Sustainability Handbook

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CALL FOR PAPERS

Dear Prospective Author

Thank you for considering contributing a chapter or article to the Sustainability Handbook.

The handbook is collected work, assembled from many scholars in the field of sustainability of the built environment and industry across Africa, featuring both refereed and non-refereed (popular interest) chapters and articles. The purpose of the handbook is to disseminate original research and new developments within the field and to advance scholarship. The most recent edition of the Sustainability Handbook series can be viewed by clicking on the link.

Refereed chapters are thematically arranged for water, waste, green building, energy or sustainable transport.

The featured themes for Volume 5 are circular economy, and sustainability for just regeneration, although any sustainability topics relevant to the built environment and industry will be considered. For a chapter or article to be published in the handbook it should be clearly written, be of interest to readers and be methodologically and technically sound. It must reference source material and not violate copyright. For a chapter or article to be considered as a refereed item, it should also make a new contribution to knowledge.

STEP 1: submit a title and 500 word abstract describing what your paper intends to cover by the abstract deadline. This will be received by the editor who will check that it is suitable. Refereed chapters are peer reviewed by subject matter experts identified by the publisher/ editor. If the item seems suitable, authors will be invited to prepare a full chapter manuscript.

STEP 2: Authors submit a 5000 word full chapter to the editor by the deadline indicated and this will be redacted to remove identifying features and sent to between one and three experts in the field. Authors will be provided feedback from their anonymous reviewers (via the editor) a few days after the review deadline and will be provided a limited time to respond to reviewers' feedback. Authors may be required to arrange independent professional language or grammar edits, at their own cost.

STEP 3: The editor reviews amended chapters received and if they are of good quality will release them to the publishers for layout and digital publishing. Photos and brief biographies of authors are included in the front-matter of the handbook. The publisher and editor reserve the right to make minor adjustment and will provide a final proof before publishing.

Whilst every effort is made to comply with Department of Higher Education and Training, Research Outputs Policy of 2015, this is not guaranteed, and prospective authors are advised to seek confirmation from their institutional offices in this regard.

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Tap for more info

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NCPC

INDUSTRIAL EFFICIENCY IN SOUTH AFRICA

Empowering Women to Participate in the Green Economy

The 2023 Women's Month is celebrated under the theme, ***"Women's Socio-Economic Rights and Empowerment: Building Back Better for Women's Improved Resilience"***.

The National Cleaner Production Centre South Africa supports the quest to achieving gender equality in the green economy through:

Promoting women participation in **green skills** courses

Building strong **partnerships** with organisations that advocate for equal rights and opportunities for women such as the United Nations aIndustrial Development Organization (UNIDO)

Capacitating women to leverage **waste as a resource** and start businesses through the Industrial Symbiosis Programme

Our services

Green skills development

The NCPC-SA offers training courses designed to offer a comprehensive learning pathway for introductory, end-user and expert level courses in Resource Efficient and Cleaner Production (RECP) and other green fields.

Industry and sector knowledge sharing

NCPC-SA offers capacity building workshops in the green economy and participates in industry events participation.

Company technical support

- The **Industrial Water Efficiency** project promotes the transformation of industrial water use practices in South Africa to reduce water consumption and improve industrial water effluent quality.
- Through the **Industrial Energy Efficiency**, the NCPC-SA has supported industry with the adoption of Energy Management Systems aligned with the ISO 50001 and Energy Systems Optimisation approach.
- The **Industrial Symbiosis Programme** provides opportunities for synergies between companies that HAVE under- or unutilised resources with other companies who WANT them.
- The **Eco-Industrial Parks Programme** promotes the greening of industrial parks by improving resource productivity, economic, environmental, and social performances of businesses.

Find out more about the NCPC-SA: www.ncpc.co.za | ncpc@csir.co.za

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THA 19-2023

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Department:
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UNIDO

CSIR
Touching lives through innovation

BENOÎT LE ROY

Benoît Le Roy is an environmental alchemist with forty years of water engineering experience and is the CEO and co-founder of the South African Water Chamber established to represent the private water infrastructure sector to collaborate with and assist government to implement the national water and sanitation master plans; he is also a founding director of Nexus Water Alchemy and Water Ledger South Africa, both incorporated South African companies at the leading edge of the nexus of water digitisation. This will not only be key in reindustrialising the water sector, but it will also provide a myriad of skilled jobs and the opportunity to again export water related products and expertise globally.

WANDILE SIHLOBO

Wandile Sihlobo, an agricultural economist by training, is Chief Economist of the Agricultural Business Chamber of South Africa (Agbiz). Sihlobo was appointed as a member of President Cyril Ramaphosa's Presidential Economic Advisory Council in 2019 after serving on the Presidential Expert Advisory Panel on Land Reform and Agriculture between 2018 and 2019. Sihlobo is also a member of the Council of Statistics of South Africa (Stats SA). He is a Commissioner at the International Trade Commission of South Africa (ITAC). Sihlobo is a columnist for Business Day and Farmers Weekly magazine. He is a member of the Agricultural Economics Association of South Africa (AEASA). Sihlobo is an author of "Finding Common Ground: Land, Equity and Agriculture" published by Pan Macmillan in March 2020. He is also a contributor to the book "Recession, Recovery and Reform" published by Jacana in August 2020. Sihlobo holds a Master of Science degree in Agricultural Economics from Stellenbosch University.

KHENSANI NKATINGI

Khensani Nkatingi is a motivated and results-driven Sustainability Consultant with a profound passion for driving positive environmental and social change. With a solid academic foundation and practical experience in sustainable development, Khensani brings a unique blend of expertise to her role. Holding a PgDip in Sustainable Development from Stellenbosch University, she stands at the forefront of innovative solutions that bridge the gap between business objectives and sustainable practices.

EMMANUEL MARUME

Cofounder and Director at Farmbuzz Agriculture solutions. Emmanuel is also an award winning Agronomist who is passionate about smart farming and precision farming.

CATHERINE WIJNBERG

Catherine Wijnberg is the Director and Founder of Fetola, a leading provider of scalable, world-class entrepreneurial support programmes for African entrepreneurs which helps people build businesses that last through scalable solutions that deliver social, environmental and economic impact. Fetola means "change" in Sesotho - and they aim to empower people through supporting the growth and development of sustainable, empowered and thriving small and medium enterprises (SMEs) at scale. She is a thought leader on small business development, sustainability and circularity, with a particular passion for effecting scalable impact at the ecosystem level for leadership development.

CHRIS CAMPBELL, CEO CONSULTING ENGINEERS SOUTH AFRICA

Over his 40-year career in engineering, Chris Campbell has worked in various capacities in a number of successful consulting engineering companies, spent several years at Transnet Freight Rail and has held executive positions at Aveng Infraset, both locally and internationally. His institutional involvement includes past Gauteng Branch Chair (SABTACO); past Vice President of the South African Institution of Civil Engineering (SAICE); past President of the Engineering Council of South Africa (ECSA); past Vice President of The World Federation of Engineering Organisations (WFEO). Currently he is a Board Member of Business Unity South Africa (BUSA). Chris, a registered Professional Engineer, holds a National Higher Diploma (T4) in Civil Engineering; a BSc. Civil Engineering degree (Summa Cum Laude).

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Annemie, an Architect at 2ADSpace Architects Inc., holds a BSc (Arch) from the University of Pretoria. She achieved distinction in her BSc (Arch) (Hons) and BSc (Arch) (Prof) degrees, with a decade-best performance in her Master's degree. Her approach centres on holistic design, respecting cultural heritage and context. Annemie emphasizes in-depth contextual analysis to guide considerate designs that harmonize with people and the built environment.

BRIAN MANTLANA

Brian Mantlana leads the work of climate change at the CSIR. Brian studies environmental science at the Westville University and at Natal University. He then did his Ph.D at Wageningen University, in Netherlands, while based at the Max Planck Institute for Biogeochemistry, in Jena, Germany. He started working at SANBI, in Kirstenbosch before joining the Department of Environmental Affairs as a Chief Director. He then joined the CSIR in 2017. Brian Mantlana is a member of the Presidential Climate Commission. He has led several climate change related projects, and has published more 25 peer reviewed articles in the field of soil-plant-atmosphere interactions, climate policy and SDGs.

DR. MAO AMIS

Dr. Amis is the Co-founder and Executive Director of the African Centre for a Green Economy, a leading non-profit think tank based in South Africa. The Centre's mission is to champion an inclusive and just transition in Africa, through undertaking research and providing thought leadership. Dr. Amis has more than 15 years' experience in the green economy sector in Africa and globally, as a researcher and thought leader. He advices on a range of issues including climate finance, low carbon development, inclusive business models, corporate sustainability strategies, water stewardship etc. He began his career as a conservation biologist, working for WWF-South Africa as a freshwater programme manager, where he worked with leading companies to help them understand their water related business risks and develop mitigation strategies. Between 2016- 2017, Dr. Amis was an Adjunct Professor at the Graduate School of Business, University of Cape Town and he currently serves as an external examiner for the MBA programme at the Said Business School, University of Oxford. He also serves on various Boards including the South African Renewable Energy Business Incubator (SAREBI), the Freshwater Research Centre, and the Table Mountain Fund (TMF) as a non-Executive Director. Dr. Amis holds an MSc and PhD in Conservation Biology from the University of Cape Town.

DR MMALEWANE TEFFO

Dr Mmalewane Teffo is a highly accomplished Principal Researcher and the esteemed leader of the CSIR Electrochemical Energy Technologies (EET) Research Group. With her extensive expertise in heterogeneous catalysis, oxidation catalyst development and electrocatalysts for fuel cells, she assumes a crucial role in providing invaluable technical and strategic guidance to the group. Mmalewane demonstrates exceptional proficiency in various domains, including the fabrication of membrane electrode assemblies, fuel cell performance testing and the advancement of materials for fuel cells and batteries. Her unwavering dedication to research and academic excellence is evident through her impressive publication record of over 20 articles in renowned peer-reviewed journals, supervision of post-graduate students and by actively engaging in international collaborations and consistently achieving significant research milestones. Recently, she has been involved in lithium-ion battery reuse, repurpose and recycling to support the circular economy. Mmalewane continuously strives to expand the global impact of her work, establishing herself as an exemplary leader and trailblazer in the field of fuel cells and energy storage research. Email Mmalewane Teffo (née Modibedi): MModibedi@csir.co.za

SHANNON MANUEL

Shannon Manuel is the senior content producer and features writer for GQ Magazine South Africa. On a personal note, she is an individual with a slighly alarming sugar addiction and a love of everything dark, macabre, weird and creative. Earphones in, music blasting is her default setting. Professionally, she has a penchant for creating engaging content for both print and digital platforms, and is an adaptable writer skilled in strategic communication, artistic vision, and project coordination. One could say she is a supreme multitasker, with a BA Degree in Media & Writing and Film & Television Studies from UCT. Has written for Glamour SA, House & Garden SA, Leadership and Black Business Quarterly magazine - previously an editor for the latter.

CATHERINE LARKIN APR CMILT

Catherine is a communication and marketing professional, specialising in Logistics, Transport and Supply Chain. She does a lot of work for membership-based associations in logistics, transport and supply chain. She is the only consultant in the country who currently does work for the 5 leading transport associations in South Africa. She also served as judge in the Women in Transport Awards hosted by the Transport Evolution Africa Forum & Expo in 2018, as well as the Africa Rail Awards, hosted by Terrrapin in 2019. An accredited public relations professional (APR) and a Chartered Member of the CILT (CMILT, Catherine believes that lifelong education and learning is the key to success, as is mobility – hence her passion for transport and logistics! Catherine has developed a high-level and extensive network in this sector and loves connecting people and sharing opportunities. Her company, CVLC Communication, is a corporate public relations, communication, marketing and events consultancy. Established 19 years ago, Catherine has succeeded in positioning the company as a professional organisation, developing an extensive network and strong reputation in logistics, transport, supply chain and warehousing. The company's services range from full secretariat support, project management and administration, strategy development, stakeholder engagement, through to event organisation, media, social media and publicity, as well as a range of writing and creative services. She recently completed her Global Supply Chain and Logistics Practitioner Certification (GSCLP). She holds a BA degree, Diplomas in Marketing Management and HTML Programming, a Higher Certificate in Project Management and a Certificate in Public Relations. She has also completed various courses in social media, digital marketing and content marketing.

DR LUYANDA MPAHLWA

Dr Luyanda Mpahlwa, is a practising professional Architect (PrArch SACAP), an Urban Design professional (UDISA) and Adjunct Prof at the UCT African Centre for Cities(ACC). He is writing in his personal capacity. Research Assistants: Lea Chisolm and Camilla Allan.

VISHAAL LUTCHMAN

Vishaal Lutchman is currently the Managing Director: Transport at Zutari. He leads a highly skilled team of engineering and advisory professionals providing solutions for clients in South Africa, selected African geographies and the Middle East. Previously, he was the Chief Executive Officer of the South African Institution of Civil Engineering (SAICE). He led the advancement of engineering practitioners in addition to advocacy and oversight of the engineering profession capacity. Prior to joining SAICE he was Director in Transportation and Infrastructure at WSP | Parsons Brinckerhoff in the management, design and implementation of the firm's freight logistics projects in the maritime, aviation and rail sectors. He was also the Deputy Chief Engineer at Transnet overseeing the parastatal's capital projects and port infrastructure development. Vishaal has been focussing on integrating organisational strategy, operations and technical capacity with future-fit leadership for the development of African solutions by Africans.

DANIEL ASAFRA TIBU

Daniel Asafra Tibu started his professional career as an English and French teacher before venturing into the Travel, Tourism and Hospitality industry. He has worked with the National Tourism Office of Ghana in various capacities since the year 2000. Mr. Tibu is currently a Development Consultant and Executive Director of Centre for Sustainable Tourism, Environment & Resource Management (CENSTERM), a local NGO in Ghana. He holds a Degree and Postgraduate Diploma in Marketing from Maastricht School of Management, Master in Development Management, and Postgraduate Diploma in Environmental Management from Technische Universitat Dresden. Daniel is also a trained UNWTO tourism specialist.

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Patricia Schröder obtained an MBA, a BSc in Chemical Engineering and a master's degree in Environmental Management. Patricia is a registered Chartered Environmental Manager with the Chartered Institute of Environmental Manager's, London, and a Certified Director ® with the Institute of Directors of Southern Africa. Patricia has a passion for environmental protection and SMME Development in this sector, and her career of 30 years supports her passion. She serves on various Boards and is an executive member of professional organisations and serves as Chair on various Environmental Committees, is a member of various professional organisations. She is the current Vice President for the Institute of Waste Management of South Africa. She serves on the International Solid Waste Association (ISWA) working group as Chair of Legacy and Sustainability. Patricia is the spokesperson for Circular Energy NPC, a not for profit Producer Responsibly Organisation established in 2021, to fulfil the requirements of the Section 18 Extended Producer Responsibility Regulations published in November 2020, that assists its members regarding the Extended Producer Responsibility compliance scheme.

MR DAVID NICHOLLS

Mr David Nicholls is highly respected in the nuclear industry and regarded as a non-compromising leader who gets things done. He holds a BSc (Hons) in Mechanical Engineering (2-1) from the Royal Naval Engineering College, Manadon. He was responsible for the nuclear new build programme and overseeing the Koeberg power station until his retirement in December 2018. While at the utility he revitalised the Pebble Bed Modular Reactor (PBMR), an area in which South Africa was a world leader. He had worked his way up through the ranks at Eskom, working in its nuclear engineering department in the early 1980s before being appointed as Technical Support Manager at Koeberg in the early 1990s. He headed up the PBMR project. He was later appointed Chief Nuclear Officer at Eskom, and has experience managing Koeberg, which is the lowest cost provider of electricity to the grid. With 33 years of experience at Eskom, Dave Nicholls is no stranger to the Nuclear industry. Previously Chief Nuclear Officer at Eskom, accountable for all Eskom's nuclear activities, including the operation of the Koeberg Nuclear Power Station. He was also the General Manager for Nuclear Engineering, accountable for Nuclear Engineering at Koeberg and new build nuclear programme.

SUSTAINABLE DEVELOPMENT CREATING A FUTURE!

27 - 29 February 2024

CSIR International Convention Centre

The 2023 edition of the Summit will be held as a hybrid event – combining both the in-person and virtual experiences. Thus offering both exponential global reach and accessibility by easily bringing the content directly to the audience. The world is collectively embracing the idea of a green recovery as a means to achieve sustainable, resilient, inclusive economic growth. Imagine a world of zero-carbon growth–where industry is water wise and energy efficient, where infrastructure is smart and inclusive, where waste is converted into lucrative revenue streams. Imagine an economy that takes care of business needs while securing the rights of future generations and offering women and youth the space they deserve.

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SUSTAINABILITY SUMMIT

From Despair to Action: Crafting Solutions in the Midst of Polycrisis

Polycrisis, a term initially coined by the French philosopher Edgar Morin and later popularised by historian Adam Tooze, characterises a situation where multiple crises converge and interact, creating a complex and interconnected challenge. The daily news reminds us of a palpable, seemingly ever-present polycrisis. It manifests itself as economic woes, social disparities, environmental strains, and political dilemmas, all interwoven into a multifaceted tapestry that tests our resilience.

An analysis underscores the depth of our local challenges. The energy crisis, primarily due to the struggles of Eskom, our state-owned power utility, disrupts daily life. Load-shedding, water shortages, and service delivery disruptions are stark examples of its impact. The food insecurity crisis, worsened by droughts and floods induced by climate change, leads to hunger and malnutrition. The far-reaching effects of corruption and state capture have eroded trust in government institutions. Infrastructure (and pride) crumbles under neglect, as exemplified by the Lilian Ngoyi Street belch. Discontent bubbles in the ugly face of inequality and unemployment.

Living with polycrisis can impede action and blur focus, negatively affecting the sustainability agenda. It can overwhelm decision makers, promoting short-term solutions, delaying progress toward long-term sustainability goals, and making it challenging to prioritise sustainability issues effectively. Resources like money, personnel, political capital, and media attention get naturally diverted to address immediate crises, leaving less for sustainability efforts. Multiple crises can result in fragmented or gridlocked policymaking, preventing comprehensive sustainability policies.

These crises are certain to have endless potential to take a profound psychological toll on society. The collective psyche sometimes shows signs of being burdened by stress, anxiety, and a sense of hopelessness and helplessness. Decision-making becomes thwarted with an apparent response of pulling in all different directions. Consensus on what should be priority and cohesive leadership is lacking.

In this challenging environment, the articles in this handbook can play a helpful role:

- "The Silent Threat: Unveiling the Hidden E-Waste in Our Homes" sheds light on the unnoticed perils of electronic waste, contributing to a sustainable solution for our interconnected challenges.
- "Bridging Theory to Practice: Overcoming Difficulties in Adopting and Pursuing Regenerative Design" presents a case study and some approaches to built environments with resilience.
- An appeal to introduce comprehensive, globally binding rules and measures against plastic pollution aligns with international efforts to combat environmental issues, resonating with our environmental concerns.
- The paper "Measuring the Environmental Impact of Conventional Car Washes" introduces sustainable alternatives, aligning with our need for practical solutions.
- "Electrochemical Energy Technologies: Transfiguring Local Energy Storage and Conversion" represents innovation crucial for overcoming the energy crisis.
- "Precision Agriculture for Food Security in Africa" addresses the agricultural challenges and aligns with our need for food security.
- The potential role of non-profit organisations is discussed, underscoring the importance of collaboration and community efforts in leveraging food and trees to build resilience.
- The opportunities for using environmental, social, and governance (ESG) investment for unlocking a sustainable future is discussed in two articles. It is first discussed from a perspective of R,D&I as catalysts against COP28 objectives and broader economic concerns, and then relative to transport and logistics for collective action.
- The "Tourism and the Sustainable Development Paradigm" highlights the potential of tourism to drive positive change.
- Opportunities for youth to play a role in building a more sustainable future are discussed in the manufacturing economy through entrepreneurship, education, activism, and innovation.
- The University of Free State highlights the vital role of research in our quest for solutions.
- And other topics…

This handbook, with its collective wisdom, represents a humble effort to navigate this state of polycrisis, albeit in a fragmentary way. It acknowledges the existence and gravity of some of our challenges and provides some food for thought and debate on how to address pain points. It sets out some constructive ways we might pursue a brighter, more sustainable future for ourselves and our children.

Foreword

Editor
Peta de Jager

South Africa's Sustainable Future: Balancing Global Goals and Local Realities

Production Editor
Shannon Manuel

As it stands, South Africa finds itself at a crucial juncture, balancing the aspirations of the world stage with the pressing needs within its own borders. When comparing the nation to some of the world's top sustainable countries, the prospects appear challenging and the path to catching up seems herculean. South Africa faces big challenges on its path to sustainability, which make it different from the countries that are doing really well in this area.

While the National Development Plan of South Africa articulates aspirations for a just society and an environmentally resilient, low-carbon economy, the country remains entrenched in an unsustainable trajectory. Its heavy reliance on fossil fuels, particularly coal, combined with energy-intensive supply chains and carbon-intensive transportation systems, positions South Africa among the globe's most carbon-intensive economies. Beyond environmental concerns, the nation grapples with critical societal issues, including soaring unemployment rates and staggering inequality levels. The persistent issue of load-shedding and the years-long energy crisis further exacerbates these challenges.

Ranked at 110 out of 166 in the 2023 Sustainable Development Index report, South Africa's performance underscores its struggles in the realm of sustainability. The rankings of nations in terms of sustainability are influenced by a complex interplay of indicators, policies, cultural dynamics, and historical contexts. Nations consistently excelling in sustainability assessments typically shine in areas such as adopting renewable energy, managing waste, reducing carbon emissions, safeguarding the environment, promoting social equality, and governance.

As the 2023 SDG Index reveals, Finland secures the top spot, closely followed by Sweden, Denmark, Germany, and Austria. European nations continue to dominate the SDG Index's upper echelons, with the top 10 positions occupied by European countries. These nations are on track to meet more targets than any other region. Denmark, Czechia, Estonia, Latvia, and the Slovak Republic stand out as the top five countries that have either achieved or are progressing toward the largest number of SDG targets this year.

Interesting though, despite there being clear global leaders in sustainability, at the midpoint of the Sustainable Development Goals (SDGs), a sobering reality emerges: at the current rate, not a single goal is projected to be achieved by 2030. The logical explanation for these stats, one could argue, is that there are just too many countries unable to keep up the global sustainability expectations.

The Sustainable Development Report (SDR) reveals that, based on progress since 2015, none of the SDGs are on track for accomplishment by the designated deadline. On average, less than 20% of the SDG targets are projected to be achieved. Although there was modest progress in the SDGs between 2015 and 2019, the outbreak of the COVID-19 pandemic and concurrent global crises have led to a substantial stall in progress, with the trajectory falling short of pre-pandemic projections.

Some of the indicators that experienced the most significant reversals in progress include subjective well being, access to vaccination, poverty, and unemployment rate. SDG goals related to hunger, sustainable diets and health outcomes (SDG 2 and SDG 3) are particularly off-track, as well as terrestrial and marine biodiversity (SDGs 14 and 15), air and plastic pollution (SDG 11 and SDG 12), and strong institutions and peaceful societies (SDG 16). On average, since the adoption of the SDGs in 2015, the world made some progress in strengthening access to key infrastructure, covered notably under SDG 6 (Clean Water and Sanitation), SDG 7 (Affordable and Clean Energy), and SDG 9 (Industry, Innovation, and Infrastructure).

Importantly, the report raises an alarm, underscoring the risk of a widening disparity in SDG outcomes between high-income countries (HICs) and low-income countries (LICs) in 2030 compared to 2015, potentially undoing a decade's worth of global convergence progress. This prompts the question of whether applying identical sustainability goals to high-income and low-income countries, without accounting for their distinct circumstances, might perpetuate a cycle of inequality

On the surface, it might seem equitable to apply uniform goals to all nations, regardless of their economic status. After all, the challenges posed by environmental degradation, resource depletion, and climate change affect every corner of the globe. However, a deeper exploration reveals that a one-size-fits-all approach might inadvertently set up certain nations, especially low-income and developing countries, for failure.

As South Africa strives to weave its sustainable future, it must tread carefully on the tightrope between global ambitions and local urgencies.

CSIR SMART SOCIETY

SMART PLACES

Enable smarter natural resource use, environmental sustainability and smart infrastructure

SMART MOBILITY

Enable South Africa to have an effective, efficient, integrated, safe and competitive Transport and Logistics sector

NEXTGEN ENTERPRISES AND INSTITUTIONS

Enable digital transformation in government, public institutions and industry

science & innovation

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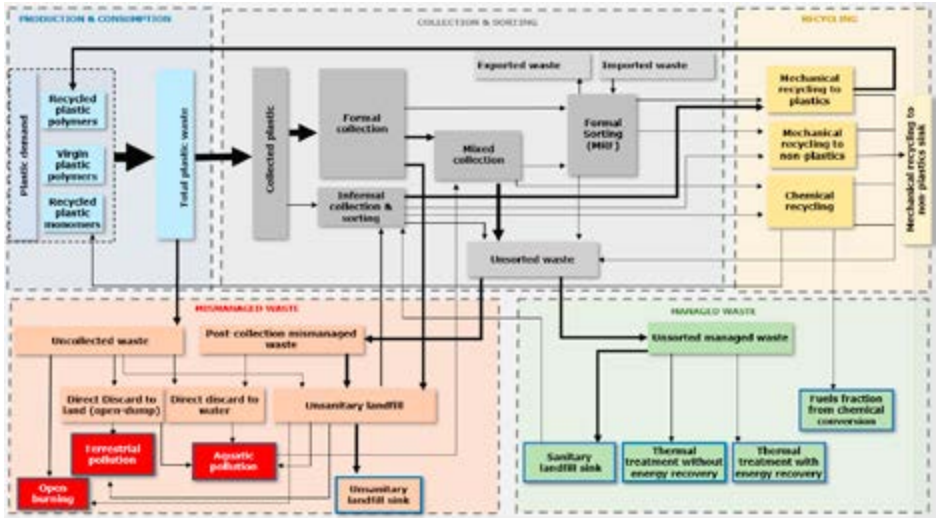
Science-policy interface is critical to providing solutions to the plastic pollution crisis

"Science provides the evidence to support South Africa's policy response to the plastic pollution problem."

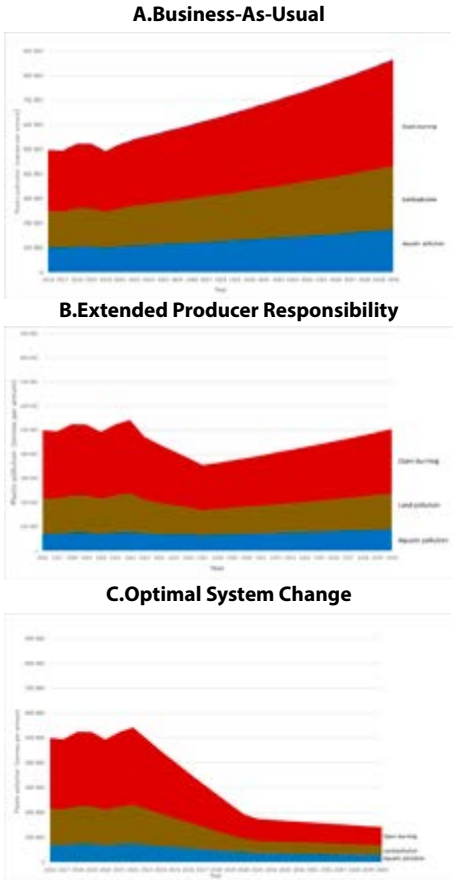
William Stafford (CSIR) was part of the South African delegation at the second session of the Intergovernmental Negotiating Committee on Plastic Pollution (INC-2, UNESCO, Paris, 2 June 2023)

The rapid increase in the production and consumption of plastics, particularly for single-use applications, has overwhelmed waste management systems in many countries, resulting in increased leakage of plastic into the environment. The persistent nature of plastic means that it accumulates in the environment, with risks to human health, biodiversity and ecosystems. Plastic waste is now so ubiquitous in the environment that it represents a geological marker of the Anthropocene era.

The "Breaking the Plastic Wave"[1] study provided the first global assessment of the sources and pathways of plastic pollution. It was based on the Pathways software tool[2], which was designed to model plastic flows and evaluate different strategies to reduce plastic pollution. The Council for Scientific and Industrial Research (CSIR) has recently applied this tool in South Africa (the first time that the tool has been applied at a country level) to provide an evidence-based approach to reducing plastic pollution[3]. Three scenarios were explored: business-as-usual, extended producer responsibility and optimal system change. The study showed that only an optimal system change, with strategic interventions throughout



System map for plastic flows in South Africa. The width of each flow indicates the total mass of plastic for the year 2020 in the business-as-usual scenario (see https://wasteroadmap.co.za/research/grant-046/).



Plastic pollution (consisting of air pollution from open-burning, land pollution and aquatic pollution) under: (A) Business-as-usual scenario, with no policies or measures introduced; (B) Extended producer responsibility (EPR) scenario, with five-year recycling targets as per the recent EPR legislation; and (C) Optimal system change scenario, which combines the strategies of reducing plastic demand, increasing collection and recycling, and increasing safe disposal to sanitary landfill.

the plastics lifecycle, can significantly reduce plastic pollution. This system change will involve measures to:

- Eliminate high-risk plastic products;
- Create a circular economy through design for durability, reuse and recycling;
- Identify suitable sustainable alternative materials with reduced environmental impacts; and
- Improve the collection and management of plastic waste.

On 2 March 2022, 175 countries, including South Africa, supported the creation of an international legally binding instrument to end plastic pollution. At the second session of the Intergovernmental Negotiating Committee on Plastic Pollution (INC-2, 2 June 2023), countries agreed to develop a first iteration of the treaty text, and to carry out intercessional work to identify what exactly must be done to control plastic pollution, and how this will be achieved.

The INC is set to draft a global legally binding treaty on plastic pollution by 2024. However, the success of the instrument in addressing plastic pollution relies on country commitments and achieving global agreements on rules, definitions, standards and regulations to reduce plastic pollution; as well as how to effectively monitor, evaluate and report on progress.

Science is an essential ingredient in strong policy and effective implementation; and has a key role to play in providing evidence, data, solutions and innovations. Science can help identify which control measures and regulatory instruments are needed to make the required system change, how these changes can effectively be achieved, and if the desired objective of ending plastic pollution is being achieved. Research at the science-policy interface allows innovations and solutions to be tailored to the local context, and provides evidence to inform global commitments and national action plans. With an effective science-policy interface, we can end plastic pollution and effectively transform the linear take-make-dispose plastics economy into a resource-efficient and circular economy that provides a path for a sustainable future.

For more details on the study, see https://wasteroadmap.co.za/research/grant-046/

References

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THOUGHT LEADERSHIP

Unlocking South Africa's Sustainable Future: A dive into ESG Investment and R, D&I as Catalysts for the implementation of the Paris Agreement

Brian Mantlana

"We must position ourselves as resilient bold Igniters of the Green Revolution in SA, empowering communities, and leaving a Legacy of Sustainable Brilliance. That must be our contribution to future generations" - Brian Mantlana

Environmental, Social, and Governance(ESG refers to a set of criteria that investors use to evaluate the environmental, social, and governance performance of companies or organizations. ESG factors consider how a company operates and in so doing its impact on the environment, treatment of employees, relationships with stakeholders, ethical practices, and overall corporate governance. By integrating ESG considerations into investment and Innovation decisions, investors aim to support sustainable and responsible business practices using novel ideas whilst seeking financial returns

ESG investment has rapidly transformed from a niche concept to a mainstream strategy, driven by the increasing importance of sustainability and responsible business practices. South Africa, recognising the need to embrace ESG principles, aims to drive positive and robust change while aligning with global initiatives like COP28.

This article delves into the key pillars of ESG in South Africa and highlights the pivotal role of research, development, and innovation (R&D&I) in translating theory and policy into practical implementation, crucial for achieving the commitments under the Paris Agreement. It also looks at the barriers to ESG implementation in SA.

Pillars of ESG in South Africa

Environmental Responsibility: South Africa faces unique environmental challenges, including climate change, water scarcity, and expansion of alien invasive species. ESG investing in the country emphasizes the importance of transitioning to a low-carbon economy, promoting renewable energy, mitigating pollution,

and conserving natural resources. Companies are encouraged to adopt sustainable practices, reduce greenhouse gas emissions, and ensure environmental compliance to contribute to one of the goals of the Paris Agreement of limiting global warming to well below 1.5 degrees Celsius.

Social Equality and Inclusion: ESG investing in South Africa places a strong emphasis on social issues, such as promoting equality, diversity, and inclusivity. The legacy of apartheid has left lasting socio-economic disparities, and ESG principles aim to bridge these gaps. Companies are expected to promote fair labor practices, uphold human rights, support local communities, and address social inequalities. By fostering social equality and inclusion, South Africa can contribute to one of the objectives of the Paris Agreement of building a just and equitable transition to a sustainable future.

Governance and Ethics: Transparent and accountable governance practices are vital for sustainable development. ESG investing in South Africa seeks to enhance corporate governance standards, promote ethical behaviour, and combat corruption. Companies are encouraged to establish robust board structures, ensure proper risk management, and maintain ethical supply chains. Effective governance strengthens investor confidence, fosters long-term sustainability, and supports responsible decision-making, aligning with COP28's aim of promoting good governance in climate actions.

The Role of R&D&I in Practical Implementation

Research, development, and innovation (R&D&I) play a critical role in translating ESG theory and policy into tangible actions and outcomes, a key component of South Africa's Nationally Determined Contribution under the Paris Agreement. Technological Advancements: R&D&I can facilitate the development and adoption of innovative technologies that support sustainable practices aligned with COP28 objectives. This includes investing in renewable energy solutions, water conservation technologies, waste management systems, and other green technologies.

By driving technological advancements, South Africa can contribute to reducing greenhouse gas emissions, enhancing energy efficiency, and achieving COP28's ambition of transitioning to a low-carbon future.

Data and Metrics: R&D&I can contribute to the establishment of robust data frameworks and standardized ESG metrics, providing the necessary information to monitor and assess progress towards COP28 targets. By developing comprehensive and reliable data sources, South Africa can measure its environmental impact, track social progress, and evaluate governance practices. These metrics enable informed decision-making, accountability, and effective progress tracking consistent with the Transparency obligations under the Paris Agreement. Collaboration and Partnerships: R&D&I fosters collaboration between stakeholders, enabling the co-creation of sustainable solutions. By collaborating with government, businesses, academia, civil society, and investors, South Africa can leverage collective knowledge, resources, and expertise to address climate challenges. Such collaborations promote the sharing of best practices, the development of innovative solutions, and the scaling of successful initiatives, aligning with a key pillar towards national and international achievement of climate goals, which ismultilateral cooperation. Capacity Building: R&D&I programs contribute to capacity building by developing human capital and enhancing skills in ESG-related areas. Through training and education on ESG principles, sustainability practices, and responsible investment strategies, South Africa can empower individuals to drive positive change and effectively implement ESG initiatives. Building a knowledgeable and skilled workforce strengthens South Africa's ability to meet COP28 targets and supports the country's just transition to a sustainable, low-carbon economy.

In conclusion, it is important to acknowledge the challenges and barriers that South Africa may face in its ESG journey. One significant challenge is the need for widespread awareness and education about ESG principles among various stakeholders, including businesses, investors, and the general public. This requires concerted efforts to promote understanding and build a strong ESG culture throughout the country.

Another barrier is the availability and reliability of data and metrics related to ESG performance.

Accurate and standardized data is crucial for measuring progress, making informed decisions, and attracting investors. South Africa must invest in data collection and reporting infrastructure to ensure transparency and credibility in its ESG efforts.

Additionally, the country may encounter resistance from traditional industries that are less inclined to adopt sustainable practices. Overcoming this resistance requires collaboration, engagement, and the creation of economic incentives that encourage businesses to integrate ESG considerations into their operations.

South Africa has to also address socio-economic disparities and promote inclusivity in its ESG initiatives.

Being intentional to ensure that marginalized communities are not left behind is essential for achieving sustainable development and creating a more equitable society.

Despite these challenges, I am confident that South Africa has the potential to overcome them through proactive measures, collaboration, and policy frameworks that support ESG integration. By addressing these barriers head-on, South Africa can emerge as a key global player in responsible investment and sustainable development, making a profound and "wow"-inspiring contribution to global climate action.

Research with a sustainable focus

The University of the Free State (UFS) has a clear vision of where it wants to be within the next few years leading up to 2034 when the university turns 130 years old. This is encapsulated in its Vision 130, which expresses the university's intent and commitment to be acknowledged by its peers and society as a top-tier university in South Africa, ranked among the best in the world.

The university is consistently renewing and reimagining itself to ensure that it impactfully supports societal development. Since opening its doors in 1904, the university has evolved into a research-led, student-centred, and regionally engaged institution that contributes to development and social justice through the production of globally competitive graduates and knowledge.

It has expanded its reach and influence, becoming a multi-campus university with three campuses. This includes the Bloemfontein and South campuses located in the capital of the Free State, as well as the Qwaqwa Campus in Phuthaditjhaba.

The focus of our seven faculties, i.e. Economic and Management Sciences, Education, The Humanities, Health Sciences, Law, Natural and Agricultural Sciences, and Theology and Religion, is to inspire excellence. With a list of high-quality and internationally accepted degrees, diplomas, and certificate courses, we are transforming lives through quality, care, and impact.

In line with our core values of excellence, innovation, impact, accountability, care, and social justice, sustainability holds a significant place within our institution. We not only prioritise sustainability as a fundamental institutional focus, but also actively engage in numerous projects that contribute to a more sustainable world, aligned with the United Nations Sustainable Development Goals (SDGs).

Zero hunger

The Department of Sustainable Food Systems and Development actively participates in various sustainability research and development projects that support the SDGs.

Supporting SDG 1 (No Poverty) and SDG 10 (Reduced Inequalities), the department provides training opportunities on the Paradys Experimental Farm to individuals in the surrounding community, teaching them how to add value to wool, and to manufacture products in the wool processing hub. In this process, community members – especially women – acquire entrepreneurial skills in wool processing, such as knitting, making felt products, spinning, and weaving. Creating products from wool encourages job creation; it empowers communities to participate in economic activities and to develop sustainable livelihoods for themselves, ultimately reducing poverty.

Also aligning with SDGs 1, 10, and 2 (Zero Hunger), is the Agribusiness Transformation Programme. The Entrepreneurial Value Chain programme has seen 111 farmers receive training to develop black commercial farmers and foster a black-owned sustainable agricultural sector representing the country. Specialist instructors taught the farmers various farming principles, focusing on animal health, animal and pasture management, feeding, crop production, water and soil management, and farm management, including business training, entrepreneurship, and mentorship training.

Aiming to address the issue of food and nutrition insecurity in South Africa and in line with SDG 2, the Food Innovation Laboratory in the department is developing nutritious products tailored to the needs of the food insecure. Children from households in this income bracket must have access to healthy and affordable food alternatives. Central to the Food Innovation Laboratory is plant-based products focusing on soya, which is rich in health benefits and considered a source of all the essential amino acids. Since the lab's opening earlier this year, it has developed a range of products, including soya sausages, soya mince to use in various applications, and soya nuts as a healthy snack option.

The research conducted by the university on cactus pear aligns with SDGs 2, 3 (Good Health and Well-being), and 7 (Affordable and Clean Energy), and is uncovering many potential applications of this versatile plant. From food products to pharmaceuticals, livestock feed, and biofuels, the cactus pear has the potential to be a valuable crop for farmers and industries alike.

The plant can yield nearly 40 tons of dry matter per hectare per year with a rainfall of 500 mm per annum (65% of South African land). This translates to eight tons of biomethane or 11 000 litres of diesel-equivalent energy per hectare. PhD research indicates that the plant contains 30 to 50% of easily digestible sugars, which degrade effortlessly in an anaerobic digester. Inside the digester, naturally occurring

bacteria break down the cactus, producing methane and carbon dioxide biogas. By separating the methane from carbon dioxide and compressing it, compressed biomethane is created and can be used as a substitute for liquid petroleum gas, petrol, and diesel. The carbon dioxide generated in the process can replace the fossil-based carbon dioxide typically used in producing carbonated beverages. Additionally, it can be applied to extend the shelf life of packaged foods and serve as a water softener. Biogas production also has the potential to create employment – generating one million direct jobs using just 3% of South Africa's land area.

The Department of Plant Sciences, through its SARChI Chair: Disease Resistance and Quality in Field Crops, has conducted impactful research resulting in the release of new crop cultivars across Africa. This research has contributed significantly to food security in several countries, aligning with SDG 2. The strength and distinctiveness of this research chair lie in its dual focus on breeding cereal crops for fungal disease resistance and the improvement of crop quality for processing and consumption. Through this collaborative effort, the chair has made a substantial impact on food security in South Africa and the rest of Africa.

Research conducted on Sclerotinia sclerotiorum, a fungal pathogen that causes yield-limiting diseases in soybean and sunflower, also aligns with SDG 2. This pathogen is responsible for significant crop losses in soybean worldwide. The Plant Disease Epidemiology Group focuses on developing an integrated pest management (IPM) approach for oil and protein seed crop producers, which is believed to be the most sustainable method for economically viable crop production. The research team also involves screening cultivars for tolerance to head and stem rot under field conditions, ensuring that producers plant varieties that can either evade the disease or withstand disease pressure to protect yields. Additionally, their recent research explores the use of biological control agents as seed treatments against seedborne S. sclerotiorum in soybean. The biocontrol approach uses microbial organisms to suppress pathogenic activity and promote plant health, making it a sustainable alternative.

Clean water

The Centre for Environmental Management (CEM) actively contributes to water quality projects aligned with SDG 6 (Clean Water and Sanitation). Through its pioneering work in ecological engineering, the CEM has developed groundbreaking solutions that are transforming domestic wastewater treatment and revolutionising water infrastructure in the country. The CEM has introduced natural-based solutions such as phycoremediation, phytoremediation, and microbial bioremediation to address issues of pollutant discharge into rivers. These environmentally friendly technologies effectively remove contaminants from wastewater effluents and break down soil, water, and air pollutants, reducing harmful substances to non-toxic or less toxic forms.

The CEM is also leading the way in domestic water treatment technology innovation, optimising ecologically engineered systems for industrial wastewater treatment. Further research will also enable the widespread implementation of these solutions, addressing the challenges faced by small and medium municipalities. By integrating solutions such as phycoremediation into public sector service delivery efforts, the CEM is improving the quality of life for South African communities and protecting precious water resources.

Additionally, the CEM's work extends to reinstating ecological functions in natural wetland systems, with a notable achievement in treating acid mine water. It addresses water pollution, incorporates a socio-economic component, and develop a comprehensive cost-benefit analysis tool to assess the financial and environmental impacts of mining activities.

Moreover, the CEM is developing the continent's first biodiversity credit system through an integrated approach called the Ecological Engineering Nexus Accounting Framework (EENAF). This framework assesses the impact of ecological engineering projects on the environment, society, and economy, ensuring their sustainability and contributing to planetary health.

Innovation and infrastructure

Cement, an essential component for making concrete, carries significant environmental drawbacks due to its high energy requirements and associated pollution. The Department of Engineering Sciences' Green Concrete Laboratory is researching practical methods and processes where waste materials are used to substitute cement in a concrete mix. Materials with the required properties include fly ash, waste glass, waste aluminium, and tin cans.

Several of the materials have been used successfully and their long-term durability has been tested. Green concrete has been found to have superior qualities to that of conventional concrete, such as a much higher compressive strength, a smaller carbon footprint, and comparable production costs. A very high level of resistance against chemical attacks is also present, as well as resistance to carbonation, sulphate attack, and acid attack.

Through these research efforts – aligning with SDG 9 (Industry Innovation and Infrastructure) – the department contributes to more sustainable practices in the construction industry.

Life on land

The Afromontane Research Unit (ARU), located at the base of the scenic Maloti-Drakensberg range, aims to be a leading institution for African mountain research. It is dedicated to promoting sustainable development in the Maloti-Drakensberg region and nurturing an African-based mountain research 'community of practice' to contribute to global mountain research and policymaking from an African perspective.

Similarly, the Risk and Vulnerability Science Centre (RVSC) supports SDG 15 through its focus on the sustainable development of Phuthaditjhaba as an African mountain city. The RVSC facilitates solution-oriented programmes that provide societal value and impact, contributing to the sustainable development of the region. Together, the ARU and RVSC demonstrate the university's commitment to sustainability and their dedication to addressing the challenges and opportunities presented by mountainous environments.

The university is proud of the strides made in its continued contribution to sustainability, and consistently improving its research productivity in distinctive research areas.

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RESEARCH WITH A *sustainable* FOCUS

VISION 130 SUSTAINABILITY

Affordable and Clean Energy

From food products to pharmaceuticals, livestock feed, and biofuels, cactus pear has the potential to be a valuable crop for farmers and industries.

No Poverty and Reduced Inequalities

By producing products from wool, communities are creating sustainable livelihoods for themselves.

Since opening its doors in 1904, the University of the Free State (UFS) has evolved into a research-led, student-centred, and regionally engaged institution that contributes to development and social justice through the production of globally competitive graduates and knowledge. The university has a clear vision as encapsulated in its Vision 130, and is consistently renewing and reimagining itself to ensure that it impactfully supports societal development.

It has expanded its reach and influence, becoming a multi-campus university with three campuses. This includes the Bloemfontein and South campuses located in the capital of the Free State, as well as the Qwaqwa Campus in Phuthaditjhaba.

Life on Land

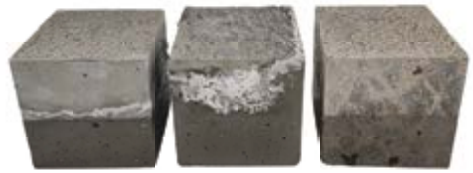
Dedicated to promoting sustainable development in the Maloti-Drakensberg region.

The focus of our seven faculties, i.e. Economic and Management Sciences, Education, The Humanities, Health Sciences, Law, Natural and Agricultural Sciences, and Theology and Religion, is to inspire excellence. With a list of high-quality and internationally accepted degrees, diplomas, and certificate courses, we are transforming lives through quality, care, and impact.

In line with our core values of **excellence**, **innovation** and **impact**, **accountability**, **care**, and **social justice**, sustainability holds a significant place within our institution. We not only prioritise sustainability as a fundamental institutional focus, but also actively engage in numerous projects that contribute to a more sustainable world, aligned with the United Nations Sustainable Development Goals (SDGs).

Zero Hunger

Research conducted on Sclerotinia sclerotiorum, a fungal pathogen that causes yield-limiting diseases in soybean and sunflower.

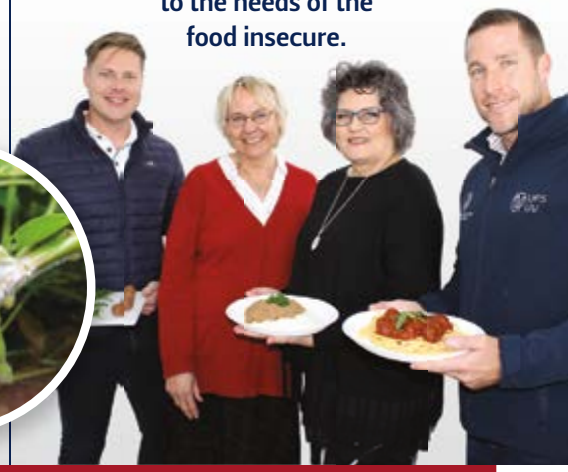


Innovation and Infrastructure

The microstructure of concrete influences the mechanical and physical properties of the concrete during service life. In formulating the green concrete mixture, parameters are optimised to obtain the desired properties in all aspects.

Good Health and Well-being

Developing nutritious products tailored to the needs of the food insecure.



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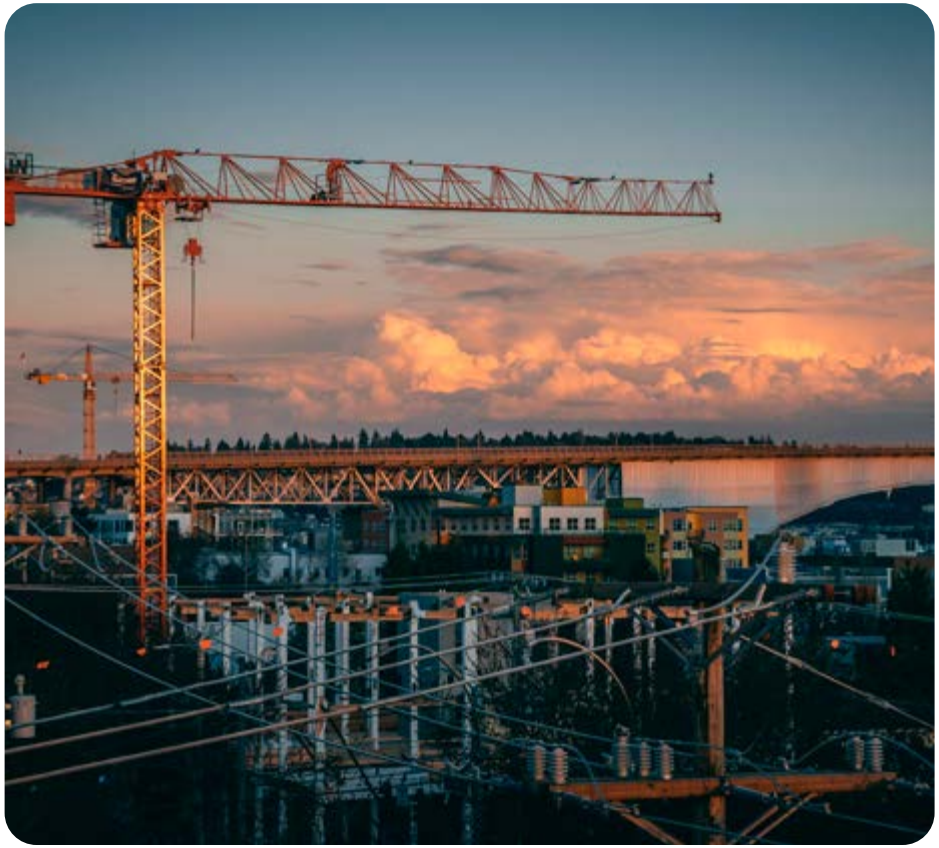
Advancing the civil engineering profession in South Africa for 120 years

The South African Institution of Civil Engineering (SAICE)



Over the past century, the South African Institution of Civil Engineering (SAICE), which celebrates its 120th anniversary this year, has witnessed, and adapted internally, to the evolution of the built environment and has been actively responding to changing societal needs, technological advancements, and global trends.

From the early days of building roads and bridges to the complex and innovative engineering solutions of today, SAICE has been at the forefront of shaping the future of civil engineering in South Africa, explains Dlozi Mnisi, Chairperson of the SAICE Future Leaders Panel, Executive Board Member and Council Member at SAICE.

The world has evolved from computers used in the 1960s – initially huge slow installations fed by punch cards; to surveying becoming simpler because long tedious calculations involving 7-figure logarithms can now be solved in seconds on calculators, to the revolution of Building Information Modelling (BIM) that is digitally transforming the industry, explains Tony Murray, SAICE History and Heritage Panel Committee Member.

Murray talks to this evolution: "For example, the need for integrated township development had resulted in it developing into a separate sector of civil engineering that involves drainage, water supply, sewerage, electricity, roads, recreation facilities, and housing construction, all coordinated by sophisticated project management programs and cost control."

In fact, even SAICE has come a long way since its inception 120 years ago, says Chris Roth, SAICE's History & Heritage Panel Chairperson and SAICE Vice President, who joined the organisation as a student member in 1990, to becoming the leading voice in the field of civil engineering in South Africa, promoting excellence in engineering, and advocating for the advancement of the profession.

Mnisi concurs and adds that one significant change that SAICE has undergone is diversification.

"This has brought new perspectives, ideas, and approaches to the profession, resulting in innovative solutions to some of the country's most pressing infrastructure challenges. For example, now more than ever, we see a major drive in the development of initiatives and platforms to grow and promote engineering as a career, and to support young engineers in becoming seasoned professionals."

But, one of the greatest tools that has become available to the country, has been the SAICE Infrastructure Report Card (IRC), which measures and grades South Africa's infrastructure. The IRC plays an increasingly important role in ensuring that the country's infrastructure is monitored for recommendation on areas of maintenance and improvement.

"SAICE has been a driving force in shaping the development of the country's infrastructure and supporting the professionals who have worked on all major and minor infrastructure projects, from the building of the first major hydroelectric power station to the construction of world-class transport systems and innovative water management solutions.

"Looking to the future, SAICE with its diverse membership are placing emphasis on sustainability, embracing technology and the implementation of the Growing Forward Together strategy. This strategy aims to tackle the complex challenges of the 21st century and the infrastructure space, thus delivering solutions that will benefit all South Africans," concludes Mnisi.

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The Future of our Cities: Unblocking the Debate

Dr Luyanda Mpahlwa

"The City has always been a place for people to meet and greet each other, a place to exchange information about the city and society, a place where important events were staged; coronations, processions, feasts and festivals, town meetings, and executions to mention just a few. The City was also a marketplace where goods and services were offered and exchanged. Finally the City was a thoroughfare providing access to and connecting various uses of the City. People walked about and goods were hauled from one place to another."

Jan Gehl + Lars Gemzoe (New City Spaces)

The discussion on the future of cities has been occupying urban planners and urbanists in the global north for quite a while. Cities have also been evolving over time, with urban design playing a bigger role to create liveable, accessible, more inclusive, and most importantly accessible and more affordable mixed-use environments.

This development has seen inner city precincts being re-imagined, allowing new more integrated liveable environments being created. Examples like Covent Gardens in the UK, the Meat Packing District in New York, Shoreditch in the UK, and many others examples. Cities like Copenhagen, the venue of the 2023 UIA Congress (Congress of International Architects) have transformed the inner-city overtime, removing or reducing vehicular traffic and introducing a bicycle-friendly, walkable inner city with active street edges, buildings, and establishments opening onto wide pavements and public spaces.

Urban life in these environments has been transformed and people rediscovering the dynamic life of the city. A case study on the Covent Gardens in London, UK shows the revitalisation of Market Hall precinct and the adaptation of heritage buildings for new uses contributed to create a new precinct identity anchored by public spaces and a walkable environment in a mixed-use urban environment.

Covent Gardens Precinct Diagrams, London UK

COVENT GARDENS, LONDON, UK	
HISTORY/ HISTORICAL USE	• 1630 – transformed from a garden into a neighbourhood piazza. • 1650s – traders began trading in the piazza. • 1666 – Great Fire of London drove poorer residents and traders to the West End. • 1828 – the Market Building was built to formalise trade in the market. • 1974 – the market, which had transgressed the market building and congested the streets, was moved to Nine Elms. • 1980 – the market building reopened with small shops, galleries, workshops, restaurants, and offices at first floor level. • Public space, with street theatre, pubs, cafes, shops, and museums.
IMPLEMENTED MECHANISMS FOR URBAN TRANSFORMATION	• Restoration of the old market hall. • Rebranding of the area. • Defining entry points/gateways. • Bringing back the garden. • Activating the public realm + increasing permeability. • Creating new destinations within old urban blocks. • Creating new landmarks with contemporary architecture. • Restoring and/or adapting heritage buildings for new programmes

The Covid pandemic has introduced a new debate, the "post-Covid" future of cities. With the reality of "hybrid lifestyles", work from home concepts, and the home office the debate is shifting, with the city finding a new definition towards the life, work and play concepts. It is becoming apparent, that the monocultural office buildings in the inner city will need to be reconsidered. Post Covid, it has to be recognised, that life in the inner cities is changing, with the economic pressures contributing to the change in living, working, and spending patterns. Some businesses have not been able to recover from the impact of Covid and others had to reinvent themselves. In the global North, where city life is the main urban playground characterised by integrated commercial, retail, residential, and social environments, some inner cities are faced with challenges of economic viability due to the post-Covid disruptions and consequencial economic imbalances. Various stakeholders in various cities are grappling with the new realities and seeking solutions that will define the

Covent Gardens, London, UK, Urban Transformation, Render

revival and survival of the inner cities impacted by the post-Covid realities.

Discussions in some cities in Europe, Germany in particular, the retail opportunities in the pedestrian streets have been negatively impacted and cities are discussing post-Covid, how to revitalise these erstwhile thriving urban environments? In the Dialogue 4 Urban Change Conference (an exchange and P2P Learning Network of cities between Germany and South Africa) I attended in Stellenbosch earlier in the year, colleagues from the City of Bottrop, Germany reflected in the Living Lab, on how the city is grappling with "revitalising dying inner city pedestrian zones". One of the initiatives being considered is to "change from the concepts of large retails stores" which did not survive post-Covid and bring smaller retail outlets but also "to bring affordable residential opportunities" in areas that were previously unaffordable for this land-use. Urban life is changing out of necessity.

Where does this live us in the global South? How do we assess the status of our cities in South Africa, what debate is happening regarding the condition of our cities? Most importantly, how can our cities reflect the values and aspirations of the new democratic order towards inclusivity and spatial justice?

On the 8th and 9th June 2023 I attended the 10th Conference of the Western Cape Property Development Forum (WCPDF) at the ICC in Cape Town. This is an annual conference which in 2023 saw officials and administrators of the City of Cape Town, including the Mayors, developers and property owners, corporates, professionals, academics and activists sharing a platform to discuss challenges and opportunities facing the City of Cape Town and the broader Western Cape.

The theme of this year's conference was "Western Cape Investment: People, Purpose, Prosperity".

At the WCPDF Conference, on the theme: "The balance between economic development, job creation, activism and social engagement" Prof Nick Binedell, Professor & Consultant, University of Pretoria's Gordon Institute of Business Science (GIBS) in his opening address as guest speaker and facilitator of the panel, he commented on how important and unique it was, that 'such a diverse and multi-stakeholder engagement was possible in Cape Town', noting that similar platforms are "not possible" in other parts of the country and yet these are critically needed. I shall come back to reflect on the panel by Prof Binedell and the WCPDF Conference.

The debate on the future of South African cities has been documented in various publications and journals since 1994 and before, it has also been covered in various media platforms. However, there seems to be very little public discourse on the matter. To me, this is a matter of concern!.

In the Daily Maverick (6. March 2023), Johnny Friedman points out: "South Africa's future development and prosperity depend on the creation of districts and neighbourhoods that are inclusive, mixed-use, vibrant, and that speak to young culture and entrepreneurial spirit.

"With the advent of democracy, the inner cities and central districts of South Africa were viewed as unsafe and dangerous. Many corporates and families relocated to the perceived safety of the suburbs and further afield. And in these suburbs, gated residential estates, suburban office parks and shopping centres became the norm – essentially large concrete boxes wrapped in even larger parking lots. Despite a few notable exceptional pockets, the vast opportunities that exist in the private and public areas that make up the fabric of our cities and neighbourhoods are frequently overlooked."

On the other hand, in the State of the Nation address of 2020, 13. Feb 2020 President Cyril Ramaphosa presented a vision for new cities with bullet trains and other smart city ideas have been proposed by the President in the Lanseria area and other parts of the country. In the State of the Nation address the President announced that "a new mega smart city project is taking shape in Lanseria, Gauteng", the project being "a joint project between the Investment and Infrastructure Office in the Presidency and the Gauteng and North West provincial governments". It was further reported, that this "Lanseria Airport City Mega Project' is designed to be a high-density mixed-use residential area." (Business Tech/News/Technology, 14. Feb 2020)

At the Habitat Conference held in Kenya early in June 2023, the SABC reported that the Minister of Human Settlements Ms Kubayi was saying that "South Africa needs new cities because the old ones are overpopulated and unable to serve the needs of the population". According to the SABC report, the minister said "the country could not continue to rely on the current cities, which are overpopulated due to a lack of expansion". (SABC, UN Habitat Assembly address, Kenya, June 2023).

In a response aired on NewsRoom Afrika, the Executive Director of the African Centre for Cities, Prof Edgar Pieterse reflected as follows:

"The challenge we have is not to build new cities, but to use the existing resources and to do much better with the cities we have. As a result of the legacy of Apartheid, we have a very poor spatial form in most of our cities and makes them unproductive and makes spatial inequalities continues". He goes further to point out that "the real work that needs to be done, is to densify existing cities, create greater integration between the economy where people live and most importantly across class groupings".

Prof Pieterse points out that "this is the work Government has set out in its Breaking New Ground policy in 2004, and the tragedy of this search for the silver bullet solution in new cities lies in the fact that Government has not been able to implement its own policies. The new cities are not the answer because they need additional expenditure to address current needs of society but they are also speculative bubbles which detract investment where the real challenges are and where the people are." (Interview Newsroom Afrika, 18th June 2023).

There does seem to be some public interest in the matter of 'new cities' and the need to find solutions for our cities. In another published article, the Ster North, 1 June – 7 June reported that "the Vaal River Mega City project was to be funded by the US based Citigroup to the tune of R1.4Bn in Bedworth Parth. This project at the Vaal River City Interchange between Veereiniging and Vanderbijlpark will include a mega-city with a mixed-use metropolitan development, an international airport, along with logistics, manufacturing and agricultural hubs. This development has been in planning since 2015.

The published article further reports that President Ramaphosa first made reference to this mega-city development in his visit to the Vaal as part of his presidential Imbizo.

With reference to this proposed Mega City, Prof Viruli (Associate Prof at UCT) and Director UCT Urban Real Estate Research Unit, URERU commented to the effect that "there is no need for mega cities in South Africa. The continent is riddled with mega/smart cities that have failed, often only those providing infrastructure have benefitted" he went further to say "let us look at the cities that we have in South Africa – repurposing buildings in our CBD's is an approach that is socially and environmentally sustainable.

It appears to me that a critical debate is unfolding and needs to be had regarding the future of our Cities. What informs the need for these megacities and how will these relate to existing cities and what communities are envisaged for them? The most important question is the envisaged urban quality being consider for these mega-cities?

The big question is: Where is the public discourse on the 'need for new mega-cities' or what is the discussion regarding the state of our cities? Where do we as professionals, academics, architects, urban planners and urban design practitioners stand on the issues? What perspectives do we offer? How do we characterise the post-apartheid city?

My real interest in reflecting on the state of our cities, is to stimulate public debate, especially, the perspectives we as professionals in the built environment should offer towards more inclusive and sustainable cities.

Coming back to the WCPDF Conference, Prof Nick Binedell in the panel Constructive stakeholder engagement to facilitate development, investment & job creation, reflected on the importance of the involvement of multiple stakeholders in the making of cities.

Having lived in Seattle USA, he shared the experience of the deterioration of Seattle after disinvestment by corporates like Boeing early 2000, when the "Boeing Co. stunned its hometown by announcing it is moving its headquarters out of Seattle, where the aircraft manufacturing giant was founded 85 years ago. This meant that "less than half the 1,000 employees working at its Seattle corporate center will be moved to the new headquarters. The others will be transferred to other departments or may be laid off, only the company's huge jet manufacturing plants will remain in the Seattle area, as will much of its research and development work" said the statement.

The city was facing uncertainty until the 'new Tech Corporates, Google, Amazon, Uber etc started establishing themselves in the City. Prof Binedell went on to articulate how the City administrators, the Tech Industry Executives, professionals and activists

came together to discussed plans of action for the revitalisation of the city. This has resulted in the urban regeneration which has contributed to Seattle being one of the most 'liveable cities' in the USA.

With these examples, I strongly believe, and advocate for similar approaches to be adopted in South Africa, to address the state of our cities and the perspectives for the revival and survival of these cities. If there are new cities required, there should be clarity as to how and where these are required, including how these relate to the existing cities. I do not believe that new mega-cities can be island in a sea of dysfunctional cities.

One of the contentious issues in the drive for inclusive cities in South Africa is the role of civil society. For the last decade or so, in Cape Town and other parts of the country this space has been occupied by organisations like the Social Justice Coalition and Ndifuna Ukwazi. These civil society bodes have been calling for the utilisation of public land in the inner cities and the provision of affordable housing especially in the inner cities, noting that housing opportunities in the cities should not only be provided for the higher income groups only. In the drive for affordable housing, civil society bodies have advocating for inclusionary housing which other cities in the global North have been able to provide, and this contributing to more integrated and inclusive cities.

The big issue for affordable housing is the availability of land in the inner city and Ndifuna Ukwazi and other civil society bodies have been calling for the utilisation of public land for this purpose instead of this land being sold off to private developers. This has led to contentious litigation in some cases, which has contributed to the "costly delays on projects" and a perceived "anti-developer sentiment"! This has been an unfortunate development in a space, which has been difficult for the professionals in the built environment to navigate due to the perceived "conflict of interest".

Professionals in the built environment are an integral part of urban development, private and public, but also integral part of civil society and the drive for just cities is the space that built environment professionals should be promoting and sustaining. Spatial justice has become a term, which built environment professionals need to be engaging in and should be grappling with.

In the report City Leases, City of Cape Town Failures to Redistribute Land (March 2019), the report focuses the particular problem of "leased land owned by the City of Cape Town which should be prioritised for redistribution but instead is used in an inefficient, exclusive and unsustainable manner. How is this possible? Who is managing our land and what is blocking its release? How can we change this and what is possible if we do?"

The report goes further to note, "unlocking public land remains arduous and complex. In the absence of a coherent legislative framework for land administration, developing housing on our best public land is hindered by multiple barriers. Collusion, budget cuts, and a lack of imagination often sees our best land disposed of to the private sector. Even where there is political will, the financial instruments to develop mixed-income public housing are not well developed, and narrow interpretations of legislation are used to block the disposal of land below market rate. Capacity in the City is limited or non-existent and planned projects take many years to move from feasibility to bricks in the ground."

Ndifuna Ukwazi argues in the report, that "in Cape Town, so little affordable housing has been built in well-located areas like the inner city and surrounds since the end of apartheid. It is time to review how the City of Cape Town manages our public land and stop the renewal of bad leases."

In my opinion, civil society bodies are an integral and important player in the shaping of our cities and as Prof Binedell pointed out, cities should be developed on a multi-stakeholder basis, and this includes Civil society bodies and the public in general. One of the successes of civil society bodies in the Western Cape at least, has been to achieve a threshold minimum for the provision of affordable housing in private developments, especially where public land is being utilised, or where development rights are being applied for at 20% of residential opportunities. One of the key requirements for this is ensuring that such housing is "provided for into perpertuity", thereby ensuring that affordable housing is not just a token but entrenched in the housing strategy of our cities.

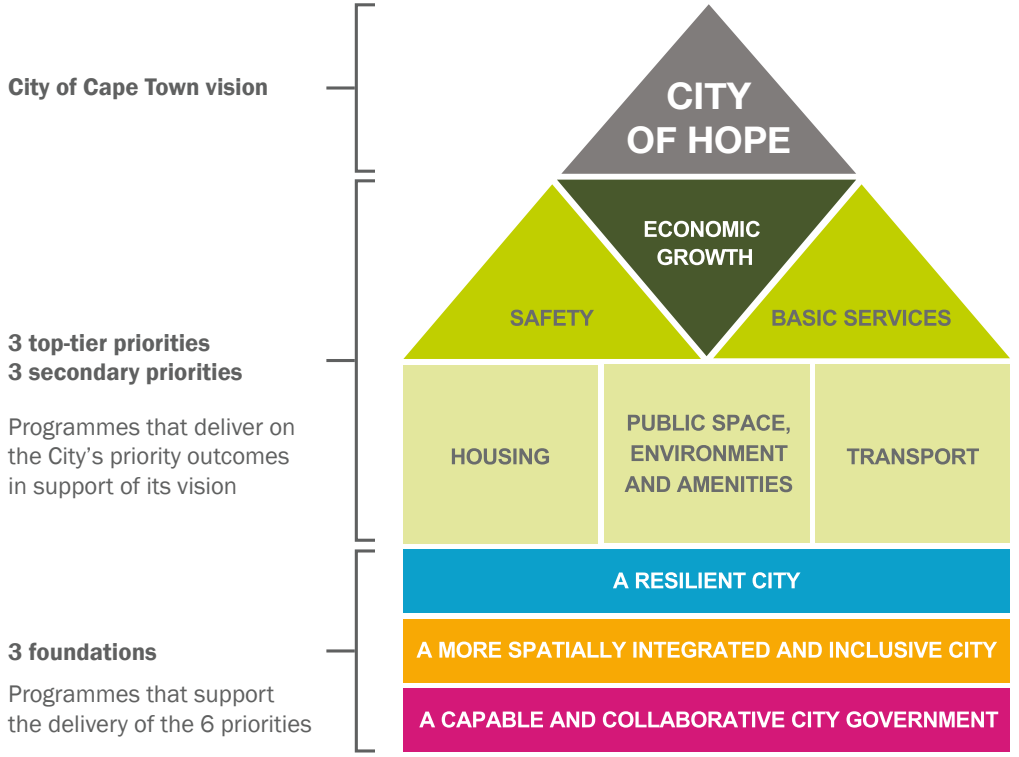
As a result of the drive for inclusive cities, the Western Cape and the City of Cape Town in the last few years have been engaging civil society bodies and developing concepts and legislation supporting "inclusionary housing".

In my opinion, these are important developments which need to be accelerated to ensure that our cities to be inclusive, accessible and more integrated to accommodate all sectors of society not only for the higher income groups. It is a known fact that the legislated social housing provision is not adequate to meet the needs of middle-income earners, and the social housing entities have not been able to meet the needs due various factors, economic constraints, unavailability of affordable land, lack of access to finance and inadequate mechanisms to manage rental social housing on a large scale. Some organisations have achieved some successes in this space, but it is known, that there are many difficulties encountered to make social housing and affordable housing viable, some form of cross-subsidisation becomes necessary in current climate.

Prof Edgar Pieterse in his response to the question of "new cities", pointed out that Government has good policies which are meant to assist with the management of urban development and the creation of integrated cities, however these are not being implemented.

To mention a few, the IDP's of most cities, the Cape Town IDP in particular calls for "The City of Hope" driven by the following parameters: (see below)

On the other hand, the IUDF (Integrated Urban development Framework) championed by the COGTA (Department of Cooperative Governance and Traditional Affairs) has nine levers which include Spatial



The IDP strategic plan, comprising priorities and foundations that all support the vision of creating a City of Hope

GREEN BUILDING

JHB CBD, Google maps

Planning, Transport and Mobility, Human Settlements etc, all these promote equitable and inclusive cities, which in my opinion includes the existing cities as well. As Prof Pieterse pointed out, it appears that these policies are not being implemented at local level. I do not see the IUDF being considered in most of the housing projects of the Department Human Settlements currently.

In the article by Ashraf Adam and Roland Postma in the Daily Maverick (16. March 2023, Urban planning – our cities are at a crossroads) quoting the former National Statistician Mr Pali Lehohla, it is stated: "Confronted by the monumental task of building a nation divided and devastated by apartheid, South Africa has indulged in a series of plans— Reconstruction and Development (RDP), Growth, Employment and Redistribution (Gear), the Integrated Sustainable Rural Development Programme (ISRDP), the Urban Renewal Programme (URP), the Accelerated and Shared Growth Initiative for South Africa (AsgiSA), the New Growth Path, the National Development Plan (NDP), the Nine Point Plan, the Fourteen Point Plan, the New Dawn, the Growth Renewal and Sustainability Plan, the Economic Recovery and Reconstruction Plan, the District Development Model and attendant master plans, and Just Energy Transition. Fourteen plans in three decades is a new toy for the nation every two years." Cabinet also adopted the integrated Urban Development Framework in 2016 and the National Spatial Development Framework was gazetted in February 2023."

The big question in my opinion is how policies can be translated into actionable programmes. This is a matter, which should be at the centre of the discourse on the future of our cities and the debate on new mega cities"! It does not seem to make sense, to call for new cities when the mechanisms which the public sector has control of, for managing existing cities seem to be ineffective, inadequate or simply failing. The way new mega cities are likely to develop, is for them to be even more exclusive than the current ones. This is a mater of concern given the lack of public debate on these issues and given the exclusive nature of our cities inherited from the apartheid era.

In the course of 2021 and 2022 I was part of an initiative exploring the urban regeneration and revitalisation of a precinct in the inner City of Johannesburg.

One of the approaches for this initiative was developing an urban strategy at precinct scale as a way of managing the transformation of a precinct which was losing its corporate image as most parts of the JHB inner city have experienced over the last decades, starting in the 90s, with the emergence of Sandton, the revitalisation of

Rosebank and later, the development of Melrose Arch which to many of us was seen as a breakthrough in creating a different sense of urban quality. All these developments were driven by the private sector working with the City of Johannesburg. More recent initiatives include the precinct of Maboneng and Jewel City, which was linked to the revitalisation of the ABSA Bank precinct in the inner city.

The urban strategy we developed for the inner city precinct in Jhb in 2021 was a result of the establishment of an advisory panel of various experts in the built environment, property experts, historians,

Jewel City, JHB

social activists and the corporate sector, calling for a multi-stakeholder platform which would include other corporate stakeholders, the City, Gauteng Province, civil society, the taxi industry etc to participate and drive the revitalisation initiative. This initiative did not succeed due to the economic and investment climate at the time, and more concerning, the difficulty to get the multi-stakeholder platform off the ground.

In addition to this, the economic viability of the envisaged revitalisation did not seem to work, and the investment climate did not seem to support it.

I am mentioning this as a painful lesson of seeing how an urban strategy and an opportunity to revitalise an inner city precinct was doomed to fail, due to the reasons of lack of coherence and interest in the revival of the fortunes of an inner city precinct and the lack of a longer term vision beyond the current economic and investment climate facing the commercial hub of Africa, Johannesburg,

In conclusion, it is important to mention, that there are no simple answers, the above contributions are part of a broader discourse which I believe is necessary in the context of the state of our cities.

Jewel City, JHB

The South African Cities Network is another important player which has been playing a key role in advocating for better cities. Somehow, it does seem that there are many voices playing a role in shaping our cities but there also seems to be a lack of coherence and the shared values do not seem to converge or translate into a coherent vision for our cities. All these voices need to be galvanised to hopefully achieve a shared vision for our cities. Cities cannot be shaped by top-down decisions and declarations at a political level only, they should be shaped by concerted efforts, to meet the needs of society on a multistakeholder basis, the public and private sector working with civil society and the public in general. The debate regarding the future of our cities should centre around ways to achieve this.

In the Daily Maverick (6. March 2023), Johnny Friedman further points out: "I also believe that the concept of a central business district has become obsolete.

"Instead, we should focus on creating multidimensional spaces where people, particularly young people, want to live, work and socialise in order to attract business. These are places that speak to our human, social and cultural needs. Places that are designed to make our cities more connected, sustainable and green foster successful, happy and safe places and people. If we do this, businesses from all over the country and the world will come to these cities, changing South Africa's outlook, perception and story."

Johnny Friedman further points out, that "I am convinced that reinventing our cities and neighbourhoods is the only way to turbocharge our economy, create jobs and provide hope to millions of young people. But it is critical to understand that commerce and economic growth are by-products of creating great private and public spaces. It rarely works the other way around."

Given the current challenges facing our cities, I am fully convinced that this public debate should be inclusive of all the stakeholders and in my opinion, professionals in the bult environment are and should be a critical voice and an active component of this broader discourse regarding a shared and vision for the long-term sustainability of our cities.

Bridging Theory to Practice: Overcoming Difficulties in Adopting and Pursuing Regenerative Design

Annemie Vermeulen

In the face of an uncertain future due to rapid climate change and inadequate governmental systems, it is imperative that we change the way we approach building design and construction. By incorporating regenerative design principles into building projects at various scales, South Africa can unlock the potential for a more sustainable, environmentally conscious, and prosperous future. Regenerative Design is a pro-active, forward-thinking approach that aims to go beyond simply eliminating detrimental practices; the goal is to create healthy spaces that actively contribute to the well-being of both people and the planet. It goes beyond traditional sustainability by focusing on healing and enhancing the environment[1].

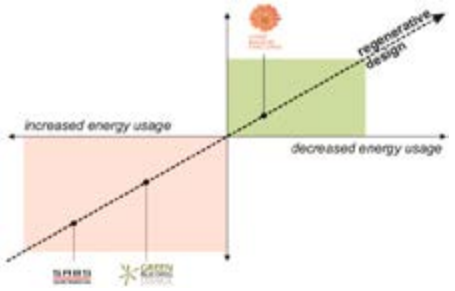
Internal view

What is Regenerative Design?

Regenerative Design seeks to mimic the natural processes found in ecosystems, where everything is interconnected and actively contributes to the whole, firmly anchored in the principles of resilience & holism[2]. As the word regeneration suggests, this design approach seeks to ensure a continuously net positive end result after project completion.

We can apply the analogy of buildings that function as living organisms, seamlessly integrating with their surroundings and promoting harmonious living. This approach prioritizes energy efficiency, with buildings generating their own clean energy from renewable sources and using it wisely. It also emphasizes responsible water usage, capturing rainwater and treating wastewater on-site to reduce consumption. In selecting materials, Regenerative Design favours safe, sustainable options that have a minimal negative impact on the environment. Locally sourced materials are preferred to support regional economies and reduce carbon footprints.

Beyond environmental considerations, Regenerative Design is about creating spaces that benefit people – not only the project's users, but also the larger community. It incorporates natural elements, green spaces, and biophilic design to improve well-being and foster connections with nature. We believe that Regenerative Design is a positive and innovative way of building that should be incorporated in the construction industry to leave a lasting impact, in both the natural and economic environment. It's about creating a more sustainable and resilient[3] future, where buildings not only 'do less harm' but actively contribute to restoring and nurturing our environment and society.



Regenerative Design Diagram

Why should you pursue Regenerative Design?

When advocating for Regenerative Design, despite potential challenges, one can recognize numerous positive benefits for South African society[4]. These include addressing core societal values such as inclusivity & respect; solutions to inadequate grid supply, and to create resilient neighbourhoods and investment opportunities.

a. Unifying design

Regenerative Design presents an ideal, holistic alignment of the values that institutions and government policies should uphold. It offers a unique opportunity to physically exemplify values such as quality, compassion, justice, respect, and accountability, representing a much-needed mindset reform in South Africa. Embracing regenerative design in building projects allows us to move away from architectural styles that may evoke negative historical connotations[5]. Regenerative design promotes human scale, social justice, and rights to nature, ensuring that buildings benefit all stakeholders and contribute positively to the immediate community. By adopting a design approach that prioritizes inclusivity and respect for diverse cultures as well as the natural environment, we can create buildings that are approachable and represent unification[6]. By promoting these universal values, Regenerative Design offers us a cause free of divisive political connotations.

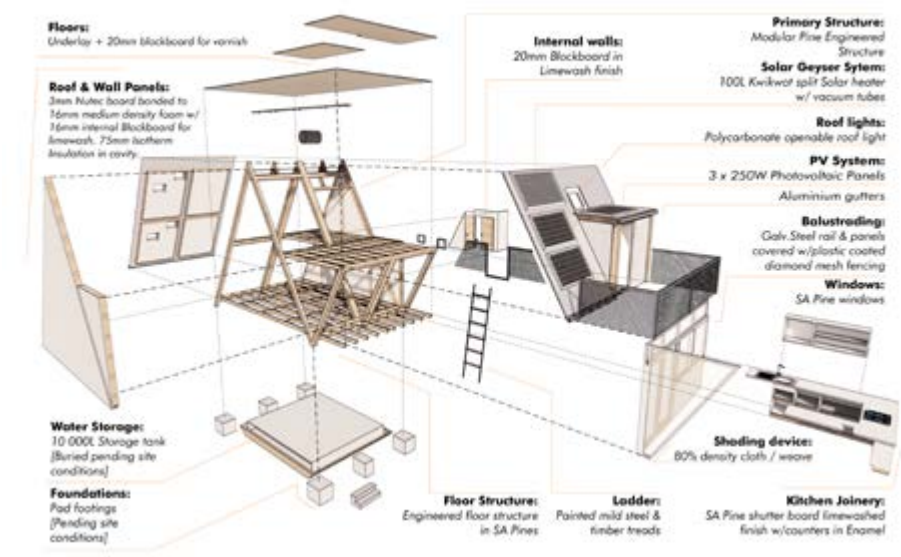
External view

b. Insufficient grid vs interconnected living

In the face of inadequate supply and overburdened governmental and municipal systems, seeking alternative solutions becomes paramount[7].

Regenerative design once again emerges as a promising avenue by fostering interconnected systems and shared resources at the neighbourhood or housing development scale. By applying regenerative principles in a coordinated manner, neighbouring

Energy Modeling, Thermal Comfort, Energy Efficiency & Lux Levels



Exploded Diagram

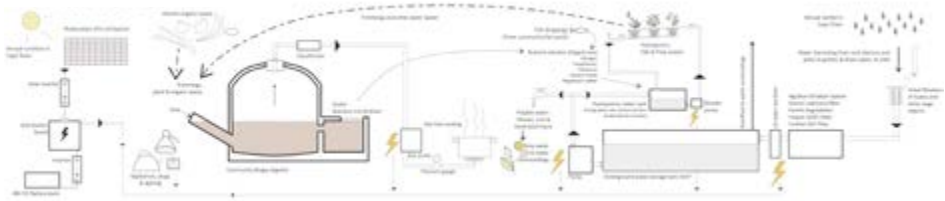
properties can collaborate to create a more resilient and sustainable community[8]. This approach facilitates the development of feedback loops and joint efforts, enabling the shared optimization of resources such as energy, water, food and waste for the collective benefit[9]. The integrated systems diagram (see below) serves as an example of how various households can efficiently share various systems. Regenerative neighbourhoods can be inspiring models of sustainable living, encouraging other communities, and the myriad of Housing Estates, to adopt similar interconnected systems and generating a positive ripple effect across South Africa's urban landscape.

c. Trendsetting and profitability

The implementation of regenerative design can lead to substantial long-term savings and increased capital gain for building owners and stakeholders. While the initial investment might be higher, regenerative buildings boast significantly lower operating costs over their lifecycle. The energy-efficient systems, reduced water consumption, and sustainable materials used in such buildings result in considerable financial benefits in the form of lower utility bills, maintenance expenses, and resource consumption.[10]

Neighbourhoods or new housing developments have the potential to be trendsetters[8], which can be a marketing advantage for developers and investors.

Regenerative principles become a positive addition that can boost property values, much like having fibre-optic internet or being "off the grid," have historically proven to be profitable assets for a property's value. Ultimately, regenerative buildings become lucrative assets, attracting tenants and



Integrated Systems Diagram

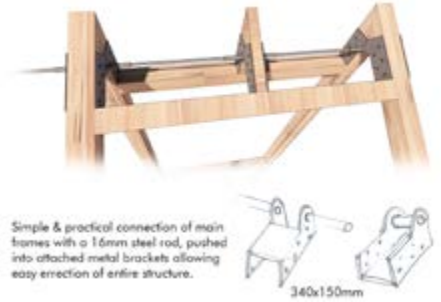
investors seeking sustainable, cost-effective, and environmentally responsible properties.

How can you incorporate regenerative design principles in everyday practice?

As with any theoretical solution, the translation and adoption into an existing industry is presented with obstacles. Bridging the gap between theoretical approaches taught in tertiary institutions and practical applications in the dynamic and profit-driven construction industry can be demanding. These challenges include a financial barrier with higher initial building costs as well as client scepticism towards regenerative design or the public perception thereof.

There are several strategies that can be used to surmount these obstacles and foster widespread adoption of regenerative design practices. Some of these include conducting long-term cost analysis, educating clients and stakeholders, and advocating for government support through incentives and progressive policies. There is also an abundance of existing design frameworks that can be implemented to achieve a regenerative project.

Ground Floor Plan



Hinge Detail

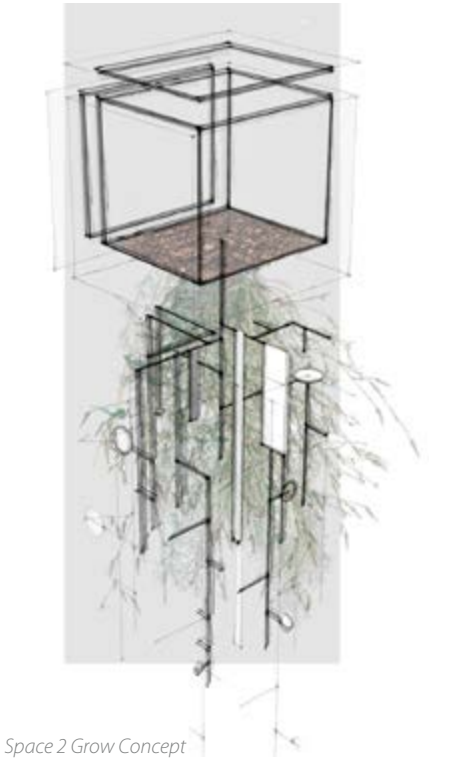
Case Study: Space 2 Grow

We have used Regenerative Design principles in various conceptual projects, but here we'll focus on our net-zero-carbon-home. We submitted this design to the City of Cape Town's 2021 'My Clean Green Home' competition and were awarded second place. The competition emphasized net zero energy and how such homes can become accessible to the general public through affordability and education. The brief of a net zero home and systems can be overwhelming.

Our approach was to break down the requirements into simple, low-tech and practical parts. Space 2 Grow is a realistic and achievable green home that gives its occupants scope to grow and refine over time. Key words we considered are systems, construct-ability, compact, economic, adaptability and education.

Construction Sequence

Section AA



Space 2 Grow Concept

Modularity was a key consideration in our approach, as this provides manageable parts that can be easily scrutinised through a regenerative lens. It is easier to source materials for a component locally than it is to police an entire project. Similarly, optimising production and thereby limiting waste is also much simpler to do in a factory setting than on a building site. By streamlining production in this way the idea is to be able to deliver a kit of parts to site. These parts should be scaled to humans so that the assembly can be safe, manageable and easily understood.

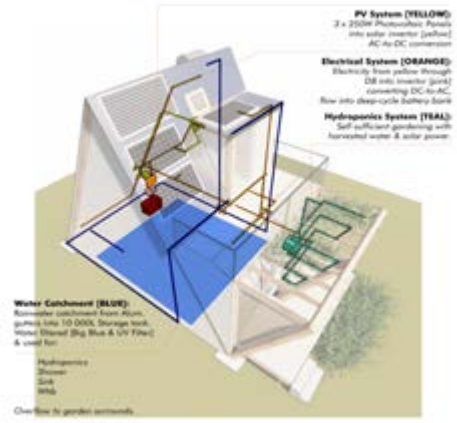
Harnessing human energy, particularly of the end-user, is a key consideration in giving back the ability to make shelter to people. This would not only empower clients through acquiring new skills, but would also foster a deeper connection and appreciation for their built environment. As with all things, the better we understand the cost, the better we will look after and maintain our buildings. The real cost of our built environment to the planet and ourselves has been removed from our consciousness for far too long.

Conclusion

In closing, this article invites us to consider regenerative design as a transformative approach that goes beyond making 'less bad' buildings, but rather to strive toward actively healing and enhancing the environment. While we acknowledge the stumbling blocks and challenges, we believe that there are strategies, certifications and programs available that can help us to achieve our goals. Leveraging the Internet of Things (IoT), data monitoring enables comprehensive measurement and management of building performance metrics.

It is imperative that the construction industry is transformed. We need to affect change that will move the driving forces away from the purely financial toward a more holistic, sustainable model. The only way that this will happen is if all of us actively promote these ideals on every project. With every successful implementation of (even isolated) regenerative strategies, the awareness in the industry will grow, ultimately paving that way for widespread acceptance and adaptation of these values.

The Cree Indian proverb reads: "When the last tree has been cut down, the last fish caught, the last river poisoned, only then will we realize we cannot eat money." In this money-driven construction industry, it is crucial to continuously aspire to the novel concepts taught to us during our student years and to infuse them into every decision we make, not to be swept away with the current. The imperative to protect our planet and conserve its resources is highly significant. It is our shared responsibility to ensure environmental sustainability for future generations and promote a



Building Systems Diagram

Loft Floor Plan

flourishing world for all species. Regenerative Design serves not only as an architectural approach but also as a compelling call to action for a more promising ecological and social future.

Acknowledgements

2AD Space Architects Inc. operate collectively and this article, likewise, reflects collaborative contributions, stemming from varied office discussions encompassing the entire team. Annemie Vermeulen led the writing, while René Winzker & Marc Degenaar assumed editorial responsibilities.

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Designing for Energy Efficiency: Discussing strategies for designing energy-efficient buildings, including passive design techniques, proper orientation, effective insulation, and the integration of renewable energy sources.

Gillian Holl, founder and principal, Veld Architects

Veld Architects believes, quite simply, that as an architect, wherever you are in the world, you should not put pen to paper unless your design will encompass sustainable and regenerative design principles. The time for warnings about the environmental damage caused by irresponsible construction is long gone. Part of our understanding of the responsibilities of our profession as architects is not merely, as the famous saying goes, to be "less bad". Rather, it is actually in designing buildings that restore ecosystems, nurture communities and sustain everything from the environment to economies and even value systems.

On one level, this means designing buildings that, among other things, generate and store energy, treats their own wastewater, capture carbon, increase biodiversity, and so on. Many of these aspects of architecture are, however, what you might call technological solutions. They involve doing the same thing that we've always done, but trying to do it more efficiently.

But perhaps one of the most important principles of designing sustainably should actually involve a shift in mindset. One of our beliefs at Veld Architects is that, instead of separating and insulating us from nature, the weather and the elements, the buildings we design should connect us to nature. It's quite possible to provide comfort and shelter and a sense of security (indeed, luxury) without wilfully separating ourselves from nature. A house that enhances our connection to natural cycles and fosters and appreciation of our natural environment and the importance of ecosystems, in turn, encourages us to care for nature, to appreciate it and enjoy living in harmony with nature. In this way, a fundamental transformation can take place in our relationship with the environment, which goes much further in creating the conditions for ongoing sustainable behaviour than simply applying a band-aid to our current situation.

At the same time, one can't help being aware that some of the technologies associated with energy-efficient architecture might be experimental or simply expensive than conventional buildings. But the truth is that before you even start looking at sustainable technologies – heating and cooling technologies, for example – the first port of call for any architect should be to reduce the energy demands of a building before they're even needed. And, as has been said before, in this respect good architecture costs not more than bad architecture! Things like orientation, building materials, insulation, ventilation lighting others, which have a significant effect on the sustainability of a house, or any other budling for that matter, are attainable to anyone building a house.

Simply by orientating a building properly, so that exposure to the sun is optimised, is the most fundamental way to take advantage of the sun's energy to naturally heat and light a building. In a warm climate like ours, simple design features like overhangs and other shading elements (even deciduous trees) can be strategically placed to provide summer shade while allowing winter sunlight to penetrate. Another low-hanging fruit is natural ventilation, which saves energy (and costs associated with artificial heating), but also improves indoor air quality.

A simple favourite at Veld Architects is a mono-pitch roof, which has a one-directional slope, which is one of the easiest ways to open the home to an abundance of natural light and panoramic views of nature, and also makes the perfect platform for solar panels and effective rainwater harvesting.

Of course, the materials we use are fundamental to this way of designing, too. Building with materials such as wood, stone, soil and the like are among the best insulators, engendering comfort and efficiency.

One natural material growing in popularity and introducing ever-new possibilities is timber, especially given the advanced strength of cross-laminated timber (CLT), which even makes timber high-rise buildings possible. When grown sustainably, timber has the capacity to store carbon dioxide absorbed from the atmosphere during a trees growth, known as "carbon sequestration" or a "carbon sink". Thus, the demand for construction actually helps remove carbon dioxide from the atmosphere, which makes for regenerative possibilities.

Another Veld favourite, the rammed earth wall, is strong and beautiful, requiring, in many cases, no transportation costs. They're a great insulator, they're porous which makes for good air quality and they also harmonise beautifully with the environment, their natural colours and textures even introduce some of the benefits of biophilic design. Related to that, natural materials tend to be healthier than their artificial counterparts: they do not emit chemicals.

Other materials like clay are known to help regulate humidity and improve air quality by absorbing toxins, which ultimately contribute to a healthier living environment. Similarly, natural light and views of nature – simply a design decision – reduce stress and improve wellbeing.

Natural materials also lend themselves to re-use and recycling. They're also often biodegradable or easier to return to the environment in a way that minimizes waste and resource consumption.

On a continent like Africa, the ravages of colonialism mean that much of the knowledge that has been employed for thousands of years in vernacular architecture has been devalued, displaced and lost. Yet, the more we explore sustainable design, look to use natural materials and seek local solutions, the more we find that many solutions lie in rediscovering lost local knowledge. While local communities have come to overvalue western materials and building typologies, some of the best solutions lie in lost and rejected local heritage.

As architects, and society at large, learn to value vernacular construction and design, it also leads to a re-evaluation of cultural heritage, restoring a sense of pride and an aspirational quality to what was always good, but became devalued. Thus, sustainable design, when done properly, also has the potential to sustain local culture and identity, while at the same time respecting the ecosystem (something that many traditional local cultures did in precolonial times, anyway).

It's important, however, to make the distinction that learning from vernacular design does not necessarily mean building in an old-fashioned way – which often holds no potential as a solution to rapid urbanisation and the escalating need of fast-growing cities – but learning to draw on lost and undervalued local knowledge to design and build in a contemporary way. This can also mean designing spatially in a way that maintains traditions, customs and social structures, but translated to suit a modern urban context.

Using local materials and skills also encourages a shift toward local construction resources, which in turn teach and nurture skills, support the local economy and create employment opportunities. Sustainability and prosperity are not, and should no be seen as mutually exclusive.

Perhaps one of the most transformative elements of sustainable or regenerative architecture, when viewed along these lines, is its ability to shift our values, attitude and beliefs. The sense that a sustainably built house can engender an awareness in its inhabitants of our interconnectedness with nature and its ecosystems has in it the roots of a shift in culture, belief and perhaps most of all, behaviour. A building itself, in its materials, efficiencies and so on, can only do so much. What the people who inhabit these buildings do, however, takes the possibilities for sustainable and regenerative living to another level. Architecture, in the way that it frames our worldview, mediates our relationship with the world and forms a platform on which our lives play out, affects the way we act. When architecture reframes our worldview to appreciate our place as humans withing a larger ecosystem, it has the potential to change what we do in all aspects of our lives, which sustains ongoing regenerative change that ripples even outward.

INFRASTRUCTURE

Building Sustainable Infrastructure for Generations: A Unifying Path Forward

Chris Campbell, CEO of Consulting Engineers South Africa

Amidst the awe-inspiring accomplishments of our South African athletes, who have united the nation under the banner of excellence, it is imperative that we channel this unity and collective will towards addressing one of our nation's most pressing challenges: infrastructure development. Just as Banyana Banyana, the Proteas netball team, Kat Swanepoel, and our Rugby team have showcased the strength of unity, our collective efforts can propel us towards a brighter future, where sustainable infrastructure serves as the foundation for prosperity that benefits all.

Infrastructure, the lifeline of a functioning society, lies at the heart of our national progress. Consulting Engineers South Africa (CESA) recognizes the vital importance of sustainable infrastructure in shaping our economic growth, enhancing the quality of life of our citizens, and securing our nation's future. As we revel in the achievements of our athletes, it's crucial to acknowledge the immense positive impact that well-planned and resilient infrastructure can have on our society.

Decaying infrastructure has far-reaching negative consequences, undermining both economic growth and societal well-being. Inadequate basic services impede commercial and public investment, hindering the potential for a thriving economy. To provide access to healthcare, education, and opportunities for all, we must first ensure access to safe drinking water, proper sanitation, and functional transportation systems. The recent gas explosion in Johannesburg's Lilian Ngoyi Street (formerly Bree Street) starkly illuminated the need for better understanding and maintenance of our urban infrastructure.

This incident underscores the importance of documentation and technical expertise in ensuring the safety and efficiency of our cities. It also reveals a wider challenge: a shortage of technical skills among professionals and artisans alike. The lack of investment in trade schools and vocational education has left us with an aging workforce and a dearth of skilled individuals capable of maintaining and improving our infrastructure systems.

While the challenges are substantial, a focused and systematic approach can yield tangible solutions. It's imperative that we prioritize key areas for intervention, directing resources and expertise to areas where they can make a significant impact. By addressing critical issues one step at a time, we can steadily overcome the immense obstacles in our path.

Yet, these solutions demand a comprehensive plan that transcends political boundaries and policies that may have contributed to the deterioration in the first place. In this context, power utility Eskom looms large, an issue that demands thoughtful analysis and reform to reverse the damage inflicted by mismanagement and corruption. Eskom's challenges are indicative of a broader problem in our nation's administration and planning, which must be addressed to secure our fundamental well-being.

Lessons drawn from this experience should be used to prevent a similar crisis in our water sector, where similar ills are already evident. We cannot be seen to be "kicking this can down the road" as well, until such time that we find the phrase "water shedding" becoming part of our daily lives and in the vocabulary of our children and grandchildren across the country. Temporary water tanks and tankers, which have become permanent owing to corruption, arguably linked to the deliberate sabotage and neglect of functioning water infrastructure needs to be rooted out. Public-private partnerships are imperative if we are to restore the functioning and capacity of countless water treatment plants, which are currently not functional. Let us indeed be serious about declaring a: "War on Leaks", where these losses of potable water continue unabated for months on end, have grown from around 30% and is now edging closer to 40%.

Chris Campbell

We must be reminded that greatness is achieved through unity and collaboration; and rally together to build resilient and sustainable infrastructure that will stand the test of time and serve generations to come. Building a nation must be characterized by the excellence of its infrastructure, enabling prosperity and opportunity for all.

Let us harness the spirit of "Stronger Together" not only in our sporting endeavours but also in our efforts to construct a future that is defined by sustainable infrastructure, economic growth, and shared prosperity. Together, we can rise above our challenges and ensure that the legacy we leave for future generations is one of progress, resilience, and enduring unity and importantly sustainable infrastructure that serves the needs of our ever growing population.

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Freedom as a Precursor to Sustainable Communities

A Focus on Freedoms – An enabler to Sustainability in South Africa and Africa alike

This article serves to argue that concept of sustainability is considered differently for developing countries versus developed countries to the idea that freedoms are articulated differently. Developed economies tend to look at sustainability with a significant focus towards environmental impact whilst developing countries consider sustainability from a socio-economic perspective which includes infrastructure-related challenges. This article creates an awareness of the fact that sustainability is envisioned differently and relates to issues faced in the country, the region, the continent, and the world. The concept of freedoms matters in South Africa and is argued to be necessary for incorporation into any sustainability initiatives.

Notwithstanding that we are globally disconnected on sustainability priorities, it remains that varying perspectives do increase dissonance by influencing how we behave, debate, construct developmental strategies, execute projects, and transform societies with the intention to remain sustainable. Depending on one's background, culture, experiences, and prevailing aspirations, we will see sustainability and its constructs differently. If we are to work as a unified collective to address sustainability at a global level, we must find each other – an altruistic view. Presently we can argue that our power crises have brought a disconnect to the fore, creating the renewables versus coal discourse. It is an example of environmental versus social/economic debate towards a sustainable energy solution.

The sustainability pillars namely social, human, economic and environmental serve as the basis for defining and articulating sustainability strategies with respect to programs, initiatives, and actions. Sustainable development pillars are the same however exclude the "human' pillar. The human pillar also referred to as the cultural pillar is a recent addition to the initial three. These pillars have been researched and constructed for businesses, communities, public sector agencies and the like, to assist with meaningful and relevant applications. Social refers to initiatives that support healthier, fair, and just communities. Environmental refers to the preservation of environmental resources so as not to over-exploit them, thereby allowing ecosystems the chance of recovery. The economic pillar refers to economic and financial sustainability in the usage of efficient assets.

The cultural pillar enables initiatives only when the beliefs, processes and practices of a given society are protected and nurtured. The identity of communities should remain intact for sustainability to flourish.

It is likely that socially just communities with strong economies and robust cultures will find that the environmental pillar is key to their sustainability. Exploring the environmental pillar may confuse other communities that are more concerned with near-term survival and prioritise other pillars. I would argue as postulated above, the latter applies to South Africa, Africa, and perhaps other developing countries. Having made a case for differences in sustainability priorities, it can be seen why there would be different emphasis on sustainability initiatives across communities.

The initiatives relevant to sustainability in South Africa and perhaps other African and developing economies relate to the following: Poverty and inequality; South Africa is struggling with high levels of poverty and income inequality exacerbated by one of the highest unemployment rates in the world, which can hinder efforts to achieve sustainability.

Poverty exacerbates environmental degradation as people may resort to unsustainable practices, such as overexploitation of resources or reliance on polluting technologies.

Access to clean water and sanitation relates to the effective provision of infrastructure. South Africa currently faces the challenges of providing adequate access to clean water and sanitation facilities to all.

Lack of access to safe water and sanitation not only affects public health but also leads to contamination of water sources and improper waste disposal, contributing to environmental degradation of which the recent cholera outbreak is indicative.

Deforestation and biodiversity loss with developing countries often have high rates of deforestation, driven by factors such as agricultural expansion, logging,

and fuelwood collection. Deforestation not only reduces biodiversity but also contributes to climate change by releasing greenhouse gases and disrupting ecosystems. This remains a current disconnect between the developed and developing economies.

Adding insult to injury, many advanced economies continue to trade and maintain the demand for natural resources whilst professing sustainable ideologies in the same breadth. Employment on the back of providing and maintaining infrastructure is a short-term initiative that has a direct and positive impact.

Climate change vulnerability relates to the environmental pillar where developing countries are often more vulnerable to the impacts of climate change due to factors like limited resources, weak infrastructure, and high dependency on climate-dependent sectors like agriculture. This vulnerability can lead to increased risks of extreme weather events, food insecurity, and water scarcity. In addition, energy access and clean energy transition is a problem that South Africa faces currently and is common to many developing countries that still rely heavily on fossil fuels for energy, leading to air pollution and greenhouse gas emissions. Lack of access to modern and clean energy sources also limits economic development opportunities in these countries.

Lastly and not limited to waste management and rapid urbanization and population growth in developing countries have led to increased waste generation. However, countries often lack adequate waste management infrastructure, leading to problems like open dumping, landfill pollution, and improper disposal. The above-mentioned sustainability issues are therefore a mixed bag that pertain to the pillars, and of which all have an infrastructure solution. As there is an endless list of problems, I postulate that initiatives that underpin freedom will gain the greatest buy-in as it promotes socioeconomic progress.

Addressing sustainability requires a comprehensive approach involving various stakeholders, including government institutions, international organizations, civil society, and the private sector. Efforts should aim to promote sustainable development practices, improve access to clean water and sanitation, promote renewable energy adoption, protect biodiversity and forests, strengthen infrastructure, and build climate resilience.

Freedom in South Africa is about the struggle for people to think, theorize, interpret the world and write from where they are located, unencumbered by colonial influences. In many developing economies, locals are engaging in diverse struggles for cognitive justice whilst trying to interpret the world as they see it. I think South Africa is no different. Therefore, a fact comes to the fore that South Africa can only articulate sustainability if it achieves political, cultural, economic, and other freedoms. The motivation is that the sustainability pillars corroborate the necessary freedoms and can therefore serve as the motivation for where the focus should be. As South Africa has transitioned to political freedom, economic freedom will allow for socio-economic growth and prosperity.

If citizens can engage in economic activities of their choice, such as starting a business or choosing their employment, it is thought that sustainability can be progressed.

In South Africa, it will therefore be reasonable to link sustainability to economic freedom to garner the support to transform existing practices, methodologies, and policies to incorporate hard-coding requirements that embody sustainability.

There is a sincere need for the government takes socio-economic development and by implication sustainability to the core of its purpose in how it leads the country which is currently not the case which is why there is an argument for growing unsustainability.

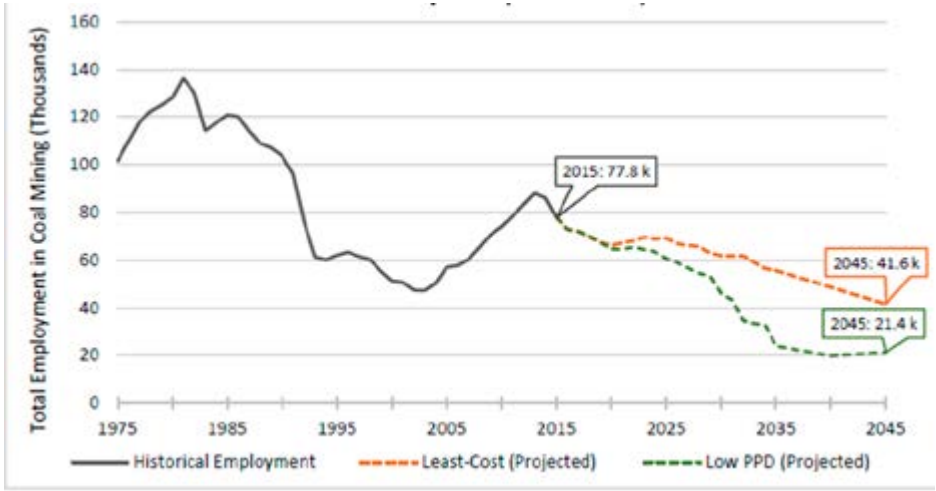
A key construct of South Africa's socio-economic freedom is that of land ownership and wage inequality which have yet to be meaningfully addressed and has become a political bargaining chip with no real resolution in sight. Both issues are significant that may secure the comfort of the majority that freedom is in fact possible. By implication South Africans risk losing their freedoms to the extent that we may even lose our hard-fought political freedom should we proceed on our current trajectory.

Pathways to unlocking green jobs in South Africa

Dr Mao Amis & Sonwabile Lugogo,
African Centre for a Green Economy

South Africa is facing an unprecedented unemployment crisis, where it's estimated that almost 60% of the country's youth are unemployed. This high level of unemployment is a ticking time bomb as its unsustainable as it will deepen the high levels of inequality which are already very prevalent. The need to create more decent jobs is not only a necessity, but also extremely urgent.

The transition to a low carbon economy, holds enormous opportunity if it's well harnessed to create decent jobs. Even though the anticipated job losses in the coal sector, could be a major drawback in the short term, opportunities for job creation could be created in other related green sectors. However, this would require the prioritisation of reskilling interventions and accelerated



Total coal mining employment in South Africa Historical and Projected (1975-2045), Source: Strambo et al, 2019 adapted from Burton et al, 2018.

investments in the local economy, in order to diversify.

There is a clear need for the creation of green jobs in order to ensure that South Africa's just transition is successful. Green jobs are understood as decent jobs that contribute to the preservation or restoration of the environment, whether they are in traditional sectors such as manufacturing, agriculture, construction, waste management, water management etc, or in new emerging green sectors such as renewable energy and energy efficiency, electric vehicles etc (IOL, 2016).

It's therefore clear that unlocking 'green' jobs is an economy wide endeavour, not restricted to specific sectors. However, despite the need for green jobs creation in South Africa, on the ground change remains very limited and a clear path forward for unlocking green jobs is yet to emerge (World Resources Institute, 2021). Due to the high rates of unemployment, there is high probability that the displaced workers from the coal sector will struggle to find new jobs if retraining and reskilling programmes are not provided.

Considering that the transition to a low carbon economy is inevitable, it's critical to understand where green jobs could be unlocked and the nature of those jobs. There is also a need understand the skills and qualifications that will be required for the green jobs that will be created.

The risk of just transition to the coal sector value chain workforce and communities

South Africa needs to grapple with the transition risks associated with decoupling its economy from a high carbon intensive pathway. More specifically, the risk of job losses in the coal sector, which will likely worsen unemployment in the country. Even though the sector is in decline, in 2021, the coal mining industry provided around 0.4 million jobs for South Africa's workforce, with 80 000 direct jobs, while creating 200 000 – 300 000 in indirect and induced jobs in the broader coal value chain and economy (NBI, 2021). Even though jobs in the coal sector are receding, the need to create alternative jobs is extremely urgent if South Africa is to achieve its decarbonization agenda.

The job losses will lead to stranded communities, who are despondent, unemployed, and unable to provide for their basic needs. Such a situation could lead to social unrests, and increase the vulnerability of those in most need, such as women and children. For example, in a recent fieldwork Mpumalanga Province, local community members shared their

anxiety about job losses, both direct and indirect because of the decommissioned Komati Coal power plant. For example, a young lady we spoke to who sold snacks on the roadside, said that coal transporters were her main customers, and was worried about her livelihoods if she is unable to trade, when traffic dwindled.

Conceptualising green jobs in the just transition

Green jobs can be created in a variety of sectors including renewable energy, green hydrogen, and energy efficiency, construction, agriculture, manufacturing, and other traditional industries. A job can be deemed green if it uses less energy and raw materials, limits greenhouse gas emissions, minimizes waste and pollution, contributes to adaptation to climate change, and safeguards and restores ecosystems (ILO, 2016). Green jobs are crucial in South Africa, particularly in light of the fact that the country is one of the top emitters of greenhouse gases globally, as well as the pressing need for the conservation and preservation of the nation's natural resources and the transformation of current production patterns toward sustainable development (McLean, 2018). The growth of new technologies, innovations, industries, and processes in South Africa has the potential to open up a wide range of employment prospects (which can be categorized as green jobs) Borel-Saladin and Turok ,2013).

The need for reskilling and retraining of the workforce to unlock green job opportunities

In order for the transition to be successful in South Africa and ensure that no one is left behind there is a need for skilled workforce. To be able to unlock green 'decent' job opportunities, industrial strategies, investment in new skills, the inclusion of workers and communities need to be prioritised (Borel-Saladin and Turok, 2013). Currently South Africa's ambitious climate commitments do not clearly outline how the workforce will be skilled in order to benefit from the transition. It is without a doubt that the green transition in South Africa has the potential to create millions of green jobs if the country invests in reskilling, upskilling and retraining of the workforce.

However, these investments need to be channeled into appropriate skills that are needed in order to drive the just transition. The skills needed will range from low to high level, which will require different strategies to build. To absorb the majority of the unemployed, building skills in areas such as home system solar installation, cleaning of solar panels at the solar plants, climate smart agriculture and driving of electric buses hold high potential to create mass jobs. Such skills can be crucial for workers that are likely to lose their jobs in sectors such as the coal sector who often do not have the necessary educational background needed for medium and high-skilled occupations.

Where can green jobs be unlocked in South Africa

Several programs have been implemented in South Africa since the concept of green jobs was declared urgent, with the aim of promoting green jobs and decent employment during the country's transition to a greener economy. Such programmes include programmes such as the "Green jobs for sustainable development: concepts and practices" facilitated by Development Bank of Southern Africa in partnership with the Department of Environmental Affairs, and the International Labour Organization (ILO), through its International Training Centre, Green Jobs Programme and Decent Work Support Team for Eastern and Southern Africa (ILO, 2015). Such programmes are mainly meant to equip both public sector and private sector representatives about where opportunities and challenges for the creation of green jobs potential exist in South Africa. Such programmes are crucial for equipping the policy makers and the industry on where can exactly green jobs be created in South Africa.

There are 26 green segments and technologies divided into key four sectors which are identified as having the potential for creating green jobs in South Africa (Lethoko, 2014; Borel-Saladin and Turok, 2013). The key priority sectors that are earmarked for creating green jobs in South Africa include:

- Energy generation: Renewable energy (Wind power, solar and hydro); Green hydrogen; Fuel based renewable energy (Waste to energy); Liquid fuel (Biofuel).
- Energy and resource efficiency: Green buildings (Insulation, lighting, windows, solar water heaters, rain water harvesting); Transportation (Bus Rapid Transport (BRT)); Industrial (Energy efficient motors, mechanical insulation).
- Emission and pollution mitigation: Pollution control (Air pollution control, electric vehicles, clean stoves, acid water treatment); Carbon capture and storage; Recycling.
- Natural resource management: Biodiversity conservation and ecosystem restoration (Conservation and restoration/ nature based solutions); Soil and land management (agriculture) (Maia et al, 2011).

Despite the fact that these industries have been identified as crucial for producing green jobs in South Africa, difficulties still exist. The South African government's lack of effective plans to use the skills acquired in the short-term green jobs created during the just transition processes, like the construction of renewable energy plants, is the other major obstacle standing in the way of creating sustainable green jobs. The majority of green jobs produced by programmes like the Expanded Public Works Programs and the development of renewable energy facilities are temporary and offer low salaries, and as a result, they cannot be characterized as green and decent employment. Additionally, research from South Africa shows that the country has trouble retaining workers who acquired new skills while working on renewable energy projects or supporting the REIPPPP with training or capacity building (Leigland and Eberhard, 2018). As soon as the construction of renewable energy plants are completed, people have no other place to make use of the skills learned from the construction of renewable energy plants.

Key recommendations for driving the uptake of green jobs and skills training programmes in South Africa

The development of the Just Energy Transition Framework, Just Energy Transition Partnership (JETP), Just Energy Transition Investment Plan (JET IP), and other policy frameworks that support the just transition show how much South Africa has invested in advancing the just transition. However, efforts to prioritize and create green jobs in the country are still behind schedule or are not sufficiently clear as to how the workers who will be affected by the just transition will be absorbed. This is demonstrated by the high level of fear among coal industry workers who claim that it is unclear how precisely their employment will be protected. This shows how many employees in polluting industries are still doubtful about the promise of green jobs in the just transition. However, much work still needs to be done to ensure that the transition is just and fair and leaves no one behind, especially when it comes to creating the jobs that are desperately required in the country. South Africa has been one of the primary leaders in the just transition debates and plans in Africa. The recommendations that follow are essential for ensuring that green jobs are created and the most vulnerable members of society are not left behind in the transition. Particularly those who are employed along the value chain of the coal industry which are more likely to be impacted by the transition as a result of the closure of coal mines and coal-fired power plants.

1. **Recognise gender dynamics in the transition to a low carbon economy**

   Although some policies have been developed to support and promote gender equality in South Africa, several challenges still exist. According to Statistics South Africa (2022), women are more likely to be unemployed than men and are less likely to participate in the labour market than their male counterparts.[1] Women in South Africa continue to be underrepresented in education fields such as physics, mathematics or engineering, which are critical in the just transition.[2] This demonstrates that women will continue to be underrepresented within those fields, thus limiting their inclusion, especially in top management positions, if no necessary interventions are implemented to empower and support them. There is a need to therefore prioritize women in the transition, by ensuring their effective participation and creating opportunities which target women and youth. Being the most vulnerable, without such targeted interventions, it will be difficult to achieve the 'just' element of the just transiton in South Africa.

2. **Focus on reskilling and retraining of workers linked to the production and use of fossil fuels and other industries that excessively consume natural resources**

   There are numerous initiatives to improve the skills of South African employees whose jobs are associated with the extraction and use of fossil fuels. However, the majority of these initiatives for retraining and reskilling have mostly remained as ideas or discussions. Since many workers are still sceptical of the programs' plans for reskilling and retraining, implementation is still not evident on the ground. The biggest issue facing South Africa is that it is still unclear who would run these retraining and reskilling programs; at the moment, it is unclear whether the private or public sector is intended to run them. This necessitates the development of precise plans and strategies on how to reskill and retrain employees so that they can be hired for green occupations that are intended to revolutionize every aspect of the economy. The development of training and reskilling initiatives for employees involved in the production and use of fossil fuels as well as other sectors that excessively deplete natural resources, generate copious amounts of waste, and pollute the environment should be led by the government with the support of the industry.

3. **Strengthen social protection and support green investment in key economic sectors**

   In order to lower poverty and inequality rates for employees who will be impacted by the just transition, it is important to build effective social safety mechanisms. Social protection schemes like temporary wages and pension guarantees for workers in the impacted industries, including the coal value chain, are planned. However, in order to protect the concerned employees in the industries that would be impacted by the transition, such strategies have not been properly outlined. Since the majority of the skills in these industries do not require a lot of education, the government also needs to increase investments in important industries like recycling, urban farming/climate-smart agriculture, electric bus mechanics, and the manufacturing of clean technologies. The ability to absorb the workers who are expected to be impacted in the coal value chain may depend on this. Since the jobs created in the renewable energy development have shown to not be sustainable for low-skilled employees since they are temporary and do not offer significant earnings compared to the coal value chain industry, these industries could prove crucial in the just transition.

4. **Capacity building in order to have adequate resources to deliver the uptake of green jobs**

   Building the ability of local officials, especially local government officials, as the majority of them are not well informed about the just transition, is necessary to achieve a just transition. Local remote and rural municipalities around the country have shown this to be evident. Due to a shortage of private businesses in rural areas, the local governments play a crucial role in job creation. Therefore, enabling the creation of green jobs in South Africa will require providing the local government officials with the required expertise and resources.

Conclusion

There is significant potential for the creation of green jobs, especially given the perceived difficulties in South Africa's just transition initiatives. To do it, though, the public and private sectors would need to work closely together. To ensure that jobs are created, South Africa has established an enabling policy environment for the just transition. But the implementation of the policies still presents a challenge. There is a precise definition of what is required to achieve the just transition in South Africa in order to leave no one behind this is demonstrated in strategies such as the Just Transition Framework. Millions of green employment will be produced in South Africa, according to the ILO, but coordination will be essential, as was already mentioned.

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ENERGY

SUSTAINABLE ENERGY

What is the real cost of Intermittent Generation Options

David Nicholls

The classic electrical supply system has consisted of large central generating power stations feeding the customers through an integrated grid. This grid was initially city sized in the 1890s, getting steadily larger over the next decades until, in the case of South Africa, it became one single national grid in 1971. With this move to a single integrated national grid led to larger and larger power stations, with the largest built in South Africa the 1980s being some 4000MW on each site. In the South Africa, as with the vast majority of the world, these stations were coal, nuclear or large hydro electric schemes. In the 1980s natural gas fired power stations started to become commercial and have now become the dominant electrical supply technology in many countries.

The power stations were all "dispatchable", meaning the central grid controller could instruct available power plants to increase or decrease supply to match the customer demand on the grid. The cost of operating these stations, in terms of cost per unit of electricity (kWh)

could be calculated by looking at the fixed costs (capital cost of construction etc.) and the variable cost (cost of staffing, maintaining and fueling the station) and, for a given capacity factor and net discount rate, calculate the tariff per kWh need to recover the investment. This is called the "Levelised Cost of Electricity" (LCOE).

This approach led to the selection of the optimum combination of power technologies to meet the long-term national need given the load profile.

There were other needs to maintain the stable functioning of the grid, including frequency and voltage control, system inertia and consistent matching of supply with demand. These are called "Auxiliary Services" and were largely met by the large copper generators rotating in sync with the grid frequency. The control of these machines led to the ability to stabilize the overall grid. The other issue was the optimal design of the grid transmission lines.

The demand profile at various grid locations was well understood by the grid designer and the known location of the power plants, with their predictable performance, allowed the actual transmission lines to be planned.

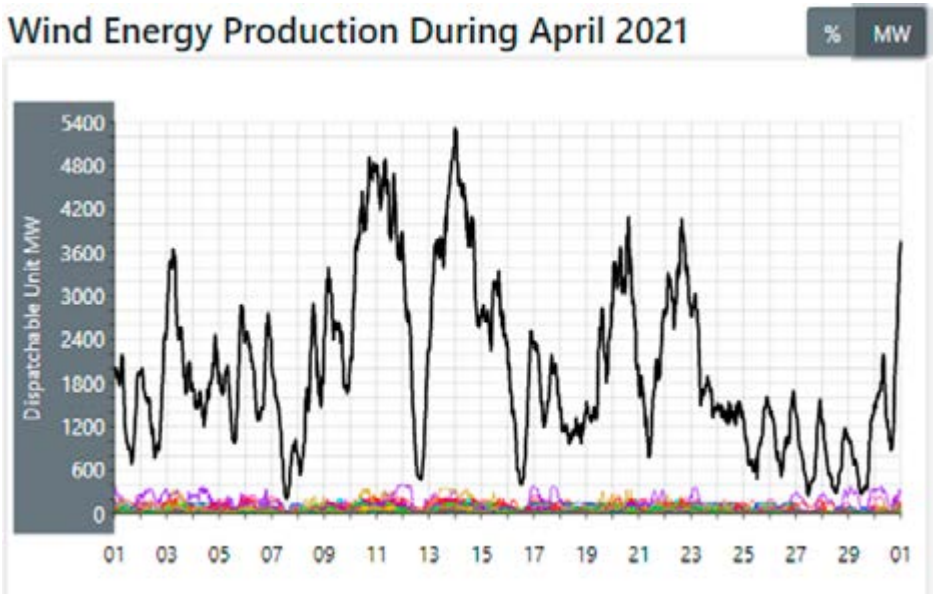
With this approach the overall transmissions cost in a national grid was in the order of 15% of the overall delivered cost of electricity. The cost of the generation portion could be easily calculated by using the LCOE from the various generating plants.

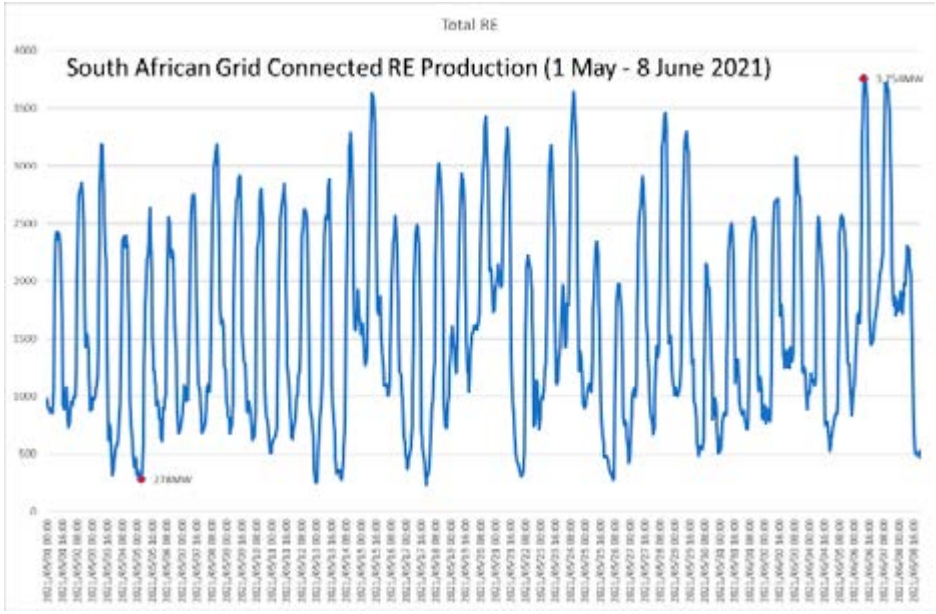
From the 2000s onwards there has been a drive to include increasing amounts of renewable electricity (RE) generating systems into the grid.

The RE is predominantly wind turbines and solar photovoltaics. There are three significant differences that these technologies have to classic dispatchable technology.

The first is that the output of the plant is linked to the weather (wind & sun) conditions. This implies that it cannot be determined by the system operator and also it is dependent on country scale weather issues.

In the case of PV the sun sets nearly at the same time across the entire country. Adding more PV to the grid does nothing to improve power supplies after sunset. Similarly, wind power is a function of weather patterns and if there is very little wind in the country then adding more wind turbines does little to solve the grid supply. The graphs below show the national level generation in both South Africa (wind and PV) and Australia (wind). These are both geographically large countries.



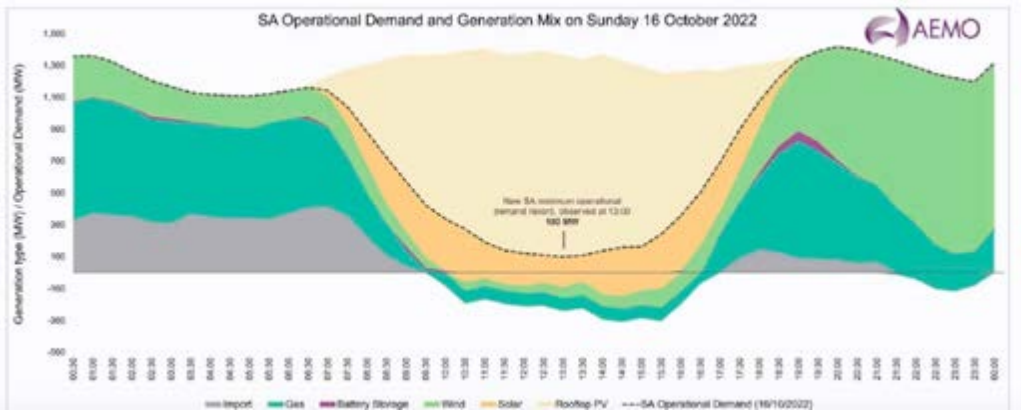


This production profile leads to very specific issues on a daily production basis as can be seen by the graph below of South Australia. In South Australia there is a very high penetration of customer rooftop solar and the overall impact of this, linked to the grid based RE production leads to a very distorted production situation. South Australia has a number of grid links to other grids and therefore can import and export excess power (as well as obtain stability control) through these links. Clearly if all the neighbours had similar RE penetration this would not be possible. The same phenomenon can be seen with a number of EU countries with high RE penetration, such as Denmark and Germany.

The second issue with the RE technologies is that they lack the system inertia normally created by the rotating generators and their related voltage and frequency control systems. When there is a disturbance on the system, either a fall in supply due to a generating unit trip or reduction in customer load due to a customer trip (e.g. a smelter), then in one case the inertia in the rotating machines allows extra power to be generated by reducing rotating speed, followed by the machine's increasing generation power from the boiler (or equivalent). In the other case the opposite occurs. This very fast response is not normally present in the inverter based RE systems.

The third issue relates to the grid costs of connecting weather based systems to the grid. An example of this is the Northern Cape PV plants. The Northern Cape is an extremely good location for PV systems but there is virtually no customer demand in the region. Therefore the Northern Cape PV plants have transmission links to the large consumers in South Africa (Gauteng, Mpumalanga etc) which are only used during the hours of sunlight and essentially are unused capacity at the system peak demand, which is from about 1700 to 2100. In terms of wind the issue is slightly different and the wind speed varies across the country. It is therefore necessary to provide adequate capacity from each area of wind farms so that whichever one has the adequate wind resource at the time can supply. Therefore, for example, if the wind resources are seen to be on the west coast and on the south costs the transmission lines have to provide adequate capacity from both areas independently.

It is argued that the availability of dispatchable plant is also not 100% and requires similar adjustments.



The difference however is that the unavailability of one unit is not coherent with that of it neighbour. Therefore if one adds more units and plans shutdowns one can ensure adequate production at all times.

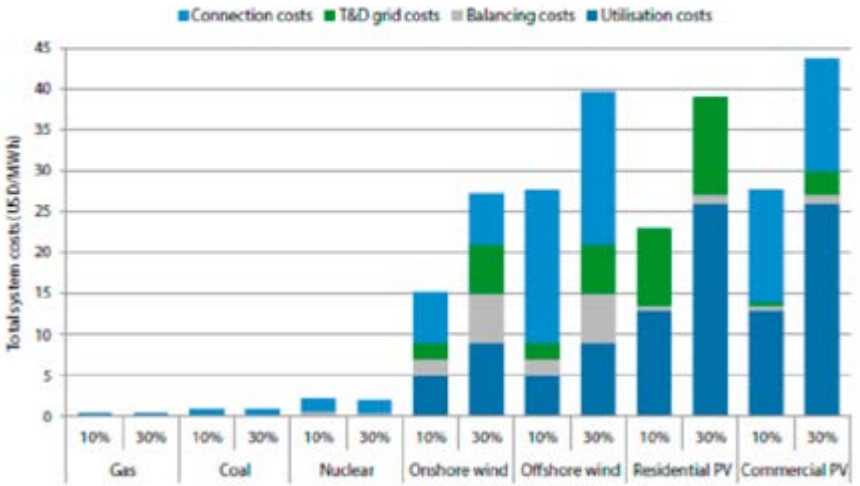
The problem that can be asked, however is how can the cost of this issue be quantified. There are two excellent references discussed below, one international and one local.

The international reference is the "OECD/NEA 2018 Report NEA 7298 – The Full Costs of Electricity Provision". The graph below shows the results of this report for Grid-Level System Costs.

These numbers indicate the overall impact of including the given technology at the level given.

It is independent of the LCOE of the actual power plant. The nuclear, coal and gas numbers

Figure ES.3: **Grid-level system costs of selected generation technologies for shares of 10% and 30% of VRE generation**



reflect the issues relating to the grid system design. Nuclear power stations are normally placed some distance away from population centres and therefore load centres and also demand a high level of grid security. Coal is normally placed on coal fields and again not on population centres and gas is the most flexible location of all. Their cost impact can be seen to be reasonably small.

In the case of the RE technologies the overall costs become very significant. As can be seen if residential PV is to meet 10% of the national demand the impact on the balance of the grid is to increase average costs (and therefore tariffs) by $24/MWh. At the exchange rate of R18:$1 that equates to R430/MWh or R0.43/kWh. As it relates to a 10% PV penetration it equates to R4.30/kWh for each kWh generated by PV. That is in addition to the direct costs of owning and operating the PV system.

The local data relates to the Risk Mitigation Independent Power Producer Procurement Program (RMIPPPP) and the Renewable Energy Independent Power Producer Procurement Program (REIPPPP) Bid Window 5. The RMIPPPP had a bid submission date of 22 December 2021 and the REIPPPP had a bid submission date of 16 August 2021. It can there fore assumed that both programs tenders were submitted under similar financial and economic conditions. Both of these programs were for a twenty year period with the same broad conditions. The basic difference was that the REIPPPP bid window 5 only asked for specific technologies while the RMIPPPP criteria included that it will be technology agnostic, it will procure dispatchable flexible generation that should be able to provide energy, capacity and ancillary services and it should be able to operate between 05h00 to 21h30.

The prices of the REIPPP bid window 5 were from R344.25/MWh to R617.70/MWh (with all the PV below R484.60/MWh). The RMIPPPP prices were from R1462/MWh to R1884.46/MWh. The average of the RMIPPPP cost was nearly four times that of the REIPPPP cost.

In conclusion it is very important to ensure that in the debate on energy selection the full needs of the market, and its related costs be considered. It is a very different picture than just using the simplistic, plant level, LCOE.

Electrochemical Energy Technologies: Transfiguring Local Energy Storage and Conversion

Dr Mmalewane Teffo (nee Modibedi)

We simply cannot miss the unique opportunities that augment the full potential of stored energy. Proper storage and conversion solutions enable the effective utilisation of green energy, thus ensuring constant availability. The time to act is now, says Mmalewane Teffo (née Modibedi)

In an era driven by the urgent need for sustainable energy solutions, Electrochemical Energy Technologies emerges as a pioneering research platform dedicated to advancing materials-based technologies for energy storage and conversion. With a focused approach on developing new materials and demonstrating their viability for industrial applications, collaboration opportunities are sought to drive innovation and propel the manufacturing of cutting-edge energy-storage systems.

Advancing electrode materials

Electrochemical Energy Technologies hinges on the development of manganese and nickel-rich cathode materials, as well as graphite, titanium and silicon-based anode materials. These advancements offer enhanced performance, durability and cost-effectiveness in energy-storage systems, unlocking new possibilities for mobile, stationary and other power applications.

Leveraging expertise in materials science, and localisation of electrode materials will position us to optimise South Africa's abundant minerals such as manganese, nickel, titanium and platinum group metal (PGM) resources.

Storage and conversion technologies

A comprehensive analysis of energy storage and conversion technologies provides insights into their costs, performance and suitability for specific applications. Relevant assessments encompass energy-storage solutions, fuel cells and electrolysers, considering factors such as storage duration, cost projections and end-of-life options.

Materials synthesis and characterisation

Synthesising and characterising electrode materials for energy- storage systems through meticulous research and development, creates materials that exhibit superior performance, stability and energy efficiency. With advanced characterisation techniques, we provide deep insights into the electrochemical properties of batteries, supercapacitors, fuel cells and electrolyser technologies.

The importance of proper material testing

From characterising battery cells, fuel cells and electrolyser cells to evaluating electrochemical properties, proper testing capabilities ensure accurate performance assessments and aid in the selection of optimal materials for your applications. Quality and precision empower industry to make informed decisions with confidence.

Prototyping and Assembly

Fabrication, assembly and testing of coin cells and pouch cells are essential components of energy-storage systems. Technical proficiency to create membrane electrode assemblies (MEAs), a crucial component of fuel cells and electrolysers, is necessary. With the right expertise in prototyping, novel concepts can be transformed into functional prototypes.

The power of collaboration

Journey with us towards a sustainable energy landscape. Together, we can unlock the power of collaboration and innovation, driving the adoption of cutting-edge technologies and materials. The CSIR Electrochemical Energy Technologies group offers unique opportunities that rest at the forefront of energy storage and conversion advancements. The focus on materials innovation, expertise in electrocatalysis and comprehensive analysis capabilities positions the CSIR as a trusted partner for restructuring the energy sector.

Join us in transforming the energy landscape and creating a greener, more sustainable world.

Sustainable wind power production within our grasp

Nordex Energy SA

Poised to fill the energy gap in South Africa, the wind sector is set to deliver new power generation at an exponential rate. The growth curve, according to the recent Renewable Energy Grid Survey Results, clearly demonstrates the commitment of this industry, revealing an impressive pipeline of wind and wind storage projects across the country, with 35 617MW expected to come on stream by 2028.

"This changing energy landscape, which is defined by the accelerated uptake of renewable energy for the foreseeable future, and to improve the cost of energy the market will likely see technology that delivers increased power capacity. This follows global trends, which demonstrates that as markets have matured, wind turbine generators with augmented unitary power are required, to not only deliver better output but relative improved cost, whilst also addressing the environmental impact," said Managing Director of Nordex Energy South Africa, Compton Saunders.

Not only will turbine tower heights increase by up to 70% to access higher wind shear, and wind turbine generators (WTG's) be more powerful, but we can expect that these massive machines aiming to become close to 100% recyclable.

Currently, 85% – 95% of a Nordex WTG is already recyclable. For many of the materials used, there are established recycling processes for environmentally-friendly disposal, especially for steel and concrete, which make up the largest share of a wind turbine in the tower and foundation – and turbine blades globally are following suit.

Turbine rotor blades consist of a combination of different materials such as wood, various metals, adhesives, paints, and composites. The composites are glass-fiber-reinforced plastics, as well as carbon-fiber-reinforced plastics.

Until now, rotor blades have posed the biggest challenge, due to the heterogeneity of the material and the strong adhesion between the fibers and polymers being difficult to recycle.

This, however, is expected to be addressed in the following decade.

"As a group, we have already reduced the carbon footprint of our wind turbines, but now, in line with the Nordex Group's Sustainability Strategy 2025 ambitious goals have been set, including offering the market a fully recyclable blade by 2032, which is not too far into the future," concluded Saunders.

SUSTAINABLE ENERGY

SUSTAINABLE ENERGY

A little less conversation, a little more action, please

Lance Dickerson

No one needs any reminding that we are in the midst of an unsustainable energy crunch, with breakdowns thrusting the country back into higher levels of load shedding, while the Electricity Minister has sounded the warning about Koeberg's delays stretching out longer than had been anticipated.

President Cyril Ramaphosa recently said that a year on, the country's emergency plan was starting to show signs of working. He wrote in his weekly newsletter: "Since the launch of the energy action plan, we have worked to add as much power as possible to the grid. Eskom has unlocked close to 400MW from companies with extra available capacity, and a further 600MW is in the process. We have sourced an additional 400MW from Cahora Bassa in Mozambique."

He further explained: "We are fast-tracking the procurement of new generation capacity from renewables, gas and battery storage. Later this year the first three projects from the emergency power programme are expected to connect to the grid."

While renewables feature prominently in the country's plans, it has been a painfully slow process and it would be good to see increased momentum.

There tends to be somewhat of a payoff - work towards the "dream" of clean energy generation, a moment deferred to some point in the future, or settle for more dirty power to deal with the immediate crisis of load shedding.

We are often told that we don't have the luxury to worry about renewables because there is an urgent energy crisis to fix. The solution, we are told, lies in ships burning gas off our coastline and a re-investment in our notoriously unreliable and dirty coal power stations.

Think about conversations at restaurants and social braais. Often, the theme is that we don't have the so-called luxury to worry about the lowest carbon footprint energy backup solutions because we must keep the lights on at all costs, as cheaply as possible. This inevitably leads to people using generators or battery systems made from inferior chemistry, or from the right chemistry but without much thought going into the carbon footprint of the battery.

Worrying about whether we will have a planet in a generation's time is certainly not a luxury. It is the absolute crux of the point. This is the radical mind shift that's required. It is time more South Africans stood up for the environment. If anyone needs to be reminded just how dire the situation is, log onto the Human Impact Lab's Climate Clock. Eight years until midnight - we are less than a decade away from life planetary support.

In order to rush Kusile's collapsed flue duct unit back into operation by the end of this year, a host of environmental standards have been waived. However, does the prospect of acid rain on innocent people in Mozambique not keep officials awake at night? It should.

A common refrain in South Africa is that renewables cannot produce the amount of power we need. In one year Vietnam's ambitious and forward-looking rooftop solar programme added 9.3 gigawatts of electricity to the country's energy supply. Today, because they did not invest fast enough in transmission infrastructure at the same time, they have to put a lid on the sheer amount of power being generated. It is easy to predict that South Africa's transmission infrastructure will also be a limiting factor, but that's an entirely new topic. The point is, renewables can produce enough electricity. It is poor regulations and an outdated mindset that is preventing renewables from generating enough electricity.

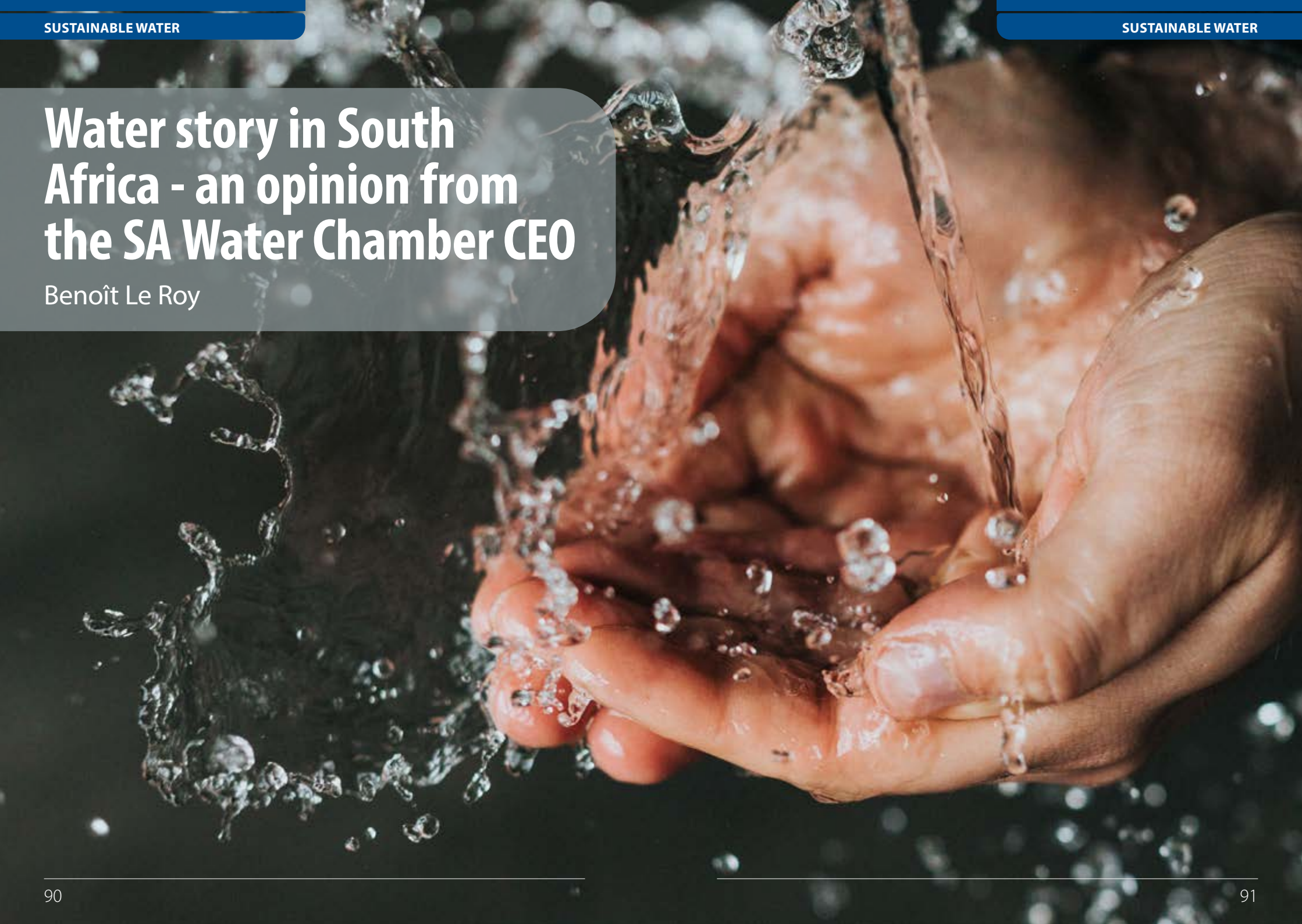
Renewable energy, backed up with 2nd LiFe battery technology - with as close to a zero carbon footprint as possible, and which fills a crucial spot in the circular economy as it solves what to do with replaced electric vehicles' battery cells instead of dumping entire batteries in landfills - ensures we have an almost endless supply of clean energy storage capacity waiting to be put to use. The planet can't survive endless waiting. In the words of Elvis Presley: "A little less conversation, a little more action, please."

WATER

SUSTAINABLE WATER

Water story in South Africa - an opinion from the SA Water Chamber CEO

Benoît Le Roy



The water crisis in South Africa is in full swing since my last opinion piece earlier this year with over thirty South Africans losing their lives to cholera and the city of Johannesburg experiences daily water shedding for the past few years and this month an entire week with major outages also now continuous in the two neighbouring metros of Tshwane and Ekurhuleni. This is on the back of full dams country wide, except for the Nelson Mandela Bay Municipality, and we still cannot provide water to our cities. There are still some in the water sector debating whether we are in a crisis or not, what must happen for it to sink in? We need to understand the state of decay in our water sector to have any hope of working ourselves out of the water crisis that is far more complex and difficult to get out of than the energy one destroying our daily lives for over a decade now. I write these opinion pieces with the clear intention of sharing my views so that we can increase the dialogue and get going on redressing our water woes and rebuilding our country.

Many ask me how we got here, and, in this edition, I would like to share some of my understanding of this issue that starts as a good news story until two to three decades ago. Whilst I may not see the turnaround in my lifetime, I sincerely hope that our previous success stories will be used and leveraged as our water history is rich and has many lessons that we can take advantage of.

With the discovery of gold in South Africa late in the 1900th century in what was then the Transvaal, so central inland region of South Africa, significant population increases, and industrialisation required considerable amounts of water to drive this all with a region sitting on a watershed with no large water sources. The Vaal Dam was constructed between the two world wars after its predecessor the Vaal Barrage that was completed in 1923. This was initially for the miners and is now replenished additionally from the Tugela River in the KwaZulu Natal province in an inter-basin transfer via the Sterkfontein Dam, built in 1980 and at an altitude of 1,7km's.

The Integrated Vaal River System, IVRS, now has fourteen dams and is the largest water catchment system in the country and supplies nearly half of the economy's water. Water is also pumped uphill from the Vaal River system to the petrochemical complex in Secunda and also feeds the coal fired power stations in the Mpumalanga province. Lesotho also feeds through an inter-basin transfer system water to the Vaal catchment system where the second phase is in the construction phase scheduled for completion around 2028, some ten years late. These mega projects catalysed by the discovery of gold in South Africa were at the time of construction by far the largest inter-basin transfer systems globally, now supporting some thirty million citizens, only to be eclipsed two decades ago by the South-North Water Transfer Project, SNWT, in China supporting one hundred and twenty million citizens, so, four time the IVRS. South Africa remains in the top ten globally with the number of significant dams it has. Without these dams the region would not have been able to industrialise and provide the vast rail, water, roads, electricity, mining mineral beneficiation and remains the commercial capital of the continent.

The diamond mines in the Northern Cape were also established late in the 19th century and eventually the mines, industry and human settlements required additional water that was available from aquifers but rather salty. The development of Sasol, new Gold Fields in the Orange Free State and large-scale Eskom coal fired power stations required the use and reuse of water where salts had to be continuously removed and desalination membranes were a key component requiring developing in a very harsh sanctions era.

South Africa started developing brackish water desalination using electrodialysis in 1953 that was commissioned in 1959 that became the largest in the world at the time placing South Africa clearly at the forefront of the global desalination movement using membranes. Reverse Osmosis membrane developments continued in the decades to follow with the subsequent establishment of Debex Desalination and Membratek that were subsequently absorbed into the Veolia international organisation that today boasts one of the largest fleets of desalination plants where it claims to have supplied around 1 950 of the estimated 21 000 already in operation. The origins of this substantial fleet of desal plants can also be traced back to South Africa in its heyday.

Another success story was the pioneering development and patenting of 16-inch Reverse Osmosis membranes in South Africa in the 1990's that is now widely used globally. The driver for these larger membranes was to reduce energy requirements whilst improving on flux rates and decreasing fouling rates.

South Africa currently has in excess of 1 000 sewage treatment plants excluding the numerous package plants that were largely designed, constructed and commissioned between the 1960 to 1990 era. The "godfather" of biological nutrient removal developed in South Africa in the 1970's is Doctor James Barnard reinforcing the strong intellectual property development in South Africa in sewage treatment. In the 1990's Israel decided to embark on the construction of advanced sewage treatment systems to alleviate the pollution of their water resources due to inadequate sewage treatment and a South African consortium was awarded the design, construction, and operations for a large fleet of medium sized sewage plants in the late 1990's and early 2000's. This high-quality treated sewage effluent was then used to irrigate key crops in Israel to further its food security and enhance the environmental issues, another proudly South African achievement.

The very famous and world first direct reuse reclamation plant was designed in South Africa and implemented in Windhoek in the 1960's providing the desert city with around a third of its potable water demand that is still in operation today after several upgrades to include the latest water treatment technologies such as ultra filtration. This technology has set the benchmark for global reuse plants, notably Singapore that reuses mostly its sewage for industrial uses although the reclaimed water is of the best potable standard. The towns of Beaufort West and Ballito both have direct reuse systems designed and constructed in South Africa and now operating for over a decade. The city of Cape Town is designing a large-scale reuse plant that will be fed from the recently upgraded Zandvliet sewage works that produce a consistently high-quality effluent for further reclamation processes. This reused effluent will be blended with 80% dam water and processed for a third time in the Faure Water Treatment Plant.

Today, in absolute contrast to our water pedigree, we have 97% of the South African sewage plants not complying to Green Drop standards with poor governance and the collapse of many of these systems all under local government mandates. Very few new sewage plants have been designed and constructed for the past three decades although the population has grown from 40 million to 60 million and rapid urbanisation requiring major capacity and technology upgrades. The volume of treated and untreated sewage has increased by more than 50% with a receiving environment inland with roughly the same water reserve, so nutrients are destroying our potable and irrigation water resource. The latest advanced treatment technologies are required to effectively treat our sewage to far more stringent qualities to protect our water reserves and resources.

We had the capability and capacity to lead the world in many water related aspects and have to regain this ability to rebuild our water cycle before it collapses everything around us and results in increased misery of the poor and unemployed ranks increasing daily.

There is an ideal opportunity to reindustrialise South Africa on the back of a water rejuvenation master plan, let's do it as no one else will.

Benoît Le Roy

Measuring the Environmental Impact of Conventional Car Washes in South Africa

Over the past decade, we have collectively witnessed with concern the imminent water crises that loomed over Cape Town and Port Elizabeth. With the specter of "Day Zero" and the implementation of stringent water restrictions, these areas managed to avert the doomsday scenario - at least temporarily. Nevertheless, in recent years, more regions across South Africa have found it necessary to implement water conservation measures. The question lingers: How long can these restrictions stave off the arrival of "Day Zero"? Urgent action is required from South Africans to explore and adopt more sustainable approaches to preserving the increasingly scarce water resources.

Since 2015, South Africa has grappled with a pressing water shortage crisis. Multiple factors have contributed to this crisis, including:

- **Climate Change:** Altered rainfall patterns resulting from climate change have led to delayed and reduced precipitation, consequently lowering dam levels.
- **Aging and Insufficient Infrastructure:** The aging and underdeveloped water infrastructure struggle to cope with demand, necessitating prolonged water cuts during infrastructure upgrades.
- **Urbanization Challenges:** Much like other developed and developing nations, South Africa contends with significant service delivery disparities. According to Greenpeace, both rural and urban populations face inadequate water access and sanitation services. Over 26% of all schools and 45% of clinics lack reliable water access.
- **Global Water Scarcity Trends:** The Food and Agriculture Organization of the United Nations (FAO) projects that by 2025, around 1.8 billion people will reside in countries experiencing absolute water scarcity, potentially subjecting two-thirds of the world's population to water-stressed conditions.

This situation has particularly dire implications for local communities in Africa, where safe drinking water access is already limited. The compounding stress of climatic pressures exacerbates the challenge of water scarcity.

SUSTAINABLE WATER

Environmental Impact of Conventional Car Washes in South Africa

One often overlooked sector with substantial water usage is the car wash industry. On average, South Africans wash their cars twice a month, while commercial entities like car dealerships and fleet managers engage in daily car washing. This contributes significantly to water wastage and pollution.

Conventional car washes in South Africa, much like their global counterparts, impose notable environmental burdens due to operational practices and chemical usage. These impacts go beyond mere water consumption and encompass water pollution, energy consumption, and waste generation. Here's an overview of the environmental implications associated with conventional car washes in South Africa:

- **Water Consumption:** Traditional car washes consume substantial volumes of water to clean vehicles. Given South Africa's water scarcity, excessive water use places strain on local water resources, particularly during drought periods. Consequently, these car washes contribute to water scarcity and ecosystem disturbances.
- **Water Pollution:** Car wash runoff contains a mix of detergents, oils, greases, and contaminants that infiltrate stormwater drains and eventually reach rivers and oceans. This pollution jeopardizes aquatic life and compromises water quality, impacting both ecosystems and human well-being.
- **Chemical Utilization:** Many conventional car washes employ harsh detergents, soaps, and cleaning agents containing detrimental components like phosphates and surfactants. These chemicals enter water bodies through runoff, adversely affecting aquatic ecosystems.
- **Energy Demand:** Traditional car washes rely on energy-intensive equipment, including pressure washers and dryers. The energy required for heating water and operating machinery contributes to greenhouse gas emissions, amplifying the carbon footprint of car wash operations.
- **Waste Generation:** Solid waste, such as used filters and disposable materials, is generated by car wash activities. Poor waste disposal practices further pollute land and water bodies, magnifying environmental degradation.
- **Air Pollution:** Some conventional car washes utilize fuel-powered pressure washers or generators during power outages, emitting pollutants into the air. This contributes to local air quality issues and potential health risks.
- **Lack of Water Recycling:** Conventional car washes often lack effective water recycling systems, perpetuating freshwater demand. This exacerbates water resource strain and heightens overall environmental impact.

A recent study by Stanford University revealed that a traditional car wash consumes more than 100 liters of water per session, with much of it lost through runoff and evaporation, without recycling. Additionally, the use of harsh chemicals in traditional car washes contributes to toxic runoff, contaminating water sources, and impacting rivers, drinking water, and ecosystems.

The Role of E-Wash in Water Conservation within the Car Wash Industry

Amid the quest for sustainable alternatives, the car care sector remains a critical focus area. One pioneering solution is E-Wash, a waterless car wash concept that operates in South Africa. While the average South African engages in bi-monthly car washing, commercial players, including car dealerships and fleet managers, conduct daily car washes. This routine results in significant water wastage and environmental harm.

E-Wash addresses this challenge through innovative and eco-conscious practices. By employing advanced cleaning technology, E-Wash significantly reduces water usage per car wash by over 90%. Moreover, E-Wash employs environmentally friendly wash products that are fully soluble and biodegradable, further minimizing the ecological impact.

About E-Wash

E-Wash stands as a pioneering force in the realm of waterless car wash solutions, operating at the forefront of South Africa's car care industry. By revolutionizing traditional car cleaning methods, E-Wash offers a sustainable, mobile, and convenient alternative that upholds environmental stewardship.

E-Wash plays a pivotal role in aiding South Africa's efforts to conserve its precious water resources. Conventional car washing methods entail substantial water consumption, while E-Wash's innovative approach eliminates the need for excessive water usage. Employing advanced cleaning agents and techniques, E-Wash ensures thorough vehicle cleaning with less than a liter of water. This approach not only saves substantial water volumes but also prevents runoff pollution, rendering E-Wash an eco-friendly and sustainable choice.

Collectively, we have the capacity to effect significant change by prioritizing water conservation. As a responsible corporate entity, E-Wash is committed to these core values:

- **Sustainability:** E-Wash is unwavering in its dedication to promoting sustainability and curbing water waste. By adopting our waterless car wash solution, the excessive water consumption inherent in traditional methods becomes obsolete. Our process curbs water pollution by preventing runoff into drains and natural water sources. Furthermore, we champion the use of environmentally safe cleaning products that safeguard both nature and the well-being of our patrons.
- **Customer Satisfaction:** At E-Wash, our paramount concern is customer satisfaction. Our devoted team, composed of trained professionals who are passionate about their work, ensures the provision of exceptional service. We prioritize delivering a seamless and gratifying experience to our clientele. Feedback is invaluable, and we continually seek avenues to enhance our services, surpassing customer expectations.
- **Social Responsibility:** E-Wash takes an active role in community welfare and contributes to social initiatives. By collaborating with local organizations, we support projects focused on water conservation, environmental awareness, and initiatives aimed at uplifting disadvantaged communities. We strive to make a positive societal impact and fulfill our responsibilities as conscientious corporate citizens.

Our unwavering commitment to a sustainable, eco-friendly future propels us forward as a company. We aim to ensure that our present decisions benefit future generations, demonstrating that even seemingly modest contributions can collectively make a substantial difference.

SUSTAINABLE WATER

Thirst for change:
Securing a water positive future

Did you know only **0.5%** of water on Earth is classified accessible freshwater?

Learn more:

bsi.

Circular economy mindset can help secure a water positive future to benefit people and the planet

Theuns Kotze, Managing Director, Assurance IMETA at BSI

Water is one of our most precious and undervalued resources. We need it to maintain good health and a biodiverse environment, to grow food and across every industry. Access to clean water is at the forefront of building a more equitable society, which is why the UN included this in the Sustainable Development Goals.

However, recent events have challenged the perception that drought and flooding are rare. As the climate crisis intensifies, communities are increasingly facing challenges arising from too little and too much water. Effective management of water has never been so important. In some countries, water conservation is a key priority. But globally we do not always recognize this to the same degree as other environmental issues such as emissions reduction, where we have seen a willingness to partner and innovate. In fact, the two are intrinsically linked - water provision and use contribute around 10% to global carbon emissions.

Levels of water insecurity are soaring as annual water use has risen by around 3,500 billion m3 globally over the last century. South Africa is approaching physical water scarcity in 2025 where it is expected to reach a water deficit of 17 percent by 2030. In fact, South Africa faces multiple water crises across all provinces and sectors.

Action to increase water circularity through global collaboration and innovation could help tackle this.

Doing so will bring wider benefits - including reducing drought risk, supporting climate goals and advancing social development to meet the UN Sustainable Development Goals as suggested in our new research in partnership with Waterwise. The report sets out the key steps that could have a positive impact to help society meet this challenge, including recognizing that accelerating progress towards a water positive future could be a sustainability opportunity as large as reducing climate change, making it easier for consumers to choose water-saving products and embedding a circular economy mindset.

The research identifies that using water wisely can bring important benefits, including enabling equitable global access, protecting precious habitats and making us more resilient to climate change and drought. It makes a series of recommendations, including:

1. Recognize water wastage as a serious challenge - Acknowledge the issue and act, with utility companies leading the way to reduce network leakage
2. Ensure it is easy to choose water-saving products and make sustainable choices – for example learning from countries including Australia and Singapore, which apply mandatory product water efficiency labelling systems, aligned with the relevant standard
3. Embrace innovation and make better use of data - smart meters have the potential to be a game changer when it comes to saving water
4. Encourage a water saving culture - Prioritize protecting our planet through water management, whether that is at home or in the workplace, and across different sectors
5. Close the loop - Make water recycling and reuse the norm where possible, using techniques such as water recycling and water reuse in new buildings, or rainwater harvesting
6. Partner for impact - Collaborative effort across a wide range of players from government and regulators to the water industry and ultimately all of us as water users can help us address the growing challenges around water availability.

Some of the steps identified above were implemented to alleviate the Cape Town Water Crisis in 2017/2018 when dam levels reached their peak level, with water hovering between 15 to 30 per cent of total dam capacity impacted by a severe drought. Water restrictions were imposed on residents, agriculture and businesses and water tariffs were introduced. The result was that dam levels reached around 70% of total capacity, subsequently ending the water shortage.

With a growing, increasingly urban global population, we are placing greater demands on resources. Yet we have a finite amount of water to draw on. We have seen that drought and flooding often come at an enormous societal cost. Learning to manage water differently and applying strategies to move towards a water-positive future can benefit us all. By collaborating to address water security, we can accelerate progress towards a water secure future and a sustainable world.

BSI provides support across a number of areas of water management, including Water Safety Plans, which is a critical foundation for effective risk management and control for all types of biological, chemical, physical and radiological hazards.

For more information, visit: Thirst for change | BSI (bsigroup.com)

About BSI

BSI is the business improvement and standards company that enables organizations to turn standards of best practice into habits of excellence, 'inspiring trust for a more resilient world'. For over a century BSI has driven best practice in organizations around the world. Working with over 77,500 clients across 195 countries, it is a truly global business with skills and experience across all sectors including automotive, aerospace, built environment, food and retail and healthcare. Through its expertise in Standards and Knowledge, Assurance Services, Regulatory Services and Consulting Services, BSI helps clients to improve their performance, grow sustainably, manage risk and ultimately become more resilient.

The partnership with Waterwise sits alongside work underway internally at BSI to gather information about the organization's water impact in terms of consumption and ownership, and to identify what is done currently to preserve water. These data will then be used to set a company-wide strategy for water preservation at BSI.

The model for delivering water and sanitation must entirely be revised

Rand Water CE Sipho Mosai explains that adding more water to the system will not be enough to future-proof it, new methods and ways of thinking are required.

Water has become one of the foremost modern-day challenges in this early part of the third millennium. This is because the era of free drinking water in unlimited quantity is over. During recent decades, a combination of human demographics and human activity has in many global regions transformed water from an abundant element to a scarce resource.

The water shortages that have affected thousands of people in Gauteng are a "perfect storm" that is developing into a hurricane. Taps have run dry in several suburbs for weeks, with high-lying areas worst hit because of rolling blackouts that affect the pumping of water, major infrastructural backlogs and increased demand because of hot temperatures. Notably, water service is mostly dependent on infrastructure availability and a perfect equilibrium between water demand and the system's capacity to meet both average and peak demands.

There is an urgent need to put water higher on the country's agenda. Various water problems are escalating at a rapid rate. The country is water scarce because of its arid to semi-arid climate and below-average annual rainfall of 465mm compared with the global annual average of 860mm. It is ranked the 40th driest country in the world.

Secondly, the management of water consumption has been poor. South Africa is a water-scarce country, yet the average domestic water use is estimated at 237 litres per person per day, 64 litres higher than the international benchmark of 173 litres per person per day.

System constraints

In the entire value chain, there is so much that the system or infrastructure can provide. Future water requirements by municipalities, industry and other water consumers will affect the current and future demand for water. Statistics South Africa's growth estimates further bolster this figure.

In turn, the future needs to dictate the requirements for infrastructure upgrades and refurbishments upstream and midstream of the value.

The bulk water infrastructure midstream within the value chain is designed for average water consumption and peak water demands of about 35 000 megalitres a week. What does this mean?

If water demand is of typical consumption (4 400 megalitres in 2021/22), then the system can provide water with relative ease. Hence, in most instances, every household receives water without exception. If peak water usage exceeds Rand Water's purifying output, municipal water is drawn from reservoirs. The reservoirs at municipal level dry out quickly as a result of excessive use. Because Rand Water continues to pump at optimum capacity, water will continue to be delivered to low-lying areas regardless. The irregular water supply in the high-lying areas is aggravated by intermittent power outages and loadshedding. Pumping and reservoir filling are impossible without a steady supply of electricity. In the event that there is no electricity to operate pumps and water usage rises to the point that reservoirs are depleted, high-lying areas will be left without water.

The final segment of value chain (downstream) lies under the purview of municipalities known as water services authority. Municipalities draw water from Rand

Water's reservoirs and distribute it to individual residences and various other customers through a system of their own pipes and reservoirs.

Non-revenue water, notably physical water losses because of ageing infrastructure, is the greatest impediment that characterises the value chain, particularly in the downstream. Municipal physical water losses range between 20% and 30% (1 000 to 1 500 million litres of water a day when Rand Water is pumping at maximum capacity). In a water-scarce nation that imports the majority of its raw water, this quantity of water is enormous. With the purpose of addressing the distribution of water, local governments should make significant investments. Sadly, the sector does not spend enough on water conservation and demand-management methods to turn the situation around as quickly as possible. The expansion of cities and towns necessitates substantial future investments to not only reduce water loss but also free up additional water to meet the water needs of future urban growth.

Consumer behaviour

As water consumers, we must conserve water and change our behaviour to reflect our situation. We should resist the temptation to fill swimming pools and irrigate our lawns with potable water during periods of extreme heat. During times of high levels of loadshedding and heat waves, avoiding these will considerably improve water supply for all. Secondly, local municipalities must prioritise nonrevenue water. This will also aid in reducing wastage by paying for water that is not used. To maintain water-supply sustainability and reliability, infrastructure upgrades and refurbishments must receive sufficient funding.

By the end of 2023, Rand Water will have added 600-million litres of water per day to the system. In the next five years, Rand Water will invest R30-billion to expand its network of pipes and reservoirs. As part of this plan, Rand Water inaugurated a 210-million-litre storage reservoir in February.

Lastly, the water and sanitation delivery model must entirely be revised in order to provide long-term and sustainable water services.

Revenue generated from paying customers of water and sanitation must be ring-fenced for infrastructure operations, maintenance, renovation and augmentation. I believe that the current structural arrangement should be revised and be replaced by new utilities that will operate the full value chain from abstraction to reticulation.

Governance and funding mechanisms can be developed to ensure that these utilities are successful and sustainable.

RAND WATER | 120 YEARS OF FINDING NEW WAYS

ABOUT RAND WATER

Rand Water is Africa's biggest bulk water utility that meets and exceeds exacting standards. Rand Water provides bulk potable water to more than 11-million people in the South African provinces of Gauteng, Mpumalanga, the Free State and North West – an area that stretches over 18 000km2. Rand Water customers include metropolitan municipalities, local municipalities, mines, and large industries. Rand Water has a global reputation for providing water of high quality that ranks among the best in the world and consistently meet and exceeded national standards and international guidelines on water quality. The strategic objectives of Rand Water include achieving growth, operational integrity, and a culture of high-performance. Rand Water uses best-fit technology and positively engages with its stakeholder base to maintain financial health and sustainability.

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Mr Sipho Mosai

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WASTE

The Plastic Pollution Treaty: A Global Solution for Africa's Environment

Zaynab Sadan

Plastic pollution is an urgent crisis threatening the well-being of our planet and our communities. Increasing volumes of plastic in our rivers and oceans are consumed by terrestrial and aquatic biota and have infiltrated the water and food humans consume. [SZ1] If we continue along this Business-as-Usual path, plastic production will double, and subsequent leakage of this plastic into the ocean will triple by 2040[1]. While Africa only produces 5% and consumes 4% of the total global plastic volumes, our people, land- and seascapes and the economy are experiencing its devastating impacts[2]. As Africans, we must unite to combat this global problem and demand action from our governments and businesses.

Zaynab Sadan

Thankfully, there is hope on the horizon. In March 2022, after years of policy advocacy and campaigning, 175 UN member countries unanimously adopted the resolution to end plastic pollution at the UN Environment Assembly in Nairobi. The time has come for us to seize this opportunity and push for comprehensive, binding global rules and measures across the entire plastic life cycle. To pave the way for effective change, we must draw on the recommendations outlined in the WWF's plastic report[DKL2] [SZ3] .

First and foremost, the treaty must include binding global measures to ban, reduce, safely circulate, and manage high-risk plastics. We must prioritise plastics with the highest pollution risks and identify specific polymers, products, applications, and chemicals of concern. Immediate global bans should be imposed on single-use, short-lived plastic products, such as cutlery, plates, cups, cotton bud sticks, and cigarette filters. After an initial feasibility assessment at the global level, it was found that these bans may be implemented without any overt negative environmental and socioeconomic consequences[DKL4] [SZ5] ; however, there may be a need to assess any socio-economic implications at national level. Furthermore, it is necessary to ensure that any alternatives and substitutes to these plastic products should be fit-for-purpose, suit the local context and prevent any further unintended environmental and socioeconomic consequences.

Most African countries are net importers of plastics; however, the existing collection, sorting and waste management infrastructure cannot cope with the flood of high-risk plastics entering the continent. Harmonised and binding global measures provides African countries a chance to control what enters their borders and curb the current rate of plastic pollution. Furthermore, the treaty must contain measures to remediate the existing, legacy plastic pollution currently found in nature.

To ensure successful implementation, the treaty must be accompanied by ambitious mechanisms that provide timely, predictable, accessible, and sufficient support, including technical and financial support, technology transfer, and capacity strengthening. We must pay special attention to the needs of the least developed countries and small island developing states, ensuring that every nation is supported in effectively addressing plastic pollution.

The success of this treaty hinges on inclusivity and collaboration. Meaningful consultations with stakeholders, including those in the informal sector and communities most affected by plastic pollution, are vital for creating a treaty representing global input and addressing local concerns, which is essential for a just transition.

This plastic pollution treaty is a turning point in human history, offering a lifeline to our planet. It is our chance to eliminate the plastics that inflict the most harm on our people, wildlife, and ecosystems. Furthermore, it presents an opportunity to shift away from the single-use mindset exacerbating the climate crisis. With this, we can actively shape a future that values and protects nature, fostering positive ecological outcomes for future generations.

Governments must rise to the occasion and raise their ambitions. The second round of negotiations meeting for the UN Global Treaty to End Plastic Pollution (INC-2) held in Paris from 29 May to 2 June 2023 has provided another important step forward in global efforts to address the worsening plastic crisis. The majority of governments actively called for global binding rules across the plastics lifecycle and many echoed WWFs proposals to tackle the most high-risk plastic categories. This meeting concluded with a mandate to develop a first iteration of the treaty text (a'zero draft') ahead of the next round of negotiations taking place in Kenya in November 2023 (INC-3).

While tangible progress has been made, the world also witnessed delays in the negotiation process in Paris, wasting critical time. As we prepare for the next round of negotiations on African soil later this year, we must not see a repeat in delays to the process. While consensus is the aspiration of multilateral processes,

policymakers must ensure that no single country can veto the progress of the global community. This is an urgent global crisis that needs an urgent global response.

The global plastic pollution treaty is our one chance to rectify the mistakes of the past. Let us unite, demand action, and hold our governments and businesses accountable. Together, we can safeguard our environment, protect our wildlife, and ensure the well-being of all animals, including domestic and farmed animals. We can also work towards healthy communities and people and secure a sustainable future for Africa and the world.

- [1] OECD (2022), Global Plastics Outlook: Economic Drivers, Environmental Impacts and Policy Options, OECD Publishing, Paris, https://doi. org/10.1787/de747aef-en
- [2] WWF (2022) Plastic Pollution in Africa: Identifying policy gaps and opportunities, https://wwfafrica.awsassets.panda.org/downloads/wwf_plastic_pollution.pdf

WASTE

The Silent Threat: Unveiling the Hidden E-Waste in Our Homes

In a world driven by technological advancements, it is easy to overlook the silent environmental threat lurking in our very own homes. Small used electronic items, often forgotten at the back of drawers or tucked away in garage boxes, are contributing to a significant source of e-waste.

Patricia Schröder, spokesperson for the producer responsibility organisation (PRO) Circular Energy, highlights the importance of shedding light on this overlooked issue and promoting sustainable disposal practices.

"While larger electronic devices like old computers and televisions often grab the headlines, the hidden e-waste— smartphones, chargers, headphones, and other small devices— also deserve our attention. Outdated and forgotten gadgets may seem insignificant, but they collectively pose a substantial environmental challenge," Schröder emphasises.

"As technology evolves, many of us upgrade our devices without considering the environmental implications. These small electronic items contain hazardous materials such as lead, mercury, and brominated flame retardants," she cautions. "When disposed of improperly, these toxins can leach into the soil and water, polluting ecosystems and potentially contaminating our food and water sources. Moreover, the improper incineration of e-waste releases harmful pollutants into the air, contributing to air pollution and exacerbating respiratory issues."

Creating a Culture of Sound Waste Management

Schröder advocates for increased awareness and the implementation of sustainable disposal practices. "Every small electronic device, when recycled or treated properly, can make a difference," she asserts.

"The solution lies in fostering a culture of sound waste management at the individual level. Users must be encouraged to actively seek out authorised recycling facilities that specialise in handling small electronic devices. The recycling and reuse of e-waste, including small electronic devices, create numerous job opportunities and have a positive impact on our society."

Starting Small makes a Big Difference

Schröder urges individuals to take responsibility for their small electronic devices and embrace sustainable disposal practices.

"Responsible waste management is not just the responsibility of the government and big businesses.

Each one of us plays a crucial role. It's essential that we take stock of our homes, rummage through those drawers, and dig into those garage boxes to uncover the hidden e-waste within. Once identified, these items should be recycled through proper channels, ensuring their materials are recovered and reused," she advises.

And consumers who don't know where to start, can simply make use of Circular Energy's "Give It Back" service.

"They can request a collection for their waste electric or electronic equipment, lighting or lighting equipment and batteries by completing and submitting the form on our website," Schröder says.

"One of our accredited service providers will then contact the user, to arrange the details of the collection directly with them."

Patricia Schröder, spokesperson for the producer responsibility organisation (PRO) Circular Energy

AGRICULTURE & FOOD SECURITY

Farming in South Africa is being hobbled by power cuts and poor roads, and rural towns are being hit hardest

Wandile Sihlobo

South Africa's agriculture has had great consecutive seasons since 2019/20. The sector's gross value added grew by 14.9% in 2020, 8.8% in 2021 and modestly by 0.3% in 2022. This was primarily supported by favourable weather conditions.

The current season is also likely to deliver solid growth for the sector, with variation across sub-sectors. We already see prospects of large crops across the country.

Export performance is likely be robust, especially with a weaker rand exchange rate, which makes South African products more competitively priced in the global market.

Still, the sector is not reaching its full potential. A number of factors stand in the way of even greater successes and greater participation of black farmers in commercial value chains.

The first factor to mention is worsening power cuts. The agricultural sector is heavily reliant on energy. For example, recent work by the agriculture and food policy research group, the Bureau for Food and Agricultural Policy shows that roughly a third of South Africa's farming income depends directly on irrigation, which requires power.

But that's not the only challenge. Deteriorating roads, collapsing water infrastructure and rising crime are barriers to functioning effectively and efficiently.

These are not new issues. They have been flagged before. But they have worsened. They are a challenge for large commercial farmers as well as smaller farming enterprises. The emerging or new entrant black farmers, with limited financial resources, face it more acutely.

These challenges highlight the effects of weak governance across all spheres of government in South Africa. It is serious for all sectors, but particularly so for agriculture, which depends on the proper functioning of essentials such as roads, water and power.

Provincial governments and municipalities have not maintained or upgraded infrastructure that would support agriculture.

The results of this neglect, over time, are likely to lead to declining economic conditions and employment opportunities in small towns. Farming and agribusiness play a crucial role in sustaining the economies of small towns and rural areas. Paying attention to infrastructure could catalyse a virtual cycle in which the private sector increases investment, in turn leading to increased economic opportunities.

Roadblocks facing farmers

The impact that poor roads have on farmers is well illustrated by a recent case in the Eastern Cape province. Dairy farmers in the Ncorha area struggled to receive farm supplements, feeds and diesel because of the poor state of roads. And they couldn't deliver their produce to the market.

Ncorha is a small region in the Chris Hani District Municipality in the Eastern Cape province of South Africa. One of its vital economic activities is farming, primarily the dairy industry. The Eastern Cape accounts for nearly a third of South Africa's dairy production.

Poor infrastructure is not isolated to the Eastern Cape. Roads across the rural towns of the Free State, North West, Limpopo and KwaZulu-Natal, all of which are major agricultural provinces, are also poorly maintained and are in a bad condition.

More than two-thirds of South Africa's agricultural produce is now transported by roads, as rail transport has faced challenges over the years. This is a major change from two decades ago when rail played an important role in transporting agricultural produce, specifically grains.

The poor road network has forced some farmers to pay for road maintenance. They have not been able to reap the full benefit of higher agricultural output because they're incurring additional operating costs. Farmers have to step in when municipalities misuse funds allocated for infrastructure. Details of this have appeared in numerous Auditor General reports.

Water has often been flagged by various agribusinesses and farmers as another major problem. Key is the maintenance of water infrastructure such as dams and purification systems. Agribusinesses in some towns have had to step in and maintain water infrastructure. This again takes financial and human capital away from businesses to public service that municipalities should be covering.

Agribusinesses and farmers are also seeing a rise in corruption and crime. Commercial farming businesses have had to tighten security over the years at their own cost because of lawlessness in rural South Africa. Harvest and livestock theft affect all farmers and are

much harder for new entrant farmers without a strong financial position to invest in security and technical solutions. Again, having to tighten security shifts resources from more productive uses to cover for the government's shortcomings.

Why strong agricultural sector matters

South Africa faces a high unemployment rate at just under 33% in the first quarter of 2023. Rural areas tend to face the harsh effects of the poor economic conditions.

Resolving the unemployment crisis requires that all economic sectors perform optimally, especially the primary sectors with an ability to absorb even the least skilled labour. Agriculture is one such sector, while agribusiness and agro-processing also present a range of employment opportunities.

But all these hinge on effective provision of public services such as roads, water and electricity.

In turn, these depend on strong provincial governments and municipalities.

The recently launched Agriculture and Agro-processing Master Plan presents practical steps for implementing Chapter Six of the National Development Plan, which outlined a vision for developing the agricultural sector further.

Weaknesses of the provincial government and municipalities are undermining the government's plans to expand agricultural output and resolve inefficiencies within the Department of Agriculture, Land Reform and Rural Development.

These weaknesses are also hindering the economic vision for South Africa set out by President Cyril Ramaphosa.

Addressing local government failures should be a top priority for the presidency. Rural towns and communities support millions of people and are currently in despair.

Public-private sector partnerships can also be considered to help tackle some of these challenges. Models of how these can work are outlined in various master plans and need commitment and effective leadership.

Wandile Sihlobo is Chief Economist at the Agricultural Business Chamber of SA and the author of Finding Common Ground: Land, Equity, and Agriculture.

Precision agriculture for food security in Africa

Emmanuel Marume

Population is increasing everyday and our land size for production is decreasing as land for agriculture is somehow being taken for human occupation. This has caused food insecurity in most of our African countries .

So farmer need to take the business of farming to the next level by introducing precision farming which is site specific crop management (data driven Agriculture) which will increase yields and make us food secured . All Farm management decisions must be based on DATA , gone are the days when farm management decisions were based on experience now through the use of modern technology like drones , sensors and GIS and remote sensing which collects data and the data is analysed to make farm management decisions helps farmers to produce more for less . Applying the same amount of inputs across the entire field does not always make sense , as we have different soil types , soil fertility, different crop growth rates , different disease and pest infestation etc . So farmers need to invest in precision farming techniques which makes their farming interesting and easy attaining yields yields per square meter . And be able to apply inputs based on certain plant's needs .

Development in precision agriculture is required as environmental sustainability is considered to ensure the food security of the swiftly growing population globally in general, and for the people of developing countries in particular who are mostly at risk of food insecurity. The use of variable rate input through the variable rate technology for crop input such as seeds, lime, fertilizer, and pesticides is an effective management strategy to address the field variability.

The reactive approach of precision agriculture requires the updated and latest technology of electrical and mechanical systems for the formation of variable rate technology.

The effectiveness of the adoption of the variable ate technology will not provide equal benefits to the farming community, but it will reduce the environmental hazards resulting from unrestricted use of agricultural inputs. The adoption of precision agriculture through the variable rate technology will not provide equal economic benefits, but it will provide the route path to select suitable technologies for better crop production while maintaining system sustainability. The use of GPS, GIS, and remote sensing has provided the opportunity to map the field variability and factors affecting the optimum crop production, especially in the era of climate change. The sensors and ICT application improve the measurement and evaluation of field variability, and decisions are made for the improvement of crop production.

Precision farming is the 4th agriculture revolution which farmers need to adopt and benefit from .

As adoption increases, the average cost of production decreases, all other factors being equal. As a result, crop prices adjust downward in the long-run due to the competitive nature of markets . The result of a technological innovation like PA in the long-run is that consumers should pay a smaller part of their income for food, which is certainly positive for food security.

Precision agriculture principally plays a role in the production area of the supply chain, through increased efficiency in the use of crop production inputs, increased production scale effects, yields, and yield stability. From more efficient crop inputs there is more production as related to the effect on the environment, and farmers realize a greater net return on their investment.

Every farmers needs to adopt precision farming from small holder farmers to commercial farmers . Small holder farmers in recent years have been slow in adopting technology because of different reasons like lack of investment .

So we call upon government institutions and NGO to work with small holder farmers and introduce precision Agriculture programs that benefit small holder farmers. In a developing country like in my country Zimbabwe small holder farmers own about 70% of land and if they could adopt to technology and take farming as a business Africa will be food secured .

In 2020 I corefounded a company called Farmbuzz Agriculture solutions which offers precision Agriculture technologies offering services such as crop drone spraying, drone fertilizer application, remote crop scouting and analysis etc . When we introduced in in 2020 a lot of our own African farmers were resistance to that technology but in 2021 we started to see a change as a lot of farmers where now adopting to our precision farming services.

Leaving no one behind: innovating for good in the non-profit space

Food and Trees For Africa

Leave no one behind. This is the central, transformative promise of the 2030 Agenda's Sustainable Development Goals. It requires not only reaching the most under-resourced communities, but also tackling inequalities and injustices at their root cause. The goals call on all sectors of society - from government to corporate - to take affirmative action towards an equitable, sustainable world, but none are, arguably, as well placed to do so as the nonprofit sector.

In South Africa, where one in 10 people go to bed hungry every night, nonprofits must take seriously the job of creating significant change and discovering previously untapped possibilities in order to achieve a sustainable impact. Apart from remaining relevant in a country where over 220,000 registered nonprofits exist, innovation in the South African nonprofit sector has become essential to driving Corporate Social Investment (CSI)/Environmental Social Governance (ESG) strategies toward the most meaningful impact.

For the past 33 years, Food & Trees for Africa (FTFA) has been at the forefront of innovation in the food security, environmental sustainability and climate action spaces, and hosts two award-winning programmes, namely, Trees for All and EduPlant.

With the core purpose of improving lives and landscapes towards healthy people on a healthier planet, FTFA recently pioneered two data-driven social development platforms, FootPrint and the Inclusive Carbon Standard (ICS). These innovations have helped enable the planting of over 4.7 million trees, the development of thousands of school and community gardens, and the support of hundreds of market gardens and farmer enterprises. The developments have further bolstered FTFA's climate action initiatives by enabling strategic tree planting and afforestation that create greenbelts, and restore urban and rural wildlife corridors. The platforms have proven to be paramount in meeting the increasing pressures to serve more of the most vulnerable communities and environments, and deliver long-term, measurable results.

FootPrint

The paradigm of business has shifted and nonprofits must think beyond what has traditionally been done in the past to what will be needed in the future. FTFA asked the questions: how do sponsors know that the social investments they make have had the impact that they wanted to achieve? How do they know that their resources are going to the right places? FootPrint, FTFA's beneficiary impact platform, evolved as the answer to these questions and represents three decades of data gathering and community engagement.

FootPrint is a novel data-driven application designed to assist FTFA and funding partners in maximising the success of their social investments. The system utilises assessment data across thousands of projects to match corporate support with committed beneficiaries in line with a company's CSI/ESG strategy.

The system feeds in 33 years of experience and tracks more than 150 data points, thereby simplifying the intervention process through guided selection and aided decision-making. The technology utilises scorecard algorithms to rank beneficiaries and identify key areas needed to improve their chances of sustainability. Simply put, regardless of strategy, framework, project type, or need, FootPrint provides better data and insight on interventions and an accurate way to measure investment impact.

The database contains thousands of existing and potential beneficiaries and projects in communities looking for the support they need to empower themselves and build their futures. Importantly, FootPrint was developed as a beneficiary-first platform which prioritises their needs at its core. The platform was also designed to protect their privacy and rights.

One of the primary reasons for this protection is to limit any potential exploitation of good performing projects. With this in mind, FTFA is committed to ensuring that data will always be utilised to the betterment of those served by our programmes.

Although the technology-based platform and processes are largely objective, it remains important to FTFA to ensure that the 'heart' behind each project is accounted for. It is important to not only represent the beneficiary with clean, concise data but to also communicate their success stories. The database thus also includes qualitative data received from the field by our ecopreneurs, funders, and beneficiaries, and comprises inspirational stories, motivations and individual backgrounds that play a large role in decision making.

The Inclusive Carbon Standard (ICS)

Globally, the carbon emission reduction and offsetting space is becoming increasingly important, with many of the conversations centred around 'net zero' and ESG. Over the last few years there has been a more concerted effort by individuals and companies to acknowledge their carbon footprint and seek ways in which to take responsibility for their emissions.

In 2000, FTFA launched the Trees for Home programme under the Voluntary Carbon Standard methodology in which 200,000 trees were planted. However, the challenge of high audit costs resulted in no credits being issued. This sparked the idea to create an affordable carbon standard that could operate at the same credibility as existing standards with a reduced auditing, design and registration cost.

Subsequently, the ICS, a new open-source carbon standard to help local communities access global carbon markets, was developed. An accessible carbon registry, such as the ICS, it is hoped, will encourage more businesses and individuals to earn carbon credits, without the cost and administrative burden of existing standards. The platform has slashed the cost of registering carbon offset projects, allowing even small initiatives in vulnerable communities to be rewarded for their efforts to fight climate change.

Not only is the ICS Africa's first carbon registry system that reduces costs by an order of 10, it is also set apart by a number of other elements.

The ICS prides itself on inclusivity. Unlike existing standards it does not have any geographical or jurisdictional boundaries. The intention is to make the standard globally accessible by obtaining accreditation with international bodies such as the International Carbon Reduction and Offset Alliance (ICROA) and the International Civil Aviation Organisation (ICAO).

"This standard is going to help South Africa, Africa and potentially the world to meet their global climate targets," says FTFA executive director Chris Wild. "There are currently people in this space doing good work, and we want them to be rewarded for the work that they do."

Technological advancements in terms of efficiency and precision in collecting and measuring data have progressed, making it possible to utilise multiple, highly accurate techniques. ICS allows projects to join the registry through an online platform and quantify their contributions via cutting-edge technology, such as satellite imagery, LiDAR and drones. The standard will be able to evaluate land-based projects, renewable energy projects, and energy efficiency projects.

AGRICULTURE & FOOD SECURITY

Another significant difference between ICS and other standards is the use of component methodologies. Instead of binding users to a single cumbersome project methodology, the ICS allows users to develop smaller component methodologies and build out projects using a variety of them. These component methodologies are open-source and can be accessed by any registered projects.

"We have developed methodologies and incorporated the latest technologies, such as the Internet of Things (IoT), to create a standard that all communities in South Africa can access," says Wild.

"We want to make the audit costs of doing good work negligible, and the only way you can do this is with technology."

By July 2022, the Environmental Integrity Committee (EIC) was formed, consisting of 8 members and a secretariat and calls for applications to the technical committee are currently open. The ICS was officially launched in June 2023 and will be hosting methodology and auditors workshops up to the end of September 2023.

FTFA plans to continue to be leaders in innovation in the years to come. It is essential to remember that true sustainable growth means responsibility. You cannot grow if others are left behind. As nonprofits and corporations, we have a mandate to strengthen the social fabric of our shared world and build human capital. If we are to walk the path of prosperity together we need to lead by empowering communities and supporting causes that matter.

About Food & Trees for Africa

Our vision is one where everyone has access to nutritious, naturally grown food that promotes health and happiness. We aim to help build a society made up of communities where our ecosystems are preserved and an urban balance of biodiversity is restored through tree planting. This is a world where the people of South Africa are provided a sustainable livelihood that does not negatively affect the environment.

We envision a sustainable future that provides for everyone, as the effects of man-made climate change are halted and reversed.

Our vision works toward a point in time where people are educated, understand, and respect the link between the environment, themselves and their prosperity.

FOOD & TREES FOR AFRICA.

CORPORATE SOCIAL INVESTMENT

One of Food & Trees for Africa's missions is to inspire positive change across our food system with the help of our funding partners. By pursuing the Sustainable Development Goals within each of our programmes, we are building a greener, more food sovereign and food secure future for all.

ENTERPRISE SUPPLIER DEVELOPMENT

We aim to support under-resourced farmers to conquer the barriers to entry to the commercial marketplace, enabling them to earn an income. We understand what it takes to develop sustainable, reliable businesses and incorporate them in the supply chain.

Food & Trees For Africa

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Footprint

THE CARBON PROTOCOL • CARBON NEUTRAL APPROVED •

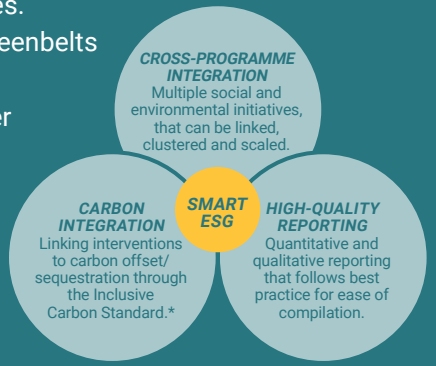
CARBON

As part of our collective responsibility to reduce and offset global emissions, Food & Trees for Africa promotes easy access to a socially inclusive carbon market that supports under-resourced communities. We emphasise processes that promote transparency, affordability, accessibility and accountability.

URBAN & COMMUNITY GREENING

We aim to preserve and protect our terrestrial environment and transform landscapes by planting trees in shared spaces. We plant at schools, community centres, as well as at informal homes.
Food & Trees for Africa has created strategic greenbelts in major city centres across the country and are currently driving greenbelt initiatives in a number of townships nationally.

Inclusive Carbon Standard



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AGRICULTURE & FOOD SECURITY

Minister Didiza launches the Agro Energy Fund with Land Bank to assist farmers to alleviate energy challenges

The Department of Agriculture, Land Reform and Rural Development

The ongoing load shedding in South Africa has become a serious constraint on growth and profitability for various sectors, agriculture included. In addressing the negative impact on the productivity and profitability of farm operations brought about by the load shedding crisis, Land Bank and DALRRD, on 29th August launched a blended finance fund called the Agro Energy Fund that is geared towards financing alternative energy solutions with a focus on energy intensive agricultural activities which include irrigation, intensive agricultural production systems and on-farm cold chain related activities.

The fund aims to support all South African producers and agri-businesses in the agricultural sector from smallholder to large scale and mega commercial producers.

"I must emphasise that the purpose of the Agro Energy Fund is to incentivise farmers to invest in alternative energy sources. This Fund will run parallel to other existing financial instruments that are designed to support farmers with production, farmer infrastructure, market and other. Applications will be directed to the Land Bank and will be subjected to approval guidelines of the bank" said Minister Didiza.

The funding will be deployed through a blended finance structure which is a combination of a loan and grant. DALRRD will contribute a grant portion to a total value of R500 million which will be matched with a loan portion to a total value of R710 million from Land Bank. This will effectively create a R1.21 billion fund size. The fund will be available in the market until the allocated funds are completely drawn down.

The prioritised focus will be on supporting dairy farming, piggeries, poultry, all irrigated commodities and on-farm processing. In deploying funding to producers, the Bank will also rollout its Green Finance product offering with a focus on financing solar panels, biogas and biomass plants which will result in the installation and commissioning of energy efficiency projects across the country which will partially offset electricity usage from the grid.

The Agro Energy Fund will enable the Bank to contribute to building resilience for enterprises against energy shocks in the sector which have negatively impacted productivity and profitability in farm operations. Food security and rural development remain key priorities in the agricultural sector. The intended support to producers will also indirectly result in the maintenance of jobs in the sector which is experiencing growth in employment numbers.

"We are delighted to be in this partnership with the Department for the implementation of the Agro Energy Fund which is important to provide energy security to ensure that farming continues uninterrupted even during load shedding hours and there will be extra energy produced by farmers through this funding. This may also reduce the electricity bill of the farmers as they will no longer buy full units but use solar- generated energy" said Mr Andrew Makenete, Deputy Chairman of the Land Bank Board.

The launch of the Agro Energy Fund follows the successful launch of the Blended Finance Scheme (BFS) in October 2022 through the partnership between Land Bank and DALRRD.

The launch therefore marks the opening of lending activities under the Agro Energy Fund. More details about the fund, product offering and how clients can contact and apply for funding support from the Land Bank can be found on www.landbank.co.za or www.dalrrd.gov.za.

TRANSPORT

How to use Environment, Social and Governance (ESG) to increase sustainability in your organisation

Catherine Larkin APR CMILT – Executive Director: Chartered Institute of Logistics and Transport: South Africa (CILTSA)

ESG (Environmental, Social, and Governance) factors are a subset of sustainability considerations that provide a framework for evaluating the sustainability performance of companies and investments. ESG criteria are used to assess how well a company is managing its impact on the environment, society, and its internal governance processes.

In this way, ESG is a practical way to measure and analyse various dimensions of sustainability. The Chartered Institute of Logistics and Transport: South Africa (CILTSA) recently hosted its second ESG conference, which provided a valuable opportunity for the logistics, transport and supply chain industries to learn about various options, innovations and solutions in implementing ESG.

Business leaders need to drive effective ESG strategies

In 2022, carbon dioxide emissions reached the highest levels ever recorded. Research by the World Meteorological Organisation shows that the world is increasingly likely to experience global warming of 1.5 degrees Celsius within the next five years because of record greenhouse gas (GHG) levels. Despite this concerning incline, 80% of the South African organisations surveyed by PwC South Africa in 2022 had not yet made a net-zero commitment.

PwC's 25th Annual Global CEO Survey showed that 73% of South African CEOs are very or extremely concerned about social inequality in the country impacting their company over the next 12 months.

Julie Rosa – Associate Director-PwC

Oliver Naidoo – JC Auditors Managing Director

Julie Rosa, Associate Director at PwC, stated that business leaders could no longer afford to ignore the importance of ESG performance, as this can have a direct impact on societal well-being. Research conducted by the University of Oxford's Sustainable Finance Programme shows that an increase in company-level ESG performance can result in a positive effect on a country's living standards - both in developed and emerging markets.

Rosa highlighted that local organisations are lagging behind their global peers in adopting ESG goals and strategies. Decarbonisation and managing climate risk are key differentiators as consumers, investors and regulators increasingly demand climate action.

Successful organisations are those taking steps today to minimise their negative impact on the climate; and adapt to avoid adverse climate impacts on their business.

ESG makes business sense

There is a growing body of evidence suggesting that companies with strong ESG performance tend to outperform their peers in the long run in delivering higher, sustainable returns. Oliver Naidoo, Managing Director of standards and certification firm JC Auditors, highlighted some of the benefits ESG brings to an organisation: it promotes greater transparency and accountability; mitigates environmental concerns (climate change); helps to protect the business brand, allows for socially responsible behaviours and promotes good governance (system of rules, practices and processes that directs/controls a business).

Naidoo said: "For ESG to be effective and yield tangible results, it must be integrated into the business strategy, which drives and directs the business' various systems and processes. At the same time, certifications in the various management systems provide concrete evidence of ESG performance."

JC Auditors recently introduced an ESG verification service which aims to enhance sustainability practices and promote responsible business operations within the industry. JCA's ESG verification services for the transport and logistics sector enable companies to demonstrate their commitment to sustainability, transparency and ethical practices. Through a defined process, JCA evaluates various ESG factors, including carbon emissions reduction initiatives, supply chain ethics, employee welfare, community engagement, and corporate governance measures.

The company's ESG verification process is designed to meet international standards and guidelines set out by organisations such as the Global Reporting Initiative (GRI). "We have customised our verification criteria, taking into account materiality factors applicable to the transport and logistics sector, especially in the context of the operating environment in Southern Africa", explained Naidoo.

"By adhering to these frameworks, JCA ensures that the verified companies gain credibility and recognition in the marketplace."

Telematics a key enabler

Global telematics company MiX Telematics emphasised the business case for ESG, confirming that businesses with a high ESG score have a lower cost of debt and equity.

Henry Smith - Sales Director (Fleet Africa) at MiX Telematics

Henry Smith, Sales Director (Fleet Africa) at MiX Telematics explained: "A strategy that includes sustainability key performance indicators, can drive profitability by decreasing operating costs. This is achieved through effective risk management and more efficient operations, as well as gaining a competitive edge through long-term sustainability initiatives that transcend several areas or teams within an organisation."

Telematics' technology is a powerful tool in a fleet manager's arsenal and is primarily used to improve safety, efficiency, compliance, security and sustainability. The beauty is that telematics is not a new ally in the efforts to reduce CO_2 emissions, but one which may not have been considered before now.

Telematics technology tracks a range of connected metrics in real-time. Driver behaviour is monitored, and performance is tracked, fleet locations of all assets and vehicles can be accessed, while engine diagnostics for preventative maintenance and the optimised route planning further aid a business that uses this technology. Besides delivering on increased efficiencies and reducing fleet operating costs, telematics also enhances a business's sustainability initiatives, by reducing a fleet's energy consumption and carbon emissions.

Telematics provides real-time insights into driver behaviour, vehicle performance, and environmental conditions, enabling proactive measures to enhance safety.

Smith outlined the strength of using telematics to reinforce and support sustainability efforts:

- It identifies opportunities to reduce waste with data: fuel inefficiency is one of the biggest problem areas in fleet businesses and can increase the carbon footprint considerably. The main contributor to this wastage is poor driver behaviours like harsh acceleration and excessive idling.
- Better regulatory compliance: as governments enact regulations to reach their net-zero targets by 2050, in line with the Paris Agreement, integrating sustainability initiatives into your business, positions it to meet changing regulations pre-emptively.
- Awareness of engine errors: Similar to the way that OBD (onboard diagnostics) technology can be used to monitor driving habits, it can also point out how an engine is performing and whether maintenance should be completed in the future to limit costly and unexpected downtime. In addition, connected telematics systems can monitor engine errors that lead to excessive CO_2 emissions.
- It boosts employee morale by incorporating sustainability into day-to-day operations, and the mission impact statement goes a long way toward improving employee morale, recruitment, and retention. A company with strong ethical and environmental values fosters employee loyalty, pride, and satisfaction.

Smith highlighted real returns for companies in recent years – which improved sustainability and the bottom lines:

- Through monitoring fuel use, MiX customers saw an 85% reduction in harsh braking.
- Through effective fleet management using telematics, MiX customers saw an 93% reduction in speeding.
- Through effective data management, MiX customers saw a reduction of 73% in harsh acceleration

Craig Uren - Isuzu

Isuzu and ESG

Global brand Isuzu shared some of their ESG goals. Craig Uren, Senior Vice President of Revenue Generation, explained that some of the short-term goals for ESG include introducing duel-fuel vehicles across all Isuzu vehicles available in the market. Compressed Natural Gas (CNG) will be available on selected models, while the portfolio of EURO 5 trucks is set to increase. Medium-term plans include introducing more battery-electric vehicles, while long-term strategies will be focused on hydrogen-electric vehicles in selected Isuzu trucks.

In summary, ESG factors provide a structured approach to evaluating a company's performance in environmental, social, and governance dimensions, all of which are integral components of sustainability. By examining these factors, stakeholders can assess whether a company is taking meaningful steps towards being a sustainable and responsible entity.

A company that performs well in ESG areas is more likely to align with sustainable practices and contribute to a healthier, more equitable, and more prosperous future.

There are many tools and products available that can greatly assist companies in their sustainability journey.


YOUTH

The manufacturing economy – an unrealised opportunity for SA's youth?

As the world's population sees a demographical shift, the growth of South Africa's manufacturing sector could present an exciting opportunity to address youth unemployment. Insights & Innovation Lead, discuss.

The global stage Is shifting in terms of regional demographics. In China, we see a population that is ageing – a result of the country's low birth rate coupled with an extended lifespan – which will see almost 40% of Chinese over the age of retirement by 2050, according to projections.

Conversely, emerging economies such as India and Africa will soon hold the youngest populations in the world. South Africa, for example, sees a median age of around 27 years old, making us a babe-in-arms when compared to certain European countries such as Monaco (55 years), Germany (47 years) and Greece (45 years).

A young population sounds like a good thing but could prove to be a double-edged sword. On the one hand, a young population can offer what is known as a 'demographic dividend'; a potential boost to the economy resulting from a reduction in youth dependency ratios and there being a good proportion of working-age people.

A young population could point to the kind of productivity that leads to economic growth – but here's the kicker – if the landscape is conducive to human capital development.

On the other hand, a sizeable youth population – if largely unemployed – can contribute to social unrest, crime, violence and instability, which can negatively impact economic growth. In a country such as ours, with the second highest rate of youth unemployment in the world, a young population has the potential to be a ticking timebomb.

What's to be done? According to a study by Wolfgang Lutz et al. (2019), to maximise the benefits of South Africa's demographic transition, improving education is far more important than changing the age structure.

Today, 81% of Grade 4 pupils in South Africa still can't read for meaning, according to the recent International Reading Literacy Study (PIRLS). Thus, the demographic dividend can only "payout" if associated with an investment in human capital.

In short, we need to educate and upskill our young people and get them into employment. And fast.

Hold that thought for a second, and let's look at the manufacturing sector.

According to a South African Reserve Bank (SARB) 2020 economic note, manufacturing comprised 42% of exports in 2019. The question is, how do we encourage the growth of our manufacturing economy so that we don't export all our natural resources to other countries for processing?

The 'Revitalizing SA Manufacturing Sector Report' (2022) suggests that to re-industrialise, there needs to be an effective partnership between public and private sectors.

Much of our raw materials are exported due to a lack of knowledge and technological infrastructure. The emphasis should be on technological innovation and education so that we have the skills and technological know-how for the kind of manufacturing that takes issues such as climate change into account.

A thriving manufacturing sector will play a massive role in the growth of the South African economy. According to the same Revitalizing SA report, a 10% increase in manufacturing investment is projected to produce a medium-term GDP contribution of 13%.

And it is not only manufacturing that will reap the benefits but the entire ecosystem, positively impacting unskilled jobs while creating new jobs across different skill levels.

Let's connect the dots.

Manufacturing jobs require specific technical skills and training, and a gap very clearly exists between the skills we have and the skills we need. So, what is currently stopping us from upskilling our youth – a large portion of which are unemployed – to bridge this gap?

In South Africa, there are only 50 public training colleges (with 200 campuses across the country) and 350 private colleges. We need to increase their capacity so that these institutions are equipped to take on more students across more regions.

We also need to address the matter of access. As an example, three years of training to be a welder can cost up to R95 000, excluding the exams. While there are grants available, not everyone will make the cut.

If youth cannot access quality, affordable vocational training, it will make it harder for them to pursue a career in this sector.

While manufacturing is one of several areas that government has committed to focusing on through its Nationals Skills Fund (NSF), more attention is needed. Collaboration between government, corporates and colleges must happen for South Africa to keep abreast of the technological innovation that is happening on the global stage. Young people will be more incentivised to pursue a career in manufacturing if they know they are "future-proofed" against ageing technology and automation. This collaboration also needs to incorporate a mentorship programme, which prepares graduates to enter the working world.

At the end of the day, the South African government wants to eradicate poverty and grow the economy while the private sector needs these technical skills. Partnering with this goal in mind will help drive momentum and get more youth into manufacturing jobs.

Finally, there needs to be more social awareness and a strong education drive about the opportunities that exist. This year saw a significant drop in registrations at technical and vocational education and training (TVET) colleges, with around 10 000 fewer students registering than in 2022.

Part of the reason could be that there is still a high societal value placed on careers within science, technology, engineering and mathematics (STEM) fields, even though in many cases, artisanship might be a better fit for certain individuals or offer more income-generating opportunities. Many young people are encouraged by their parents or family members to pursue a career in mathematics or science – especially if these family members didn't have similar access to these opportunities.

Artisanship skills also create more opportunity for young people to learn as an apprentice or even venture out on their own as a small business entrepreneur – whereas STEM qualifications are more contingent on conventional employment opportunities, which we know are constricted at present.

Ultimately, more needs to be done to promote the exciting career paths that young people can pursue in this space. The manufacturing sector offers the opportunity to boost South Africa's flailing economy, offering exciting, opportunities for young people while redressing the unemployment issue. Now, it's up to us to realise this potential.

Youth at the Forefront of Sustainability

Khensani Nkatingi

The time has arrived for the youth to take charge & be at the forefront of sustainability. Youth are not only tomorrow's leaders; they are also change agents now. It is critical to empower and inspire them to act by giving them the resources, platforms, and mentorship they require. The concept of youth at the forefront of sustainability emphasizes the critical role that young people play in pushing positive environmental and social change. Climate change, biodiversity loss, pollution, and social inequality are just a few of the issues confronting young people today. As a result, they have a vested interest in ensuring a sustainable future for themselves and future generations. Youth-driven innovation is key to solving complex sustainability challenges. Their fresh perspectives and out-of-the-box thinking can lead to groundbreaking solutions, ranging from renewable energy technologies to sustainable agriculture practices.

The United Nations, Department of Economic and Social Affairs has stated that the youth are a powerful force for sustainable development, as well as vital agents of social change, economic progress, and technical innovation. Young people are driving the Decade of Action for the Sustainable Development Goals (SDGs) forward, from calling for urgent climate action to addressing inequities and gender prejudices.

The following key themes that the youth's involvement is important for sustainability:

1. Youth Activism:

Youth activism holds leaders accountable for their climate-related activities (or lack thereof). Young activists demand transparent and ambitious climate measures by speaking out and protesting. Young people are crucial in combating climate change. They make up the majority of the population in many countries and are increasingly concerned about the environment. The youth continue to carry their climate activism online, stating that conserving our planet is a prerequisite for nations to flourish and economies to prosper.

Youth activism for sustainability and climate change is a potent force that energizes and mobilizes society to face our time's most critical concerns. The combined actions of young people all around the world have the potential to have a transformative influence and pave the path for a more sustainable and resilient future. This active participation of the youth embraces the diversity of perspectives within the movement, emphasizing the significance of inclusive climate action that tackles social and environmental justice.

2. Education:

Investing in education is very important because with growing awareness that the future of our planet is strongly dependent on the decisions we make right now, education is becoming a higher priority. Education provides young people with the skills and information they need to actively participate in sustainable development projects and contribute to the well-being of their communities.

From an advocacy and activism perspective, an educated youth can effectively advocate for sustainable policies and to drive positive change. Which means that they can engage and in global and local projects to promote sustainability. Youth education is a human capital investment. Youth education levels are crucial for long-term economic growth and development.

3. Innovation and Collaboration:

Fostering Innovation and Collaboration for sustainability is critical for solving our planet's complex and urgent challenges. Youth-driven innovation is key to solving complex sustainability challenges. The youth's fresh perspectives and out-of-the-box thinking can lead to groundbreaking solutions.

Fostering innovation and collaboration for sustainability is critical for discovering effective solutions to global challenges, increasing resource efficiency, building resilience, and creating a more fair and sustainable future for all. To address these complicated concerns and make a beneficial impact on the world and its inhabitants, governments, corporations, academics, civil society, and individuals must work together. When it comess to building a sustainable future it is vital to encourage the youth to drive innovation, network and collaborate with other individuals. As this will build their confidence, capacity and skills to become the most effective leaders and change of today and tomorrow.

Nations can overcome complex issues and build a more sustainable, inclusive, and prosperous society for future generations by giving the youth the tools and resources they need to lead innovation. The development of a vibrant, forward-thinking society capable of navigating a world that is constantly changing depends on the participation of the various stakeolders.

4. Financial Inclusion:

Youth financial inclusion is a vital component of sustainable development. It encourages young people to take an active role in tackling environmental and social issues, promoting economic growth, and creating a more sustainable future for themselves and future generations.

Financial inclusion for women is important because it has the potential to empower young women in particular by providing them with economic independence and decision-making authority. When women are economically empowered, they are more likely to invest in education, health, and environmentally sustainable practices.

Conclusion

We cannot talk about building a sustainable future and not have an inclusive engagement with the youth. The climate and sustainability issues that are being faced will mostly affect the younger generation therefore in the same line of sight, it is critical to collaborate with young people to secure their input and participation in this topic. Young people are frequently marginalised and treated as a checkbox. Mutual collaboration is required to guarantee that young people receive information and have the opportunity to express their concerns and thoughts. This means that participation methods will include and be accessible to youth from diverse backgrounds.

YOUTH & SUSTAINABILITY

The Path to Profitability: Simple measures for Sustainable Entrepreneurship

Catherine Wijnberg, CEO of Fetola

Whats the allure? Change will happen when the value of circularity is clearly visible.

There is no shortage of climate change headlines to terrify us and motivate new ways of living and doing business. Strangely though, despite the raging fires, deadly heat and supersized climate events, very few individuals and even less businesses are taking action to change this future. Why is this?

It is clear that we need solutions. And fast. Yet to take hold they must be solutions that make sense for citizens and business alike. One of these is "the circular economy" - a climate change antidote that also promises to be good for job creation and economic growth. The circular economy at its core is about eliminating waste – all waste – from our system. Designing out waste at its root and keeping products and their components in use forever.

So, if the circular economy is so great, why aren't more people sold on it? And why are even less actually adopting it? To answer this we need to get down to basics. Anyone that has tried to change a bad habit knows that change is painful and is made of three

parts – the heart, the head and the hands. The heart is our emotional motivation for change, the head is our technical ability to make the change and the hands are the outcome of our actions.

The motivation for monitoring

Millions of people are feeling the emotional concern of climate change, what they need is the belief that there is a solution, so they can be inspired and motivated to take action. Here we need better storytelling of the successes that the solutions such as the circular economy can achieve!

Next, we need to educate people on the how. Educate them on ways in which they can reduce or eliminate waste and become more circular.

What you measure you master and what you monitor you motivate (Just check the increase in fitness activities since the invention of the smart watch to be convinced of that!). So, to embed change we need to measure, monitor and report the positive effect that this delivers so we are motivated to do more of it.

And here is where it gets a little tricky. Whilst monitoring of electricity and water useage is made easy through utility meters, and monitoring our recycling waste is within reach if we count the number of bags we take to the recycling plant, a full report on circularity is much more than that.

Making circularity visible

The question is how do we make measuring and reporting of circularity simple and easy to do so that it's value can become visible – both to citizens and business?

In Fetola's circular economy accelerator we have discovered that this is not a simple task. Entrepreneurs are motivated to improve their circularity but struggle to measure it in a simple, meaningful and measurable way. The challenge is twofold – firstly to reduce the complexity of a systems change to a manageable message and secondly to find simple ways to measure and report these results.

If a business aspires to expand globally, especially into the EU and countries with punitive carbon footprint taxes, it is going to become essential to be transparent, measurable and accountable on the climate impact of production. Just labelling a product circular because the packaging is recycled cardboard won't cut it. But how practically does an entrepreneur measure their processes, their energy and waste efficiencies and environmental footprint? This impact monitoring is important for brand positioning, to reduce carbon tax and to identify improvements in profitability that measures the effectiveness of a shift to circular economy principles.

Impact Models can become extremely complicated, and the measuring of it even more onerous, so it's important to bring the focus back to three principles: eliminate waste and pollution, circulate products and materials, and regenerate nature. The key for trust building is to keep it simple, logical and easy to understand:

1. What are you going to measure
2. How easy is it to measure
3. Can it be verified

The value of verifiable measurement is that it turns circularity from a 'nice-to-have' into a tangible financial asset - something that companies can monitor and invest in. A typical calculation might go as follows: (see below)

In theory each component in the manufacturing cycle could be monitored, for example circular water discharge, renewable energy consumption vs total energy consumption and so on. Water starvation is

$$\text{\% Of Non-virgin Material Inflow for Production} = \frac{\text{Mass of Renewed Raw Materials}}{\text{Mass of Total Raw Materials}} * 100$$

(Equation provided by https://research.aimultiple.com/circular-economy-metrics/)

expected to displace up to 700 million people in Africa by 2030 and is a critical resource to save, so reporting this saving is a very valuable indicator. Entrepreneurs could simply start tracking their water saving by calculating the reduction in fresh water usage, or go deeper to monitor the portion of recycled water as follows:

$$\text{\% Of Circular Water Consumption} = \frac{\text{Quantity of Treated Waste Water Consumption}}{\text{Quantity of Total Water Consumption}} * 100$$

Tracking product recycling is more difficult to measure, but a workaround might be to employ a returns policy with a deposit system that can be monitored. Another measure would be to determine what percentage of a product is repairable, or reporting lifetime durability using an extended warranty system.

What is really important is that entrepreneurs are not left feeling overwhelmed by the monitoring process, and that citizens are able to understand and trust the measures they are reporting.

Cape Town based business Plant The Seed launched a 'Zero Waste Toolkit' programme in 2022 to drive sustainability in schools has mastered this. Within a year the holistic recycling and waste management service already has meaningful, verifiable and visible metrics they can leverage to build their business and their reputation:

https://planttheseed.co.za/

Dilex, another participant on Fetola's circular economy accelerator, currently cleans 600,000-kilolitres of used car oil for re-use, which saves 500 billion litres of water annually from contamination. Used engine oil doesn't wear out, it just gets dirty - less energy is required to re-refine this than to use crude oil and can be repurposed again and again as an eternal resource. Another useful measurement would be the savings of the re-refined product, since one litre of re-used engine oil is reported to replace the need for extracting & refining 42 litres of crude oil.

Creating simple solutions for self-monitoring is a critical step towards increased profitability, enhanced market access and investment opportunities. Circularity is a legitimate future for small and micro business, so providing the tools that demystify and uncomplicate the process are vital to inspire that early stage of business

Further addressing this basic gap are programmes such as Youth Business International, which has launched their trial of a global circular business startup toolkit encompassing all industries to form a free resource accessible for all. But designing it is often complex and legislative frameworks don't necessarily translate across international borders.

Whilst the majority of mid-income South Africans are more concerned about crime, corruption, loadshedding and government incompetence, perhaps it is time for small business to ignore consumer trends and rather focus on getting onboard before they are left behind the curve. Now is the time to listen to that instinctive business sense: one of honing cost inefficiencies and finding opportunity.

Simple measurements set entrepreneurs apart from the competition. When metrics are clear and trustworthy entrepreneurs and their products become more credible with both customers and financiers alike. This trust is the starting point for positive change.

About Fetola

Fetola is a leading provider of scalable, world-class entrepreneurial support programmes that deliver lasting social, environmental and economic impact. Their goal is to grow the economy, create inclusive wealth and generate jobs by helping people build businesses that last. This is achieved by providing proven business strategy, systems and support, while unlocking the personal leadership power of entrepreneurs who are inspired to leave a lasting legacy.

Fetola means "change" in Sesotho - and the Fetola team are inspired by UN Global goal 17 to generate change at a global scale and foster partnerships that are a force for good. For more information, visit https://fetola.co.za/.

Using art and song to help tackle South Africa's plastic waste crisis

Seven tonnes of plastic waste has been successfully diverted from the environment thanks to a pioneering new collaboration in South Africa which aimed to change behaviours through art, song, comedy skits, as well as practical measures.

Researchers from the University of Portsmouth's Revolution Plastics team and the Department of Agriculture, Rural Development and Environmental Affairs (DARDLEA) partnered with UK-based charity WasteAid to run a pilot study in the Thembisile Hani Local Municipality of the Mpumalanga Province. They combined creative ways to educate people about the dangers of dumping and burning waste with on-the-ground action to increase waste recycling including supporting informal waste collectors and introducing community drop-off points for recyclables.

The pilot study has made promising strides in combating the problem of plastic waste; with two-thirds of local people reporting a positive change in their environment as a direct result of the project.

A survey of local residents showed that arts-based methods - in particular the creation of murals - were significant drivers in the success of the project.

Murals sensitised 86 per cent of those who saw them on how to separate waste; and changed the attitudes and behaviours of 80 per cent of those who saw them.

By the end of the project the amount of waste managed by burning or dumping had fallen by 27.7% per cent.

In just three months, the Masibambisane project successfully diverted seven tonnes of plastic waste, the equivalent weight of a large African bush elephant, from entering the environment. The uncontrolled

disposal of plastic waste in the area poses a severe threat to the environment and human health, with waste often burned, contributing to climate change and poor air quality.

Working closely with the local community, WasteAid implemented strategies to enhance plastic waste collection and boost the revenue for local collector groups. The project focused on both supply-side factors, such as educating households on better waste separation and providing collection bins, and demand side factors, including training collectors on the types of plastics with value and promoting good business management. Additionally, the project facilitated connections with off-takers committed to purchasing plastic waste regularly from collectors.

The University of Portsmouth played a crucial role in designing a creative sensitisation campaign to support the pilot scheme. Collaborating with local stakeholders including artists, musicians, and waste collectors, the campaign aimed to demonstrate the value of waste and raise awareness about the harmful impacts of dumping and burning waste on human health.

Dr Cressida Bowyer, Deputy Director of Revolution Plastics at the University of Portsmouth, said: "Sensitisation is a vital process for educating communities, raising awareness and inspiring behaviour change. To make messaging more effective, it's important for the message creators to reside in the target community, understand local social and cultural contexts, and actively participate in the production of campaign materials."

Ceris Turner-Bailes, CEO of WasteAid added: "This is a great example of the positive outcomes that can be achieved through collaboration between the third sector, academia, and private sector. The educational and creative elements for this project made it almost impossible for people in the community to ignore our initiative. It sparked interest and helped facilitate important discussions on the steps people could take to improve waste collection and increase recycling."

Embracing arts-based sensitisation methods such as murals, music and street theatre skits, the campaign was accessible to old and young alike, making the messages easily comprehensible and encouraging open discussions.

Two murals were designed and deployed in the project area with additional support from another local NGO Upcycle. Mural one provides a clear graphical guide to which items of waste are currently collected for recycling, which are not currently accepted at the buy-back centre and to encourage separation of these items at the source. The mural was painted on the wall outside the largest local buy-back centre, which lies on the main road entering KwaMhlanga. The mural content was informed by observations made during the field visit and stakeholder discussions including engagements with the buy-back centre. Key features included the use of Ndebele patterns to appeal to the local culture and a focus on types of plastic. Minimal text and clear,

bold messaging ensure an eye catching and easy to interpret message.

Mural two illustrates a community environment before and after improved waste management, comparing a clean environment with a polluted environment. This mural is a future-visioning image of the environment following better waste management and beautification. The mural was painted at the aggregation bay site, previously used as an illegal dump. Key features on one side include a polluted environment where waste is open dumped and burnt, causing people to be sick, rivers polluted with plastic waste, livestock die from eating plastic and the environment is unable to meet the needs of the people. On the other side a healthy environment is portrayed where waste is taken to the collection bins, the sky is clear, rivers and animals are healthy, and the environment can provide spaces for agriculture and recreation.

Recognising the power of music as a driver for social change, a locally crafted song was composed and performed by talented local waste pickers and musicians, tapping into the emotional resonance that music brings. The catchy chorus and captivating video showcasing the murals, theatre skits and community events reinforced the campaign's core messages and the lyrics and performance reflect the pride that the waste collectors have in their work. View the video by following this link https://www.youtube.com/watch?v=Vqrf_LvrWos

Community-based participatory research was integral to the design and implementation of these creative interventions. Engaging with local creatives and waste collectors as equal partners ensured the campaign was ethically and contextually relevant.

The campaign showed promising results in just a short period of time. Nearly 21 percent of community members surveyed now use the community bins for better waste separation and segregation. Most importantly two-thirds of respondents noted a positive change in their environment, with nearly half attributing the transformation to the presence of community bins.

There are exciting opportunities for developing the circular economies in rural areas such as Mpumalanga, where interventions such as this pilot are very relevant. Despite the challenges waste collectors and innovators face, there is both drive and necessity for the development of circular economy principles.

The study has shown there are both demand and supply signals in the marketplace. Communities are willing to change littering behaviours and increase the collection (and sometimes separation) of materials at household level if they are engaged through participatory processes and appropriate infrastructure is provided.

The feasibility study was funded by the Waste & Resources Action Programme (WRAP) and UKRI International Circular Plastics Competition, which aimed to address plastic waste collection challenges in specific geographies.

TOURISM

SUSTAINABLE TOURIM

Tourism and the sustainable development paradigm

Daniel Asafra Tibu

Before the adoption of the 2030 Agenda for Sustainable Development along with the Sustainable Development Goals (SDGs) by governments in 2015, the phrase 'sustainable development' has appeared in public discourse decades earlier. It was not therefore surprising the bold agenda sets out a global framework that builds on the Millennium Development Goals (MDGs) with the objective to end extreme poverty, fight inequality and injustice and fix climate change in the world.

Hence to better understand what sustainable tourism is all about, it is essential that we discuss the fundamental concept of sustainable development as have been captured by various schools of thought. First of all, the beginning of the sustainable development paradigm can be traced to the environmental movement in Europe and North America during the 1960s. In June 1972, the international community met in Stockholm to focus for the first time specifically on global environmental and development issues. At the event tagged Conference on the Human Environment, the UN came up with a declaration, which contained 26 principles on the preservation of the environment.

Subsequently, in 1986, the UN World Commission on Environment and Development studied the dynamics of global environmental degradation and made recommendations to ensure the long-term viability of human society. Gro Harlem Brundtland, the then Prime Minister of Norway, chaired the Commission named the 'Brundtland Commission' that came out with the report titled Our Common Future in 1987. The report became the benchmark for thinking about the global environment, and also first popularized the term 'sustainable development' that was defined as development that meets the needs of the present without compromising the ability of future generations to meet their own needs. The report echoed the basic principles outlined in the 1972 Stockholm Convention, such as redistribution of economic activity, conservation of and equitable access to resources, and increased technological effort to use them more effectively. It also recommended observance of carrying capacity and sustainable yield, and minimizing adverse impacts.

In 1992, the United Nations Conference on Environment and Development popularly known as the Earth Summit 1992 or Rio Summit brought environment and development issues to the forefront. The Summit produced the Rio Declaration on Environment and Development, which added the principles of intergenerational equity, citizen participation and empowerment of women, the youth and indigenous peoples. Its accompanying document called Agenda 21: Program of Action for Sustainable Development, identified ways by which various stakeholders can operationalize the actions outlined in the document on a wide range of issues. The well-attended 1992 Rio Summit highlighted the value of international cooperation, issues concerning global environmental protection, the health and well being of future generations amongst others.

Also in common with the Stockholm Summit, was the 2002 World Summit on Sustainable Development (WSSD) in Johannesburg, which identified poverty as the main cause of environmental degradation and social problems. Consequently, measures such as access to clean water and sanitation facilities, credit facilities and application of new environmentally friendly technologies to eradicate poverty were raised and considered essential for a sustainable future. A very significant aspect of the WSSD is the inclusion of sustainable tourism development, particularly ecotourism and community-based tourism, as strategies for reducing poverty.

It is however of interest to recognise that prior to the 2002 World Summit on Sustainable Development, an international conference had been held in Lanzarote 1995 which specifically focused on integrating sustainable development in tourism but not sustainable development as the previous cases have been. The Lanzarote conference on sustainable tourism resulted in two documents – the Charter for Sustainable Tourism and The Sustainable Tourism Plan of Action. The Charter for Sustainable Tourism is a declaration, which sets out 18 principles for tourism control so that it can be included in the global strategy for sustainable development. The Sustainable Tourism Plan of Action specifies strategies and proposals for action to be developed by the signatories of the Lanzarote Declaration. It is significant to also mention that prior to Lanzarote, two documents were exclusively released by the World Tourism Organization (WTO), the World Travel and Tourism Council (WTTC), and the Earth Council 1996 which together produced a document more specific to the travel and tourism industry - Agenda 21 for Travel and Tourism Industry: Towards Environmental Sustainable Development. The document called for establishment of mechanisms for the implementation of sustainable tourism practices, participatory decision-making, and the interdependence of tourism and peace, among others. Similarly, the Pacific Asia Travel Association (PATA) and the Asia Pacific Economic Cooperation (APEC) also published in 2001 the document Code for Sustainable Tourism. The Code emphasized natural environment conservation, respect local cultures, maintain environmental management systems, conserve and reduce energy, eliminate wastes and pollutants among other relevant practices.

Evidently, the sustainable development approach implies that resources for development should be conserved for the indefinite future as well as present use. The approach ensures that future generations of people everywhere will have sufficient resources to adequately sustain themselves and maintain a reasonable quality of life. Since tourism as activity touches on every sphere of life, the sustainable tourism concept aligns with the sustainable development approach. Sustainability as an objective requires much time and effort to be achieved. It therefore means that sustainable tourism requires that resources for tourism development must be conserved, maintained, protected and often enhanced for both present and continuous future use and enjoyment by residents and visitors alike. Tourism development must respect the environment, society and culture of the destination and at the same time, ensuring that the livelihoods of host communities are improved and sustained.

A cursory look at Africa's tourism landscape – from Cape Verde to the West through to Somalia in the East; and from Cape of Good Hope in the South to the Strait of Gibraltar in the North suggests the continent largely depends on a variety of tourism resources such as nature, history, and culture. However, dominant among these resources is the continent's nature-based tourism resources, which require careful planning and management to achieving sustainability for the benefit of both present and future generation. For instance, the Cape Verde Archipelago located in the North Atlantic, the Nzulezo village on stilts built on Lake Tandane in western Ghana and Table Mountain in Cape Town, South Africa are environmentally dependent destinations that require detailed and strict environmental management practices to ensure their conservation for generations yet unborn.

It is also indicative to mention that to achieve sustainability in tourism, tourist attractions, facilities, services and infrastructure must be planned, located, designed and managed in an environmentally and culturally sensitive manner so they do not pollute or degrade the environment or create social problems. It's also worth stating that to attain sustainable tourism we have to establish systems to regulate and control visitor flows to attractions in order to ensure environmental sanity, which leads to sustainability.

One such system is the carrying capacity measures that a destination puts in place to ensure non-disruption to ecological systems, no loss of cultural identity and a no reduction in visitor satisfaction. So, for example carrying capacity can be established for the Cradle of Humankind, a UNESCO World Site to determine the number of visitors visiting within a particular time; the number of tourist entering the habitats of mountain gorillas in Uganda in a day in order not to create any environmental imbalances for the primates; and more importantly the number of holiday revellers who can use open destinations such as beaches within a specified duration must be determine.

Sustainability is undoubtedly very relevant in today's world due to the debilitating effects of climate change and global environmental concerns. As such, it has become vital for corporates, Non-governmental organisations, governments and destinations alike, to adopt Environmental, Social and Governance (ESG) practices to ensure sustainability is achieved in whatever they do and whichever sphere they operate.

To conclude, since sustainability has become a key objective to achieve in all sectors of an economy, the Global Sustainable Tourism Criteria is a recommended tool all destinations, corporates and governments can readily use. To achieve sustainability in tourism we should demonstrate effective sustainable management, which for instance will ensure personnel receive periodic training regarding their roles in the management of environmental, socio-cultural, health, and safety practices. Secondly, sustainable tourism should enable us maximize socio-economic benefits to the local community and minimize negative impact.

In this situation, the business offers the means for local small entrepreneurs to develop and sell sustainable products that are based on the destination's nature, history, and culture – including food & drink, crafts, performance arts, agricultural products et cetera. Also, to achieve sustainability, destinations must maximize benefits to cultural heritage and minimize negative impacts thus contributing to the protection of local historical, archaeological, culturally or spiritually important sites, and does not impede access to them by local residents. And finally, to achieving sustainable tourism, there is need to maximize benefits to the environment and minimize negative impacts through conservation of resources, reducing pollution and conserving biodiversity, ecosystems and landscapes.

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