



# Engineering

in KENYA

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# Engineering the Future



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# Call for Papers

## Engineering in Kenya Magazine - Issue 010

The Institution of Engineers of Kenya (IEK) publishes Engineering in Kenya magazine, whose target audience includes engineering professionals, practitioners, policy makers, researchers, educators and other stakeholders in engineering and related fields. The publication is distributed to its target readers free of charge through hard and soft copies.

IEK invites you to contribute articles for our next and future editions. Articles should reach the Editor not later than October 30, 2022, for our next issue, whose theme shall be "Aerospace and Aviation Engineering" and related sub-themes, across all engineering disciplines. An article can range from engineering projects to processes, machinery, management, innovation, news and academic research.

The articles must be well researched and written, to appeal to our high-end readers in Kenya and beyond. The IEK Editorial Board reserves the right to edit and publish all articles submitted, in line with standing editorial policy. All articles should be in Word document format, 500-700 words, font type Times New Roman and font size 12.

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ENG. PROF. LAWRENCE GUMBE

# Engineering The Future



WE URGE OUR NEW GOVERNMENT TO DIALOGUE WITH ENGINEERS ON THE FUTURE OF INDUSTRIALISING OUR AGRICULTURE AND PROTECTING OUR ENVIRONMENT.



WE congratulate HE Dr William Samoei Ruto on winning the 2022 presidential election in Kenya. President William Ruto will now serve as head of state for the next five years. Five very significant years in our history as citizens and engineers.

The noble profession of engineering is responsible for the creation, improvement and protection of the environment, providing facilities for living, industry and transportation, including large buildings, roads, bridges, canals and railways, water supply systems, dams, irrigation, harbours, docks, aqueducts, tunnels and other infrastructure and systems.

The new government of Kenya has the opportunity to re-engineer the national economy for the benefit of the nation. This can enable the political economy to tackle challenges such as unemployment, poverty, security, inadequate access to quality food, housing and sanitation, education and healthcare.

National planning is key to development. Engineers are uniquely qualified to lead the national planning process because their education and training enables them to visualize complex systems, breakdown the same into components and re-integrate the same into a judicious whole. Kenya has a national government and 47 county governments. All the 48 governments have a planning role. We are, therefore, urging the national and county governments to involve

engineers in their planning roles. An engineer as the Cabinet Secretary for planning would be ideal! Engineers as County Executive Committee Members in charge of planning would also be ideal!

Engineering educators, researchers and practitioners respond to needs in history and geography to develop systems which advance human civilisation. We are glad to note that there has been fruitful dialogue between the Commission for University Education (CUE), Engineers Board of Kenya (EBK), the Institution of Engineers of Kenya (IEK) and universities to solve the recent difficulties on the recognition and accreditation of university courses. Our new government should lead dialogue so that statutory entities may exist harmoniously. This may need review of legislation and administration instruments.

Engineering research is key to our industrialisation and achievement of Vision 2030 and the Africa Union's Agenda 2063. We urge our new government to move fast to implement funding of the research at the level of the Science Technology and Innovation Act. The government should thereafter give priority to engineering research funding.

A few years ago country comparison of the number of persons served by an engineer were, in part, as follows: Kenya, 6,300; South Africa, 3,166; Korea, 285; UK, 311; Brazil, 227; and China, 130. We see from the figures that the

level of industrialisation, economic development and affluence have a direct relationship to the quantity of engineers in a country. Hence Kenya must strive to expeditiously increase its quantity and quality engineers.

The number of graduates of engineering programmes has increased. As discussed above, the number should actually increase rapidly in the near future. The process of licensing, registration, of engineers should also be modernised and streamlined so that the pending and future candidates are processed efficiently and effectively. Again, we may learn from other countries such as the USA.

We are happy to note that the scale of fees for engineers was recently operationalized by the government. This is good for the profession. Medical doctors, and others, who are in the public service are paid non practice. Engineers are not paid this allowance. We urge the new government to pay non practice allowance to engineers in the public service.

Work in the factory, farm, office, hospital or transport system is dependent on access to reliable and affordable energy, especially electricity. An analysis of the national energy shows heavy dependency on petroleum 22%, electricity 9%, others account for 1%. Electricity access in Kenya is low despite the government's ambitious target to increase electricity connectivity to at least 65% by the end of the year 2022.

To achieve Vision 2030, the country's electricity generation, transmission and distribution needs to be developed in order to attain a consumption rate of 3,000 kWh/capita from the current level of about 164 kWh/capita.

We must be ambitious and innovative in developing our energy sector in Kenya. This sector is a necessary condition for our industrialisation, economic security and transformation. We urge the new government to give energy the necessary priority.

Engineering inputs in agriculture are effected through agricultural mechanisation.

Agricultural mechanisation aims at increasing the power inputs to farming activities hence intensified production and enhanced value addition resulting to decreased cost of production and reduction of drudgery in farming activities.

The degradation of the environment during production is a serious challenge in modern times. Climate change and its adverse effect can be directly attributed to lack of respect for prudent environmental management through responsible production in agriculture, extractive industries, transport and manufacturing.

We urge our new government to dialogue with engineers on the future of industrialising our agriculture and protecting our environment.

Roads have contributed immensely to economic development and growth in the modern world. They have brought important social benefits to society. They are of vital importance in order to make a nation grow and develop. In addition, roads provide access to employment, social, health and education. Therefore, the road network is crucial in fighting against poverty. Structured dialogue between our government and engineers should continue so as to advance this crucial sector.

The Covid-19 pandemic has demonstrated the importance of information and telecommunication engineering to the world. In education, universities and schools were variously forced to discontinue physical instruction and revert to virtual learning which could not have been possible without information and communication engineering, ITE.

The primary actors in the ITE sector are engineers. Engineers are playing a leading role and will continue. The new government should engage the engineering community in order to develop this crucial sector.

Historically, the manufacturing sector has played an important role

in driving economic development by stimulating and sustaining high productive growth, boosting employment opportunities for semi-skilled labour and building country competitiveness through exports. The path to industrialisation, economic transformation and increased human welfare has been through an enhanced manufacturing sector. Engineers play a lead role in manufacturing. Engineers are available for dialogue with the new government on the development of manufacturing in Kenya.

Biomedical engineering is the application of the science and art of engineering to the planning, design and management of systems for health care of human beings. It combines expertise in engineering with expertise in medicine and human biology to develop technologies and techniques for healthcare and patient care. This field includes: Biotechnology; Health Care Systems; Amenity; Human Biology; Pharmaceutical industries; and The Environment.

Kenya must hasten its capacity to address disease from the perspectives of prevention, diagnosis and treatment. This implies the capacity to develop environmental and public health systems and hospital. Also crucial are the development of capacity in research and human resource development through education and training. The building of hospitals and manufacture, installation, operation and maintenance of equipment and machinery for disease diagnosis and treatment need the participation of engineers.

Engineers are excited and expectant that we can all enter a new dawn with our new government. Through the leadership of the Institution of Engineers of Kenya, we are ready to dialogue and participate effectively in national development in the government of HE Dr William Samoei Ruto.

**Eng Prof Lawrence Gumbo**  
**Editor**





ENG. ERIC OHAGA

## The Strides we have Made

fraternity in Kenya, to sincerely thank the Chairman, Engineers Board of Kenya (EBK), Eng. Erastus Mwongera, EBS, together with his team in spearheading the exercise and the process that has made this dream for many engineers, a reality.

The Council has taken matters legislation and regulation with vigor. Among the legislations that we have voiced our input include; National Building codes, NEMA levy Reinstatement notice, Kenya Roads Board amendment bill, just to mention but a few.

I am glad to report that we have achieved additional 351 engineers being registered as members of the institution. Out of this, 55 are in the student category, 175 in the graduate category, 118 in the Corporate Member category and 3 being bestowed upon the honors of fellow of the Institution of Engineers of Kenya.

The Council has approved and established a structured mentorship framework that will be oversighted by a Mentorship Board; established a Benevolent Fund for the engineering fraternity and acquired the Mhandisi Sacco that will now be domiciled within the secretariat to serve the members. The Mentorship Board will comprise of as part of its membership, the Chairs of the various Panel disciplines from the Professional Review Board.

### IEK Members Welfare

The Benevolent Fund initiative was passed in a Special General Meeting of 2015 and was to be operationalized the following year 2016. I am glad to announce that we have launched the Benevolent Fund and will be operationalized immediately.

The idea of having a cooperative society that would give engineers an opportunity to save and obtain affordable credit facilities to enable them achieve their socio-economic goals was mooted way back in the year 2013. This was by a group of experienced and qualified engineers

from a variety of disciplines.

The Council this year engaged in discussions with the directors of Mhandisi SACCO and arrived at a Memorandum of Understanding (MOU). We have since witnessed execution of documents between the directors of Mhandisi SACCO and the IEK. I encourage all the members of IEK to consider becoming members of the SACCO.

On Policy, Research and Advocacy-Engineers, The Council has been hard at work on various advocacy issues. Key among them has been the Kenya Roads Board Amendment Bill early this year where the PRAC committee met with the Transport Committee of the National Assembly and presented our views. We are also following up the NEMA reinstatement of Environmental Impact Assessment & Related Fees. PRAC committee members in addition presented the 2021 Infrastructure Report Card at the Engineers Partnerships Convention (EPC), which was organized by the Engineers Board of Kenya.

### IEK Mashinani & Outreach

On the Outreach front, we have launched an additional branch, the IEK North Rift Branch, which joins the ranks of other branches that have already been established: IEK South Rift, IEK Western, IEK Coast, IEK North Eastern, IEK Central and IEK Capital branches.

### The 29<sup>th</sup> IEK Annual Convention

This year, we are moving away from what has been our tradition of holding annual conferences. Commencing this year, the Council has re-defined this yearly event into a Convention. This year, therefore, we shall be hosting the 29<sup>th</sup> Annual IEK International Convention which will run through the period of dates of 21<sup>st</sup> to 25<sup>th</sup> November 2022. Planning and arrangements for the same are underway and I urge all of us to endeavor to participate in this event which is meant for each one of us.

**T**HE past few months of my leadership as your President have been largely busy, but very productive. The Council spent the initial four weeks constituting various committees through which it was going to deliver its agenda. I am happy to say that eleven (11) committees and fourteen (14) sub-committees have since been constituted and the relevant activities under each committee's mandate are active. The work plans for the committees have been signed off by the Council and colleagues working through the committees are now busy at work.

### Strides Made in First 120 days in Office

In Legislation and regulation, this year marks a historical moment for the engineering fraternity in Kenya. It's a year in which we witnessed the commissioning of the Engineers [Scale of Fees for Professional Engineering Services] rules 2021. Indeed, it has been a long wait but it has been worth the patience.

For the first time, engineers offering professional engineering services have a common scale of fees reference which is anchored in law. The framework will, in addition, safeguard the quality of value proposition being presented to the users of professional engineering services.

I take this opportunity, on behalf of the Institution of Engineers of Kenya (IEK), and the entire engineering



ENG. SHAMMAH KITEME

## Message from IEK Honorary Secretary

As we put out the 9<sup>th</sup> Edition of the Engineering in Kenya magazine, I would like to appreciate the continued commitment our members have to the growth of the institution. Thank you for your support without which all these achievements would not have been possible. I would also wish to congratulate you all for the successful and peaceful elections that was carried out recently. We pray for a prosperous future for our country, Kenya.



In this edition, we explore the Engineer's agenda for the new government. We include our manifesto to the new president and his government and we hope that we will be able to work closely with him.



We celebrate the great achievement of the commissioning of the Engineers scale of fees recently. As IEK, we have continually pushed for the development and review of an Engineer's scheme of service that allows for flexibility in changes of salaries and allowances for our members in the civil service. We need to have a regular review of these policies to ensure that changes which are introduced in the grading structures through government documents are simultaneously incorporated in the respective Schemes of Service. Engineers holding government positions deserve a non-practicing allowance (NPA) in exchange for not earning additional money by working as consultants, just as doctors and other professionals in the civil service. We currently do not have any policies to this effect.

Graduate engineers still struggle to get employment in Kenya even though there is

a scarcity of engineers. Over 2000 student engineers graduate each year, while there is need for 20,000 more credentialed engineers than we currently have.

We want to urge the government and other interested parties to prioritize funding for manufacturing, research, road building, and other industries where our graduate engineers can find employment right away after completion of their university studies. To improve the odds of local graduates finding employment, we must regain the confidence of international investors in their education.

The exclusion of local content in the delivery of our infrastructure projects is another glaring issue facing engineers in Kenya today. Local expertise and economic growth go hand in hand since enlisting more local engineers in huge infrastructural projects which are normally done by foreign companies, will significantly boost the economy of a nation by creating jobs, lowering project costs, and advancing knowledge and technology through knowledge transfer. Procurement laws should be amended to readily achieve this because, as things are, the procurement for infrastructural projects does nothing to aid domestic consultants, contractors, suppliers, and manufacturers in the nation.

These past few months have been quite eventful and pivotal in the history of the institution. We launched the IEK North Rift branch which is expected to serve Elgeyo/ Marakwet, Nandi, Trans Nzoia, Turkana, Uasin Gishu and West Pokot counties. We also launched the IEK Benevolent Fund and the Mhandisi Sacco officially on 29<sup>th</sup> July 2022 during the 2<sup>nd</sup> Presidents Dinner. The Benevolent Fund was set up to cushion members during times of bereavement while the Sacco which has been in existence for a while now, was fully adopted by IEK to provide our members with a facility for financial development and investment.

Enjoy your read!





# 1972 – 2022

## THIS YEAR, IEK CELEBRATES



The East African Association of Engineers (EAAE), which was the precursor to the Institution of Engineers of the Kenya (IEK), was formed in 1945 as a professional and learned body, independent of control by governments and with membership spread in the original East Africa i.e. Kenya, Uganda, and Tanzania (Tanganyika and Zanzibar). The break up of the East African Community in the early 1970's resulted in the splitting of most of the professional/learned bodies, among them the EAAE. IEK was born out of this split. IEK was registered as a professional/learned and independent body in 1972.





# Congratulations

The Council, management and staff of the Institution of Engineers of Kenya, would like to congratulate his **Excellency President Elect Dr. William Samoei Ruto, EGH** on his successful election as the 5th President of the Republic of Kenya.

As the institution mandated with the promotion and development of the Engineering profession in the country, we wish to express our ultimate support and confidence in your commitment to steer the development agenda for this great Nation. We also wish to congratulate the people of Kenya, the IEBC and the judicial system in ensuring that the election process was peaceful, credible, free and fair.

May the Almighty God Grant you wisdom and good health to serve this country.  
**Hongera Bwana Rais!**

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## OUR VISION

**Engineering a sustainable world**





# Institution of Engineers of Kenya

## MEMORANDUM TO HE PRESIDENT

### WILLIAM SAMOEI RUTO



#### 1. Engineering in Kenya

The modern world has been an engineering project. The structures, machines, processes, and organization, which have led to increased affluence, life expectancy, comfort and enlightenment are all due to engineering efforts. Kenya's Vision 2030 aims to transform the country into a newly industrialized, middle income economy, providing a high quality of life to all her citizens by 2030. This vision is largely an engineering one. The country has faced many problems in the last decade which urgently need intervention. Engineering

in Kenya is uniquely qualified to help midwife these myriad challenges and deliver lasting solutions.

##### 1.1 The Institution of Engineers of Kenya

The Institution of Engineers of Kenya (IEK) is the learned society of the engineering profession and co-operates with national and other international institutions in developing and applying engineering to the benefit of humanity. It was established to promote the general advancement of the science and practice of Engineering and to facilitate the exchange of information and ideas on those subjects amongst members.

#### 2. The focus for the next government

The national focus must now shift to the productive sectors. These include Agriculture, Manufacturing, Mining, Assembly. Sufficient national budget should be allocated to these productive sectors that create jobs and not just the service sector that largely should serve a robust productive sector. In the history of the nations that have developed rapidly there was a meaningful and aggressive investment in productive sectors.

#### 3. Challenges Facing the Engineering Profession in Kenya

##### a. Engineering Education, Training and Licensing

- Kenya should expeditiously educate and train enough engineers so that we attain the requisite international ratio of engineers per capita. Also important is the provision of mandatory 2 - year paid internship for all Engineering students/graduates under the various public and private projects being undertaken to equip them with skills relevant to the job market.
- There is need to harmonize the Engineers Act and Universities Act to ensure that the challenges facing the accreditation of engineering programs are removed. Students graduating from engineering schools should be registrable with EBK as they start their professional journey. This will also ensure that EBK is able to assure the rest of the world that programs being carried out under their watch meet international standards and fast track Kenya's journey towards joining the International Engineering Alliance.
- It is urgent that there is harmonization of the Engineers Act and the Kenya Engineering Technicians and Technologists Act so that there is no conflict and misunderstanding in the society.

##### b. Job opportunities for engineers in the national and county governments and the private sector

- The number of Engineers in the National Government should be optimized so that development work, such as planning, design, and construction supervision, may be undertaken efficiently. There is almost a complete lack of Engineers in county governments.
- Where short term assignments or contracts do not economically justify employment, qualified Kenyan Engineers and Engineering firms should be engaged to oversee Engineering projects and works at all levels of Government

- The 40% local content requirement should be fully implemented. The minimum contract sum that cannot be issued to foreign firms should be reviewed upwards to KES 2 billion. This should include establishing an infrastructure bank to finance local firms to do projects successfully

- All construction projects should be registered with NCA including their nature and cost. All development should be declared to KRA by electronic means.

**c. Remuneration for Engineers;** We call upon the National and County Governments to look into remuneration for Engineers. The current remuneration is not sustainable.

- Proper remuneration will lead to attraction, recruitment and retention of competent engineering personnel in the National and County governments. The Salary and entry level of engineers needs to be improved from Job Group K to L.

**d. Lack of meaningful participation** (conceptualization, prefeasibility study, Feasibility, design) of Kenyan engineers in large infrastructure projects such as SGR, multipurpose dams, and Nairobi Expressway, unlike in Ethiopia and Tanzania where local engineers play prominent roles

**e. Engineers Scale of fees** to be fully implemented and be the point of reference for compensation of Engineers in Public and Private sector. The Engineers Scale of fees should be solely applicable for compensation.

**f. Enhancing local manufacturing** by ensuring that foreign contractors implementing public infrastructure projects buy and use Kenyan products.

**g. The Government should hasten the completion of Nuclear energy construction** and production as well as full exploitation of Geothermal, Solar and Wind potential which would provide reliable, stable, cost effective, and clean source of energy for faster industrial growth.

#### 4. Engineering Research and Development

Enhanced financial support towards engineering innovation and research especially with the objective of decarbonizing the country to achieve net zero by 2050.

#### 5. Industrialization

As the government continues to implement infrastructure development program, there is need for leveraging and making it pay by promoting enhancement of manufacturing and industrial Sectors. Under this, there should be strong county value addition throughout all the counties. Engineers will greatly support this initiative.

#### 6. Way Forward

We propose that the incoming government incorporates a small team of Institution of Engineers of Kenya (IEK) members into the transitional and program implementation team in the new government once elected into office to fasttrack the realisation of these dreams.

#### 7. Commitment

IEK commits to work closely with the next government to ensure that it is led in a way that will advance Engineering in Kenya to ensure sustainable economic growth and development.

Signed

Eng. Erick Ohaga, CE, FIEK  
President  
Institution of Engineers of Kenya

# Commissioning of the Engineers (Scale of Fees for Professional Engineering Services) Rules, 2022



From Left: Prof. Arch. Paul M. Maringa, (PhD), CBS, F.A.A.K, MKIP, the Principal Secretary, State Department of Infrastructure and Eng. Erastus K. Mwongera, CE, FIEK, CBS, Chairman, Engineers Board of Kenya launching the Engineers (Scale of Fees for Professional Engineering Services) Rules, 2022

Engineers Board of Kenya (EBK) is a statutory body established under Section 3(1) of the Engineers Act, 2011. The Board is the successor to the Engineers Registration Board (ERB) established by the Engineers Registration Act, Cap 530 (1969). The Board has the overall mandate of developing and regulating engineering practice in Kenya. The development and regulation of the engineering practice is considered a key component to the achievement of infrastructure foundation under the country's Vision 2030 development blueprint.

Regulation of Engineering Practice is a key contributor to the achievement of the Sustainable Development Goals (SDGs). In this regard, the Board developed the Engineers (Scale of Fees for Professional Engineering Services) Rules, 2022 pursuant to Sections 7 (1)(m), 7 (1)(s) and 58 (d) of the Engineers Act, 2011. The process of development was consultative and inclusive as provided for in the Statutory Instruments, 2013. The Rules were gazetted on 18<sup>th</sup> May, 2022 through Legal Notice No. 20 of 2022.

The official commissioning of the Rules was held on **Tuesday, 19<sup>th</sup> July, 2022 at the Kenyatta International Convention Centre (KICC)**. The jubilation of the launching ceremony was led by

the **Principal Secretary, State Department of Infrastructure, Prof. Arch. Paul M. Maringa, (PhD) CBS, F.A.A.K, MKIP** who was the chief guest.

Other guests in attendance included, Eng. Erick Ohaga, the President of the Institution of Engineers of Kenya, Eng. Wangai Ndirangu, the Chairman, KeNHA, CEOs and DGs from Key Stakeholders, the Taskforce Committee members who developed the draft Rules and the Board led by Eng. Erastus Mwongera, CE, FIEK, CBS. The Board was lauded by different presenters on the successful development of the Rules which is a major milestone in the regulation of the engineering profession and guaranteeing the safety and welfare of the public.



## The Intended Purpose of the Rules is to: -

1

Lay a framework for engineers, for provision of technically feasible, economically viable and sustainable engineering solutions in an ethical and professionally accountable manner while in return receiving reasonable compensation for the professional engineering services, for the safety and welfare of the Public and for posterity.

2

Be used as a guide and to prescribe the minimum fees chargeable by professional engineers for professional engineering services

3

Ensure the provision of quality professional engineering services thereby ensuring the safety and welfare of the public and enhancement of socio-economic development of the Country in the realization of the National Developmental Agenda such as Vision 2030, Africa Agenda63 and the SDGs.

4

Prevent undercutting by and among professional engineers who offer professional engineering services

The Rules were effected from 15th August, 2022 through a Circular from the Principal Secretary, State Department of Infrastructure to all Stakeholders. Therefore, the Scale of Fees therein shall apply in all engagements with Professional Engineers regarding the provision of professional engineering services. A copy of the Rules can be accessed from the Board's website; <https://ebk.go.ke/>.

Further, the Board would like to express immense gratitude to the Principal Secretary, Prof. Arch. Paul M. Maringa, the Ministry and all the stakeholders (Consumers of professional engineering services and the engineers) for their contribution from the development stage to the commissioning and adoption of the Rules, and looks forward for continued partnership to get value for money and quality enhancement. Finally, the Board will conduct a stakeholder sensitization exercise for further clarification in the implementation of the Rules.



From Left: Eng. M. S. Nabende, PE, Director, Kenya Institute of Highways and Building Technology (KIHBT); Eng. Maurice Akech, MBS, Executive Director, National Construction Authority (NCA); Eng. Erastus K. Mwongera, CE, FIEK, CBS, Chairman, Engineers Board of Kenya (EBK); Prof. Arch. Paul M. Maringa, (PhD), CBS, F.A.A.K, MKIP, the Principal Secretary, State Department of Infrastructure; Eng. Margaret N. Ogai, CE, Registrar, EBK; Eng. Wangai Ndirangu, Chairman, Kenya National Highways Authority (KeNHA); Eng. Kungu Ndungu, CE, Director General, KeNHA, and Eng. Lilian Ogombo, PE, CEO Association of Consulting Engineers of Kenya (ACEK) gracing the event.



Engineers Board of Kenya Chairman Eng. Erastus Mwongera, Registrar Eng. Margaret Ogai, WFEO National member & past IEK President Eng. Nathaniel Matalanga & EBK managers attend Conference on Capacity Building in Engineering Education organized by Engineers Council of Zimbabwe in August, 2022.



Board members, consultant and EBK senior management during a 4-day program to review the 2022-2023 Tactical Strategic Plan and Board Policies from 23rd to 26th August 2022, Kwale County.



Engineers Board of Kenya team led by Chairman Eng. Erastus Mwongera (Seventh, left) hosted JKUAT School of Engineering team led by Prof. R. Kingua, Deputy Vice Chancellor, Academic Affairs during a courtesy visit in August 2022.



CEOs & Senior Managers of Engineers Board of Kenya (EBK), The Board of Registration of Architects and Quantity Surveyors of Kenya (BORAQS) met to discuss implementation of MOU to strengthen regulation of the built industry in Kenya. They agreed to develop joint stakeholder engagement program including induction of County governments.



The Board and management of Engineers Board of Kenya interacted with Diani Cerebral Palsy (CP) Group (CBO) in Kwale County. Parents with affected children shared experiences during the CSR program. At least 3 out of 100 live births have Cerebral Palsy in Kenya while 17 million people around the world suffer Cerebral Palsy.



IEK President Eng. Erick Ohaga and Engineers Board of Kenya Chairman Eng. Erastus Mwongera pay a courtesy call on Amb. John Mwangemi, Ag. Managing Director, Kenya Ports Authority in early September 2022. Accompanying him: IEK CEO Eng. Linda Radiro, Chairperson IEK Coast Branch Eng. Mwaka Mungatana, former Chairperson Coast Branch Eng. Zachary Anganya and Anderson Mtalaki, GE.



# The Nairobi Hospital: Providing Quality Healthcare

**Y**OU never go wrong with experience! For 68 years, The Nairobi Hospital has excelled and earned recognition in the provision of quality healthcare in the African region and beyond.

The combination of highly skilled modern medical and non-medical technology has placed the hospital on top in undertaking a wide range of routine and complex medical investigations and procedures including brachytherapy, open heart surgery, kidney transplants, trauma care, orthopedic surgery, neurosurgery, laparoscopic surgery, and cancer therapy among others.

Apart from the main hospital along Argwings Kodhek Road the hospital has six outpatient centers located at Kiambu Mall, Rosslyn Riviera Mall along Limuru Road, Warwick Center in Gigiri, Southfield Mall – Embakasi, Capital Center –Along Mombasa Road, and Galleria Mall – Langata.

The Nairobi Hospital accident and emergency center is conveniently situated next to the main entrance of the Hospital along Argwings Kodhek Road, with close proximity to the laboratory, radiology theatres, labor ward, cardiac catheterization lab and the critical care units. The unit is open 24 hours a day, 7 days a week including public holidays to handle people of all ages presenting with all types of illnesses and injuries.

The doctors and the nursing staff at Accident and Emergency have specialized training in trauma and emergency care, advanced cardiac life support, advanced pediatric life support, emergency triage assessment and treatment of patients, advanced trauma life support and are able to handle any life threatening emergency cases.

The Nairobi Hospital has a network of labs, this includes the Main lab and satellite labs at the Main hospital and at the six Outpatient Centres.

The main lab has different sections of operations such as Biochemistry, Hematology, Microbiology, Histology & Molecular biology.

The Nairobi Hospital is also a center for renal excellence in the country, the region, and beyond. The Renal Unit

provides cutting-edge technology through more than ten continuous dialysis machines in the Intensive Care Unit, Hemoperfusion services, and liver dialysis.

The hospital also has well equipped pharmacies which provide services for both inpatient and outpatient clients ensuring efficient, timely and safe provision of services, providing quality medicine at the best possible prices.

## Anderson Specialty clinics

For specialized treatment Nairobi Hospital has set up the Anderson Specialty clinics.



**The unit operates as a one stop centre, offering specialized diagnostic (Radiological & Laboratory services) and treatment services to patients with diverse needs. There are 34 Specialty clinics managed by a team of experienced staff ranging from consultants as well as nurse led clinics. It also incorporates the Executive wellness clinic that provides individualized care and medical checks ups within an atmosphere of safety and comfort.**

Anderson Specialty Clinics is strategically located on the first Floor in the Anderson building, which makes it easy to access. It operates from Monday to Friday 7am-5pm, and Saturday 8am to 1pm. However, the Laboratory and Pharmacy section operates up to 7pm.

The clinic also has a neurophysiology section that offers diagnostic services for conditions relating to the brain and the nerves. These Include EEG and NCS that is very key to diagnosing brain disorders.

The clinic also has OCT (Optical Coherence Tomograph) machine which

promotes the ophthalmology services, which is a unique service within the region.

The clinic is also a vaccination centre offering diverse vaccines for both routine immunization and travel medicine.

## Physical Medicine Center

The Physical Medicine Center at the Nairobi Hospital comprises Four Multidisciplinary teams namely

- Physiotherapists
- Hydro therapists
- Occupational therapists
- Speech and Language Therapists
- Orthopedic technology.

The Nairobi hospital was the first hospital in Kenya to start a multidisciplinary approach to management as stipulated by World Health Organization (WHO)

The department runs outpatient care and has units in Warwick, Galleria and Kiambu.

The availability of a multi-disciplinary rehabilitation workforce in a health institution helps to ensure that all the rehabilitation needs of the population are met. These needs are diverse, and requires the skills of various, multiple rehabilitation disciplines.

For example, the skills required to rehabilitate an adult with an orthopedic condition differ from those required to rehabilitate a child with cerebral palsy.

As different rehabilitation professionals have different specialties, a multi-disciplinary rehabilitation workforce can significantly improve the quality of care to its population. The benefits of multi-disciplinary rehabilitation are demonstrated in health outcomes and in indicators such as reduced hospital admission rates and greater patient satisfaction.

At the Nairobi Hospital we ensure that Rehabilitation is provided in both hospital and home settings to ensure timely intervention and access to services. We offer services like Homecare to ensure that this happens.



# Engineering The Future

By Eng Prof Lawrence Gumbé

## Introduction

ENGINEERS are responsible for the creation, improvement and protection of the environment, providing facilities for living, industry and transportation, including large buildings, roads, bridges, canals and railways, water supply systems, dams, irrigation, harbours, docks, aqueducts, tunnels and other infrastructure and systems

Kenya has undergone a political transition in 2022. Political transition provides opportunities for re-engineering the national economy for the benefit of the nation. This enables the political economy to tackle challenges such as unemployment,

poverty, inadequate access to quality food, housing and sanitation, education and healthcare. Political transition also provides opportunities for the system to improve the rule of law, enhance international competitiveness and generally improve the material and spiritual welfare of the nation. The last major political transition occurred in Kenya after the 2002 general elections. The new NARC government elected at this time had a bold political manifesto, political vision and commitment to delivering on its political programme.

Within a very short time, the NARC government stabilized the economy. The Kenyan shilling strengthened. The government refrain that there was no money to undertake programmes stopped. Suddenly, government offices had stationery and other supplies. Rehabilitation works was cancelled on infrastructure everywhere. Government started paying engineers and contractors on time. The economy

expanded. We started to experience a shortage of labour where we had had acute unemployment.

The nation thrived during the NARC government, 2002-2007, and the grand coalition government, 2008-2013. Vision 2030, a new bold vision of transforming Kenya into a newly industrialised nation by 2030 was adopted. The number of universities multiplied several fold. The country was largely able to pay for development projects using internally generated funds.

The engineering community has the agenda of transformation of Kenya into a prosperous industrial society. Engineers are excited about working together with the new national and county governments in order to achieve the above transformation.

We discuss opportunities and possibilities of a re-engineered Kenya in the following sections of this article.

## Re- Engineering Sectors in Kenya



(Photo Courtesy)

### Planning

The old saying goes: If we fail to plan, we plan to fail. Planning is crucial for national development and transformation because it enables us to translate our vision of society into reality. This is effected through the development of various physical and system infrastructure.

Engineers are uniquely qualified to lead the national planning process because their education and training enables them to visualize complex systems, breakdown the same into components and re-integrate the same into a judicious whole.

Kenya has a national government and 47 county governments. All the 48 governments have a planning role. We are, therefore, urging the national and county governments to involve engineers in their planning roles. An engineer as the Cabinet Secretary for planning would be ideal! Engineers as County Executive Committee Members in charge of planning would also be ideal!





*Dedan Kimathi University of Technology engineering students prepare for an international competition in August 2021. The institution has been keen on hands-on training to deliver quality professional engineers.*

## Engineering Education, Research and Practice

### Educating Engineers

Engineering educators, researchers and practitioners respond to needs in history and geography to develop systems which advance human civilisation.

Recently, the Covid-19 pandemic has made it necessary and urgent to review engineering education, research and practice worldwide.

The pedagogy at universities historical circumstances.

Vision 2030 recognizes that we need to greatly increase the number of engineers in Kenya if we are to implement the projects which will make us realize the vision. At the same time, we have recently been reading in the press that some Universities have had to close because of students' unrest due to polemics between the universities and the Engineers Board of Kenya. There have also been court cases on the same.

The Court of Appeal judgment of 11 June 2020 on petition No. 35 of 2017 consolidated into Petition 106 of 2017 reaffirmed the constitutionality of the 2016 amendment to the Universities Act which introduced Section 5A which gave the Commission of University Education the mandate to accredit university programmes. The Engineers Board of Kenya, and other professional regulatory boards, had also been

given this same mandate by an act of parliament.

We are very glad to note that The Commission for University Education, Engineers Board of Kenya and universities are in dialogue to enunciate how they will work together in approval and accreditation of university programmes. As a number of universities also produce technologists and technicians, this dialogue may be broadened to include Kenya Technologists Registration Board. The agreement on the way forward must be within the letter and spirit of the law. Otherwise, you all know how litigious Kenya has become!

The new government should lead dialogue so that statutory entities may exist harmoniously. This may need review of legislation which the new government should support.

### Engineering Research

Section 32 of the *Science Technology and Innovation Act (STI) 2013* establishes the National Research Fund, NRF. The act states that the amount contributed by the government to the fund as a **sum of money amounting to two percent of the country's gross domestic product, provided by the Treasury every financial year**. The funds which should have been released this year would be about KES 215 billion. To-date, only a

small fraction of this prescribed amount has been released for research since 2013.

Engineering research is effected at universities and agencies such as the Kenya Industrial and Development Institute, KIRDI. Traditionally, the government of Kenya and international donors have traditionally prioritized funding social science, health and agricultural research.

It is crucial that the government of Kenya should move fast to implement funding of the research at the level of the STI. The government should thereafter give priority to engineering research funding. This is the only way to drive forward our industrialisation quest. The new government should ensure that the lawful research funding threshold is instituted.

### Engineering Practice

A few years ago country comparison of the number of persons served by an engineer were, in part, as follows: Kenya, 6,300; South Africa, 3,166; Korea, 285; UK, 311; Brazil, 227; and China, 130. We see from the figures that the level of industrialisation, economic development and affluence have a direct relationship to the quantity of engineers in a country. Hence Kenya must strive to expeditiously increase its quantity and quality engineers.

The number of graduates of engineering programmes has increased. As discussed above, the number should actually increase rapidly in the near future. The process of licensing, registration, of engineers should also be modernised and streamlined so that the pending and future candidates are processed efficiently and effectively. Again, we may learn from other countries such as the USA.

We are happy to note that the scale of fees for engineers was recently operationalized by the government. This is good for the profession. Medical doctors, and others, who are in the public service are paid non-practice allowance. Engineers are not paid this allowance. We urge the new government to pay non practice allowance to engineers.



(Photo Courtesy)

## Energy and Mining

Work in the factory, farm, office, hospital or transport system is dependent on access to reliable and affordable energy, especially electricity.



**An analysis of the national energy shows heavy dependency on petroleum 22%, electricity 9%, others account for 1%. Electricity access in Kenya is low despite the government's ambitious target to increase electricity connectivity to at least 65% by the end of the year 2022.**



To achieve Vision 2030, the country's electricity generation, transmission and distribution needs to be developed in order to attain a consumption rate of 3,000 kWh/capita from the current level of about 164 kWh/capita.

It has been estimated that African countries lose an estimated 4 percent of their annual GDP for lack of energy.

Grid electricity is the main source of electricity in Kenya. In 2021 the major sources of electricity being hydropower at 838 MW, Geothermal, 863 MW, thermal at 619.2 MW, wind, 437 MW, solar at 173 MW and cogeneration, 59.8 MW. The national electricity installed capacity was at 2,990MW as of November 2021 according to Kenya Electricity Generation Company, with a connection rate at 8.6 million people in an estimated population of 50 million.

In order to achieve middle income status, the electricity generation in Kenya needs to rise significantly. Estimates range from 20,000 MW

to 60,000 MW installed generation capacity. In order to meet this projected demand, possible new sources like coal with a projected potential of 1,920MW, liquid natural gas (LNG) at 1,050MW potential need to be explored. Other sources include Nuclear and other renewable sources.

Electricity generation in Kenya is largely the function of the Kenya Electricity Generating Company (Kengen) which is the leading company in the production of electricity in power stations, generating more than 60% of all the electricity consumed in the country. Other electricity producers include Geothermal Development Company (GDC) and Independent Power Producers (IPPs) which accounts for an estimated 39% of the installed capacity. Importation is also another source of electricity generation for the Country. However, to realize the Vision 2030 of consumption rate of 3,000 kWh/capita.

Most transmission of the power is carried out by Kenya Electricity Transmission Company (KETRACO) which handles high voltage lines of above 132 kV whose core mandate is to plan, design, build, operate and maintain new electricity transmission. The major challenge is the centralized system of transmission and for the country to meet its target, this may need to be decentralized.

The distribution and retail of electricity is the main function of Kenya Power and Lighting Company. KPLC currently helps the Rural Electrification and Renewable Energy Corporation (REREC) in distribution in rural areas.

Electricity costs in Kenya are high when compared to Kenya's competitors in this sector. There is need to address this issue urgently.

Electricity sector in Kenya is currently governed by a number of legislation and acts. These are: Energy Act of 2019, which requires the regulator to ensure that the rates and tariffs established electricity sales contracts, transmission and distribution are just and reasonable, the national Energy policy, 2018, whose aim is to provide affordable quality energy for all Kenyans.

The recent shortage of petroleum products which led to long queues outside service stations has reminded

the public that a decade ago the government reported the discovery of oil in Turkana.

Kenyans were hoping for good times in which there would be abundant cheap petrol and plenty of hard currency earned through oil exports. Efforts should be redoubled in mining and refining this oil as soon as possible.

The cost of off grid solar electricity systems has recently been declining leading to more connections of these systems in rural areas. This is an encouraging development.

Having wood fuel and other biomass accounting for 68% of the total energy consumption is disastrous to the environment, health and the economy.

The Ministry of Environment and Forestry estimates Kenya's forest cover at about 7.2%. Cutting trees and burning the same in open stoves as wood fuel leads to depletion of forest cover, increasing carbon and degrading our capacity to absorb the same, also inhalation of smoke from the stoves leads to respiratory diseases.

We must move away from wood fuel to better sources of domestic energy. Liquefied petroleum gas, LPG, has become a popular alternative to wood fuel.

The problem with LPG is that it is imported. This leads to the problem of finding the hard currency to buy the same.

Tanzania has found large deposits of gas in its territory. It wishes to develop an LPG industry at Likong'o village in Lindi town. Kenya has been in discussions with Tanzania on the possibilities of developing a gas pipeline to transport the product from Tanzania to Kenya within the auspices of East African Community (EAC) cooperation. This may be helpful in the long run.

Recent estimates have revealed that it may now be cheaper to cook with electricity than LPG in Kenya.

This is interesting because electricity is versatile and can be used for: Cooking in homes; powering machines and processes in industry; mass transport systems in urban areas; SGR railway transport; lighting and operations in offices and homes; and operations in agricultures such as pumping of irrigation water.



Electrifying Kenya is crucial to its transformation through industrialisation and economic development. In this endeavour, we must firstly produce or import the electricity.

In 2003 the installed capacity for Kenya was 1,207 MW. In 2021 the installed capacity in Kenya is 2,990MW. In 2003 the installed capacity for Ethiopia was estimated at just about 500 MW according to Ethiopia Country Report of 2015. Ethiopia has been more ambitious in developing its generation capacity. In 2021 the Installed capacity for Ethiopia is 4,967 MW, this figure will soon grow to more than 10,000 MW.

The Democratic Republic of Congo has recently joined the EAC. Congo has immense hydroelectricity generation potential. Some estimates put this potential at 200,000 MW. Through EAC cooperation Kenya may benefit from this potential.

We must be ambitious and innovative in developing our energy sector in Kenya. This sector is a necessary condition for our industrialisation, economic security and transformation.

## Engineering Agriculture and Environment

Official figures indicate that most Kenyans, 75%, are employed in agriculture. Agriculture accounts for about 26% of the GDP. This means that the efficiency and effectiveness of our agriculture must be urgently increased. This can only be done through engineering.

We have all been very often reminded that the degradation of the environment during production is a serious challenge in modern times. Climate change and its adverse effect can be directly attributed to lack of respect for prudent environmental management through responsible production in agriculture, extractive industries, transport and manufacturing.

Engineering inputs in agriculture are effected through agricultural mechanisation. Agricultural mechanisation aims at increasing the power inputs to farming activities hence intensified production and enhanced value addition resulting to decreased cost of production and reduction of drudgery in farming activities.

The different sources of agricultural



power available include human, animal, mechanical, electrical, and renewable energy. Use of farm machinery and equipment is determined by the production systems which include farm size and availability of power. For successful agricultural mechanization planning and implementation, a holistic approach should be used to encompass private sector involvement, economic profitability and creation of an enabling environment.

In 1900 farmers represented 38 percent of the U.S. labour force. By the end of the century that number had plunged to 3 percent- dramatic evidence of the revolution in agriculture brought about by mechanization. Beginning with the internal combustion engine and moving on to rubber tires that kept machinery from sinking in muddy soil, mechanization also improved the farm implements designed for planting, harvesting, and reaping. The advent of the combine, for example, introduced an economically efficient way to harvest and separate grain.

As the century closed, "precision agriculture" became the practice, combining the farmer's down-to-earth know-how with space-based technology. **1902**, First U.S. factory for tractors driven by an internal combustion engine. **1966**, Electronic monitoring devices allowed farmers to plant crops more efficiently. Attached to mechanical planters and air seeders, the devices monitor the number and spacing of seeds being planted. The devices monitor the planting of up to 96 rows at a time. During the **1990s**, similar devices are used at harvest time for yield mapping, or measuring and displaying the quality and quantity of a harvest as the combine moves through the field. **1994**, Farmers begin using Global Positioning System (GPS) receivers. ushering in the new "precision

agriculture," farmers begin using Global Positioning System (GPS) receivers to record precise locations on their farms to determine which areas need particular quantities of water, fertilizer, and pesticides. The information can be stored on a card and transferred to a home computer. Farmers can now combine such data with yield information, weather forecasts, and soil analysis to create spreadsheets. These tools enable even greater efficiency in food production.

In the 21st century, agricultural mechanization is changing, Precision agriculture to ensure efficiency of inputs such as water and fertilizer application, and to maximize productivity, quality, and yield, tractor performance, soil type and soil tests and other equipment's by use of satellite imagery, GIS tool and GPS devices, use of Internet of Things (IoT), driverless tractor

Agricultural production consists of crops, livestock and fisheries systems.

In Kenya, crop production systems consist of small, medium and large-scale farms averaging 0.2 to 5, 5 to 100 and over 100 hectares, respectively. Small-scale farmers are predominant in the high and medium rainfall areas that produce over 75 percent of agricultural production.

Use of machinery on small-scale systems is very low in relation to the medium and large-scale agricultural production systems.

In Africa, most of the livestock is raised in extensive systems with communal grazing and free ranging of rain-fed rangelands. Intensive production is practiced in the high rainfall areas, semi-intensive systems are found in semi-arid lands and extensively in arid areas. Use of mechanized livestock production systems is very low. However, potential for mechanization is high to meet the

growing demand for livestock and livestock products.

Fisheries production systems include capture which takes place in the marine waters, inland waters and aquaculture which can be land based in ponds or water based in cages. Production systems in capture fisheries are categorized into artisanal fishing and semi-industrial fishing. Aquaculture systems are categorized as semi-intensive, intensive and extensive depending on the inputs and production system. However, adoption of mechanized production system is low.

It is often argued that as agriculture employs the vast majority of our labour force, it is therefore our most significant economic sector. Implicit in this statement is that this state of the affairs has to be maintained, at least for the foreseeable future. What is the validity of this argument?

As stated above, the primary objective of agriculture is to provide

food and other raw materials. This process must obviously be carried out in the most efficient and cost-effective manner. Employment is created in this sector because we require human labour intervention in the production process.

Mechanisation leads to more labour and process efficiency, resulting in better energy utilization and lower production costs. In an industrializing economy, labour requirements are reduced in various industries as production systems are progressively mechanised. The workers displaced in such industries are absorbed in other industries where they are required. In fact, the lowest unemployment rates are in the most industrialized countries which have the highest levels of agricultural mechanisation.

Mechanising our agriculture will displace some labour from the sector. This is actually desirable in a modern industrialising economy. In such an

economy, labour is required in many other areas.

The challenges facing agricultural mechanisation in Kenya include: Inadequate machinery, Inadequate staff; plant operators and mechanics, Inadequate mechanization extension, Inadequate access to mechanization technologies, Lack of adequate credit and finance to farmers and private contractors, Inadequate after sales and service back-up, Decreasing land sizes, Enterprises that do not support mechanization business model, Vast area of coverage for the Government mechanization stations, Inadequate resources/ funding for stations, Gender and youth imbalance in agriculture, aged farming citizens among others.

As we mechanise our agriculture, we must ensure that the environment is protected.

The new government must dialogue with engineers on the future of agriculture and the environment



## Engineering Roads, Transport and Housing

Roads have contributed immensely to economic development and growth in the modern world. They have brought important social benefits to society. They are of vital importance in order to make a nation grow and develop. In addition, roads provide access to employment, social, health and education. Therefore, the road network is crucial in fighting against poverty.

Roads open up more areas and stimulate economic and social development. For those reasons the road network is one of the most important of all public assets.

According to the **Kenya Infrastructure Report Card, 2021**, Kenya is ranked 60th in terms of road quality according to the **Global Enabling Trade Report**

**2016.**

The report noted that it is not economically sustainable to maintain a large unpaved road network. The total length of paved roads per 1,000 inhabitants in Kenya was 21.9km which is less than the EAC member countries' average of 25.3km.

The report recommended that roads be upgraded to paved standards to create a reliable and resilient road network and to minimize maintenance costs in the long term for sustainability. In its analysis, it is noted that the Kenya Roads Board undertook **Road Inventory and Condition, RICS**, surveys in 2009 and 2018.

From the 2018 RICS, road network conditions for both county roads and

national trunk roads improved over the 10 years. In summary, 46.17% of all the classified paved road network were in good condition, 40.22% were in fair conditions, 10.62% were in poor condition while 2.99% were under construction. 14.54% of the classified unpaved network were in good condition, 46.91% were in fair condition, 36.71% were in poor condition while 1.83% were under construction.

Thus, the report noted that 73.92% of all the classified roads were in maintainable state whereas 26.08% are either dilapidated and require reconstruction or are under construction.

The **Kenya Sessional Paper No. 3 of 2016 on National Housing**



**Policy** expects the country to ensure progressive realization of the right to accessible and adequate housing and reasonable standards of sanitation for every person as **per Article 43 of the Constitution**.

Housing is one of the basic human needs besides food and clothing. It is considered as one of the most basic human rights and an essential component of the right to an adequate standard of living.

Further, adequate and affordable housing is not only necessary for security and comfort, but also critical in fostering social cohesion and development of a nation.

According to the above sessional paper, households who live in extremely inadequate housing conditions characterized by poor structural conditions, inadequate basic services, insecure tenure, and inadequate space and privacy live predominantly in slums and informal settlements in urban areas.

However, such households are also found in rural areas. Estimates by Kenya National Bureau of Statistics for the period between 1999 and 2009 indicate that households in extreme housing deprivation increased by 31% from 889,696 to 1,166,138 (which translates to 13.3% of total households) while those in some form of deprivation<sup>1</sup> increased from 3,368,135 to 4,454,121 (50.8% of all households) over the same period. This is an indication of the need for State intervention particularly for the low income segment of the population who live in extremely inadequate conditions.

The Constitution affirms this in Article 21, which provides that “the State shall take legislative, policy and other measures, including the setting of standards, to achieve the progressive realization of the rights guaranteed under Article 43.”

In order to give effect to this constitutional provision, the National Housing Policy aims at reducing the number of households living in extremely deprived housing conditions by half in the next 5 years.

The new government must dialogue with engineers so that the crucial sectors of roads and housing may be developed rapidly.



## Information and Telecommunication Engineering

A functional definition of information is knowledge or data which can be collected, analysed, stored and communicated. Telecommunication in the modern world is the transmission of information by various types of technologies over wire, radio, optical or other electromagnetic systems. The modern and future worlds cannot function without information and telecommunication engineering (ITE).

The Covid-19 pandemic has demonstrated the importance of information and telecommunication engineering to the world. In education, universities and schools were variously forced to discontinue physical instruction and revert to virtual learning which could not have been possible without ITE.

ITE has also been instrumental in the biomedical area. The Corona pandemic began in China in 2020. Initially, there were many deaths. The government took strict measures to control the pandemic, these measures included strict lockdown. In addition to the lockdown, the government of China was able to use ITE to trace and quarantine all the contacts of people who tested positive for the virus. Using ITE, China was also able to deploy massive resources to build (in record time), equip and run huge hospitals specifically dealing with Covid19 patients, saving many lives. ITE was also instrumental in the development and administration of Covid-19 vaccines worldwide.

In Kenya, measures to combat the pandemic included discouraging cash transactions. ITE provided a ready solution for alternative payment methods through MPesa, Airtel money etc. The filling of physical form for government services is largely being

replaced by online ones through ITE. In agriculture various smart ITE systems for the leasing of tractors, input procurement, marketing of produce and other pertinent issues are increasingly being available to farmers.

In engineering design and infrastructure ITE has the potential advantage of bringing about more effective and efficient design processes, faster construction through 3D printing, lower labour costs, increased complexity and/or accuracy, greater integration of function, and less waste.

The significance of ITE to the world economy cannot be understated. The five largest ITE firms in the USA, the Big Tech of FAANG, Facebook, Amazon, Apple, Netflix and Google, are all valued at over USD 3 trillion, which, incidentally, is the GDP of India. A walk down any street in a Kenyan town or city would immediately indicate to one the significance of the ITE industry. The streets are dominated by shops selling telephone handsets, mobile money agents and related activities. Safaricom alone is a major contributor to the Kenyan economy.

Safaricom, in its **Sustainable Business Report for 2020**, showed that the company's social impact was valued at KES 654 billion (US\$6 billion) for the year, which is nine times the financial profit the company earned during the year. Kenya's GDP in 2019 was \$95.5 billion, according to the World Bank.

Safaricom said it added economic value worth KES 358.6 billion (\$3.3 billion) to the Kenyan economy, during the past financial year, through operations and taxes. It also sustained more than 1 million direct and indirect jobs, an increase from 979,000 jobs the previous year.

The contribution of ITE to agriculture, industry, entertainment and other sectors in the Kenyan economy is immense and has potential from more spectacular growth leading to the creation of quality stable jobs.

The primary actors in the ITE sector are engineers. Engineers are playing a leading role and will continue to do so going into the future - hopefully, very gainfully!

The new government must engage the engineering community in order to develop this crucial sector.



(photo Courtesy)

8.4% to 15%.

The Big 4 has identified 8 priority sectors under its manufacturing pillar including agro-processing, textile, leather, construction materials, oil and

mining, iron and steel and ICT. KAM is a key partner to the National Government as it sets out to enhance the role of the manufacturing sector to economic growth and development in Kenya.

Engineers play a lead role in manufacturing. The new government must involve engineers in the development of policies and strategies for manufacturing in Kenya.

## Manufacturing

Historically, the manufacturing sector has played an important role in driving economic development by stimulating and sustaining high productive growth, boosting employment opportunities for semi-skilled labour and building country competitiveness through exports. The path to industrialisation, economic transformation and increased human welfare has been through an enhanced manufacturing sector. The Kenya Association of Manufacturers has outlined the challenges of manufacturing in Kenya. The views are being reproduced here below.

Kenya, like many other developing countries, has not managed to develop a robust manufacturing sector and growth has been primarily driven by the agriculture and services sectors respectively.

The country has thus experienced a premature deindustrialization as evinced by the decline in GDP contribution by the manufacturing sector which was at a paltry 8.4% in 2017 and 9.2% in 2016.

Deindustrialization has been characterized by a rising share of the services sector in GDP and fuelled debate as to whether services can replace the manufacturing sector as an engine of economic growth. Despite this debate, boosting outcomes in the manufacturing sector remains an important strategy for countries such as Kenya seeking to boost economic outcomes.

Increasing the size of the country's manufacturing sector with an emphasis on exported goods is one of the Big Four Agenda. This policy initiative, unveiled on 12th December 2017, places one of the four main targets of the Government's priorities up to the year 2022 as an increase contribution of the manufacturing to GDP from the current

## Engineering Biomedical and Healthcare Systems

The tragic deaths of Kenyans from cancer, including the Governor of Bomet County, Dr Joyce Laboso, and the Member of National Assembly for Kibra Constituency, Ken Okoth, brought to fore the discussion on the need for much improved medical services and healthcare systems in Kenya.

Governor Prof Peter Anyang' Nyong'o of Kisumu County stated at Laboso's funeral service that there is urgent need to develop local human resource capacities in the medical services area. The focus on building specialist hospitals alone would not solve the problem. Doctors, nurses, laboratory specialists and others are needed in the diagnosis, treatment and management of cancer. This is true of all diseases, communicable and non-communicable.

Kenya must hasten its capacity to address disease from the perspectives of prevention, diagnosis and treatment. This implies the capacity to develop environmental and public health systems and hospital. Also crucial are the development of capacity in research and human resource development through education and training. The building of hospitals and manufacture, installation, operation and maintenance of equipment and machinery for disease diagnosis and treatment need the participation of engineers.

Biomedical engineering is the application of the science and art of

engineering to the planning, design and management of systems for health care of human beings. It combines expertise in engineering with expertise in medicine and human biology to develop technologies and techniques for healthcare and patient care. This field includes: Biotechnology; Health Care Systems; Amenity; Human Biology; Pharmaceutical industries; and The Environment.

The operation areas of engineers in Biomedical and Health Systems include: Clinical and Instrumentation Engineering; Biomedical and Rehabilitation Engineering; Hospital and Health Systems Engineering; and Public Health Engineering.

There are biomedical engineering degree and diploma programmes offered at many universities and colleges worldwide. In Kenya, Kenyatta University has a programme in Bachelor of Science in Biomedical Engineering. The Technical University of Kenya intends to offer a similar programme soon.

Engineers are crucial to the development and operations of biomedical and healthcare systems. The national and county governments must put the hiring of engineers in this area at the same level with doctors and other medical personnel. Licensing and development of education and training programmes for the same area must also be supported.

## Finance, Services and Devolution

Engineers are responsible for the development of ICT infrastructure used in financial services. MPesa, Airtel Money and other financial transaction infrastructure contribute immensely to the facilitation of business. Government services like issuance of licenses, payment of fees and litigation are now effected in many instances using ICT.

Engineers must be constantly consulted by the government on matters ICT. Services such as taxi hailing, food and merchandise delivery, record keeping and entertainment are also being increasingly facilitated through ICT. County governments have very few engineers. This is inimical to the implementation of infrastructure and other projects in counties. This issue should be addressed urgently.



## The Way Forward

The Institution of Engineers of Kenya being a learned society and professional societies of engineers in Kenya is uniquely qualified to spearhead the participation of engineers in national development. Specifically, the IEK, can, with the gracious permission of the government, effect the following:

1. Nominate relevant candidates to various public office positions in the national and county governments.
2. Advise government on the development of infrastructure and other projects;
3. Collaborate with government on planning, feasibility studies, detailed designs and construction supervision of relevant projects;
4. Effect capacity building of public officers in engineering aspects of their work;
5. Develop relevant government papers and other official documents;
6. Advise government on the recruitment; training and remuneration of engineering personnel; and
7. Advise the government on any other pertinent issue.

We would be very grateful if the government would consider:

- a. Leading dialogue so that statutory entities may exist harmoniously. This may need review of legislation which the new government should support;
- b. Implementing the funding of the research at the level of the Science Technology and Innovation Act. The government should thereafter give priority to engineering research funding; and
- c. Medical doctors, and others, who are in the public service are paid non-practice allowance. Engineers are not paid this allowance. We urge the new government to pay non practice allowance to engineers;



## Powering the Future with Solar and Wind Energy

By Jane Wanjira Munyi

only require sunlight to power the home, vehicles, recharge large battery systems and allow the sale of extra energy to utility companies. Wind power can function similarly by producing energy from wind-powered turbines.

### Worldwide Installation of Solar Panels and Wind Turbines

Wind is generated all over the planet, and it is economically possible to install wind turbines almost everywhere on earth. With technological advancement, it is possible to create wind farms at very high altitudes in a bid to minimize wind unpredictability in such areas. It is also possible that all nations invest in wind farm projects as well as photovoltaic solar panels that convert energy from the sun to electricity. Both solar panels and wind turbines are efficient since solar panel systems convert up to 50% of the solar energy into electrical power and wind turbines convert more than half of the wind that hits them into electrical power. That, therefore, renders it possible for the world to thrive on solar and wind energy.

### Conclusion

The sun is everywhere, although areas around the equator are naturally more exposed than those at the North and South poles. The efficiency of solar power conversion is influenced by the geography of each area and with advanced technologies, it is possible to detect the proper directions of panel placement to ensure 100% efficiency in converting the solar energy to electricity. Wind occurs naturally and cannot be used up. Wind energy has been used to pump water and power generators for centuries, and with enough wind turbines, the wind energy can be converted to rotational energy and eventually electrical energy. Wind and solar power can therefore be harnessed to provide inexhaustible energy, hence is the future for the power needs of humanity across the globe.

*Jane Wanjira Munyi is a 2019 Civil Engineering graduate of the Technical University of Kenya (TUK).*

### Introduction

**C**LEAN and renewable energy from solar and wind power never runs out. Unlike non-renewable sources like fossil fuels which can be exhausted, we can never use up wind and sunlight such that there is none left. The supply of wind and solar power may be inconsistent, but it is potentially limitless. However, where there is a will, there is a way; hence the barrier of inconsistency can be eliminated by investing largely in the two sources. Solar and wind energy are, therefore, viable sources that can power the future and provide for all our needs.

### Complementary Aspects of Solar and Wind Energy

One may doubt how much solar and wind can supply a country's electricity grid and argue that it is almost impossible to eliminate fossil fuels from the foreseeable future energy mix. That is a challenging question to answer given the fact that both wind and solar power fluctuate in both time and space. However, the two sources fluctuate in ways that are complementary to each other. For example, the generation of solar power is greatest during summer and least during winter. On the other hand, wind power is greatest in fall and spring. The two complementing variations can, therefore, balance out the power provided by solar and wind.

### Sufficient Storage of Solar and Wind Energy

Most of the time, the two energy systems generate power that is too much to be used, hence it is possible for mankind to fully depend on solar and wind energy without necessitating the use of any non-renewable energy. As such, the energy could be stored in voltaic cells or by pumping water to storage tanks that are elevated and letting the water fall during the night to turn the turbines. Solar power systems



## Kenya Ports Authority Infrastructure Development Transforming Shipping and Maritime in the Region



*Amb. John Mwangemi  
Ag. Managing Director*

**M**ultibillion shillings investments in the construction and upgrade of infrastructure projects by Kenya Ports Authority is set to transform the ports industry in the region.

The strategic investments spanning various port facilities have been bolstered by a sharp rise in demand for shipping services across the east and central region, and the need to meet these demands efficiently and in a timely manner.

By investing in these infrastructural projects, KPA intends to enhance its service delivery through improved efficiency in port operations, lower cost of doing business and enhanced supply chains in the region. Among the mega projects under developments that KPA prioritized include the recently commissioned phase two of the second container terminal at the Port of Mombasa.

The project is part of the Mombasa Port Development Program (MPDP) which was started in early 2000s as one of the country's Vision 2030 flagship projects. The first phase of the three-phased project was completed and commissioned for operations in September 2016 and increased the port's annual capacity by 550,000 TEUs.

With the completion of phase two, the Port of Mombasa has added a further 450,000 TEUs annual capacity, bringing the total capacity at the Port of Mombasa to 2.1 million TEUs annually.

According to Amb. John Mwangemi, the acting Managing Director at KPA, this firmly cements the Port of Mombasa's position among the top five ports in Africa and the regional hub for maritime and shipping.

The project was undertaken by Japanese contractor, Toyo Construction Company and comprised the construction of the 300 m long berth number 22, stacking yards and other administrative facilities.

Ambassador Mwangemi also registered his gratitude to the Governments of Kenya and Japan for the investments towards the modernisation and expansion of the Port of Mombasa during its commissioning.



*I wish to commit here that we shall put our best foot forward to ensure optimal utilization of this facility for the benefit of Kenya and the region.*





Mr. Haruo Yoshida, the Toyo Construction company Project Manager expresses his delight saying the complex infrastructure project was successfully and safely delivered on schedule. Mr. Yoshida said that he believed the completion of Berth No. 22 is a major step towards the realisation of the economic growth of Kenya, not only by presenting economic opportunities to the surrounding communities but also by putting Mombasa Port and city on the map as a regional gateway to the larger East African Corporation as well as an international trade hub and destination.

This project was constructed on a reclaimed area of approximately 17.5 hectares and came in three packages including construction of civil works and buildings, procurement of equipment namely four Ship to Shore (STS) Gantry cranes and 12 Rubber Tyred Gantry Cranes (RTGs) and the installation of an integrated Port and Terminal Security system.

Another significant project that Port of Mombasa now also boasts of, is a new oil terminal. The new Kipevu Oil Terminal will enhance the port's capacity to handle petroleum products for both the local and regional market.

The 40 billion shillings oil terminal is estimated to save the country more than Ksh 2 billion annually in demurrage costs incurred by oil shippers hence contributing to a significant reduction in fuel pump prices.

The Oil Industry is a key driver and main artery to business and economic growth of Kenya and the region. The new KOT shall streamline marine oil terminals operations to create synergy, enhance safety and operational excellence. This will also enhance provision of quality services that meet World Class standards and provide avenue to optimize resources to reduce petroleum tanker vessels' delays, improve turnaround time, and eliminate demurrage.

The project consists of one offshore island terminal with four berths whose total length is 770 m and one work boat wharf at Westmont area for landing facilities. The terminal can discharge and backload three larger petroleum tankers of up to 170,000 DWT simultaneously to facilitate handling of six different hydrocarbon products including

Automotive Gasoline Oil (AGO) – diesel, Premium Motor Spirit (PMS) – petrol, Heavy Fuel Oil (HFO), Dual Purpose Kerosene (DPK) – aviation fuel, Liquified Petroleum Gas (LPG) and Crude Oil (CO)

It also has five sub-sea pipelines which were buried 26 meters under the seabed to allow for future dredging of the channel without interfering with the pipes. There are risers each dedicated to a separate oil product and six onshore pipelines each dedicated to a separate oil product connecting the terminal to the Kenya Petroleum Refineries Limited (KPRL) and Kenya Pipeline Company (KPC) storage tanks.

Other support facilities of the KOT project include electrical power distribution system which is drawn from a substation onshore. It also has an elaborate water supply and drainage system, firefighting and detection facilities, telecommunications SCADA and control monitoring systems, and navigation aids.

KPA embarked on the construction of the Port of Lamu, the second commercial port in the country. This anchor project of the vision 2030 under the Lamu Port, South Sudan Ethiopia Transport project has opened the country to trade with her northern region neighbours. Currently, phase one of the project which comprises berth one to three and its accompanying infrastructure is complete. Since its operationalization last year, the port has received 12 commercial vessels.

KPA is in the process of procuring modern equipment to ensure the port operates optimally. This includes new mobile harbour cranes, ship to shore gantry cranes and terminal tractors.

With its strategic location and superior infrastructure, the Port of Lamu is set to competitively rival other ports in the continent by further opening the east African coast to more trade opportunities with the rest of the world.

Similarly, the port which boasts a natural depth of minus 17 metres and berths measuring 400 metres wide will also increase transshipment business owing to its ability to handle panamax and post panamax vessels.



## Nuclear Science Education

**N**UCLEAR Power and Energy Agency team held Science, Technology, Engineering, and Mathematics (STEM) Career talks and tree planting activities at Uyombo Girls Secondary school, Katana Ngala Secondary school, Roka Maweni Secondary School and Chumani secondary School on the 7<sup>th</sup>-9<sup>th</sup> June, 2022 in the potential nuclear power plant host county of Kilifi.

The team demystified and informed the students more on Kenya's Nuclear Power Programme, potential careers in the nuclear energy field with emphasis on STEM and opportunities for further learning to attain advanced university degrees.

The STEM Career talk sessions were interactive with students posing a number of questions to the NuPEA representatives and getting feedback on nuclear related issues.

Institutions of learning form a vital component of the nuclear power programme. Given the lead time required for a nuclear power programme to attain maturity, the students of today will most certainly be the professionals undertaking various aspects of this endeavor, a decade or so from now. The most ideal approach to guarantee future achievements is to ensure that students are well versed in STEM subjects. NuPEA continues to intensify the outreach to schools all around Kenya.



1.



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2.



5.



3.

1. Eng. Eric Ohaga - Director for Nuclear Energy Infrastructure Development at NuPEA and President of the Institution of Engineers of Kenya speaking to Students at Chumani Secondary School in Kilifi County.
2. Eng. Eric Ohaga - Director for Nuclear Energy Infrastructure Development at NuPEA and President of the Institution of Engineers of Kenya (IEK) engaging with Katana Ngala Secondary School Students
3. NuPEA's Director for Strategy & Planning- Dr. Winfred Ndubai delivering a nuclear career talk at Roka Maweni Secondary School
4. A student from Chumani secondary School posing a question to NuPEA Team.
5. Mr. Basett Buyukah- Director for Publicity & Advocacy at NuPEA addressing students of Uyombo Girls Secondary School at a Nuclear Career Talk



## Environment

NuPEA also made a strong pitch for environmental conservation by carrying out tree planting exercises in the four Secondary Schools where the students and teachers joined NuPEA in planting tree seedlings at the school compounds. This encouraged them to be committed to preserving the environment.

In conjunction with the activities, there was The Nuclear Student Ambassadors Programme held at Pwani University in Kilifi County. In attendance were Students and Teachers from Katana Ngala Secondary School, Roka Maweni Secondary School, Uyombo Girls Secondary School & Chumani Secondary School, partners from the International Framework for Nuclear Energy Co-operation (IFNEC) through the (FIRST) Foundational Infrastructure for Responsible use of SMR Technology network -USA and NuPEA representatives.

The Programme helped broaden the student's perspective in STEM careers and its importance in the nuclear field.



The students got a broad understanding of how STEM programmes are implemented in the USA, benefits and applications of Nuclear technology and the importance of stakeholder engagement in Nuclear embarking countries like Kenya.



Nuclear Power and Energy Agency offers students the tools, academic guidance and mentoring needed to pursue educational and career opportunities in Science, Technology, Engineering and Mathematics (STEM). The Agency hopes to continue to inspire students and young scientists to pursue and excel in science as a foundation to choosing nuclear science careers.



*Eng. Eric Ohaga with a student from Uyombo Girls Secondary School watering a tree seedling after planting*



*Dr. Winfred Ndubai planting a tree with Roka Maweni students*



*Eng. Edwin Chesire of NuPEA conserving the environment at Katana Ngala Secondary school.*



*Chumani secondary School students and Mr. Basett Buyukah strike a pose during the tree planting exercise.*

*Photos: The Nuclear Student Ambassadors Programme at Pwani University*



# NuPEA- COFEK in Consumer Dialogue Forum



NuPEA's Director for Strategy and Planning- Dr. Winfred Ndubai speaking at the Consumers Dialogue Forum in Kilifi County, on benefits of a nuclear power plant to Kenya, the Host County and the Host Community.

On 6<sup>th</sup> June 2022, Nuclear Power and Energy Agency and the Consumers Federation of Kenya (COFEK) hosted a Consumers Dialogue Forum at Hotel Titanic, in Kilifi County. The objective of the forum was to communicate to stakeholders the status of Kenya's nuclear power programme, achievements to date and the next steps envisaged on the journey towards nuclear electricity generation in Kenya, as well as present an opportunity to obtain insights and perspective from the public.

The forum attracted various stakeholders from various walks of life including industry, civil society, academia, media, as well as women and youth groups, who were eager to know more about Kenya's nuclear power programme, benefits of the technology to Kenya and its challenges and mitigation measures.

Speaking during the Consumer Dialogue Forum, NuPEA's Director for Strategy and Planning Dr. Winfred Ndubai stated that the Nuclear Power Programme will provide great benefits to the Country, Kilifi County & the local community and for the programme to be successfully implemented, she urged all partners to work together towards a common goal. She further stated that NuPEA is ready and willing to work in collaboration with all partners and stakeholders for the common good and to ensure successful implementation of the first Nuclear Power Plant in Kenya in Kilifi County, giving assurance that the Kenya government is in the process of reviewing and signing commitments in line with international nuclear generation protocols.

Nuclear energy has been identified as a stable, efficient and reliable source of electricity to spur industrial development and stimulate economic

growth. At the Dialogue Forum, nuclear safety was explained as set of institutional, organizational and technical elements and conditions established to provide a sound foundation for ensuring a sustainable and high level of safety to the public and environment. Participants were assured that Kenya fully recognizes and is committed to establishing a robust national nuclear safety infrastructure and commitment to the Global Nuclear Safety Regime.

Eng. Eric Ohaga - Director for Nuclear Energy Infrastructure Development at NuPEA & President of the Institution of Engineers of Kenya (IEK) took participants through the Pathway to Kenya's Development of Nuclear Energy and Nuclear Infrastructure issues that help Nuclear embarking countries like Kenya to understand the commitments and obligations associated with developing a nuclear power programme. "Kenya's economic prospects will thrive as soon as the plant is completed." He said.

Cofek Vice Chairman Mr. Benjamin Langwen urged NuPEA to engage with its stakeholders continuously and involve the counties in its outreach programmes. He thanked NuPEA for their continued support and looked forward to more opportunities of engagement between Cofek and the agency. NuPEA has a robust public information, awareness and education program that serves to demystify Nuclear technology and misconceptions about nuclear electricity generation.

Mr. Wilfred Baya the Ass. Director for Energy at Kilifi County Government also present at the forum mentioned that Nuclear Power investments have impacts hence there is need for closer co-ordination between the two arms of government and deeper stakeholder engagements on the various aspects relating to nuclear investments.

The Role of the Academia in the Rollout of Nuclear Electricity Program was also captured at the forum. Dr

Fanuel Mugwang'a from the Physics department at Pwani University stated that NuPEA should impact on content, the definition of programmes & fields of research for both undergraduates & post- graduates at higher education institutions & number of research projects supported at higher education institutions as well. He added that NuPEA and the academia should collaborate in reviewing current curriculum to include the new technology and methodology of running the technology.

Stakeholder sensitization, education and awareness creation are the cornerstone for a successful Nuclear Power Programme. This boosts understanding, enhance confidence and social acceptance.



Eng. Eric Ohaga - Director for Nuclear Energy Infrastructure Development at NuPEA & President of the Institution of Engineers of Kenya (IEK)



Cofek Vice Chairman Mr. Benjamin Langwen speaking during the Consumers Forum.



Mr. Wilfred Baya the Ass. Director for Energy at Kilifi County Government



Dr. Fanuel Mugwang'a - Physics department at Pwani University



# WATERPROOFING THE FUTURE



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## SIKA WATERPROOFING SYSTEMS

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- Sika's solutions are suitable for the most diverse challenging requirements to keep water in or out of long-lasting structures, such as tunnels, bridges, dams, basements, or roofs
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- Sika considers the entire waterproofing process to the very last detail and can provide solutions for both newly built and projects under construction.
- Sika's long-term experience and know-how provides both products and system solutions is a key added value for your next project.

#### **Sika has a range of waterproofing solutions including:**

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- Bituminous membrane
- Roof systems

**Sika is committed to providing proven and economical watertight solutions for diverse challenging requirements.**



By Eng. Kevin Njuki Gichanga

# Waste Water Treatment Plants and Energy for the Future

## Anaerobic Digestion

**W**ASTEWATER stabilization ponds are the most economical methods of waste water treatment in the tropical countries where the weather is favorable for natural biological treatment processes. Therein lies an untapped potential for energy recovery. Typical waste stabilization ponds consist of anaerobic (oxygen-free) ponds as primary treatment process, whereby anaerobic bacteria break down the organic content in wastewater, in the absence of oxygen, to produce methane containing biogas and biosolids as products. Basically, the anaerobic pond acts like an open septic tank. The methane can be harvested and used to power the treatment plant and excess can be taken to a natural gas grid as biomethane for use in heating, cooling or transport. On a smaller scale, where there is non-sewered sanitation and households have installed septic tanks, biogas can still be harvested and used as fuel for domestic purposes. Biogas can be used directly as fuel or may be converted to electricity using methane driven engines that turn generators to produce electricity. We have also seen recently the use of microbial fuel cells in place of anaerobic treatment, where there is direct conversion of organic energy to electricity, which is more efficient than the latter by 10 -20%.

## Sludge Incineration

A by-product of sewage treatment is solid sludge which can be another energy source through incineration. This is mostly disposed in a landfill as solid waste but in the spirit of sustainable waste management, it may be reduced in size through incineration and energy generated as well in the process, making it a double win. Incineration consumes energy as well, but the net energy produced after the process is more, especially if the sludge has been pre-dried in sludge drying beds using solar energy to reduce the moisture content. The best energy output is usually through

application of combined heat and power (CHP) plants, whereby through thermal conversion, the sludge produces heat and biogas that generates electricity. This reduces the greenhouse gas emission and contributes to renewable energy production.

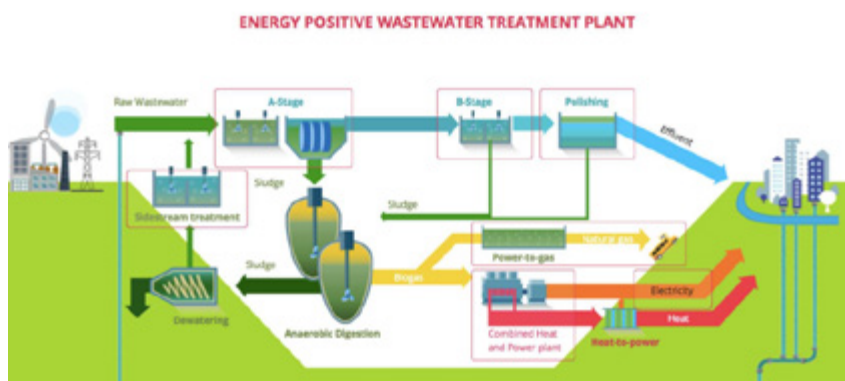


Figure 1 - A schematic representation of an energy positive wastewater treatment plant from

## Heat Pumps

Another source of energy from wastewater is thermal energy. This can be tapped using heat pumps and used in residential, commercial areas, industrial plants, sludge heating etc. Preferably though it would be much better to use it on-site, however we have seen development of thermal energy storage facilities such as aquifers which can bridge the gap of supply and demand in terms of time and location. A successful story of large-scale heating using wastewater thermal energy is that of Osaka in Japan, where its energy consumption reduced by a third.

Apart from the above three main sources of energy from wastewater, there are also conversations of exploiting nitrous oxide emitted from waste water treatment plants and biohydrogen from ponds algae as energy sources.

## Conclusion

Wastewater is an important resource for energy production and definitely a game changer for those who are ready to get dirty! It is definitely not a new idea but the time is now to seize its potential energy. Apart from energy production and subsequent revenue stream, various benefits are realized from reuse of wastewater including reduction of greenhouse emissions to the air, thereby mitigating the effects of climate change. It is also used for agricultural purposes, thereby reducing the stress for water that may be used for other purposes. It is definitely a sure candidate in promoting the circular economy, in regards to the water-energy-food nexus. Furthermore, it presents an opportunity for intra- and inter-disciplinary collaboration within the engineering field and beyond. Civil engineers and electrical engineers may work with environmentalists, statisticians and policy makers.

With all the above in mind, perhaps will we see a paradigm shift in designing sewer treatments with a focus on energy recovery as well apart from achieving wastewater treatment?

Eng. Kevin Njuki Gichanga is the Principal Engineer, Water & Sanitation Infrastructure, Tana Water Works Development Agency.





Eng. George Okoth  
Managing Director  
Sprintex Engineering Services Limited

## Sprintex Engineering: Leader in High Tech Refurbishment of Electric Machines

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Sprintex Managing Director Eng. George Okoth explains to a customer conditions of bearings and sensors.



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## The Lamu Port-South-Sudan-Ethiopia Corridor - a Regional Transshipment Hub

**E**ngineering in Kenya Magazine explores the potential of Lamu Port-South-Sudan-Ethiopia Corridor project in an interview with LAPSSSET CEO Stephen Ikua (Inset).

**Share with us the mandate of LAPSSSET Development Authority, what you have accomplished as an agency so far and projects you are currently working on?**

Some of the functions bestowed on the authority include planning, coordinating and sequencing the LAPSSSET Corridor projects, provision of leadership and direction in the projects, promotion of the competitiveness and use of the LAPSSSET Corridor and resource mobilization.

**The Lamu Port is worth Sh310 billion and will boast of 23 berths upon full completion, making it the largest deep-water port in Sub-Saharan Africa. What economic potential lies in this port?**

Development of Lamu Port will open up the Northern and North Eastern parts of Kenya which have high economic potential but have historically been under-exploited due to low infrastructure development. The infrastructure development from Lamu Port through Northern Kenya to Juba and Addis Ababa will facilitate economic development through activities such as tourism, blue economy and minerals exploitation.

The LAPSSSET Corridor connects to Southern Ethiopia at Moyale. Land transport (highway and railway) from Moyale to Addis Ababa traverses through the densely populated Oromia province (a total population

of 30 million) that accounts for 35% of total population of Ethiopia. This is market for LAPSSSET Corridor and it is estimated that in the future, 30% of Ethiopian cargo will be handled through the port of Lamu. In addition, Southern Ethiopia is rich in economic resources but it is far from the traditional logistics corridor that exists between port of Djibouti and Addis Ababa. Lamu Port will fill this gap by providing a shorter transport corridor South Sudan being landlocked depends on the ports of the neighbouring countries. The distance from port of Dar-es-Salaam, or the port of Mombasa is far longer than that of the port of Lamu. Therefore, Lamu port offers a competitive advantage in terms of distance, low cargo transportation cost and economic potential.

**It has been said that LAPSSSET project will revolutionize handling shipping and storage of petroleum products. Explain.**

Physically, the berths at the Lamu port are 17.5m deep and with a quay length of 400m. These dimensions are far higher than those of traditional ports and this means that the port will have the ability to handle larger shipping vessels (Post-Panamax vessels). Only the port of Djibouti has these kinds of specifications in the region. This puts Lamu Port in a competitive position in haulage of

Petroleum products.

Furthermore, the port of Lamu is a greenfield and therefore it has large capacity to store LPG, product oil, crude oil from Turkana or other countries. Most of the existing ports in the region have no room for expansion.

**What timelines are the agency looking at, in its quest to transform Lamu into a future port city and tourism hub for Kenya.**

Up to this point, LAPSSSET Corridor Development Authority (LCDA) has developed an Integrated Transport Masterplan (2018) and Preliminary Masterplan & Investment Framework (2017) which were both approved in 2020 by the Ministry of Physical Planning. Furthermore, there have been tremendous milestones at the Port of Lamu such as the completion of the first 3 berths and the commissioning of Berth 1 in May, 2021. Moreover, the plan for the SEZ (Special Economic Zone) is complete. Given these projects, such as the Special Economic Zone (SEZ), developing the Lamu resort city and developing the Lamu Industrial City are capital intensive projects, the timelines for completion are dependent on the availability and willingness of the private sector financing and the availability of foreign direct investments.

**With the growth of EAC regional integration and implementation of ACFTA, some analysts say one or two major ports and corridors in the EAC region is no longer enough. Any plans to extend your projects?**





With 23 berths, it is clear that Lamu port is going to be the largest & deepest port in Kenya. On completion, the port will have the capacity to handle 23.9 million tons of cargo. Being a greenfield, it has largest cargo storage and most efficient throughput in the East African region.



The central corridor is under expansion to improve transport links between East African Countries with Countries in West and Central Africa. The port of Bagamoyo is under construction to increase the port capacity i.e. help ports Mombasa, Lamu and Dar-es-Salaam. Furthermore, there are plans to have the East-West Beltway i.e. Lamu to Doula through Juba and Bangui to have all modes of infrastructure – highways, railways and airways.

*How are you strengthening your cooperation with other agencies to enhance port business and efficiencies along the corridor, including the Moyale OSPB?*

LCDA brings together all relevant agencies and steers them towards realization of the LAPSET Program. Currently, it has formed the Inter-Agency steering committee, the Interagency Marketing committee and the Inter-Ministerial steering committee. These committees comprise all relevant agencies committed to achieving the LAPSET dream.

To these effect LCDA has achieved development of suitable tariffs for

Lamu Port to incentivise shipping lines and other port users, geofencing of the corridor for cargo tracking and safety in collaboration with Kenya Revenue Authority (KRA). The Moyale One Stop Border Post (OSBP) has been developed in collaboration with KeNHA and KRA. The OSBP is fully equipped and operational in terms of customs administration. LCDA is working closely with KenHA to construct and upgrade highways along the LAPSET Corridor for cargo transport to and from the port.

*What are some of the challenges you have encountered in implementation of LAPSET projects, with different governments and agencies involved? How are you mitigating these?*

LAPSET project components are supranational and are planned, designed and managed as infrastructure of each individual country. This poses a challenge because there are differences in design and operations standards of infrastructure from country to country. An example is difference in axial load restrictions which forces cargo transporters to offload and on-load cargo across borders. Secondly, there arises differences in institutional arrangement in development of infrastructure. To mitigate these challenges, LCDA is developing a regional coordination framework to operationalize a regional corridor management institution which will ensure harmonized design and operational standards.

Within the country, differences in priorities of different agencies make it difficult to harmonize approaches for development of LAPSET projects. Different institutions that are involved in development of LAPSET projects have varying priorities depending on

their development plans and finances. The government of Kenya created the LAPSET Corridor Development Authority (LCDA) in 2013 to sequence, provide leadership and manage the LAPSET program.

*The Lamu Port project plan includes transportation hubs for rail, highway and international airports in Lamu, Isiolo and Lodwar. How much are local Engineers involved in this project?*

LCDA has employed both Professional and Graduate Engineers to oversee the development of LAPSET Projects and ensure proper standards. Further, consulting Engineers in Kenya have consulted on LAPSET projects.

LCDA aims to ensure that Kenyan engineers are involved in LAPSET projects that are undertaken by foreign developers. In this way, skills are passed to our local engineers.

*The government is structuring some 20 berths to be handed over to private sector investors for financing, construction, and operation. How useful is public- private partnership for realization of this project?*

The government did the first three (3) berths to create an enabling environment and show commitment for the LAPSET Program. The remaining berths will be developed by the private sector through allowable financial arrangements one of which is Public Private Partnerships (PPPs).

Last year (2021) the government of Kenya amended the PPP Act to facilitate increased participation of private sector in the development of infrastructure projects such as those in LAPSET Program.

*Overall in terms of GDP, how will the project impact East Africa Region?*

The LAPSET Program is projected to increase the GDP of the region by about 2-3%.



(Photo Courtesy)

# Engineering Water for 7 Million People – The Mandate of Lake Victoria North Water Works Development Agency



Eng. Samson Peter Gongi –  
Ag. C.E.O, Lake Victoria North  
Water Works

**E**ngineering in Kenya spoke to Lake Victoria North Water Works Development Agency Chief Executive Officer Eng. Peter Gongi, whose agency is attempting to resolve water and sewerage challenges afflicting residents of Western Kenya. Here, excerpts.

## **Lake Victoria North Water Works Development Agency. What's your mandate?**

The Lake Victoria North Water Works Development Agency (LVNWWDA) is one of the nine (9) Water Institutions established under the Water Act 2016, Legal notice No. 28 of 26<sup>th</sup> April, 2019 amended with variations and modifications made through Legal Notice No. 5 of 4<sup>th</sup> February, 2020 as part of the reforms which seek to improve governance and service provision in the water sector.

The Agency covers six (6) counties namely Nandi, Trans Nzoia, Bungoma, Busia, Kakamega and Vihiga with a population of 6.9 million (2019 census). Our mandate includes development, maintenance and management of the national public water works and sewerage infrastructure within our area of jurisdiction through funding from The National Government and other development partners that are sanctioned by The National Treasury through the parent Ministry of Water, Sanitation and Irrigation as per the 2016 water act and 2010 constitution. We also provide technical services and capacity building to such county governments and water services providers within our area of jurisdiction as may be requested; provide to the Cabinet Secretary technical support in the discharge of his or her functions under the Constitution as may be requested.

We have mapped out the water and sanitation infrastructure needs across all the counties and included them in our strategic and investment plans for current and future investments, in order to improve from the current

coverage of 58% to 70% for water and 32% to 50% for sanitation by the year 2030.



**Our undertakings entail projects appraisals, feasibility studies, technical designs, actual construction and handing over after completion for operations to water services providers that are under respective county governments.**



Currently the Agency is implementing major water projects, financed by AfDB in Malaba, Kiptogot-Kolongolo and Nandi Hills, and a sewerage project in Malaba town. Additionally, GoK is financing implementation of water and sanitation projects in Malava town and Mois-Bridge and Matunda towns, among several other small projects. There are several planned projects that await funding.

## **What are some of the reforms your Agency is seeking to improve governance and service provision in the Water Sector?**

The Agency seeks improved and structured cooperation with county the governments within the region on matters that entail trans-boundary waters so as to serve its entire population adequately. This is because certain water sources emanate from a given county, their conveyance systems are constructed to traverse other counties while service areas are meant to be at other counties downstream. Sewerage services, likewise, face similar scenarios and such has caused conflicts between

different county governments and water services providers. There is, therefore, the need for understanding among county jurisdictions to share water resources and sanitation facilities.

The Agency also roots for harmonized water infrastructure investment planning with respective county governments in order to reduce cases of duplication, and also enhancement of quality service delivery. Since the promulgated Constitution of 2010 gave the mandate to County Governments to be the provider of water services and the same got anchored in Water Act 2010, there have been challenges of breakdowns of the constructed facilities coupled with inefficient operations of the water supplies and sanitation infrastructure across board. These challenges are eminent countrywide. As a policy reform, unlike the current situation, water and sanitation infrastructure ought to be inspected by and corrective measures recommended by Water Agencies in order to minimize rate of dilapidation, and also to enhance sustainability and service delivery to the population demand.

## **How are your strategic investment plans aligned with your ratified mandate?**

Our strategic and investment plans have taken into account the National Water Sector Strategic Investment Plan and have been aligned to Vision 2030 mission and SDGs. We have done needs assessment and prepared concepts, feasibility studies and preliminary designs on mega flagship projects that would be implemented under Vision 2030. These are bulk projects that would serve the ever growing demands, many years beyond year 2030. This is being done in line with the guidelines of the parent Ministry of Water, Sanitation and irrigation and The National Treasury. However, successes



of these plans require political goodwill, prioritization of funds allocation by The National Government and development partners.

In ensuring that quality of services is above board, the Agency has in place departments and divisions that encompass Engineering, Human Resources, Procurement, Legal, Environmental, Finance, and IT and Audit specialties, each of whose personnel are regulated by professional bodies. Additionally, the Agency upholds integrity and ethical values and has its processes monitored through ISO audit and EACC monitoring and reporting.

***What role does partnerships play in realizing water security?***

The Agency is regulated by the Water Act 2016 and is under supervision of the Ministry of Water, Sanitation and Irrigation through various policy guidelines that are published from time to time. Together with the regulations, we do engage partners at various levels in the process of achieving our mandate.

Considering that water is a devolved function as per schedule 4 of the current constitution, involvement of the county governments and other stakeholders is key to acceptability and successful take over for smooth operations and maintenance.

Fundamentally, the Agency does public participation and mobilization with community representatives and elected leaders and this goes on throughout the projects' life cycle from needs identification through to implantation and handing over of completed projects.

For Financing we engage development partners such as The World Bank, African Development Bank, UNICEF and GoK through the parent Ministry and National Treasury, and private partners by sharing with them proposals for funding, and accounting for the same during and after implementation of projects.

While implementing the projects, we interact with key institutions for approvals and joint monitoring. The institutions include NEMA, Kenya Forestry Services, Roads Agencies,

Water Resources Authority, National Construction Authority, Kenya Power, Water Services Providers, KEBS, County Governments among other regulatory bodies.

The Agency, additionally works closely with The National Government Projects Coordinating Units, i.e. the Presidential Delivery Units, and the administrative offices in the respective county jurisdictions.

We also involve professional consultants and works contractors has always come handy in achieving our operational and infrastructural development plans and progress.

***What are some of the major resources you would recommend to one looking to gain insight in becoming a better engineer/executive?***

Other than selection and recruitment of the best professional brains with commitment to achieve organizational goals, a conducive environment that enables wider consultations across the divide of professionals and academia, on ideas and engineering principles is key to successful concepts

development and implementation of major hydraulic infrastructure projects within our mandate. This also becomes a spring board for experienced human capital resource and show case project models. I therefore recommend enhancement of better working environment for personnel in different cadres and academia with the emphasis to providing requisite equipment and continuous capacity building.

***Concluding remarks?***

Lake Victoria North Water Works Development Agency's achievements are courtesy of its committed Board of Directors, staff and the parent Ministry. We have a culture of wading through challenges and moving forward positively for the benefit of the people that we serve, and being an example to upcoming engineers and other institutions. Infrastructure development cannot be done through pocket change. New ideas on resource mobilization will come in handy for speedy development and attainment of national & global water and sanitation coverage.



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# Role of Academia-Industry Linkage in Engineering the Future

**T**he University of Nairobi Faculty of Engineering is strengthening industrial linkages driven at producing high-caliber Engineers for Kenya's growing economy. Our Staff Writer **Maureen Mwangi** spoke to the Dean, Faculty of Engineering Eng. Prof. Ayub Gitau

**You have over 30 years of academic and practical engineering experience. Why is engineering and technology education critical in Kenya today?**

There is little distinction between engineering and technology. Technology is an application of science closely related to Engineering and Industry. As a country, we have to embrace the changes in industry or find ourselves left behind by industrial revolution. Technology is very crucial. We are now dealing with data, and it is important to teach our students Artificial Intelligence, the Internet of Things (IOT) as well as and machine learning, in a bid to completely embrace technology. The University of Nairobi Faculty of Engineering offers a five-year degree, two-year master's and three-year PhD programmes. For the first and second years, we prepare learners to become Engineers. We teach them a lot of mathematics, basic sciences and complementary studies such as HIV, Entrepreneurship, Management, Elements of philosophy, Communication skills etc. The latter is important for our students to become holistic, forming a basis before studying engineering. At third and fourth years, we start teaching them mainstream engineering and engineering design. The Faculty is composed of several departments: the Departments of Electrical, Civil, Geospatial and Space Technology, Bio-systems and Mechanical Engineering.

As we train them, they are also working closely with the industry through internal and external attachment and finally, they go for internship (On Job Training)

structured by the Engineers Board of Kenya (EBK). We encourage our students to get training within their area of specialization from various industries to be well packaged in their fields.

**How is your Institution working towards properly equipping engineering students to tackle today's challenges, to envision and innovate for the future?**

The University of Nairobi Faculty of Engineering is well staffed with highly professional engineers, technical staff and innovative researchers who train our students to re-engineer the world. We work closely with the industry to equip our students with the necessary skills.



**Currently, there are software applications that have been designed to help our students design and bring high-end results where high accuracy is needed.**



We might be having a higher population of students than an engineering faculty can accommodate, but we try to group them according to their thematic areas and go through rotational way learning operations. Equally important, today we have online packages for our students to ensure that we can accommodate all students in the faculty and help them acquire relevant skills.

**The Covid-19 pandemic made it necessary and urgent to review engineering education, research and practice worldwide. How are you**



*Inside a lab at the University of Nairobi. (Inset)*

*Dean University of Nairobi Faculty of Engineering Eng. Prof. Ayub N. Gitau*



**adapting as UoN?**

Engineering is very hands-on, you have to see, touch and interact with the equipment. We embraced virtual learning during the pandemic but it was coupled with a myriad of challenges. For practical's, they had to come to the laboratory. We highly recommend a physical examination as online is quite a challenge.

We have to do quality control and bring in integrity, and we had to do physical interactions at some level. The University has innovated smart boards where you can interact with a small number of students, and discuss and have a conversation with your class but the nature of the course does not allow us to fully focus on virtual classes. The world has entered Industry 4.0; the Fourth Industrial Revolution, which encompasses the automation of conventional engineering work. How is the University of Nairobi prepared for this? The university has embraced machine learning, artificial intelligence and the Internet of Things to be able to deal with enormous data and automation of conventional engineering. We introduce our students to design packages and software and technology when they come in.



*In your view, how would you describe an ideal institution of higher learning offering engineering courses?*

The whole idea of an engineering faculty is to have good industrial linkages, state of the art equipment and high-calibre professionals who are not only teaching here but also practising.

We are at a very advanced stages towards building at the university of Nairobi an Engineering and Science Complex(ESC) funded by the French Development Agency (AFD), which will facilitate academic training in Science, Technology, Engineering, and Mathematics in Kenya and enable engineering. This will also enhance building stronger links with industry and increase the internationalization of students in partnership with top French Science and Engineering universities. The agreement, which was signed on October 29, 2021, saw

the University receive approximately 4 billion shillings to accomplish the same. This will increase our state of equipment, laboratory and workshops.

“We have to establish good linkages with the industry because that is where our students will be received.”

The ESC will enable our students to interact closely with manufacturers, consultants and other engineering professionals. We have already made agreements with our PhD students to collaborate with workshops in France and the United Kingdom. We teach our students for five years and the rest of their time they spend in the industry, this means that we have to establish good linkages with the industry because that is where our students will be received. Most of our PhD student join the teaching staff after they are done with their studies and publications to lecture at the faculty.

Equally important, we encourage our lecturers to independently practice professionally to advance their skills to empower our students. We also motivate them to join professional bodies.

*How can Kenya's academia make contribution towards engineering the future?*

Engineering requires very skilled and patient graduates. The University of Nairobi is also very privileged to receive very bright students from high school and we believe that we are advancing as the economy grows.

I have worked as a Council Member at the Institution of Engineers of Kenya. I also conduct interviews for young graduates who want to become professionals under IEK and EBK. We are working towards empowering graduates to minimize waste and also inculcate discipline in them.

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# Renewable Energy Sources Poised to Enhance Rural Electrification Efforts in Kenya - REREC



**CPA Peter Mbugua (Inset) is the CEO, Rural Electrification and Renewable Energy Corporation (REREC). He spoke to *Engineering in Kenya Magazine's* Diana Kawira.**

***The Energy Act 2019 redefined the role of your state agency. What is the core mandate of REREC today?***

REREC was established to ensure we fast-track electrification in rural Kenya and achieve universal access. According to the Energy Act 2019, the Corporation has a broad mandate around spearheading Kenya's renewable energy drive and implementing rural electrification projects. The mandate cuts across planning, managing revenues, sourcing for additional funding, development, promotion of research and collaboration with the relevant stakeholders.

***What have been your priority areas of the recent past, and what's the way forward terms of strategy towards delivery of REREC's mandate?***

Our Corporate strategic plan is to enhance focus on the development of renewable energy sources in the country. The corporation is expected to take a lead in the renewable energy drive. Some of the core projects we are implementing today focused on the promotion of renewable energy. The corporation has enhanced rural electrification around Kenya; at public facilities and through installation of transformers connecting households in many places around Kenya.

***What are some of the key indicators of your success regarding 2018/2019-2022/2023 Strategic Plans?***

Connectivity. The corporation has overseen tremendous electricity connectivity - from 4% in 1973 to

75% connectivity in 2022. We have helped to connect over 63,000 public facilities, among them primary schools, secondary schools, hospitals, dispensaries and public boreholes.



**In regards to transformer maximization. We have installed over 3,200 transformers, a project aimed at ensuring that the connection to customers is achieved hence connecting thousands of customers.**



In the off-grid areas we have established 27 mini-grids around the country. REREC has connected power to consumers who are far away from the national grid. We have the largest solar power plant in East and Central

Africa, the 50 MW solar power farm in Garissa. The solar plant puts Kenya on the path of achieving green energy sufficiency as the East African nation also runs one of the largest wind farms in the continent.

The construction of 66 Kv Turkwell Kalimungorok – Lokichar Line, with two substations. Recently we have employed over 230 staff who are now helping in terms of institutionalization of our mandate.

REREC has institutionalized Renewable Energy by creating a dedicated Directorate with Alternative Energy departments, Energy Synthesis and the Research and Innovation Departments. These departments fully address issues on renewable energy resources.



REREC CEO CPA Peter Mbugua giving his remarks during the commissioning ceremony of the Bura - Bilbil - Charidende Line under electrification of public facilities project in Bilbil dispensary, Bura Constituency, Tana River County. He noted that due to limited resources, the Corporation try as much as possible to get free access to customers' lands and install power lines which help to transmit power and ensure that more customers connected, rather than using the same resources compensating for wayleave



The corporation has continued to carry out projects which are renewable energy-based, commonly known KOSAP- Kenya Off-grid solar access project.

The initiative promotes the use of solar and clean cooking technology to drive the electrification of households, enterprises, community facilities, and water pumps. The facilities target 14 of the 47 counties in Kenya in West Pokot, Turkana, Marsabit, Samburu, Isiolo, Mandera, Wajir, Garissa, Tana River, Lamu, Kilifi, Kwale, Taita Taveta, and Narok.

*As a CEO, you sure have a lot on your plate. How do you juggle between work life and personal life?*

Other than being a CEO I am also married with four kids. Having a balanced plan is my secret. I usually start my day at 6.00 am and rarely will you find me in the office past 5 pm or on weekends unless the duties I am undertaking demand that I should be in the office. It is a matter of serving the country and taking care of both friends and family.

*How do you motivate your staff to ensure the team brings their A-game?*

Among the things we are doing to ensure we are a teamwork is by taking care of our staff welfare. Anything that benefits the staff needs to be addressed fully and quickly.

We recognize and appreciate good performance and check on staff who require improvement, by checking on the training needs and providing the necessary skills needed. We are also keen on staff's career growth, we have our career guidelines which define your progression and growth within the organization.

*What are some of the challenges you are encountering, and how are you overcoming them?*

Life without challenges is meaningless. Funding. REREC is fully under the government and heavily relies on funding from the government and the development partners. In many cases, the budget is limited.

Security and terrain. A major constraint while working in rural areas

is that the roads are poor. Therefore, we are forced to navigate and find our way while carrying out projects.

The issuing of way leaves. If the way leaves are not granted on time it delays our projects. In terms of funding, we have been able to look for alternatives, like working together with counties and constituencies.

Security wise, we have partnered with the Ministry of Internal Security and they have been giving us security in some of these areas. In terms of the way leaves we negotiate with the stakeholders from the beginning of a project all way to the end.

*As a CEO, what is your preferred style of management?*

There is no single style that can be used to run an organization, different situations call for different managerial styles. Generally, I believe in participatory and transformation management styles. I like to gather a lot of knowledge, experience, and ideas from everyone both internally and externally.



REREC CEO Peter Mbugua visited Jamhuri Energy Centre in Nairobi County for purposes of welcoming and issuing offer letters to staff transitioning from the Ministry of Energy-Renewable Department to Rural Electrification & Renewable Energy Corporation.



REREC's officials, led by CEO CPA Peter Mbugua, inspecting Itaa trading center in Makueni Constituency, Makueni County. The Corporation has planned to start the project of electrifying the center this coming week, with the aim of enabling economic development in the region.



CEO Peter Mbugua received a delegation from the European Union visiting REREC to discuss the DESIREE programme, a joint initiative developed by the European Investment Bank and the European Commission (EU-INTPA) which aims to foster socio-economic growth through development of innovative business models for the provision of clean and efficient energy solutions. The EU delegation was led by Project Manager, Milan Jezic von Gesseneck



Ministry of Energy CS, Amb. Dr. Monica Juma joined by REREC's chairperson Wacuka Ikua and REREC CEO CPA Peter Mbugua, commissioning Bura Constituency in Tana River County. The region will now access electricity for social economic development.



# Engineering the Future of Civil Aviation in Kenya — Kenya Civil Aviation Authority

**E**ngineering in Kenya magazine spoke to Mr. Emile N. Arao, Director General (Inset), Kenya Civil Aviation Authority (KCAA) on the projects, programmes and activities being undertaken by KCAA and how the engineering fraternity and the country stands to benefit from them.

## a) Construction of Control Tower at Kisumu Airport.

### Rationale of this project

The existing air traffic control tower which was constructed many years back before the expansion of the runway is not able to effectively facilitate the aircraft that fly into and out of the airport. The construction of the new tower will improve efficiency in handling aircraft which will be using the airport thereby enhancing aviation safety.

Currently the ANS services are offered from the old control tower constructed many years ago. It does not allow the controller to have a commanding view of both ends of the runway and there is no adequate office space.

### Project scope

The project will entail construction of a Control Tower at site located within Kisumu International Airport. The Tower will comprise of office space to be located on ground and first floors, while the tower cabin will be located on the fifth floor of the building which is expected to have a height of 22 metres.

Following the expansion of the runway and construction of new terminal in Kisumu terminal airport, traffic in terms of the number of passengers handled by the airport has grown tremendously.

### Benefits to the engineering fraternity

Professional engineers will be contracted to perform the design of the control tower. Similarly, professional engineers will be involved in the supervision of the project during all stages of construction until commissioning.

### Benefits to the country

The enhanced efficiency of Air Navigation Services at Kisumu International Airport will attract more flights to the airport. This in turn will spur economic development at Kisumu County and Kenya as a whole.

## b) Voice Communication & Control System (VCCS) and Voice Logging System (VLS) at Wajir and Lokichoggio Airports

### Project rationale

Maintenance of the current equipment is uneconomical. Currently the systems do fail regularly and servicing them takes

long due to lack of readily available spare parts. Equipment has been operational for over ten years.

### Project scope

Delivery, installation, training and commissioning of VCCS and VLS at Wajir and Lokichoggio Airports.

### Benefits to the engineering fraternity

Engineers will be involved in the supervision of the projects during all stages of implementation until commissioning. Also, there will be technological transfer to local engineers by the expatriates involved in the project.

### Benefits to the country

The enhanced efficiency of Air Navigation Services at Wajir and Lokichoggio Airports will attract more flights to the airports. This in turn will spur economic development at Wajir County, Turkana County and Kenya as a whole.

## c) Implementation of Performance Based Navigation - Distance Measuring Equipment Constellation

### Project rationale

KCAA has implemented PBN- GNSS based navigation. The implementation of DME/DME constellation is required to enable continuity and predictability of aircraft position in the event of outage of GNSS navigation infrastructure. The GNSS navigation is to be complemented by PBN (DME/DNIE) as a redundant system of navigation within the Terminal area.

### Project scope

The project will entail procurement, installation and commissioning of DOE equipment at Ngong hills VOR station. Another DME equipment has been successfully relocated from the decommissioned Garissa site to Stony Athi VOR site.

### Benefits to the engineering fraternity

Engineers will be involved in the supervision of the projects during all stages of implementation until commissioning. Also, there will be technological transfer to local engineers by the expatriates involved in the project.

### Benefits to the country

The enhanced safety and efficiency of Air Navigation Services



at Nairobi terminal area will attract more flights to both airports of Wilson and JKIA. This in turn will spur economic development at Nairobi County and Kenya as a whole.

#### **d) Establishment of the Proposed New Area Control Centre at Mlolongo and Disaster Recovery System**

The current Area Control Centre which is located at Jomo Kenyatta International Airport (JKIA) has no disaster recovery system in place thereby posing a severe risk of disruption of air navigation services in the event of disaster at SKIA. Following an assessment carried out by a technical team constituted by the Authority in 2012, it was recommended that in order to address the aforementioned risk, the Authority establishes a new ACC that incorporates a Disaster Recovery System (DRS) at Mlolongo.

##### **Project scope**

The project entails the supply, installation, training and commissioning of Area Control Centre and Disaster Recovery System equipment that comprises of four (4) Lots namely 4.1. Lot 1 - ATM System, Synchronized voice and data recorder and replay system and Universal GPS master clock; Lot 2 - VCCS; Lot 3 - Extended AMHS; Lot 4 - VHF Transceivers; Lot 5 - Auxiliary Facilities (AVR, UPS, air conditioners).

##### **Benefits to the engineering fraternity**

Engineers will be involved in the supervision of the projects during all stages of implementation until commissioning. Also, there will be technological transfer to local engineers by the expatriates involved in the project.

##### **Benefits to the country**

The establishment of Disaster Recovery System will ensure continuity of services in case of interruption at Nairobi FIR. This will lead to enhanced safety and efficiency of Air Navigation Services in the Nairobi FIR attracting more flights into Kenya. This in turn will spur economic development of the whole country.

#### **e) VHF Radio Systems for Kisumu and Malindi Airports**

##### **Project rationale**

Currently the VHF Radio systems at Kisumu and Malindi Airports have been in operation for over ten (10) years and have become uneconomical to maintain. There is need to replace this equipment with a modern state of the art equipment that are more reliable with enhanced capabilities.

##### **Project scope**

This will entail design, supply and installation of a modern state of the art VHF Radio systems to improve the services offered by KCAA at Kisumu International Airport and Nalindi Airport.

##### **Benefits to the engineering fraternity**

Engineers will be involved in the supervision of the projects during all stages of implementation until commissioning. Also,



Mobile control tower- Ukunda Airstrip

there will be technological transfer to local engineers by the expatriates involved in the project.

##### **Benefits to the country**

The implementation of this project will provide reliable communication between air traffic controllers and pilots to ensure safe, orderly and efficient operations. The enhanced safety and efficiency of Air Navigation Services will attract more flights to both airports of Kisumu and Malindi.

#### **f) Establishment of a Relay Station for Wilson Tower Operations**

##### **Project rationale**

Traffic congestion on Wilson tower air frequency 118.1 MHz currently emitting signals from the airport with a range of 60 NM radius. The presence of the valley beyond Ngong hills creates a situation where all aircraft (approximately 15 during peak hours) call within 8 KM to 10 KM.

Cost helicopters flying low in the valley will establish contact with Wilson tower at approximately 6 KM, coupled with presence of fixed wing aircraft makes it difficult for controllers to effectively arrange traffic for the purpose of sequencing them in an orderly manner. This poises a safety situation around 6KM to 8 KM from Wilson airport on final approach runway 07.

##### **Project scope**

The project will entail procurement and installation of VHF system to enable effective provision of ANS service at Wilson airport.

##### **Benefits to the engineering fraternity**

Engineers will be involved in the supervision of the projects during all stages of implementation until commissioning. Also, there will be technological transfer to local engineers by the expatriates involved in the project.

##### **Benefits to the country**

The project is to enhance safety in air navigation by reducing traffic conflict and congestion around Wilson Airport and will ensure constant and continuous communication thus facilitating aeronautical search and rescue.

The project will enhance safety and ensure effective and efficient provision of air navigation services around Wilson airport and facilitate seamless and expeditious flow of air traffic at Wilson Airport and by extension the Nairobi FIR. This in turn will spur economic development at in Kenya as a whole.



Disaster Recovery Centre- Mlolongo



Poror Radar Station



Wilson control tower

# Kenya Power Banking on Improved Service Delivery to Return to Profitability



Kenya Power Acting MD Eng. Geoffrey Muli (Centre), Eng Peter Mwangi, in charge of the Live Line Lab and Callen Kembo, a Live Line Lab technician during the launch of the Live Line Lab in Ruaraka, Nairobi.

Eng. Geoffrey Muli is the acting Managing Director, Kenya Power. A graduate of the University of Nairobi class of 1990, he is a professional Electrical Engineer, and has worked with Kenya Power since 1998. He spoke to Engineering in Kenya Magazine's **MAUREEN MWANGI**.

## **What Strategies are you Laying in Place to Reposition KPLC in the Local Market?**

For us, the most important thing in the local market-place is for Kenya Power to remain the leading energy provider of choice to all customers and enterprises in Kenya. We are doing this by ensuring a resilient and stable network so as to continue supplying Kenyans with affordable, reliable and quality power. This will in turn position Kenya Power as the preeminent leader both locally and in the region. Kenya Power recently marked a century of powering the nation, and our strategy is aimed at ensuring that the Company continues to do so for the next 100 years.

We are fast-tracking connectivity and have launched an online portal for applications. To enhance customer experience, we have launched the \*977# USSD platform and MyPower app through which customers can easily and conveniently report power outages, and carry out prepaid token purchase queries. Post-paid customers can also query their bills, and submit their meter readings so as to get their actual monthly bills.

We have also stepped up inspections to address the issue of faulty meters and transformers so as to reinforce the network and enhance its robustness.

## **Talking of Optimization, What Amount of Effort is Kenya Power Engaging Towards Growing and Securing Revenue?**

In terms of commercial cycle optimization, we are striving to be viable by automating our billing activities. This has resulted to more accurate and timely billing. To improve our efficiencies and enhance revenue collection, we rolled out a smart meters roadmap that has seen us install smart meters in 7,000 Large Power and 67,000 SME customers. We have also established seven smart meter data control centres across the country. We are planning to install an additional 75,000 smart meters for SME accounts in this Financial Year. These meters automatically send readings for billing and disconnects defaulters without the need for our staff to physically go to a customer's premises. The system alerts us whenever there is a phase failure or power outage, and incase the meter installation is interfered with.

Additionally, we are striving to bring on board new customers, especially industrial and larger consumers, as this category contributes hugely to our revenue.

Besides focusing on the premium customers, we are also putting in effort to satisfy our domestic customers, who contribute to our books too.



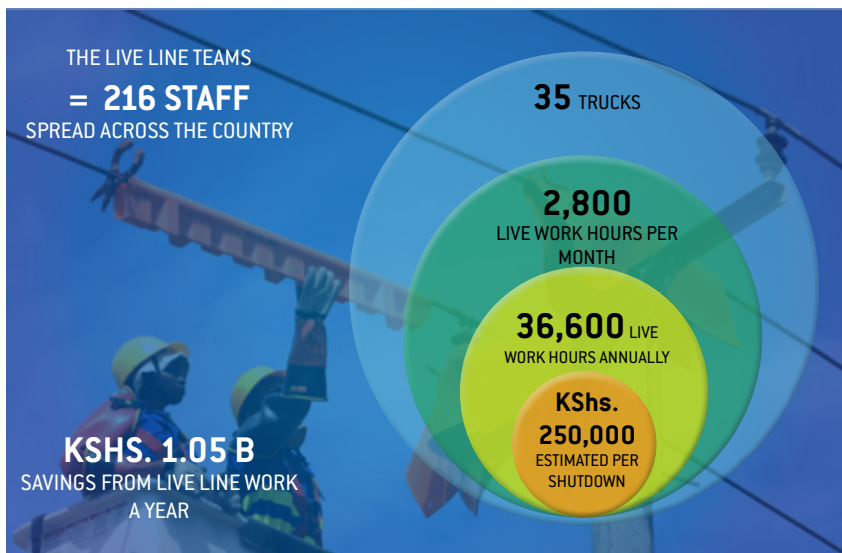
Additionally, the Company boasts over 7,000 kilometres of fiber network which offers dark fibre services to the country's and the region's leading Internet Service Providers (ISPs). We are planning to launch our Lit Fibre business in the course of this financial year as part of our diversification strategy.



## **How Much Is KPLC Investing in Modernizing of the Electricity Network? Which Station[s], Feeders, Substation[s] are Completely Modernized and Where Next?**

We have installed the Advanced Distribution Management System (ADMS) project commencing with Nairobi county and parts of Kajado, Kiambu and Machakos counties. The project entails the installation of automatic power line insulators, and control equipment, which are manned and operated remotely from the Company's Regional Control Centres. This has reduced customer outage time leading to improved satisfaction and growth in sales. In addition, we are able to quickly transfer customers to alternative feeders when incidences occur hence minimizing unserved energy. Additionally, we have invested in network automation through the Supervisory Control and Data Acquisition (SCADA) project that offers an automated platform to enable





remote access of our substations and network from both the national and regional control centres. We have automated 244 out of the current 294 transmission and primary substations. Adoption of SCADA has helped in improving service delivery by enhancing flexibility in power distribution operations and enabling efficiency in network management.

**Renewable Energy. Electric Vehicles are a New Frontier Touted to Hold Immense Potential for the Future. How Prepared is Kenya Power to Tap into this Emerging Market?**

Kenya Power is supporting the entrenchment of e-mobility in Kenya through a liaison office. We are working with other stakeholders including the Ministries of Energy and Transport, investors, and assemblers to support the development of the e-mobility ecosystem. The office is also working closely with customers seeking to set up charging stations to make the process seamless. In fact, we recently participated in the launch of BasiGo, the country's first electric PSV buses, and connected the charging stations. During our Expo held in July, we also provided an opportunity for two other organisations producing and supplying e-motorbikes and bicycles to showcase their products. The Company is also in talks with several other stakeholders who are keen to invest in this exciting space.

**Tell Us About the Recently Launched Live Line Laboratory. What Sort of Financial Reliefs Do You Stand to Reap?**

The main purpose of our Live Line Lab is to test equipment used in our Live Line Technology, so as to effectively enable us maintain high and medium voltage networks without switching off customers.

Kenya Power, which has been outsourcing these services at a cost of KShs.36 million annually, is looking to make a saving in line with its cost management philosophy. Additionally, the Company is working to have the facility certified by the Kenya Accreditation Services (KENAS) which will enable it to offer testing services to other organisations, including manufacturing industries within the region as way of revenue generation.

The Live Line technology has contributed significantly to a reduction in unserved energy, and improved customer satisfaction, especially in industrial areas. The Live Line teams, which comprise 216 staff spread across the country and 35 trucks, are currently doing an average of 2,800 live work hours per month, which translates to 36,600 live work hours annually. Based on an estimated outage cost of KShs.250,000 per shutdown, the annual savings from Live Line work is approximately KShs.1.05 Billion a year.

**What Challenges is Kenya Power Presently Grappling with? What Sort of Remedies Are You Implementing in Mitigation?**

We have a grid comprising of

86,986kms of high and medium voltage lines, serving more than 8.8 million customers in cities, towns, and villages across the country. Our customer base has grown by more than 260% in the last 10 years, increasing the electricity access rate to 75% from a low of 29%; making Kenya a regional electricity powerhouse. This growth has come with its fair share of challenges, making our network to be constrained in some areas in terms of loading. This has led to technical losses that we are working to reduce by investing in system reinforcement. The increased number of customers requires us to have increased human resource and ICT capacity, to service those customers. Vandalism and electricity theft is also another challenge we are facing. We are tackling it by working with the Ministry of Interior to tame this menace, and placing our transformers in areas that are not prone to vandalism.

**Kenya Power's Present Goals and Objectives. What Do You Aim to Do to Engineer a Complete Turnaround?**

Our main area of focus is on loss reduction and increasing sales. We work in a regulated environment and the cost of power is fixed. This means we have to ensure that every meter is reading and customers have continuous supply of power to be able to sell more.

We are working towards commercial cycle billing automation so that our billing is correct. We are also working towards improving our customer service to ensure our customers are satisfied.

**Where Do You Envision Kenya Power in the Next 10 Years?**

Kenya Power will continue to chart a path of good service delivery, our focus being providing reliable, affordable and clean power. We envision to continue being a tough leader in the energy space while also ensuring we remain profitable in the foreseeable future.

# LAKE VICTORIA NORTH WATER WORKS DEVELOPMENT AGENCY



*Julius Barasa Wasike, H.C.S., -  
Chairman, Lake Victoria North  
Water Works*

Lake Victoria North Water Works Development Agency (LVNWWDA) is one of the Water Works Development Agencies under the Ministry of Water, Sanitation and Irrigation (MoWSI) established by the water act 2016 section 65(1), as part of the reforms in the water sector with the mandate of developing of water and sanitation infrastructure within their respective areas of jurisdiction on behalf of the national government. The Agency serves 6 counties of Bungoma, Kakamega, Vihiga, Busia, Trans-Nzoia and Nandi with a total area coverage of approximately 15,000km<sup>2</sup> and an estimated population of about 7 million people.

Over the period since the establishment of Water Sector Reforms of 2002, the Agency (previously known as Lake Victoria Water Services Board), water and sanitation infrastructure development and services provision has been remarkably implemented across the entire Western Kenya region and part of Rift Valley region. With the growing population and expansion of urban and peri-urban settlements, the Agency is determined to meet the water and sanitation demands of the region with the aim of achieving the MoWSI set target of 80% access to clean water and 46% for improved sanitation by the year 2030.



*Eng. Samson Peter Gongi – Ag.  
C.E.O, Lake Victoria North  
Water Works Development  
Agency*

## Infrastructure Development under Lake Victoria North Water Works Development Agency

As the core mandate, Lake Victoria North Water Works Development Agency constructs water and sewerage infrastructure through funding from The National Government and other external financiers that are sanctioned by The National Treasury through the parent Ministry (MoWSI).

We have mapped out the water and sanitation infrastructure needs across all the counties and included them in our strategic and investment plans for current and future investments, in order to improve from the current coverage of 58% to 70% for water and 32% to 50% for sanitation by the year 2030. Our implementation approach entail projects appraisals, feasibility studies, technical

designs, actual construction and handing over after completion for operations to water services providers that are under respective county governments.

Our current interventions include implementation of major water projects, financed by AfDB in Malaba, Kiptogot-Kolongolo and Nandi Hills, and Malaba Town Sewerage Project. Additionally, GoK is financing implementation of water and sanitation projects in Malava town and Mois-Bridge and Matunda towns, among several other small projects. There are several planned projects that await funding. Most recently (2021) the Agency has successfully implemented Greater Vihiga Cluster Water Supply Project at a cost of EUROS 15.5 Million (KES 2 Billion). Our achievements are courtesy of international stakeholders participation and commitment by our Board of Directors, staff the parent ministry.



*Eng. George Odedeh, Chief  
Manager Technical Services,  
Lake Victoria North Water  
Works Development Agency*

## Completed Vihiga Cluster Water Supply Project

For a period of over a decade, potable water service level coverage for Vihiga County has been below 32% and before our intervention, the available water supply facilities could not adequately serve its population. The county has 10 urban centres (namely; Maseno, Mbale, Luanda, Chavakali, Jeptulu, Kaimosi, Serem, Gambogi, Hamisi, Shamakhokho and Vihiga) and with a growing population and increasing demand.

Challenges in water services provision in Vihiga county were eminent due to the following reasons: Underdevelopment of infrastructure; Old and dilapidated water supply facilities; High electricity costs which consumes 60% of total revenue collections; High operation and maintenance costs, at 40% of total revenue collections; High

Non-Revenue Water (Un-Accounted – for water) at >43% in average across all the working water supply projects within the county; Low metering ratio at only 60% within the service area; High cases of waterborne diseases; and Low economic growth occasioned by poor potable water coverage. The Agency, therefore sought financing from the Government of the Kingdom of Belgium through the Ministry of Water and Sanitation and The National Treasury for an additional capacity of water by 12,500m<sup>3</sup>/day from the initial 4100m<sup>3</sup>/day; optimized operational energy by integrating solar system with the grid system, and capacity building of the WSP through equipment supplies and trainings.

The targeted service areas were clustered into:

- (i) Kaimosi Water Supply System, covering Kaimosi Complex- Shamakhokho - Mudete regions;



- (ii) Mbale Water Supply System, covering Mbale town, Chavakali town and surrounding centres; and
- (iii) Maseno Water Supply System, that covers Emuhaya-Esirabe-Kima-Luanda-Maseno University region. The interventions in these areas cater for more than 70% of the urban water requirements in Vihiga County.

With the increased treated water capacity, it is expected that the County Government would operate the facilities efficiently, increase their revenue collection and improve access of water by the population.

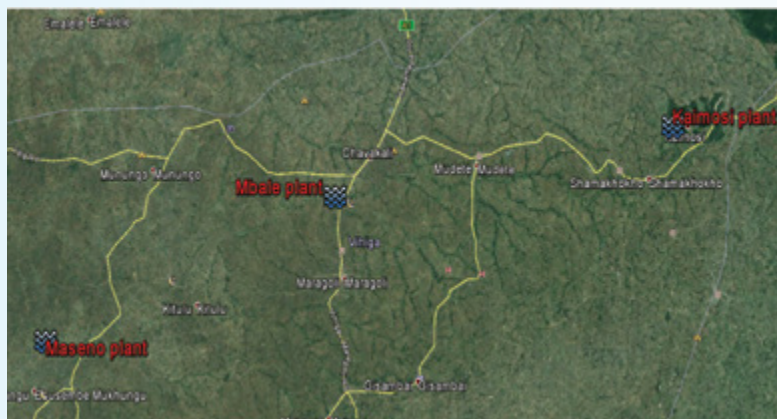


Figure: Location of the three Vihiga Cluster Water Supply Projects

### Project I: Kaimosi Water Supply



Figure: Solarized power configured with grid to power Kaimosi Water Treatment Plant

Additional Population to be served (by 2033)	57,427 people	Initial Capacity	1,100 m <sup>3</sup> /day
Total Projected population to be served (by 2033)	137,427 people	Additional Capacity	2,500 m <sup>3</sup> /day

### Project II: Mbale Water Supply



Figure: Mbale Water Treatment Plant

Additional Population to be served (by 2033)	60,123 people	Initial Capacity	2,000 m <sup>3</sup> /day
Total Projected population to be served (by 2033)	145,123 people	Additional Capacity	5,000 m <sup>3</sup> /day

### Project III: Maseno Water Supply



Figure: Solarized power configured with grid to power Maseno Water Treatment Plant

Additional Population to be served (by 2033)	60,123 people	Initial Capacity	2,500 m <sup>3</sup> /day
Total Projected population to be served (by 2033)	145,123 people	Additional Capacity	5,000 m <sup>3</sup> /day



## GDC Engineers Crucial in Development of Geothermal Resources

By Pauline Sheghu, HSC

On a typical hot day in Baringo-Silali Geothermal project, a GDC team of engineers and technicians are busy clearing bushes and rolling over boulders, as they prepare an access road to an identified drilling site. At the site, a GDC team of drillers anticipates drilling the earth for geothermal steam that will be used to generate power.

Indeed, drilling operations are more than assembling rigs and boring the earth. It involves a series of activities which include development of access roads, preparing of well pads and laying water pipes for use in drilling. These initial critical tasks are carried out by a team of engineers and technicians. Their main job is to ensure a successful site preparation in readiness for drilling activities. Here, electrical, civil and mechanical engineers alongside technicians engage in project implementation. It is this pool of engineers that GDC relies upon to take the lead in the design and execution of GDC projects, in all engineering matters.

In Baringo-Silali Geothermal Project, the team has played a critical role in developing infrastructure which include access roads and developing a water system for drilling, domestic and power plant operations. The engineers and technicians have also been involved in the development of drill pads.

"A well pad is normally 150m by 80m, making it one of the major infrastructure components in drill site preparations. The magnitude of such a project requires that we assemble an elite pool of engineers, technicians and other support staff such as plant operators and articulated drivers," says GDC Chief Engineer Joseph Mberia.

"As we develop geothermal wells, there is no huge hill or boulders that



▲ GDC technicians at Work

Waterline ►

we can't flatten with bulldozers and excavators. We ensure that we level grounds according to the needs of the organization and we also take into consideration the proposed use of the area to be levelled", says Eng. Mberia.

The team has also been involved in the provision of drilling water to enable drilling of wells, designing the evacuation line as well as taking part in the design of the Steam Gathering System (SGS) in the Menengai Geothermal Project. The role of the SGS is to collect steam from different wells which is then channeled to the power plant. GDC engineers are operating and maintaining the SGS.

Among notable engineering projects achieved by the team in GDC Menengai Geothermal project include the construction of water boreholes, the transmission mains, distribution pipeline, water storage, access roads

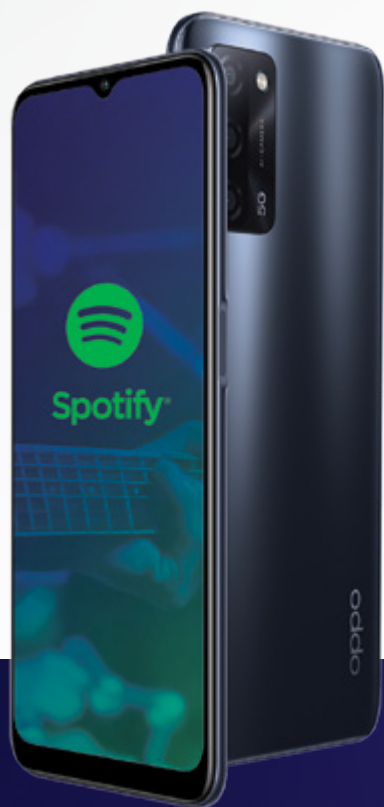


and drill pads. In the Baringo-Silali Project, the team has played a key role in the construction of high lift pump stations, water pipeline used for drilling, community water distribution pipeline and watering points, access roads and drill pads.

Indeed, engineers play a crucial role in the development of geothermal resources. The skillset possessed by this specialized group of professionals contributes heavily to the success of a geothermal project.

**Pauline Sheghu, HSC is a Communications Officer Geothermal Development Company (GDC)**





## OPPO Teams Up with Spotify for Smart and Customized Music Experiences in ColorOS 13

**September 2, 2022, Nairobi, Kenya** — Global leading technology company OPPO today announced a new partnership with popular audio streaming platform Spotify, to create an all-new easy, and customizable music experience on OPPO smartphones through its latest ColorOS 13 Android-based Operating System.

With the Spotify app fully integrated with many new smart features in ColorOS 13, Kenyan listeners can now enjoy music, podcasts, and audiobooks with easier access and convenient control over the Spotify app on the home screen of their OPPO device in Kenyan markets where listeners may register for and use the Spotify service. This includes:

**Smart Always-On-Display (AOD):** Kenyan Spotify listeners have a whole new way to keep their music, podcasts, and audiobooks at their fingertips. They can now know what Spotify content is playing simply by glancing at the AOD and double-clicking on the music control panel, without the need to wake the device up. The AOD integration also allows users to access and control the playback of their favorite audio content from Spotify and access Spotify content recommendations - all without unlocking the device.

### Smart Always-On-Display supports Spotify controls and information display

**Shelf:** The new Shelf feature in ColorOS 13 includes an in-built Spotify Card containing Spotify content recommendations and through which Kenyan OPPO users have access to their favorite music on the Spotify app just a slide away.

### In-built Spotify card in shelf in ColorOS 13

**Home Screen Widgets:** The Spotify widget can also be added to the ColorOS 13 home screen to provide quick and easy access to the Spotify app.

### Spotify widget on ColorOS 13 home screen

**Clock1:** An alarm integration in the ColorOS 13 Clock app enables users to wake up every morning to their favorite Spotify tracks, playlists, and podcasts.

### Spotify alarm integration in the ColorOS 13 Clock app

“Our partnership with Spotify represents a new exploration into the possibilities of smartphone operating systems,” said Gary Chen, Head of OPPO Software Product. “Through smart, convenient, and human-centric features developed with our partners, we are bringing a more intelligent and efficient operating system to users, enabling them to spend more time enjoying music and the other most-loved features on the OPPO smartphones.”

Ian Geller, Global Head of Consumer Business Development at Spotify said, “At Spotify, we’re always working to offer our users the best listening experience out there. Through our partnership with OPPO, we aim to elevate the Spotify experience through OPPO ColorOS 13’s smart and human-centric features, delivering value for existing and new consumers of both brands”.

ColorOS 13 is the latest Android-Based Operating System from OPPO. Designed for simplicity and comfort with its Aquamorphic Design, ColorOS 13 features a series of innovative and intelligent features that include Multi-Screen Connect, Meeting Assistant, Smart AOD, and Home Screen Management. Based on the Android Operating System, ColorOS provides exclusive, intelligent, and user-friendly experiences to over 500 million global monthly active users. It is available in 67 languages, including English, French, Spanish, and Hindi.

### About OPPO

OPPO is a leading global smart device brand. Since the launch of its first mobile phone - “Smiley Face” - in 2008, OPPO has been in relentless pursuit of the perfect synergy of aesthetic satisfaction and innovative technology. Today, OPPO provides a wide range of smart devices spearheaded by the Find X and Reno series. Beyond devices, OPPO also provides its users with the ColorOS operating system and internet services such as OPPO Cloud and OPPO+. OPPO has footprints in more than 60 countries and regions, with more than 40,000 employees dedicated to creating a better life for customers around the world.



# BIM and GIS Integration for Infrastructure Planning and Design

By Elijah Ochieng'

It has never been easy for Infrastructure planners and design engineers to aggregate and use existing data and geo-information (GIS) to correctly plan, design, construct and even operate and maintain assets such as rail networks, airports, bridges and roads. GIS provides the context in which the new infrastructure is positioned with respect to the existing utilities, buildings and other infrastructure. While GIS helps us understand how to put the infrastructure in that context, BIM information is the vital element that allows for the designing and building process of that infrastructure to take place.

In the AEC industry, the process that many use solely relies on consistent data and software systems with inherent problems of data validity, incompatibility and inability to share the data seamlessly between different platforms. Such problems have been causing more issues than the industry can solve. Each time data is moved between the stages of a certain project a good percentage, if not the entire sets of data, are lost.

The problem appears the moment a project stakeholder requires data from an earlier stage of the process. Engineers, designers, and planners must retrieve that data, sometimes manually, which causes even more problems. The GIS industry stepped forward by making a move towards 3D modelling to solve this issue.

The process of merging BIM and GIS data is referred to as BIM and GIS Integration. Once merged, BIM and GIS data provides a geospatial element that can be used in infrastructure design, which allows for more efficient workflows and consistent data. This has greatly helped in reducing the data loss when moving from the planning stage down to design through to construction and even operation.



Figure 1 – Integrated relationship between BIM and GIS

In simple terms, BIM and GIS integration is the process of blending the BIM model into layers of the geospatial context. This will enable designers to make use of GIS, sometimes including surveyed data to get the most accurate information about proposed construction project areas. For example, GIS can provide the designers with the information on flooding history of a location proposed for construction, and if it reveals that the area is prone to flooding, appropriate design provision will be made and correct construction methods can be taken to avert future flooding once the project is open for public use.



Figure 2 - Integrated GIS and BIM Model

BIM and GIS Integration is important because GIS information can be applied in varying project sizes – from small, localised project areas to cities, provinces/states and even country areas while BIM data is closely tied to designing and constructing infrastructure components such as roads, bridges, rails, drainages structure of different shapes and sizes. The integration therefore allows both the GIS and the Engineering team to work together to deliver more resilient and sustainable infrastructure. Put data at the centre, remove silos and connect workflows with integrated GIS and BIM Models.

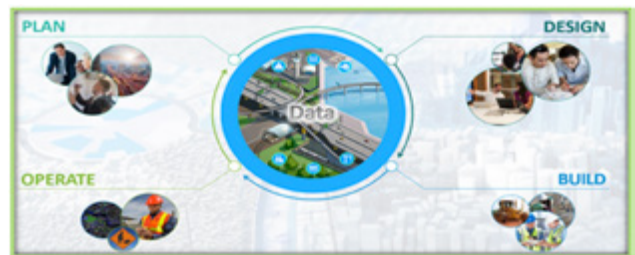


Figure 3 - Putting Data at the centre and connecting workflows

Including GIS broadens the picture by adding a smarter and larger environment context, meaning that the object will become a part of the roads, utilities and land in that environment. Integrating GIS and BIM data allows design and construction companies to collect accurate and valuable data that will lead to much more effective and efficient design and project management.

Some of the Benefits of GIS and BIM integration include combining BIM information with up-to-date GIS, eliminating data redundancy, Access to GIS during design without data duplication, access to BIM details from within GIS and combination of BIM models in one spatially correct environment, Moving data seamlessly between the stages of the design and construction process, storing all data in the cloud to improve data management in any environment and eliminating the need to convert data for use in other contexts.

In conclusion, the need for GIS/BIM integration has risen from the initiative to take the most innovative infrastructure design and construction approach toward building smart cities. To do that, geospatial companies must make their decisions, plans and everything else smarter than before.

The best way to do that effectively is by connecting and integrating GIS and BIM. Such integrated systems are the very foundation of the evolution to come. This evolution will include the most advanced infrastructure ranging from autonomous vehicles to entire smart cities.

*Elijah Ochieng' is a Civil Engineer & BIM Consultant. His contact [elijah.ochieng20@gmail.com](mailto:elijah.ochieng20@gmail.com)*



# In North Rift, a New IEK Branch is Born

By Maria Monayo

THE Institution of Engineers of Kenya launched the IEK North Rift branch in a colorful event held at the Boma Inn hotel on 6<sup>th</sup> August 2022. The North Rift Branch is expected to serve Elgeyo/ Marakwet, Nandi, Trans Nzoia, Turkana, Uasin Gishu and West Pokot counties. The event was attended by the IEK President Eng. Erick Ohaga as well as the IEK Honorary secretary Eng. Shammah Kiteme and IEK CEO Eng. Linda Otieno. The event was graced by area leaders including the then Uasin Gishu governor Jackson Mandago who was represented by his Deputy Daniel Chemno. The launch was an initiative of the Outreach Committee as part of the Institution's goal to enhance participation in "Mashinani", bringing on board Engineers that are not yet members of IEK in bid to enhance industry-wide linkages for Engineers across the country. Currently the

Institution has 5 branches namely Coast Branch, Central Branch, Western Branch, Capital Branch and North Rift Branch.

The established leadership will undertake Coordination of activities within its jurisdiction so as to tap into the pool of shared experiences, identification and nurturing of linkages within the industry, collaboration with institutions of higher learning and engineering organizations to promote studies in engineering disciplines while providing mentorship to students within its jurisdiction, mentorship to encourage students in high schools in the counties of Elgeyo Marakwet, Nandi, Trans Nzoia, Turkana, Uasin Gishu and West Pokot to study engineering as well as organizing various CSR activities Mashinani in liaison with the Welfare Committee.



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**LVSWWDA CEO**  
**Mr. Chrispine Juma, HSC**

# Lake Victoria South Water Works Development Agency

## Project Name

**TRANSFORMATION OF WATER SECURITY AND SANITATION IN KISUMU COUNTY THROUGH LAKE VICTORIA WATER AND SANITATION PROGRAM (LVWATSAN)**

### Background

Lake Victoria South Water Works Development Agency in collaboration with the County Government of Kisumu and KIWASCO have embarked on a milestone 5 year plan to transform Kisumu City and County as regional hub to the Western Kenya. Kisumu city is the third largest city (in Kenya) with a population of 610,082 (2019). The city is located at the shore of Winan Gulf of Lake Victoria, strategically connecting Kenya, Uganda and Tanzania, through Lake Victoria. The city is undergoing rapid urbanization and industrial development. Currently, the Government is rehabilitating the Kisumu Port. Establishing Industrial Complex at Ombeyi (Miwani Area) and expansion of Jomo Kenyatta Highway through the city among other ongoing development projects implemented by the National Government of Kenya in collaboration with the County Government of Kisumu.

### Goals

A healthier population, cleaner environment and economic growth of Kisumu city and satellite towns through an increased water and sustainable sanitation service coverage to meet the Sustainable Development Goals by the year 2030.

### Objective

- Increase access to clean, portable water supply in Kisumu City, Kiboswa, Ahero and Maseno towns.
- Increase access to sanitation in Kisumu city to reduce water and hygiene related diseases.
- To rehabilitate Kisat and Nyalenda ponds and construct new Wastewater Treatment Plant at Otonglo to improve the effluent quality discharged into the Lake Victoria.
- Reduce Non-Revenue Water from 46% to 20%
- Enhance capacity of KIWASCO/LVSWWDA in management of LVWATSAN

### Development Relevance

The LVWATSAN Project will facilitate the realization of the Big-Four Agenda through water and sanitation connection to:

- Industries: 15No industries including: Industrial park at Ombeyi, Kisumu Port, 7No. railway stations, Coca-cola, Kenya Breweries, Kenya Pipeline Co, Unga Limited, Kisumu Int.Airport, e.t.c,
- Health facilities: Oginga Odinga Referral Hospital, District Hospitals, St.Jairus Hospital, Kisumu Specialist Hospital, e.t.c
- Education Institutions: Over 21 Primary Schools, 10 Secondary Schools, Colleges and Technical institutes (RIAT) and Universities (Maseno).
- Informal Settlements: Manyatta, Mamboleo, Nyamasaria, Kanyamedha, Kaloleni, Nyalenda, Bandani and Otonglo.



### Scope

The scope of LVWATSAN Project includes;

- Construction of 110km of water supply distribution networks in Kisumu city, Kiboswa and Maseno towns to achieve 90% coverage.
- Construction of 70 km sewer networks within Kisumu city covering Mamboleo, Manyatta, Nyamasaria, Kanyamedha, Bandani, Otonglo, etc to achieve 50% sanitation coverage.
- Rehabilitation of Nyalenda Waste Stabilisation Ponds and Kisat Wastewater Treatment plants.
- Water Supply and sanitation in Bandani, Kanyamedha, Otonglo, Airport, Korando and areas.
- Construction of a modern Sewerage Treatment Plant at Otonglo Area.
- Water Resources and Wastewater Masterplan for Kisumu County.
- Water and Water Quality Monitoring for water bodies in Kisumu county.
- Technical training to KIWASCO, LVSWWDA and County Government of Kisumu.
- Technical Support to KIWASCO to reduce Non-Revenue Water from 46% to 20%.
- Corporate, Social Responsibility measures within Otonglo Area e.g New Dispensary, Rehabilitation and upgrading of Ngege Primary School and Training of 20 students from the community at KEWI (Diploma and Certificates).

**Estimated Cost** The overall LVWATSAN Project estimated cost is KES 7.0 Billion.

### Benefits

The project will benefit residents of Kisumu and beyond through:

- Reduction of water and sanitation borne diseases e.g. Cholera, Bilharzia, Typhoid, dysentery, amoeba, e.t.c.
- Reduction of pollution of Lake Victoria
- Economic development due to industrial production
- Community empowerment through Employment creation to over 1500 youths (during construction), 5,500

### Beneficiaries

Over 350,000 residents will benefit from clean water and safe sanitation, 7,000 people through employment and 20 students from the local community by Sponsorship in Technical Training Institutes e.g. KEWI and Kisumu Polytechnic.

### Key Stakeholders

County Government of Kisumu, KIWASCO, Project Affected Persons, NEMA, WRA, NLC, KAM, Maseno University, Political Leaders (MPs, County Women Rep, MCAs), NGOs, Financiers (AFD, EIB, EU),

### Main Risks

- Global macro-economic fluctuations on key materials
- Residual impact of COVID -19 Pandemic

### Time plan

Overall Timeline : October 2021 – December 2027



LVSWWDA hosted a delegation from France headed by the French Ambassador to Kenya and Somalia, Her Excellency Mrs. Aline Kuster to a mission tour of Dunga water intake and treatment plant in Kisumu County.

**Lake Victoria South Water Works Development Agency**

P.O. Box 3325-40100, Kisumu

**Tel:** +254 (057) 2025128, (020) 2157233,

**Hotline** 020-2463081 | **Email:** info@lvswwda.go.ke





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- Diploma in Electrical and Telecommunication Engineering
- Diploma in Mechanical Engineering



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<b>Bachelor Degree</b>	-	KCSE with C+ (plus) mean grade or its equivalent as determined by KNEC.
<b>Diploma</b>	-	KCSE with C (plain) mean grade or its equivalent as determined by KNEC.

Application should be made through the Multimedia University of Kenya online application portal <https://onlineapplication.mmu.ac.ke/> on prescribed forms available on from the Corporate Affairs Office at MMU Main Campus, or downloaded from the university's website ([www.mmu.ac.ke](http://www.mmu.ac.ke)).

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# IEK Mentorship Molding Future Leaders

ON 20<sup>th</sup> August 2022, the Women Engineers Chapter led by the Chair, Eng. Florah Kamanja visited the Nova Pioneer Tatu Girls High school in Kiambu. In an event organised during the school's annual Career and University Day, the team motivated students from all forms.

Nova Pioneer Tatu Girls is a girls secondary school located at the fledgling Tatu City. The school focuses on giving a holistic approach to education by encouraging critical thinking, independent learning, self-discovery, leadership and innovation. The campus is a full boarding facility fully equipped with a swimming pool, playing field, volleyball and basketball courts.

The Future Leaders Committee led by the chair lady Eng. Lilian Kilatya on Saturday 30<sup>th</sup> July 2022 held a mentorship drive at the Maryhill girl's high school in Thika. The girls were mentored in the disciplines of Civil, Mechanical, Electrical and Telecommunications. Also in attendance was the legislative and regulations committee chair Eng. Paul Ochola.

Maryhill Girls High School is one of the best girls' national boarding school in the country. It was founded in 1933 and is situated in Thika. It is an eight streamed school offering the 8-4-4- curriculum with a student population of over 1600. The school also offers a variety of other co-curricular activities such as Drama, Music, and variety of games like hockey, swimming, volleyball and tennis.



IEK Council Members Eng. Christine Ogut (Third Right) and Eng. Florence Kamanja (7<sup>th</sup> Right) pose with mentees of Nova Pioneer.



A mentorship session in progress at the Nova Pioneer Girls School, Tatu City.



THE FUTURE: Mentees parade with Engineering outfit at one of the mentorship drives recently organized by IEK.



IEK Legislation and Policy Committee Chair Eng. Paul Ochola guides a mentee during a session at Maryhill Girls High School.



Eng. Martin Tsuma,  
The Chief Executive Officer,  
Coast Water Works Development  
Agency

## THE BARICHO WELLFIELD PROTECTION WORKS

### Introduction:

The Baricho wellfield is located downstream of the Athi-Galana-Sabaki river (approx. 50km from the mouth of the river at the Indian Ocean) at Lango Baya in Kilifi County. It is the largest source of portable water in the Coast Region with installed production capacity of 110,000 m<sup>3</sup>/day and supplies water to Kilifi and Mombasa Counties.

The Baricho wellfield waterworks accounts for about 64% of the total bulk water supply for the coast region, the other sources being Mzima springs/pipeline, Tiwi boreholes and Marere Springs/pipeline. The waterworks is managed by the Coast Water Works Development Agency (CWWDA), a state corporation under the Parent Ministry of Water, Sanitation and Irrigation (MWS&I) mandated (Section 65&68 of the water Act 2016) with the responsibility of undertaking development, maintenance and management of the national public water works within the Coast Region.

As shown in Figure 1, water is produced from eleven (11) high yield boreholes in two wellfields (upstream and downstream) located on the southern bank of Sabaki River. Boreholes 1-8 were constructed between 1993-97 while Boreholes 9-11 were done in 2017.

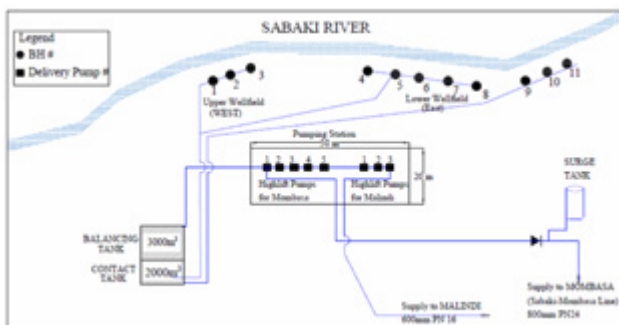


Figure 1: Schematic Diagram of the Baricho Waterworks

### Impacts of Floods on Baricho Wellfield:

In the last 60 years (1960 – 2020), Sabaki River has experienced three very large flood events (1961, 1998 and 2018) which have greatly impacted the Baricho wellfield (Figure 2). The 2018 flood event caused severe damage to infrastructure, completely inundated the boreholes and interrupted water production for one (1) week. Three (3) boreholes (BH1, BH3 and BH4) that were completely damaged by the 2018 floods and have

been reconstructed under the Water and Sanitation Development Project (WSDP) funded the World Bank.

The position and intensity of the Intertropical Convergence Zone (ITCZ) is traditionally considered a key driver regarding the onset, duration, and intensity of rains in Kenya. However, three other phenomena namely the Indian Ocean Dipole (IOD), the Madden-Julian Oscillation (MJO) and the Tropical Cyclones in the Indian Ocean have been found to particularly influence the large floods. The El-Nino Southern Oscillation (ENSO) has also been extensively quoted as a key driver for some floods.

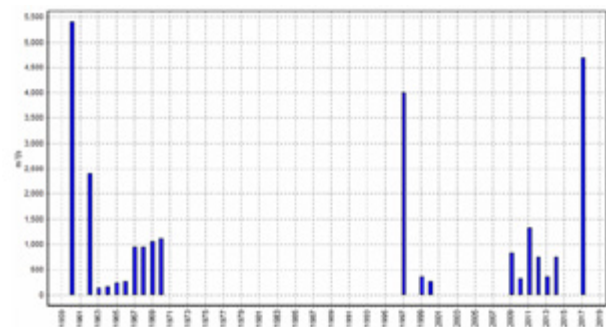


Figure 2: Available Annual Flood Maxima

Recent studies have attributed the November 1961 and January 1998 floods to positive IOD while the April 2018 flood is strongly associated to a combination of an active MJO event and a number of tropical cyclones in the Indian Ocean.

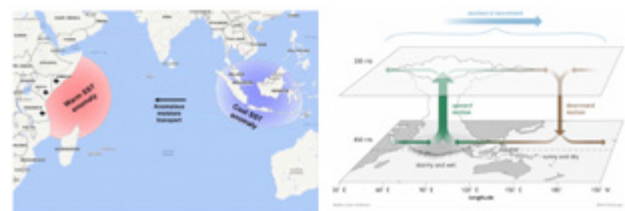


Figure 3: Schematic diagrams of IOD (left) and MJO (right)

The 1998 floods damaged the wellfield (especially Boreholes 1,2,3 & 4) and interrupted water production. A wellfield protection works was designed and constructed in 2005. These protection works were destroyed by the 2018 floods.



Figure 4: Borehole No. 4 after the 2018 flood.



## New Protection Works for the Baricho Wellfield

The level of investment the Government of Kenya (GoK) and the Development Partners (DPs) through CWWDA have put in Baricho is substantial. In addition, the strategic position of the wellfield/or Baricho water works as a water supply source cannot be overemphasized.

Therefore, CWWDA, GoK and the World Bank (through the WSDP) decided to construct a new robust wellfield protection system for the Baricho wellfield. This will make the installed infrastructures to be climate resilient hence the planning, design, construction and operation should anticipate, be ready for and adapt to the uncertain climatic conditions.

The detailed designs and tender documents for the proposed wellfield protection works were completed in 2021 and construction is currently ongoing. This will in effect climate proof this important infrastructure.

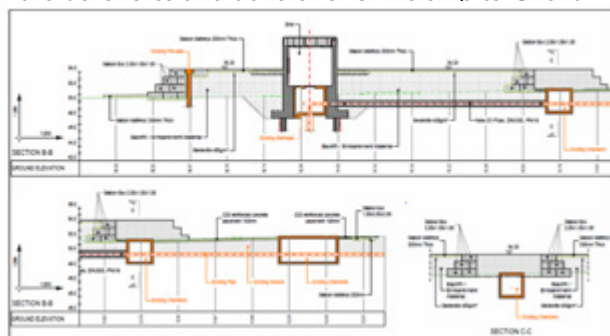
The detailed design considered prediction of the probable effects of climate change and depending on the scenario and length of time chosen, the level of uncertainty is increased. The Intergovernmental Panel for Climate Change (IPCC) has defined scenarios referred to as Representative Concentration Pathways (RCPs) corresponding to rise in temperature for the years 2046-2065 and 2081-2100. For the Baricho protection works, the time horizon of 2046-2065 was adopted to assess the effects of climate change on future floods. Further, the flood frequency analysis has been modified for temperature rise of 1.5 degrees Celsius for RCP 4.5 and RCP 6 which are intermediate scenarios corresponding to assuming “slowly declining emissions” and “stabilizing but not declining emissions” for Green House Gases (GHGs) respectively. Consequently, a return period of 200 years was adopted in the design of the protection Works (Table 1).

*Table 1: Summary of peak flood discharges for different return periods.*

Return Period (years)	Peak Discharge from Frequency Curve Fitted to Available Data (m <sup>3</sup> /s)	Peak Discharge from Frequency Curve Modified for Climate Change Impacts (m <sup>3</sup> /s)
10	2,985	3,635
20	3,960	4,858
50	5,222	6,441
100	6,167	7,627
200	7,109	8,809
500	8,352	10,368
1000	9,291	11,547

The scope of the protection works contract include but not limited to:

- Construction of concrete protective structures on pile foundations at the eight productive boreholes.
- Construction of river-bank scour prevention works.
- Construction of scour prevention works under new Baricho Bridge over Sabaki River and at the site.
- Construction of erosion protection works along access roads and pipeline corridors and protection of electricity pylons.
- Construction of a raised, over-toppable, access road with culvert underdrains across the low-lying floodplain of the downstream wellfield so that access to productive boreholes is possible during lesser floods.
- Construction of new elevated building (transformer and switchgear) for the upstream wellfield and transfer/setup of all equipment from old building.
- Raising of levels of electrical switchboards and transformer in the building serving the recent boreholes BH9, BH10 and BH11 and improving robustness/watertightness of covers for same boreholes and associated chambers as required.
- Reinstatement of all pipelines, valves and other equipment, electrical supply and signal cabling and connections so that all boreholes are operational. Provision of lighting and power supply within all new boreholes structures.
- Provision of a mobile telescopic crane for the servicing (replacement of pumps, cleaning of boreholes etc) of the boreholes and transfer of ownership to Client



*Figure 5: Protection works at borehole 4 – raised wellhead chamber and gabion works.*

### Coast Water Works Development Agency

Physical Address: Mikindani Street, Off Nkurumah Road, Mombasa

Postal Address: P.O. BOX 90417-80100, Mombasa

Telephone: 041-2315230

Email: info@cwwda.go.ke

# Student Voices



## HOW JKUAT SES IS BUILDING HOLISTIC ENGINEERS IN TRAINING

**T**he J.K.U.A.T. Society of Engineering Students (S.E.S.) is a body established for students who desire to discover what lies beyond books. S.E.S.'s activities are geared towards holistic development of its members, molding individuals who are not only well-adapted at classroom level, but also stand out in the practical scene and corporate engineering world at large. Through the committees, the students are able to gain skills, both technical and soft, guide other students and learn from them, as well as give back by inspiring younger students and upcoming engineers in training. The committees include Projects, Women in Tech, Publicity, Outreach, Editorial, Mentorship and Corporates Committee.

SES current ongoing projects include the SES Board, SES Voting Booth which we use to vote electronically for our leaders and renovation of a park inside JKUAT as part of a way to give back to the school for its continued support. Over the past year we have achieved major milestones including a Mentor-Mentee fun day where mentors linked to industry gave talks and encouraged us while having a fun time with them, as well S.E.S Dinner at the end of the academic year. We have also had a Women in Tech event where ladies from all engineering disciplines came together to encourage us. The SES Tech-Week is set for 30<sup>th</sup> September and 1<sup>st</sup> October, a fun-filled event full of competitions while we get to interact with people in the field. All are invited to follow through our social media handles Twitter: @jkuatases Instagram: @jkuatases LinkedIn: @JKUAT Society of Engineering Students.

*Lilian Nandutu is President of JKUAT Society of Engineering Students*



## ENGINEERING THE FUTURE

**I**f your dreams don't scare you, they aren't big enough.  
Every great inventor was a dreamer, who is not afraid to think differently  
- the likes of Graham Bell and Thomas Edison.

Researchers all over the world are working round the clock to come up with solutions to human problems and some of us can hardly keep up. But every coin has two sides. Unfortunately, inventions and innovations have had adverse effects on humanity, climate change and the planet in general.

This cannot be ignored. We should not destroy the planet all in the name of invention because for us to Engineer the future, we need a future to look forward to. Governments should invest more in green energy, zero emissions transport systems, sustainable and environment-friendly construction methods, controlled AI advancements and so forth.

In Kenya, we cannot fail to recognize the move by the Ministry of Education to introduce coding and computer programming into the primary and secondary schools' Syllabus. The setting up of a Google Development Centre in Kenya is also a big win for our country that will not only create job opportunities for our local tech gurus, but also increase our exposure and better our understanding of global technological trends.

We have all the necessary resources, it is up to us to play our part. We owe it to ourselves and to all future generations to dream big and think different in order to come up with sustainable solutions. Let's Engineer the Future!

*Eunice Ndung'u is the Vice Chair, Technology Students' Association Moi University.*





### **KENHA GRADUATE ENGINEERS INTERNSHIP PROGRAM TIMELY**

**K**eNHA enrolled over 100 interns in projects where they are exposed to different integral phases of a construction project including geometric, pavement and structural design, hydrology and hydraulics, traffic engineering, design implementation, contract administration and management. The training program consists of on-site training, online virtual training sessions as well as project visitations. KeNHA has further collaborated with organizations including Engineers Board of Kenya, Institution of Engineers of Kenya, consulting firms as well as individual Professional Engineers to facilitate knowledge transfer from the industry gurus to novice engineers.

In embracing modern technology and techniques, KeNHA created an enabling environment for young engineers to learn current techniques needed to navigate the engineering world. An example of this is visitation programs to the Nairobi Expressway Road meant to expose interns to modern technology and techniques used in design and construction of the highway.

KeNHA is also cognizant of the role of women in engineering and the prevailing deficit in the industry. According to one report carried by Engineering in Kenya magazine in March 2021, women only accounted for 7% of the Kenyan engineering fraternity. Accomplished women engineers are encouraged to inspire and motivate women trainee engineers and mentor them on their journey to success.

It will take a joint effort by the government, industry, academia and engineering society to achieve the envisioned goal of having trained Graduate Engineers transition into professionally competent Engineers. Stakeholders should work closely with the government to develop policies and frameworks aimed at training and building Graduate Engineers' capacity.

*Stephanie Moraa is a beneficiary of the KenHA Graduate Engineers internship program.*



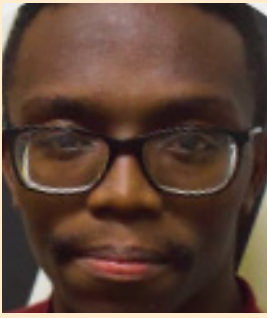
### **ENGINEERS, TECHNOLOGY AND SOLUTIONS TO SOCIAL PROBLEMS**

Emerging technologies, and the prospect of solving social problems through technology, make engineering particularly exciting and important today. Sustainable energy and materials, smart electronics, smart logistics, urban planning, and personalized medicine are some of the fields that the support of engineers is inevitable.

Yet the prospect of using technology to address social problems also raises fundamental questions; what decisions can and should engineers make? Will this approach indeed solve problems, or bear new ones, as has been in the past? In turbulent times like ours, the future is uncertain, as are the consequences of our actions.

To address these societal problems, the engineering fraternity ought to process, manipulate and utilize the growing set of data in this information age and make the most of it. Engineering firms ought to collaborate with technology powerhouses so as incorporate the discoveries made so far in that field such as the use of artificial intelligence into engineering designs and manufacturing. This necessitates investing in the re-training of engineering employees as well as changing the way we educate future engineers. According to one Stanford Professor, "Engineers will need communication skills, the ability to work in teams, global knowledge, and an entrepreneurial outlook as much as they will need technical depth." This requires a multidisciplinary approach to allow cross sharing of information thus leading to creativity in identifying solutions that will enhance the quality of life of humankind. Embracing the Information Age will thus reinvigorate the engineering industry and provide a diverse and collaborative workforce capable of solving societal problems going into the future.

*Churchill Ouma is Vice President, University of Nairobi Engineering Students Association.*



By Arnold Kabare

## Introduce Parking Booking App to Solve Traffic Congestion in Nairobi CBD

**T**RAFFIC congestion is a massive menace in Kenya, contributing to both urban pollution and revenue losses. In fact, one economic survey statistics have claimed Nairobi loses an estimated revenue of 60 billion as a result of traffic congestion. This often triggers policies to try and address the issue albeit with minimal positive impact.

So what's the root cause of traffic jams in Nairobi, one may ask? Many believe it to be public transport vehicles like matatus. The 2020 KNBS economic survey report states otherwise. From the report, the number of private vehicles registered and imported into Kenya outweighed the number of public service vehicles. Private vehicles accounted for 96.8% of all the new vehicles registered in the year 2019 which affirms that public service vehicles aren't the root cause of traffic congestion.

To address the problem an agile and innovative approach needs to be adopted that couples well with the private carpersonnel mode of thinking. In Nairobi for instance traffic jams occur in the morning and continue to subside as the day progresses. This is because in the morning, residents are either rushing to their businesses or place of work and need to be there early enough to secure a parking

space that ensures the safety of their vehicles. Nairobi motorists prefer certified parking lots to avoid fines from the county government. Due to these preferences and the need to seek a parking lot, some fail to get a parking space in their preferred locations. They in turn circle through CBD looking for a place to park and it's during this time, that the congestion starts building up.

Ultimately as these vehicles clear from the road to their preferred parking space destination, the congestion subsides. It's evident that reducing the time spent seeking parking spaces in CBD can ultimately cut down traffic congestion.

The preferred solution would be a platform or app that can recommend the best place for the private car personnel to book a parking space in CBD close to the location he or she is going.



**This app would enable motorists keep tabs on how many lots are available in the CBD, so that when someone books a space it automatically reserves it.**



In certain situations, a driver's preferred parking lot may be full but with automatic route planning and reservation within the app, a driver will ultimately get a parking space in CBD. This means that his parking lot is already reserved before he even leaves the house ensuring when in CBD he goes directly to that location.

This app should also offer the same functionality to personnel without smartphones through USSD so that no time is wasted looking for a parking lot. In the market, parking reservation apps exist but sometimes the lots in the app may be fully booked and hence one will opt to seek another option, and if none is found they drive around CBD looking for the space ultimately resulting in congestion.

Partnerships with the County government and private parking in CBD would be the best partners to ensure the app's success in combating congestion in Nairobi. Adoption of the app will also help cut down pollution due to reduced congestion and this can come in handy for the county government to be awarded carbon credits that can be utilized in enhancing and maintaining the city's infrastructure.

*Arnold Kabare is a Techpreneur and Innovator*



# Mhandisi SACCO: Establishing Strong Financial Base for Engineers to Save and Invest

By Maureen Mwangi

INCREASED need for the engineering fraternity to save and invest necessitated establishment of Mhandisi SACCO and the Mhandisi SACCO Housing Investment Company, to enable engineers to establish a strong financial foundation.

"Mhandisi SACCO that was pioneered in 2013 with only 20 engineers, and has so far attracted hundreds of engineers eager to join and invest in their financial security," says Eng. Dr. Johnson Matu, who is among founding fathers of the SACCO. He adds that Mhandisi SACCO was solely established to create a platform for Engineers to save and get credit within reasonable interest rates, compared to other financial institutions.

"This is a good platform for creating wealth because you acquire credit to invest in rentals, startups and buy plots to establish yourself. So many people have been able to liberate themselves from struggles through loans from SACCOs," says Eng. Matu.

The SACCO is very pocket friendly. One is required to pay Ksh. 5,000 for first-time registration, and a minimum of Ksh.2000 monthly contribution. Members are allowed to borrow three times their savings but with guarantors from the SACCO.

Apart from personal investment loans, the SACCO has established a school fees plan and emergency loans to cushion their members over financial struggles. The loans attract affordable interest rates per annum, unlike banks that have comparably higher interest rates.



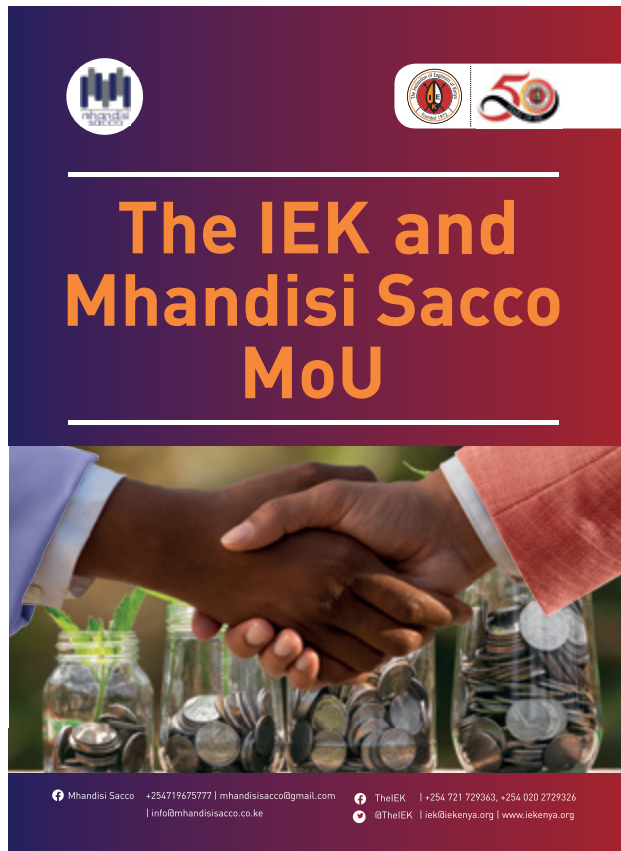
**Mhandisi SACCO interest rates are extremely low compared to banks. One does not need collateral such as titles for a piece of land to get loans, you just need two guarantors to qualify for loans, says Eng. Dr. Matu.**



The management has ensured continued financial security for the SACCO as it's regulated and managed by professionals with high level integrity. Mhandisi SACCO is entirely owned by its members and is registered under the Savings Credit Cooperatives Act.

He is concerned that even with emergence of dependable financial institutions, it has been difficult to encourage youth to save and invest. Eng. Matu is encouraging all cadre of engineers to join Mhandisi SACCO: "I bought my first welding machine after graduation with a loan from a SACCO."

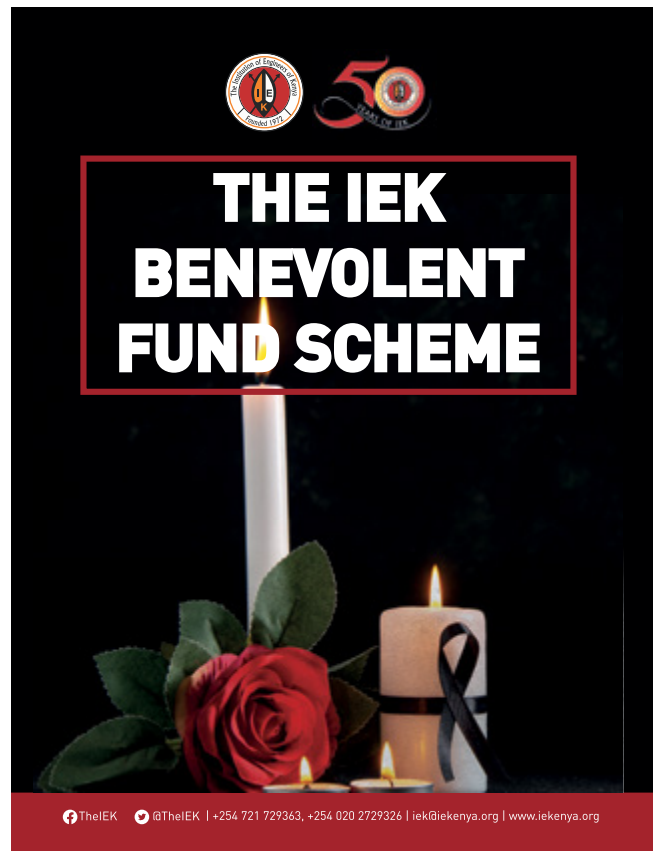
He cautions graduate engineers against overspending on non-essential things in the name of pleasing people on social media, warning that the desire for instant property and money within the millennials will crumble down their future and make them lose focus on their career paths.



The banner features the logos of The Institution of Engineers in Kenya (IEK) and Mhandisi SACCO at the top. The main text reads "The IEK and Mhandisi Sacco MoU". Below the text is a photograph of two hands shaking over several glass jars filled with coins. At the bottom, contact information is provided for both organizations.

**The IEK and Mhandisi Sacco MoU**

**Mhandisi Sacco** | +254 71 9675777 | mhandisisacco@gmail.com | info@mhandisisacco.co.ke  
**The IEK** | +254 721 729363, +254 020 2729326 | @TheIEK | iek@iekkenya.org | www.iekkenya.org



The banner features the logos of The Institution of Engineers in Kenya (IEK) and its 50th anniversary at the top. The main text reads "THE IEK BENEVOLENT FUND SCHEME". Below the text is a photograph of a lit candle, a red rose, and a black ribbon. At the bottom, contact information for The IEK is provided.

**THE IEK BENEVOLENT FUND SCHEME**

**The IEK** | +254 721 729363, +254 020 2729326 | iek@iekkenya.org | www.iekkenya.org



## IEK Membership Report

The IEK Membership Committee meets every month to consider applications for membership of the various classes received at the Secretariat. The IEK Council at its 500<sup>th</sup> and 501<sup>st</sup> council accepted the following members under various membership categories as shown below;

MEMBERSHIP CLASS	NUMBER ACCEPTED - 500 <sup>TH</sup> COUNCIL	NUMBER ACCEPTED - 501 <sup>ST</sup> COUNCIL
FELLOW	-	2
CORPORATE	43	70
GRADUATE	67	126
GRADUATE ENGINEERING TECHNOLOGIST	-	5
GRADUATE ENGINEERING TECHNICIAN	1	8
STUDENT	4	14
<b>TOTAL</b>	<b>115</b>	<b>225</b>

During the period we had 2 members who transferred from the class of Corporate to Fellow member and 102 who transferred from Graduate to Corporate member. In addition we had 190 graduates, 5 graduate engineering technologists, 9 graduate engineering technicians and 18 students were accepted as members.

### Gender Data

Class	Male	Female	Percentage (Male)	Percentage (Female)
Fellow	1	1	50%	50%
Corporate	99	14	87.6%	12.4%
Graduate	151	42	78.2%	21.8%
Graduate Engineering Technologist	5	-	100%	-
Graduate Engineeringtechnician	9	-	100%	-
Student	10	8	55.6%	44.4%
<b>TOTAL</b>	<b>275</b>	<b>65</b>	<b>80.9%</b>	<b>19.1%</b>

### Summary

Gender	No	Percentage
Male	275	80.9%
Female	65	19.1%
	<b>340</b>	<b>100%</b>

### 500<sup>TH</sup> APPROVAL

#### CORPORATE

S/NO	NAME	MEMBER NUMBER
1	Ayier William Ayier	M.9385
2	Benson Maina Ndugire	M.8940
3	Brian Khamate Wamukoya	M.8141
4	Calvin Chepkwony Tiony Kiplangat	M.3446
5	Catherine Wambui Mugai	M.3387
6	Chirchir Rodgers Ignatius	M.8011
7	Collins Airo Lung'aho	M.7411
8	Cyrus Kipkogei Rutto	M.7289
9	David Kibet Kenei	M.7977
10	Don Abuya Orony	M.9060
11	Elisheba Njoki Muchunu	M.6413
12	Ephantus Maina Githinji	M.6724
13	Ezekiel Njoroge Kuria	M.9461
14	Gachanja Muigai	M.5558
15	Herbert Kipkemai Ndiwa	M.4661
16	James Muiruri Ouko	M.9369
17	James Njoroge Ndungu	M.9847
18	Joseph Mwanyika Mwakio	M.6770
19	Josphat Kang'eri Maina	M.8810
20	Justus Mutwiri Njeru	M.6523
21	Kevin Nyakundi Onsongo	M.8284
22	Linnet Kiende Muthiora	M.7978
23	Lusiri Lukwa Felix	M.8988
24	Mark Ooko Amimo	M.10555
25	Mercy Yvonne Muthee	M.7037
26	Michael Nduati Kamau	M.10606
27	Mwangi Chege Kaburu Murikwa G. 5507	M.11226
28	Nathan Kiplagat Mibey Yego	M.8242
29	Omollo Oloo Raphael Edwin	M.2993
30	Paul Mugi Muthu	M.7880
31	Phillip Cecil Ochieng	M.9476
32	Robert Enock Odongo	M.9098
33	Samson Mbugua Maina	M.7405
34	Solomon Muthiya Muthoka	M.6726
35	Steven Cornelius Ohingo	M.6188
36	Veronica Mugure Martin	M.9484
37	Victor Kyama Nzuki	M.8856
38	Victor Wambugu Maina	M.5042
39	Wekesa Hillary Kizito	M.5548
40	Zachariah Karege Mungai	M.4591
41	Ravindra Jethalal Pattni	M.5723
42	Daniel Nyamweya Matundura	M.4805
43	John Nduu Muoka	M.6530

### 501<sup>ST</sup> APPROVAL

#### FELLOW

S/NO	NAME	MEMBER NUMBER
1	Victor Johnson Ongewe	F.469
2	Grace Muthoni Kagundu	F.1686
3	Bernard Ochieng Oketch	F.4536

#### CORPORATE

S/NO	NAME	MEMBER NUMBER
1.	Abraham Njoroge Mwigigi	M.8157
2.	Alfred Kipnetich Kiptorus	M.6840
3.	Austine Onyango Otoi	M.8611
4.	Barbara Akinyi Adhoch	M.7897
5.	Beater Oindi Nyamasege	M.8414
6.	Bilha Wanjiku Kigombe	M.8267
7.	Blasio Ikundo Githinji	M.5347
8.	Brian Asutsa Bukhala	M.7508
9.	Caroline Moraa Macoka	M.8678
10.	Caroline Wambui Kinoti	M.7878
11.	Dancan Ongwae Onyinkwa	M.10329
12.	Dennis Bundi Kinyua	M.9182
13.	Denver Indire Imbuka	M.10473
14.	Edith Chebet	M.7665
15.	George Gikuihi Kamuya	M.6342
16.	Harun Gaka Mamboleo	M.6172
17.	Isaac Wachira Mwai	M.7651
18.	James Kimani Kihui	M.8801
19.	Japheth Onyango Ojwang	M.8842
20.	Jared Ouma Okungu	M.8863
21.	Jeremiah Simiyu Kinda	M.3612
22.	Jimmy Kemboi Kiplagat	M.7602
23.	John Githenya Muthee	M.7502
24.	Jonah Kirogo Kinyua	M.5580
25.	Joseph Mathenge Ndirangu	M.7017
26.	Josphat Kamau Ngure	M.5105
27.	Julius Miatu Nginya	M.5447
28.	Kelvin Mwenda Kinotu	M.8148
29.	Kevin Jumba Mudaki	M.6341
30.	Lydia Nduku Munene	M.9083
31.	Martin Tsuma Mwango	M.3555
32.	Maureen Akinyi Odhiambo	M.9634
33.	Neville Kipkirui Yator	M.7712
34.	Omurwa Araka Michael	M.8231
35.	Patrick Karanja Mbugua	M.7116
36.	Peter Njuguna Kahuki	M.5962
37.	Pius Churu Githu	M.8561
38.	Robert Kipchumba Rutto	M.10570
39.	Robert Nyamongo Odenyo	M.2579
40.	Robert Ouko Ojoo	M.7031

41.	Seline Akinyi Olang'o	M.6717
42.	Shadrack Maina Mambo	M.8322
43.	Sosnes Omari Lugusa	M.11272
44.	Stephen Mutiso Makovo	M.6392
45.	Victor Waita Muli	M.8060
46.	Willis Kagolla	M.5178
47.	Nehemiah Kiplimo Tarus	M.5640
48.	Bevines Osati Juma	M.7439
49.	Elisha Kuria Kariguh	M.4888
50.	Ingaiza Annette Murambi	M.7147
51.	James Kioko Mutuku	M.8478
52.	Johannes Olum Omondi	M.7138
53.	Peter Ndungu Wachira	M.3409
54.	Noah Wesonga Kakai	M.7431
55.	Grace Wambui Kihumba	M.8468
56.	Joseph Gikandi Macharia	M.9073
57.	Samwel Roy Orenge	M.10060
58.	Marvin Shitemi Kayanda	M.8824
59.	Nancy Chepcheng	M.3357

The council invites Engineers and affiliate firms to apply for membership in the various membership classes, kindly follow the link **Membership Classes (iekenya.org)** for a list of classes available.

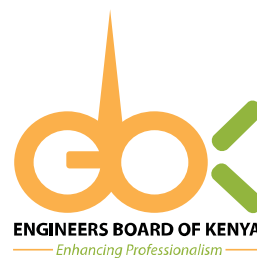
Graduate and Corporate members are encouraged to apply for transfer of class to Corporate and Fellow class respectively. Members can check eligibility and how to apply on our web-site using the following link: [https://iekenya.org/web/register\\_as\\_member](https://iekenya.org/web/register_as_member)

The IEK condoles with family and friends of our members who have passed away in the recent past. May their souls rest in peace.



"Death is not extinguishing the light . It is putting out the lamp because the dawn has come."





# African Journal of Engineering Research and Innovation

## AJERI

# CALL FOR PAPERS

The African Journal of Engineering Research and Innovation (AJERI) is published by the Institution of Engineers of Kenya (IEK) through support from Engineers Board of Kenya (EBK).

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