

UESM Newsletter

Spring Edition 2021



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Editorial

Spring, you are so welcome!!

Exciting news from, and state-of-the-art research in the UESM is much like Spring in the North-West Province... once it starts to reveal its hidden colours, it soon becomes awe-inspiring and *green* beyond expectations!

In this loaded Spring edition, we bring you bright colours which emerged from *Woman's month* and even brighter shades of hope from *Heritage month*. We celebrate woman in science, woman serving the community, women in leadership positions and woman so instrumental in supporting our daily tasks in the UESM. We also recognise and celebrate the cultural wealth in South Africa. Furthermore, we all share a similar connection with our most valuable heritage, our precious *environment*, for which we heed the call to study, manage and protect.

We treasure the diversity of cultures and of life, AND we deeply care about what keeps life alive!

Hope you had a great Heritage Month!



Frances Siebert (Editor) and Clarissa Minnaar (Sub-editor)



Professor Rialet Pieters

Flash Q's

Interview by
Clarissa Minnaar

- Dark chocolate or milk chocolate - **Milk chocolate**
 Floral fragrance or spicy botanical - **Floral fragrance**
 Polka dots or stripes - **Both**
 East coast or west coast - **West coast**
 Rain or sunshine - **Sunshine**
 Falling leaves or blooming flowers - **Falling leaves**
 Board game or card game - **Board game**
 Online shopping or in person - **Both**
 Favourite song - **The Proclaimer's I'm gonna be (500 Miles)**
 Favourite dessert - **Tangy cheesecake**

General

Where did you grow up?

All over the old Transvaal: Heidelberg, Rustenburg, Standerton, Wolmaransstad, Birchleigh, Potchstroom.

Where did you get your schooling? Standerton (Primary School), Wolmaransstad (Primary School), Birchleigh (Primary and Secondary School), Potchefstroom Gimnasium.

What childhood memory are you most fond of?

Spending holidays with my maternal grandmother.

What did you want to become when you were a kid?

I always wanted to be a scientist – I even managed my own 'lab' in a vacant room in our large old-style house in Wolmaransstad! I guess this is where my passion came to life. However, no dream comes easy or without a few important detours. Financial circumstances led me to apply for

a bursary in the education sector, and I was granted the opportunity to complete a Master's degree, after which I had to teach for at least four years according to the bursary conditions (although for some reason, I received an unplanned, but welcome 'discount', and only worked back three years). During the third year of teaching at Kriel High School, a lecturing position in Zoology at the NWU opened, after which opportunities came my way to develop a research career in Ecotoxicology. While I was writing up my NRF rating application in 2015, I was thrilled to realise how the Lord ensured that my childhood dream and passion, and the career I was meant to follow, finally became a reality.

What do you like doing in your spare time?

I enjoy sewing, paper crafting, reading, hiking.

Which fictional character would be the most exciting to meet in real life? Sherlock Holmes, because he made such meticulous observations and took such care in paying close attention and thereby alone, made accurate inferences. Of course, he was also highly intelligent. I think that's super cool.

What's your biggest pet peeve? Slow moving traffic: cars on the road and people inside malls.

Do you speak any other languages? None aside from Afrikaans and English.

If you had to pick two persons to be on your team during a zombie apocalypse, who would they be, and why?

The original (1985) McGyver as he was very good at survival with only a Swiss army knife in dire circumstances and Mary Poppins as she could 'fix' miserable circumstances with a touch of magic.

If you could travel to any year in a time machine, what year would you choose and why?

I would have loved to witness the first time man walked on the moon. I was a tender one year when Neil Armstrong managed the giant step of mankind, but too little to be aware of it. So, I would have loved to be in the USA in 1969.

What's your dream road trip destination?

Kruger National Park. I don't go there often enough.

What's an activity that you do not find fun at all?

Going to a crowded bar where the music is too loud.

What are three items on your bucket list?

I'd like to do a guided hiking tour in any of our national parks. Have a gourmet chef prepare a meal at my house for my friends and I (provided I am not being left with a dirty kitchen!). I'd like to learn to pilot a helicopter – I've always wanted to learn how to fly something else than a broom.

NWU/Career related

You have recently presented your Inaugural Lecture. Please share with us your path to becoming a Full Professor at the NWU?

In short, hard work and many sacrifices. I was appointed at the university in 1996 and attempted to complete a PhD in educational research twice, until Professor Bouwman offered me a PhD position which paved the way for my career in Ecotoxicology. After finally completing my PhD I

applied for a promotion and became a senior lecturer. By 2015 I had published enough to apply for an NRF rating and obtained a C-rating. This was followed by promotion to associate professor. Thereafter, I maintained the required research publication outputs, trained several postgraduate students, and secured funding for research. A Full Professor also must serve in leadership positions and be involved in some form of community service.

What do you enjoy most about your job?

I am absolutely passionate about my field of research. I am very excited about it and can talk endlessly about it. To be able to share that passion and some lab-related "tricks" with my postgraduate students is totally rewarding and a source of great pleasure. I guess at heart, I really am a teacher. I'd love to know that one day my legacy would be measured in the quality postgraduate students I delivered, rather than a tonne of research papers. I'd like to believe that I

make a difference in the lives of those I teach and that is more important to me than winning the Nobel prize for Science. It is thrilling to see the enthusiasm and devotion of my postgraduate students towards science.

What's the biggest challenge in the workplace?

Keeping experimental cells alive. Those who know me well would burst out laughing because they'd recognise the truth in that.

What conference/workshop would you describe as your most memorable one, and why?

Spending three months in Michigan in 2003 to learn working with cells in a lab. I established my career on the knowledge and experience I gained there.

What is the motto by which you operate as a lecturer and researcher?

No matter how you feel, get up, dress up, show up and NEVER give up. This is not only the motto I strive to live by in my career, but also the foundation of my outlook on life.

James Bond themed birthday party with Prof Rialet and her students.



ANNOUNCEMENTS

PHOTOGRAPHY COMPETITION



Grab your camera and get your entries ready! We are hosting another [photography competition](#)!

All UESM staff members, postdoctoral fellows and postgraduate students are invited to participate.



ETHICS

Visit the [FNAS eFundi link](#) for a detailed summary of the ethics process.

For any queries or assistance, please contact:

Madelien Burgers: 37630067@nwu.ac.za

Roelof Burger: Roelof.Burger@nwu.ac.za

FNAS Ethics Committee meetings in 2021:
23 September; 28 October & 25 November

More information on Ethics [here](#).

WANTED

For the **Summer edition of ENVIRA**, we would like to reflect on **excursions, research field trips and workshops** from the UESM.

Please send us a short summary (~300 words) of these events, accompanied by some action and group photos.

CHANGE YOUR AFFILIATION ON RESEARCH GATE

Change your affiliation to the Unit of Environmental Sciences and Management on Research Gate

This is easy to do! You can complete it in less than a minute the next time you log on to your Research Gate **'profile'** page. This is the page with your name, photo and other info. On the right there is a box with the heading **'Current Affiliation'**. If under 'Department' it states **'Unit for Environmental Sciences and Management'** you have nothing further to do. If anything else, then click on 'edit' to the right of **'Current Affiliation'** and then **'edit current affiliation'**. Under 'Department' scroll and choose **'Unit for Environmental Sciences and Management'**. Do not copy and paste, just start typing and it will appear. And then right at the bottom click 'save'.

Welcome to one of the most active, dynamic and productive research communities of the NWU!

ANNOUNCEMENTS

UESM: eFUNDI FORMS

Get all the Admin forms here – the UESM One Stop Source

Did you know that all the procedures and documents for UESM staff and students are uploaded onto a single eFundi page?

Click on this link to get to the UESM eFundi portal:

<https://efundi.nwu.ac.za/portal/site/f39464c0-cfe7-41c4-9ab1-5bbea6d0afbc>

This site contains the latest version of the most important forms used by the unit.

NEWLY APPOINTED PERMANENT STAFF MEMBERS



The **School of Geo- and Spatial Sciences** would like to officially welcome:

Mr Monde Mangali
who has joined the team as a Lab Technician on 1 July 2021.

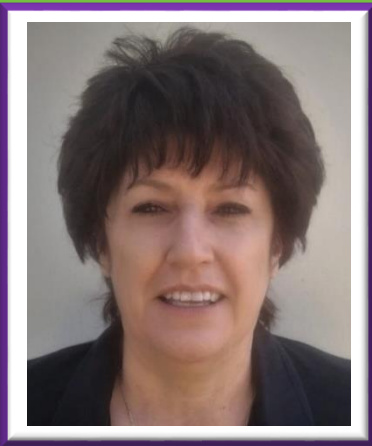
The **School of Geo- and Spatial Sciences** would like to officially welcome:

Professor James Chakwizira
who has joined their team, under the subject group Urban and Regional Planning on 1 October 2021.



UESM Support Staff

To all the new staff members, postdocs and postgraduate students in the UESM, please meet our support staff. These people are invaluable in their contributions to the success of the UESM as they fulfill multiple important functions within the unit. Our deepest appreciation goes towards them!

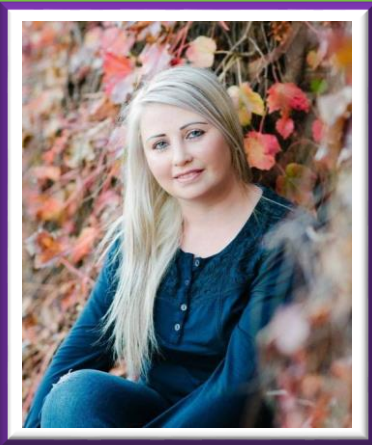


Anita du Preez
Senior Financial Officer

Responsibilities: Finances of UESM and the Schools of Biological Sciences, Geo- and Spatial Sciences, and the Center for Water Sciences and Management

Hobbies: Reading

Favourite Quote: Some people come in your life for a reason and some people for a season



Coréne van der Merwe
Senior Administrative Officer

Responsibilities: Responsible for the administration of the Taught Master's Program and all human resources appointments for the UESM and the Schools of Biological Sciences and Geo- and Spatial Sciences.

Hobbies: Photography and traveling

Favourite Quote: If you cannot do great things, do small things in a great way.



JC van Rooyen
Senior Administrative Officer

Responsibilities: Responsible for the administration of all the Masters and PhD Programs in the UESM. Head travel officer and fleet manager for UESM vehicles.

Hobbies: Formula 1

Favourite Quote: Kom ons braai!



Mada Vosloo
Administrative Assistant

Responsibilities: Office assistant to the Research Director and general activities within the UESM. Financial administration support to the UESM.

Hobbies: Painting, writing poetry, music, spending time in nature

Favorite Quote: Never stop laughing. Look to the small things in life and you will see miracles of grace. Never stop to be a child. Aldous Huxley said: "The secret of genius is to carry the spirit of the child into old age."

Congratulations

The following awards and accolades demonstrate the high quality and significant impact of research and teaching within the UESM.

Unit for Environmental Sciences and Management (UESM)

In a recent report, the Shanghai Ranking Consultancy's 2021 Academic Ranking of World Universities (ARWU) recognised the NWU as one of the world's top 1 000 research universities based on transparent methodology and objective third-party data.

<https://news.nwu.ac.za/nwu-excels-among-top-ranked-universities>

We are particularly proud to mention two categories in which the UESM contributed substantially to this achievement:

In the category 201 to 300: Atmospheric Science

In the category 401 to 500: Ecology

Sub-programme Spatial Planning, Development and Implementation

Prof Ernst Drewes and **Dr Karen Puren** have been appointed as sub-editor (Prof Drewes) and member of the editorial board (Dr Puren) of the Journal of Town and Regional Planning, the only accredited peer-reviewed journal for the discipline of Spatial Planning in South Africa.

Subject Group Urban and Regional Planning

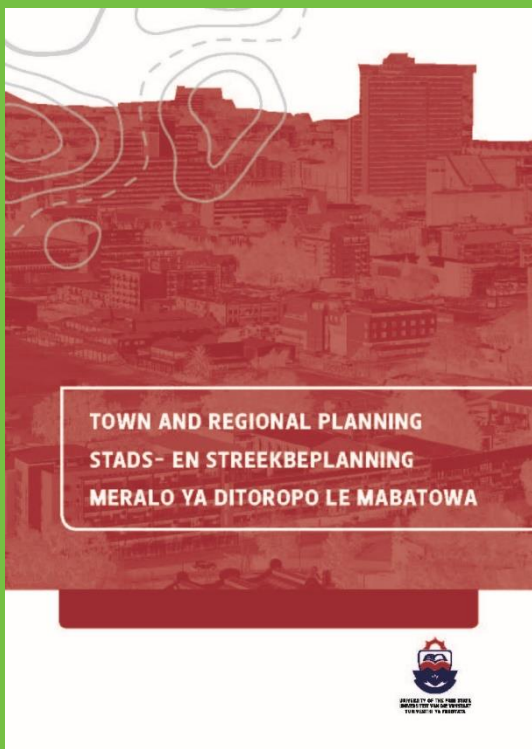
After a rigorous external program evaluation by their statutory body, the South African Council for Planners (SACPLAN), the Subject Group Urban and Regional Planning has received full accreditation for the next five years.

Prof Carlos Bezuidenhout

'Antimicrobial resistance is a serious threat to human and planetary health'.

Prof Carlos Bezuidenhout was part of the international team that contributed directly to writing a UNEP report on the "Environmental Dimensions of Antimicrobial Resistance", as was mentioned in the recent speech by Inger Anderson, Executive Director of the Global Leaders Group on Antimicrobial Resistance United Nations Environment Programme.

Furthermore, our research director was also [invited](#) to be part of the Water Research Commission (WRC) Legacies publication. In this publication, the WRC are putting together contributions from leading researchers in the field of aquatic science to honour those research partners who have made, in its view, a significant contribution to the water and sanitation sectors. This Legacies publication is in celebration of the WRC's 50th anniversary.



The South African
Council *for* Planners
S A C P L A N

UN
environment
programme

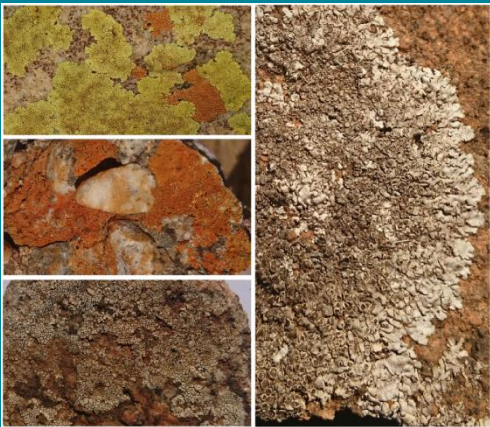


50
1972-2022





Mildred van der Merwe-Radloff Awards



Prof Klaus Kellner and Dr Reletile Mangani

International Organization for Standardization (ISO) is an independent, non-governmental international organization. The head courters are in Geneva, Switzerland. ISO brings together experts to share knowledge and develop voluntary, consensus-based, market relevant International Standards that support innovation and provide solutions to global challenges.

Prof Klaus Kellner and Dr Reletile Mangani, recently contributed to ISO TC 207/ SC5/Working Group 13 to illustrate the application of good practices in combatting Land Degradation and Drought (LDD). The title of the case study: "Restoration after woody clearing conducted in the D'Nyala Nature Reserve and Shongoane village in the Limpopo Province, South Africa". All regional case studies from the globe are available on a CD or websites: SO14055-2:2020(E) or ISO/TC 207/SC 5/WG 13 "Land degradation and desertification" or <https://sd.iso.org/documents/ui/#!/doc/0978424a-c741-4b76-9532-2f2b9d390454>.

Mildred van der Merwe-Radloff awards:

BJ Smit (MSc)

Supervisor: Prof SJ Siebert; Co-supervisor: Dr G Mahed (Nelson Mandela University).



The Mildred van der Merwe-Radloff 'MSc Award' of the North-West University is made to a student specialising in a botanical field and graduating *Cum Laude* with the highest mark during a given period. The 2020-2021 prize was awarded to Mr BJ Smith for his dissertation: *Biogeochemistry of the lichen-rock interface on different silica-rich rock types in the Vredefort Dome, South Africa*.

Read his News Flash article [here](#).

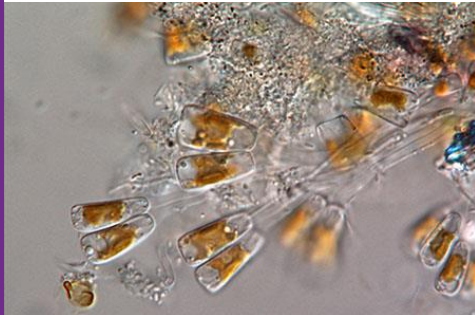
Sutapa Adhikari (PhD)

Promotor: Prof SJ Siebert; Co-promotors: Drs A Jordaan & J Marcelo Silva.



The Mildred van der Merwe-Radloff 'PhD Award' of the North-West University is made to a student specialising in a botanical field, and who received the most favourable examiner reports and have published extensively from their thesis. The 2020-2021 prize was awarded to Dr S Adhikari for her thesis: *Chromium dust deposition on plant leaves in Sekhukhuneland, South Africa, and the importance of leaf traits*.

Read her News Flash article [here](#).



Dr Roksana Majewska

(Postdoctoral fellow under the mentorship of Prof Jonathan Taylor)

An epizoic diatom project under the research lead of Dr Roksana Majewska, has recently won the Inqaba's Africa Genome Challenge.

<https://news.nwu.ac.za/nwu-trailblazer-diatomology-scoops-prestigious-award>

<https://www.youtube.com/watch?v=QLuwq0KSGH8&t=340s>

https://www.youtube.com/watch?v=caQmQKfO_aY&t=350s

PARSA (Parasitological Association of Southern Africa) symposium awards

UESM students and postdocs performed exceptionally well at the recent PARSA symposium, where they were acknowledged for their scientific contributions in the field of Parasitology in South Africa.



Photo:

Willie Landman,
Anneke Schoeman,
Linda van der Spuy,
Marliese Truter,
Geraldine Oosthuisen

Willie Landman: Junior Neitz medal for the best MSc in Parasitology in South Africa. (Supervisor: Prof Louis du Preez)

Anneke Schoeman: Senior Neitz medal for the best PhD in Parasitology in South Africa. (Supervisor: Prof Louis du Preez)

Marliese Truter: Angela Russel Davies medal for the best publication in parasitology in 2020/2021 (Supervisors: Prof Nico Smit and Dr Kerry Malherbe)

Michelle van As: Runner-up for the Angela Russel Davies medal for the best publication in parasitology in 2020/2021. (Supervisor: Prof Nico Smit)

Linda van der Spuy and Geraldine Oosthuisen: Recognition for excellent publications in parasitology during 2020/2021. (Supervisors: Dr Bjoern Schaeffner and Prof Nico Smit)

Further symposium awards to UESM students include:

Mpho Tawana: Third position for the best First time poster presentation. (Supervisor: Prof Oriel Thekiso)

Linda van der Spuy: Best Senior Student poster presentation. (Supervisors: Dr Bjoern Schaeffner and Prof Nico Smit)

Aline Acosta: Second and third positions for best Veteran poster presentation. (Supervisor: Prof Nico Smit)

Teneal Nel: Second position for First time platform presentation. (Supervisor: Prof Louis du Preez)

Marliese Truter: Best Senior Student platform presentation. (Supervisors: Prof Nico Smit and Dr Kerry Malherbe)

Anja Vermaak: Second position for Senior Student platform presentation. (Supervisors: Prof Nico Smit and Dr Olena Kudlai)

Ed Netherlands: Third position for Veteran platform presentation. (Mentor: Prof Louis du Preez)

PARSA





Three-minute-thesis (3MT) Competition Summary

Refentse Phetla (MSc student under the supervision of Prof S.J. Siebert, Mr R.B. Boneschans and Dr J.M. Marcelo) and **Anneke Lincoln Schoeman** (PhD student under the supervision of Prof Louis du Preez) represented the UESM at the annual 3MT competition. The first competitive round was among students of the Faculty of Natural and Agricultural Sciences (FNAS) where Refentse obtained second position in the MSc category, and Anneke first position in the PhD category. They advanced to the institutional round to represent FNAS, where Anneke won the overall 3MT competition.

View the link to the 3MT presentation of Refentse [here](#) (2:01:38), and to Anneke's winning 3MT [here](#) (1:42:47).



Ms Refentse Phetla

Faculty of Natural and Agricultural Sciences

3MT Title:

Soils and vegetation of naturally eroded areas in Sekhukhuneland, South Africa



WINNER
R15 000.00

Dr Anneke Lincoln Schoeman

Faculty of Natural and Agricultural Sciences

3MT Title:

Tiny parasites (not their frog hosts) answer big questions about the spread of disease



UESM Media personality Spring 2021

Fortunate Mafeta Phaka

Fortunate Phaka's passion for the environment, biodiversity and culture has earned him multiple print- and media appearances, as well as various honours and rewards.

[See more and view](#) Fortunate's features in print, radio, video and television.



SUPER SCIENTISTS THE SCRIBE

AFRICA

FORTUNATE PHAKA
NORTH-WEST UNIVERSITY
WILDERVAC

BORN : GP, SOUTH AFRICA
HARD WORK : 89
CREATIVITY : 83
CURIOSITY : 84

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Why 'The Calliper'?

A calliper is an instrument that measures the diameter of an object. In this

Regulars item, we measure and reflect on scientific outputs in the UESM.

How the top 5 most cited and published female researchers in each category were determined:

In the light of Women's Month (August), we decided to list only the top female researchers in the UESM. This list is based on citations and publications of UESM-affiliated female Professors, Lecturers and Post-docs as reflected by SCOPUS from 1 January 2020 - 15 September 2021.



Research Performance UESM Female Staff

Professors

	<u>Sub-program</u>	<u>Number of Publications (2020-2021)</u>	<u>Citations</u>
Driekie Fourie	IPM	24	261
Hannalene du Plessis	IPM	17	204
Frances Siebert	EIER	12	169
Sarina Claassens	EIER	7	195
Rialet Pieters	AEH	5	118

Lecturers

	<u>Sub-program</u>	<u>Number of Publications (2020-2021)</u>	<u>Citations</u>
Charlotte Mienie	AEH	9	67
Kerry Hadfield-Malherbe	AEH	8	149
Claudine Roos	EM	8	32
Lindah Muzangwa	EIER	5	38
Courtney Cook	AEH	4	101

Post-docs

	<u>Sub-program</u>	<u>Number of Publications (2020-2021)</u>	<u>Citations</u>
Roksana Majewska	AEH	14	183
Brigitte Language	CCAQI	11	28
Bianca Greyvenstein	IPM	6	14
Aline Acosta	AEH	5	81
Lizaan de Necker	AEH	5	13

The number of persons evaluated under each category:
Professors: 10
Lecturers: 21
Post-docs: 14



Research Ethics in Environmental Sciences and Management

Ethics

Roelof Burger

The Senate has decreed that all studies, including MSc and PhD students, should have an ethics number and all studies need an ethics review. As many have experienced, students are not being allowed to submit their studies without such an ethics number. The Faculty of Natural and Agricultural Research Ethics Committee (FNASREC) was formed to review low and no risk studies in the Faculty. While many research groups had their own processes before 2018, all research in the NWU now has to undergo a second ethics review, independent of the scientific reviews that continue to be the responsibility of the sub-programmes. The Senate provided a grace period for FNASREC to review studies that started before 2018, but that ran out in September 2020. We must now be aware that no research can start without an ethics number. Another important consideration is that the responsibility for ethics approval lies with the supervisor and not the student. Staff should, therefore be careful to monitor all studies under their supervision. FNASREC has tried to construct an archive of students in the faculty. We estimate a total of 390 active MSc and PhD students in the Unit for Environmental Sciences and Management. Of these, we can confirm 305 ethics numbers, with 266 of these provided by FNASREC. During 2020, we reviewed 252 studies from the unit. An important insight is that 85 students still need ethics clearance, of which 17 have been registered for more than a year. Supervisors should confirm that all their students have ethics numbers at this point and should be aware that they risk disciplinary action from the Senate if their ethics approvals are not in place. Applications to FNASREC can be submitted to <https://tinyurl.com/fnasrec>. Ethics approval is only valid for a year, after which an annual review will be conducted and the certificate renewed.

What you need to know about ethics in the Unit for Environmental Science and Management

1. All research needs to be reviewed by one of the ethics committees at the NWU, including masters and doctoral students.
2. No research is allowed to start without an ethics number.
3. No student is allowed to submit his dissertation without an ethics number from one of the NWU ethics committees.
4. The ethical responsibility of student studies lies with the supervisor, not the student.
5. For low and no risk studies, the process is fairly quick and painless. Start by submitting an application to <https://tinyurl.com/fnasrec>

Community projects

Introducing the NWU Green Team

Leandri Wessels

Who is the NWU Green Team?

The NWU Green Team is tasked with cultivating environmental consciousness amongst North-West University (NWU) students. Firstly, by sharing information that is truthful and scientifically sound, and secondly, by creating opportunities where students can take constructive action to address environmental issues.

The Faculty of Education founded the NWU Green Team in 2012. The Geography and Environmental Education subject group acts as the guardian. The team currently consists of 30 student members representing all faculties of the NWU. The diversity of disciplines allows for reaching ambitious goals through utilizing various perspectives and skillsets. Green Teams have also been established on the two NWU sister campuses.



NWU Green Team members with Eagi working on a project for later this year. (Photo credit: Karlien Muller)



Planting Elephant bush trees (*Portulacaria afra*). (Photo credit: Karlien Muller).



NWU Green Team and Good Deeds planting trees at under resourced schools. (Photo credit: Future Bokamoso Maseda)

NWU Green Team Projects

Projects are based on specific days from the environmental calendar or themes that committee members deem important. The team embraced opportunities presented by the COVID -19 pandemic by hosting both virtual and small, targeted in-person events. Under the theme of linking consumer choices to the associated impacts, students were particularly fond of the “Minute to Win It” games. During the one-minute challenges students learned about recycling and circular



Elephant bush tree (*Portulacaria afra*).

economy opportunities. The Deswalner Recycling Course and the Plastic Free July campaign followed to inspire environmentally conscious consumer behaviour. In partnership with Deswalner Recycling, JB Marks and the Student Campus Council, a competition to clean up Potchefstroom was also launched in September. These projects enable the team to convey specialists' knowledge into layman's language. Thereby enabling students to address the environmental challenges with a deeper understanding. Postgraduate students' level of understanding is serving as an effective bridge to convey environmental knowledge to students.

To welcome spring, Arbour month projects started off with planting elephant bush trees (*Portulacaria afra*) with actress Pascal Pienaar and the community outreach group, Good Deeds. Under this theme, multiple projects are yet to be revealed. Keep an eye out for our Science and Law Panel that serves as an opportunity for networking and knowledge transfer later this year, as well as the sustainable living tutorial series nicknamed "ECO DIY's" where members share their tips and tricks for eco-friendly do it yourself student living.

Thinking beyond the NWU Green team

Green Team members and alumni are challenged to apply what they learn wherever they find themselves. The environmental consciousness cultivated through the NWU Green Team is carried on with students as they step into becoming teachers, engineers, lawyers, among others. Our hope is that this ripple effect continues throughout and beyond the NWU.



NWU Green Team members with Eagi working on a project for later this year. (Photo credit: Charnè Coetzee and Karlien Muller).



Scholars planting elephant bush trees (*Portulacaria afra*) with actress Pascal Pienaar and Good Deeds. (Photo credit: Karlien Muller).

Links to NWU Green Team social media accounts:



Instagram: [@nwugreen](https://www.instagram.com/nwugreen)



Twitter: [@NWUGreen](https://twitter.com/NWUGreen)



Facebook: [@NWUGreen Team](https://www.facebook.com/NWUGreenTeam)



TikTok: [@nwugreen](https://www.tiktok.com/@nwugreen)



AP Goossens Herbarium: A hidden botanical treasure

Stefan Siebert

What is a herbarium? It is a collection of preserved plant specimens and associated collection data used for scientific study.

The year 1932 is of great significance to one of the oldest collections of the School of Biological Sciences, but it is a year probably better known for the discovery of the neutron by nobel prize winner, James Chadwick (which paved the way, unintentionally, to the development of the infamous atomic bombs 13 years later). But 'flower power' also holds a lasting legacy, albeit rooted in beauty and harmony, and 1932 marked the establishment of the Herbarium of the Potchefstroom University College (PUC). It formed an important building block as part of the inspiring [100 year history of Botany](#), which Jooste so aptly refers to as a 'science of beauty' in the 100 year history of the Faculty ([Jooste, 2017](#) – see p. 91-113).

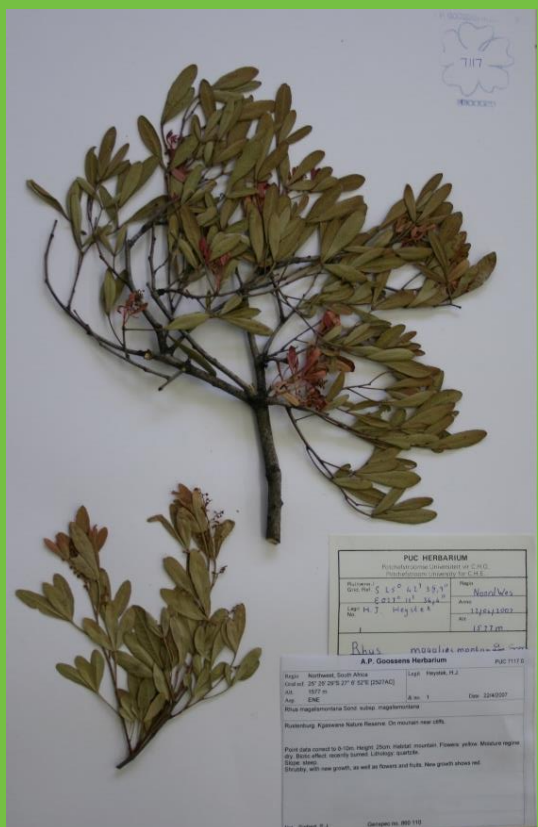
The herbarium was established by Antonie Goossens, first professor and head of the Botany Department. Goossens was a prominent grass taxonomist ([Goossens 1941](#)) and served as curator for nearly 30 years and subsequently there have been seven curators ([Cilliers et al. 2021](#)). The sixth curator, Matt Buys, renamed the herbarium in honour of its founder and today the PUC is known as the A.P. Goossens Herbarium and is [internationally registered](#) as one of the 3 100 herbaria worldwide which cumulatively house 390 million specimens. However, since the formation of the North-West University in 2004, no collections manager has been appointed to oversee the optimal functioning of the herbarium. Ever since, SANBI/DST interns and student assistants, whenever funding became available, have erratically been attending to the vast array of day-to-day functions and databasing, and a curator handles new accessions and plant identifications when time permits.

The herbarium holds over 30 000 specimens from central South Africa for educational and research purposes. The herbarium is widely recognized for its large, regionally representative collection of grasses of almost 4 000 specimens. It is therefore quite fitting that the oldest specimen in the collection is of a grass species, Common Crowfoot ([Dactyloctenium aegypticum](#) (L.) Willd.), which was collected in 1886 in Amboland, Namibia, by Hans Schinz.

One of the main initiatives since 2010 was to reduce the size of the fast-growing collection to create more space in the herbarium cabinets for voucher specimens of new projects. Specimens from the coastal provinces often originated from casual collecting and were therefore repatriated to reputable herbaria at other universities in these provinces. This freed up space for approximately 5 000 specimens, which has since been filled. Fortunately, the collection is now specifically focused on the plant diversity of central South Africa



The herbarium is named after Antonie Goossens, founder and first curator.



A herbarium specimen.



Collection, mounting and identification equipment in the herbarium lab.



The AP Goossens Herbarium.



Herbarium cabinet with herbarium specimens in genus covers stacked in pigeonholes.



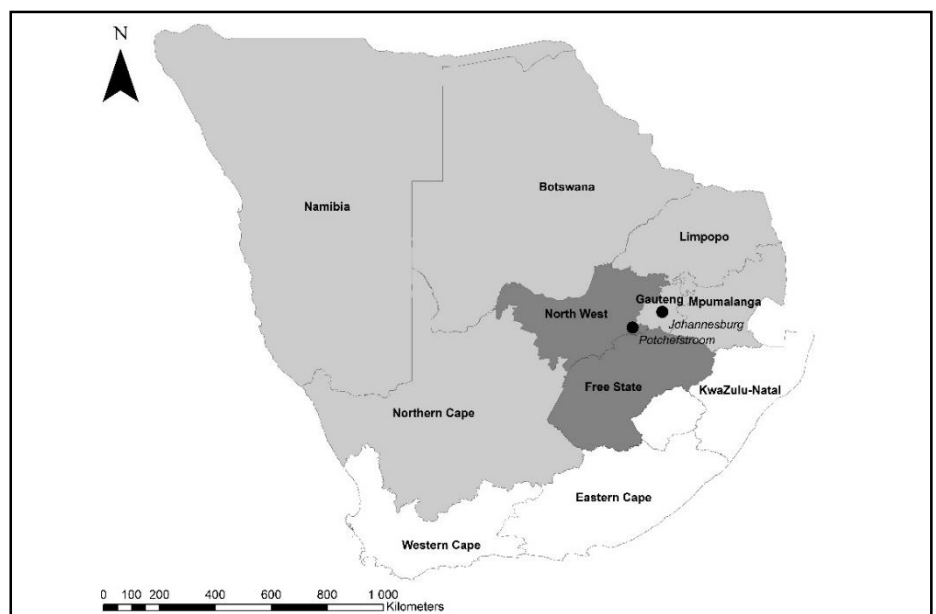
Lerato Molebatsi from Mafikeng Campus using the herbarium for her research project on Tswana homegardens.

(mainly North-West and Free State, but also bordering areas of other provinces), and is now by far the largest of the six herbaria in this region. The herbarium has also established a strong specimen exchange programme with herbaria in Bloemfontein, Kimberley, Mafikeng and Pretoria.

So, why is a herbarium important? Many people do not consider a herbarium, with its flattened, dry plant specimens, to be a very interesting or valuable place. It has become a case of the age-old adage 'Don't continue watering a dead flower', despite the major contribution this 90-year old facility has made towards teaching, learning and research at the North-West University over the last two decades (Cilliers *et al.* 2021). This non-living collection is widely used by all three our campuses, and also by other universities, provincial government departments and the general public. University herbaria have a different function from large national herbaria due to the specific academic services which are required. The biggest users of herbarium data and storage space are involved in agriculture, botany, conservation, ecology, education and pharmacology. Below is a brief explanation of the services provided by the Goossens Herbarium:

- 1) Training post- and undergraduate students in herbarium practices.
- 2) Providing a standard reference collection for plant identifications.
- 3) Preserving voucher specimens for research projects.
- 4) Maintaining an extensive database of species locality records and habitat data.
- 5) Supporting the plant initiatives of the NWU Botanical Garden.
- 6) Serving as a reference collection for plant systematics research.
- 7) Providing plant material and data for ecological studies.
- 8) Maintaining a historical account of the flora of the dry Grassland Biome.

Anyone that requires to use the herbarium, or learn more about it, can contact Prof Stefan Siebert (stefan.siebert@nwu.ac.za). It is open daily on weekdays from 8h-16h. Please make an appointment as the herbarium is not staffed full time.



Broad coverage of specimens kept in the A.P. Goossens Herbarium (shaded areas). More than a third of the collection originates from the darker shaded provinces. (Map created by Wynand Muller)

Champion Tree

NEW

Stefan Siebert

A **Champion Tree** is one of the largest specimens of its species in a region and holds historical or cultural value. On 6 December 2006, the then Minister of Water Affairs and Forestry, Mrs Lindiwe Hendricks, proclaimed the first 21 Champion Trees as protected under the National Forests Act No 84 of 1998 in the Government Gazette. Since then there has been a concerted effort to locate and proclaim more of these special trees as Champions.

An impressive specimen of *Platanus wrightii* (Arizona sycamore; *Alamo* (Spanish); *Arizonaplataan* (Afrikaans)) rises above the F1 building opposite the Acacia tree statue on the Potchefstroom campus. This giant is considered the largest tree on campus. **Arizona sycamore** is native to the Sonora Desert in the most southern part of North America, stretching from the states of Arizona and New Mexico, in the United States of America, south into the most northern parts of Mexico. In its natural environment it is prevalent in riparian areas along desert valleys and rocky canyons. One can therefore imagine that our Champion Tree really enjoys the higher rainfall in Potchefstroom and is tolerant to the often long dry spells that we experience. And as a bonus, the tree can survive temperatures as low as -20°C. A very useful trait to cope with our Highveld winters.

Arizona sycamore is a member of the Platanaceae (plane tree family) and species of the *Platanus* genus are the sole living members of this family which are restricted to the Northern Hemisphere. The genus name refers to the Greek name, 'platanus', given to the Oriental plane (*Platanus orientalis*). The species name of the Arizona sycamore commemorates Charles Wright (1811-1885), world-wide explorer and botanical collector.

Arizona sycamores are colossal, deciduous trees, growing up to 22 m tall with a canopy spread of 10 to 20 m. These dimensions suggest that our Champion Tree is indeed a majestic specimen, at 22.6 m tall and with a mean canopy diameter of 33.4 m. The current stem circumference of our tree at breast height (taken at 1.4 m) was 633 cm when measured in March 2021. As specific tree dimensions can vary greatly between species, trees on campus can be compared with the Size Index ($SI = \sqrt{sd} \times h \times \sqrt{cd}$) values, where sd = stem diameter, h = height and cd = mean crown diameter. Our Champion Tree has a SI of 185, which is 27 index points higher than the next tree on the campus list of champions, namely a *Eucalyptus camaldulensis* (River red gum). To put its size in perspective, our Champion Tree has a large enough



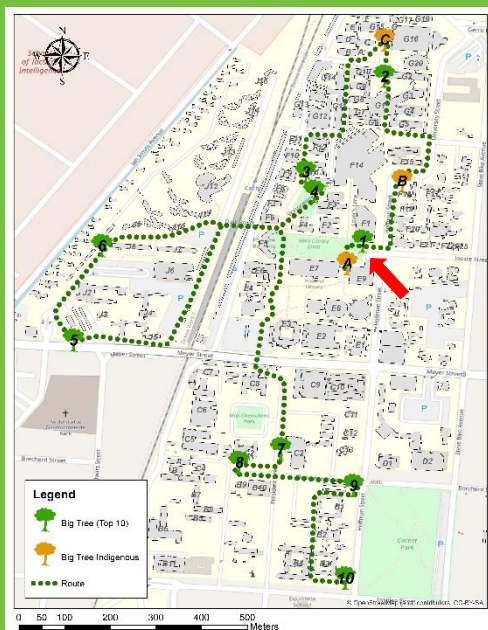
Champion Tree in front of the F1 building.
(Photo credit: Marié du Toit).



Button balls with ripe seed.



Leaves of Arizona sycamore (left) and London plane (right).



[View enlarged map](#)

A Champion Tree route has been developed for the campus. It takes you to the 10 largest trees on campus and is a nice 5 km walk. (Map created by Wynand Muller).

More on campus tree routes in the next issue of ENVIRA.

SI to be considered for the list of Champion Trees of South Africa as declared by the Department of Water Affairs and Forestry (DWAFF), but it is probably too young. The trees in ‘Lover’s Lane’ turned 61 this year, and it can be assumed our tree was part of that planting. It is therefore a young tree if one considers that trees of this species in cultivation elsewhere in the world have been documented by horticulturists to be up to 400 years old. The reason our tree is already so big is because the species is a fast grower, with species’ growth rate having been established at 60-90 cm in height per year. And, of course, a very shallow water table on campus has its benefits.

The Arizona sycamore has far spreading, beautifully arched, white branches. The specimen on campus is an excellent example of this growth form and also boasts the typical large trunk with mottled bark which originates when light-grey outer bark flakes off to reveal the white inner bark. Leaves are simple, alternate and large (90-250 x 90-300 mm), and deeply palmately lobed with a starlike appearance. The leaves differ morphologically from the other plane/sycamore species on campus. The leaves of Arizona sycamore are 5-lobed (sometimes 3-lobed), with lobes long and finger-like, while London Plane (*Platanus acerifolia*), which is cultivated more extensively on campus, have 3-lobed leaves (sometimes 5-lobed), with each lobe nearly as broad as long. Yellow-green flowers, but ever so inconspicuous, emerge with the leaves in early spring. Male and female flowers are carried separately on the same tree (monoecious) in dense, globose, unisexual heads, referred to as button balls, either solitary or in racemes. The fruit, which ripen in autumn, are four-sided achenes (think sunflower seed), with a basal tuft of long hairs. The button balls disintegrate in winter, and the seeds are then released and dispersed by wind.

Although these trees become large hardwoods with massive trunks, they are more favoured as ornamentals and for shade, than timber. This in contrast to its sister species, *Platanus occidentalis* (American sycamore), one of the most valuable timber species in the United States. Arizona sycamore is favoured as a butcher’s block for cutting meats and other food items, because the wood is not brittle and therefore does not easily break apart.

Arizona sycamore is easy to propagate with cuttings or seed. Button balls that have overwintered on a tree can be crushed in a bag to remove the seed. The seed can be planted in early spring and will germinate promptly. As you could imagine, these desert trees are hardy, but to obtain optimal growth, seed should be planted in well-drained, moist and nutrient-rich soil, and with ample sunlight.

Just remember that this tree grows large quickly, and although it does not readily cause root damage to paving and buildings, the massive size of its spreading branches makes it a risk for telephone/fibre lines and roofs. But observing our own Champion Tree on campus, I would think it is just perfect for a tree house!

SCIENCE FACT BOX



SANPARKS: We're getting a new park!



The upside of workplace interruptions



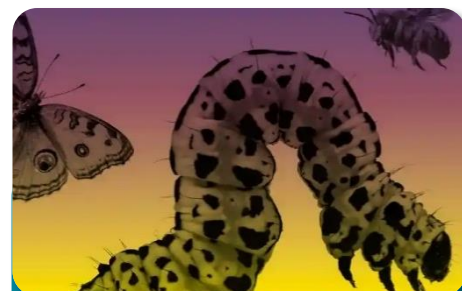
Baby bats babble like humans



ECOSIA: The search engine that plants trees



'No healthy planet without a healthy ocean'



The insect apocalypse!



Mars habitability limited by its small size



Forests store more carbon than we thought



WATCH: Spectacular footage - right whales



Personality matters, even for squirrels



No to rehab?



Threat supervolcano eruptions ever-present

Hobby Showcase: *Biodiversity & Conservation Ecology*

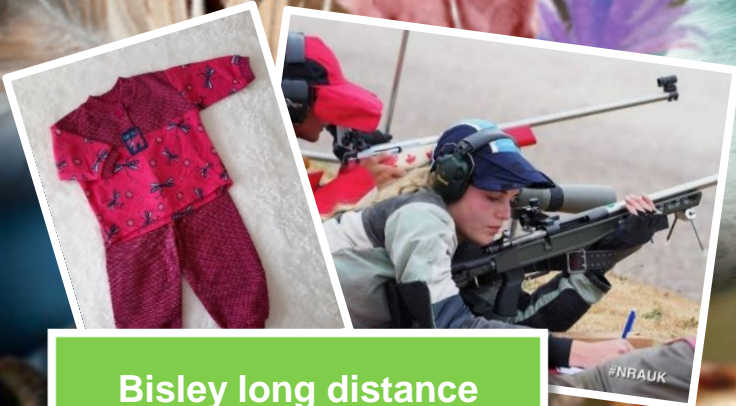
Interactive buttons



Bird ringing
Kirsty Kyle



Woodturning
Louis du Preez



Bisley long distance shooting & sewing
Lenaldi Görgens




Traveling
Moitshepi Plaatjie



Photography, videography & cultural anthropology
Fortunate Mafeta Phaka

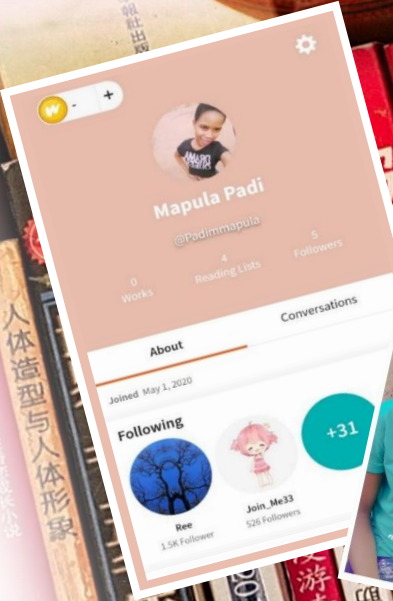
Hobby Showcase: *Biodiversity & Conservation Ecology*

Interactive buttons 



Basketball & Ultimate Frisbee
Michelle Hamman

Numerous hobbies including playing multiple instruments & cultivating Lithops
Willie Landman



Reading fantasy Chinese novels & plaiting hair
Patricia Padi

Sewing
Anneke Lincoln Schoeman

Platinum: bringing countries together

Hannes Erasmus (Postdoc)
Water Research Group

South Africa is the world's main supplier of platinum group elements (PGE) and some of the most productive platinum mining operations are located in the Bushveld Igneous Complex, near Rustenburg. The Hex River is the main arterial drainage system in this intensive mining area, with relatively unimpacted headwaters and severely impacted lower water zones. It therefore provides the perfect case study to assess the impacts of platinum mining on aquatic ecosystems, while also designing and validating a passive sampling device (artificial mussel) as monitoring tool of platinum exposure in freshwater environments. This formed the focus of a collaboration between the Water Research Group (WRG), North-West University and the Aquatische Ökologie (Aquatic Ecology) Group, Universität Duisburg-Essen with funding from the National Research Foundation (NRF) and the Federal Ministry of Education and Research (BMBF/PT-DLR).

This [collaboration](#) was established to advance the understanding of the role and effects of PGE in aquatic systems. The main aim was the exchange of expertise between the two partner institutions and the chance to provide young researchers the opportunity to learn from and work with international partners. The two institutions provided several equipment and facilities to advance student training from fieldwork to laboratory analyses, while providing expertise in water and sediment quality assessment, as well as various biological assessment techniques (macroinvertebrates, fish and parasites). This collaboration provided 15 students (seven South Africans, eight Germans) the opportunity to visit international laboratories and learn valuable scientific techniques, meet internationally established



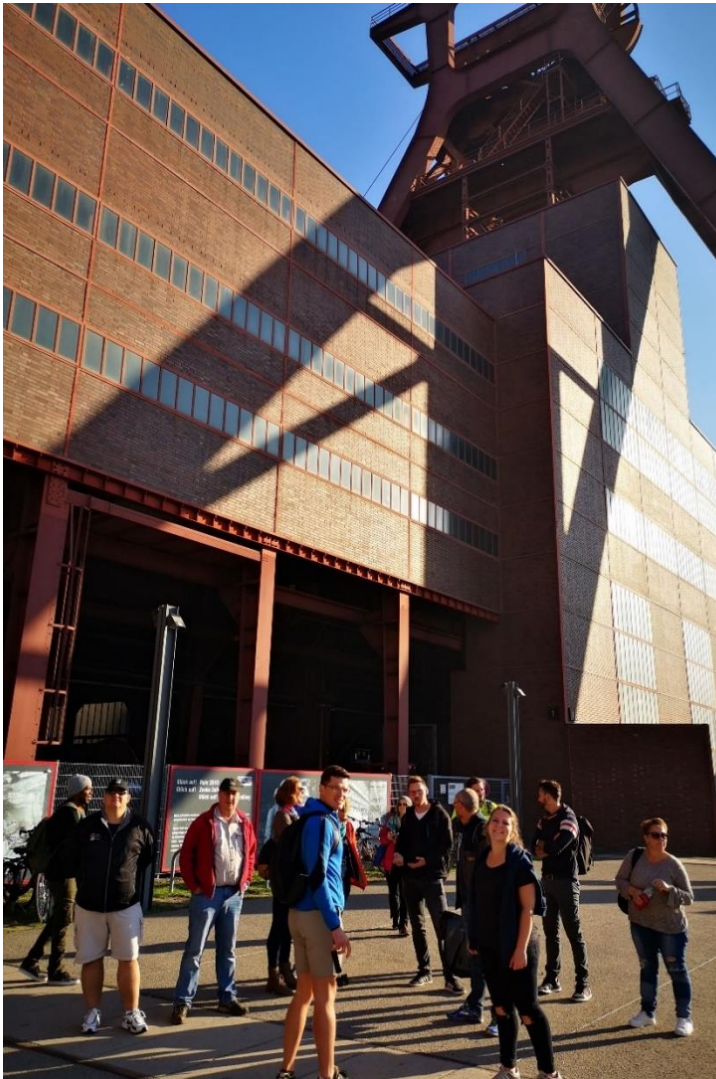
Collaborators of the PGE project during a workshop in Essen, Germany.

researchers and peers in their field, but also experience the different cultures and scenery.

Using laboratory bioassays, platinum uptake and biological responses were assessed in Zebra mussels, *Dreissena polymorpha*, from aqueous exposures, while the PGE associated metal uptake and toxicity in soils and sediments were assessed using the nematode *Caenorhabditis elegans*. The use of [artificial mussels](#) (a passive sampling device) was also validated as a monitoring tool of platinum exposure in freshwater environments to reduce the number of live animals used in biomonitoring and to contribute to the 3R principles (replacement, reduction and refinement) for ethical use and animal testing.

In field assessments, the changes in macroinvertebrate community structures due to platinum mining effects were assessed based on both a species diversity and





Collaborators enjoying a bicycle tour through the city of Essen, Germany. First stop – UNESCO’s Zollverein Coal Mine Industrial Complex.

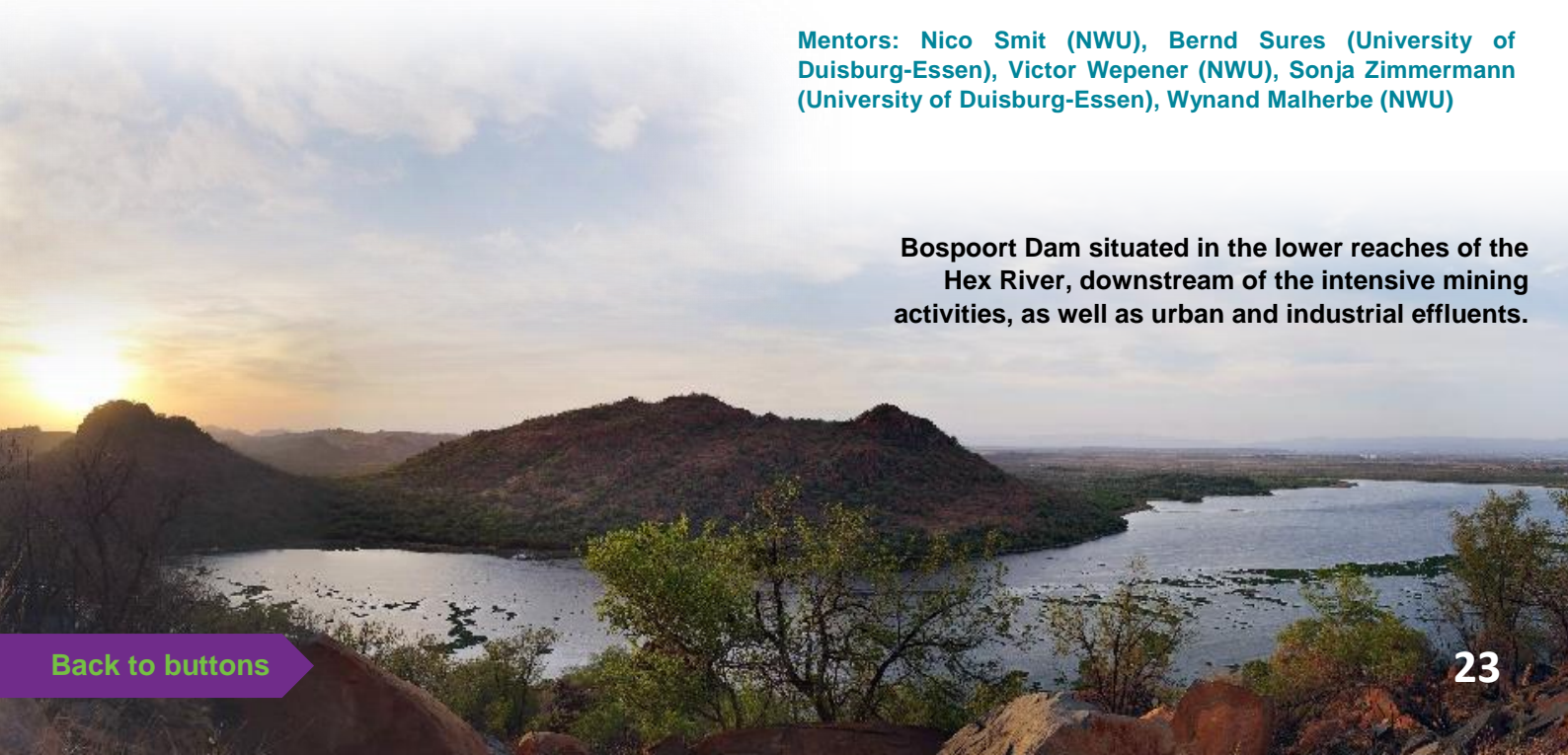
functional approach. Metal accumulation in macroinvertebrates were assessed to establish bioindicators of metal exposure, but also to identify species that can be used as sensitive indicator organisms. Metal uptake in three fish species frequently consumed by the local community in the Hex River catchment, namely common carp (*Cyprinus carpio*), sharptooth catfish (*Clarias gariepinus*), and Mozambique tilapia (*Oreochromis mossambicus*), was assessed to establish the human health risks associated with fish consumption. Furthermore, metal uptake in parasites (both nematodes and cestodes) were also assessed and compared to their fish hosts. Results indicated that these parasites have a detoxifying effect of harmful metal concentrations and may have a positive effect on their hosts. To conclude, this collaborative project aimed to showcase how to design future studies to assess stressors in the aquatic environment and how to incorporate it into a One Health concept whereby a holistic view and full extent of stressors in the environment could be obtained.

The results obtained during this collaboration once again underlines the advantages of international collaboration. Thus far the project has produced 13 peer reviewed publications in high impact factor international journals, as well as several oral and poster presentations at national and international conferences. In addition, two PhD and four MSc theses have been completed on aspects related to the project.

Click [here](#) for more information on this collaboration, and find the latest output from this collaborative research [here](#).

Mentors: Nico Smit (NWU), Bernd Sures (University of Duisburg-Essen), Victor Wepener (NWU), Sonja Zimmermann (University of Duisburg-Essen), Wynand Malherbe (NWU)

Bospoort Dam situated in the lower reaches of the Hex River, downstream of the intensive mining activities, as well as urban and industrial effluents.



Capers on coral reef islands: Part 2

Agalega: A traffic accident, prayers, and cognac

Henk Bouwman & Henrik Kylin

Isolated 1100 km north of Mauritius are the dual islands of Agalega, discovered in 1509. Its geologic origin is not well understood but it has narrow fringing coral reefs. Within 6 km, the ocean depth drops to 2000 m. Careful where you step! Agalega's average winter temperature is 28 °C and 29 °C in summer. The highest point is about 14 m (Montagne d'Emmerez), and it boasts the only freshwater lake (Bassin Capucin) for hundreds of kilometres. Vingt Cinq (Twenty-five) is the capital, remembering the 25 lashes slaves received as punishment. At the time of our visit, there were about 350 inhabitants on the island, with a surprisingly large diversity of religions. Money was introduced in 2004 so that the islanders could watch the soccer world cup via satellite. Otherwise, they are employed by the Mauritian government in the coconut plantations. Thousands of coconut trees look after themselves in a 'Jurassic Park' reminiscent jungle-scape. Wildlife has been badly affected by rats, cats, and humans, but still very interesting. It boasts a very isolated small colony of Glossy Ibis, for instance, and a dragonfly diversity to be explored.



Bassin Capucin, the freshwater lake on North Island



How the Glossy Ibis got to the island, and that it manages to maintain a small but continuous presence, remains a mystery.



The 'harbour' at La Fourche, Agalega. We had to transport everything by barge from Patrol One, to and from the island.

Adventure called and we arranged an expedition to Agalega for the Blue Skies project on pollutants on coral reefs. Patrol One took us at high speed from St. Brandon's ([see previous article](#)) in a modicum of luxury; but the rocking, rolling, and slamming into the waves made life very uncomfortable. The oven failed—we ate half-frozen rice dishes and cookies. Nevertheless, the journey was memorable. French wine smoothed and cemented relations with the governor with whom we lodged. We were treated very friendly as we were the

first tourists for many a year. We dove on the coral reefs collecting coral samples and fish, and did bird and plastic surveys. Quite a number of small adventures were had by the six of us on the team.



Caption: From left to right: Marinus du Preez, Veronica van der Schyff, and Karin Blom, dissecting parrot fish for analyses.

For departure, our equipment had to be uploaded into Patrol One. With an almost non-existent traffic infrastructure, two clapped-out bakkies were volunteered—the best freight transport we could find. Four of us were off-loading the first bakkie at the pier, when the second came over the dune. The brakes promptly failed as it could not handle the diving equipment, compressor, the leftover wine, and big guys on the back. Of the four of us, three managed to jump out of the way, but Henrik, a hefty personage, was slammed between the bumpers just above his knees.



Henrik Kylin entertaining an audience of well-wishing islanders.

Keeping him upright as we would not be able to pick him up afterwards, we bundled him in the back of another car and rushed him to the clinic, under supervision of Karin. I remained behind to arrange a day's delay in our departure. The doctor thought that Henrik might have broken his leg. With no X-ray equipment for confirmation, he had to be flown out. Arrangements were made by satellite phone between Sweden and Mauritius (what a palava!) to get him airlifted to Seychelles two days later. But by then, we had departed to St. Brandon's, abandoning Henrik to the ministrations and care of the kind people of Agalega, each religious group performing their prayers on him in bed. This was the first traffic accident on this island—ever—so we contributed a little to the rich history of Agalega.

With no phone charger, no money, flat on his back, and not able to speak French, Henrik managed to be stranded again, in Seychelles. Fortunately, nothing was broken, but painful nevertheless. While we were cavorting (working) on the beaches and coral reefs of St. Brandon's (and drinking the leftover wine—after hours mind you), Henrik was eventually airlifted back to Sweden. The airline upgraded him to first class to accommodate his stiff leg, and comforted with wonderful champagne and a 54–135-year-old blended cognac as recompense for the missed days in the field!

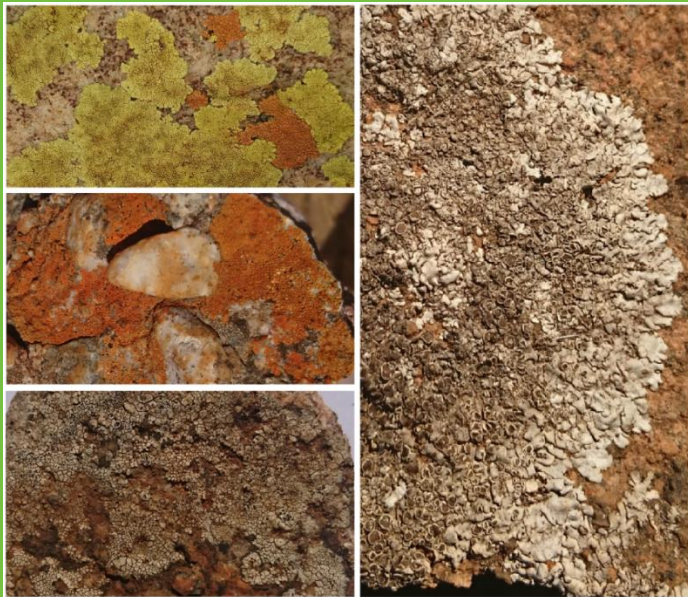
PS: Unfortunately, global [power politics](#) has caught up with Agalega, and a naval and air base is under construction, forever transferring the isolated nature of this beautiful island. Au revior, bon Agalega, you made an impression on our hearts (and knees)!



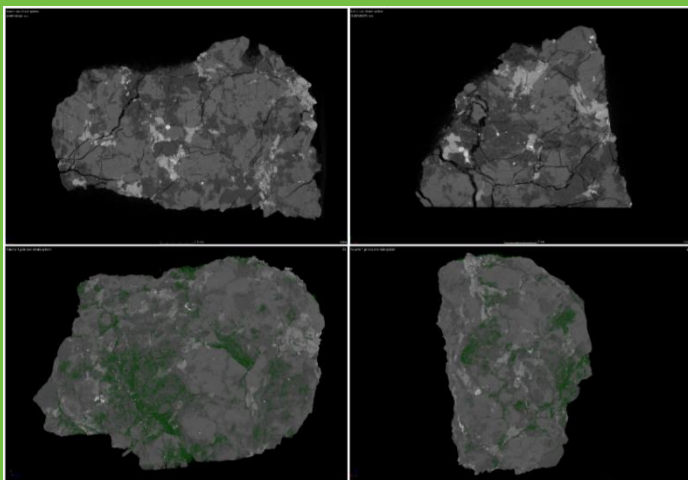
On Patrol One. Front, from left to right: Marinus du Preez, Karin Blom, Jovanni Raffin (dive supervisor). Back: Veronica van der Schyff and Henk Bouwman

Between a rock and a hard place: lichen-induced rock-weathering in the Vredefort Dome

A lichen is a composite organism that arises from algae or cyanobacteria living among filaments of multiple fungi species in a mutualistic relationship. Also see page 21 and 22 of the [Spring 2020 edition of ENVIRA](#).



Saxicolous lichens



Granitic rocks characterized by a well-developed pore-fracture network that are more extensively invaded by hyphal penetration. Matrix of lichen thalli has been rendered semi-transparent in shades of green.

[Impact cratering](#) is a ubiquitous geological process that is characterised by often intense and sudden deformation of immense volumes of planetary objects with a solid surface (Reimold and Gibson, 2009). The effects of impact cratering have also been shown to extend far beyond the production of craters with evidence of its involvement in major biological extinctions and the ability to produce tsunamis, extreme atmospheric disturbances, and short- and long-term climate change. Nevertheless, impact cratering can favorably change the availability and habitability of a substrate for living organisms (e.g. lichens and microbes), which are then able to (re)colonize microfractures and pore spaces created during the impact. In doing so, these living organisms in turn weathers the rock substrate through biomechanical- and biochemical weathering actions, contributing to the preliminary phases of soil formation and cation mobilization.

It is well documented that land colonization by plants and their fungal and bacterial symbionts was fundamental to the evolution of terrestrial ecosystems, but how their communities influenced mineral weathering and soil development in the southern hemisphere and African environments remains largely unknown. Based on these shortcomings, the $\sim 2023 \pm 4$ Ma Vredefort Dome in South Africa was selected as a case study to investigate the potential role of saxicolous (rock-living) lichens in the deterioration of impact-induced rock surfaces in the southern hemisphere and African environments. The research formed part of the geocological research conducted by the GeoEco Lab of Prof. Stefan Siebert.

The study found that granitic rocks were characterized by a well-developed pore-fracture network and were generally more extensively penetrated by hyphae compared to metasedimentary rocks, which show a well-

Mildred van der Merwe-Radloff
'MSc Award'

BJ Smit (MSc graduate)
GeoEcology Research Group

defined decrease in particle size and permeability, presumably related to pore collapse and/or impact-induced annealing. However, the heterogeneous distribution of collapsed pores, melt phases, and subsequent recrystallization, resulted in heterogeneous lichen colonization patterns. Cavities and vesicles which formed during melting yielded new habitats for both cryptoendoliths (living in rocks) and chasmoendoliths (living within rock fissures), manifested in the natural colonization of meteor impact-shocked silica-rich rocks. The pore-fracture network serves for element transfer in the subsurface part of solid rocks and releases important nutrients that otherwise would remain bound. Moreover, the substrate zone where the saxicolous lichens are attached is most affected by weathering reactions and

shows the highest co-occurrence of lithobiontic microorganisms.

Because of their crustose and foliose morphology, the saxicolous lichens examined were mainly involved in combined biophysical and biochemical action, mainly on nutrient-rich, weatherable minerals. Generally, fungal hyphae were localised to the feldspar (mostly plagioclase), mica (mostly biotite and muscovite) and amphibole (mostly Fe-hornblende) component of silica-rich rock varieties compared to quartz and iron oxides. Nevertheless, quartz and iron oxide were also weathered quite significantly. The importance of variable microtextural features, such as twinning and cleavage planes, physical micro-flaws, etch pitting and dissolution lines, seems to be prominent, inducing macro-scale effects which lead to the progressive disintegration of the substrate, with detachment and progressive incorporation of their fragments into the lichen thallus.

Major products of rock transformation in situ are the neoformed phyllosilicate clays (and possible amorphous silica), iron release and oxide staining along cracks, oxalate, mycogenic minerals, organic matter accumulation and abundant biofilms that are formed within the porous space in the subsurface part of solid rocks. Such secondary weathering products are mainly attributed to degradative activities, metabolite excretion and/or sorption phenomena. It is thus likely that the physical and chemical properties of the substrate, along with lichen and microorganism activity, determine weathering rates in different microenvironments and microhabitats.

Further reading:

Adamo, P. and Violante, P. 2000. Weathering of rocks and neogenesis of minerals associated with lichen activity. *Applied Clay Science*, 16:229-256.

Chen, L., Blume, H.P. and Beyer, L. 2000. Weathering of rocks induced by lichen colonization - a review. *Catena*, 39:121-146.

Gadd, G.M. 2017. Geomicrobiology of the built environment. *Nature Microbiology*, 2(16275):1-9.

Supervisors: [Stefan Siebert \(NWU\)](#), [Gaathier Mahed \(Nelson Mandela University\)](#)



Examples of lichen colonies.

An EAGER look at Disaster Risk Reduction and Sustainable Development

Kristel Fourie

Disaster Risk Science Research Group

Researchers in academic institutions are regularly criticised for working in ‘ivory towers’. From within the complex society in which we function, a blindspot is created when we only look at a problem from one disciplinary vantage point. It is crucial to analyse a system, environment or problem from various perspectives. Two disciplines that often intersect in terms of knowledge, and influence one another, are sustainable development and disaster risk management. This was the context for determining how the EAGER (Engaging African GIRRLs¹ in Gender Enriched Risk Reduction) Project, implemented between 2015 and 2017, contributed towards Sustainable Development (SD) and the Sustainable Development Goals (SDGs).



EAGER session at Kasika Namibia.

The EAGER Project was developed as a capacity-building initiative focusing on risk reduction. EAGER was implemented in parts of Botswana, Eswatini, Mozambique and Namibia. In each project site, 40 participating students (both male and female) were selected from schools in the area. Participants were selected by the EAGER Trainers, who in most cases were teachers in each of the participating schools. The EAGER project intended to address vulnerabilities and build capacity to combat the impact of hazards in the four project sites ([NWU-ACDS, 2017](#)). Hazards in the four project sites include seasonal flooding and wildlife interaction in Namibia, drought and flooding in Botswana due to its proximity to the Chobe and Zambezi river. In Eswatini and Mozambique, areas experience extensive droughts and environmental degradation with flooding

especially in Mozambique being a concern. The project activities, and ripple effects thereof, indirectly contribute to SD and the objectives of the SDGs.

It is generally accepted in both development and disaster risk management theory that bad development decisions can contribute greatly towards increased disaster risk and increase the negative impacts of disasters. In turn, disasters can wipe away progress made in terms of sustainable development initiatives and outcomes ([O’Keefe et al. 1976](#); [Cuny et al. 1983](#); [UNDP 2004](#)). In 2015, two key international policies were developed, i.e., Sendai Framework for Disaster Risk Reduction (DRR) and later in the same year the United Nations 2030 Agenda for Sustainable Development identified 17 SDGs. Notably, language in the SDGs recognise the link between development and DRR by explicitly using DRR-related terminology. Such a link creates a basis for researchers, practitioners, and government to literally talk the same language when addressing disasters and development challenges.

EAGER results showed that project activities identified and developed by the participants related to various SDGs. One area where the link between DRR and SD is most clear was with EAGER sessions relating to SDG1: End poverty in all its forms everywhere. In DRR theory, poverty is highlighted as one of the main drivers of vulnerability ([UNISDR, 2015](#)). In the Namibian project sites, specifically, the contribution was clear. The project areas in Namibia are some of the most isolated of all the EAGER sites. The economic prospects for the children in these areas are not favourable. Only a few high-end



Lodge and compound, Kasika Namibia.

¹G.I.R.R.L - Girls in Risk Reduction Leadership

tourism lodges exist in the area offering employment potential. Job opportunities are limited and most people remain dependent on fishing and livestock farming as alternatives for some kind of income. With the area being so rich in wildlife, poaching offers an attractive livelihood strategy in the context of limited options. EAGER trainers identified entrepreneurial skills, knowledge and business management as some of the crucial aspects to offer students and to emphasise creative thinking in generating an income. Trainers developed sessions focussing on entrepreneurship, business development and career guidance. Stimulating creative thoughts about economic opportunities and generating an income contributes to fighting poverty. In addressing poverty,



Fishing practices at Impalila Island, Namibia.



Barber Entrepreneurship Day at Impalila Island, Namibia.

vulnerability is reduced and thus disaster risk is lessened in the process.

This is one of the main examples discussed as part of a chapter published on the EAGER Project with the intention to build DRR capacity and to illustrate how project activities indirectly also addressed sustainable development. This chapter can be found in the newly published book: Sustainable Development in Africa as part of the World Sustainability Series from Springer.

<https://doi.org/10.1007/978-3-030-74693-3>

Livestock farming,
Namibia.



Little patches of diversity: the value of small fragments of pristine grasslands

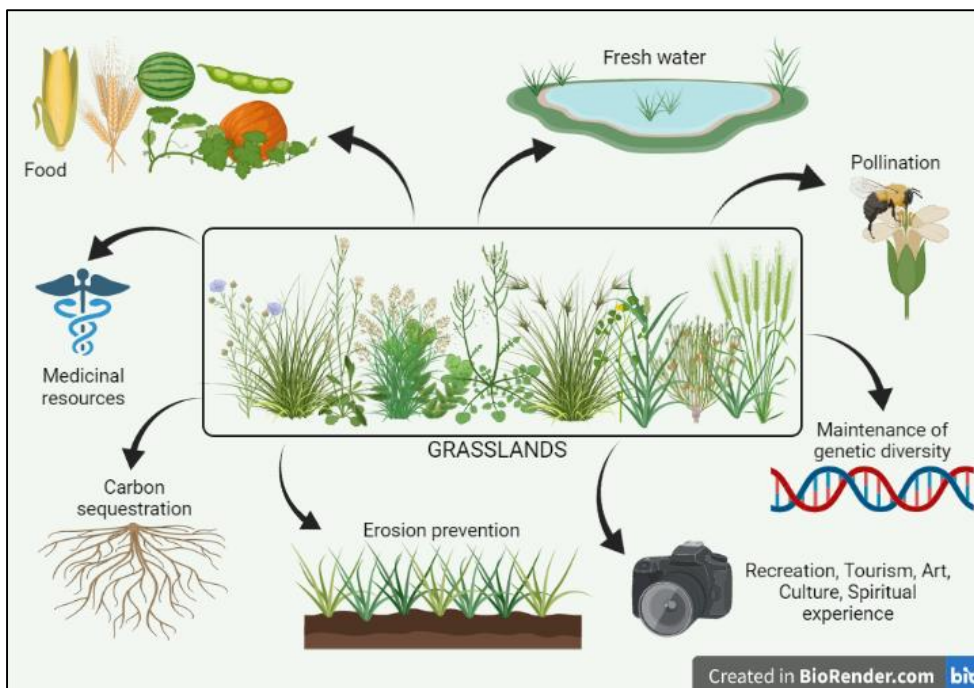
Marlize Muller (PhD student)
Forb Ecology Research Group

Grasslands have long been neglected as an important ecosystem, since it is erroneously believed that forests represent the dominant climax state. This notion has been challenged by the fact that more than 58% of the planet's land area is covered by non-forested, ancient open-ecosystems (including deserts, grasslands and savannas). Despite this, the threats faced by forests are well understood, documented and resourced (think Amazon rain forests), while open-ecosystems such as grasslands are poorly managed and conserved ([Bond, 2019](#)).

Grassland systems are host to an exceptionally high diversity of animal and plant species, habitats and communities. For instance, there are 161 orchid taxa in the Grassland Biome of South Africa, of which 67% are endemic. Grasslands are, however, threatened by human activities, as species richness decreases by nearly 50% after land transformation ([Muller et al., 2021](#)). Many grassland species are not tolerant to anthropogenic soil disturbance and disappear completely from the system. This is especially true for plant species with underground organs adapted to survive harsh winter conditions, drought and fire. The loss of species when grasslands are transformed could have a significant impact on the ability of these systems



The Orange River lily (*Crinum bulbispermum*), grows in moist grasslands.



Some of the ecosystem services provided by grasslands.

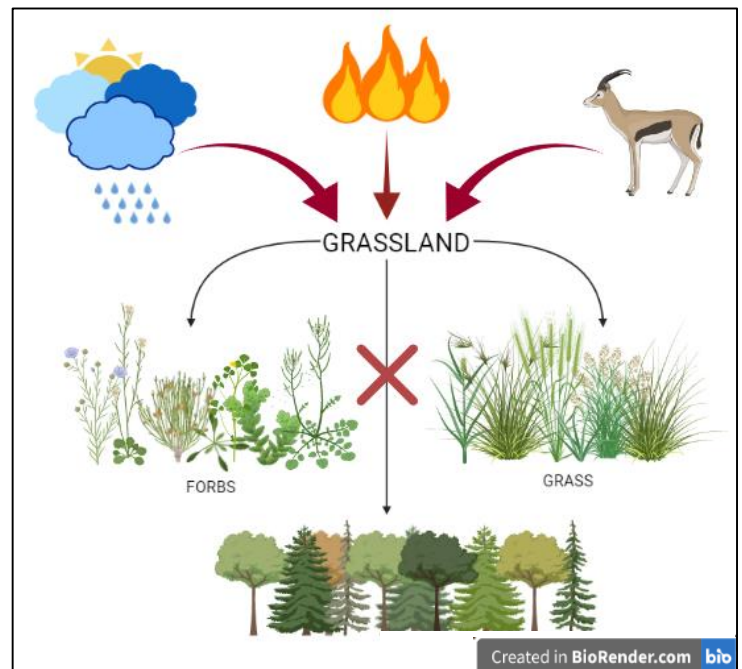
to provide vital Ecosystem Services (ESs). Untransformed grasslands provide a variety of ESs that are necessary for our survival (Figure 1), including the provisioning of food, fresh water, medicinal resources and the regulation of systems, such as erosion prevention and carbon sequestration ([TEEB, 2011](#)).

The Grassland Biome is one of the most threatened biomes in South Africa, as 40-60% has already been irreversibly modified, 60% of the remaining grassland is threatened, and only about 15% remains natural grassland with less than 3% of grasslands formally protected. One grassland ecosystem that is particularly threatened is the Woodbush Granite Grassland (WGG)

that is found close to the small town of Haenertsburg in Limpopo. Only about 6% of the WGG is still in a natural state, with the largest fragment being 192 ha in size ([Dzerefos et al., 2017](#)).

This small fragment of WGG contains ~660 plant species, making the conservation value of the area especially high. Most of these species are forb species, since grasses represent only a sixth of the total richness. Herbaceous bulbs and forbs are the life forms that contribute to the high diversity even though they occur in low densities.

Pristine patches of grasslands, such as the WGG furthermore provide a natural buffer to extreme events, such as droughts. Grasslands have evolved in the presence of endogenous disturbances, such as lightning-ignited fires, rainfall variability and large mammalian herbivory and are therefore tolerant and to some extent dependent upon these natural disturbances (Figure 2). The Forb Ecology Research Group ([FERG](#)), in close collaboration with the South African Environment Observation Network (SAEON) and Potsdam University assessed the effect of the severe drought of 2014-2016 on the floristic diversity of fragmented grasslands, with a specific focus on the WGG. Results revealed that the floristic diversity of the WGG remained largely intact when pre-drought, in-



Grasslands consist of a high diversity of forb- and grass species that are maintained by inter-annual rainfall variability, fire and herbivory. Indigenous trees are scarce, although large areas of natural grasslands are covered by exotic timber plantations.

drought and post-drought data were compared. Our further investigations into the functional ecology of these grassland patches are expected to improve the understanding of ecosystem resilience in grasslands and why they need to be protected, restored and managed sustainably.



An orchid species, *Eulophia ovalis* var. *ovalis* (left) occurs in open grassland and a bulbous geophyte, the thick-leaved gladiolus (*Gladiolus crassifolius*) (right) is found in rocky grasslands.



An orchid species, *Eulophia welwitschii*, is often found in marshy areas and seasonally flooded grasslands.

Supervisors: Frances Siebert (NWU), Anja Linstädter (University of Potsdam), Dave Thompson (SAEON), Stefan Siebert (NWU)

People eat that food, so if you give a hoot, don't pollute



Sutapa Adhikari (PhD graduate)
GeoEcology Research Group

Rachel Carlson, eminent environmentalist of the 1940s-50s, said that “the most alarming of all man's assaults upon the environment is the contamination of air, earth, rivers, and sea with dangerous and even lethal materials”. Nothing has changed since, and in South Africa the pollution impact of human society is becoming more prevalent every day.

This research project was concerned with chromium (Cr) dust pollution associated with the mining industry along the eastern Rustenburg Layered Suite (RLS) in Sekhukhuneland, Limpopo. Of specific interest was the influence of plant/leaf morphology on foliar dust deposition and metalliferous dust contamination of useful plants and the associated health risks. Useful plants refer to plant species used for food and/or medicinal purposes by local communities. Cr dust deposition on leaf surfaces, mostly from mines, tailings, ferrochrome smelters and ore transport routes was found on 67% of the assessed plant species (Figure 1). A significantly higher foliar Cr dust deposition was linked to plant height and larger leaf area. Various leaf micromorphological traits (i.e., epicuticular wax structures, stomata and trichomes) further enhanced Cr dust adhesion. As one would expect, proximity to multiple pollution sources increased Cr dust deposition on plant leaves.

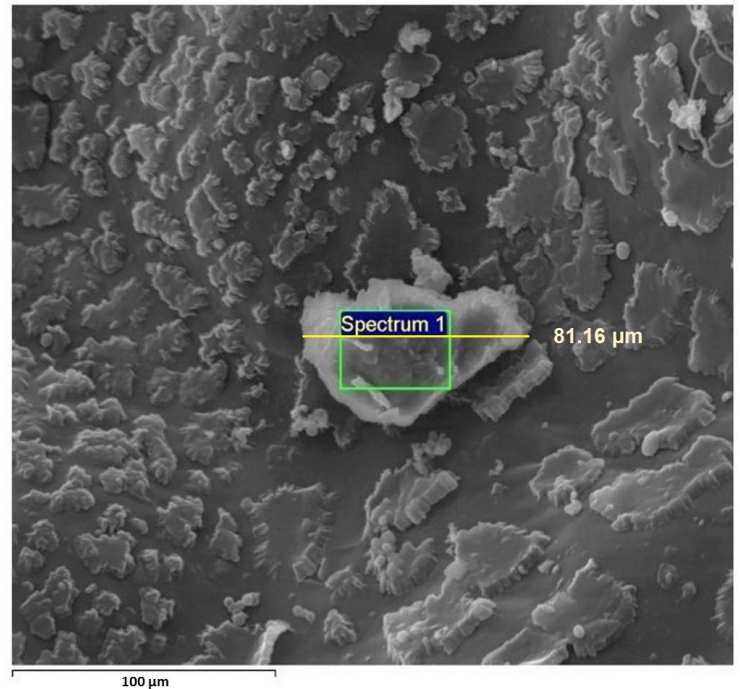


Figure 1: Scanning electron microscope image of the adaxial leaf surface of *Carica papaya* (pawpaw) with an identified Cr particle lodged in dense wax platelets. Leaves of this commonly grown exotic fruit tree in home gardens are used to treat tuberculosis, sexually transmitted diseases and skin ailments (Mogale *et al.*, 2019). ‘Spectrum’ indicates randomly selected particles for Energy Dispersive X-ray Spectroscopy analysis to record elemental compositions and thereby identify Cr containing dust particles.



A typical tailings dam in Sekhukhuneland.

Total Cr content of unwashed and washed leaves exceeded international permissible levels set for food and medicinal plants, indicating severe Cr contamination. A three-fold higher mean total Cr content on unwashed compared to washed samples, suggested dust as a major source of Cr in Sekhukhuneland. High carcinogenic risks were estimated for total Cr, Cr(VI) (the highest valence state with greatest toxicity potential) and nickel via ingestion of leafy vegetables. Fortunately, negligible non-carcinogenic health risks were estimated for both these metals. Among other metals with toxicity potential (i.e. Al, As, Cd, Co, Cu, Hg, Mn, Mo, Pb, Sb, V

and Zn), aluminium was responsible for the highest estimated daily intake. People inhabiting mining localities in Sekhukhuneland are probably exposed to cumulative effects of potentially toxic elements via consumption of contaminated plant leaves whether washed or unwashed. Dust pollution should be of concern as prolonged ingestion of Cr may induce serious health problems in humans, e.g., skin and gastrointestinal ailments, and liver and kidney damage ([Awodele et al., 2013](#)).

A further comparison of accumulated metal concentrations (Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Sr and Zn) inside plant leaf tissue of 47 dominant plant species and the soil (rhizosphere), sampled from various topographic positions and land uses, revealed that mine tailings had significantly higher Cr levels compared to other land uses (Figure 2). This confirms that tailing facilities are a major source of Cr dust in Sekhukhuneland. Foliar metal bioaccumulation factors (BAF, a ratio of metal concentration in leaf tissue to that in soil) indicated several plant species as metallophytes (ability to tolerate metal toxicity, [Baker et al., 2010](#)) that survive on metal enriched soils of both geogenic (ultramafic) and anthropogenic (mining activity) origin. Indigenous species with a greater metal bioaccumulation trait (BAF > 1 for several metals) and fast growth rates hold potential for use in phytoremediation to restrict further dispersion of pollutants from contaminated sites, especially tailing facilities.

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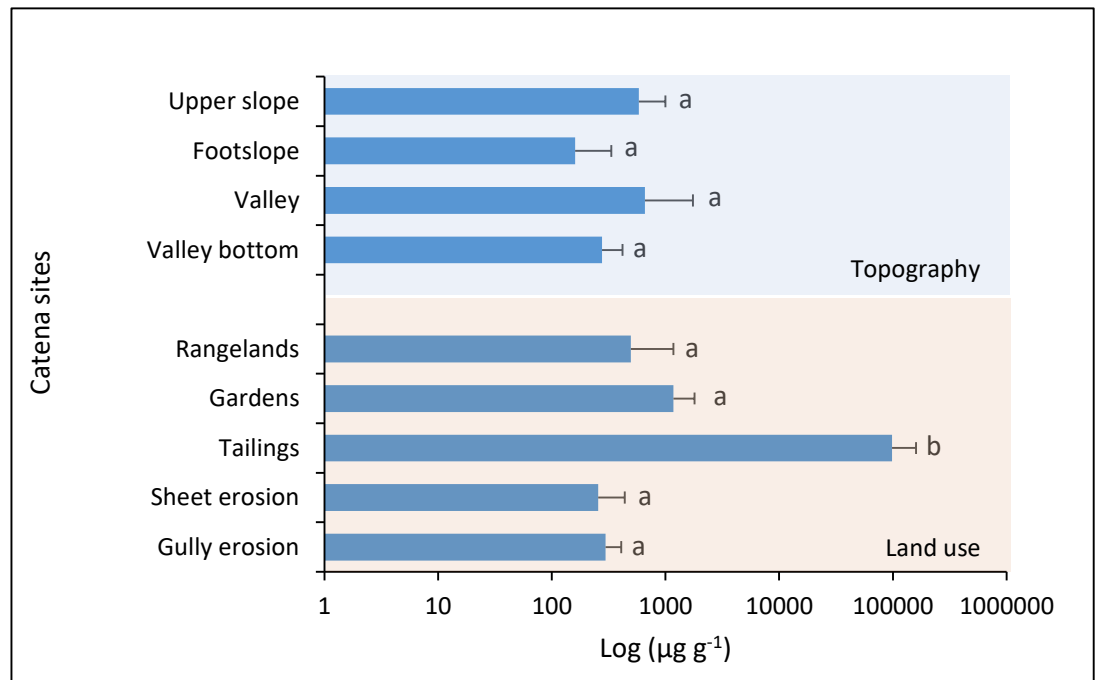
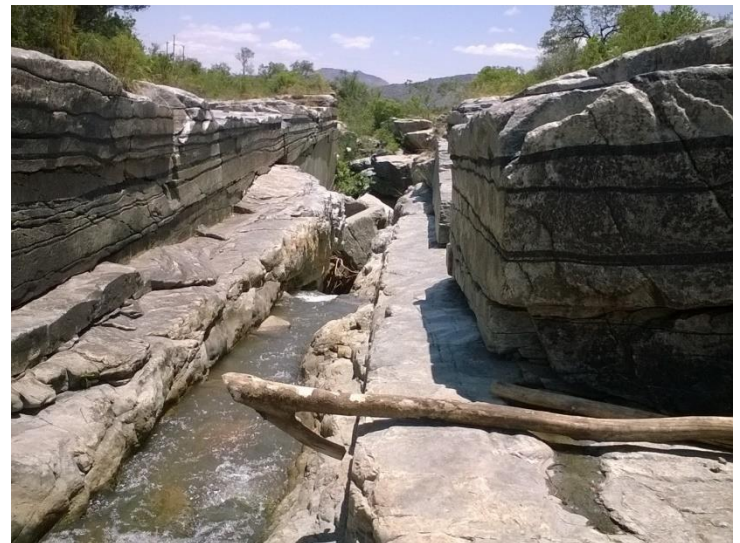


Figure 2. Cr concentration in soil. Different letters represent significant difference in the pairwise *post hoc* comparison ($p < 0.05$). The graph indicates that tailings hold the highest concentrations of Cr among the evaluated localities.



Exposed chromitite (dark-coloured) and anorthosite (light-coloured) rock layers of the eastern RLS at the Dwars river valley, Steelpoort, Limpopo.

Promoters: Stefan Siebert (NWU), João Silva (NWU), Anine Jordaan (NWU)



Improving the effectiveness of Environmental Impact Assessment: researching the effectiveness of environmental auditing in South Africa

Theunis Meyer

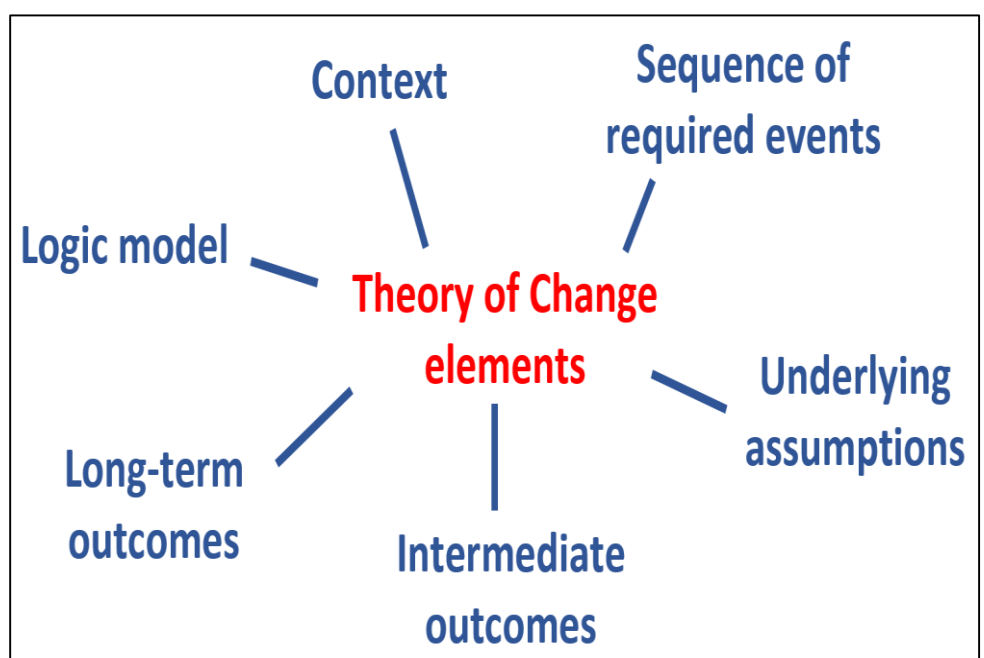
Environmental Impact Assessment (EIA) supports environmental protection and sustainable development by linking development to the biophysical and socio-economic elements of the environment. It is one of the most successful policy instruments globally to achieve linking economic development with environmental and social concerns. Society at large relies mainly on EIA processes to safeguard the environment, while promoting justifiable economic development.

Confidence in the EIA process is the key to success, as EIA is most successful when all parties trust each other and work together, even when interests are not aligned. When these parties trust the process, it promotes meaningful collaboration and can improve outcomes, but distrust creates conflict and leads to uncertain outcomes.

EIA effectiveness is critical to promoting confidence among role players in the process. In most EIA systems, effectiveness evaluation focuses on the decision-making process, with little attention to post-decision-making implementation. However, most environmental impacts occur during implementation, when environmental management activities and mitigation measures are implemented. Post-decision-making activities are, therefore, essential components of EIA effectiveness. Unless such activities are performed effectively and deliver the results required, they may compromise the expected outcomes, negatively affecting the confidence in the EIA process.

To date, few scientific studies have evaluated the effectiveness of environmental auditing (Evans *et al.*, 2011). To address this, new research at the UESM will evaluate the effectiveness of environmental auditing in the South African EIA system, in line with the research focus on the effectiveness of EIA. The research will apply a multi-dimensional and integrative Theory of Change (ToC) approach to evaluate EIA effectiveness. 'Theory of change' (ToC) relates to how and why an initiative works (Weiss, 1995). It is not an evaluation method, but an outcomes-based approach to evaluation, which is increasingly applied in the monitoring and evaluation of policy and programme implementation globally and has also been selected by the South African government.

ToC is a participatory dialogue-based process to generate a 'description of a sequence of events that is



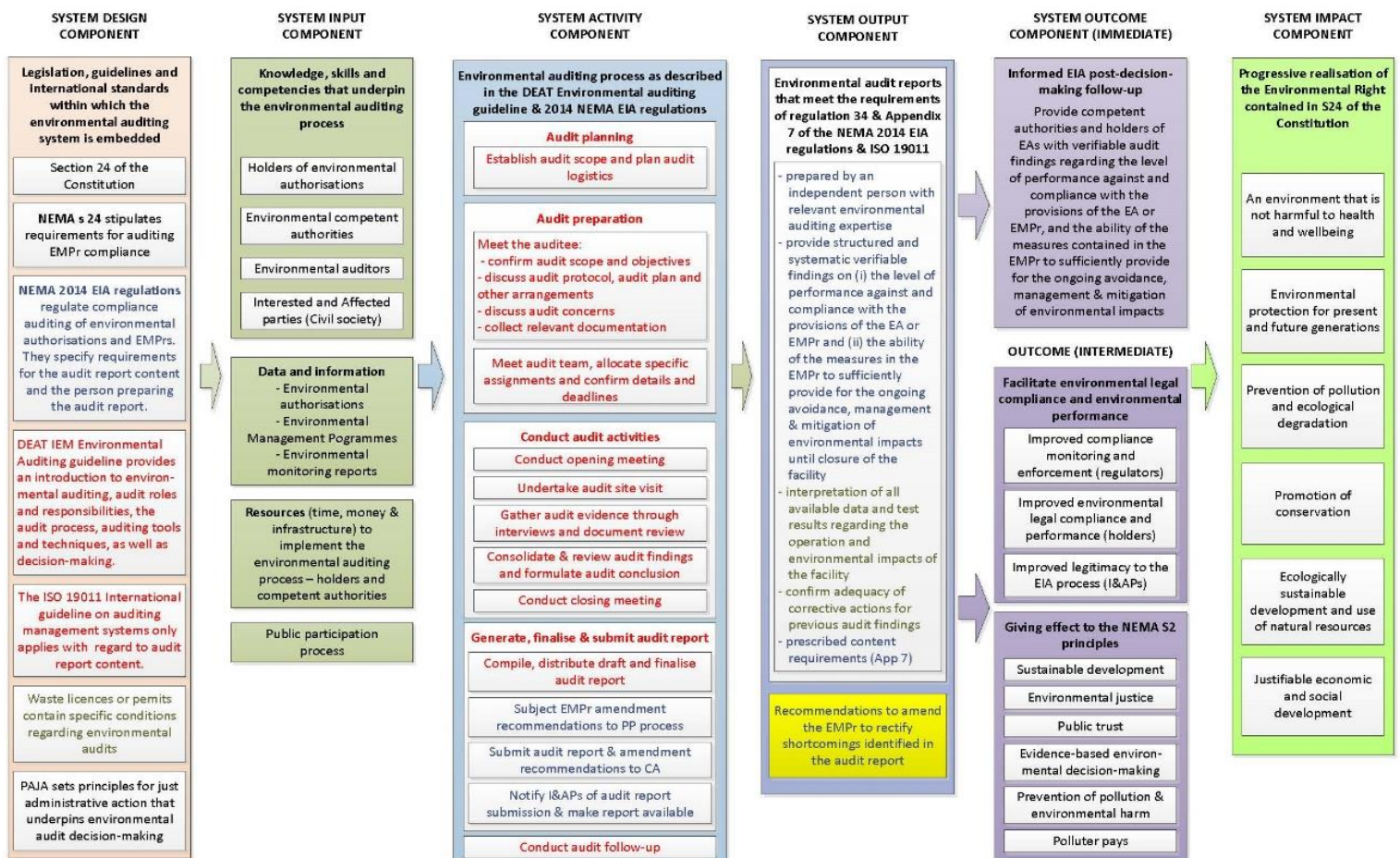
Generic TOC elements

expected to lead to a desired outcome' (Vogel, 2012). The ToC evaluation framework is based on critical assumptions about the change process, the drivers thereof and the contextual conditions that may affect the desired outcomes. The assumptions are the 'theories', i.e. those conditions in the environment in which the initiative will take place that must hold for the theory to be realized. Explicitly formulating assumptions is perhaps the most important and most challenging stage in a ToC process. The ToC model is used to test hypotheses and evaluate the assumptions about what actions bring about the intended outcomes, using indicators of success as a roadmap for monitoring and evaluation.

For this purpose, I have already developed an initial ToC framework and critical assumptions for environmental auditing in the South African EIA system, which is being refined. I am currently working on identifying key questions with key performance indicators, which will allow me to evaluate the effectiveness of environmental auditing in the South African EIA system. Once this is done, I will make recommendations to improve the effectiveness of environmental auditing and the EIA process as part of my PhD studies.

Promoters: Francois Retief (NWU), Kobus van der Walt (NWU)

ToC conceptual framework for the evaluation of the effectiveness of the South African environmental auditing system



TOC framework developed for the evaluation of environmental auditing effectiveness.

PHOTOGRAPHY COMPETITION

Once again, our Features section of the Summer Edition of ENVIRA will consist of a

Photo Gallery'

We invite all UESM staff members, postdoctoral fellows, and postgraduate students to participate in this photography competition.

Show off your *Spectacular* photos and stand a chance to win R1000.00 per category.

Photos taken with professional cameras will be judged separately from those taken by lower-quality cameras (see rules and regulations and entry form for details).

Entries are accepted in any of the following prize-winning categories:

1. Landscape photography
2. Macro-organisms / wildlife
3. Micro-organisms / microscopy
4. Funny features and creatures

Strictly one photo per category will be allowed which totals to a maximum of four photos per participant.

Winners will be announced in the

Summer edition, 2021.

[Competition Rules and Guidelines & Entry Form](#)

Photo submission deadline:

31 October 2021



Acknowledgements

We would like to thank the following people who have made invaluable contributions towards this *Spring* edition of ENVIRA:

- Prof Rialet Pieters, for her willingness to participate in this edition's Interview in celebration of Women's Month.
- All the authors who willingly shared their accolades, community projects, facilities, hobbies and research with readers of this edition.

We appreciate every contribution.

Look out for the *Summer* edition 2021, coming soon.

Frances and Clarissa

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