

BITRI Newsletter



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BITRI Energy Division Awarded Funds from the National Environmental Fund for the 'Decarbonization of Tlokweng SOS Children's Village' Project

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Editorial Team

Text & Pictures: Frank Rakgomo

Editor: Lesego Moribame

Chief Editor: Dr. Bathsheba Mbongwe



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CEO's Foreword



Botswana Institute for Technology Research and Innovation (BITRI) continues its commitment to research, innovation, and collaboration across various sectors, exemplified by its engagements in matters of defence, providing solutions for our local government partners, seminars to forge local and international partnerships, and efforts to help stakeholders achieve the utilisation sustainable and clean energy. Through these endeavours, BITRI aims to provide technological solutions stemming from research and development (R&D) and contribute to the development of Botswana and the global village. To further such objectives, this quarter was primarily focused on stakeholder engagements with national and international organizations.

Starting with the most positive news, I am delighted to highlight that BITRI's Energy Division received funding approximating BWP2,000,000 from the National Environmental Fund (NEF) for a project aimed at decarbonizing the Tlokweng SOS Children's Village through the use of solar energy. The project will focus on providing electricity and water purification using solar-powered systems. It is our utmost hope that the project will demonstrate the viability of renewable energy in different settings, especially its relevance to providing sustainable energy in community project settings, domestic, and various commercial settings. The division has developed capabilities in R&D and applications in this regard and lends contribution through the capacity building of trainers, who will, in turn, impart their knowledge to students. Through this effort, BITRI is hopeful of sowing expertise and belief in the application of R&D, and in this regard, renewable energy in providing the energy needs presently and in the future.

BITRI's Electronics & Communications division also conducted a stakeholder engagement session for the Ministry of Local Government



and Rural Development (MLGRD). The meeting focused on the presentation of the Seding® LED solar light version 3 and its retrofitting capabilities. The MLGRD expresses its commitment to continuing the relationship with BITRI and supporting the institute through the procurement of BITRI products, and the institute is poised to exploit such a positive gesture. Pages 6 and 7 carry details that expand on this story.

In a drive to attract international partnerships, BITRI hosted various esteemed researchers. Besides establishing partnerships in line with the expertise of the researchers' teams, the institute aims to create funding opportunities for BITRI, including potential collaborations for PhD students from Botswana. Engage the stories on this subject matter on pages 9 and 11. Still on the strand of international partnerships, the institution hosted military personnel on a study tour at the Botswana Defence Force Staff College who visited to learn about BITRI's mandate and to explore potential collaborations. The contingents expressed their appreciation for the warm welcome and expressed hope for future partnerships. The stories that carry the details of these engagements are on pages 12 and 14.

Prof. Shedden Masupe PhD, SMIEEE, Pr.Eng
Chief Executive Officer



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BITRI Energy Division Awarded Funds from the National Environmental Fund for the 'Decarbonization of Tlokweng SOS Children's Village' Project



Main Picture: The Board member of the National Environmental Fund, Mr. Bapsy Jibichibi, Deputy Permanent Secretary in the Ministry of Tourism, Ms. Abigail Engleton, BITRI Senior Researcher—Energy, Dr Edward Rakgati, SOS Children's Village Fund Development & Communications Manager, Ms. Agnes Malanda, BITRI Researcher—Energy, Dr. Mareledi Gina Maswabi, and SOS Children's Village Alternative Care Manager, Mr. Kabelo Tshimologo posing with a token cheque awarded for the project.

Botswana Institute for Technology Research and Innovation's (BITRI) Energy Division has been awarded P1,815,970.00 from the National Environmental Fund (NEF) for a project titled 'Decarbonization of Tlokweng SOS Children's Village'. The main aim of the project is to decarbonize the Tlokweng SOS Children's Village by utilizing solar energy for water purification and electricity provision in the village.

The project has 3 specific objectives being, to provide electricity from a localized Agrivoltaic solar PV mini-grid system; to purify borehole water for drinking using a solar-powered water purifying system; and to demonstrate the use of renewable energy in a community set-up through continual research and development activities.

The Energy division had responded to a Fifth Call for Proposals that was released in October 2022, which attracted 110 submissions under the themes: (i) Climate change mitigation and adaptation, (ii) Waste management and pollution control, (iii) Protection of the urban environment, and (iv) Veldt product conservation and management. Out of these, only 16 projects got funded. The project will be delivered in 24 months, led by Dr Mareledi Gina Maswabi.

The NEF was established by the Government of Botswana through Statutory Instrument No. 70 of 2010 to promote and provide financial support for projects that are geared towards the protection and conservation of the environment. ■

The BITRI Energy Division Holds Basics of Solar PV Training of Trainers



Main Picture and below: The Trainer of Trainers putting the lessons into practice. token cheque awarded for the project.



Left: The Trainer of Trainers posing with their certificates of attendance. To the extreme left is the BITRI Executive Director—Technologies, Dr. Sebusang Sebusang.

The BITRI Energy Division held a 4-day training, from 5th to 8th June 2023, on the Basics of Solar PV. The training covered theory and practicals on fundamentals and principles of solar PV, types of solar PV systems and major components, solar PV system design and installation, as well as quality assurance and maintenance of PV systems.

The training of trainers was sponsored by the Department of Skills Development and the trainees were Instructors from various brigades and technical colleges around Botswana, including Kanye Brigade, Jwaneng Technical College, Kgatleng Brigade, Selebi Phikwe Technical College, Maun Technical College, Ghanzi Brigade, and Madiba Brigade.

At the end of the training, participants were issued Certificates of Attendance by the Executive Director - Technologies, Dr. Sebusang Sebusang. ■



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The Seding[®] Version 3 Stakeholder Engagement



The Electronics & Communications division recently held a stakeholder engagement session for the Ministry of Local Government and Rural Development (MLGRD) at Maranyane House boardroom. The meeting was attended by senior technical personnel from district councils and sub-district councils, as well as the Principal Electrical Engineer in the MLGRD, Mr. Onneile Mmereki.

Dr Ephraim Gower - Lead Researcher in the Electronics & Communications (E&C) division delivered core presentations on the Seding[®] LED solar light version 3 (V3) as well as the aspect of retrofitting. The presentation covered some salient components such as the evolution of the Seding[®] from its earlier versions to the more advanced V3 capable of 6000 to 9000 lumens for areas where increased brightness is required. Dr. Gower explained how the Seding[®] combines the latest technology in LED, battery and control electronics technology, expounding on its durability, portability and intelligence in comparison to similar products in the market. ▶



Main Picture: Lead Researcher in the Electronics & Communications (E&C) division Dr Ephraim Gower delivering a presentation on the Seding[®] LED solar light version 3.



Right: The Principal Electrical Engineer in the MLGRD, Mr. Onneile Mmereki highlighting the ministry's commitment to procuring locally-produced goods and services.



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Seding® Version 3 Stakeholder Engagement (Cont'd from Page 6)



Above: The Q&A Session afforded the technical personnel from the various councils to ask questions about the Seding® LED solar light version 3.



The E&C team was on hand to respond to questions and provide clarity during the discussions. Pictured above, is Mr. Nakale Kelapile fielding a question from one of the attendants.

Dr. Gower added that the Seding® due to its use of a specific type of LED technology, comparatively converts more electrical energy to light than most light sources, a factor that leads to high efficiency. Additionally, its light spectrum provides superior and appropriate level of brightness and is friendly to the eye. On the aspect on optimising performance, Dr. Gower said the recommended pole height for the V3 is between 8 and 9 metres, and the determination of final height is to be made after conducting a luminance level assessment of the environment.

In his Closing Remarks MLGRD's Mr. Mmerekhi, who anchored the delegation reiterated the ministry's commitment to continuing the relationship with BITRI, as well as to support the institute through the procurement of BITRI products, including the Seding®, provided they satisfactorily serve the needs of end users. ■



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Seding® LED Solar Light

The Seding® LED solar light developed by Botswana Institute for Technology Research and Innovation enhances safety whether you use it to light up your farm, highways, residential property, school compounds, factory, workshop, office park, or public areas.

Benefits of the Seding® LED Solar Light

- Durable and dependable
- Environmentally friendly (uses clean solar energy)
- Low maintenance and cost of ownership
- Operates off grid (in urban and remote locations)
- Offers 2-day autonomy (assuming 12 hours of operations per day)

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BITRI Hosts Prof. Sun



Above: Prof Sun is one of eminent Materials Science Researchers BITRI will host for the purpose of exploring collaboration opportunities and creating opportunities for PhD students from Botswana.

BITRI hosted Prof. Luyi Sun from 14 – 15 June 2023. Prof Sun is a professor of Materials Science, Chemical Engineering and Biomolecular Engineering at the University of Connecticut in the United States of America. He was in Botswana as a US-Africa Frontiers of Materials Science Visiting Fellow to BITRI. This is an initiative that is supported by the US National Academies of Science, Engineering and Medicine (NAEM), the African Academy of Sciences (AAS) in collaboration with the African Materials Research Society (AMRS).

The AMRS has its headquarters at BITRI of which Dr Samuel Chigome who is the immediate past President of the AMRS highlighted that he will continue to facilitate such visits with the aim of capitalizing on the established global networks in materials science to create collaboration and funding opportunities for BITRI.



Prof Sun receiving a token of appreciation from BITRI Executive Director—Technologies, Dr. Sebusang Sebusang after his visit in June 2023.

Prof Sun presented a seminar at BITRI on **“Bioinspired Smart Hybrids with Multiscale Architecture and Surface Engineering”**.

Prof. Sun's research interest focuses on the design and synthesis of nanostructured materials for various applications. He has published about 280 peer-reviewed journal articles. He is the inventor/co-inventor of about 70 international/US patents and patent applications. Many of his patents have been licensed or commercialized. He is a Fellow of the Society of Plastics Engineers, the Royal Society of Chemistry, and the National Academy of Inventors, and a member of the Connecticut Academy of Science and Engineering.

Prof Sun is one of four globally recognized Materials Science Researchers who will be visiting BITRI this year to explore collaboration opportunities with BITRI which will also include creating opportunities for PhD students from Botswana. ■



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BITRI Hosts Prof Choonara and Prof Bhaw-Luximon for the Exploration of Partnerships



Above: Prof Yahya Choonara who is the Head of the Wits Advanced Drug Delivery Platform (WADDP) at the University of the Witwatersrand delivering his presentation to BITRI Executives and Nanomaterials team at BITRI Maranyane House.

BITRI hosted Professor Yahya Choonara who is the Head of the Wits Advanced Drug Delivery Platform (WADDP) at the University of the Witwatersrand and Professor Archana Bhaw-Luximon who is the Head of the Centre for Biomedical and Biomaterials Research (CBBR) at the University of Mauritius from the 28th to the 29th of June 2023. The world-renowned researchers presented their research work at BITRI on the topics **‘The Design of 21st Century Neuro-Therapeutics: Advancing Drug Delivery, Nanomedicine**

and Regenerative Medicine’ and **‘Biomaterials engineering for Biotechnology oriented applications’**, respectively.

Prof Choonara’s work entails developing innovative neurotherapeutics solutions designed on the principles of nanomedicine to improve the neuro-availability of Central Nervous System (CNS) drugs in treating Neurodegenerative disorders (NDs) such as Alzheimer’s and Parkinson’s diseases, as well as application in Glioblastoma Multiforme and NeuroTraumas. ►



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BITRI Hosts Prof Choonara and Prof Bhaw-Luximon (Cont'd from Page 10)



These solutions piggyback on the advances in nanomedicine that reveal that engineered nanomaterials can interact with biological systems at a molecular level to revolutionize neurotherapeutics by stimulating, responding to, and interacting with target sites to induce physiological responses while minimizing side effects. Prof Choonara is internationally recognized as an outstanding global pharmaceutical scientist working to produce advanced lifesaving medicines that have an impact on global health, infectious, hereditary, and lifestyle diseases, which are becoming common.

The second presentation delivered by Prof Bhaw-Luximon, outlined her team's research in using biomaterials engineering to design filtration membranes, nanofertilizers, tissue engineering scaffolds, and regenerative medicine supports. The significance of her work is premised on providing more cost-effective research and development pipelines in order to reach clinical and community applications. Coupled with the use of Artificial Intelligence (AI) and predictive modelling, a breakthrough in this arena will lead to the accelerated provision of healthcare and modern agribio-tech for Africa for the overall improvement of the socio-economic indices across the continent.

With these seminars, BITRI is leveraging its position as the host of the headquarters of the African Materials Research Society (AMRS) of which the Head of the Secretariat is Dr Samuel Chigome. The professors are part of the four Materials Science Researchers who will be visiting BITRI this year to explore collaboration opportunities which will also create opportunities for Ph.D. students from Botswana to benefit. ■



Above: Prof Bhaw-Luximon, outlining her team's research in using biomaterials engineering to design filtration membranes, nanofertilizers, tissue engineering scaffolds, and regenerative medicine supports. team at BITRI Maranyane House.



Above: Prof Yahya Choonara receiving a token of appreciation from the BITRI Executive Director of Natural Resources and Material, Dr. Mataba Tapela.



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BITRI Hosts Nigerian Delegation on a Study Tour



The Botswana Institute for Technology Research and Innovation (BITRI), at the behest of the Botswana Defence Force (BDF), hosted a delegation from Nigeria's National Defence College. The Nigerian contingent is in Botswana on a study tour and visited BITRI to appreciate its mandate. The study tour titled **'Extractive Industries and National Development in Botswana: Lessons for Nigeria'** focused on issues relating to socio-politics, economy, foreign policy, and security.



Above: The BITRI Chief Executive Officer Prof Shedden Masupe welcomed the delegation to pave way for discussions.

The BITRI Chief Executive Officer Prof Shedden Masupe welcomed the delegation to pave way for discussions, giving context of BITRI's capabilities by highlighting that the institution had an agreement with the BDF, which entails both organisations collaborating on research and development on specific areas that are of interest to the latter. Prof Masupe added that he was hopeful that the tour BITRI would create an opportunity for the institute to collaborate with its Nigerian equivalent to help advance the areas of interest as highlighted in the objectives of the tour.



Left: BITRI's Kholwani Velepini explaining the value add of the Design division, including the capability to manufacture replacement parts for military equipment.

The Director Research and Partnerships Dr. Bathsheba Mbongwe presented on BITRI, giving an overview of the reporting lines as the institute is an R&D arm of the Government of Botswana, the Mandate and focus research areas, key projects under each research area, as well as capabilities in relation to how BITRI can provide solutions in line with the pain points as outlined by the delegation. The delegation was later treated to a tour of the BITRI Centre for Materials Science (CMS) and the Additive Manufacturing Laboratory.

The leader of the delegation and member of Nigeria's National Defence College Commodore Ikella Ugochukwu Ubani expressed gratitude toward BITRI for acceding to host the delegation. Cdre Ubani articulated that the tour ►

BITRI Hosts Nigerian Delegation on a Study Tour (Cont'd from Page 11)



had the potential to cultivate grounds for collaborations.

The team was taken on a conducted tour of the Centre for Material Science and the Additive Manufacturing (AM) Laboratory, where they learned about materials fabrication and characterisation services and their potential applications in line with their needs, as well as various AM services, including design and consultancy, 3-D printing of artefacts and components, product digitization and prototyping.

At the end of the tour, Mr. Rabiū Habu Sambo was given the honour to deliver a word of appreciation on behalf of the delegation. Mr. Sambo highlighted the value of the detailed brief about the Mandate of the institution, commercialisation strategies, and the key projects the institution has embarked on since its inception. He further added that the brief and the tour of the BITRI laboratory facilities enriched the delegation's appreciation and potential of research and innovation, and they would use the newly gained knowledge to augment their R&D endeavours. ■



Above: The BITRI Chief Executive Officer Prof Shedden Masupe receiving a token of appreciation to Mr. Rabiū Habu Sambo.

Below: BITRI, Botswana Defence Force (BDF), and the delegation from Nigeria's National Defence College posing for a group photo at Maranyane House.



BITRI Hosts Team of Army Personnel



Above: The BITRI SEM Specialist Mr. Stephanus Hermanus Coetzee took the delegation through a tour of the Centre for Materials Science.

Botswana Institute for Technology Research and Innovation (BITRI) hosted a team of army officers from various countries who were attending a course at the Botswana Defence Force (BDF) Staff College in Gaborone.

In his welcome remarks, the BITRI Chief Executive Officer Professor Shedden Masupe informed the delegate that BITRI signed a Memorandum of Agreement (MoA) with the BDF to establish cooperation and collaboration to address the technological needs of the BDF and enhance the generation of new knowledge at BITRI. He further said currently BITRI is developing a solution for BDF operations.

In his remarks, the head of delegation for the visitors Brigadier General Erick Mhoro of the

National Defence Force of Tanzania appreciated the warm welcome to BITRI. He said the main purpose of the visit was to appreciate what the mandate of BITRI is and he expressed hope that the visit could give birth to partnerships or collaborations to provide innovative security solutions.

The Executive Director of the Natural Resources and Materials department, Dr. Mataba Tapela gave an overview of BITRI mandate, key projects and commercialization of selected projects. The team was taken on a conducted tour of the Centre for Material Science and the Additive Manufacturing Laboratory. ■



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Why the KSBB Is the Perfect Choice for Your Next Construction Project



The Kgalagadi Sand Building Block/Brick (KSBB) Technology, developed by BITRI, uses the abundant Kgalagadi Sand with the locally produced KSBB blend to manufacture less expensive but high-quality blocks and bricks that are environmentally-friendly and cost-effective in terms of both production/ extraction and application, possess fit-for purpose strength, are durable, and are aesthetically-pleasing.

KSBB is made from Kalahari sand, which covers approximately 75% of Botswana, predominately to the west of the A1 road covering the area from Bokspits to Kasane. The area concerned covers most of the market in Botswana, and those in Gaborone and surrounding areas can source their KSBB products from Artesia.

The KSBB can be used to construct residential as well as commercial properties for both individuals and companies.

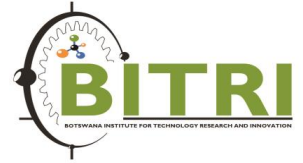
The costs for construction, whether for a bachelor pad or 5-bedroom family home have sky-rocketed over the years and are bound to continue in this trajectory. In the process, housing or decent accommodation, which is a basic need for all, has become extremely expensive for those who can qualify for property finance or any other sources. In extreme scenarios, the reality of home ownership remains a pipe dream for some who cannot afford property finance. ►

The Positive Environmental Factor of the KSBB Technology

Currently river sand can only be harvested in only a few areas with Mahalapye being the only source supplying the southern part of Botswana, while the northern part of Botswana is supplied from sources in the Francistown/ Nata area. An alternative material in the form of crusher sand, is only available from quarry sources wherever they are across the country.

More critically, both river sand and crusher sand as conventional building materials, degrade the environment where they are extracted and are amongst others, not energy efficient in relation to the insulation of buildings that we occupy. As a way of comparison, when a customer builds a house in Bokspits, their nearest river sand, and crusher sand sources are Mahalapye (over 980 km away) and Gaborone (over 780 km away), respectively.

A customer in Gaborone also sources river sand extracted in Mahalapye, which is an odd 200 km away from the site of construction. Likewise, a customer in Maun or Kasane buys river sand sourced in the Francistown/ Nata area. To demonstrate the costs for the above-stated activity, a 20m³ river sand or crusher sand truckload costs approximately 5, 000 Pula. However, the delivery of a 20m³ Kalahari Sand (KS) truck full load costs approximately 2, 500 Pula. The KS price can be translated to each locality with slight price variations while the transport cost of river sand and crusher sand greatly escalates the cost of the two materials as the distance increases from source. Essentially, a customer in Kasane will have the KS they need sourced within the vicinity of Kasane; the same applies to a customer in Lehututu, Phitshane Molopo, Artesia, Takatokwane, Charleshill, or Gumare. ■



Depots from Which you Can Buy KSBB Products

(as of March 2023)

- Artesia
- Charleshill
- Ghanzi
- Gumare
- Kasane
- Lehututu
- Maubelo / Tsabong
- Maun
- Phitshane Molopo
- Takatokwane

**** More depots to be rolled out in the near future**

For product enquiries and orders, please contact: communications@bitri.co.bw



Above: The KSSB in application: strong, durable, and aesthetically-pleasing.



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