research and social interventions. Its areas of focus are violence against women and children; torture and violence prevention; sexual and reproductive health and rights; and law, policy and criminal justice reform projects.

Key projects include work with the South African National Prosecuting Agency on a report making recommendations for victim-centred prosecutions for victims of sexual and gender-based violence, which was concluded in March 2021. In another 2021 project, the GHJRU developed tools to monitor child abuse and maltreatment cases, and sexual offences, to identify and track reported cases to ensure that systemic challenges with these processes are identified and addressed.

Co-designing violence prevention interventions



In 2021 the [Children's Institute](#) conducted a project with a feminist NGO, [MOSAIC](#), to co-design and test a new violence-prevention intervention. Led by Professor Shanaaz Mathews, the research team conducted a review into the shared risk factors of this violence and established that multi-component interventions have better success in achieving improved and sustained outcomes. This work then fed into the project with MOSAIC to design a fit-for-purpose intervention drawing on practitioner-based knowledge and ways of thinking.



Accountability and governance

Strengthening judiciaries in Africa

The [Democratic Governance and Rights Unit \(DGRU\)](#) is an applied research unit in the Faculty of Law. Their mission is to strengthen judiciaries in Africa through research, judicial training and providing free access to the law.

Key projects include [Judges Matter](#), which researches and monitors the judiciaries in Africa. In 2021/22 this project's research and advocacy led to a more competitive and transparent process of appointing the new Chief Justice of South Africa. In 2021 the DGRU published a research report, "[The state of the judiciary in Malawi, Namibia and South Africa](#)", finding that there is strong public trust in the judiciaries of all three countries, but some institutional weaknesses that need addressing.

Through its [Judicial Institute for Africa](#) project, the DGRU in 2021 offered nine specialist courses to 159 participants from 14 countries, strengthening the skills and knowledge of judges and judicial staff across Africa.

Protecting the rights of rural South Africans

The [Land and Accountability Research Centre \(LARC\)](#) supports people living in rural areas of the former South African homelands, who are often under the rule of traditional leaders without the same rights and access to justice afforded to South African citizens. LARC helps rural communities defend and assert their land rights, confront oppression and hold power to account.

One such example involves residents of Makhasaneni in KwaZulu-Natal, who rely on the surrounding natural landscape as a source of food, construction materials and livestock fodder. In May 2021, after six weeks of intensive fieldwork in the area, LARC published a research report titled "[Land-based livelihoods matter in Makhasaneni](#)".

The study made use of participatory methods and household surveys to place an economic value on the use of natural resources per household per year. Since a mining company has expressed interest in the land, the results of the study can be used by the community to protect their land rights.

"Through its work, the DGRU has filled a gap in research and advocacy on the judiciary in South Africa. The DGRU speaks up for the judiciary in a way that judges cannot. We as judges appreciate this."

– Justice Mandisa Maya, Deputy Chief Justice of South Africa

Police strategy, conduct and accountability under COVID-19 regulations

In 2021 UCT's [Centre for Criminology](#) collaborated on a large-scale national research project for the South African Police Service (SAPS), supported by the Government Technical Advisory Centre and the National Research Foundation.

They conducted interviews with SAPS members from various ranks and non-SAPS members from various national departments to better understand the capabilities, achievements and failures of the SAPS in enforcing the COVID-19 regulations, and the impact on the quality of ordinary policing and levels of crime.

"This work not only contributed to the explosion of global scholarship on the challenges of policing the pandemic, but also provided specific recommendations to help South African police improve their performance in future crisis situations."

– Associate Professor Kelley Moul, Head of the Centre of Criminology



Case study

The trilingual dictionary of Kaaps 

Kaaps, or Afrikaaps, is a language created in settler-colonial South Africa that was developed by the 1500s. It took shape as a language during encounters between indigenous African (Khoi and San), South-East Asian, Dutch, Portuguese and English people.

Today, Kaaps is most used by largely working-class speakers on the Cape Flats, an area in Cape Town to which many disenfranchised people were forcibly moved by the apartheid government. It is used across all online and offline contexts of socialisation, learning, commerce, politics and religion. And, because of language contact and the temporary and seasonal migration of speakers from the Western Cape, it is written and spoken across South Africa and beyond its borders.

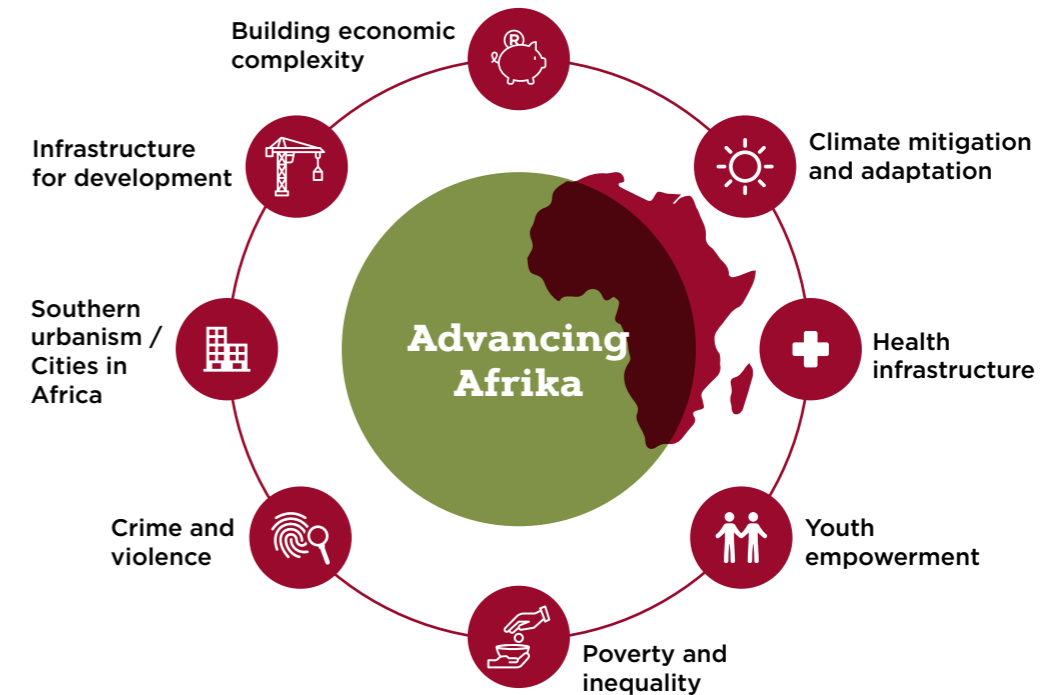
Thanks to the work of Professor Adam Haupt, Director of the Centre for Film and Media Studies, and others, [the first ever dictionary of this language was launched in 2021](#). The dictionary is in Kaaps, English and Afrikaans.

“Acknowledgement of Kaaps is imperative because Afrikaner nationalists appropriated Kaaps in order to create the dominant version of the language in the form of Afrikaans. This was part of the efforts to construct white Afrikaner identity, which shaped apartheid based on a belief in white supremacy.”

– Professor Adam Haupt, Director of the Centre for Film and Media Studies



3.4 Advancing Afrika



Climate change mitigation and adaptation

Building a climate-resilient African society 

The [African Climate and Development Initiative \(ACDI\)](#) aims to catalyse and support the transition towards an equitable, sustainable, low-carbon, climate-resilient Africa through research, education and action in collaboration with society.

In 2021 ACDI researcher Anna Taylor and colleagues began a process of knowledge sharing and discussions with the [South African Presidential Climate Commission \(PCC\)](#) on how a [Climate Resilient Development Pathways](#) approach could be operationalised in various South African contexts to navigate a just climate transition. This resulted in a formal scoping exercise for the PCC.

“South Africa’s just transition aims to achieve a better quality of life for all South Africans, through increasing the ability to adapt to the adverse climate impacts, fostering climate resilience, and reaching net-zero greenhouse gas emissions by 2050.”

– Dr Anna Taylor, ACDI researcher

Effective climate action for sustainable development 

Effective climate action for sustainable development is predicated on relevant climate information coupled with skilled decision-making capacity to implement responses. The [Climate System Analysis Group \(CSAG\)](#) has been at the forefront of contributing to both these aspects.

CSAG researchers are, among other things, deeply involved in the work of the Intergovernmental Panel on Climate Change (IPCC) and the World Climate Research Programme. In 2021 several CSAG researchers contributed to the Working Group 1 component of the Sixth Assessment Report of the IPCC, including as lead authors on Chapter 10, “Linking global to regional climate change”, and Chapter 11, “Weather and extreme events in a changing climate”.

Other key work in 2021 included a publication on the evaluation of the suitability of vegetation indices to monitor the responses of Africa’s terrestrial ecoregions to drought.

“For understanding the regional impacts of climate change, CSAG’s contracted projects have addressed the development of context-relevant climate change information aligned with the knowledge needs for policy and adaptation actions at the appropriate decision scale.”

– **Professor Bruce Hewitson, the South Africa National Research Chair on Climate Change and director of CSAG**

Supporting Afrika’s youth and adolescents

South African Child Gauge 

All too often the needs, vulnerabilities and views of children are rendered invisible in national data sets. The *South African Child Gauge* is an annual publication of the [Children’s Institute](#) that aims to track progress towards the realisation of children’s rights and ensure that their best interests are prioritised in policy and programming. The publication is widely used by academics, government officials and thought leaders in civil society.

The most recent issues have focused on [Food and Nutrition Security](#) (2020/21) and [Child and Adolescent Mental Health](#) (2021/22).

Accelerating healthy development of Africa’s adolescents 

The [United Kingdom Research and Innovation Global Challenges Research Fund \(UKRI GCRF\) Accelerating Achievement for Africa’s Adolescents \(Accelerate\) Hub](#) aims to generate evidence identifying development accelerators that – alone and in synergy with one another – can support adolescents in Africa to reach multiple SDGs.

In 2021 the hub provided evidence that shaped social protection policies affecting millions of young people and families. Their work, in close partnership with policymakers in South Africa and UN agencies – such as the United Nations Children’s Fund (UNICEF), the World Health Organization and the United Nations Development Programme – is documented in the UNICEF Innocenti [Beyond Masks](#) report.

“When we started the hub in 2019, our five-year goal was to reach 20 million children and adolescents in Africa with accelerator services. In the two years since the start of the COVID-19 pandemic in March 2020, our hub has reached over 210 million families in 198 countries and territories.”

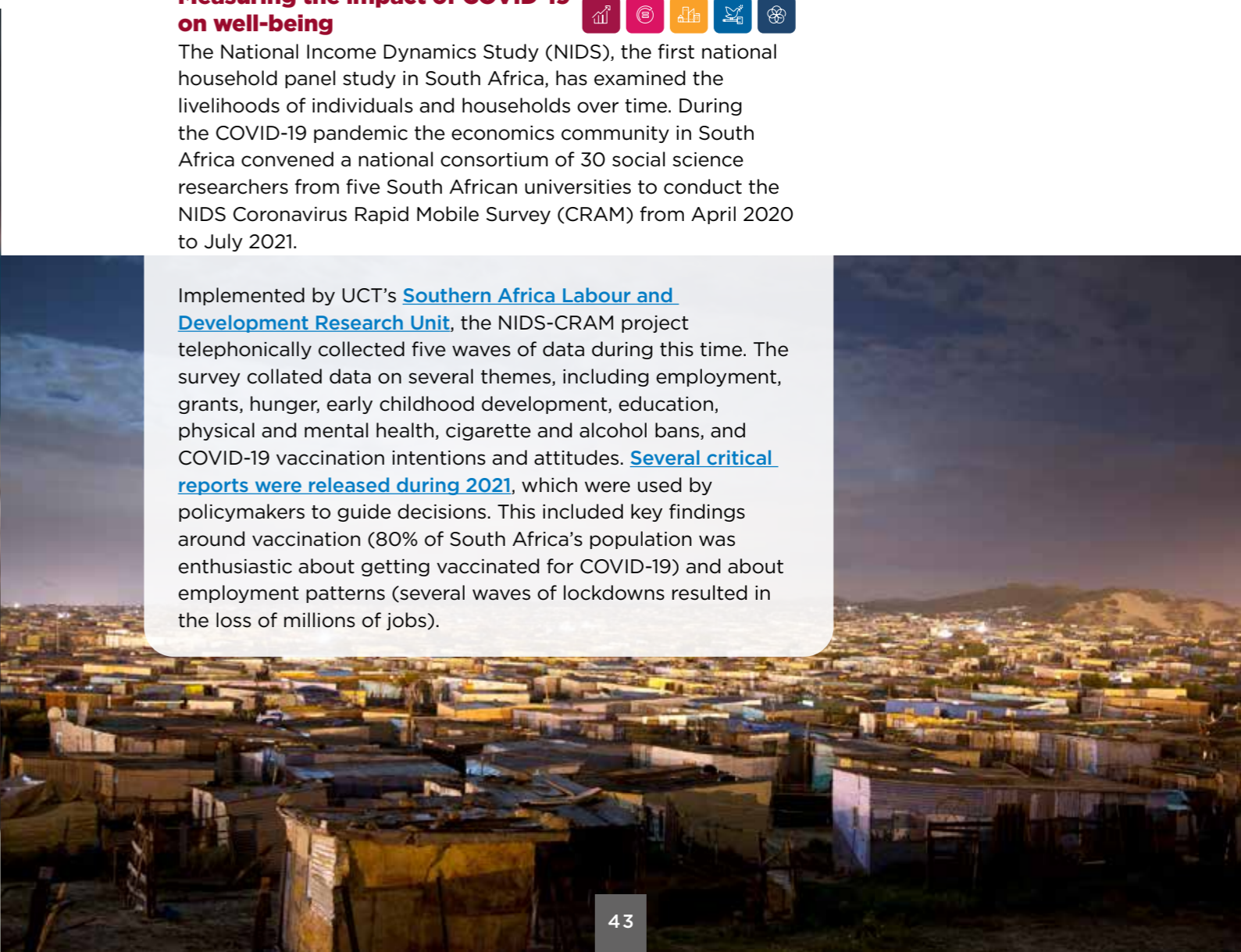
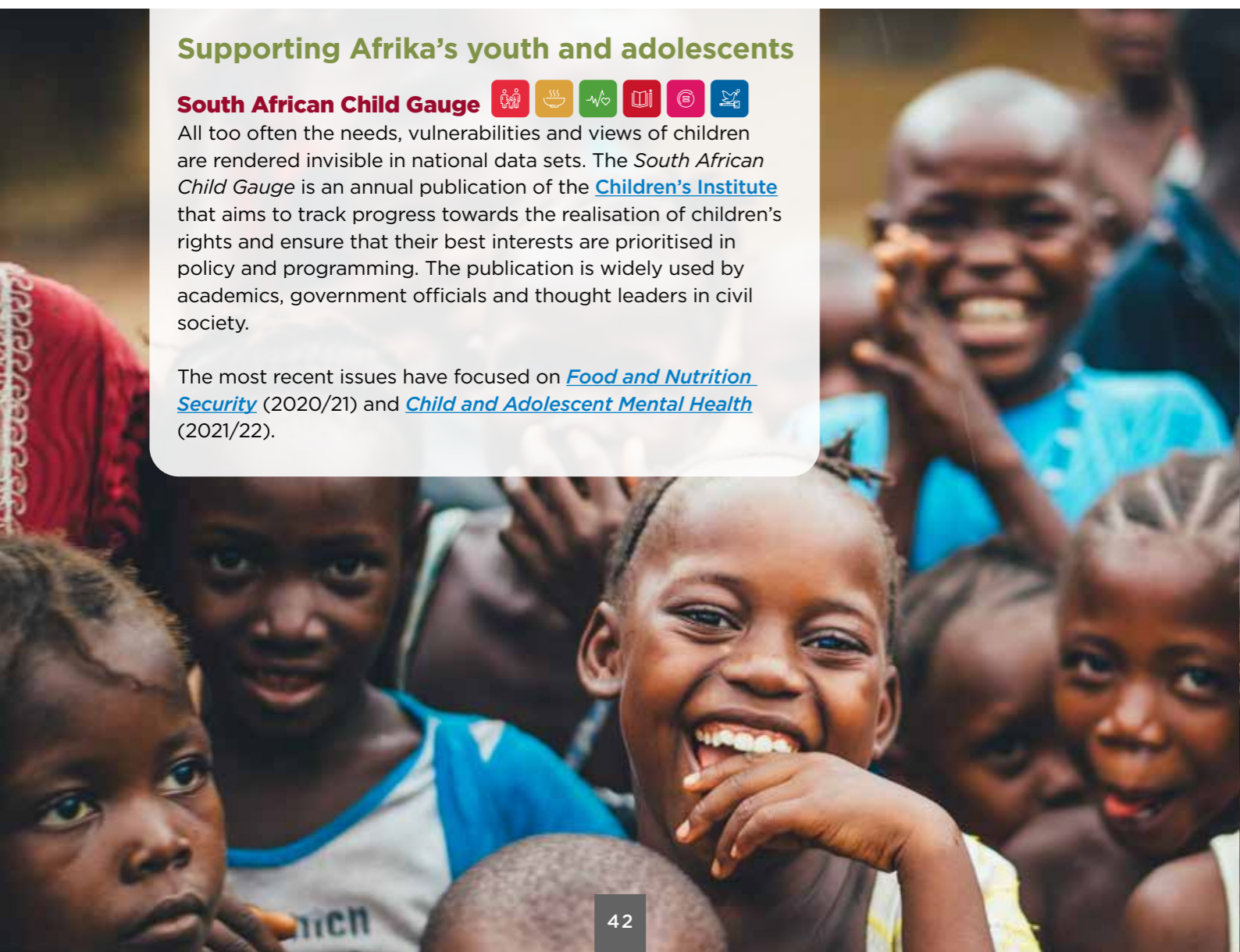
– **Dr Elona Toska, UCT lead of the UKRI GCRF Accelerate Hub**

Poverty and inequality

Measuring the impact of COVID-19 on well-being 

The National Income Dynamics Study (NIDS), the first national household panel study in South Africa, has examined the livelihoods of individuals and households over time. During the COVID-19 pandemic the economics community in South Africa convened a national consortium of 30 social science researchers from five South African universities to conduct the NIDS Coronavirus Rapid Mobile Survey (CRAM) from April 2020 to July 2021.

Implemented by UCT’s [Southern Africa Labour and Development Research Unit](#), the NIDS-CRAM project telephonically collected five waves of data during this time. The survey collated data on several themes, including employment, grants, hunger, early childhood development, education, physical and mental health, cigarette and alcohol bans, and COVID-19 vaccination intentions and attitudes. [Several critical reports were released during 2021](#), which were used by policymakers to guide decisions. This included key findings around vaccination (80% of South Africa’s population was enthusiastic about getting vaccinated for COVID-19) and about employment patterns (several waves of lockdowns resulted in the loss of millions of jobs).



The impact of South Africa's minimum wage

Major challenges in South Africa include poverty, wage inequality and labour market vulnerability. The [Development Policy Research Unit's \(DPRU\)](#) work on minimum wages and labour regulation deepens understanding of how policy interacts with the economic realities in the country, to create space for informed policy and debate about solutions that improve worker well-being and livelihoods.

In 2021 the DPRU released a report for the National Minimum Wage Commission and a working paper titled "[The impact of the national minimum wage in South Africa: Early quantitative evidence](#)" with a specific focus on the short-term labour market impacts of the national minimum wage.

Working towards well-governed and safe cities

Cities of integrity

More than two-thirds of the world's population will be living in cities by 2050, and the fastest urban growth is happening in Africa and Asia. The [African Centre for Cities \(ACC\)](#) Cities of Integrity project worked with urban planners and their respective professional bodies in South Africa and Zambia to understand how they experience and deal with corruption in their daily practice. The project concluded in July 2021.

Developing effective, accountable and transparent institutions at all levels is crucial to building inclusive and just cities, and the Cities of Integrity project believes that urban planners - with the right support to address their complex professional experiences - can become champions of integrity.

"To tackle corruption, it is necessary to move from a narrow focus on legalistic compliance towards a more proactive promotion of professional integrity and collective accountability mechanisms."
- Dr Laura Nkula-Wenz, senior researcher on the Cities of Integrity project

Preventing fires in informal settlements

[Lumkani](#), a UCT spin-off company, directly improves the safety, financial security and quality of life of residents of urban informal settlements, slums and refugee settings, which are prone to rampant fires. Their low-cost fire-detection device is coupled with a community-wide radio-frequency alert, and the service can be combined with insurance for fire damage and funeral cover for a sector that is marginalised and usually excluded from access to such products. In 2021:

7 000 fire detectors were installed	47 000 high-fire-risk homes were protected	310 000 direct and indirect beneficiaries were protected	R326 million in informal property was insured
92% of recorded fire events were controlled	130 full-time jobs were created.		

Tackling urban hunger

The work of the ACC has shown that food insecurity and hunger are increasingly urban phenomena. The following are snapshots of some of the ACC's urban food research projects.

The Nourished Child

In South Africa and other developing countries many people struggle with storing food and preparing nutritious meals at home, which has a negative impact on the growth and development of children. The [Nourished Child](#) project seeks to understand what it would take to develop and support food-systems change in urban areas, particularly in relation to how food intersects with other urban systems, to reduce malnutrition in urban settings.

In 2021 ACC researchers engaged with local government and communities to identify and implement strategies to change food-systems actions to support higher nutrition.

"The ACC's Urban Food Research highlights the importance of grounded context-specific work in cities and for far greater integration between the SDGs."
- Dr Gareth Haysom, researcher at the ACC

Planning for Food Secure African Cities podcast

The [Planning for Food Secure African Cities](#) podcast, presented by Dr Jane Battersby from Environmental and Geographical Science, first aired in 2021. The podcast is based on the work of a project titled Consuming Urban Poverty, which has been running since 2015 and uses urban food systems and the dynamics of food poverty as a lens to understand and alleviate poverty in cities in Africa. The podcast is designed to help African planning scholars and urbanists to think through how and why food can be incorporated in urban planning and governance.



Sustainable mining for human development in Afrika

Remediation of degraded mining land

The [Towards Resilient Futures Community of Practice \(CoP\)](#) Phase 2 continued in 2021, involving attempts to build the post-mining economy in South Africa by rehabilitating degraded mine land with the potential to sustain production of renewable feedstock or raw material.

The CoP's approach is to use fibre plants such as hemp, kenaf or bamboo to transform degraded land into a restorative agricultural sector and a dynamic manufacturing sector. This can provide employment opportunities, inclusive socio-economic growth and poverty reduction in mining communities beyond the working lives of mines.

Operationalising the SDGs in the mining industry

Dr Megan Cole of the [Future Water](#) institute has mapped, classified and collected census data from over 100 mining villages, towns and cities (home to over 5.7 million people and associated with 176 large-scale mines) across South Africa. In 2021 this information was visualised in SDG barometers for different commodities and community types to provide the first comparison of living standards of all mining host communities in South Africa. "[Measuring the sustainable development goals \(SDGs\) in mining host communities: A South African case study](#)" was published in 2021.

Notable differences between mining communities highlight the impact of South Africa's past policies of racial segregation and discrimination. SDG reporting by mining companies shows significant financial investment in mining communities, but Cole's research shows that thousands of people living near mines still experience multiple forms of deprivation.

"My research identifies key challenges around data gaps, indicator selection and host community definitions that need to be urgently addressed to ensure SDG reporting in mining moves beyond a public relations exercise to a useful tool that supports sustainable development."

- Dr Megan Cole

Partnering to protect communities and environments from mine dust

Dust generated by mining activities is a major problem in all mining-intensive developing countries. It can, when inhaled, cause lung disease and other respiratory problems. It can also contaminate soil, vegetation and water, including along the roads and railway lines on which mineral ore is transported.

The [Mine Dust Network](#), now funded by the UKRI GCRF, was established in 2016 at UCT in recognition of the need for a more collaborative, interdisciplinary and multi-sectoral approach to tackling the mine-dust problem. In 2021 and 2022 the network managed to bring together an interdisciplinary team consisting of academics from several departments at institutions across South Africa as well as stakeholders from industry, government and community organisations.

Infrastructure for development

Calculating the cost of rural infrastructure access in South Africa

During 2021 Professor Don Ross and Dr Matthew Townshend of the [School of Economics](#) served as consultants to the World Bank to estimate the financial cost of achieving South Africa's SDG 9 target by 2030. The focus of their work was on the access of rural populations to quality transportation, as measured by the World Bank's Rural Access Index (RAI).

As part of the project, the pair modelled and cost-estimated 18 scenarios for rural road-access improvements. Six of the scenarios presumed a policy choice to increase the RAI score as quickly as possible; the remaining 12 scenarios applied a national rural-road-project prioritisation model sensitive to longer-run efficiency and sustainability.

"Achievement of world-quality transport access for all rural South Africans is possible and affordable, given the right plan."
- Professor Don Ross, School of Economics

Quality, durability and sustainability of infrastructure in Southern Africa 

Global urbanisation, coupled with a continued increase in global population growth, is associated with the need for new infrastructure and the maintenance, repair and rehabilitation of existing infrastructure. However, in a world facing many environmental and social challenges, this infrastructure development must have limited ecological impact.

Research of the [Concrete Materials and Structural Integrity Research Unit \(CoMSIRU\)](#) is focused on improving the quality, durability and sustainability of infrastructure in Southern Africa. In 2021 they began long-term research that brings together close to 100 research and industry partners from around the globe and seeks to drive innovation and help solve the climate challenges related to the construction industry.

“Concrete is by far the most consumed substance on the planet, after water. To achieve SDGs 11 and 12, we need to reduce its environmental impact and associated societal problems to provide adequate solutions for our growing urban spaces, especially on the African continent.”
 – Professor Hans Beushausen, Director of CoMSIRU



Innovation, intellectual property and economic growth in Afrika

Intellectual property, innovation and development 

Professor Caroline Ncube – in her capacity as the Department of Science and Innovation/National Research Foundation South African Research Chair in Intellectual Property, Innovation and Development – focuses on raising employment through faster economic growth; improving the quality of education, skills development and innovation; and building the capability of the state to play a developmental, transformative role.

In addition to a number of publications in 2021, including a policy brief on intellectual property and trade in the African Continental Free Trade Area and [Science, Technology & Innovation and Intellectual Property: Leveraging Openness for Sustainable Development in Africa](#), Ncube also served as co-leader on the theme Science, Technology and Innovation at the [International Summit on the SDGs in Africa 2021](#), and she included a draft positioning paper. This theme considered how to stimulate the strong growth in capacity for science, technology and innovation that is required for achieving the SDGs in Africa.

African innovation research 
[The Open African Innovation Research Partnership \(Open AIR\)](#)

is a large multidisciplinary network of African and Canadian researchers addressing questions around, among other things, how open and collaborative innovation can help scale the impacts of next-generation technologies to promote gender equality, youth employment and other aspects of inclusion.

In 2021 the project developed a draft report titled “Innovation and knowledge governance in Africa: Insights from the work of the Open AIR partnership”, which encapsulates 10 years of focused research. Other achievements from the year include the publication of four books, 12 book chapters, 27 journal articles, four working papers and one policy brief.

Through its work in numerous African countries, Open AIR has uncovered that innovation is happening in Africa in ways that were previously overlooked and how effective intellectual property systems can play a critical role in the recognition of and opportunities afforded by such innovation.

Case study

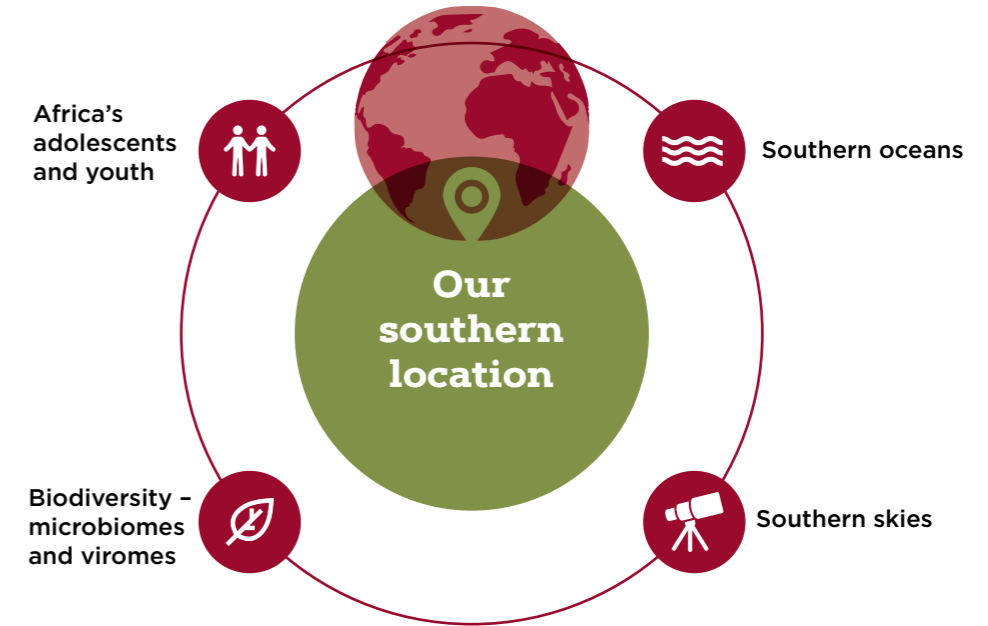
Creating a more just and inclusive society

Through reports, case studies, capacity building, information sharing and dynamic partnerships, the [Bertha Centre for Social Innovation and Entrepreneurship](#) focuses on creating a more just and inclusive society in the Global South. The Bertha Centre's innovative finance initiative continued to support the implementation of the [Green Outcomes Fund \(GOF\)](#) in 2021. The fund, using innovative finance principles, incentivises fund managers to invest in green small, medium and micro enterprises (SMMEs) by paying for outcomes related to climate change and job creation. The fund works to mobilise private sector investment into risky, innovative green solutions that have the potential to provide positive environmental and social benefits.

In 2021 multiple full- and part-time jobs were created through GOF investments. Fund investments also led to SMME growth within the green economy. SMMEs, with the support of the GOF, also achieved multiple climate mitigation outcomes in the waste, water and energy sectors.

“We have learned from experience that siloed solutions don't work, and the opportunity before us is to partner in novel ways – sharing knowledge, capacity and new perspectives, enabling effective responses to the wicked problems of our time. The SDGs offer a comprehensive framework for articulating those complex challenges and identifying entry points for social innovation and social change.”
 – Solange Rosa, Director of the Bertha Centre for Social Innovation and Entrepreneurship

3.5 Our southern location



Southern oceans

Climate-driven impacts on coastal ecosystem services

The United Nations has proclaimed 2021-2030 a Decade of Ocean Science for Sustainable Development, recognising that while the oceans support the livelihoods of over three billion people, ocean health is rapidly declining. Along with warming up and acidifying, the ocean is losing oxygen (hypoxia). The Benguela upwelling system (BUS) off south-west Africa is one of the most fertile ocean regions globally, hosting fishing grounds that are critical to the South African and Namibian economies. The BUS experiences events of oxygen depletion that can cause mass fish kills, with potentially catastrophic consequences for the people reliant on the BUS ecosystem.

Through a combination of observations and modelling, a research group – led by [Dr Sarah Fawcett](#) in the Department of Oceanography – continued its work in 2021 to develop an understanding of the physics and biogeochemistry that lead to hypoxia in the BUS, with the ultimate goal of developing predictive capabilities that can be leveraged by those responsible for managing the Benguela region, which is home to 10 million people.

“An improved predictive understanding of loss of oxygen in the oceans will increase resilience to short-term environmental shocks that leave subsistence fishers without food or income and cost African economies billions.”

– Dr Sarah Fawcett

Understanding ocean-atmosphere interaction for climate variability 

Ocean-atmosphere interaction has an important effect on Southern Africa’s weather and climate. It is also a driver of the surrounding coastal water that sustains important marine ecosystems and fisheries.

UCT’s [Nansen Tutu Center for Marine Environmental Research](#), under the directorship of Professor Mathieu Roualt, works to better understand this interaction. The focus is on research with societal impact, including modelling and forecasting of droughts, floods, marine heat waves or oceanic events detrimental to the marine ecosystem.

In 2021 researchers in the centre published a total of 12 peer-reviewed journal publications, including a paper on extreme rainfall in Southern Africa. In the same year Dr Marjolaine Krug, a researcher at the centre, was awarded the [Africa Award for Research Excellence in Ocean Sciences](#) for her significant original contributions to ocean science research in Africa, excellence in research, student mentorship and outstanding service and outreach to society.

“The societal impact and application of the research is a great motivation for all of us, staff and students, on top of training African students who would not have had this opportunity back home.”

– Professor Mathieu Roualt, Director of the Nansen Tutu Center for Marine Environmental Research

Air pollution in South Africa: Katye Altieri 

There remains a critical gap in the understanding of the role aerosols play in past, current and future climate change. Dr Katye Altieri, an atmospheric chemist based in UCT’s Department of Oceanography, is working to help fill this gap.

In 2021 Altieri was involved in several research projects looking at air pollution, including in coastal cities; the impact of human activities across South African ecosystems; and the remote marine atmosphere of the Southern Ocean as a proxy to understand more about climate during the preindustrial era.

“It is critical as researchers in South Africa to focus our state-of-the-science efforts on research that ultimately improves air quality and human health and helps us understand the impact of air pollution on South African ecosystems and global climate.”

– Dr Katye Altieri



Tackling plastic pollution in our oceans 

Plastics are ubiquitous global pollutants, especially in aquatic systems. Professor Peter Ryan, Director of the [FitzPatrick Institute of African Ornithology](#), has studied environmental plastics since the 1980s, with a particular focus on macro-litter. Large plastic items account for most of the mass of environmental plastics and, if not captured, will break down into microplastics.

It is widely assumed that since 1989, when Annex V of the International Convention for the Prevention of Pollution from Ships (MARPOL) banned the dumping of plastics and other persistent wastes at sea, 80% of plastics at sea have come from land-based sources. However, Ryan’s studies, using bottles as tracers of general refuse, show that most drink bottles washing up away from urban source areas are dumped illegally from ships. These findings from 2019 and 2020 have since been used to pressure the International Maritime Organisation to tighten up controls on illegal dumping from ships.

In 2021 Ryan worked on a two-year litter inception project, funded by the Waste Research, Development and Innovation Roadmap, that aims to cut plastic emissions from land-based urban sources in South Africa.

“Big scientific data changes the way we do science. Platforms like ilifu enable scientists to use cloud technologies to process and visualise their data, testing hypotheses and applying scientific methods quickly and effectively even in the era of big data. Its flexibility and scalability make it an important step toward building a financially sustainable South African open-science cloud.”

– Professor Mattia Vaccari, Director of UCT eResearch

Southern skies

Astronomy driving innovation 

The [Inter-University Institute for Data Intensive Astronomy \(IDIA\)](#), a partnership between three South African universities (UCT, the University of the Western Cape and the University of Pretoria) and the South African Radio Astronomy Observatory, is working to build capacity and expertise in data-intensive research, driven by the co-hosting of the Square Kilometre Array project in South Africa and associated data-intensive infrastructure, like the MeerKAT telescope. One of the first elements required to reach this goal was for IDIA to set up a data-intensive research cloud facility, known as ilifu, to service its scientific community. Currently, ilifu is the primary platform to support five out of eight MeerKAT large survey projects. It is also being used to support bioinformatics research as well as smaller MeerKAT projects. Two MeerKAT-related publications appeared in 2021: “[MIGHTEE-HI: The HI emission project of the MeerKAT MIGHTEE survey](#)” and “[A tidal disruption event coincident with a high-energy neutrino](#)”.

The South African MeerKAT radio telescope is a precursor to the Square Kilometre Array telescope. **Photo** South African Radio Astronomy Observatory



Case study

Studying the Antarctic sea ice for climate change insights



The unprecedented springtime retreat of Antarctic sea ice in 2016, recent massive disintegration of ice shelves, glacier retreat, decreasing sea ice days and intense snowmelt may signal an irreversible and escalating trend adversely affecting the huge ice shelves surrounding Antarctica. These have become known as the safety band of Antarctica, as they hold back the ice of glaciers that continuously flows towards the sea. In order to monitor and study the Antarctic shelf ice retreat due to anthropogenic climatic changes, the departments of Civil Engineering, Electrical Engineering, Mechanical Engineering and Geomatics have expanded their polar research endeavour to include questions relating to the structural integrity of the Fimbul Ice Shelf.

Under the leadership of Professor Sebastian Skatulla and Dr Keith MacHutchon, a multidisciplinary research project, in collaboration with the South African Department of Forestry, Fisheries and the Environment, is carrying out long-term observations that combine satellite, deep-ground-penetrating radar and geodetic surveys of the Fimbul Ice Shelf with glaciological modelling and analysis of shelf stability. Preliminary work in 2021 consisted of a risk analysis of resupply operations for the South African National Antarctic Expedition (SANAE) IV, a South African Antarctic research project taking place at Penguin Bay in Antarctica.

A direct outcome was the reporting of the finding that the mooring and offloading at Penguin Bay are hazardous operations and should be discontinued, as the shelf edge is vulnerable to crumbling and calving. These findings will also lead to further research to better our understanding of global climate change.

Two UCT students conducting a glaciological survey of the Fimbul Ice Shelf edge during the 2020-2021 SANAE IV supply run. The crane of the *SA Agulhas II*, the research ship used to access the site, is visible in the background.

CHAPTER 4

Partnerships for the goals

The grand challenges of our time – climate change, poverty, inequality, disease, crime and violence – are global problems, and the solutions to these problems must be global in scope and nature.

Global research networks facilitate international partnerships between universities, offering spaces where members can be strategic partners in collaborative research that has real impact.

While these partnerships offer obvious advantages, they are often imbalanced, favouring the greater wealth, power and resources of partners in the Global North. UCT's many collaborations with international colleagues and membership of international networks find it well placed to challenge these imbalances.



Driving fair and equitable partnerships

In 2021 UCT's Office of Research Integrity (ORI) reported on the university's research collaborations as part of the Research Fairness Initiative (RFI), which is a drive to ensure fair and equitable partnerships in research. This internal benchmarking exercise explored performance across three domains:

- fairness of opportunity before the research is initiated
- fair process during the collaboration
- fair sharing of benefits, costs and outcomes after the research is completed.

Initiatives like the RFI report take cognisance of the positioning of the contributions of research partners in the overall project (e.g. avoiding 'helicopter science'), championing fairness and ensuring access to data.

South-South partnerships to build African genomics research

The [Human Heredity and Health in Africa \(H3Africa\)](#) consortium is an inspiring case study on the fair collaboration between scientists from Africa and those from elsewhere. Their policy framework is firmly focused on African leadership and capacity building as guiding principles for African genomics research.

One example of an H3Africa project is H3ABioNet, the Pan-African bioinformatics network for H3Africa led from UCT, which has trained over 4 500 people in Africa, building skills in genomics data management and analysis since the project began. In 2021 they conducted seven courses, covering topics from grant writing and data management to the analysis of data for next-generation sequencing and metagenomics.

"H3Africa builds equitable partnerships between researchers and other key stakeholders. Equitable partnerships can help build strong research systems. They are also a means to counter exploitation and promote mutual respect and trust, and they offer an opportunity to ensure that research is responsive to local health needs and that data interpretation is contextualised."

– Dr Jantina de Vries, H3Africa researcher and Associate Professor in Bioethics in the Department of Medicine

"For a research partnership to bring maximum impact, all partners need to be equal stakeholders, unless there is a mutually agreed upon and accepted reason why this is not feasible for a particular project. The time when it is acceptable for researchers from the Global South to be junior partners focused primarily on data collection must come to an end."

– Dr Lyn Horn, Director of the Office of Research Integrity

UCT is championing Africa-based data repositories. UCT's [ZivaHub](#) repository is central to the new technical and social ecosystems that are emerging to support robust open-science research practices that define how we build equitable data-sharing relationships that are mutually beneficial in our research collaborations.

The Knowledge Co-op

Partnerships that cross the various sectors of society are critical to tackling many of the SDGs both locally and globally. To support these inter-sectoral partnerships at UCT, the [UCT Knowledge Co-op](#) provides a channel for external constituencies to access knowledge, skills, resources and professional expertise within the university. At the same time, it provides an opportunity for academics and students to engage with society and address the needs of communities.

In 2021 the Knowledge Co-op provided 60 new project topics from 18 community partners, including 23 master's projects, five honours projects and six undergraduate research reports. Topics ranged from a study on governance of homelessness in Cape Town to producing stories of empowerment for survivors of intimate partner violence.

Global research partnerships

UCT's Research Office hosts a global engagement and research partnerships hub to broker relationships between UCT researchers and their international counterparts, including those on the continent. UCT is a member of the following global networks:

- The [African Research Universities Alliance \(ARUA\)](#)
- The [International Alliance of Research Universities \(IARU\)](#)
- The [Worldwide Universities Network \(WUN\)](#)
- The [Southern African-Nordic Centre \(SANORD\)](#)
- The [Australia-Africa Universities Network \(AAUN\)](#)
- The [South Africa-Sweden University Forum \(SASUF\)](#).



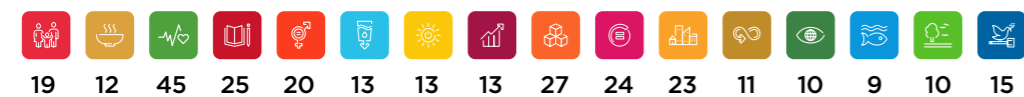
Highlights from 2021

- UCT received a grant from the WUN Research Development Fund for a project titled “Political and institutional determinants of human development in Sub-Saharan Africa’s resource-rich economies”, which aims to investigate the role of institutional mechanisms in ensuring that resource-rich African countries use their resource revenues in ways that promote human development.
- Professor Sue Harrison, Deputy Vice-Chancellor for Research and Internationalisation, became chair of the WUN Academic Advisory Group (AAG), which oversees the academic portfolio of the network and advises the WUN Partnership Board on strategic direction.
- Both the WUN and SASUF established student networks during 2021, and UCT has representatives on the student network of SASUF and on the WUN student working group.
- A memorandum of understanding was concluded with Zhejiang University (ZJU) to foster a research partnership that will address SDGs 3, 7 and 11. ZJU is also a member of the WUN.
- A formal partnership was established with the University of Groningen (UG). UG is a member of the Guild network (comprising leading European universities), which has concluded a strategic partnership with ARUA. Thus, support for the UG–UCT partnership will come from multiple directions.
- UCT explored several initiatives with the University of Toronto (UoT). The most significant of these is joining the Higher Education Health Collaborative, for which UoT is the Secretariat, funded by the Mastercard Foundation.

UCT’s accredited interdisciplinary centres and institutions

UCT has [87 accredited interdisciplinary research centres and institutions](#) that form the basis of a great number of internal and external partnerships. These formal research groups include staff and students from various departments and faculties, working across disciplines to understand and alleviate some of society’s major challenges. All formal research groups are accredited by the University Research Committee.

SDG coverage by UCT’s accredited research groups



All of UCT’s accredited research groups work through partnerships of varying types with a range of institutions to support the attainment and impact of their research endeavours.

Inter-university programmes and degrees

International exchange programmes

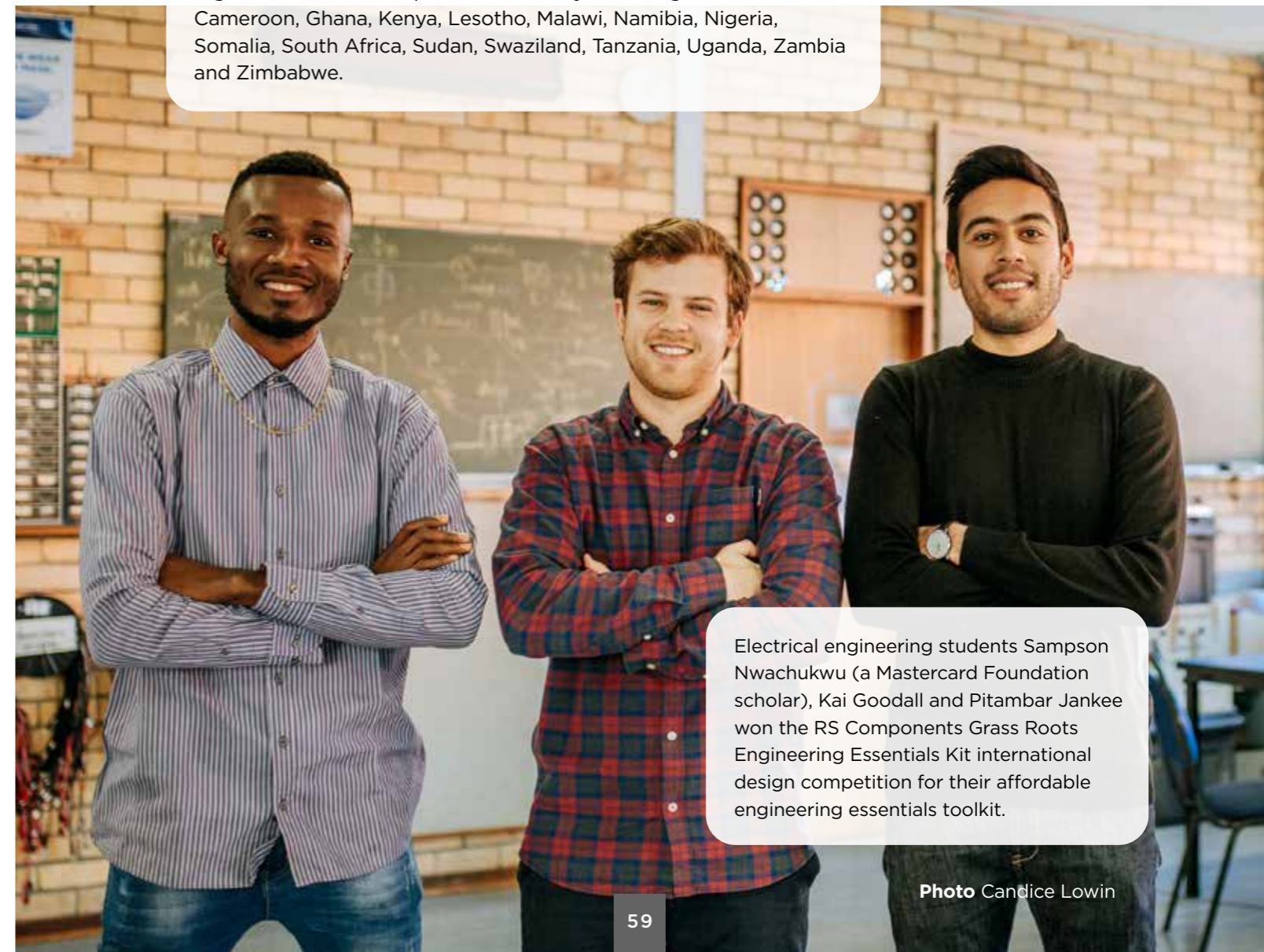
In 2021 UCT had 75 active inter-institutional agreements for student exchange programmes, including those with the University of Groningen and the University of Bristol.

African postgraduate partnerships

UCT hosts four postgraduate partnership programmes with other institutions in Africa and globally. These include:

- the Mastercard Foundation Scholars Program
- the University Science, Humanities, Law and Engineering Partnerships in Africa programme
- the Africa Regional International Staff/Student Exchange programme
- the Organisation for Women in Science for the Developing World.

In 2021 over 130 African students on these programmes were either registered at UCT or a partner university, including in Botswana, Cameroon, Ghana, Kenya, Lesotho, Malawi, Namibia, Nigeria, Somalia, South Africa, Sudan, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe.



Electrical engineering students Sampson Nwachukwu (a Mastercard Foundation scholar), Kai Goodall and Pitambar Jankee won the RS Components Grass Roots Engineering Essentials Kit international design competition for their affordable engineering essentials toolkit.

Photo Candice Lowin

Collaborative degree agreements 

UCT's collaborative degree programmes aim to connect our postgraduates with opportunities to travel to and study in partnership with international universities. The programmes seek to allow for cohorts of postgraduates to study towards their postgraduate degrees at both UCT and an international partner institution, thereby earning a jointly awarded or co-badged degree. The programmes also forge stronger collaborations between the institutions through co-supervision.

In 2021 UCT had six active collaborative degree agreements with international partners: the University of Bristol, the University of Groningen, the Danish School of Media and Journalism, Paris-Sorbonne University, Swansea University and IMT Atlantique.

UCT was also in discussion with nine new European partner universities to develop our pipeline of joint collaborative programmes. These are the University of Vienna, Université de Bretagne Occidentale jointly with the Institut de Recherche pour le Développement, Leeds Beckett University, the University of Oslo, the University of Amsterdam, the University of Barcelona, Lund University, the University of Gothenburg, and Jawaharlal Nehru University jointly with Albert-Ludwigs-Universität Freiburg.

DSI/NRF Centres of Excellence 

The Department of Science and Innovation / National Research Foundation (DSI/NRF) Centres of Excellence (COEs) concentrate existing research excellence and resources that enable researchers to collaborate across disciplines and institutions on long-term projects that are locally relevant and internationally competitive. UCT hosts three DSI/NRF CoEs:

- Centre of Excellence in Birds as Keys to Biodiversity Conservation
- Centre of Excellence in Catalysis Research, c*change
- Centre of Excellence in Biomedical Tuberculosis Research (UCT hosts a node).

Photo Francois Mougeot



Case studies

African Research Universities Alliance Centres of Excellence  

ARUA is enhancing research and graduate training in member universities by setting up CoEs as focal points for aggregating world-class researchers from member universities to undertake collaborative research in priority thematic areas.

African Centre of Excellence for Inequality Research

The establishment of the [African Centre of Excellence for Inequality Research \(ACEIR\)](#) directly addresses the analytical and measurement needs required for policy interventions and civil society action to turn the tide against inequality. Highlights in 2021 included:

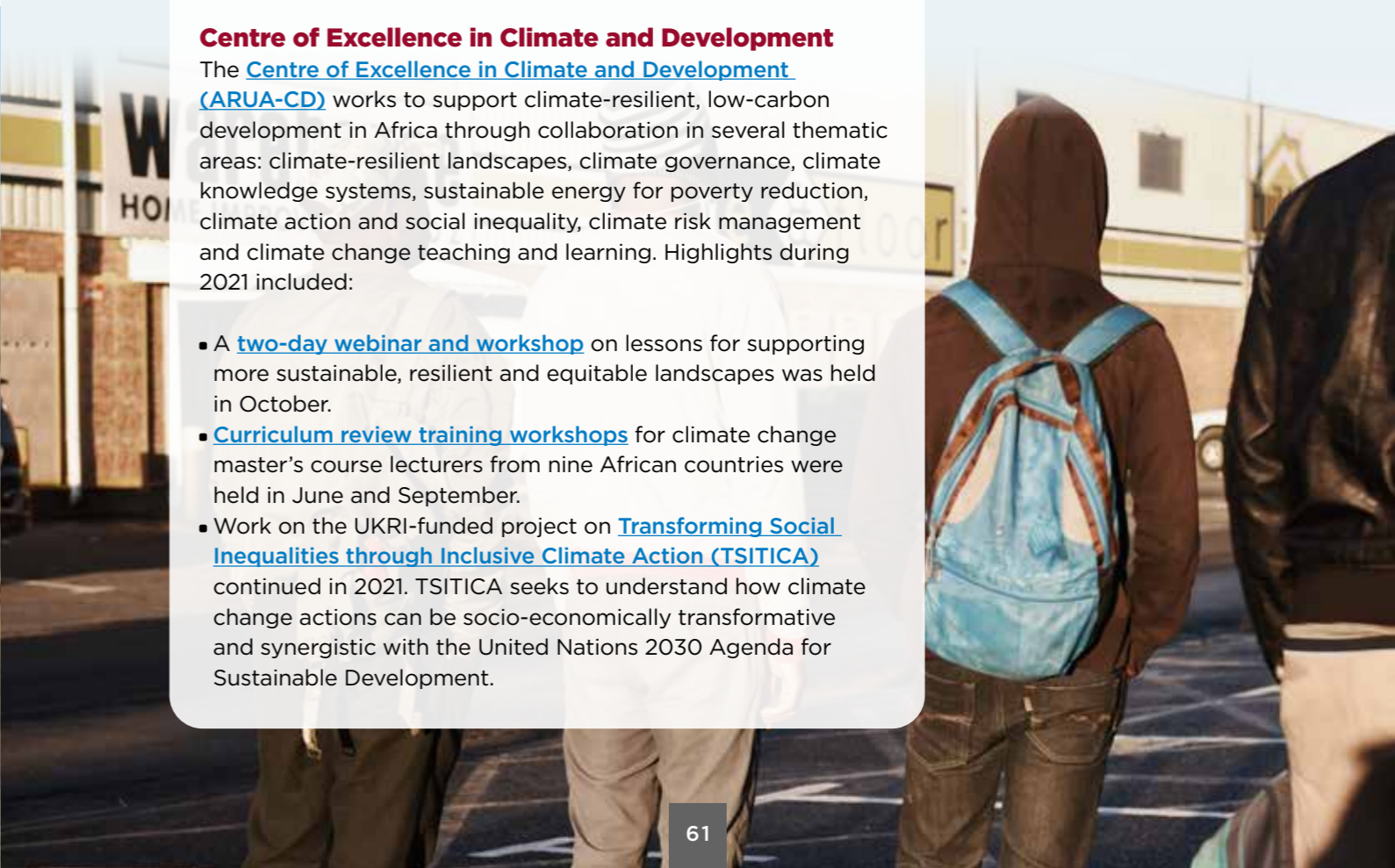
- Inequality diagnostics for Ghana, Kenya and South Africa, which aimed to inform public policy, were presented in March at a high-level final conference of the Research Facility on Inequalities of the European Union and the Agence Française de Développement.
- A study was published in July on "[Housing, sanitation and living conditions affecting SARS-CoV-2 prevention interventions in 54 African countries](#)".
- A workshop on climate change, inequality and health for early career researchers was hosted in November at the ARUA 2021 Biennial International Conference.

Centre of Excellence in Climate and Development

The [Centre of Excellence in Climate and Development \(ARUA-CD\)](#) works to support climate-resilient, low-carbon development in Africa through collaboration in several thematic areas: climate-resilient landscapes, climate governance, climate knowledge systems, sustainable energy for poverty reduction, climate action and social inequality, climate risk management and climate change teaching and learning. Highlights during 2021 included:

- A [two-day webinar and workshop](#) on lessons for supporting more sustainable, resilient and equitable landscapes was held in October.
- [Curriculum review training workshops](#) for climate change master's course lecturers from nine African countries were held in June and September.
- Work on the UKRI-funded project on [Transforming Social Inequalities through Inclusive Climate Action \(TSITICA\)](#) continued in 2021. TSITICA seeks to understand how climate change actions can be socio-economically transformative and synergistic with the United Nations 2030 Agenda for Sustainable Development.

The ARUA CoEs work on a hub-and-spoke model. UCT is host to two of the 13 CoEs, in each case with East and West African nodes at the [University of Nairobi](#), Kenya, and the [University of Ghana](#).



CHAPTER 5

Snapshot of SDG coverage

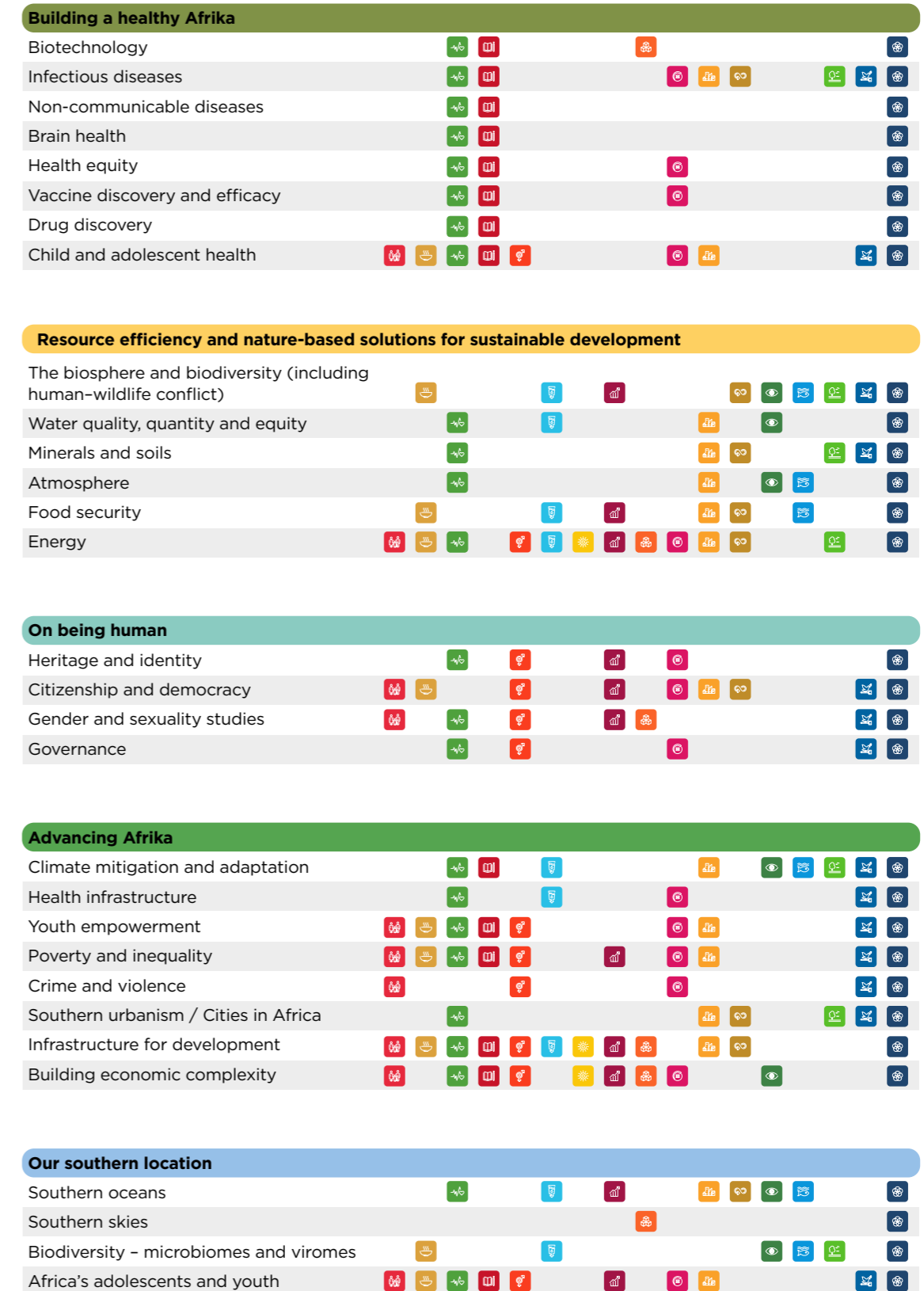
UCT remains committed to the SDGs and contributes meaningfully to all 17 of them. As the leading university in Africa, we have a critical role to play in addressing continental and global challenges through research.

Our research vision is based on research themes that were established by identifying our research strengths and emerging areas of strategic research importance. Taking cognisance of the nature of the grand challenges faced by South Africa, Africa and the world, we established five overarching research focal areas.

These newly adopted research themes tie in very closely with both the SDGs and the African Union's Agenda 2063, providing a focus for our research in meeting UCT's Vision 2030.

The table that follows is a snapshot of the points of confluence between the UCT research focal areas and the SDGs.

UCT's research themes and the SDGs



The way forward

This is the first of many future reports on UCT's SDG work, both on its own campuses and across the continent and the globe in the form of the many and varied partnerships across academia and industry that are helping to drive our research and institution forward.

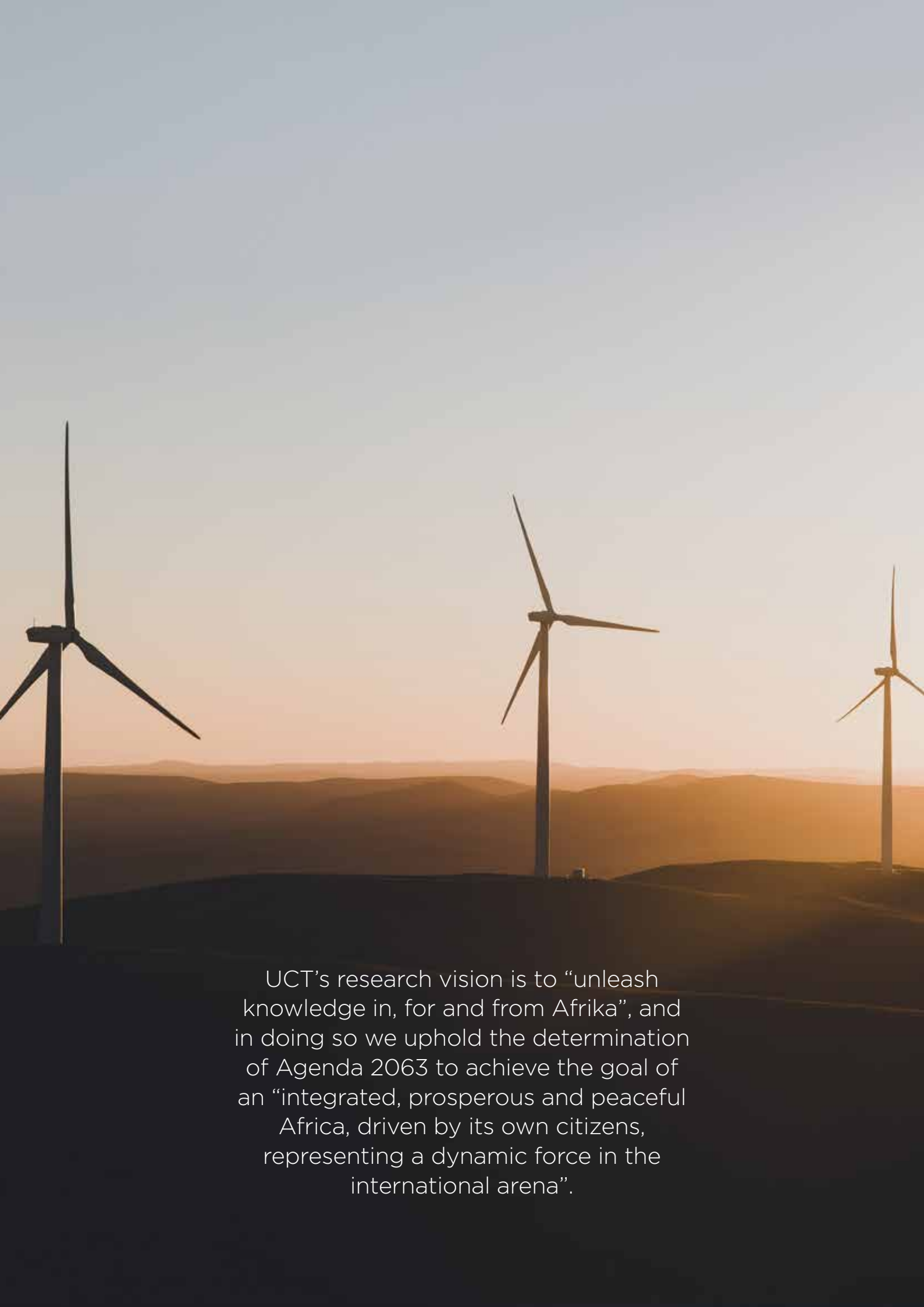
It is clear, in light of this report, that UCT's new research themes are encouraging our academic and research efforts along the same paths that the SDGs have outlined for us, and it is thus important for us to consolidate our work behind these research themes and the SDGs if we are to achieve continued meaningful impact in so many critical areas, both locally and globally.

Working in line with the UCT research themes and the SDGs is not enough, however. It is the cross-cutting work enabled by the many local and international multi-, inter- and transdisciplinary partnerships that have really enabled us to push the boundaries and consolidate the impact of our efforts. We have to nurture and grow existing partnerships to achieve success in creating new knowledge and its translation, and we have to establish new and innovative partnerships to ensure that we, as a global community, are able to achieve the SDGs by 2030.

The cross-cutting and integrated research teams at UCT already have a clear focus on responding to the world's grand challenges. Researchers in these cross-cutting teams of integrated expertise provide mutual support by bringing together their knowledge and expertise. If we are to ensure the social impact of our work, we have to continually identify emerging areas of importance, particularly those that speak to the African Union's Agenda 2063 and the SDGs, while maintaining focus on our existing areas of research expertise.

UCT is one of the top universities in Africa, and our Vision 2030 clearly positions us as an inclusive, research-intensive African university with global reach that addresses the grand challenges of our time with cutting-edge teaching and learning and research facilities. This university will continue to champion knowledge from Africa and generate new knowledge in Africa in order to contribute to global knowledge and to ensure that our research has tangible social impact in Africa and further afield in line with the SDGs.





UCT's research vision is to “unleash knowledge in, for and from Afrika”, and in doing so we uphold the determination of Agenda 2063 to achieve the goal of an “integrated, prosperous and peaceful Africa, driven by its own citizens, representing a dynamic force in the international arena”.