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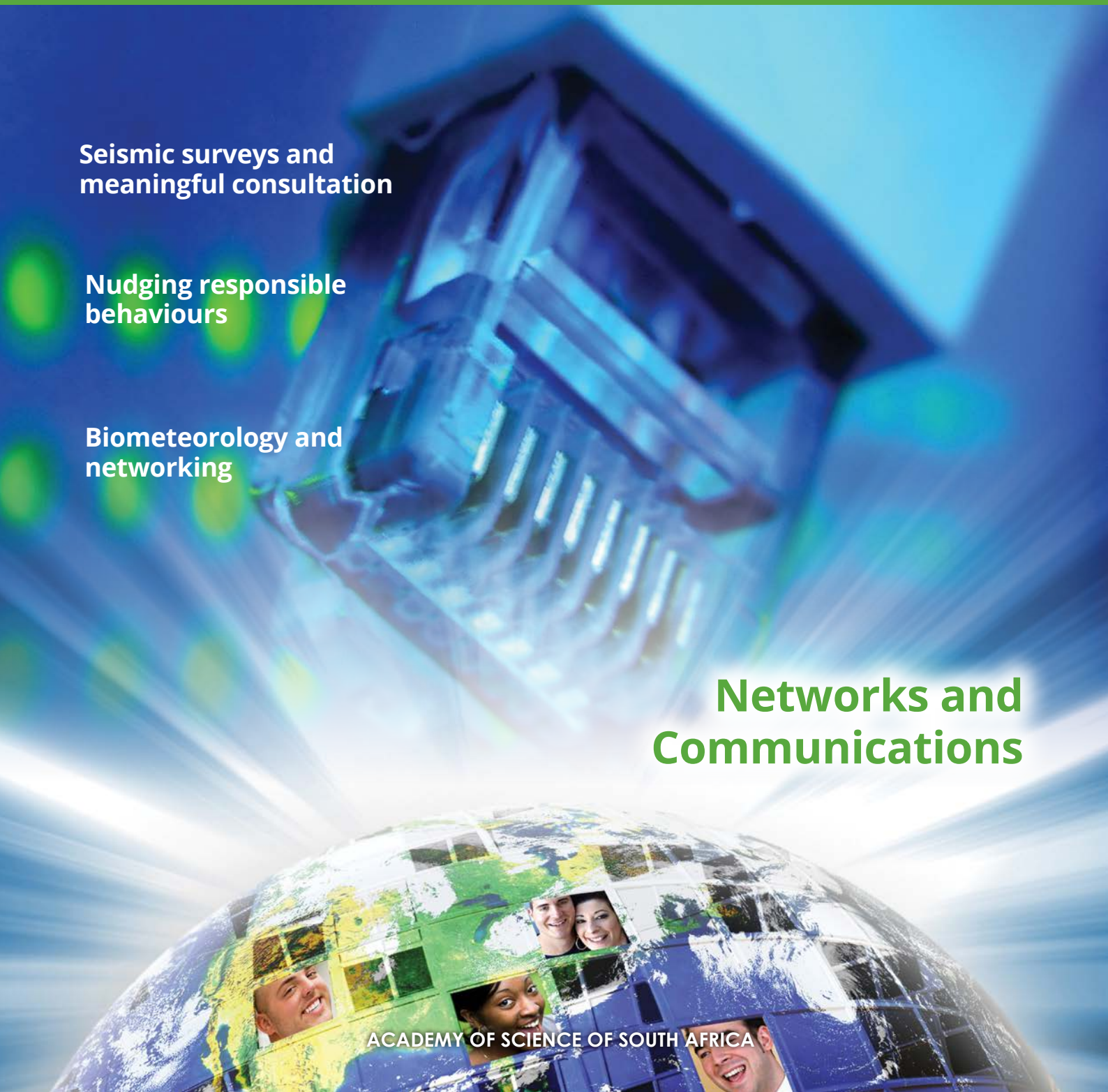


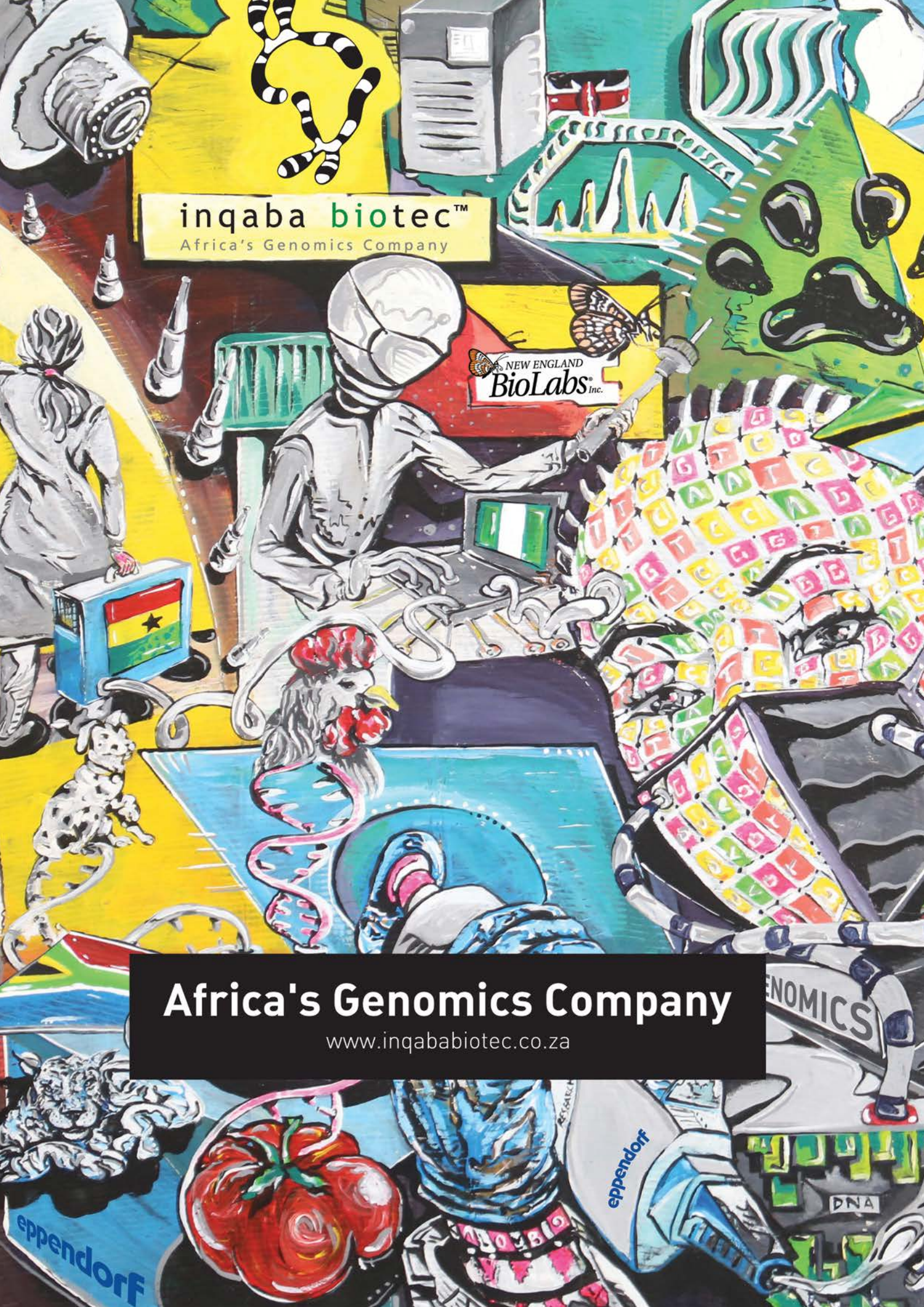
Seismic surveys and meaningful consultation

Nudging responsible behaviours

Biometeorology and networking

Networks and Communications

ACADEMY OF SCIENCE OF SOUTH AFRICA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Networks and Communications

The Internet is probably the largest network of all time that connects not only computers but people from all over the world. The architecture of the Internet was based on the concept of 'a network of networks'. The way it draws together networks and data provides a capability so powerful that it can be used to search for almost absolutely everything.

Networks and networking are intricately linked concepts. A network like the Internet is a collection of computing devices connected via a communication medium to exchange information and resources. Networking is the entire process of creating and using networks made up of hardware, software, wired and wireless technology. Networking in science, technology, engineering, art, mathematics and innovation (STEAMI) is about communication as we strive to solve global challenges in collaborative, interdisciplinary ways.

This issue's theme is *Networks and Communication*. Recently, there were plans for seismic surveys, that look for oil and gas, to take place off the Eastern Cape coast. Our first theme article looks at how public engagement must be well executed to ensure equality and inclusivity for all affected and interested parties for such a sensitive issue.

In biometeorology, we see connections and networks between the biosphere, the atmosphere and life on Earth. Biometeorology and its interdisciplinarity hold great promise for supporting Africa's preparedness against the impacts of climate change.

Communicating with vulnerable groups has been and continues to be a critical issue during the Covid-19 pandemic. People with disabilities experience challenges that make daily tasks and adhering to Covid-19 rules difficult. We explore these difficulties and call for just, practical solutions.

'Nudge theory' is a type of behavioural linguistics that gently guides people to alter their behaviour. A non-subtle example is the spatial distancing circles placed on supermarket floors to help us remember to social distance. But nudge theory can be used in climate change communication too – read the article to see how!

Research translation is the process of rewriting science into text that can be useful to the public. Several articles transform scientific research into text, graphics and charts that help people relate to key messages. Look at the chart on page 25 to see how sewerage is telling us where the next Covid-19 outbreak might happen.

In conclusion, we acknowledge with gratitude Sue Matthews, the immediate past Editor of Quest, for her commitment to timeous delivery of each issue, as well as very interesting and visually pleasing content.

Caradee Y Wright
(*Quest* Guest Editor)
with support from
Susan Veldsman
and Tsepo
Majake (ASSAf)
and Joanne
Riley (SAASTA).

Lesisiqephu simayelana nokuxhumana. Ukuxhumana kwezesayensi, nobuchwepheshe , nobunjiniyela, nobuciko, nezibalo kanye nokuqhamuka nezindlela ezintsha zokwenza izinto (STEAMI) kuzosiza uma sizama ukuxazulula izinkinga ezikhungethe umhlaba ngokubambisana .

Translated by Zamantimande Kunene

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Seismic surveys: what constitutes meaningful consultation?

Recently, there was debate about whether seismic surveys should take place off the Wild Coast in the Eastern Cape of South Africa, and an important form of communication, called consultation, was highlighted.

What is seismic exploration?

Seismic exploration or survey involves estimating shapes and physical properties of Earth's subsurface layers from the returns of sound waves that are transmitted through the Earth. Seismic surveys are used by the hydrocarbon (oil and gas) industry to locate and estimate the potential size of oil and gas deposits below the Earth's surface.

Marine seismic surveys use airgun arrays towed behind ships that produce high intensity, low-frequency impulsive sounds at regular intervals aimed at mapping the seafloor and underlying rock strata. The sea floor is mapped and any hydrocarbon reservoirs can be found.

Marine seismic surveys can be harmful to marine life. Recently, seismic surveys became a 'flashpoint' in South Africa. A debate began between the hydrocarbon sector, government officials, affected communities, civil society organisations, environmentalists, and scientists.

In December 2021, the debate led to a court case challenge about marine seismic surveys off the coast of the Eastern Cape. This event highlighted the importance of meaningful consultation and holds important lessons for those intending to pursue such surveys in South African waters.

Background to the Eastern Cape seismic survey court challenge

In the first quarter of 2013, Impact Africa Ltd (acting on behalf of oil company, Shell) applied to the Petroleum Agency of South Africa (PASA) for an exploration right to survey oil and gas deposits off South Africa's Eastern Cape coast. The proposed survey area size was more than 6,000km, which equates to almost the entire Eastern Cape coastline.

The Mineral and Petroleum Resources Development Act 28 of 2002 requires applicants of prospecting rights to notify in writing and consult with the landowner or lawful occupier, and any other affected party, and to submit the result of the consultation to relevant officials within 30 days from the date of the notice.

To comply with this requirement, Impact Africa (referred to as the company 'Shell' here) placed advertisements in four Afrikaans and English newspapers to notify the public about the proposed project and the consultation process. Members of the public were invited to provide comments.

A draft Environmental Management Programme (EMP) was placed on the project website and people were given 30 days to comment. Notification was sent directly to all interested and affected persons. Then group meetings were held as part of the engagement process. All interested and affected persons on the stakeholder database were invited to these meetings.

A final EMP was produced in June 2013, which PASA approved on 9 September 2013 with a few conditions (not given here). The Deputy Director-General of the Department of Mineral Resources and Energy approved the EMP and granted the exploration right on 29 April 2014. Shell decided to begin the exploration seven years later, in late 2021, but then faced a court challenge to its planned seismic survey.

After the Makhanda High Court dismissed an urgent application by several parties to interdict (or ban) Shell from conducting its seismic survey, Shell commenced its survey in early December 2021.

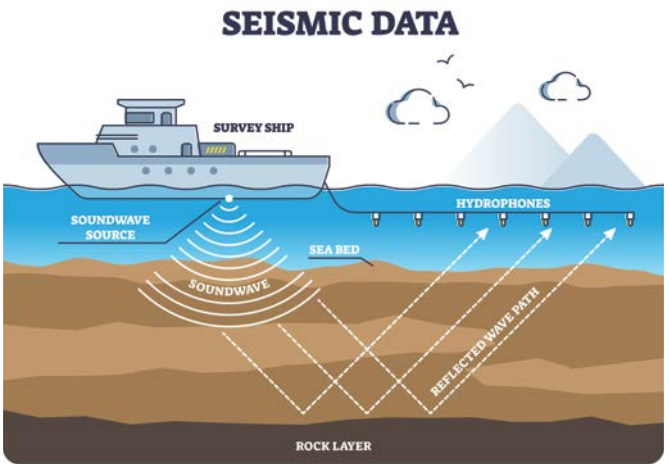
On 17 December 2021, several other parties (called 'the applicants' here) approached the Makhanda High Court again to interdict Shell from conducting the survey. The applicants argued that Shell had failed to meaningfully consult them about the survey.

Why did the applicants believe Shell's consultation process was flawed?

The applicants argued that the Afrikaans and English newspapers in which the notices of the seismic survey were published in 2013 were only accessible to literate persons with access to those newspapers. Moreover, notifications of Shell's seismic survey were not published in isiZulu or isiXhosa, the languages spoken by affected communities.

The applicants argued that Shell should have used radio and community newspapers, which would have facilitated communication with them in the language used in their respective communities.

The applicants also argued that group meetings were not held in the communities in question. Instead, Shell held consultation meetings in Port Elizabeth, East London and Port St Johns, all of which were far from the affected



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communities. The applicants contended the location of those meetings excluded the communities from attending.

Moreover, the approach followed was inconsistent with the communities' custom of seeking consensus. The applicants argued that Shell deemed it adequate to speak only to the 'Kings' or 'monarchs' of communities and to assume that those monarchs spoke for their 'subjects' (their community members). The applicants argued this 'top-down' approach mirrored that taken during colonial and apartheid eras.

The applicants said that communities, such as the Amadiba, have strict rules about consultation that emphasise the importance of seeking consensus. Decision-making is part of their customary law and avoids the use of top-down decision-making. The applicants argued that meaningful consultation means providing communities with the necessary information on the proposed activities and affording them an opportunity to make informed representations. The monarchs cannot make representations on behalf of all of the community members.

The applicants also argued that the monarchs did not have authority over large communities who stood to be affected by the seismic survey. For instance, the monarchs who were consulted did not have authority over amaMpondo aseQaukeni. Thus, none of the monarchs engaged were empowered to speak on behalf of customary fishing communities anywhere along the Wild Coast.

While the EMP referred to a request for five additional meetings to be held with the monarchs, there was no suggestion that those meetings were held. The applicants argued that Shell did not follow through with the consultations proposed in its EMP. Before reviewing how the court evaluated Shell's consultation efforts, two important concepts need to be considered: public engagement and community consultation.

What is public engagement?

Public engagement is a process that provides people with trustworthy information on key policy issues, asks for their input, and integrates it into decision making

and social action. This type of engagement occurs with a wide diversity of stakeholders (for example, religious leaders, traditional leaders, community leaders, and local communities themselves).

Public engagement could also include engagement with civil society organisations (CSOs) who aim to further the interests of the communities they serve. CSOs include non-governmental organisations, community-based organisations, faith-based organisations, or networks.

CSOs are often well respected in some communities as being 'non-government' distinguishes them from governmental power structures. CSOs are also often better placed to access vulnerable, marginalised communities, such as traditional fishing communities, who may be largely invisible and inaccessible to a person from outside the community unfamiliar with local customs, traditions, or power structures.

How do we define a 'community' and what constitutes community engagement?

The term 'community' has been used to describe interactions among people on the basis of geographic localisation. However, people who live together in a community do not necessarily form a community since they may differ with respect to value systems and other cultural characteristics.

Some say that the defining feature of a community is the common identity shared by its members. A single individual may belong simultaneously to different religious, occupational or ethnic communities. Another individual may live in a community with distinct values and aspirations that may inhabit a single geographic area.

Common culture and traditions, common knowledge and shared history, common economy / shared resources, a common communication network, and self-identification as being part of a community are all things that define community.

Given the complexity of the concept of 'community', it is not surprising that there is no universally accepted understanding of 'community engagement'.

Community engagement goes beyond community participation. It is the process of working collaboratively with relevant partners who share common goals and interests. This involves building authentic partnerships, including mutual respect and active, inclusive participation.

Those who seek to engage with communities must, by necessity, ask three important questions: *How* should I consult? *Where* should I consult? *Who* should I consult with? Community leaders (including monarchs, traditional leaders, religious leaders, and political representatives) may not necessarily represent all persons in their respective communities or even have their interests at heart.

How did the Makhanda High Court assess Shell's consultation efforts?

After documents were submitted to the court and reviewed, the Makhanda High Court held that affected communities could not be expected to participate in Shell's consultation process.

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To become interested and affected persons, community members had to have knowledge of the seismic survey and the contact details of Shell's consultants. The court noted its concerns that the advertisements were published in only English and Afrikaans, which were not the languages spoken by affected communities.

Moreover, Shell's draft EMP was published on the project website and notification was sent to registered interested and affected persons. The court noted that this meant that unless a person was already registered as an interested and affected persons, he or she would not know where to find the draft EMP or how to comment. There was little prospect of community members registering as interested and affected persons or otherwise discovering the relevant documents.

The court found that Shell did not provide an explanation of how its 'stakeholder analysis' was done or why it considered the previous studies that it relied upon were sufficient. The court found that the stakeholder analysis and the previous studies relied upon were insufficient because they did not identify the numerous small-scale and subsistence fishing communities along the coastline where the seismic survey was to be performed.

The court noted that the applicants are holders of customary fishing rights and, because the seismic survey could negatively impact upon those rights, the customary fishers of the Wild Coast had a right to consultation in respect of the seismic survey. Accordingly, the consultation process carried out by Shell was inadequate.

Shell argued that the customary practices and spiritual relationship that the applicant communities argued they have with the sea was not objectively verifiable. The court rejected this argument, saying that those practices and beliefs must be respected and where conduct offends those practices and beliefs and impacts negatively on the environment, the court has a duty to step in and protect those who are offended and the environment.

The court held that Shell was under a duty to meaningfully consult with the communities and individuals who would be impacted by its proposed seismic survey. Given all these shortcomings, the court concluded that Shell's consultation process was inadequate and flawed. Accordingly, the exploration right was unlawful and invalid. The court thus interdicted (banned) Shell from conducting its seismic survey, until Part B of the application – which will focus on whether Shell was required to obtain environmental authorisation to conduct the survey – happens later this year.

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Implications of the Makhanda judgement for holders of exploration rights

The Makhanda judgment holds important lessons for those wishing to exercise their exploration rights. Consultation is not a 'tick-box' exercise. Affected stakeholders must be engaged in the languages they speak and in communication mediums accessible to, and used by, them.

Consultations must be held in settings that are accessible to affected communities. Engagement with monarchs and traditional leaders should never be regarded as proxies for consultation with affected communities and individuals. Put differently, consultation should be bottom-up (i.e. occur at the grassroots level), not 'top-down'.

Article prepared by Jerome Amir Singh who is the Director of the Scientific Advisory Group on Emergencies (SAGE) associated with the Academy of Science of South Africa (ASSAf); an Honorary Research Fellow at the Howard College School of Law, University of KwaZulu-Natal, Durban, South Africa; and an Adjunct Professor, Dalla Lana School of Public Health, University of Toronto, Toronto, Canada.

Kamumva nje, kubenenkulumo mpikiswano mayelana nenhlolovo ngokuzamazama komhlaba ogwini lwasempumalanga koloni, eningizimu ne Africa, kuvelele izindlela ezibalulekile zokuxhumana, ezinjengokubonisana nokuxoxa nemiphakathi. Njengoba lezindlela zokuxoxa zingazange zihleleke kahle azikwazanga ukuba zenzeke.

Translated by Zamantimande Kunene, South African Medical Research Council

Research in Africa to tackle the climate crisis

How biometeorology is interdisciplinary and requires connections and communication between different fields of science

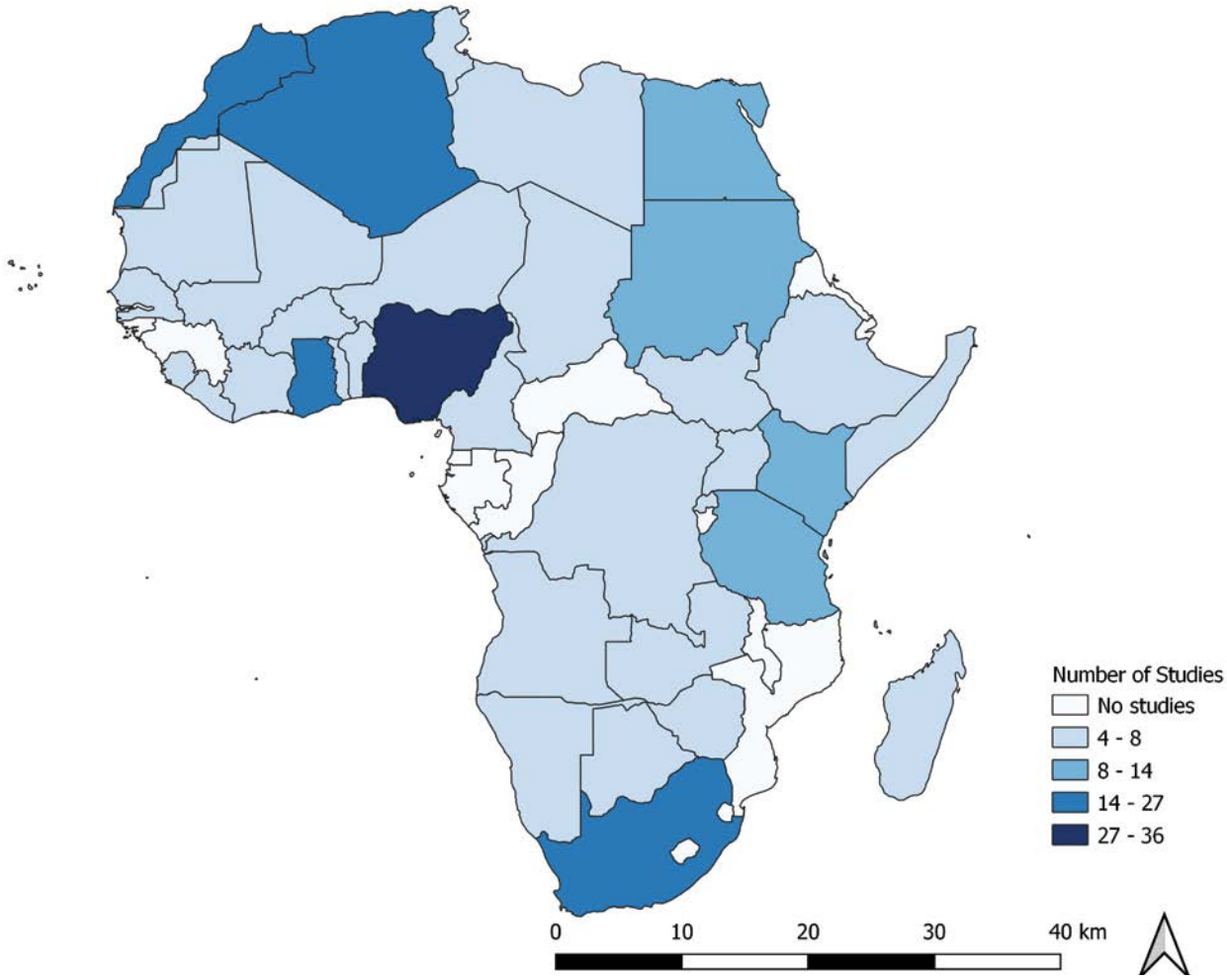
Biometeorology is the study of the impacts of climate change on plants, animals, and people. Africa is an exciting location for biometeorological research. Many countries across the continent rely economically on agriculture and tourism – sectors which are heavily reliant on favourable and predictable climate, and which have been the focus of biometeorological research for many decades.

Many climate-sensitive diseases, such as malaria, cholera and Ebola, occur in Africa. Africa is highly vulnerable to climate change. Projections of temperature in Africa suggest that the places on the continent will experience temperature increases as much as 1.5 times higher than that of the global mean temperature by 2100.

Africa is also vulnerable to climate change because of its relatively low adaptive capacity, for example, not having infrastructure to adapt to climate change, such as building retaining walls to prevent flooding and installing desalination plants for fresh water during droughts. These steps often have large costs, which are difficult to fund while countries strive to meet more immediate human rights-related needs like food and shelter.

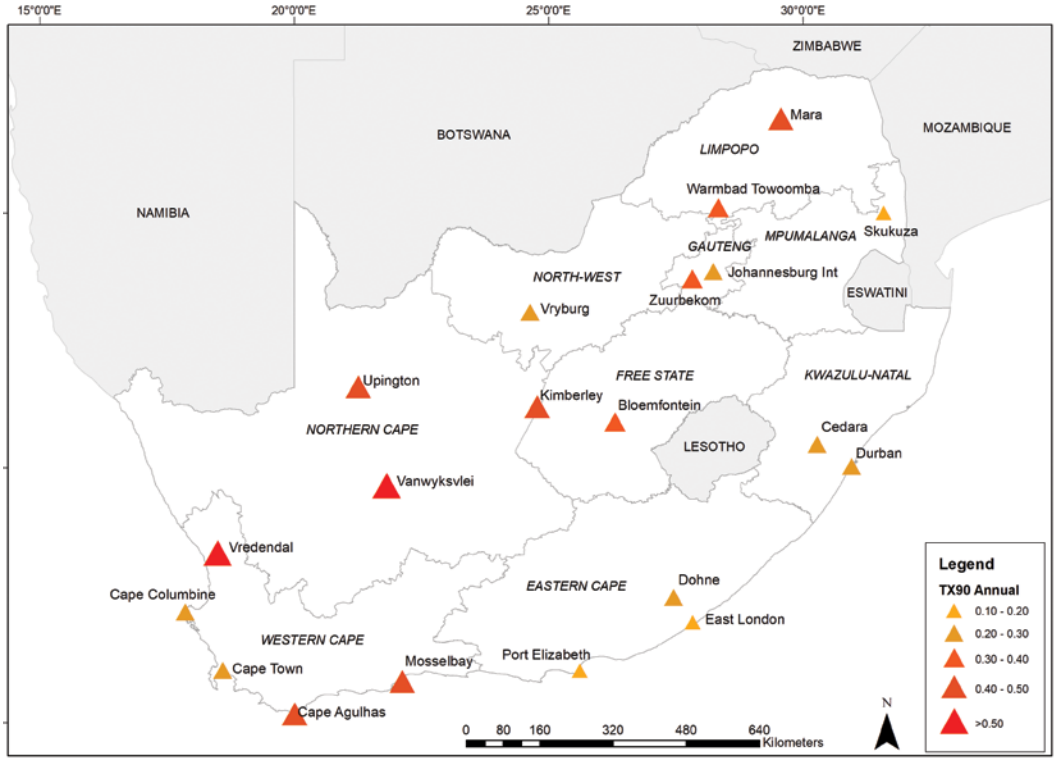
Until now, Africa has not featured much biometeorological research. Of the 4,014 research papers that had been published in the *International Journal of Biometeorology* by the end of June 2020, only 135 were on biometeorology of or in an African country. The majority of this research was done in Nigeria on animal biometeorology, and in South Africa on climate and building design, tourism and climate change, thermal comfort and stress, and health biometeorology.

The reason why so little biometeorological research has been done in Africa is probably because many African



Number of studies on biometeorology per African country (adapted from Fitchett, 2021).

researchers have not yet heard about biometeorology. They could be doing work on the intersection between climate and health, climate and ecology, or climate and tourism, and submitting their research to journals that focus on health, ecology or tourism, respectively, or to climate or climate change journals. This will change as we leverage existing African networks, and communicate among researchers, students and practitioners across the continent to increase the African biometeorology footprint.



Map showing increases in the incidence of temperatures in the 90th percentile over the period 1960-2016 (Adapted from van der Walt and Fitchett, 2021).

What kind of research is being conducted in biometeorology in Africa?

Phenology

Phenology refers to the timing of annually recurrent biological events like the flowering of plants each spring, and leaves turning orange in autumn. Phenology also includes migration of birds each winter to warmer climates, and the timing of hibernation of many mammals. Phenology is one of the most sensitive bioindicators of climate change. When temperatures increase, the triggers that tell a plant or animal that springtime has started will occur earlier in the year. Such triggers might be temperatures above a certain level, or a couple of warmer than usual days. It might even be the early onset of rainfall.

Caradee Wright

Jacaranda tree in bloom in Johannesburg in October 2021.

In South Africa, this has recently been documented for the Jacarandas in Gauteng and for the Namaqualand Daisies. Both are flowering about a month earlier than they used to, most likely as a result of global warming over the past century.

Biometeorology, climate and human health

The climate has an impact on what diseases we are exposed to, and when and where we are at risk. A common example is that we know when we travel to malaria-endemic regions in summertime, the risk of being bitten by a mosquito can be high and getting malaria is a possibility. We try to prevent this by wearing long-sleeved shirts, long pants and taking medicine called prophylaxis.

Biometeorological research on malaria and mosquitoes has shown that in a changing climate, the malaria risk area of South Africa is increasing in size, expanding further west and south.

Other biometeorological research on health includes studying the impact that climate has on COVID-19 transmission, and understanding the role of the seasons in when colds and flu occur.

Caradee Wright

An ostrich on an ostrich farm in Schoemanskloof, South Africa.

Thermal comfort and extreme climate events

Plants, animals and people are all adapted to specific climates. When experiencing climatic conditions within the usual range of temperature and humidity, human energy use, comfort and productivity will be maximised. As the boundaries of those conditions are reached, or exceeded, thermal (or temperature) stress is likely to occur.

In humans, the temperature levels we can cope with have increased with adaptations like wearing cooler or less clothing, and using air conditioning and mechanical fans. However, we do still experience heat and cold stress when conditions have been exceeded by too large a margin, or when temperatures change very rapidly.

In South Africa, extreme temperature events are sometimes called heatwaves and cold snaps. In biometeorology, thermal comfort indices (which are mathematical equations that use weather data to calculate the chance of heat comfort or stress) are used to identify these events. Recently, increases in the frequency of heatwaves are being recorded across the country.

Climate change and tourism

South Africa is marketed as 'sunny South Africa', particularly to international tourists who escape to our warm summers during their cold, dark and rainy winters across Europe and parts of the United States of America.

Our climate is well-suited for tourism, as calculated through tourism climate indices. This is fortunate because a lot of our tourism is outdoors, such as beach tourism, nature-based tourism and adventure tourism. But while this is an important drawcard for South Africa now, it also makes South Africa vulnerable to future climate change. If the weather is less favourable, tourists may choose other sunny destinations. Biometeorological research explores the climatic preference of tourists, the weather experienced at a range of destinations, and makes projections about how this weather and climate will change in future.

Animal biometeorology

Animal biometeorology explores the impact of weather and climate on a range of physiological experiences of animals. This includes things like their thermal comfort, thermal stress, metabolic conditions, and fertility (ability to reproduce).

Some animal biometeorology focuses on livestock, such as cattle and sheep, and other studies look at hamsters, toads, dogs, lizards and prawns, to name just a few. While some of these studies are conducted in the field observing animals in their living environment, some are conducted in laboratories under experimental conditions.

Biometeorological research that brings together researchers from different fields is crucial for Africa. This includes fields of geography, biology, history, engineering, ecology, botany, zoology, demography, psychology and others. When these researchers work together, they will be able to better address climate change and other environmental challenges and their impacts on Earth. Climate change is not a threat of something that might happen in the future – it is happening now and we are already seeing the impacts of it.

Article prepared by Prof. Jennifer M. Fitchett and Dr Adriaan van der Walt. Prof. Jennifer M. Fitchett is an Associate Professor in the School of Geography, Archaeology and Environmental Studies at the University of the Witwatersrand, Johannesburg, South Africa. Dr Adriaan van der Walt is a Senior Lecturer in the Department of Geography at the University of the Free State.

CURRICULUM CORNER

NATURAL SCIENCES: GRADE 7-9
Life and living
- Interactions and interdependence within the environment
- Conservation of the ecosystem

LIFE SCIENCES: GRADE 10-12
Environmental studies

GEOGRAPHY: GRADE 8 and 12
Climate regions (focus: South Africa and world)
Climate and weather: cyclones, local climate.

Afrika I ndhawu yo tsakisa hi thlelo ra vulavisisi bya Biometereorological. Biometeorological I dyondzo ya swa ku cinca ka ntshamelo-maxelo eka swimilana, swiharhi na vanhu. Vanhu vo tala vale Afrika lava va endlaka vulavisisi va sungula ku tirhisana eka swilo swo fana na maxelo na rihanyo, maxelo na dyondzo ya ntumbuluko, kumbe maxelo na swa vupfumba.

Translated by Millicent Masina, South African Agency for Science and Technology Advancement

Protecting Today's Technology for Tomorrow

Space weather has been identified as a global challenge and can adversely affect our technological systems such as communications, navigation and electronic infrastructure.

South African National Space Agency will establish its operational Space Weather Center in the coming months to monitor and forecast space weather on a 24/7 basis.

To **Learn more about SANSA's Space Weather project and other exciting projects as well as how you can be involved by visiting www.sansa.org.za.**

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The role of language in climate change conversations

Behavioural linguistics is about nudging responsible action through communication.

Making decisions comes down to instinctive reasons that we are often not aware of. A central part of making decisions is through communication: what we read, hear, say and mentally process leads to the decisions we make and the actions we take.

New to the world of behavioural science, Behavioural Linguistics is the science-based use of language to persuade. It is rooted in 'nudge theory' combined with psychology, sociolinguistics, and applied principles of content marketing.

The theme of nudging responsible and pro-social action is important in the context of climate content. Despite climate conversations becoming more and more relevant in mainstream media, there is still a lack of individual action by many people.

Language offers one of the solutions to motivating people to act

The words we choose to use when discussing the environment matters. There is no more pressing issue facing humanity today than the consequences of climate change. How people view climate change is closely linked to how it is communicated, and so the language used reflects and expresses facts and observations, as well as influences attitudes, ideology, and behaviours.

Storytelling is crucial in the fight against climate change. Content creators need to find a way to create compelling stories or narratives to make people feel a sense of shared purpose and identity and pay attention to our global environmental issues.

Words matter

Over the past few years, there has been a dramatic increase in more emotive and strategic language being applied to stories about climate change. In early 2019, *The Guardian* newspaper made an editorial decision to refer to the 'climate crisis' rather than 'climate change'. When they did this, there was a 40% increase in people using 'climate crisis' during 2021 compared to previous years.

Similarly, other climate campaigners, including the United Nations, talk about a 'climate emergency'. The move away from the word 'change' reflects the idea that change is not necessarily negative, whereas 'crisis' and 'emergency' have a much clearer sense of imminent danger and invoke a stronger, and more immediate, call to action.

"The language we use has to speak to a person's values and resonate with them. If it doesn't, people will simply say, 'I'll deal with the problem when I see it.' But by then it will be too late."
~ George Marshall, Founder of Climate Outreach

The Guardian newspaper made other language updates to their style guide when reporting on environmental issues:

- **Climate science denier'** or '**climate denier**' instead of '**climate sceptic**', as denier is more accurate given the overwhelming scientific evidence of climate change. This links to our sense of self and our innate desire to present ourselves to the world in positive ways. People who previously considered themselves 'sceptics', which suggests critical thinking, are less likely to want to be seen as 'deniers', which has more of a negative connotation.
- '**Global heating**' instead of '**global warming**', because this is more scientifically accurate, as greenhouses gases form an atmospheric blanket that stops the Sun's heat escaping back to space. '**Warming**' most typically conveys a positive or desirable quality – we warm our toes by the fire, enjoy warm baths and feel warm and fuzzy inside. Heating is more purposeful, even uncomfortable, and refers to the systematic process of increased temperature – we see it used with plumbing and ventilation, where we can take action to turn it up, down, on and off. Evoking this sense of control can also be helpful. We are unlikely to change our behaviour for a lost cause, but if we feel that our actions can make a difference, we are more persuaded.
- '**Wildlife**' instead of '**biodiversity**', which is, again, a more accessible word and less clinical when talking about all of the creatures who share the planet with us. This shifts us more to the familiar, as most of us have a concrete sense of wildlife but are perhaps less clear about what biodiversity really involves. This term helps to 'humanise' the animal world, elevating them from the innate to living, breathing souls that we should care more about.

Tips to include Behavioural Linguistics in climate content

1. Frame statements positively

While certain semantics about climate change are moving towards more negative connotations, there should be a strong push to frame our actions positively. Of all our cognitive biases, the framing effect is one of the strongest affecting our decision-making processes. This is where we make decisions about information depending on how it is framed, i.e. framed positively or negatively. In general, humans are more likely to change behaviour when challenges are framed positively, instead of negatively.

When it comes to climate change, there's a need to move away from the typically violent rhetoric that surrounds the topic: the 'war' on carbon, 'slashing' emissions, 'combating' global warming. Through these metaphors, climate change is often presented as an evil force or as something happening to us that we are powerless to control, and this strips people of both agency and responsibility, forcing us into a victim role, simply through language. We need to flip this around and present climate change not as an obstacle, but as an opportunity to innovate and reimage our actions.

2. Highlight the herd

When communicating a sense of shared purpose, look no further than the behavioural principle of social proofing. This

is a bias that plays out in unfamiliar situations where we tend to follow the crowd and look to others when deciding how to behave.

By highlighting the desired behaviour as being the most popular behaviour or that of a representative group, using phrases such as 'the majority', 'most people' and 'others like you', you are more likely to persuade someone to take up a call to action.

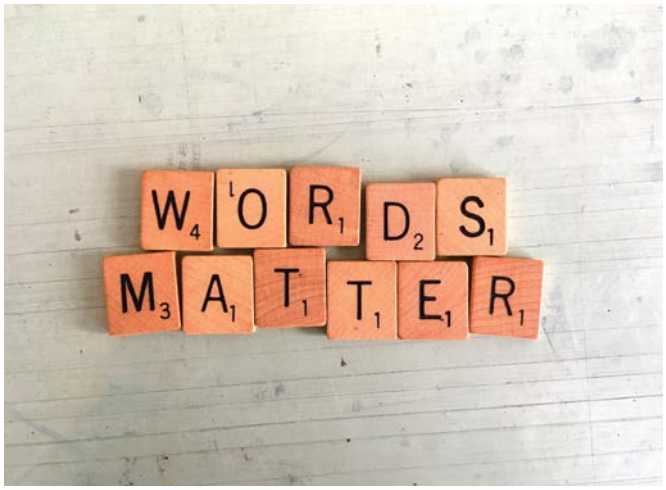
3. Focus issues in the *now*

A big obstacle when it comes to making climate change tangible is that we like to live in the moment, preferring to satisfy our immediate needs rather than considering what may be better for us in the future. This behavioural bias, known as the present bias, means we overvalue present-based rewards or benefits at the expense of larger and more beneficial rewards in the future.

For example, in the case of choosing to drive or walk to the nearby grocery store, we often give in to the easier 'self-gratifying' yet un-environmentally friendly option and take the car. If the aim is to try and get people to make decisions that will change things in the future, they need to feel much more emotionally attached.

4. Pay attention to the messenger

The messenger effect is a behavioural principle that shows that when we send messages through someone we trust, it commands authority and credibility and makes it more persuasive. When we're making decisions on an issue, we consider whether we believe the person informing us. Do we know them? Like them? Respect them? Trust, therefore, is key, and the communicator is often just as important as the language used. It's important to think about who would be most influential for your message, whether that might be Greta Thunberg (a young climate activist), David Attenborough (broadcaster and biologist) or even a high school geography teacher.



Sourced from: Sprout Marketing

Small, sustainable steps = big impact

Overall, we need to reframe climate change communication to be more urgent, tangible, relatable, and convey a sense of shared global responsibility. Once we get this right, more and more people will be encouraged to make the small changes in their lives to help the environment.

Article prepared by Tegan Crymble who is the Head of Behavioural Insights at BreadCrumbs Linguistics, voted the top global behavioural communication firm in 2021. With a Master of Science degree and academic background in zoology and human kinetics and ergonomics, Tegan is a strong advocate for sustainable living and the role that persuasive communication can play in environmental behaviour change. Find out more about them here: www.thebreadcrumbs.co.za or contact them at hello@thebreadcrumbs.co.za.

Marito lawa hi wa tirhisaka loko hi vulavula hi timhaka ta swa mbangu. A ku na xiphiqo xo tika lexi nga langutana na vumunhu ku fana na switandzaku swa ku cinca ka ntshamelo-maxelo. Leswi vanhu va vonisaka ku cinca ka ntshamelo-maxelo hi swixona, swi fana na leswi va vulavurisaka xiswona. Kambe ririmi leri ri tirhisiweke ri komba ntiyiso na vuxiyaxiya, mavonelo na matikhomelo. Mavonelo ya Nudge, I ndlela yo hlawuleka eka mvulavulurisano ku hlohlotela vanhu ku va va endla ku cinca ku ntsongo eka vutomi bya vona leswi swi nga ta pfuna mbangu.

Translated by Millicent Masina, South African Agency for Science and Technology Advancement

Digital readiness and the role of language in the Fourth Industrial Revolution

Linguistic diversity and language relevance is a key component of digitization. Language is the tool by which the Fourth Industrial Revolution can be meaningfully understood. To fully participate in the 4IR, individuals need to access information in a language that is familiar to them to competently engage and personalise the 4IR as a concept.

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How people with disabilities struggle during the COVID-19 pandemic

While all South Africans have experienced challenges during COVID-19, most people with disabilities have experienced extra difficulties.

People with disabilities may have a condition of their body or mind that makes it difficult for them to do certain activities and interact with the world around them. In South Africa, during the COVID-19 pandemic and lockdown, many people with disabilities have struggled to get services that they needed, such as shopping for food, getting to work or school, buying medicine, or even getting to a healthcare facility like a hospital or day clinic.

One of the biggest challenges people with disabilities face, even before COVID-19, is transport. Most people with disabilities do not have their own vehicles. While many people without disabilities rely on public transport, such as taxis, buses and trains, to get to work, school, shops, and healthcare facilities, many people with disabilities, especially those with physical or visual impairments, face extra difficulties using public transport.

For the majority of wheelchair users, difficulties include getting on and off taxis and buses; train platforms not being level, which makes getting on and off trains difficult; and subways and railway bridges having steps and not ramps.

Some taxis charge wheelchair users extra money to travel with them as their wheelchair may take up a seat. In South Africa, during 'hard lockdown' (Levels 4 and 5), when we were only allowed to leave our homes for a few hours a day to buy food or get medical help, many people with disabilities found using public transport very challenging.

It takes some people with disabilities extra time to get out of bed, to eat, to bathe or wash, and to get dressed. So, during the 'hard lockdown', by the time they had managed to get to the taxi or bus stop, taxis were often full. Particularly toward the end of the day, close to curfew when we needed to be back in our homes, drivers often chose not to stop for them as they might have taken extra time to get on and off.

Other people with physical disabilities who use assistive devices, such as crutches, can get on and off public transport by themselves, but have still experienced other challenges during lockdown. Some people may need to hold onto surfaces, such as doors, to balance. Some people with visual disabilities rely on their sense of touch and have to hold someone's arm to guide them, or feel the seat of a taxi to see where they must sit. The need to feel and touch places some people with disabilities at a higher risk of getting COVID-19 because of having to feel and hold onto things that are touched by many other people.

While many shops and medical facilities have hand sanitiser that is dispensed via a foot pump, some people with disabilities, including wheelchair users, are not able to step onto the plate to make the sanitiser spray.

Sanitiser is expensive for many people, especially when they have to also sanitise their assistive devices, such as crutches and wheelchairs, or white canes used by visually-impaired people. Many people with disabilities do not have jobs, so they find having to pay for products to sanitise their assistive devices too expensive.

Some people, and many children, with disabilities find wearing a mask very difficult, especially if they have breathing difficulties, or get anxious by having things on their faces or by not being able to see their family's or friend's facial expressions.

When it comes to understanding information about getting or preventing COVID-19, or how to access services to get help, some people with disabilities have extra challenges. People who are Deaf and who use sign language cannot understand what is being said on TV or radio because there are no sign language interpreters or sub-titles (the writing at the bottom of the screen that shows what the speaker is saying).

People with hearing impairments, who need to lip-read to understand what others are saying, find communication very difficult, as people need to wear masks, covering their mouths, to stop COVID-19 from spreading from one person to another.

Some people with disabilities need to visit healthcare facilities to collect medicine; get assistive devices, such as wheelchairs; or therapy, such as physiotherapy or speech therapy. Unfortunately, because of transport challenges, social distancing challenges, and many rehabilitation centres being closed during the pandemic, many people with disabilities cannot get what they need to help them.

People who are Deaf have challenges as most healthcare workers cannot communicate in sign language and friends and families are not allowed into hospitals to interpret what the health workers are saying to them. People who rely on lip-reading, again, face challenges, as healthcare workers have to use personal protective equipment (PPE) like masks at all times.

Many children with disabilities cannot go back to school, especially those who live in school hostels or travel by school buses. Reasons why are social distancing, not having enough people to help children get on and off transport, or not having enough PPE and sanitiser to keep safe. Some children with visual disabilities read and write using Braille, and they need their fingers to do this. In the classroom, the teachers and children need to touch the Braille paper and Braille machines, which cannot be sanitised.

Other children use computers and assistive devices to type or communicate for them, and sanitiser will damage these products. For children who are Deaf and Blind, who have difficulty seeing and hearing, their teachers have to hold their hands when communicating and need to be close to the child.

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Some children with disabilities find change very difficult, so seeing their classroom look different with desks being moved around for social distancing, and doing things differently like taking temperatures and sanitising, and not being able to hold their teachers' hands or see their friends' faces, can be very scary for them. The most important thing for all people is to be considerate and caring for people with disabilities, and even more so during the COVID-19 pandemic.

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Nakuba abantu base ningizimu ne Africa babenezinqindamba ezeyamene ne COVID-19, kodwa abantu abaphila nokukhubazeka babe nezinqinamba ezengenziwe. Isibonelo salokhu ukuthi noma izindawo eziningi zine Sanitiser yogugeza izandla kodwa le sanitizer iphuma kokuthi ucindezele ngonyawo, abanye ke babantu abaphila nokukhubazeka, kubalwa kuba abahamba ngezihlalo, abakwazi ukucindezela ngonyawo ukuze kuphume I sanitizer. Kubalulekile kakhulu ukuba nozwelo nokucabangela abantu abaphila nokukhubazeka.

Translated by Zamantimande Kunene, South African Medical Research Council

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DUST STORMS IN SOUTH AFRICA

How can science and knowledge can be translated for public awareness

Major dust storms, the front edges of which may span tens of kilometres and pass over great distances, are well known across the world, including in Africa, Asia and America.

Often described as a 'solid wall of dust', dust storms have wreaked havoc with agricultural land, caused immense damage to property, worsened air quality, disturbed road and air transportation, and caused harmful health impacts, even loss of life.

Dust storms have been associated with both natural factors, such as precipitation and wind strength, and human factors, such as poor agricultural practices. There also is growing concern that our changing climate may be causing an increase in the frequency, intensity and distribution of major dust storms.

From a public health perspective, there is a need to explain the implications of dust storms, and share preventative measures to protect human health by increasing public awareness. Drawing on international and local information about dust storms, Professor Angela Mathee and Dr Vusumusi Nkosi of the South African Medical Research Council (SAMRC) developed a public information sheet for South Africans.

The human consequences of the Dust Bowl in the United States of America

A devastating period of dust storms occurred in the United States of America in the 1930s. Known as the Dust Bowl, it followed a period of drought, with strong winds sweeping from Texas through to Nebraska.

Millions of tons of topsoil were shifted across millions of acres of land over a period of approximately a decade. The Dust Bowl was exacerbated by several human factors, including local land policies and harmful agricultural practices.
During this period, severe dust storms, sometimes called 'black blizzards', would darken the skies for several days. At homesteads, dust deposition often needed to be cleared with spades, and would intrude into even well-sealed dwellings, forming coatings on food, furniture and people's skin.
A major consequence of the dust storms was crop failures, and the deaths of people and livestock. A condition known as 'dust pneumonia' was also common. The devastating consequences sparked a migration among despairing farming families (more than 2 million people migrated) to search for jobs and better living conditions elsewhere.

The health consequences of dust storms point to a range of effects and are a serious concern. For example, exposure to dust storms has been associated with skin and eye irritation, decreased lung function, increased cardiovascular effects, increased hospital visits and admissions, and more frequent use of emergency services.

In the longer term, for people exposed to many dust storms over many years, there have also been associations with adverse pregnancy outcomes and birth problems. Children, neonates, the elderly, pregnant women and people with chronic cardiopulmonary diseases have been shown to be particularly vulnerable to the health consequences of dust storms.

In South Africa, there is limited information available on dust storm patterns, with a key reason being the lack of a detailed, long-term national system of data collection on dust storms. This database is needed to assess changes in the frequency, severity and distributions of dust storms in the country.

From sources of information like anecdotal accounts and satellite imagery, there is evidence that major dust storms do occur in South Africa from time to time. For example, satellite imagery indicated an increase in dust storms in the Free State province between 2006 and 2016. The South African Weather Service reported large dust storms that swept across most parts of the country in October 2014 and January 2016. Dust plumes that 'turned skies red' in Alexander Bay (Northern Cape) during September 2019 were also visible from satellite images.

The big dust storm that swept across South Africa on 16 October 2014 originated in the Northern Cape, where strong winds occurred as a dry thunderstorm built up. High wind speeds in the Free State caused the soil to lift from large areas of dry, open farmland, forming a 'wall' of dust that swept through Gauteng and the Northwest province

Just as information about when and where dust storms occur is needed, data about how dust storms impact human health are also needed. After dust storms passed over the city of Kimberley in 2014 and 2016, the SAMRC conducted a pilot study looking at the impacts on health; however, the information in the study (as yet unpublished) is limited, and considerably more research is needed to fully understand how dust storms affect health in South Africa.

Further research and information are needed to inform evidence-based policies related to dust storms and health. In the meantime, it is important to communicate to the public how to protect themselves during dust storms. As a starting point, the SAMRC, in partnership with the National Department of Health and the Department of Forestry, Fisheries and the Environment, compiled basic health protection steps to take during dust storms.

Article prepared by Professor Angela Mathee and Dr Vusumusi Nkosi of the South African Medical Research Council.

The big dust storm that swept across South Africa on 16 October 2014 originated in the Northern Cape, where strong winds occurred as a dry thunderstorm built up. High wind speeds in the Free State caused the soil to lift from large areas of dry, open farmland, forming a 'wall' of dust that swept through Gauteng and the Northwest province.

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Isiphepho sezintuli sesidale umonakalo kwezolimo, salimaza izimpahla, sadunga umoya, saphazamisa ezokuthutha zomgwaqo kanye nezomoya, sabanga imiphumela engemihle kwezempilo, nokulahlaleka kwempilo imbala. Iningizimu ne Africa indawo ebanazo iziphepho zezintuli. Ulwazi ngisiphepho sezintuli luncane kubahlali baseningizimu Africa, mayelana nokumele bakwenze uma kufika isiphepho sezintuli, nolwazi ngokuthi obani abasencupheni yokuguliswa isiphepho sezintuli. Kusetsheziswa ucwaningo olwenziwe phesheya, nasekhaya eningizimu Africa, kwenziwe incwadi echaza ngalo lonke ulwazi olumayelana nesiphepho sezintuli, nokuthi ungazivikela kanjani wena nomndeni wakho.

Translated by Zamantimande Kunene, South African Medical Research Council

FACT SHEET

DUST & SAND STORMS

A global environmental problem that affects the environment and people in various ways. They reduce air quality and visibility and may have adverse effects on health.

What is a dust storm?

Dust or sand storms are natural events that usually occur when **STRONG WINDS** lift a large amount of sand, dust, dirt and other fine particles from bare and dry soil into the atmosphere, transporting them to sites hundreds to thousands of kilometres away. Dust storms are **MOST COMMON IN DRY SEASONS** or arid regions with little vegetation cover, and their frequency may be increased after periods of drought. Human activities and global climate change have resulted in an increased frequency of dust/sand storms in various parts of the world.

Why can dust or sand storms be a problem?

Depending on weather conditions and fine particle sizes, dust can remain suspended in the atmosphere for a few hours or several days. However, its impact can last for months and years afterwards and can be dangerous for several reasons:

A dust or sand storm may ***REDUCE VISIBILITY*** while driving a car or riding a motorcycle, leading to a higher risk of motor vehicle incidents and associated injuries, disability or death

Dust and sand storms are associated with ***INCREASES*** in emergency room visits and hospital admissions

Dust storms may ***REDUCE AGRICULTURAL PRODUCTIVITY*** by removing organic matter and nutrient-rich particles from topsoil which is blown away

There may be an ***INCREASE*** in hospital visits for health outcomes related to sand and dust storms, including acute and chronic respiratory affections, eye irritation or injuries and traffic injuries.

Dust or sand from storms may settle on agricultural lands, ***CAUSING DAMAGE*** to crops, as well as houses and other infrastructure

Prolonged ***EXPOSURE*** to airborne dust may lead to chronic breathing and lung problems, and possibly heart disease

Dense dust in the atmosphere can ***REDUCE VISIBILITY*** for pilots, causing delays and cancellation of flights

Dust or sand storms may ***HARM*** animals and the environment (e.g., livestock, wildlife etc.)

CONTAMINATION AND REDUCTION of water supplies for drinking irrigation etc.

Breathing dusty air during a dust storm may cause ***RESPIRATORY AND HEART PROBLEMS***

Who is mostly affected by dust or sand storms?

Anyone may be detrimentally affected by a dust or sand storm. The longer you are exposed to high levels of dust or sand, the more likely you are to experience health effects. Those at **HIGHEST RISK** of developing relatively severe symptoms include:

- Infants and children
- Pregnant women
- The elderly
- People with existing breathing or lung conditions, such as asthma, bronchitis and emphysema
- People with heart conditions or diabetes

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How can a dust storm harm my health?

Relatively large particles of sand or dust usually remain in the nose, mouth or throat, and cause local irritation. Smaller particles may be inhaled deeply into the lungs. Very small dust particles may enter the bloodstream and cause damage to blood vessels, as well as alter the coagulation pathway, cause structural and biological changes of the cells, leading to inflammatory response and increase the risk of heart failure and heart attacks. Most of the time particles of sand or dust during storms are large and not inhaled; however, some people, especially those with existing breathing-related problems, such as asthma and emphysema, may experience difficulties.

The **MOST COMMON SYMPTOMS** and ill health outcomes experienced during or after a dust or sand storm are:

Skin irritation

Worsen heart problems

Hay fever and other allergic conditions

Throat irritation, coughing, sneezing, wheezing or chest tightness

Itchy and burning eyes

Lower respiratory tract infections (including viral, bacterial and fungal infections) | Triggering of conditions such as asthma, bronchitis and chronic obstructive pulmonary disease | Lung fibrosis (sand and dust storm-associated silicosis)

What can I do to protect myself and my family during or after a dust or sand storm?

STAY INDOORS until the storm passes. If you have to go outside, spend as little time outdoors as possible. Close all doors and windows

SWITCH OFF AIR CONDITIONERS or set them to the recirculate setting to avoid drawing air from the outside indoors

COVER your nose and mouth with a mask or damp cloth to prevent the inhalation of dust particles

If you have **GOGGLES** or **GLASSES**, put them on

AVOID VIGOROUS EXERCISE during dust or sand storms, especially if you have asthma, another breathing-related health problem or diabetes

Continue to take prescribed **MEDICATION**

Help other people to **UNDERSTAND WHAT DUST STORMS ARE**, how they can affect health and how to prevent negative health impacts

If you are an asthmatic or have a respiratory condition and you **DEVELOP SYMPTOMS** such as shortness of breath, coughing, wheezing, or chest pain during or after a dust or sand storm, follow your prescribed treatment plan. If symptoms do not settle, seek medical advice

Visibility deteriorates very quickly during a dust or sand storm. If you are on the road and your ability to drive a vehicle is impaired by poor visibility, **REDUCE YOUR SPEED**. Be prepared to pull off the road at a safe location if visibility deteriorates to less than 100 metres. If your car is air-conditioned, reduce the amount of dust entering your car by switching the air intake to 'recirculate'

Where can I find more information about dust and sand storms?

The South African Weather Services (SAWS) monitors the climate conditions and air quality in South Africa. If a dust storm is imminent, SAWS will alert the public on their website and through radio and television news bulletins.
For more information, visit the SAWS website: www.weathersa.co.za/home/warnings

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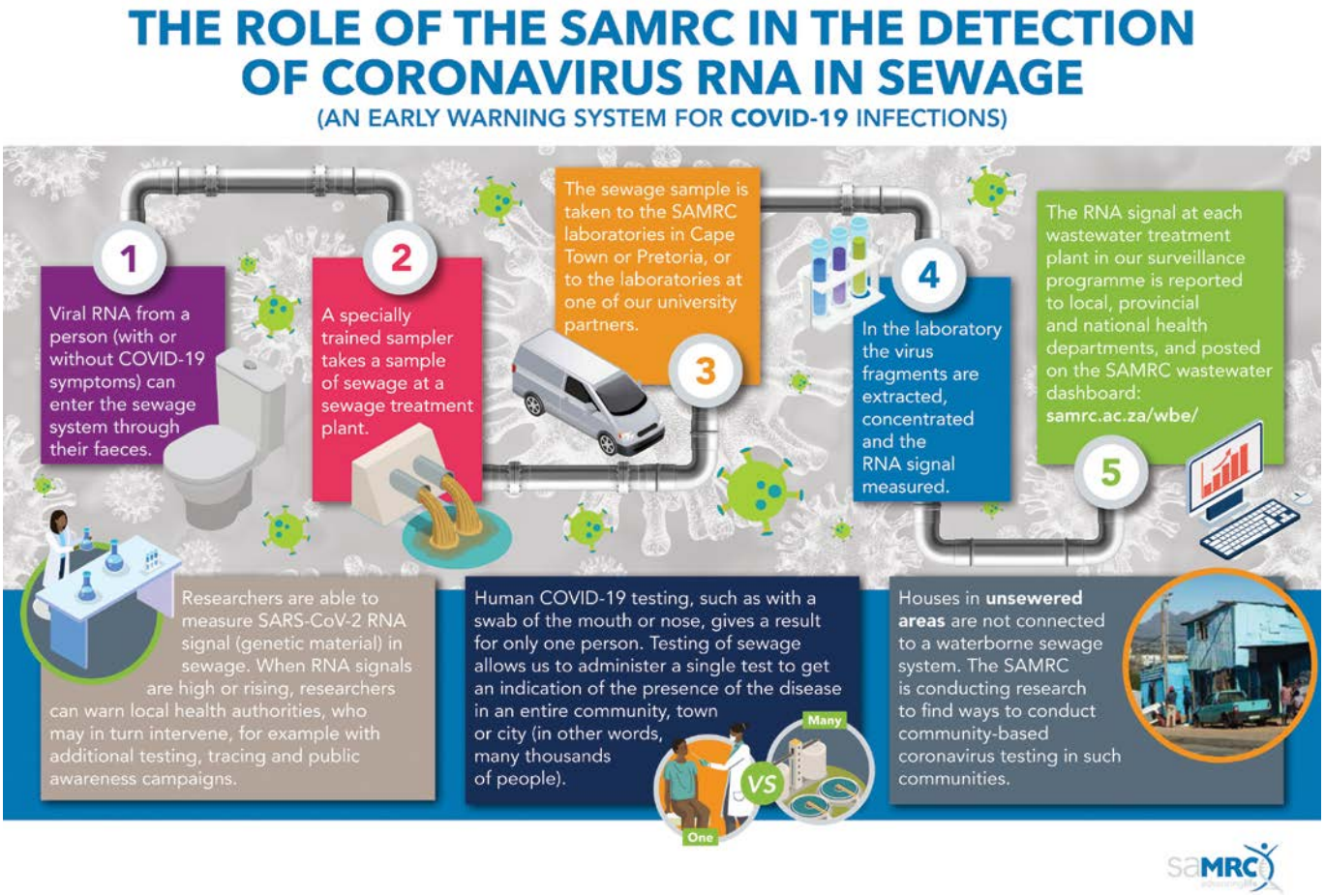

Ukuqoqa amasampula amanzi endle kusiza kanjani ukukhomba izindawo lapho kungase kube nokuqubuka khona kwe-COVID-19?

Emva kokuqubuka kwe gciwane le Corona, amazwe amaningi emhlabeni aqala ukufuna izindlela zokuqapha I covid 19 emiphakathini yabo. Enye yezindlela zokuqapha ukubhebhetheka kwaleligciwane emphakathini ukuhlola amanzi endle. Lendlela yokuhlola isidlale indima enkulu ukuthuthukisa amasu okulwisana namagciwane ayingozi afana no Vendle, i-norovirus ne hepatitis.

Emva kokuqubuka kwesifo se COVID-19 I South African Medical Research Council (SAMRC) yahlanganisa iminyango emihlanu yocwaningo ehlanganisa abacwaninga ngemvelo nempilo, I-biomedical research and innovative platform, abacwaninga ngesifo sofuba, I Genomics Centre Kanye ne Biostatistics Unit, ukuba bahlanganise ithimba lase SAMRC, elizosebenzisa ubuchwepheshe ukubheka ukukhula kwegciwane I COVID-19 besebenzisa amanzi endle. Lelithimba lochwepheshe base SAMRC libheka igciwane SARSCoV-2 Okuyigciwane elibanga I COVID-19, ngokuqoqa amasampula amanzi asendle lapho kuhlanzwa khona lamanzi endle eningizimu ne Africa. Izincezwana ze SARS-CoV-2 eziqhamuka kubantu abatheleleke ngaleligciwane, abanezimpawu ze COVID-19 nobanganazo zingena lapho kuhamba khona indle emva kokuzikhulula kwabo. Ngakho, ukuhlola amanzi endle kusisiza ukuba sibone ubukhona be COVID-19 kuloyomphakathi.

Lokhu kuqashwa kwe SARS-CoV-2 emanzini endle kwenziwa emadolobheni athile ezifundazweni ezehlukene eningizimu Africa. Okubalulekile ukuthi uma kuhlolwa igciwane le SARS-CoV-2 emanzini endle lisuke lingasathathelani. Okwamanje ayikho imibiko etshengisa ukuthi umuntu angagula abe ne COVID-19 ngoba ethinte amanzi endle.

Njalo ngoMsombuluko ekuseni, isampula lamanzi endle liyathathwa ngumuntu oqeqeshiwe, ezindaweni ezahlukahlukene lapho kuhlanzwa khona amanzi endle. Lamasampula aqoqwa ngesikhathi esisodwa njalo ngeviki. Ngokuphazima kweso ngemva kokuqoqwa kwamasampula, ahanjiswa ngesiqandisi eya e SAMRC noma kwabasebenzisana nabo enyuvesi laboratories. Kubalulekile ukuthi lamasampuli ahlale kwisiqandisi ukuze angonakali.

I-SAMRC isungule indlela yokuhlola I SARC CoV-2 emanzini endle futhi iyona eqeqesha ozakwabo ababambisene nabo kulomkhankaso. Uma amanzi endle efika lapho ahlolwa khona, izincwezana ze SARS CoV-2 ziyakhishwa ebese zifakwa esikalini. I laboratory ebese iyaqiniseka ubukhona nobungako begciwane I SARS CoV-2 kwisampula ngalinye. Ngenxa yokuthi igciwane le SARS CoV-2 liyazishintshashintsha, kumele kwenziwe olunye icwaningo ukuhlola izinhlobo ezahlukahlukene zaleligciwane. Lomkhankaso unochwepheshe abakwazi ukubona izinhlobo ezahlukene zaleligciwane. Ngokuhlola amanzi endle njalo ngeviki, siyakwazi ukubona ukuthi izincezwana ze SARS-CoV-2 zingakanani, sikwazi ukubona uma kunyuka izinga lokutheleleka emphakathini.

Uma yonke imininingwane isisqoqiwe yahlelwa kahle, kubalulekile ukwabelana ngemiphumele nabezempilo nezokwelapha. Izincwezana ze SARS-CoV-2 ezitholakale kuzona zonke izindawo okuhlanzwa kuzo indle kuloluhlelo lase SAMRC WSARP zibikwa kubaphathi bezindawo, izifundazwe kanye nabaphathi bezempilo kuzwe lonke, ziphinde zibikwe ezinkundleni zokuxhumana nomphakathi zocwaningo zokuhlola amanzi endle zase SAMRC.

izinkundla zokuxhumana zalolucwaningo lwase SAMRC zethulwe ngo November 2020, ukuze kubikwe ngemiphumela yezincwezana ze SARS-CoV-2 emanzini endle. Lezinkundla zokuxhumana zenzelwe ukuthi umphakathi ukwazi ukuzibhekela imiphumela yalolucwaningo ngokwawo. kulamanzi endle sikwazi ukubona indlela eliziphethe ngayo igciwane, lokhu kusenza sibone indlela eliziphethe ngayo igciwane kuleyondawo. Lokhu kusisiza ukuthi sibone ukuthi baningi noma bancane abantu abatheleleke ngegciwane le COVID-19 futhi kusisize ukuba sikwazi ukuqhamuka namasu okulwa negciwane le COVID-19. Abezempilo bayakwazi ukusebenzisa imiphumela yohlolo lwamanzi endle neminye imiphumela yezempilo ukuze baqhamuke namasu ukulwa nokusabalala kwegciwane le COVID-19, njengokuqwashisa abasebenzi bezempilo uma kukhuphuka izibalo, ukwazisa imiphakathi ngokubaluleka kokufaka izimfonyo, ukuqhelelana Kanye nokugeza izindla.

Sizwe Nkambule is a Senior Scientist and Zamantimande Kunene is a Scientist both working in the Environment and Health Research Unit at the South African Medical Research Council.

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- Conservation of the ecosystem

LIFE SCIENCES: GRADE 11-12
- Environmental studies
- Human impact on the environment and current crises

Dunes of the Namib Sand-Sea. The vegetated clumps of grass in the inter-dune valleys are speargrass (*Stipagrostis sp.*). Speargrasses have hairy leaves, designed to trap fog water and channel it down to the roots buried deep in the sand.

Wonders of the Namib Desert

You might think that nothing exists in a desert? Think again! The Namib Desert is teeming with life if you look closely.

The Namib Desert lies along much of the coast of Namibia, north of South Africa. This coastal desert is a land of two halves. The northern part, from the Kuiseb River to the Angolan border, is mostly a flat gravel desert. The southern part, from the Kuiseb River to the South African border, mainly consists of sand dunes (called the Namib 'Sand-Sea').

The climate of the Namib Desert is unique. The coast of the Atlantic Ocean that lies next to the desert is regularly covered with fog, which rolls in from the sea overnight and can travel inland for up to 60 km. Many of the coastal desert species, both plants and insects, are specially adapted to capture fog water.

The gravel plains of the hyper-arid central Namib Desert

When you look at the Namib desert, the gravel plains and sand dunes appear to be hot, dry and empty wastelands. Nothing could be further from the truth!

Both the plains and dunes are teeming with life! Some of this life is invisible to the naked eye; some of it is hidden by camouflage or by burrowing; and some of it is large and obvious.

The large and the obvious

The macrofauna and flora of the Namib Desert are famous. There is the stately oryx (a large antelope) that stands out on the golden dune sands, silhouetted against the sky. Oryx herds range widely across the entire desert, moving to where there has been rain and the growth of fresh grass.

One of the Namib's special inhabitants is the mysterious welwitschia plant (*Welwitschia mirabilis*). The welwitschia is restricted to a narrow inland stretch of land from southern

Oryx on the dune crest – a behaviour to promote cooling

A mature welwitschia (male) plant

Namibia into southern Angola. These slow-growing plants, ancient relatives of the pine tree, are dotted across barren and rocky landscapes, seemingly surviving the extremes of heat and desiccation with apparent ease. Their style of growth is very unusual. They have elongated fibrous 'leaves' that squeeze outwards from a woody stump. They can grow up to several metres long (if not eaten by oryx or mountain zebras!)

The Namib hosts many other drought-resistant trees and plants that are all adapted in some way to survive in an environment where precipitation is limited and intermittent. Coastal species, like the colourful lichens, adsorb water from morning fog. The dune-living tree called !Nara is also a fog-trapper, and protects itself from grazing animals with its sharp thorns. The !Nara have traditionally played an important role for the Namib Desert tribes, providing fruit as a source of water and nutrients.

The 'fairy circles' of the Namib Desert are a phenomenon of wonder and argument across the world. The origins of these enigmatic circular patches of bare ground, surrounded by 'lush' desert grasses, have been a matter of speculation for centuries.

The indigenous peoples of the Namib thought that they were the work of dragons. Recent scientific theories about their origins include the actions of UFOs, radioactive hot-spots, poisonous residues of dead *Euphorbia* plants, the presence of colonies of sand termites or infective fungi, or the result of complex and natural ecological interactions. But the true cause of fairy circles remains a mystery!

The hidden

Much of the life in the Namib Desert is hidden from our sight. Days are so hot that many insects, rodents and other small animals are nocturnal and feed at night. If one takes an early morning walk on the dunes, there is plenty of evidence of their night-time activities. Fascinating tracks lay in the sand.

The golden mole, one of the apex (top) predators in the dunes, forces a shallow sub-surface tunnel through the sand until it detects an insect on the surface. Moles have very acute hearing and when it hears the insect on the surface, the mole emerges from its tunnel, a scuffle ensues, and the mole dives back into the sand as soon as it has finished dinner. The moles spend all day buried deep in the sand, hidden from sight and protected from the heat and drying effects of the sun.

Other species rely on camouflage. Many of the desert species, of all sizes, are a sandy brown colour to help them blend in with the terrain. For example, the stone grasshopper looks exactly like the pebbles around it.

Most microbial life is microscopic and invisible to the naked eye. But, in special settings, microbial life can come together

The coastal lichen field north of Swakopmund. The orange foliose lichens adsorb water from morning fog events.

Foliose lichens in the lichen field, capable of adsorbing water from morning fog events

***Moringa ovalifolia* tree adapted to the extreme desert environment. Note the enlarged trunk at ground level, adapted to store water.**

to form visible macroscopic structures — like in the moister areas of the Namib where there are biological soil crusts on the desert surface. These are complex groupings of lichens, green algae and cyanobacteria (green photosynthetic filamentous bacteria).

In the more arid areas of the desert, life moves underground beneath quartz rocks and pebbles. These microbial communities are termed 'hypoliths' ('under', 'rock') and are invisible from the surface. Turn over a quartz rock embedded in the desert pavement, and you are greeted by a black/green crust stuck to the rock surface and at the rock-soil interface. Hypolithic communities are dominated by cyanobacteria, but can contain bacteria, fungi, viruses and phage, and even invertebrate 'grazers' such as springtails. The hypoliths are the 'tropical rainforests' of the Namib Desert.

The hypolithic niche is a much less extreme environment than the exposed soil surface. The overlying quartz is translucent, allowing light to penetrate to the sub-surface and supporting cyanobacterial photosynthesis, which in turn supports all the other species in the 'under rock' community.

The invisible

The most numerous yet invisible inhabitants of the Namib Desert are the soil microbes. Each gram of soil may contain

***!Nara* plant growing in Namib dune sands.**

***!Nara* melons are an important subsistence resource for the Topnaar community living along the Kuiseb**

millions of microorganisms, such as bacteria, archaea, fungi, viruses and phage.

During the long, dry periods between the infrequent rains in the desert, many of these organisms are dormant, with little or no metabolic activity. However, recent research has shown that a small fraction of the microbial species in dry desert soils retain some metabolic activity: slowly acquiring carbon by degrading lipids and nitrogen by reducing nitrate (nitrate is often present at quite high concentrations in the driest desert soils). The very latest research suggests that some desert soil microbes might make their own water by oxidising atmospheric hydrogen,

A flowering *Hoodia currorii*. Once thought to be an appetite suppressant (now disproved), Hoodia is widely sold as a health food product

Fairy Circles scattered across the sands of the eastern Namib Desert

The nocturnal activities of the burrowing Golden Mole. Mole tracks are everywhere in the dune sands, but the moles are very rarely seen above ground. Inset: The Namib Golden Mole, the "shark" of the dunes.

which generates energy to drive other processes in the cell.

Water in the desert

Water, or the lack of it, is what makes a desert. The aridity of a desert is determined by the ratio of precipitation to evapotranspiration. In deserts such as the central Namib, where precipitation is very low (an average of a few mm of rain per year) and the heat of the desert induces a very high evapotranspiration rate, the desert is classified as 'hyper-arid'.

Yet, a desert can burst into life when it rains. In early 2011, the central Namib Desert received over 70 mm of rain over

A Toad Grasshopper (*Trachypetralla andersoni*) camouflaged in the desert pavement

a few weeks. In the following month, the desert came to life with a sea of knee-high *Stipagrostis* grass. For a short time, the desert was a prairie, attracting herds of oryx, mountain zebra and springbok, and millions of seed-eating grey-backed sparrow-larks.

Research in the Namib Desert

The Namib Desert is a haven for scientific research. The unique climate, the fascinating and varied geology and the diversity of specialised fauna and flora of the desert offer wonderful opportunities to scientists.

The Gobabeb-Namib Desert Research Institute (the 'Station') is perfectly positioned in the heart of the desert and at the interface of the gravel plains and sand-sea zones. The Station has been supporting scientists from all over the world for more than 70 years and has made significant contributions to the global understanding of desert ecology.

Prof Donald Cowan from the Centre for Microbial Ecology and Genomics, University of Pretoria and his team have been working on research projects in the Namib Desert since 2010, first with Dr Mary Seeley (Director: 1970-1998) and, since 2013, with Director Dr Gillian Maggs-Kölling at the Gobabeb-Namib Research Institute, Walvis Bay, Namibia.

Ungacabana ukuthi akukho mpilo ogwaduke? Cabanga futhi! Ugwadule lase Namib lugcwele impilo uma ubukisisa kahle. Indilinga ye Fairy, I mole esagolide kanye nezinyamazane, konke lokhu ezinye zezinto zemvelo ezinhle ongazithola khona.

Translated by Zamantimande Kunene, South African Medical Research Council

CURRICULUM CORNER

LIFE SCIENCES: GRADE 10-12

- Diversity, change and continuity
- Biodiversity and classification
- Biosphere and ecosystem

Explore the interactive digital landscape of the STEMulator

A virtual landscape to click on different systems and landscapes and understand how things work.

This South African initiative aims to get youngsters excited about the science, technology, engineering and mathematics (STEM) world and careers. Conscious of the shortage of candidates for STEM careers, the STEMulator aims to encourage interest in STEM opportunities by providing a digital virtual landscape. Here, children can explore, discover, and learn about the natural and built environments and the career possibilities that exist.

The STEMulator reveals the hidden world of many different parts of our lives, from human hearts to jet engines, marine life, satellites, and home energy systems, among many other places, spaces, and things.

The STEMulator creates an awareness of, and stimulates an interest in, the fascinating STEM world. The virtual landscape, which is expanding with more content, covers

mountains, meadows and rivers, farms and agriculture, machines and food produce, cars and their components, and hospitals and their elaborate equipment. Ever wondered how an ultrasound, X-ray, CT scanner or MRI machine really works? Click on them to find out.

When you visit the online website, you can virtually wander off in any direction you choose. From the farm to the orchard, to the orange tree, to orange juice in the fridge. Or from the wheat fields in the farm to the loaf of bread in the pantry.

Ever wondered how an aeroplane works? Or what it looks like if you take it apart? The STEMulator does just that for you. Piece by piece you can see all the different parts that come together in one of the most powerful and useful modes of transport we have on Earth today.

Every page includes a photo, a labelled diagram, a fascinating animation, and brief explanatory text. Each page also contains information about related careers and professions, and even about the local institutions offering the relevant courses you might need to pursue.
What makes the STEMulator extra special is that it is homegrown, truly South African. As it expands, it will include video clips of experiments in the school science laboratory landscape. Even the connections with the South African curriculum will be available for teachers to locate relevant material for different grades.

What if you cannot access the internet to explore the STEMulator online? Don't stress. The STEMulator has been loaded onto USB memory sticks for distribution to schools across the country.

The STEMulator is an exciting new platform for learning about how stuff works, and for finding subjects you like and maybe even your future career. Take a moment to visit the website: https://stemulator.org/aboutus/#s-home or email: info@stemulator.org for more information.

CURRICULUM CORNER

LIFE ORIENTATION: GRADE 10-12

- Career and career choices
- Subjects, career fields and study choices: decision-making skills
- Competencies, abilities and ethics required for a career

South Africa's newest space satellites

South African-born Elon Musk and his company, SpaceX, are famous for their cutting-edge scientific and technological advances.

Some of SpaceX's achievements include missions that have transported astronauts and cargo to the International Space Station using reusable rockets as well as the development of a satellite constellation called Starlink. The satellites in the Starlink constellation provide high-speed internet to even the most remote locations around the world.

Things got exciting for South Africa when three nano-satellites were launched on 13 January 2022 onboard the Falcon 9 rocket, taking off from the Cape Canaveral Space Force Station in Florida, USA.

The three nano-satellites are part of a new mission called Maritime Domain Awareness Satellite (MDASat-1), which aims to have direct benefits for South Africa.

The mission will monitor ship movements off the coast of South Africa. This forms part of the government's 'Operation Phakisa' which aims to fast-track critical development issues.

Using Automatic Identification System data, which are transmitted at radio frequencies, the positions of ships will be monitored in the territorial waters of South Africa. This will help effectively manage our natural resources, identify ships that may be fishing illegally and protect fish stocks and species found in the waters around South Africa.

This mission has demonstrated that South Africa has the potential to contribute to space technology as these nano-satellites were locally produced at the Africa Space Innovation Centre at Cape Peninsula University of Technology (CPUT).

These were not the first satellites to be developed and produced at CPUT. In collaboration with the French / South African Institute of Technology and the South African National Space Agency two previous launches have taken place. In 2013, the ZACUBE-1 was Africa's first nano-satellite launch, followed by the launch of ZACUBE-2 in 2018.

The initiation of the mission MDASat-1 paves the way for future space endeavours by South Africa.

Article prepared by David Jean du Preez who has a PhD in Meteorology from the University of Pretoria. Jean is presently the Chair of Model-Based Environmental Exposure Science at the University of Augsburg in Germany.

Read more

https://www.cput.ac.za/newsroom/news/article/4400/asic-team-reaches-milestone

Teacup artwork highlight environmental issues

What can you do over a cup a tea? Rather a number of socially significant things, such as hooking up with old friends. At the Walter Sisulu National Botanical Garden (NBG) a cup of tea became the product of innovation when more than 2,000 cups were used to create an impressive artwork in June 2021.

The South African Rooibos Council decided to pledge support to efforts to better manage the environment with a display titled 'Working towards a sustainable future'. The South African National Biodiversity Institute (SANBI) was a suitable partner as the environmental champion and Walter Sisulu NBG was the host venue.

The display was part of the annual World Environment Day celebrations that seek to highlight the importance of good environmental management for a sustainable future. The artwork installation was the product of mixed media artist Gina Waldman, who was commissioned to do the artwork using various rooibos tea blends that were carefully positioned to resemble a globe when viewed from above.

SA Rooibos director, Nicie Vorster, said the industry was renewing its focus on sustainability. Vorster also said in the statement they chose to illustrate their pledge towards social and environmental stewardship in a creative way, because art has the ability to connect with people on emotional and subliminal levels, sometimes inspiring a heightened appreciation for nature or a re-evaluation of human progress.

"On average, about 14,000 tons of rooibos are produced every year, of which half is consumed locally, while the rest is exported to more than 30 countries across the globe. Germany, the Netherlands, Japan, UK and the US are currently the biggest importers of the tea," said Vorster. "While enormous strides have been made to make the rooibos tea chain more sustainable, we can always do more, and we will build on the foundation we have to continue working on all three dimensions of sustainability — environmental, economic and social — while also taking the Agenda 2030 Sustainability Development Goals into account."

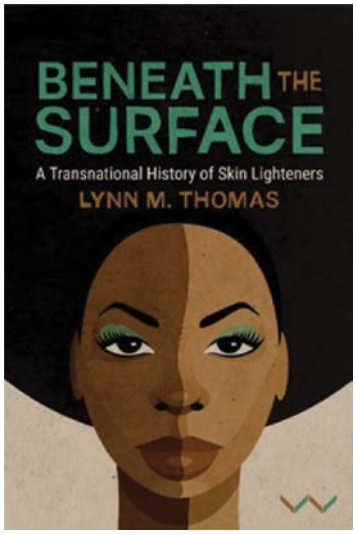
Vorster emphasised, "As our sustainability journey continues to gain momentum, we are encouraging other industries and the public to also play their part in preserving the environment and building a green economy in which all can thrive."

Written by Ronny Tshabalala. First published by the South African National Biodiversity Institute (SANBI) in the SANBI Gazette November 2021. Republished with permission.

Books

Beneath the surface: A transnational history of skin lighteners

By Lynn M. Thomas, Wits University Press



Skin lightening (also called skin bleaching or brightening) is a cosmetic procedure that aims to lighten dark areas of skin or achieve a generally paler skin tone. In her book, *Beneath the surface: A transnational history of skin lighteners*, Lynn Thomas talks about how skin colour contributes to our image of ourselves.

The story takes you on a journey to learn about historical practices of skin lightening and how it occurred in different places. It was used by many different cultures and diverse groups of people. For example, Black women's application of skin lightening products was for many different reasons, from beauty ideals to embracing consumer culture. Over time, commercial manufacturing and marketing of skin lighteners changed their products, packaging and adverts to make sure they appealed to the consumer of the day. Thomas's book has excellent stories and examples from South Africa. Take the 'Black is Beautiful' campaign that was embraced by activists who condemned skin lighteners to promote racial self-respect.

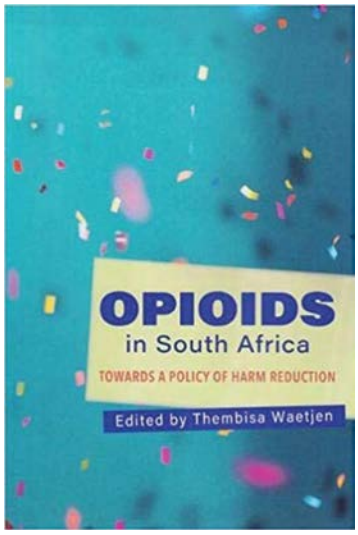
One of the main ingredients in skin lighteners is hydroquinone. When hydroquinone became a medical concern, skin lightening creams containing hydroquinone were banned in South Africa — being the first country globally to do so in 1990. Today, these products with hydroquinone are still used under medical supervision for treatment of some skin conditions in South Africa.

Beneath the Surface is a comprehensive book on skin lighteners and a good resource for anyone wanting to learn more about the history and issues around skin lightening. It has wonderful original advertisements, photographs, newspaper clippings and personal accounts that bring the narrative to life.

The full review of this book was published in the South African Journal of Science. Wright CY. Unravelling historical and intertwined complexities of light and dark skin. S Afr J Sci. 2021;117(3/4). https://doi.org/10.17159/sajs.2021/9092

Opioids in South Africa: Towards a policy of harm reduction

Edited by Thembisa Waetjen, by Health Sciences Research Council Press



Historically, the use of psychoactive and opioid substances in South Africa has been approached with prejudice and fear: there is stigma, stereotyping, and criminal association. The book *Opioids in South Africa: Towards a policy of harm reduction* suggests a mindset shift in considering how people who use opioids are treated – they should be approached with compassion and practicality rather than judgement. Thembisa Waetjen presents this way of thinking by combining case studies, reflections, and archival graphics.

Harm reduction seeks to introduce practical, achievable, and sustainable options to provide drug users with support and treatment they deserve. By decriminalising substances and approaching drug users with compassion and humanity, the long-standing preconception and attitudes towards drug users can be changed.

Drug users are being uplifted by several organisations, empowering them to be researchers: skills and tools are provided for them to be a part of and conduct research within the communities of drug users. This reduces other participants' suspicions of the researchers' motives or opinions, and allows the participants to respond freely and honestly.

The voices of different groups of people are heard throughout this book, including those who use opioids, their family members, healthcare professionals, and the police. Waetjen and the other authors encourage the reader to re-think opioids and their users, and the ways in which to reduce harm that people using opioids face in South Africa.

The full review of this book was published in the South African Journal of Science. Millar D.A., and Wright C.Y. 'Meet people where they are': An approach to opioids and harm reduction in South Africa. S Afr J Sci 2020; 116(5-6), 1. https://dx.doi.org/10.17159/sajs.2020/8141

TASK

1. Become more aware of your **"Carbon Footprint"** by calculating it here: https://trees.org.za/carbon-calculator/
2. Find 11 ways in which you can reduce your carbon footprint in the word search below...
3. Check out the **"Anatomy of Action"** by following the link below. In the table below, write down 5 sustainable lifestyle changes you commit to this year : https://www.anatomyofaction.org/AnatomyOfAction_MINI_SocialMedia_HOWTOUSE_Kit_Sep19.pdf
4. Test your knowledge in the climate quiz questions in the...
5. Share this fun activity page with friends and family!

A: The increase in the average temperature of the Earth's atmosphere is referred to by scientists as...?

LIFESTYLE CHANGES

I commit to the following 5 sustainable lifestyle changes in 2022:

1.....

.....

2.....

.....

3.....

.....

4.....

.....

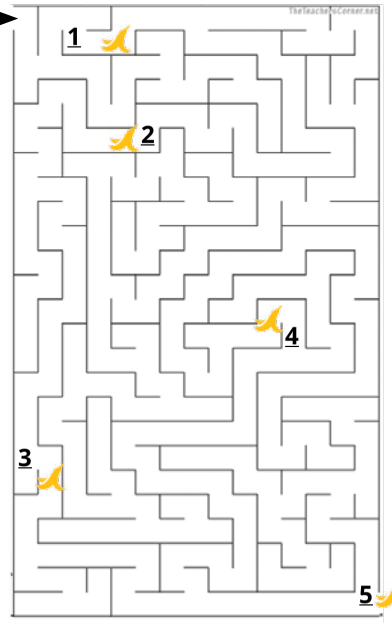
5.....

.....

Climate Change Maze Craze !

Can you find your way through the maze, by picking up the trash?
Tick off tasks 1 – 5 as you make your way through the maze!
Don't slip on the banana peels!

Start here →



The end! Well done, you are well on your way to live a more climate conscious life!

D: The pattern of weather conditions over many years is called...?

E: What are the gases called that become trapped in the Earth's atmosphere and are heating the planet?

B: What is the name of gas released into the atmosphere when we burn fossil fuel for energy like coal, oil and natural gas?

C: All of the gases on the planet make up the Earth's...

WORD SEARCH

L	I	N	E	D	R	Y	C	L	O	T	H	E	S	I	M	F	O
B	N	G	D	R	E	C	Y	C	L	E	S	Z	B	P	L	E	R
U	S	W	I	T	C	H	O	F	F	L	I	G	H	T	S	L	S
Y	H	R	I	H	X	U	S	I	W	B	S	S	Q	A	N	L	C
L	D	R	I	V	E	L	E	S	S	C	N	H	N	Q	C	S	O
O	A	B	I	V	P	I	C	I	Z	T	O	M	Y	W	K	G	M
C	B	C	E	A	T	L	E	S	S	M	E	A	T	M	H	G	P
A	A	V	O	I	D	F	A	S	T	F	A	S	H	I	O	N	O
L	U	S	E	L	E	S	S	P	L	A	S	T	I	C	Y	S	S
G	R	O	W	Y	O	U	R	O	W	N	F	O	O	D	I	D	T
S	P	U	P	P	P	Q	Y	M	G	X	R	X	I	U	W	C	Q
E	E	A	T	S	E	A	S	O	N	A	L	L	C	I	P	K	L

Find these words in the word search to the left:

Avoid fast fashion
Buy local
Compost
Drive less
Eat less meat
Eat seasonal (food)
Grow your own food
Line-dry clothes
Recycle
Switch off lights
Use less plastic

Answers: A: Global heating B: Carbon dioxide (CO2) C: Atmosphere D: Climate E: Greenhouse gases Reference: PowerPoint Presentation (cheshirescouts.org.uk)

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JOIN THE CONVERSATION

with the National Schools Science Debates competition.

It's time for the National Schools Science Debates competition to kick off for 2022. We are excited to hear what young people think about some of the important science topics on our minds this year.

This schools' debating competition, run by the South African Agency for Science and Technology Advancement (SAASTA), is unique because it asks teams to focus on different perspectives around science, to come together for a discussion and to propose possible solutions for positive change. Science is such a big part of our world and is intertwined in other important aspects of society, such as our economy, politics and culture. These perspectives are all discussed in SAASTA's science debates and make for very interesting conversations.

It's a 'hot' topic

For the first round of the competition in 2022, we are turning our attention to the big and complex problem of climate change. When we talk about climate change, we mean the changes in weather patterns over the long term (over 30 years or more). So we're not comparing the weather of last summer and this summer, but rather the kind of climate your parents and grandparents experienced when they were young compared to the climate you experience today.

When we talk about climate change, we also talk about global warming, because it is warmer this century than it was a hundred years ago. In fact, the average global temperature has increased by 1°C since 1900. While that might not sound like a lot, the Earth's systems are very sensitive to a warming climate. The Paris Agreement, which is an international treaty on climate change, has a goal to limit global warming to well below 2°C, preferably to 1.5°C, compared to pre-industrial levels (before 1900).

The more the Earth warms, the more we will see more extreme weather, heatwaves, droughts, flooding, fires, sea levels rising, oceans becoming more acidic and affecting marine life, loss in biodiversity and extinction of species, and diseases spreading.

Working together for solutions to complex problems

Many parts of South Africa and other parts of the world have already experienced extreme weather and changes in climate, and many people are being affected by climate change. Complex problems like climate change don't have simple solutions. We need many people to work together to contribute to solutions.

Scientists are working hard to discover new things and create new knowledge to help us reduce the impact of climate change. This includes developing new technologies that reduce greenhouse gases, like renewable energy technologies (such as solar or wind power); and technology that captures and removes carbon dioxide from the atmosphere; and better ways of farming to reduce the use of fertilisers and reduce the amount of methane and nitrous oxide that is released into the atmosphere.

We also know there is a wealth of knowledge in local communities that can help many people respond, adapt and be more resilient to climate change. Indigenous knowledge is knowledge that has been collected by indigenous people of a specific region, and is passed down, usually orally, through generations. This includes, for example, knowing which local plants are beneficial or harmful, and how they could be used to improve health. It also includes knowledge about how to predict and adjust to different kinds of weather.

The importance of indigenous knowledge and local solutions

Letago Kgomoeswana, FameLab 2021 winner, talking about the importance of indigenous knowledge in climate change response.

Researchers around South Africa are looking at how indigenous knowledge can help reduce the impact of climate change. For example, the 2021 FameLab South Africa winner, Letago Kgomoeswana from North West University, is involved in studying the impact of climate change on small holder farmers in the Mopani District in Limpopo. She has been finding out more about how they think about, understand and respond to climate change. Climate change is affecting the farmers by reducing the quality of land, the amount and health of their crops, and the health of their livestock. She says farmers are using indigenous knowledge to help them adapt to climate change and the variable weather. For example, leftover seeds can be stored in firewood ash so that seeds can be saved for more than one season. Firewood ash is also a pesticide and helps keep pests away from food that needs storing for later. These examples have helped improve food security that can be affected by climate change. Letago believes indigenous knowledge systems are important sources of knowledge and should be used when developing disaster management strategy in climate change policies.

How do you think indigenous knowledge systems should be incorporated into climate science and solutions to climate change?

If you are in high school and your school can enter a team (of five learners in grades 9-11), you can register to participate in the debate.

For the first round of the competition, you can choose one of the debating perspectives - Applications and Benefit; Political; Socio-Cultural or Economic – and submit a prepared opening and closing statement as an entry to this year's competition.

For more information and to find a link to register, visit:
https://www.saasta.ac.za/competitions/national-schools-debates/

Or contact SAASTA at debates@saasta.ac.za.

If you can't be part of a school team to enter the competition, have a discussion in your classroom, in your school or among your friends and family. Share what you think and learn about what others think.

Important dates for the National Schools Science Debates:

Registrations close: 8 April 2022
Entry submissions close: 6 May 2022
Provincial workshop (online): 6 August 2022
Provincial tournaments (in person): 20, 27 August, and 3 September 2022
National tournament (in person): 5 October 2022

science & innovation
Department:
Science and Innovation
REPUBLIC OF SOUTH AFRICA

NRF National Research Foundation | SAASTA South African Agency for Science and Technology Advancement

SAASTA SCHOOLS DEBATES

RESILIENCE IN A TIME OF COVID-19

Since the advent of COVID-19, the SAMRC has been responsive to change, leading research and innovation.

> R260 million
raised and allocated to more than 50 Covid-19 research and development projects

Close to 500 000 healthcare workers
vaccinated through the Sisonke Study

124 Scholars funded
by the programme since inception

62 Scholars graduated
overall

Overview

Established in 1969, the South African Medical Research Council (SAMRC) has for the past five decades been at the forefront of responsive research, medical innovations and transformative science – the organisation conducts and funds health research, innovation, development and research translation.

Through laboratory investigations, preclinical and clinical research, and public health studies, the SAMRC has been examining the top ten causes of mortality, disability and associated risk factors against the backdrop of South Africa's colliding epidemics of maternal, new-born and child health, tuberculosis and HIV/AIDS, non-communicable diseases (NCDs), injury and violence.

8 Clean audits out of the last 9

As a public entity, the SAMRC prides itself as being exemplary in many areas of its mandate including excellence in its fiscal discipline and adherence to strict corporate governance strategies in administering scientific research – leading to an achievement of eight clean audits out of the last nine, including 2020/21..

These accolades were all achieved without lowering the high standard of locally impactful and globally competitive research conducted and supported by the SAMRC.

Moving forward, the SAMRC 2020/21 – 2024/25 Strategic Plan builds on the successes and considers, the lessons learnt, from the previous Strategic Plans and will chart a new direction as a reimagined organisation set to make further impact in the disease burden in South Africa and globally.

Leading research and innovation in a time of COVID-19

Since the advent of COVID-19, the SAMRC has been responsive to change, leading research and dialogue on the pandemic. We also continued with supporting pioneers in cutting-edge medical innovations and programmes to support the government's response to the pandemic and improve the quality of life and health status of South Africans.

Over R260M has been raised and allocated to more than 50 COVID-19 research and development projects, including 30 projects that are supported with Department of Science and Innovation (DSI) funds. The SAMRC, in partnership with the DSI and Technology Innovation Agency (TIA), is funding several COVID-19 diagnostic product development projects and has co-funded the participation of South Africa in vital global studies on COVID-19 treatment and prevention, including the Solidarity Trial, the CROWN Coronation study and several vaccine studies.

The SAMRC has also supported studies on COVID-19 surveillance and epidemiology that have laid the foundation for enhanced infection control practices in healthcare settings, contributed to community surveillance initiatives and improved understanding of the epidemic in South Africa.

COVID-19 vaccines – finding solutions to save lives

The SAMRC has played a key role in initiating the national rollout of COVID-19 vaccination in South Africa through an implementation study known as Sisonke – which means "We are Together". Through the Sisonke Study, we have enabled government to make the Ad26.COV2.S COVID-19 vaccine (JnJ vaccine) immediately available to healthcare workers using a research programme.

As part of the initial phase of the national vaccine programme, close to 500 000 healthcare workers have been vaccinated through this programme at 122 vaccination sites nationwide. This was necessary to maintain a healthy work force to deal with the predicted third wave of COVID-19 infections and admissions, which was predicted to start in May-June 2021.

Halfway through, the South African Health Products Regulatory Authority (SAHPRA) temporarily suspended the Sisonke study to investigate extremely rare and severe blood clots detected in six out of about 6.8 million people vaccinated with the JnJ vaccine in the United States of America. However, the study resumed after approval was granted to proceed with an amended protocol to augment safety and oversight. This time, more rigorous pre-vaccination screening and post-vaccination monitoring of participants at risk of blood clotting disorders were introduced after the resumption.

Although the decision to pause the Sisonke Study initially precipitated a rise in vaccine hesitancy and fall in demand for COVID-19 vaccination, healthcare workers were later queuing in large numbers at vaccination sites across the country in the last week of the study; seizing the chance to get vaccinated ahead of the national rollout which started on 17 May 2021. Largely, this was achieved through widespread public and participant (both past and future) communication, education of vaccination staff and other healthcare workers, and an increase in the number of vaccination sites from the initial 46 to 93 across the country, including in rural areas.

Later in the year (November), the SAMRC and the NDoH commenced the Sisonke 2 which allowed for the provision of booster doses of the J&J vaccine to health workers who received their initial dose during the first phase of Sisonke between February and May. The decision to give an additional dose of the vaccine is based on data showing the safety, immunogenicity and efficacy of a two-dose regimen.

This study enabled early access to a booster dose ahead of the of the predicted fourth wave.

By the end of 2021, over 230 500 health workers had received their booster shots.

SAMRC Wastewater Surveillance and Research Programme

The SAMRC established the Wastewater Surveillance & Research Programme (SAMRC-WSARP) in July 2020 as an extension of several interventions to support the country's efforts to manage the COVID-19 pandemic. The Programme includes a SARS-CoV-2 Wastewater Surveillance Dashboard, an interactive public-facing dashboard to share information on levels of SARS-CoV-2 in wastewater in participating communities.

Wastewater-based surveillance for detecting SARS-CoV-2 has been carried out in a number of countries, and a good correlation has been found between viral load in wastewater and subsequent COVID-19 cases. At this stage, the system is monitoring wastewater in Cape Town, the Breede River Valley in the Western Cape, the Mopani and Vhembe Districts in Limpopo and the OR Tambo and Amathole Districts in the Eastern Cape, with Gauteng to follow.

In July this year, scientists from the SAMRC detected the presence of the highly infectious SARS-CoV-2 Delta variant in wastewater from several towns in the Western Cape, as well as the City of Cape Town, using this wastewater-based early warning system for COVID-19.

The new system, although currently focused on COVID-19, has broader application to develop an early warning system for diseases such Hepatitis A, measles and Norovirus.

Now and into the future

The SAMRC works with the National Department of Health towards 'a long and healthy life for all South Africans'. The organisation is also aligned to the national agenda to systemically redress past inequalities through a long-term process of growing and transforming the current and future knowledge economy, and thereby ensuring succession and sustainability. Transformation remains an integral part of developing towards a more inclusive and economically vibrant society. We see transformation as the blueprint of growing a responsive scientific community in South Africa.

The development of a cohort of interns and clinicians is a key transformation endeavour, which includes the Bongani Mayosi National Health Scholars Programme, an ambitious public-private partnership. Since inception the programme has funded 124 scholars (110 PhD and 14 MSc scholars). Overall, 62 scholars have graduated, 54 PhD and 8 MSc scholars of which 50% are black Africans.

As part of redressing historical inequalities, we fund eight previously under-resourced universities in our quest to strengthen institutional capacity in health research.

Since 2015, the highly competitive self-initiated research (SIR) grants programme was re-engineered to address racial diversity and gender parity in funding, with impressive results year on year. By 2018/19, more than 40% of the SIR funding was allocated to African black researchers. In addition, 54% of SIR grants were allocated to females in 2018/19.

The SAMRC has transformed grant funding initiatives that have significantly improved funding for young scientists, black African scientists, and women.

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