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 $x)=\frac{e^{x}+e^{-x}}{2}$

Xr Xn

 $\log_{a^{p}} x = \frac{1}{p} \log_{a} x$

 $\lim_{n \to \infty} \left(1 + \frac{4}{n}\right)^n = e$

X, + X2 Xn

a

 $\sinh(x) = e$

 $x^n dx = \frac{x^{n+1}}{n+1} + C$ log(x)

A=cosBcosC+sinB.sinCcosd

log (ab) = log a + log b

0

0

 $S = \frac{1}{2}absind$

4=x2

Losd - 1

c(n)/n





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Credits

Article Submissions: Frank Mwangilwa, Moses Chulu, Katayi, Kanfwanwa, Pauline Phiri Editing and Layout: Pauline Phiri Photo Credits: FIDIC Africa Conference - ACET Photographers CHAIRPERSON'S MESSAGE



promote

SUSTAINABLE INFRASTRUCTURE DEVELOPMENT

Zambia like many other African nations is facing the brunt of climate change impacts, including water scarcity, decreased agricultural yields, decreased power generation due to low water levels, and slower economic growth. It has become evident that in the face of a changing and uncertain climate future, infrastructure investments must be resilient to both current and future climatic conditions, provide essential services, and offer a return on investment. Therefore, integrating climate resilience into these infrastructure projects is crucial for to build resilience and Zambia protect the substantial resources needed to bridge the significant infrastructure gaps.

One of the unique challenges is the higher financing cost for infrastructure projects in Africa as compared to similar initiatives in developed markets. This cost disparity is primarily driven by perceived risks in areas such as economic instability, creditworthiness, and weak institutional frameworks. The Zambian Construction industry has seen new infrastructure projects being undertaken using the Public Private Partnership model with the aim of leveraging private sector efficiency and innovation while delivering public services and infrastructure that are critical to the country's growth.

Young professionals are essential drivers of infrastructure projects and thus it is therefore imperative that the future leaders' voices are heard in the industry. The ACEZ future leaders' group is a platform brings together engineering that professionals under the age of 40 working for ACEZ member firms to participate actively in the FIDIC regional and global community. Our quarterly Newsletter aims to make contributions and share innovative viewpoints to promote new. the development of infrastructure.

Frank Mwangilwa

ACEZ Future Leaders Group Chairperson

Engineering, Entrepreneurship & Beyond

MEET OUR PATRON

Moses Chulu

CIVIL ENGINEER MANAGING PARTNER, DESIGN LINKS ENGINEERING

Specialty in Consulting Engineering and other life activities

I am Moses Chulu, a Civil engineer trained at the Copperbelt university, with a major in structural engineering. I am very passionate about Engineers taking a lead role in entrepreneurship and in transforming our Zambia, nation, through enterprise. Currently, I serve as the Managing Partner of Design Links Engineering, an engineering consultancy firm mostly offering structural and civil consultancy services, and the CEO of Clean Power Solutions, a renewable energy business. Additionally, I am a farmer, actively pursuing this on a farm that is now my home in Chongwe and I am passionate about the environment. enjoy entrepreneurship and have an enthusiasm for leadership and people - development.

Journey to Becoming a Full ACEZ Member

My journey to becoming a full member of the Association of Consulting Engineers of Zambia (ACEZ) began during my university years. Influenced by colleagues who transitioned into consultancy from university, I was drawn to design and structural analysis. I however Initially started work in various construction companies where I believe I gained invaluable site experience before moving on to consultancy. My first consultancy role at Civilstruts Consulting Engineers was pivotal, providing fast-paced growth and opportunities to work on complex projects like the Ndola Energy Power Plant where I worked as a resident engineer. In 2015, I applied to join ACEZ as a full member but my qualifications were not satisfactory. I was offered Associate Membership as an alternative, which offered me the opportunity to be mentored by seasoned professionals, and continued to grow my expertise in this sector.

By 2023, I qualified for full membership and after being encouraged by some colleagues in the Association, I stood and was elected as an ACEZ Council Member. This eventually led to my appointment as a Patron for the Future Leaders Group. This role allows me to interact with younger engineering professionals, something that I am also passionate about.

Navigating the Industry with Diverse Expertise

My philosophy in consultancy has always been one of diversification and proactive problem-solving to navigate the volatile consultancy industry, particularly given that activity in the industry is largely tied to government spending and private sector growth. For example, after recognizing the power challenges that the country was experiencing in the first cycle of load shedding the country experienced in 2015, I founded Clean Power Solutions, a renewable energy company, to participate in addressing Zambia's energy needs during that significant load shedding period. Additionally, as a family we shifted our attention to farming, particularly when we realized that among, the few sectors that remained active in providing income during the Covid 19 pandemic were the food and agricultural sectors. I hold deep convictions in the agricultural sector's potential to elevate Zambia to a middleincome nation, and I have since intensified this commitment by moving our family to a farm in outer city Lusaka to enhance our crop production and raring of livestock.

my steadfast passion for growth and understanding of the importance of this balance helps me keep working towards my goals and life ambitions

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I also believe in continuous professional development and a growing, evolving career. Besides qualifying as a Project Management Professional under the Project Management Institute, one of my short-term goals is to become an arbitrator, as law was also one of my early passions besides engineering. To lay the foundation for my arbitration aspirations, I am currently pursuing a Bachelor of Law at the University of Lusaka, and I am in my final year. Whenever asked why I didn't just take the short cut of doing the fewer arbitration courses for purposes of certification as an arbitrator, my answer is that when I pursue a goal, I want to pursue it without any reservations and I felt that a full understanding of the law would enhance my arbitration career when it kicks off. Balancing work, school, entrepreneurship, and family, among other responsibilities, has not been without its challenges and it is a continuous stretch. I have had my own failures like having to defer exams due to work commitments. However, my steadfast passion for growth and understanding of the importance of this balance helps me keep working towards my goals and life ambitions.

Advice to Future Leaders

In the long run, I intend to contribute significantly to the engineering and renewable energy sectors while also impacting future generations of engineers. I aspire to be an example and inspiration to young Zambians, encouraging us to take ownership of our challenges and actively participate in resolving them rather than just complaining or protesting and looking to the government or outside sources for solutions. By God's grace I hope to retire a farmer and live out the rest of life enjoying the nature at our farm while contributing to our nation's food security.

MAY - JUNE 2024

ACEZ FL NEWSLETTER



FUTURE LEADERS COUNCIL 2024 /2025



Pauline Phiri Immediate Past Chairperson

I have a passion for research in engineering skills development and the capacity building of young engineers.

I am passionate about infrastructure design and project management. I enjoy being part of projects that solve community needs and improve the lives of the end users.



Collins Sichali

I am a firm believer that the current generation of young people in engineering fields, given the right opportunity and mentorship, can act as a bridge in the consulting engineering field.



Harold Chibwe



Malita T. Sichone

I am passionate about building services and energy in general but with advances in technology taking place rapidly in this sector, I find design and setting to work on smart buildings especially exciting.



Frank Mwangilwa Chair Person

I am passionate about leveraging my technical skills and knowledge to take on new challenging infrastructure projects.



Misheck Daka

I am committed to professional excellence in project delivery and enthusiastic about engineering developmental initiatives regardless of the specific engineering discipline.

I am dedicated to green and sustainable design driven by my commitment to create environmentally friendly and safe buildings.



Mulenga Sampa

I am passionate about building sustainable infrastructure, with a focus on high-quality dams, hydropower, roads, and buildings that minimize environmental impact.



Thembi Ndhlovu Vice Chair Person

I am passionate about contributing to sustainable infrastructure development in Zambia and enhancing the skills of young engineers



Hannah Nzovu



Engineering allows me to be creative and to think outside the box to solve problems, I extend this diversity to designing structures such as buildings, bridges, dams, water projects and bringing drawings to life.

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International Women in **Engineering Day 2024** Celebrates #INWED24

Engineering the future, one woman at a time **#INWED24 - #EnhancedByEngineering.**











Showcasing young female engineers who are enhancing everyday lives through engineering

The Engineering space continues to widen as more women take up engineering as a career. From the days of shattering glass ceilings and combating gender disparities in the workplace, women are finally developing interest and enthusiasm about embracing career opportunities available in this exciting industry.

Raising the profile of women in engineering, promoting diversity in the workforce and celebrating achievements of omen across the globe, form the essence of the International Women in Engineering Day (INWED) which is celebrated annually. INWED falls on 23rd of June every year, with various themes. This year's global theme was 'Enhanced by Engineering'.

ACEZ joined the rest of the world in honouring the remarkable contributions of women in the engineering community whose achievements remain overlooked. The Association showcased how young female engineers from different engineering disciplines and sectors enhance everyday lives in engineering. The showcase was online on ACEZ social media platforms from 21st – 24th June 2024.



The annual FIDIC Africa Infrastructure Conference took place in Dar Es Salaam, Tanzania at the Julius Nyerere International Conference centre. Scheduled for the 26th to 29th May 2024, the fourday event was set to host local and international delegates with pre-conference activities, a 2-day conference and a day of excursions to view some of Tanzania's best tourist attractions. The Future Leaders (FLs) kickstarted the conversation centred on the theme "Innovations and Infrastructure Development for Sustainable Projects" in their customary Future Leaders Symposium. The FL Symposium is a congress for professionals under the age of 40.

The Future Leaders Symposium

Hosted by Eng. Kutlo Modie from Botswana and Eng. Janeth Kihamba from Tanzania, the FL Symposium attracted 105 participants of which 85 were locals and 20 were international delegates hailing from Ghana, Kenya, Uganda, South Africa and Zambia.

Messages of Support

A welcoming message of support was given by the Association of Consulting Engineers Tanzania (ACET) President Eng. Chedi Masambaji. This opened the door for more messages of support from Eng. Abe Thela, the Immediate Past President of FIDIC Africa and Eng. Martina Hess, a FIDIC Board Member. Representing the FIDIC Africa FL Council, Vice Chairperson Eng. Pauline Phiri from Zambia addressed the FLs by encouraging them to take on leadership roles and to be active agents of change.



Keynote Address by the newly elected president of FIDIC Africa, Eng. Rizwan Qadri

Following the salutations, a keynote address was delivered by newly elected FIDIC Africa President, Eng. Sayed Rizwan Qadri, who highlighted key areas of focus that should influence sustainability for Africa such as renewable energy infrastructure, smart grids, sustainable transportation, green building and construction, water management, waste management, digital infrastructure, sustainable agriculture as well as financing sustainable infrastructure. He also emphasized on the importance of involving young professionals in infrastructure projects and conferences.

Presentation on FIDIC Africa FL Group

Aimed at promoting growth and membership of the FIDIC Africa FL Group, Eng Kutlo Modie, made a presentation about the FL Council by highlighting its objectives and how to formulate a local FL group. This led to Tanzania forming an initial steering committee to jump-start a local FL group. This was a pinnacle moment at the symposium.

Panel Discussion: Innovations and Trends in Infrastructure Development

The Symposium progressed by setting the scene of the conference theme by way of a panel discussion on "Innovations and Trends in Infrastructure Development". This session was moderated by Eng. Pauline Phiri who led a panel of FLs namely; Eng. Charles Frank (Tanzania), Eng. Uzair Osman (South Africa), Eng. Joseph Timbe (Uganda), Eng. Harold Chibwe (Zambia), Eng. Brenda Pauline Mloka (Tanzania) and Eng. Jean Baptista Nyaku (Ghana).

The discussion dissected some key areas:

- Building resilience to climate-related disasters;
- Bridging Africa's large technological uptake and innovation gap;
- Promoting urban resilience and resource efficiency;
- How advancement in connectivity, advanced analytics, automation, and advanced-manufacturing technologies have affected innovation in the infrastructure space;
- Emerging funding models and financial innovations;
- Effective collaboration between public and private sectors across Africa.



Panellists highlighted environmentally responsible and human-centered design, including new technology that creates a digital twin of existing structures for monitoring and modelling. Notably, Africa was mentioned to have a large technology uptake gap and as such there was a need to keep abreast with emerging technology and to adopt it in infrastructure development. They collectively discussed the need to create solutions that are relevant to today's challenges in the African context by taking environmental, social, technological and financial aspects into consideration. Ultimately, it was emphasised that young Engineers should have a seat at the decision-making table to influence policies by taking on leadership roles.

Interactive Workshop Session

The FL Symposium closed off with an interactive session which was facilitated by Design Firm Seminar, a company that focuses on helping professionals to grow, thrive, manage and deliver quality service. The moderators of this session were Eng. Jeshika Moonsamy and Eng. Michael Walker who are also Lead Trainers for newly launched FIDIC Africa Future Leaders Management and Development Programme.

The session was conducted in two parts:

Part one imparted knowledge on career advancement strategies and personal branding in consultancy. The desired outcome was for FLs to apply personal branding in their careers through networking, reflective practices and showcasing their expertise.

Part two involved a practical exercise to develop sustainable solutions to real-world infrastructure challenges in Africa. The identified challenges were access to clean water and sanitation, transportation and connectivity, and energy access and reliability. The FLs formed groups to brainstorm, proposed solutions and presented them to fellow symposium attendees. This brought an insightful, interactive day to a close.





• • • Key Lesson learnt

Efforts should be made to capacitate Future Leaders, enabling them to take on more active roles in the global engineering landscape.

• • • Highlight of the Day

Tanzania FLs formed an initial steering committee for their FL group. The initial steering committee will be headed by Eng. Charles Frank.



The Main Conference



Over 600 delegates from across Africa, including participants from Canada, Spain, Portugal and the United Kingdom gathered to address the growing need for sustainable infrastructure solutions across Africa. ACET hosted the forum for consulting engineers and a plethora of professionals ranging from public officials of government: Central, Local, State - owned entities to funding agencies, contractors, suppliers of construction equipment and materials, investors and stakeholders in the built environment from the public and private sectors.

The Guest of Honour was the Vice President of the United Republic of Tanzania, Honourable Philip Isdor Mpango who emphasised on the importance of engineers providing solutions for the challenges faced today. A keynote address was delivered by Prof. PLO Lumumba in which he he challenged Africa to be the fuel that catalyses sustainable development through research and development.



Four sub- themes were deliberated on in order to further explore the theme, and to discuss how innovation can drive the creation of infrastructure projects that are environmentally friendly, economically viable, and socially beneficial. Some of the key takeaways were:



Circular Economy Influencing a Cross-sectoral Approach for Viable Development:

- Regenerative design in which we reduce, reuse, recycle and recover resources can conserve resources, support productivity and environmental health as well as address global challenges of climate change and food security.
- Community engagement is vital in planning and implementing circular economy strategies
- Circular economy principles should be integrated into sustainable development planning and policies.
- Engineers are urged to become more involved in local projects, with an emphasis on increased participation from Future Leaders.

) Green Energy and Eco-friendly advancements

- Advocate for projects that are human-centric and work with the environment, to save the environment by utilizing innovative natural materials for construction to achieve sustainable development.
- Promote sustainable water resource management by better water management and efficient water use.
- Use more nature friendly materials

Building Smart Infrastructure through Digitalization:

- Embrace digital technologies by having an open-minded approach to their adoption and use for the enhancement of FIDIC contract applications.
- Consultants should embrace the use of FIDIC contracts in a positive manner to ensure better project delivery and outcomes.
- New technology should be viewed as an enhancement to existing implementation methods, and Africa should thus foster a positive attitude towards digitalization.
- Empower engineers with the skills and resources necessary to participate in and contribute to mega projects

Linfrastructure Investment and Financing:

- Adopt more innovative, sustainable financial models away from the traditional debt financing as a continent.
- Diversify our revenue sources by transitioning from extracting and exporting raw minerals and materials, to processing them for value addition.
- Africa should promote the increased use of the Public-Private Partnership (PPP) model to support infrastructure development. Competitive PPP frameworks increase clarity of roles of involved parties, have attractive investment incentives and more flexible provisions for strategic projects.
- Implement robust measures to curb corruption within the industry, beginning with inculcating ethics and integrity in future leaders. This fosters a culture of transparency and accountability.



The Social Scene

Welcome Reception

After a long day of discussions and reflections, the festivities began at Four Points by Sheraton Hotel. A welcoming night of appreciation filled with laughter, coupled with scrumptious food and signature drinks set the conference social scene in motion. As per tradition in celebratory occasions, a small cake cutting ceremony took place which was followed by networking, eating and swaying the night away.



🔴 🌒 🔴 Gala Dinner

Conference day one transitioned to an elegant night of fine dining and soothing sounds at the Dar Es Salaam Serena Hotel for the Gala Dinner. The night sky glistened in the fairy lit garden set up, creating a relaxing ambience. In the spirit of gratitude, awards were given to sponsors, organisers and FIDIC Africa past presidents. Zambia's Eng. Levi Zulu was presented with an award of service which was received by Eng. Patrick Kampengele.



The Culture

Local Colour night

Tanzania's culture stood out through performance, local cuisine and music at the Local Colour night which closed out Conference day two at The Dome. Afrocentric décor depicting the essence of Tanzania created a sense of familiarity and comfort, reminding all, that Africa is rich in culture and heritage. Awards were also presented to FIDIC Africa Executive Committee Members including Zambia's Eng. Patrick Kampengele It was a night in which all cultures of countries present, were embraced, from the language and the traditional attires, to the music and dance.



As FLs, attending conferences is important for personal and professional development. They are the best chance to travel, connect with new people, and have a great time learning new things. FIDIC Africa Conferences are hosted in different locations across Africa and each event brings a unique flair. FLs should seize the opportunity to experience these events to showcase their expertise on an international scale.



We are in an era where environmental protection is key to securing funding for construction projects, and a fundamental component of what regulators look for when granting development permits. It is therefore critical for engineers when tasked with work that involves developing areas that are ecologically sensitive, to take this into consideration and to provide solutions that will mitigate some of the adverse impacts of their work.

Lusaka South Multi Facility Economic Zone (LSMFEZ) sits in an area that was degazetted from forest 26 (JICA, 2009). This area is known to be of importance to Lusaka city's groundwater renewal. Being the highest point of the Lusaka dolomite aquifer system Karen et al., (2019), this area also has one of the city's highest annual natural groundwater recharge rates of over 350 mm (Baumle et al., 2012).



Figure 1: Hydrogeology, groundwater flow directions and monitoring network of Lusaka with location of LSMFEZ (Karen et al., 2019).

It can be clearly seen that the various development taking place at LSMFEZ is altering land use from mainly forest and scrubland to industrial which inevitably alters the natural infiltration processes, thus making it necessary to invest in interventions that can help mitigate these adverse effects brought about by development. I have been part of a team working at a named beverage factory for the past six years which has transformed a 75-acre bare lot of land in LSMFEZ into 140671.736 square meters of roofs, roads and carparks which equates to 35 acres of developed land. As earlier pointed out this has taken away areas of natural recharge and left impervious surfaces that are runoff generating. The topography of the land also poses a challenge on drainage as the site has its lowest point in the middle of the development. This has made channelling water to the existing municipal drains not economically viable, as it requires either elevating the site with fill or mechanical pumping of runoff to the drains.



TYPICAL SECTION THROUGH INFILTRATION DRAIN SCALE 1:25

Figure 2: Typical cross section of infiltration drain system implemented



Figure 3: Showing excavation of infiltration drain system with geotextile layer.at the base.



Figure 4: Infiltration drain system with rock fill layer before completion.



Figure 5: Complete Infiltration drain system with final rock fill layer complete.

To manage runoff on this site, an intervention was proposed which would utilise an infiltration drainage system that was going to promote fast and efficient drainage of runoff into the subsurface. This was chosen for various reasons, chief among them was to enable artificial recharge of groundwater to reduce the ecological impacts of the development. The other advantage of choosing an infiltration drain system on this site was that the physical conditions of the soil proved suitable after percolation tests showed drainage rates greater than 0.324 litres per minute.

The subsurface geology is mostly composed of karst features with soils that can be described as coarse-grained silty sands with gravels or sandy clays with gravel in some areas covering a depth range of 1-7 metres. This was determined after particle analysis was done on samples collected from borehole logs along the area earmarked for the installation of the infiltration drainage system.

The design criteria of the infiltration drainage system was based on a 1:25 year return period for a storm of 1 hour intensity. The water balance equation to determine drain size, volume and storage equated (Inflow - Outflow = Storage Volume), of which: I = the inflow from the impermeable area drained to the infiltration drain; O = the outflow infiltrating into the soil during rainfall; S = the required storage in the infiltration drain to balance temporarily inflow and outflow. It is worth noting that outflow from the infiltration drain was calculated at fifty percent of the effective depth to allow for a safety factor that took care of long-term clogging caused particle migration and the fine soil bv heterogeneity along the drainage

The infiltration drainage system has been in use since 2021 and from observations it has dealt with seasonal runoff effectively. The estimated groundwater renewal artificially recharged the past three seasons has been estimated to be more than 250,000 cubic meters (taking Lusaka average rainfall of 800 mm/year).

The example highlighted is a simple but effective intervention implemented at a project site that has netted significant positive environmental benefits for a critical area for the cities water security. Such interventions should be the norm and engineers need to be deliberate in their designs to include solutions that will be beneficial to the environment.

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- 2.JICA (2009). The study on master plan of Lusaka South Multi-Facility Economic Zone. Karen, M., Godau, T., Petulo, P. and Lungomesha, S., 2019. Investigation of groundwater vulnerability and contamination in Lusaka as possible factors in the 2017/18 cholera epidemic (No. 1). GeoSFF Technical Report.



ACEZ FL NEWSLETTER

Local





ADMIT ONE

ACEZ Consulting Engineering Business Seminar for Future Leaders

Venue: The Urban Hotel, Lusaka Discussion Topics:

1. The Consulting Firm as a Business

- 2. Forming Strategic Partnerships and Collaborations
- 3. Legal Matters and Ethical Considerations in Consultancy
- 4. Environmental Social Governance (ESG) in the Built Environment

14-16 AUGUST

Energy Forum For Africa (EFFA) Conference 2024

Venue: Mulungushi International Conference Centre, Lusaka Zambia

Theme: Investment Opportunities in the Energy Sector in Zambia and Africa.

Join experts, thought leaders, and practitioners in the energy sector to explore the challenges and opportunities in driving Africa's energy transition.

For more information: https://www.energyforumforafrica.com/





Venue: Radisson Blu Mosi-oa-Tunya Resort in Livingtsone, Zambia

Theme: Paving the Path to a Dispute-Free Infrastructure Project

Join the Dispute Resolution Board Foundation for sessions on the fundamentals of Dispute Board practice and practical application in Zambia, Africa, and the world.

For more information:

https://www.drb.org/southern-africa-regional-conferencezambia-28-30-august



ACEZ FL NEWSLETTER







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b AUGUST



Hoternational FIDIC Africa Future Leaders (FAFL) Programme

Venue: Online

This programme will kick off on 23rd July 2024, the first of its kind, online, available anytime, with access to specific modules which form part of the complete programme. Take advantage of the current offer to Member Associations to register 4 participants for the price of 3! Offer valid until 22 July 2024.

For more information: Scan the barcode

Call for Applications: Join the FIDIC Africa FL Committee!

FIDIC Africa Future Leaders Committee is seeking passionate and dedicated individuals to fill vacant positions in the following working committees:

- 1. Growth and Membership
- 2. Integrity, Quality, Risk, and Standards
- 3. Business Development
- 4. Capacity Building

Must be under 40 years old and working for a company that is part of a FIDIC Africa Member Association

Submit applications to: (ktlmodie@gmail.com) and/or (michellesekgopa@gmail.com)

2024 FIDIC Global Infrastructure

8-10 SEPTEMBER



Venue: President Wilson Hotel, Geneva

Conference

Theme: Transforming lives with infrastructure - Investing in and building a better world for all

This conference will highlight the central importance of good, sustainable, ethical and efficient infrastructure investment in improving and enhancing both the global environment that we all depend on and also the living standards and economic prospects of citizens around the world.

For more information: https://events.fidic.org/fidicgic24

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