BITRI

BOTSWANA INSTITUTE FOR TECHNOLOGY RESEARCH AND INNOVATION

2016/17 ANNUAL REPORT


90
1.25

Table of Contents

Message from the chairperson, **Board of Directors**

It is my pleasure to share with you the 2016/2017 Botswana Institute for Technology Research and Innovation (BITRI) annual report. The year 2016/2017 was a very fruitful and rewarding one for BITRI. I am honoured to share our achievements and challenges with you, our valued stakeholders. BITRI has now been in existence for just over four years and already we see projects gaining pace at a steady momentum and we can finally see a bright future for our country through the research that we are doing. We are confident that at the rate we are going we will play our part in meeting the aspirations of the nation - to transform Botswana's economy into a knowledge economy.

I am happy to highlight that during the reporting period, a number of projects that we conceptualised with you our stakeholders through the BITRI philosophy of "From You to Us For You", showed significant progress. These include; the development of the rapid test kit tool for Foot and Mouth Disease in collaboration with the Canadian Food Inspection Agency (CFIA) and the Botswana Vaccine Institute (BVI); Mobile Tutoring System for secondary school students, Development of a communication platform using the Television White Space (TVWS), Load Management Device for conservation of electricity in households. The Climate Change division has also been working hard to identify stakeholders' needs and conduct research that could advance the decision support process for the agriculture, health, energy and water sectors for a changing climate amongst others. In our quest to preserve and promote our rich indigenous products we have seen it fit to development some into mobile applications. We are happy to announce completion of our first product in this regard, the Moraraba game, which is now ready for use. The game can be downloaded from the google play store. You will get an in-depth description of each of the projects that I have made reference to in the various sections of this annual report.

As stated, at BITRI, we are an institution that closely works with its stakeholders in providing technology solutions, therefore, stakeholder engagement is a big part of our strategy to ensure that the technologies we develop are relevant and addresses the immediate needs of our communities. It is for this reason that several activities such as Council addresses and seminars were held to brief our stakeholders about what we do as well as learn about the typical issues on the research we conduct. At BITRI we pride ourselves as a people-centred organization that ensures that the needs of the people of Botswana and Africa are met, hence our focus on developing custom made solutions to address customer needs on request. We do what we do through Co-creation!

As the Board we have consistently capacitated BITRI to provide technologies that make notable difference in the lives of Batswana. Right from the onset we have facilitated BITRI to explore readily available technologies that could mitigate the country's challenges associated with the provision of energy and housing. To this end BITRI significantly advanced its offering of Seding Street Light to Batswana by establishing a manufacturing plant for the light in Kanye, and by creating an electronics research laboratory at the main campus in Gaborone. These facilities were considered necessary for ensuring that BITRI continuously meet increasing and changing demands of citizens for the solar street light. We are proud to announce the completion of BITRI's improved version of Seding Light. Our dream is to see Botswana joining the rest of the world in reducing the national carbon footprint by adopting green technologies to mitigate effects climate change, and also minimise electricity generation and distribution costs.

We are adamant that these efforts will in one way or another propel the country to achieve some aims of the Kyoto Protocol on Climate Change. In recognition that shelter is a fundamental need of humankind, and in response to the Presidential housing appeal for the needy, we have pledged our Kgalagadi Sand Building Block (KSBB) technology as a cornerstone for housing projects in the remote areas

Message from the Chairperson, (Continued)

of Botswana where fine Kgalagadi sand is the only readily available construction material. We partnered with the Poverty Eradication Coordination Unit in the Office of the President to put up a KSBB ready-mixed cement production facility in Palapye, as well as KSBB brick yards in strategic locations around the country. We are confident that with these facilities fully operational, Batswana will fully harness the benefits of the KSBB technology.

To stimulate generation of innovations the Board approved substantial expenditure on acquisition of current world-class scientific and technological research platforms. We continued to equip BITRI's Materials Laboratory to permit production and analysis of materials at the finest levels. In other words we prioritized spending on nano-technology. We are convinced that BITRI needs these of facilities to carry out research and prove innovation concepts that are competitive globally.

Lastly, it is my pleasure to thank my fellow Board members for their meaningful contributions in providing BITRI with excellent strategic direction. I would also like to applaud the BITRI Management and staff for their hard work and dedication as well as encourage them to keep the momentum going in providing the technology solutions for Botswana and the rest of the world with the view to achieve the overall target of Vision 2036 which is "Achieving Prosperity for all". To our Collaborating partners and funders I wish to thank them for working with us and helping us drive our mandate. To the Government of Botswana, all this would not have been possible without your support financially and we are forever grateful for that. However, we could have achieved more and better with a bit of more funding. Clearly, limited funding was the root cause of many of the challenges that hindered us from outperforming ourselves. We are very optimistic that as we continue to engage with our shareholder and sponsors we will succeed in gaining increased funding for BITRI to make BITRI the greatest economic development catalyst that we wish it to be.

In conclusion, I want to assure the stakeholders that the Board will strive to ensure that BITRI delivers on its promise to develop high quality technology solutions that will improve the livelihoods of Batswana.

I thank you

Dr Martin Kebakile
Chairperson, Board of Directors

Message from the CEO

It is with deep gratitude that I present to you the 2016/2017 annual report of the Botswana Institute for Technology Research and Innovation (BITRI). The report gives an overview of activities that took place during the reporting period. Further, the report also marks the conclusion of my productive engagement as BITRI's founding Chief Executive Officer.

The report outlines some of the BITRI team's achievements as part of the implementation of the five year strategic plan, for 2015-2020. The strategic plan focuses on three main themes namely; Research and Development, Strategic Partnerships and Organizational Excellence. In addition for ease of implementation of the strategy, a performance management system was also put in place and all employees have signed performance contracts with implementation expected to begin in the next reporting period on April 2017. In order to ensure adherence, awareness as well as ownership of the strategic plan, we also crafted the BITRI strategic intent coded, #1640. The strategic intent is a bold summary of our strategy that ensures everyone lives what we have set out to do, as 1 is for the team and leadership role that BITRI should play whilst, 6 is for the expected products that will reach market and 40 is for the percentage level of income contribution to the annual budget. BITRI teams are expected to review their strategic orientation and contribution on a regular basis so as to ensure that our pursuits are in line with the current thinking and that we continue to be relevant to our stakeholders.

In order to drive our strategic ambitions and intents, it is imperative that we have on board the right caliber of staff. We continually invest in the organization and our employees, proactively innovate to improve processes and results, and strive to meet the highest standards of integrity and such by the end of the reporting period BITRI had a staff establishment of 151 employees. Our aspirations to become the leading technology solutions provider that transform lives will be achieved through our workforce. Our talented workforce enable us to produce quality research work and technologies, operate effectively. As an institution, we work hard to ensure that BITRI consistently merits the confidence of our stakeholders and partners. Amongst our staff are researchers from various disciplines, technical, and corporate support staff. We endeavor to make it the best work environment, hence we ensure that staff growth, health and wellness are priority areas.

To this end, I am happy to mention that through the hard efforts and commitment of our staff, the Centre for Material Science (CMS) was completed during the reporting period. The CMS is a world-class state of the art laboratory facility for materials fabrication and characterization that will serve the research needs as well as the commercial materials analysis needs of Botswana and the region across a variety of sectors. We envisaged that the services that will be availed through the CMS would relieve various stakeholders especially in the building, mining, forensic and health sectors the burden and expense of taking samples outside Botswana. We have the expertise in house to undertake this kind of work. Further to our strategic intent of #1640, CMS will be one of our revenue generation stream.

On the research front, BITRI is performing very well with steady progress on various on-going projects at different levels of development or prototyping. For instance, the development of the Foot and Mouth diagnostic test tool kit for the detection of foot and mouth disease (FMD). The project is part of our collaboration with the Botswana Vaccine Institute (BVI) and the Canadian Food Inspection Agency (CFIA). When ready, the test tool kit should be able to detect FMD in an animal within 25 minutes at site, and should assist in monitoring the disease. We are positively expecting the FMD diagnostic kit to transform the lives of Batswana, particularly in the agricultural, hospitality and health sectors. We are also in the process of developing an energy monitoring device. The load management system enables systematic management and control over different electrical equipment in the house. The aim is to have a system that manages power consumption by means of

Message from the CEO, (Continued)

information communications technology like sms and email, thus allowing the end user ease of power utilisation.

We have also completed a flagship assembly plant of the solar street light in Kanye. The assembly plant produces 150 lights per week. To date, over 1000 lights have been installed in various places like Diphuduhudu, Bere, Ukhwi, Ngwatle, Chanoga, Qangwa, Somelo and Qabo. The assembly plant will soon move on to assemble high lumen solar lights, Seding 1600 and the new Seding light version that is 100% locally designed, thanks to our talented team. In yet another exciting project and in joint collaboration with the Poverty Eradication Programme, BITRI has started rolling out twenty nine (29) Kgalagadi Sand Building Block Technology (KSBB) depots countrywide. To date four depots were completed and these are at Maubelo, Phitshane-Molopo, Lehututu and Takatokwane.

There are other range of activities that should usher in new products. For example, the Nanotechnology team is fabricating material that will be used for air filtration, water filtration as well as for protective clothing. In vivo monitoring of vital parameters will soon be possible through our implantable sensor. We have progressed very well in setting up the mineral beneficiation facility that includes components for both coal and copper. Our IT Associates program is now in its second phase with a few promising projects that we positively feel would reach the market. We have various mobile applications that should transform the lives of Batswana. The impact of our climate change team has also been rather significant both at policy and advisory levels for government and farmers, respectively. Our strategy is driven by collaborations and partnerships and as such, we consider partnerships as the most cost effective way of conducting research given our late participation in this area as a nation. We work with a spectrum of stakeholders such as farmers, village residents, industry, research organisations, academic institutions in Botswana, regionally as well as internationally on some of our projects. Engaging our stakeholders on different foras is also critical and as such we are very strong on sensitization and awareness of our mandate through seminars and exhibitions.

In conclusion, I wish to thank our stakeholders for their support and the Board for their guidance and providing the strategic direction. I would also like to thank my team for their dedication and hard work in delivering our mandate to the stakeholders. Last but not least I would like to thank the Government of Botswana for the financial assistance to enable us to carry out our mandate.

I thank you.

Nelson Torto, PhD, FBAS FAAS FRSC
Chief Executive Officer

BOARD OF DIRECTORS

1 Dr. Martin Mosinyi Kebakile - *Chairperson*

2 Mr. Baitshepi Tebogo - *Member*

3 Mr. Edwin Elias - *Member*

4 Ms. Keitseng Nkhah Monyatsi - *Member*

5 Mr. Mao Segage - *Member*

6 Ms. Mercy Bothojwame Conlon - *Member*

7 Mr. Oganeditse Marata - *Member*

8 Ms. Tekolo Modungwa - *Member*

9 Dr. Ecco Ditshupo Maje *Member*

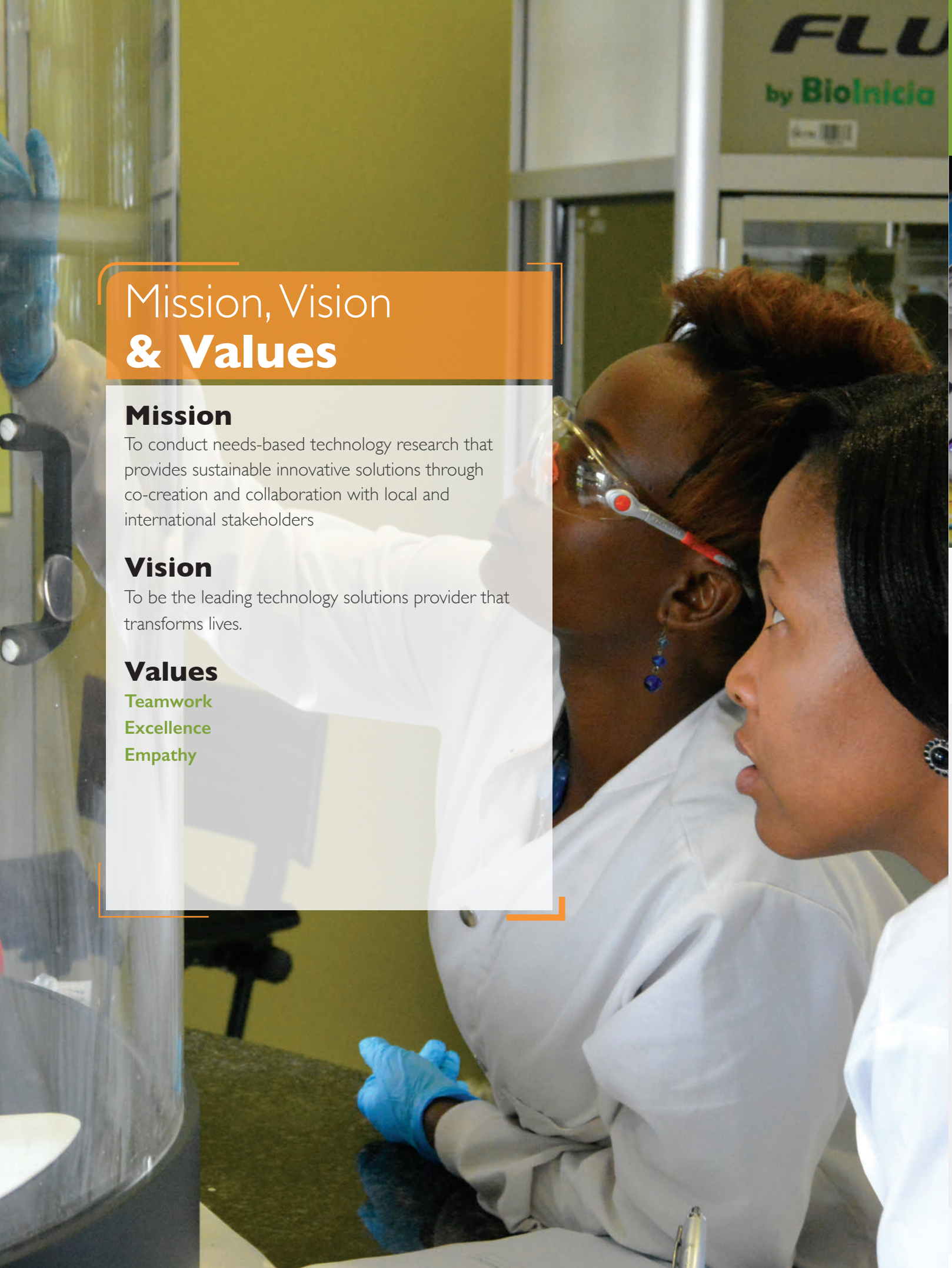
10 Professor Nelson Torto - *CEO*


4SPIN
EMERGENCY STOP
BITRI
ELECTROSPINNING LOG BOOK
FLUIDNATEK LE 100

About BITRI

The Botswana Institute for Technology Research and Innovation (BITRI) is a parastatal under the Ministry of Tertiary Education Research Science and Technology, established in 2012 to conduct needs-based research and development in focused areas. The Mandate of BITRI is to identify, develop and/or adapt appropriate technology solutions that provides sustainable innovative solutions through co-creation and collaboration in line with national priorities and needs of Batswana.

BITRI will develop technologies that will as much as possible maximize use of local materials to ensure efficiency and affordability. BITRI will harness its institutional capacity as well as collaborate with other organizations and institutions. BITRI is situated at Maranyane House in Gaborone, Botswana. It has other campuses in Gaborone, Kanye and Palapye. BITRI has Six Departments namely,
Technologies; Natural Resources and Materials; Chief Executive's Office; Research & Partnerships; Human Capital and Finance and Operations.



Mission, Vision & Values

Mission

To conduct needs-based technology research that provides sustainable innovative solutions through co-creation and collaboration with local and international stakeholders

Vision

To be the leading technology solutions provider that transforms lives.

Values

Teamwork
Excellence
Empathy

BITRI Strategic Intent

#1640 At BITRI we are focused on three strategic priorities to be achieved by 2020.

1 We are focused on developing One Team / Mission / Goal

6 We will deliver on six technologies

40 We will generate Forty percent of our own revenue

BITRI Thematic Research Areas

Natural Resources and Materials

- Building Materials
- Climate Change
- Nanomaterials

Technologies

- Electronics and Communications
- Energy
- Information Systems and Technology

BITRI Departments, Functions and **Projects at a Glance**

NATURAL RESOURCES AND MATERIALS

1. Building Materials Science

Building Materials Science Division focuses on needs based research and development of new innovative building materials from natural raw materials and industrial by-products or waste. It also develops technologies for re-cycling building materials, identify new/innovative uses and modify conventional building materials to improve their performance. In addition, the Division hand-holds companies, especially start-up companies that take up the new/innovative building materials developed in-house or are developed by other entities and evaluated by BITRI as fit-for-purpose, in collaboration with key Regulatory Organizations such as Botswana Bureau of Standards (BOBS). Building materials will develop algorithms for the selection, specification & quality control of materials for given applications, to meet the following requirements:-

- **Cost-effectiveness of both production & application**
- **Desirability of chemical, physical & mechanical properties**
- **Environmental friendliness of processes of both production & application**
- **Aesthetic appeal Project Implementation and Milestones**

a. During the reporting period, the Building Materials Division was engaged in the development of a Kalahari Sand Building Block (KSBB)-specific cement blend.

The project was motivated by the fact that one of the components of the KSBB technology is Clinker/Ordinary Portland Cement (OPC), blended with Morupule Fly Ash (FA). It was however, realized that fly ash produced at Morupule B Power Station had a chemical composition that differed significantly from that of the Morupule A FA, which had been used for blending Ordinary Portland Cement in the development of the KSBB Technology. Therefore, there was a need to determine the fitness for purpose of Morupule BFA for the production of KSBB-specific cement blends. It is for this reason that it was recognized that the KSBB-specific cement blend should have its own BOBS Standard to ensure the commercial production of the cement blend as a regulated product. Development of the KSBB-specific cement blends, based on Morupule BFA was completed. Commencement of the development of a BOBS Standard for the same was pending.

b. In Addition the division was working on the Development of mortars based on Quarry/Crusher dust and on Kgalagadi Sands.

This project was motivated by the fact that as rivers are continuously being depleted of river sand and affecting the environment there was a need to find a way to replace river sand as a building material. Therefore during the reporting period, Building Materials was investigating the potential of quarry/crusher dust as a resource for the production of manufactured sand – fit for purpose for a whole range of applications from mortars to concrete works. Development of mortars based on quarry/crusher dust and on Kgalagadi sands was completed. The test results thereof have been validated in-house. Peer review and external validation of the same were pending.

c. The Division was also engaged in the nationwide rollout of the KSBB Technology.

The KSBB Technology rollout project was a result of the selection of the KSBB Technology as one of the vehicles for the multi-pronged Economic Stimulus Programme (ESP), which was launched in October, 2015. The rollout envisages the setting up of up to twenty-nine (29) KSBB depots countrywide. BITRI's role is to provide technical support in the setting up of the depots and hands-on training of the locals in the good practice of the KSBB Technology.

BITRI Departments, Functions and **Projects at a Glance**

The roll out began with the construction of the Maubelo-Tsabong KSBB depot that began operations in October 2016. Seventeen (17) locals received hands-on training in the good practice of KSBB-moulding over a period of six (6) months.

Staff

During the reporting period, the Division had a staff complement of nine, comprising one Lead Researcher and eight Associate Researchers.

2. Climate Change

The Climate Change Division focuses on four of the Botswana National Research, Science and Technology Plan 2005, priority areas of research namely agriculture, health, water resources and energy. The specific objectives are to address the four priority areas of research through evidence based research and upscaling of the results as decision support tools and technologies to household and the national level.; User-inspired research that identify and conduct research in areas that will advance the decision support process for the agriculture, health, energy and water sectors for a changing climate.; Communications and Knowledge management: Convey climate change and extreme weather risk, impacts, opportunities, and solutions clearly, succinctly, and in a way understood unambiguously by the end user.; Services: Prototype and develop new methods and products to quantify and exploit climate change opportunities and reduce risks.

BITRI Departments, Functions and **Projects at a Glance**

Project Implementation and Milestones

During the reporting period the Division had nine projects running as follows;

a. Climate variability and change risk assessment and management: development of decision support systems for dry land small scale farmers in Barolong and Kgalagadi South Sub-District

The aim of the project is to implement adaptation actions that will deliver substantial development benefits while addressing the specific climate related vulnerabilities/risks identified through field surveys and secondary data analysis in component 1. The first part of the project which represents the "livelihoods analysis aspect" funded by BITRI has been completed. Component II seeks to implement the recommendations of Component I and therefore seeks to Reduce the impact of climate change on small holder farmers by strengthening their adaptive capacity to make their livelihoods more resilient. The following milestones were achieved during the reporting period;

i. Improve household food security and build resilient livelihoods through Implementing Decision support tools

In introducing and promoting drought tolerant crop varieties, hybrid seeds were planted, foliar feed fertilizer was also used as per requirement at both districts. A good number of farmers used rippers following the decision support tools recommendations.

ii. Project awareness raising and advocacy. Presentations on project awareness were conducted at the Kgalagadi and Southern District Councils respectively among political and district leadership

iii. Capacity Building

- 32 Agricultural Extension Officers were trained on new community engagements methodologies to facilitate communication and information sharing of climate change information with farmers. The capacity building covered traditional extension methodologies and emerging methods such as the Vulnerability and Capacity Assessment methods.

- 38 farmers from both districts attended a training workshop that focused on climate-smart agricultural practices and technologies as an integral component of this pilot project.

  The training was a first in a series of capacity building initiatives that will be undertaken under the project. A tool box package focusing on climate-smart agriculture interventions for the selected crops was put together and demonstrated at selected farmers' fields at Goodhope District.

iv. Weather forecasting outlook for tactical and strategic decision-making;

A workshop was held to enlighten farmers on the weather outlook for the 2016/2017 planting season so that they can prepare accordingly. The farmers were informed that the coming season showed signs of a relatively wet period, otherwise known as La Nina.

v. Knowledge Management and Communication strategy

- Project documentation has been ongoing throughout the project since inception (report writings, media briefs, stakeholder updates).

- Participating farmers were identified and profiled according to project requirements

- Development of a Training Manual on the Use of Vulnerability and Capacity Assessment Methods for Agricultural Extension Staff project was ongoing.

vi. Project Monitoring and Evaluation

- The monitoring approach comprised of meetings with the district stakeholders to Map project progress. In-field assessment and monitoring of progress among participating farmers and continued sharing of decision support tools to address emerging issues was ongoing. There were three farm walks at the

BITRI Departments, Functions and **Projects at a Glance**

Barolong District, key tools demonstrated at these walks included; soil moisture conservation, plant population, weeds control, crop rotation and fertilization (basal and top dressing). These activities were meant to raise awareness of adaptation and the role of community in ensuring maximum yields. During the farm walks other farmers were able to appreciate the difference that Climate Smart Agriculture (CSA) makes to production. The District Agricultural Officers' used the opportunity to encourage their farmers to adopt the CSA technologies. The farm walks were attended by farmers from Barolong farms and Ngwaketse District. Stakeholders from the Ministry of Agriculture head Office were also present.

b. *Out-scaling and up-scaling Climate-Smart Agriculture in smallholder in farming system in north east district, Botswana*

The aim of this project is to generate an appreciation and subsequently adoption of Climate-Smart Agricultural (CSA) practices through proof-of-concept sites established using participatory, farmer-centred and community based tools and approaches. The project is designed to deepen understanding of indigenous and research-derived knowledge in increasing the adaptive capacities and food security of smallholder farmers through climate-smart and gender-sensitive sustainable approaches.

The project is to be carried out in the North East District and expects to directly benefit at least 200 smallholder farmers who will benefit from more stable varieties and climate resilient and productive cropping systems from onsite field demonstrations in the target district and 40% of whom will be women. In the end the project intends to Up-scale to over 600 farmers during field days, and farmer's markets. By the end of the reporting period, the project was initiated with a project introductory meeting to the district stakeholders, so that they are aware of the project and its objectives. The introductory meeting targeted the Agricultural Extension Officers, who are pivotal to the project success and the Tribal and Local Administration Authorities.

c. *Evaluating past droughts, floods, and other climatic clues to inform future climate predictions*

The goal of the project is to 'Construct a Framework for National Drought Strategy'. The end-product of the project would be a Policy brief outlining National Drought Strategy. The research project will therefore contribute to the national goals to eradicate poverty and to have a well-educated and informed nation on the impacts of drought on the socio-economics of Batswana. The project is being carried out in the following three phases; the scientific study of past drought events in Botswana, studying the lessons learnt from analysis of past drought management in Botswana and establishing the role of science in drought management. By the end of the reporting period the analysis of Gaborone dam temporal water level dynamics over the years was complete in collaboration with London School of Economics (LSE) hydrologists. A synthesis draft report on drought management strategies and the socio economic impacts was in the process of being prepared. The Lead Researcher, Climate Change is the lead author for the country drought management strategy.

d. *Downscaling climate change scenarios to spatial scales relevant for risk management and policy decisions*

This project entails developing and adapting various techniques to downscale global climate model projections to sub-country scales. This involves downscaling climate change scenarios to district, sub-district and area levels in order to aid in policy making, climate change risk assessments and management as well as development of adaptation options for climate change and extreme weather events. By the end of the reporting period two downscaling approaches were being considered; dynamical and statistical.

There is special interest on precipitation as a meteorological variable since rainfall deficit or surplus thereof can have devastating effects on the socio-economics of any community or nation. On dynamical downscaling, a Regional Climate Model (RegCM4) developed by the Abdus Salam International Centre for Theoretical Physics (ICTP) in Italy has been identified as the model to use.

BITRI Departments, Functions and **Projects at a Glance**

The installation of the RegCM4 model had been completed and the process of localizing the model to run simulations for Botswana had commenced. On statistical downscaling, before the implementation of the identified statistical downscaling methodologies, various climate models that participated in the Fifth Coupled Model Inter-comparison Project Phase (CMIP5) project were investigated to find out their performance with regard to precipitation. The investigation aimed to identify the best climate model data to use in the downscaling.

e. *The economic impact of El Nino related drought on small and medium enterprises in greater Gaborone area*

The project is done in collaboration with London School of Economics (LSE) and funded by the Department for International Development, UK. It aims to assess the impacts of and responses to extreme drought associated with the 2015-16 El Nino on Small and Medium Enterprises (SME) in the Greater Gaborone Area, particularly how they are affected by water supply disruption. Insights of water managers and SME responses will allow for generation of recommendations on preparedness and responses that will contribute to increased resilience to future El Niño events.

With regard to meeting the objectives of the project, the following had been accomplished by the end of the reporting period;

- 12 Resource Managers Interviews from the sectors of water affairs, water utilities, research centers, meteorology, environment and disaster management were done.
- Small and Medium Enterprises survey
  Data collection was carried out and completed with a sample of 60 surveys.
- Data Analysis

  Work continued on related analyses of differential impacts of the past El Niño related water shortage and coping strategies employed by surveyed businesses sectors during the drought. These analyses set a foundation for the identification of innovative methods of coping with future drought to make businesses more resilient.

f. *Hedging dryland crop income against climatic risks: Optimal options under a changing climate*

The crop insurance project aims to develop hedging strategies for farmers to protect their crop income during years of drought. As part of the study, it is critical to learn the dynamics of farm-level inputs and outputs over time. Furthermore, farmers' value system that influences their decision making under risk is another aspect the project intends to elicit and quantify. All the elicited information will help to have a firm grip on the risks posed by climate variability, which grip is necessary to build robust and optimal hedging strategies, at least under the current climate. The study will also assess if national declarations of drought are necessary for government interventions. Thus the outcome of this project will be a tool that government can consider in order to support commercial farmers in an effort to reduce the threat to food security. Insurance companies and/or government can also use this tool as a basis for setting up insurance policies for dryland farming. By the end of the reporting period the first phase of the project which included the study of weather patterns and how they relate to crop yield was carried out and complete.

g. *Improving availability, access and use of climate information: rainfall Measurement Through Mobile Networks*

The aim of the project is to measure rainfall using microwave signal attenuation. The microwave signals are transmitted between cell phone towers for mobile communication. Areas used in the study are Gantsi and Werda. This is a collaborative project between the Climate Change Division at BITRI and Botswana Telecommunications Corporation who provide signal monitoring data and technical expertise. The results of the project were also shared with stakeholders at a highly attended BITRI public seminar. Part II of the project, which is project roll out (up scaling), was at the initial stage of seeking funding.

Staff

By the end of the reporting period the Division had a staff complement of eight comprising of one Lead Researcher, one Senior Researcher and six Associate Researchers.

BITRI Departments, Functions and **Projects at a Glance**

3. Nanomaterials

The Nanomaterials Division is mandated to perform research that make use of Nanotechnology and other technologies to develop products that address the needs of Batswana and also elevate the research and technology landscape of Botswana globally. In developing products, the abundant natural resources & materials in Botswana will be used as a way to add value. The Division has four focus areas, namely: Filtration (made up of air and water filtration), Diagnostics, Specialty Chemicals, and Centre for Material science (CMS).

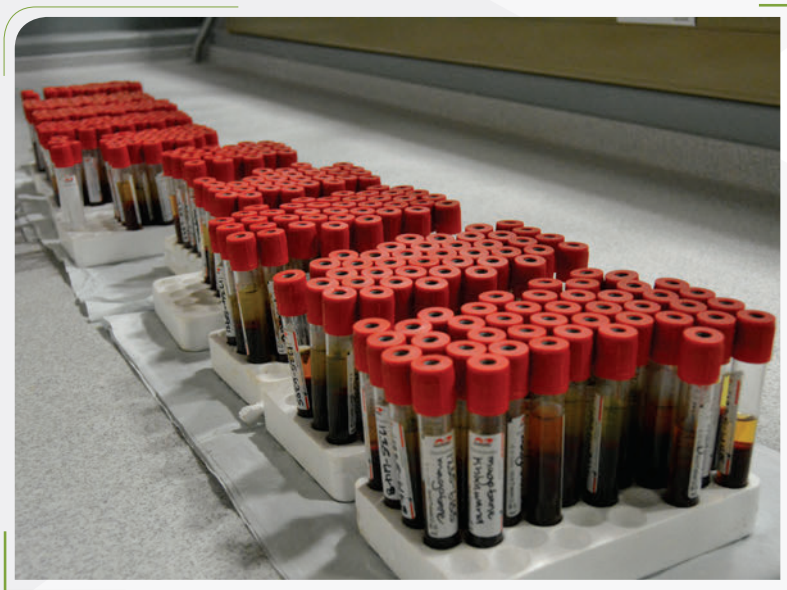
The CMS was set up to provide analytical services to BITRI and institutions in Botswana and the SADC region. Two additional staff were appointed to complement the two instrument specialists, who were at the CMS at the beginning of the 2016-2017 financial year, bringing the number to four Instrument Specialists. This doubling of Instruments Specialists at the CMS has helped in turnaround times for analyzing internal and external samples; and would help in using the CMS to generate revenue for BITRI.

Modification of a wet laboratory for Specialty Chemicals at BITRI B was nearing completion, while approval for extraction facilities to remove gases from the wet laboratory and the catalysis laboratory was due to start in the 2017-2018 financial year. A coal gasification and liquefaction equipment was set to be installed in August 2017 and the project earmarked for the beneficiation of Botswana coal soon thereafter.

The Division has a skilled, multidisciplinary team with a chemistry core and expertise stretching across the physical, chemical, biological sciences and chemical engineering. By the end of the reporting period the division had a staff complement of 28 comprising of one Lead Researcher, five Senior Researchers, 11 Researchers, two Instrument Specialists, seven Associate Researchers and two Associate Instrument Specialists. Of the twenty-eight, there are 16 PhD, 7 MSc and 5 BSc honors degree holders.

a. Diagnostics

The broad research objective is to develop affordable, simple to use point-of-use diagnostic devices in the areas of animal and human health. The team is currently engaged in developing rapid lateral flow test strips for the detection of foot-and-mouth disease virus (FMDV) and lumpy skin disease (LSD) virus. The project that advanced the most in the reporting cycle was the FMD project. As a first step, BITRI signed an MoU with the Canadian Food and Inspection Agency (CFIA) in Canada to develop a rapid diagnostic test for Foot and Mouth Disease (FMD). This was followed by the attachment of a BITRI researcher to the CFIA laboratory in Winnipeg, Canada for 6 months from February 2016, to initiate the joint project on developing a rapid diagnostic test for Foot and Mouth Disease (FMD). The CFIA has worked on similar projects and has expertise in the area. In addition to the MoU with CFIA, BITRI and the Botswana Vaccine Institute (BVI) signed an MoU to collaborate and work together in areas such as sharing of materials, exchange of scientists and sharing of facilities. In particular BITRI, Researchers spent several months at BVI to get hands-on experience in working on FMD. It is also in the context of this collaboration that BITRI and BVI held a Stakeholders' meeting with the Permanent Secretaries of the then Ministries of Infrastructure, Science and Technology and Agriculture to bring both policy makers on board with



BITRI Departments, Functions and **Projects at a Glance**

the FMD project. The project resulted in the development of a prototype test kit for the detection of antibodies to the non-structural protein of FMD in Phase 1 of project. The test kit can detect the presence of the FMD virus in 25 minutes. The result has led to agreements with BVI and the National Veterinary Laboratory (NVL) to form a validation team to validate the FMD test kit. Upon the recommendation of the validation team, 1 000 serum bovine samples were collected from Green Zones in Botswana; additional FMD positives samples were collected from outside Botswana. In particular, based on these test results, Phase 2 of the validation was planned where approximately 1 000 samples from countries outside Botswana that have FMD outbreaks and another 1 000 samples from Green Zones in Botswana would be collected.

The collaboration with the Canadian food inspection agency (CFIA) the Botswana Vaccine Institute (BVI) and the Department of Veterinary Services (DVS) has grown with all three partners becoming essential in the development and validation of the rapid lateral flow test strip for the detection of FMDV non-structural proteins test strip. Following a presentation before the then Honourable Ministers and Permanent Secretaries of the then Ministry of Infrastructure, Science and Technology and the Ministry of Agriculture, BITRI Management, technical team consisting of experts and partners on Foot and Mouth Disease matters, the Minister of Agriculture pledged P100 000.00 towards the project.

b. Air filtration

Air filtration projects focuses on using electrospinning to develop nanofibres as filter materials due to its ability of removing pollutants. The air filtration products being developed would be suitable for use within the mines, construction industries, the health sector, automobiles and households. BITRI has identified North Safety, as a collaborating partner. North Safety is a company in South Africa that manufactures masks. The plan is to incorporate BITRI's nanofibers into respiratory mask produced by North Safety. During the reporting period, the preliminary evaluation of the BITRI produced nanofibre filters showed that a one layer membrane passed Filtering Facepiece 1 (FFP1) test and a two layer membrane passed the Filtering Facepiece 2 (FFP2) test. FFP1 offers protection from atoxic and non-fibrogenic kinds of dust, as well as removal of odour. FFP2 offers protection from firm and fluid deleterious kinds of dust, smoke, and aerosols. The result of the air filters means the BITRI nanofibre filter membrane is acceptable to be used in filtration mask used in the mines. The team was also in the initial stages of developing nanofibres for Filtering Facepiece 3 (FFP3). FFP3: protection from poisonous and deleterious kinds of dust, smoke, and aerosols.

BITRI's interaction with North Safety also led to the discussion on the development of an affordable protective clothing materials that can be used in mining industry. Similarly the use of electrospinning to make filter materials suitable for various applications, has attracted interest from Protechnik, a subsidiary of Armscor South Africa, which led to the signing of an MoU to jointly develop protective clothing.

Water filtration

The water filtration team continued the development of point of use water filters for both household and community level applications. This include developing filters that target the removal of microbial contamination, particulates, bad taste, bad odor, color and heavy metals. Three main types of filter materials were developed

BITRI Departments, Functions and **Projects at a Glance**

during the reporting period, namely nanofibre filters from nylon, ceramic filters from clay and filter blocks made from commercially available activated charcoal. The Design team was working on a design that could be used in building a prototype. The ceramic filter membrane made from clay was also capable of removing 90-95% of microbial contamination in water; the project was also in the design stage to build a prototype filter for household water purification. When silver nanoparticles is incorporated in the ceramic material, the resulting filter is able to completely remove 100% of microbial contaminants. The third water filter material is a cartridge made from the activated carbon; the filter cartridge from activated carbon has been found to be a very efficient odor removal filter. BITRI and Water Utilities Corporation (WUC) signed a MoU on the 27th June 2016 to collaborate in sustainable water and wastewater research. Part of this agreement is the development of the activated carbon research project, aimed at removing odor from water bodies that have smelly compounds that come from areas where such water is found.

In another ongoing project during the reporting period, the Water Filtration team demonstrated that fly ash can remove arsenic from water. Attempts to develop fly ash cartridge resulted is a filter with very slow filtration rate. Adopting a low cost technology for desalination of salty water have commenced with an ongoing discussion for partnering with Professor Benjamin Hsiao from Stony Brook University in the USA.

c. Specialty Chemicals

The Specialty Chemicals team is focused on research that aims to transform minerals in Botswana into higher value commercial products. During the reporting period, the team was focused on acquiring equipment and personnel that would drive two projects; one that use coal as feedstock and another to look at cost effective processes that could selectively isolate nickel and copper copper-nickel matte. This process was nearing completion and it was expected that by the middle of the 2017-2018 financial year the fully functioning laboratory would be in place. This would allow the coal beneficiation project to start, which involves the conversion of coal to syngas which can be subsequently be converted to high value chemicals. The second approach which involves pyrolysis of coal to liquid products was started in the second half of the reporting period. Preliminary results indicate that pyrolysis of the coal is a rich source phenols and aromatics that can be used as additives for the food and petrochemical industries respectively.

BITRI-PROFUSA Collaboration

In July 2016, PROFUSA and BITRI signed a MoU to develop new materials for sensor application. PROFUSA Inc. is a leader in the development of a new generation of bio-integrated sensors that empowers the individual with the ability to monitor their unique body chemistry in unprecedented ways to transform the management of personal health and disease. PROFUSA technology enables the development of bioengineered sensors that become one with the body to detect and continuously transmit actionable, medical-grade data for personal and medical use. The objective of the PROFUSA-BITRI collaboration is to investigate the possibility of expanding Profusa's tissue-integrating sensor platform with electrospun sensors fiber matrices at BITRI. Currently PROFUSA uses a sphere templating approach to create tissue-integrating sensors. With BITRI's expertise in electrospinning, PROFUSA's poly (hydroxyethymethacrylate) (PolyHEMA) was electrospun; leading to the formation of nanofibres with pores sizes up to 20 µm. Further experiments to increase pore sizes large enough to house the anticipated biosensor were underway.

BITRI Departments, Functions and **Projects at a Glance**

Centre for Material Science (CMS)

By the end of the reporting period, all the major instruments and equipment had been installed and training conducted on most of them. In addition, a brochure has been completed that highlights all the key instruments and equipment available. Advertisement of the center was flighted in the inflight magazines of regional airlines with the goal of marketing CMS services to potential customers in Botswana and beyond. Two instrument specialist were recruited thus bringing the number of dedicated instruments specialists to four. The CMS also began developing a website that further enabled it to market itself and provide information of instruments and services.

Technologies

1. Electronics and Communications

The Electronics and Communications division focuses on research and development in two main focus areas; Consumer Electronics and Smart Systems. Under consumer electronics the division addresses different needs from smart lighting systems, multimedia gadgets/systems, and niche technological breakthroughs that universally address bottlenecks in achieving superior control electronic systems (at material and/or system level). Smart systems is where the division innovates and develops especially in the area of wireless communication systems, by developing agile, low power consumption communication protocols for Wireless Sensor Networks (WSNs) for various economic sectors. The division targets niche technological breakthroughs WSNs that universally address bottlenecks for advancing these fields, at an international level.

BITRI Departments, Functions and **Projects at a Glance**

Project Implementation and Milestones

i. **Seding v2 (Full Bright at 2000+ lumens and 3000+ lumens** – By the end of the reporting period the Division was developing the Seding Version 2. Progress was satisfactory with the prototype. The division was addressing issues of production after which the process for BOBS certification of the production prototype will commence.

ii. **Television White Space (TVWS) Radio Network** – The project was completed by the end of the reporting period. The Radio Network was installed, tested and was co-aired with BOFINET, who have also fully adopted the technology.

iii. **Wireless Sensor Network Communication Platforms (WSNs)** – The Project was completed by the end of the reporting period. Three communication Platforms for Zig-Bee, LoRa wan, and Sig-Fox were set up and working properly. By the end of the reporting period, the Division was configuring a server based system for collection of various sensor data from farms sensors, climate sensors, etc. This will allow for data Analytics and thus as an advisory role to key economic decision making sectors.

iv. **Seding v2+** - This is the Seding v2 lights but with communication capabilities, tailored to fit the application. By the end of the reporting period the Division was preparing a production prototype with its Seding v2 Manufacturers. The project is expected to be completed by November 2017.

The Division has a staff complement of nine,comprising of one Senior Researcher and 8 Associate Researchers.

BITRI Departments, Functions and **Projects at a Glance**

2. Energy

The Energy Division focuses on needs based research, development and adoption of Energy technologies (renewable and non–renewable) for Botswana. In addition to research and development, the Division also offers training and consultancy on energy related technologies.

Project Implementation and Milestones

During the reporting period the projects undertaken were as follows:

i. Seding® Solar Lighting

This project involved the use of intelligent solar PV lights equipped with both motion sensors and day light switching mechanism. The SEDING® light is solar powered and environmentally friendly, highly reliable, adaptable and robust and can be used in different environments such as parking lots, gardens, farms (masimo), cattleposts (meraka), playing fields, clinics, gathering places like the kgotla and in numerous other locations. As part of the roll out of the light, the office of the president contributed two million Pula under the Poverty Eradication Programme for the installation of the lights in rural areas. The areas covered during the reporting period were; Diphuduhudu, Bere, Ukhwi, Ngwatle, Chanoga, Qangwa, Somelo and Qabo with approximately 1000 lights installed. In addition to the Poverty Eradication Programme, Government institutions like Department of Building and Engineering Services also acquired the lights for use in areas of need. The setting up of the Seding Assembly plant in Kanye was completed in July 2016.

ii. Solar Traffic Lights

The aim of this project is to give a more economic and environmentally safer alternative power supply for Gaborone traffic lights. The traffic lights will be powered by a solar panel, tilted at a 30-degree angle to ensure maximum efficiency in capturing the sun's rays. The rays will be received by the photovoltaic panel array where they are converted into electric power and transmitted to a set of batteries. Each system will be capable of charging itself, storing and producing electricity even on overcast days. To prevent vandalism, the solar panels will be hosted at the top of a 6m pole, while the batteries will be placed in a support case made of cement. The traffic signal globes will be retrofitted with light-emitting diodes (LEDS) which consume less electricity than conventional light bulbs. In theory, with the proposed upgrade to solar power, savings can be achieved and existing challenges will be addressed by the system.

By the end of the reporting period permission was sought and granted from Gaborone City Council to undertake the study on two of their traffic junctions. Preliminary designs were also completed together with the supplier of component Traffic and Signal Accessories (TSA) of South Africa. Procurement of project equipment was ongoing.

iii. Solar powered load management device (LMD)

Botswana has been facing challenges of electricity shortage hence the need to manage power consumption and avoid the unnecessary use of electricity. Due to many power cuts a lot of users do not have alternatives to charge their electronic gadgets. Also due to power cuts there is a possibility of having power surge. To address these challenges a solar powered load management device was being developed. The major stakeholders in this project are BPC and the general public. The project started in 2015. The project aims at addressing the unnecessary use of electricity, damage to sensitive appliances due to power surge caused by power cuts and inconvenience caused by power cuts as far as gadget charging is concerned. By the end of the reporting period the LMD Version 1 of prototype was developed and completed and was at a rigorous testing stage. The Lab scale testing of the LMD version 1 was also done and brainstorming and development of LMD version 2 of the device was on going

iv. Quantifying The Financial Costs And Benefits Of Renewable Energy Resources In Botswana's Electricity System

This project was undertaken as a result of lack of information relating to renewable energy contribution and implementation in Botswana. Lack of information therefore hampers the formulation of appropriate policies in promoting renewable energy in Botswana. The aim of the project therefore is to investigate the actual financial costs and benefits of the existing renewable energy resources (mostly Solar PV) in Botswana from actual production data (hindsight analysis). The goal is to derive the financial benefits from

BITRI Departments, Functions and **Projects at a Glance**

the calculated impact which existing renewable energy resources have on the existing conventional generation fleet. This will be in terms of fuel savings and avoided unserved energy. The hindsight analysis will look into the existing data and this will be a precursor to the proposed similar study on forward looking costs and benefits. The results of the study will be instrumental and informative in empowering the policy making and decision-making processes. The renewable energy contribution to the energy mix in Botswana is very low and therefore it is hoped that quantification of such will result in the policy making that will promote the increase of the contribution.

The project is in collaboration with the Council for Scientific and Industrial Research (CSIR) of South Africa and by the end of the reporting period the preparation for the stakeholder's workshop was ongoing.

v. Energy Efficient Cook Stoves

Energy efficient stoves are very important because they reduce the use of fuel wood and also decrease pollution.

The stove is expected to aid in alleviating health hazards caused by continual exposure to smoke in open fire cooking. The usage of fuel wood is reduced because of the efficient insulation technology employed of the system. The goals are to design a stove which will be able to perform better than the traditional way of cooking and to design a system that will be better in terms of efficiency as compared to many of the efficient cook stoves in the market. By the end of the reporting period the project had produced two prototypes of the single burner stove and two burner cook stove. The project was at the testing, optimization and modifications stage.

vi. Solar testing platform

This project intends to set-up a world class accredited Solar Thermal Testing Facility (STTF) in accordance with ISO/IEC 17025. The facility will be affiliated to the National Certification Program, coordinated by the Botswana Bureau of Standards (BOBS). Other major stakeholders in this project are Botswana Innovation Hub (BIH), Department of Energy (DoE), Universities and the general public. All technical tests will be carried out for industry, government and any member of the public according to the test procedures and protocols that will be developed under this project.

By the end of the reporting period the project was at the implementation stage. The test lab was being constructed and it was expected to be completed by December 2017.

By the end of the reporting period the Division had a staff complement of six comprising of one Senior Researcher, and five Associate Researchers.

BITRI Departments, Functions and **Projects at a Glance**

3. Information Systems And Technology

Information Systems and Technology Division focuses on research and development to provide technology solutions and next generation products in nine priority areas of Health, Education/Learning, Tourism, Agriculture, Transportation, Security & Forensics, Entertainment, Communication Infrastructures, and Energy.

Project Implementation and Milestones

i. Mobile Tutoring System for Botswana

This project is part of the 'Education Informatics System for Botswana. The Mobile Tutoring System for Botswana part of the project is about mobile application which drills pupils on their subjects and simulates examination. The project focuses on developing a mobile tutoring system for secondary schools. It will address issues of flexible and low cost access to tutoring material.

By the end of the reporting period, the 'shell' application was complete and only content was to be uploaded. The Division was working with Kagiso Secondary school for content generation, formatting and structuring. The expected date of completion was October 2017.

ii. Web-based Tutoring Application

This project is part of the 'Education Informatics System for Botswana, The project is about desktop based application which drills pupils on their subjects and simulates examination:

The project is a replica of the mobile application on a web-based platform albeit with enhanced capabilities such as student/teacher/parent/ headmaster report generation. It was envisaged that certain analytical functionalities will later be added. By the end of the reporting period reports modules/capability were to be added and content to be uploaded. The Division was working with Kagiso Secondary School (KSSS) for content generation, formatting and structuring. KSSS had pledged a lab for BITRI to use for education technologies in general. The envisaged date of completion was October 2017.

iii. Remote Patient Monitoring:

This project is part of Health informatics system for Botswana and it focuses on remote monitoring of Non Communicable Diseases including Hypertension, cardiac arrest and Diabetes. By the end of the reporting period the project team was engaged in requirement gathering, design and development and security testing. The project was delayed due to human resource constraints. The Project completion is estimated at April 2018.

iv. Notification platform for animal disease outbreaks

Animal diseases and crop-related conditions outbreaks have the tendency to spread and affect a large number of the population of animals and crops alike. Botswana relies heavily on farming and beef exports and, any form of platform to inform authorities of any possible outbreaks is desirable, thus this projects addresses this problem. By the end of the reporting period the team was engaged in re-focusing the notification platform to be generic animal diseases and other crop related conditions & possibly Interface with existing ones. The envisaged date of completion was November 2017.

v. Television White Space (TVWS)

This project is in collaboration with the Council for Scientific and Industrial Research (CSIR) of South Africa. The project focuses on building the TVWS Experimental Network that will be used by BITRI in the long term to conduct research on dynamic spectrum access and sharing on the TVWS frequencies. Additionally an instance of Botswana TVWS data-base premised on Geo-location will be developed. By the end of the reporting period the Network deployment was to be completed. Delays were experienced in network deployment . There were also IP issues to be resolved as the network is deployed on BOFINET infrastructure. Network monitoring and testing was still to be done. The National Geo-Location Spectrum database was to be completed in June 2017.

BITRI Departments, Functions and **Projects at a Glance**

Projects Envisioned or to Continue into 2017/2018

a) Dynamic Spectrum Wireless Broadband Network on Television White Space (TVWS)

There is growing recognition across the globe that dynamic spectrum sharing, especially on the television white spaces (TVWS), enabled by geo-location databases has significant potential to increase the availability and ubiquity of broadband access. This project represents the start of the collaboration between BITRI and CSIR of South Africa, and will focus on building the TVWS Experimental Network that will be used by BITRI in the long term to conduct research on dynamic spectrum access and sharing on the TVWS frequencies Initial thoughts point to a centralized base station node connecting four (4) site around Gaborone.

b) Health Informatics System for Botswana –Biomedical data Capturing System

- Patient Monitoring in Hospital Ward
- Triaging - Outpatient and Accidents & Emergency Sections

c) Education Informatics System for Botswana–Mobile Tutoring System

The overall aim of this project is to explore fundamentally techniques in business analytics and apply them in education and learning environments in order to tackle issues in the education system of Botswana. These may include lack of quality teaching aids, poor infrastructure, proper targeted extra-curriculum activities, low attendance, distribution of qualified teachers in rural and urban areas, poverty as well as other socio-economic factors. The project will study existing data and put in place data collection and mining techniques for collection of missing data, and apply data analytics for the purposes of guiding decision makers to plan for any necessary interventions in the education system. The project will focus on the solution to incorporate data analytics hardware/software in a centralized database system for all government and private schools.

d) Tel-radiology

This will be a collaborative project with the CSIR on low cost X-raying including films digitalization and validation, design and development of low cost viewing box, and pathological annotations

e) Security Testing on IoT devices: Cybersecurity

This is a Collaborative project on network security for IoT-based heterogeneous network comprising of wireless sensors computers, smart phones and tablets. This is relevant to the health project

f) TVWS Phase 2: Cross-border Frequency Harmonization Exchange Center (xFHxC)

This is a collaborative project with the CSIR. Focus is on the cross-border frequency coordination for TVWS and other bands to prevent and resolve harmful radio frequency interference across the borders and ensure that each country is obliged to account for other stations outside their spectrum jurisdiction prior to setting theirs in operation

Challenges

Inadequate human resource to execute projects proved a challenge during reporting year

Staff

By the end of the reporting period the Division had a staff complement of 12 comprising of one Lead Researcher, one Senior Researcher, one Researcher and nine Associate Researchers. In addition the Division hosted 48 interns under the Associates @BITRI programme.

BITRI Departments and Functions at a Glance

Chief Executive's Office

Internal Audit

The Internal Audit function provides an independent, objective assurance, consultative and support designed to add value and improve the operations of the Botswana Institute for Technology, Research and Innovation (BITRI). The Internal Audit operates within the terms of reference as set out in its Charter and in conformance to the International Standards tor the Professional Practice of Internal Auditing (IIA Standards) During the reporting period, The Internal Audit Charter and Annual Audit Plan were approved by the Board. The Annual plan is based on key risks to the Organisation. The Internal Audit has direct access to the Finance, Risk and Audit Committee (FRAC) and the Board through the quarterly presentations of the reports, of which three (3) out of the four (4) reports from the planned audits had already been tabled in providing assurance on the efficiency and the effectiveness of internal controls.

Risk Management

By the end of the reporting period a combined assurance approach was in place to assist in addressing key enterprise risks and the Internal Audit Function was delegated the responsibility of establishing and managing the Organisation's risk Management, compliance and control activities as per implementation of the International Auditing Standard (IIA) 1112 (Chief Audit Executive Roles beyond Internal Audit). Thus far, 12 top risks were identified, analysed and risk treatment/ action plan were devised to prevent these risks which could adversely impact on the achievement of the organisational objectives. These risks will be monitored as per the priority set in the register during the financial year 2017/18. From these risks, three (3) were ranked as "Priority 1" type of risks due to fact that they were considered critical and required the attention from Management and the Board and the rest were ranked as "priority 2". By the end of the reporting period the Board was in the process of developing a risk policy for the Organisation.

Legal Services

Board Governance

In its efforts to enhance good corporate governance, the Board of Directors and its Committees have developed Charters that guide the operations of the Board and its Committee. The Board has also developed a Shareholder Compact with the Government of Botswana as the shareholder of BITRI setting out the expectations of each party in relation to the expected outcomes. The Board underwent performance evaluation to measure how the Board fared in relation to its responsibilities as set in the BITRI Constitution, the Companies Act and the Shareholder Compact. The performance evaluation also measured performance of the individual Directors as well as the Board as a collective. A report of the performance evaluation has been shared with the Minister of Tertiary Education, Research, Science and Technology.

The Board has also approved the formation of a Scientific Advisory Body made up of persons of international repute in the area of science, research and technology which offer advisory support to the Board. As a company incorporated in terms of the Companies Act, BITRI is under a legal obligation to comply with all statutory requirements as set out in the Companies Act. The BITRI Directors as well as the Company Secretary have been registered with the Companies and Intellectual Property Authority as mandated by the Companies Act. The annual financial statements of the Company are filed with the Companies and Intellectual Property Authority. BITRI remains of all legal requirements flowing from the Companies Act. During the year under the review the Board Tender Committee met as scheduled and conducted the business of the tender committee as per the agenda. The BITRI Constitution allows for non- Board Members to be appointed to the Committees and as a result the Committee has, through the assistance of the Public Enterprise Evaluation and Procurement Agency, co-opted a member who is not a Board Director to augment its skill base and assist it in duties for a period of three (3) years.

For the period under review the Committee and the Board on recommendation by the Committee considered and approved the following:-appointment of external auditors; -approval of the annual financial statements of BITRI; -approval of the internal audit plan; -quarterly consideration of the internal audit report; -approval of the risk register; -adoption of the International Financial Reporting Standards.

BITRI Departments and Functions **at a Glance**

For the period under review the Quality and Technology Committee and the Board. On recommendation by the Committee considered and approved the following:-post doctoral fellowship policy;-terms of reference of the Scientific Advisory Body;-quarterly consideration of update on Research and Development;-consideration of research plans;-Knowledge Commons Policies;-ICT policies.

For the period under review the Human Resources Committee and the Board on recommendation by the Committee considered and approved the following: -human capital strategy; -succession planning policy; -recruitment and selection policy; -induction policy; -variation of BITRI Terms and Conditions of Employment.

Board remuneration

The Directors sitting allowance are paid in accordance with Government rates. The sitting allowances paid during the year under the review were as follows per sitting:

Chairperson: P1 575.00
Members: P1 260.00

BITRI Departments and Functions **at a Glance**

Board and committee meetings attendance **register for 2016/2017**

	Board	BTC	HRC	QTC	FRAC
M. Kebakile	6/6	n/a	n/a	n/a	n/a
E. Maje	6/6	n/a	6/6	2/4	n/a
T. Modungwa	4/6	n/a	6/6	n/a	n/a
M. Segage	5/6	3/3	n/a	n/a	4/4
O. Marata	4/6	1/3	4/6	n/a	n/a
E. Elias	4/6	1/3	n/a	3/4	n/a
M. Conlon	2/6	3/3	n/a	3/4	n/a
K. Monyatsi	3/6	n/a	n/a	3/4	1/4
B. Tebogo	3/6	3/3	3/4	n/a	4/4
N. Torto (ex- officio)	6/6	3/3	6/6	4/4	4/4
K. Balopi (co-opted FRAC)	n/a	n/a	n/a	n/a	3/3
D. Moloi (co-opted HRC)	n/a	n/a	1/1	n/a	n/a

Strategy Office

In order to attain its mandate of conducting needs-based technology research that provides sustainable innovative solutions and transforms lives, a five year strategic plan was developed and endorsed by the Board of Directors. The 2015-2020 plan focuses on three main themes namely Research and Development, Strategic Partnerships and Organizational Excellence and is currently under implementation. Although the envisaged review of the plan is 2018, it will be constantly reviewed to accommodate changes in the internal and external environments which BITRI operates in. A strategy management tool was put in place to assist in adequately monitoring performance of the strategy.

Strategic Intent

BITRI came up with a strategic intent, which is basically the critical drivers that were set to achieve the BITRI 2015-2020 strategy.
These are set on three main priorities, commonly referred to as #1640.

1 In order to be the leading science and technology research organization, locally and globally, BITRI will be 1 team driven by 1 Mission and 1 culture

6 From 2015 – 2020, BITRI will focus on delivering 6 technology solutions that meet the needs of the customers and be value for money.

40% through a sound business model (commercialization of BITRI solutions), BITRI should be able to become a financially sustainable organization generating 40% of its revenue base.

Implementation of Performance Management System

In order to drive accountability and improve organizational excellence, a Performance management System was put in place and implementation was to commence in April 2017. All employees signed their performance contracts by the end of the reporting period. As a way of improving functionality and efficiency of PMS, efforts were underway to automate the Performance Management Process. It is anticipated that the system will eliminate paperwork and reduce costs.

BITRI Departments and Functions **at a Glance**

Research And Partnerships

The Research and Partnerships Division (R&PD) has responsibility for ensuring that BITRI Research policies and guidelines promote a high quality research environment and govern good research practice. R&PD supports BITRI researchers to obtain local and international partners, administer grants and contracts, manage the knowledge needs and assists with the technology transfer and commercialization of technology solutions to research and business partners. In addition, the division is also responsible for ensuring that BITRI's brand is marketed and the excellent technology research and impact in society and the economy is communicated. Divisions under the Department are Communications and Partnerships, Knowledge Commons and Technology Transfer.

1. Communications and Partnerships

a. *Public Seminars:* In an effort to engage with the public BITRI continued to hold quarterly seminar series addressing topics relevant to its mandate and presented by speakers from both local and international shores. A total of four seminars were conducted with guest speakers from Botswana, South Africa and Singapore. The aim of the seminars were to share and exchange research ideas on topics of current relevance to BITRI mandate in contributing to Botswana's socio-economic development.

b. *Stakeholder engagement and consultations:* As a way of engaging with various stakeholders, and further present an update on the technologies being developed, BITRI briefed six Councils during the reporting period being; the Sowa Town Council, Boteti Sub district Council, Jwaneng Town Council, Bobirwa Sub District Council, Central District Full Council and the Ghanzi Full Council. In addition two District Development Committees being; the Gaborone Urban Development Committee as well as the Chobe District Development committee were briefed. They were all briefed about the BITRI mandate, projects and services. The aim was to create awareness about the projects as well as to market the products as the Councils and District Development Committees are deemed as important stakeholders and customers. BITRI also hosted an Information Sharing Stakeholder Engagement Workshop on the development and progress of a rapid Test for Foot and Mouth Disease prototype. The workshop was held on the 18th November, 2016 in Maun. The event was graced by the Minister of Tertiary Education, Research, Science and Technology Dr Alfred Madigele, Kgosi Kealetile Moremi, Senior Government officials, Famers and other local authorities.

The media is a very important stakeholder to BITRI as they inform the nation about what we do, hence a Media brief was held on 11th August 2016 at Kanye. The purpose of the media brief was to take the media on a conducted tour of the newly established Seding® Solar Light Assembly Plant and to promote awareness about BITRI products and services.

BITRI Departments and Functions at a Glance

c. *Science commemoration and engagement:* BITRI joined other key stakeholders in commemorating the Science, Technology and Innovation (STI) Week in Palapye from 15 - 19 August 2016 under the theme 'Science, Technology, Engineering and Mathematics: Our Future Diamond'. BITRI used the event to enhance awareness and market some of its products such as Morabaraba Version 2 game, Kgalagadi Sand Building Block/ Brick Technology (KSBB), the Seding® Solar Light and also share the research findings and services of the Climate Change Division. The event attracted students, parents and officers from Palapye and surrounding areas.

d. BITRI continued its programme on public understanding of science and technology specifically looking at the BITRI research areas. The organization has produced two educational cartoon books that are geared towards educating and sensitising students on nanotechnology. The cartoon books targeted both primary and secondary school students and they were distributed to schools around the country.

e. A Science Communication Workshop for Researchers was held 15 April 2016 with the aim of improving their ability to communicate clearly what they and the organization do and improve on their report-writing skills.

f. *Open day:* In efforts to promote the organisations' brand visibility and in particular the promotion of developed technologies, BITRI conducted an open day where all divisions displayed their projects and interacted with stakeholders.

g. *Corporate Social Responsibility:* BITRI's recognizes the value that it can play in improving the lives of communities through its own human capital base and to this end, BITRI continued with its institutional project with Kagiso Senior Secondary School (KSSS), which aims to contribute and improve the school's academic performance. During the reporting period, the institutional project saw BITRI staff members volunteer to provide tutoring to students on science-related subjects.

2. Technology Transfer Office

Established in March 2015 , the Technology Transfer Office, is mandated, among others, to assist with policy development and implementation on intellectual property and technology transfer, advise on appropriate protection strategies for research outputs/intellectual property, provide guidance in respect of intellectual property laws and facilitating compliance with the same, capacity building in the area of intellectual property and commercialization of technologies invented by BITRI researchers.

Agreements

In the year 2016/2017 the Technology Transfer Officer facilitated execution of a number of agreements with both local and external key stakeholders in Research and Development. Non-Disclosure Agreements, Memoranda of Understanding, Memoranda of Agreement, and collaborative research agreements were signed to facilitate smooth Research and development between BITRI and its local and external counterparts.

Maintenance of KSBB Patent

The Kgalagadi Sand Building Block (KSBB) patent was maintained to keep various routes of rolling out and commercializing the technology open. BITRI commercializes its technologies through licensing, sale of technologies and establishment of spin off companies.

Capacity building

The Technology Transfer Office (TTO) took capacity building to a higher level by taking advantage of the World Intellectual Property Organization (WIPO) Academy Online Courses and scholarships. One Researcher was, sponsored 100% by the WIPO Academy to study the Advanced Course on Patents to appreciate how patents affect and influence Research and Development as well as the role patents play in making countries globally competitive.

BITRI Departments and Functions **at a Glance**

3. Knowledge Commons

The Knowledge Commons (KC) continues to provide information support to BITRI researchers. One of the initiatives is to subscribe to databases that support research activities at BITRI such as Elsevier, Research Africa, SciFinder, IEEE, ProQuest, Royal Society of Chemistry, ASTM, SABINET Training activities on the various databases were carried out in order to capacitate researchers on effective use of the databases. The KC developed and uploaded web content which is now available on the BITRI website. This was meant to facilitate ease of access to the services offered. The KC also hosted the Open Data Symposium in September 2016 as a way of sensitizing the research community on the value and benefits of open data. The event was organized by BITRI in partnership with Joint Minds Consult, a local research and training institute. BITRI is now part of the Open Data Open Science (ODOS) Committee, which was working towards advocacy for the recognition of the importance of Open Data in Botswana.

BITRI Departments and Functions at a Glance

Human Capital

The Human Capital Department is responsible for the following two broad areas:

- Manage, direct, coordinate and supervise the provision of human resource management and development services for BITRI to enable it to implement overall strategy.
- Lead the provision of cost effective office support services.

Performance and Milestones

The Human Capital Department continued to explore and ensure that BITRI recruited the best talented employees to execute the mandate of BITRI and ensuring that the right environment was created to retain talent, and derive maximum value from employees. During the financial year 2016/2017, the Human Capital Department ensured that there was provision of cost effective office support services to provide a conducive environment for employees to do their work. These included among other things having quality security and housekeeping outsourced services for the organization.

The Department was also engaged in the establishment of various human capital policies that are necessary to ensure that there is a common shared understanding, impartiality and consistency in handling human capital issues which is a critical ingredient to a harmonious employer - employee relationship. The following practices were leveraged to address people issues, the key focus of which was to have a holistic approach to ensure a motivated and engaged work force to deliver on the mandate of BITRI.

Recruitment of talent

There was during the period under review concerted effort to ensure that vacant positions were filled with the best talent available that BITRI could afford. All vacant positions were advertised and it was ensured that adverts were clear on what was required in terms of qualifications and experience. Potential employees were subjected to rigorous competency based interviews. A Recruitment and Selection Policy was developed and approved by the Board of Directors.

Onboarding of staff

Onboarding of new employees became an area of much focus. To this end, amongst the human capital policies that were developed was the Induction Policy to ensure that there was a systematic approach to onboarding of new staff members.

Investment in developing people

BITRI continued to explore opportunities to invest in employees by sending employees for training interventions either at Masters, PhD levels or to attend relevant short courses and seminars that were meant to improve skills and competencies. BITRI also continued to pay subscriptions for employees to join professional associations in line with their respective professions. As a research institution, it is imperative that BITRI is manned by employees at the cutting edge of their professions if they were to be expected to undertake meaningful research and to be respected both locally and internationally to be capable of undertaking cutting edge research.

Retention of staff

BITRI continued to explore ways to retain talent. It was considered more effective to invest in retention of employees than it was to rehire, retrain and realign new members of staff. A Staff Retention Policy was developed and its implementation is expected to assist BITRI in efforts to retain talent. BITRI was very committed in ensuring that the well-being of its employees was well taken care of. It has covered a wide range of facilities that are essential for the well-being of its employees, and has structures put in place such as a Staff Welfare Committee which is responsible for considering and recommending activities that help improve staff welfare. The Committee was responsible for encouraging team building through a variety of social events which included staff come-togethers and functioning of other welfare facilities such as the staff gym aimed at improving the wellness of BITRI employees. Other initiatives include medical aid, group staff loans with some commercial banks at preferential interest rates and schemes such as group life assurance. By end of the financial year of 2016/2017,

BITRI Departments and Functions **at a Glance**

BITRI had a staff complement of 151 employees from all the recruitment and selection efforts. The majority of these were researchers as will be expected for a research institute.

Achievements

- Staff complement increased from 131 to 151 due to the recruitment and selection drive.

- Continued to use an online recruitment and selection portal bringing about some efficiencies in the recruitment process. The process has had the effect of eliminating the need to receive and store large numbers of hard copy applications and saving on printing costs as the bulk of the recruitment and selection process can be done online. The online recruitment process also had the effect of significantly reducing advertising expenses.

Challenges

Challenges faced during the period include:

- Shortage of highly qualified human capital for especially senior research positions compelling BITRI to recruit from the international labour market. In some instances recruitment attempts were not able to attract qualified and experienced candidates. There were also instances where identified qualifying candidates declined BITRI offers as they were considered not competitive.

BITRI Department, Functions and **Projects at a Glance**

Finance and Operations

The Finance and Operations Department ensures the efficiency to support the organization as a whole to focus on its core business and thus attain its targets through the provision of finance and administrative services. This Includes development and execution of the organizations' budget; maintenance of official accounting records; procurement of and contracting for goods and services. It is made up of Finance, Facilities and Cafeteria.

BOTSWANA INSTITUTE FOR TECHNOLOGY RESEARCH AND INNOVATION

FINANCIAL STATEMENTS

31 March 2017

BOTSWANA INSTITUTE FOR TECHNOLOGY RESEARCH AND INNOVATION
COMPANY LIMITED BY GUARANTEE – CO2012/8667

GENERAL INFORMATION

MEMBERS OF THE BOARD		Appointed
Dr. Martin Kebakile	(Board Chairperson)	
Prof. Nelson Torto	(Chief Executive Officer)	
Ms. Keitseng Monyatsi	(Board Member)	
Mr. Edwin Elias	(Board Member)	
Mr. Mao Segage	(Board Member)	
Ms. Mercy Conlon	(Board Member)	
Dr. Ditshupo Ecco Maje	(Board Member)	
Ms Tekolo Modungwa	(Board Member)	
Mr. Oganeditse Marata	(Board Member)	Appointed 01 June 2016
Mr. Baitshepi Tebogo	(Board Member)	Appointed 01 June 2016
Prof. Otlogetswe Totolo	(Board Chairperson)	Resigned 31 May 2016
Dr. Mpaphi Bonyongo	(Board Member)	Resigned 31 May 2016

CHIEF EXECUTIVE OFFICER
Prof. Nelson Torto

PLACE OF BUSINESS
Maranyane House
Plot 50654
Machel Drive
Gaborone

BANKER
Barclays Bank of Botswana Limited
First National Bank Botswana Limited

INDEPENDENT AUDITOR
Deloitte & Touche
P O Box 778
Gaborone

FINANCIAL STATEMENTS

31 March 2017

CONTENTS	PAGE

BOTSWANA INSTITUTE FOR TECHNOLOGY RESEARCH AND INNOVATION

DIRECTORS' RESPONSIBILITY STATEMENT AND APPROVAL OF THE FINANCIAL STATEMENTS

31 March 2017

Directors' responsibility statement

The Directors are responsible for the preparation and fair presentation of the financial statements of Botswana Institute for Technology Research and Innovation ("BITRI"), comprising the statement of financial position as at 31 March 2017, and the statements of comprehensive income, changes in funds and cash flows for the year then ended, and the notes to the financial statements, which include a summary of significant accounting policies and other explanatory notes in accordance with International Financial Reporting Standards ("IFRS").

The Directors are required to maintain adequate accounting records and are responsible for the content and integrity of and related financial information included in this report. It is their responsibility to ensure that the financial statements fairly present the state of affairs of BITRI as at the end of the financial year and the results of its operations and cash flows for the year then ended, in conformity with IFRS. The independent auditors are engaged to express an independent opinion on the financial statements and their unmodified opinion is presented on pages 43 to 44.

The Directors are responsible for the preparation and fair presentation of these financial statements in accordance with IFRS and for such internal control as the Directors determine is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

The financial statements are prepared in accordance with IFRS and are based upon appropriate accounting policies consistently applied and supported by reasonable and prudent judgments and estimates. The Directors' responsibility also includes maintaining adequate accounting records and an effective system of risk management.

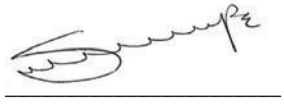
The Directors acknowledge that they are ultimately responsible for the system of internal financial control established by BITRI and place considerable importance on maintaining a strong control environment. To enable the directors to meet these responsibilities, the board of directors sets standards for internal control aimed at reducing the risk of error or loss in a cost effective manner. The standards include the proper delegation of responsibilities within a clearly defined framework, effective accounting procedures and adequate segregation of duties to ensure an acceptable level of risk. These controls are monitored throughout BITRI and all employees are required to maintain the highest ethical standards in ensuring BITRI's business is conducted in a manner that in all reasonable circumstances is above reproach. The focus of risk management in BITRI is on identifying, assessing, managing and monitoring all known forms of risk across BITRI. While operating risk cannot be fully eliminated, BITRI endeavours to minimise it by ensuring that appropriate infrastructure, controls, systems and ethical behaviour are applied and managed within predetermined procedures and constraints.

The Directors have made an assessment of BITRI's ability to continue as a going concern and there is no reason to believe the organisation will not be a going concern in the year ahead.

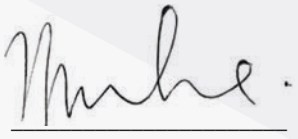
The Directors are of the opinion, based on the information and explanations given by management, that the system of internal control provides reasonable assurance that the financial records may be relied on for the preparation of the financial statements. However, any system of internal financial control can provide only reasonable, and not absolute, assurance against material misstatement or loss.

Directors' approval of the financial statements

The financial statements set out on pages 45 to 69, which have been prepared on the going concern basis, were approved by the Board of Directors on 10 November 2017 and are signed on its behalf by:



Director



Director

INDEPENDENT AUDITOR'S REPORT TO THE MEMBERS OF THE BOARD OF DIRECTORS OF BOTSWANA INSTITUTE FOR TECHNOLOGY RESEARCH AND INNOVATION

Opinion

We have audited the financial statements of Botswana Institute for Technology Research and Innovation ("BITRI"), which comprise the statement of financial position as at 31 March 2017, and the statement of comprehensive income, statement of changes in funds and statement of cash flows for the year then ended, and the notes to the financial statements, including a summary of significant accounting policies.

In our opinion, the accompanying financial statements give a true and fair view of the financial position of BITRI as at 31 March 2017, and of its financial performance and cash flows for the year then ended in accordance with International Financial Reporting Standards ("IFRS").

Basis for Opinion

We conducted our audit in accordance with International Standards on Auditing ("ISAs"). Our responsibilities under those standards are further described in the Auditor's Responsibilities for the Audit of the Financial Statements section of our report. We are independent of BITRI in accordance with the requirements of the International Ethics Standards Board for Accountants Code of Ethics for Professional Accountants (Part A and B), together with other ethical requirements that are relevant to our audit of the financial statements in Botswana, and we have fulfilled our other responsibilities in accordance with these requirements. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

Other Information

The Directors are responsible for the other information. The other information comprises the general information and the directors' responsibility statement and approval of the financial statements. The other information does not include the financial statements and our auditor's report thereon. Our opinion on the financial statements does not cover the other information and we do not express an audit opinion or any form of assurance conclusion thereon. In connection with our audit of the financial statements, our responsibility is to read the other information and, in doing so, consider whether the other information is materially inconsistent with the financial statements or our knowledge obtained in the audit, or otherwise appears to be materially misstated.

If, based on the work we have performed on the other information that we obtained prior to the date of this auditor's report, we conclude that there is a material misstatement of this other information, we are required to report that fact. We have nothing to report in this regard.

Responsibilities of the Directors

The Directors are responsible for the preparation of the financial statements that give a true and fair view in accordance with International Financial Reporting Standards and for such internal control as the Directors determine is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements, management is responsible for assessing BITRI's ability to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless management either intends to liquidate BITRI or to cease operations, or has no realistic alternative but to do so.

INDEPENDENT AUDITOR'S REPORT TO THE MEMBERS OF THE BOARD OF DIRECTORS OF BOTSWANA INSTITUTE FOR TECHNOLOGY RESEARCH AND INNOVATION

Auditor's Responsibilities for the Audit of the Financial Statements

Our objectives are to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with ISAs will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these financial statements.

As part of an audit in accordance with ISAs, we exercise professional judgment and maintain professional scepticism throughout the audit. We also:

Identify and assess the risks of material misstatement of the financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.

Obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of BITRI's internal control.

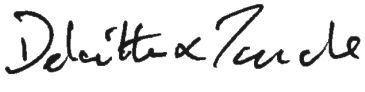
Evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by the directors.

Conclude on the appropriateness of the Directors' use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on BITRI's ability to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in our auditor's report to the related disclosures in the financial statements or, if such disclosures are inadequate, to modify our opinion.

Our conclusions are based on the audit evidence obtained up to the date of our auditor's report. However, future events or conditions may cause BITRI to cease to continue as a going concern.

Evaluate the overall presentation, structure and content of the financial statements, including the disclosures, and whether the financial statements represent the underlying transactions and events in a manner that achieves fair presentation.

We communicate with the Directors regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that we identify during our audit.



Deloitte & Touche
Certified Auditors
Practicing Member: F C Els (19980074)

Gaborone
10 November 2017

BOTSWANA INSTITUTE FOR TECHNOLOGY RESEARCH AND INNOVATION

STATEMENT OF COMPREHENSIVE INCOME

for the year ended 31 March 2017

	Notes	2017 P	2016 P
INCOME			
Revenue grant	2	88,176 176	62,794,386
Interest income	3	155,349	174,646
Other income	4	1,423,228	990,739
Total income		89,754,753	63,959,771
EXPENSES			
Staff costs		55,300,607	43,459,848
Other operating costs		37,423,156	24,723,536
Total expenses		92,723,763	68,183,384
(Deficit) and total comprehensive (deficit) for the year	5	**(2,969,010)**	**(4,223,613)**

BOTSWANA INSTITUTE FOR TECHNOLOGY RESEARCH AND INNOVATION

STATEMENT OF FINANCIAL POSITION

as at 31 March 2017

	Notes	2017 P	2016 P
Assets			
Non-current assets			
Property, plant and equipment	7	174,831,851	134,729,520
Current Assets			
Inventories	8	1,558,395	2,409,288
Trade and other receivables	9	1,043,713	3,296,769
Cash and cash equivalents	10	69,357,747	97,731,026
		71,959,855	103,437,083
Total assets		**246,791,706**	**238,166,603**
Funds and Liabilities			
Funds			
Accumulated surplus		3,113,181	6,082,191
Non-current liabilities			
Capital grant	11	101,765,150	51,487,248
Deferred revenue grant	12	71,204,668	72,910,226
		172,969,818	124,397,474
Current liabilities			
Bank overdraft	10	-	2,607,988
Deferred revenue grant	12	1,862,022	2,095,920
Project funds	13	58,042,183	93,882,595
Trade and other payables	14	3,080,117	2,859,729
Provisions	15	7,724,385	6,240,707
		70,708,707	107,686,939
Total funds and liabilities		**246,791,706**	**238,166,603**

BOTSWANA INSTITUTE FOR TECHNOLOGY RESEARCH AND INNOVATION

STATEMENT OF CHANGES IN FUNDS

for the year ended 31 March 2017

	Accumulated Surplus P
Balance as at 1 April 2015	**10,305,804**
Total Comprehensive deficit for the year	(4,223,613)
Balance as at 31 March 2016	**6,082,191**
Total Comprehensive deficit for the year	(2,969,010)
Balance as at 31 March 2017	**3,113,181**

BOTSWANA INSTITUTE FOR TECHNOLOGY RESEARCH AND INNOVATION

STATEMENT OF CASH FLOWS

for the year ended 31 March 2017

	2017 P	2016 P
CASH FLOWS FROM OPERATING ACTIVITIES		
(Deficit) for the year	(2,969,010)	(4,223,613
Adjustment for:		
Depreciation of property, plant and equipment	11,102,373	4,845,364
Interest received	(155,349)	(174,646)
(Profit)/ loss on disposal of property, plant and equipment	(144,860)	433,705
Cash inflow/(outflow) from operations before working capital changes	7,833,154	880,809
Decrease in inventories	850,893	351,532
Decrease/ (increase) in trade and other receivables	2,253,056	(2,836,286)
Increase/(decrease) in trade and other payables	220,388	(3,186,415)
Increase/(decrease) in provisions	1,483,678	(1,660,357)
Increase in capital grants	50,277,903	38,673,333
(Decrease) in the deferred revenue grant	(1,939,456)	(2,822,469)
(Decrease)/ Increase in project funds	(35,840,411)	68,476,890
Net cash (used in)/generated from operating activities	17,306,051	97,877,035
CASH FLOWS FROM INVESTING ACTIVITIES		
Interest received	155,349	174,646
Purchase of property, plant and equipment	(52,530,405)	(47,921,835)
Proceeds from disposal of property, plant and equipment	1,470,561	426,907
Net cash used in investing activities	(50,904,495)	(47,320,282)
NET (DECREASE)/ INCREASE IN CASH AND CASH EQUIVALENTS	(25,765,290)	50,556,753
CASH AND CASH EQUIVALENTS AT BEGINNING OF YEAR	95,123,037	44,566,284
CASH AND CASH EQUIVALENTS AT END OF YEAR	**69,357,747**	**95,123,037**
Represented by:		
Cash on hand	69,357,747	97,731,026
Bank overdraft	-	(2,607,988)
	69,357,747	95,123,037

BOTSWANA INSTITUTE FOR TECHNOLOGY RESEARCH AND INNOVATION

SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES
31 March 2017

GENERAL INFORMATION

Botswana Institute for Technology Research and Innovation "BITRI" is a research and development entity whose primary role is to research and develop in focused areas of national interest, deliver high standard technology solutions that maximize the beneficiation of local resources through both institutional and collaborative programs and effectively and affordably address current and anticipated needs for sustainable socio-economic development.

BASIS OF PREPARATION

The financial statements of BITRI have been prepared in accordance with the International Financial Reporting Standards ("IFRS"). The financial statements have been prepared under the historical cost convention with the exception of certain assets and liabilities at fair value through profit or loss.

Items included in these financial statements are measured using the currency that best reflects the primary economic environment in which BITRI operates - the functional currency.

The financial statements are presented in Botswana Pula, which is the BITRI's functional and presentation currency.

NEW AND REVISED INTERNATIONAL FINANCIAL REPORTING STANDARDS

In the current year, the BITRI adopted the new and revised Standards and Interpretations of the International Accounting Standards Board ("the IASB") and the International Financial Reporting Interpretations Committee ("IFRIC") of the IASB that are relevant to its operations and effective for annual reporting periods beginning on or after 1 April 2016.

Standards and Interpretations adopted in the current year with no effect on the financial statements

New/Revised International Financial Reporting Standards	Effective Date
IAS 1 Presentation of Financial Statements (amendment) Disclosure Initiative	1 January 2016
IFRS 14 Regulatory Deferral Accounts	1 January 2016
Agriculture: Bearer Plants (amendments to IAS 16 and IAS 41) amends IAS 16 Property, Plant, Equipment and IAS 41 Agriculture	1 January 2016
IFRS 11 (Amendment) Accounting for Acquisition of Interests in Joint Operations	1 January 2016
Clarification of Acceptable Methods of Depreciation and Amortisation (amendment to IAS 16 and IAS 38) amends IAS 16 Property, Plant and Equipment and IAS 38 Intangible Assets	1 January 2016
Investment Entities: Applying the Consolidation Exception (Amendments to IAS 28, IFRS 10 and IFRS 12) amends IAS 28 Investment in Associates and Joint Ventures, IFRS 10 Consolidated Financial Statements and IFRS 12 Disclosure of Interests in Other Entities	1 January 2016
IAS 27 (Amendment) Equity Method in Separate Financial Statements - amends IAS 27 Separate Financial Statements	1 January 2016
IASB improvements to IFRS 2012-2014 makes amendments to IFRS 5, 7, and 9; IAS 34)	1 January 2016

BOTSWANA INSTITUTE FOR TECHNOLOGY RESEARCH AND INNOVATION
SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES
31 March 2017

NEW AND REVISED INTERNATIONAL FINANCIAL REPORTING STANDARDS (CONTINUED)

New and revised Standards and Interpretations in issue but not yet effective
At the date of authorisation of these financial statements, the following Standards and Interpretations, which are applicable to BITRI, were issued but were not yet effective:

New/Revised International Financial Reporting Standards	Effective Date
IFRS 9 Financial Instruments: Classification and Measurement	1 January 2018
IFRS 15 (new) - Revenue from Contracts with Customers	1 January 2018
IFRS 16 (New) Leases	1 January 2019
IAS 7 Statement of Cash Flows: Amendment as a result of the disclosure initiative	1 January 2017
IAS 12 Income Taxes: Amendment regarding the recognition of deferred tax assets for unrealised losses	1 January 2017

The Directors have not yet assessed the potential impact of the adoption of the above new and revised standards and interpretations. This assessment will be performed as the standards become effective.

SUMMARY OF PRINCIPAL ACCOUNTING POLICIES

The principal accounting policies adopted are set out below and are consistent, in all material respects, with those adopted in the previous year.

CASH AND CASH EQUIVALENTS

Cash and cash equivalents are carried in the statement of financial position at cost. For the purposes of the cash flow statement cash and cash equivalents comprise of cash on hand and demand deposits, and other highly liquid investments that are readily convertible to a known amount of cash and are subject to an insignificant risk of changes in value.

GOVERNMENT GRANTS

Government grants are not recognised until there is reasonable assurance that BITRI will comply with conditions attaching to them and that the grants will be received.

Government grants whose primary condition is that BITRI should purchase, construct or otherwise acquire non-current assets are recognised as capital grants in the statement of financial position and transferred to profit or loss on a systematic and rational basis over the useful lives of related assets.

Government grants are recognised as revenue over the periods necessary to match them with the costs for which they are intended to compensate, on a systematic basis. Government grants that are receivable as compensation for expenses or losses already incurred or for the purpose of giving immediate financial support to BITRI with no future related costs are recognised in profit or loss in the period in which they become receivable.

BOTSWANA INSTITUTE FOR TECHNOLOGY RESEARCH AND INNOVATION
SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (CONTINUED)
31 March 2017

REVENUE RECOGNITION

Interest from short-term deposits and investments is recognized on a time-proportion basis using the effective interest approach. Revenue from services is exclusive of Value Added Tax (VAT) and discounts granted and is recognised in the statement of comprehensive income when the service has been rendered and the following conditions have been satisfied:

The amount of revenue can be measured reliably;
The stage of completion of the transaction at the statement of financial position date can be measured reliably;
It is probable that the economic benefits associated with the transaction will flow to BITRI.

Revenue from fees charged for services is based on the stage of provision of service determined with reference to the services performed by the end of the year. When a receivable is impaired, BITRI reduces the carrying amount to its recoverable amount.

PLANT AND EQUIPMENT

Plant and equipment is stated at cost less accumulated depreciation and accumulated impairment losses except for buildings, which were donated to the Institute, which were capitalised at their valuation amount in 2014. An equivalent amount was recognised in the deferred revenue grant.

The cost of an item of plant and equipment is recognised as an asset when it is probable that future economic benefits associated with the item will flow to BITRI and the cost of the item can be measured reliably.

Costs include costs incurred initially to acquire or construct an item of plant and equipment and costs incurred subsequently to add to the asset. If a replacement cost is recognised in the carrying amount of an item of plant and equipment, the carrying amount of the replaced part is derecognised.

Depreciation is charged so as to write off the depreciable value of the assets over their estimated useful lives down to their residual values, using the straight-line method. The estimated useful lives, residual values and depreciation methods are reviewed at each year end, with the effect of any changes in estimate accounted for on a prospective basis.

The following methods were used during the year to depreciate plant and equipment to estimated residual values:

Buildings	2%
Laboratory equipment	10%
Furniture and fittings	14%
Office equipment	14%
Motor vehicles	20%
Computer equipment	25%
Cell phones	50%
Plant and machinery	10%

An asset's carrying amount is written down immediately to its recoverable amount if the asset's carrying amount is greater than its estimated recoverable amount.

Gains and losses on disposals are determined by comparing proceeds with the carrying amount and are recognised within 'Other Income' in the statement of comprehensive income.

BOTSWANA INSTITUTE FOR TECHNOLOGY RESEARCH AND INNOVATION
SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (CONTINUED)
31 March 2017

EMPLOYEE RETIREMENT BENEFITS
BITRI's employees are engaged on a contract basis and they are entitled to their gratuities at the time preferable to them i.e. monthly, annually or at the end of their contracts. This decision was taken by the Board of Directors at its sitting of the 26 June 2015 where it was resolved that employees be allowed to choose how they prefer to have their gratuity paid over the tenure of their contracts of employment.

Employee entitlements to annual leave, gratuities, bonuses, medical aid, housing benefits, kilometre allowances, telephone allowances, retention allowances and severance benefits are recognised when they accrue to employees and an accrual is made for the estimated liability as a result of services rendered by the employee up to the statement of financial position date. Provision is made in respect of these benefits on an annual basis and included in the operating results.

FOREIGN CURRENCY TRANSLATIONS
In preparing the financial statements, transactions in currencies other than the BITRI's functional currency (foreign currencies) are recognised at the rates of exchange prevailing at the dates of the transactions. At the end of each reporting period, monetary items denominated in foreign currencies are retranslated at the rates prevailing at that date. Non-monetary items carried at fair value that are denominated in foreign currencies are retranslated at the rates prevailing at the date when the fair value was determined. Non-monetary items that are measured in terms of historical cost in a foreign currency are not retranslated.

Foreign exchange gains and losses resulting from the settlement of foreign currency transactions and from the translation of monetary assets and liabilities denominated in foreign currencies are recognised in the statement of comprehensive income.

TRADE AND OTHER RECEIVABLES
Trade receivables are amounts due from procuring entities for services performed by BITRI in the ordinary course of operation. If collection is expected in one year or less (or in the normal operating cycle of the operation if longer), they are classified as current assets. If not, they are presented as non-current assets. Other receivables include advances made to employees.

Trade and other receivables are recognised initially at fair value and subsequently measured at amortised cost using the effective interest method, less provision for impairment.

A provision for impairment of trade receivables is established when there is objective evidence that BITRI will not be able to collect all amounts due according to the original terms of receivables. Significant financial difficulties of the debtor, probability that the debtor will enter bankruptcy or financial reorganisation, and default or delinquency in payments (more than 30 days overdue) are considered indicators that the trade receivable is impaired.
The amount of the provision is the difference between the carrying amount and the present value of estimated future cash flows, discounted at the original effective interest rate. The carrying amount of the asset is reduced through the use of an allowable account, and the amount of the loss is recognised in the statement of comprehensive income within 'administration expenses'. When a trade receivable is uncollectable, it is written off against the allowable account for trade receivables. Subsequent recoveries of the amounts previously written off are credited against 'administration expenses' in the statement of comprehensive income.

PROJECT FUNDS
Project funds relate to funding received for specific projects. These are deferred and included in current liabilities as projects funds. The related expenditure is netted off against the project funds received. Over expenditure which is not recoverable from the donors is recognised as expenditure in the profit or loss of the Institute.

BOTSWANA INSTITUTE FOR TECHNOLOGY RESEARCH AND INNOVATION
SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (CONTINUED)
31 March 2017

IMPAIRMENT OF ASSETS
At the end of each reporting period BITRI reviews the carrying amount of its assets to determine whether there is any indication that those assets have suffered an impairment loss. If any such indication exists, the recoverable amount of the asset is estimated in order to determine the extent of the impairment loss (if any). Where it is not possible to estimate the recoverable amount of an individual asset, BITRI estimates the recoverable amount of the cash-generating unit to which the asset belongs.

Where an impairment loss subsequently reverses, the carrying amount of the asset (cash-generating-unit) is increased to the revised estimate of its recoverable amount. This is done so that the increased carrying amount does not exceed the carrying amount that would have been determined had no impairment loss been recognised in prior years. A reversal of an impairment loss is recognised in the statement of comprehensive income.

PROVISIONS
Provisions are recognised when BITRI has a present legal or constructive obligation as a result of past events; it is probable that an outflow of resources will be required to settle the obligation, and the amount has been reliably estimated. Provisions are not recognised for future operating losses.

Where there are a number of similar obligations, the likelihood that an outflow will be required in settlement is determined by considering the class of obligations as a whole. A provision is recognised even if the likelihood of an outflow with respect to any one item included in the same class of obligations may be small.

Provisions are measured at the present value of the expenditures expected to be required to settle the obligation using a pre-tax rate that reflects the current market assessments of the time value of money and the risks specific to the obligation. The increase in the provision due to passage of time is recognised as interest expense.

TRADE PAYABLES
Trade payables are recognised initially at fair value and subsequently measured at a mortised cost using the effective interest method. The effective interest method is as described below under 'Financial Instruments'.

LEASES
Leases in which a significant portion of the risks and rewards of ownership are retained by the lessor are classified as operating leases. Payments made under operating leases (net of any incentives received from the lessor) are charged to the statement of total comprehensive income on a straight-line basis over the period of the lease.

BORROWINGS
Interest-bearing bank loans and overdrafts are recorded at the proceeds received, net of direct transaction costs. Finance charges, including amortisation of direct transaction costs, are charged to the statement of comprehensive income using the effective interest rate method. Tranches of borrowings and overdrafts which mature on a regular basis are classified as current or non-current liabilities based on the maturity of the facility so long as the committed facility exceeds the drawn debt.

INVENTORIES
Inventories are stated at the lower of cost and net realisable value. Cost is determined using the weighted average costing method.

BOTSWANA INSTITUTE FOR TECHNOLOGY RESEARCH AND INNOVATION
SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (CONTINUED)
31 March 2017

FINANCIAL RISK MANAGEMENT

BITRI's activities expose it to various financial risks, which under the review period have been analysed, evaluated, accepted as tolerable; and hence no derivative instruments have been used to hedge the financial risks. BITRI's aim is to achieve an appropriate balance between risk and return and minimise potential adverse effects on BITRI's financial performance.

BITRI's risk management policies are designed to identify and analyse these risks, to set appropriate risk limits and controls, and to monitor the risks and adherence to limits by means of reliable and up-to-date information systems. BITRI regularly reviews its risk management policies and systems to reflect changes in markets, products and emerging best practice.

FINANCIAL INSTRUMENTS

BITRI classifies financial instruments, or their component parts, on initial recognition as a financial asset, a financial liability or an equity instrument in accordance with the substance of the contractual arrangement.

Financial assets and financial liabilities are recognised on the BITRI's statement of financial position when BITRI becomes a party to the contractual provisions of the instrument.

Financial assets and financial liabilities are initially measured at fair value. Transaction costs that are directly attributable to the acquisition or issue of financial assets and financial liabilities (other than financial assets and financial liabilities at fair value through profit or loss) are added to or deducted from the fair value of the financial assets or financial liabilities, as appropriate, on initial recognition.

Transaction costs directly attributable to the acquisition of financial assets or financial liabilities at fair value through profit or loss are recognised immediately in profit or loss.

Financial assets

Loans and receivables

Trade receivables, loans and other receivables that have fixed or determinable payments that are not quoted in an active market are classified as loans and receivables. Loans and receivables are measured at a mortised cost using the effective interest method, less any impairment. Interest income is recognised by applying the effective interest rate, except for short-term receivables when the recognition of interest would be immaterial.

Cash and cash equivalents

Cash and cash equivalents are carried in the statement of financial position at a mortised cost. For the purpose of the statement of cash flows, cash and cash equivalents comprise cash on hand and at bank and funds on deposits.

Impairment of financial assets

'Loans and receivables' are assessed for indicator of impairment at each statement of financial date. Financial assets are impaired where there is objective evidence that, as a result of one or more events that occurred after the initial recognition of the financial asset, the estimated future cash flows of the investment have been impacted.

For 'Loans and receivables' objective evidence of impairment could include:

- Significant financial difficulty of the issuer or counter party; or
- Default or delinquency in interest or principal payments; or
- It becoming probable that the consumer will enter bankruptcy or financial re-organisation.

BOTSWANA INSTITUTE FOR TECHNOLOGY RESEARCH AND INNOVATION
SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (CONTINUED)
31 March 2017

FINANCIAL INSTRUMENTS (CONTINUED)

Financial assets (continued)

For financial assets carried at a mortised cost, the amount of the impairment is the difference between the asset's carrying amount and the present value of estimated future cash flows, discounted at the financial asset's original effective interest. The effective interest method is as described below.

If in a subsequent period, the amount of the impairment loss decreases and the decrease can be related objectively to an event occurring after the impairment was recognised, the previously recognised impairment loss is reversed through profit or loss to the extent that the carrying amount of the investment at the date the impairment is reversed does not exceed what the a mortised cost would have been had the impairment not been recognised.

De-recognition of financial assets

BITRI de-recognises a financial asset only when the contractual right to the cash flows from the asset expire; or it transfers the financial asset substantially all the risks and rewards of ownership of the asset to another entity.

If BITRI neither transfers nor retains substantially all the risks and rewards of ownership and continues to control the transferred asset, BITRI recognises its retained interest in the asset and an associated liability for amounts it may have to pay. If BITRI retains substantially all the risks and rewards of ownership of a transferred financial asset, BITRI continues to recognise the financial asset and also recognises a collateralised borrowing for the proceeds received.

Financial liabilities

Financial liabilities, including borrowings, are initially measured at fair value, net of transaction costs. Financial liabilities are subsequently measured at a mortised cost using the effective interest method (as described below), with interest expense recognised on an effective yield basis. BITRI's financial liabilities are classified as 'other financial liabilities'.

De-recognition of financial liabilities

BITRI derecognises financial liabilities when, and only when, the BITRI's obligations are discharged, cancelled or they expire. The difference between the carrying amount of the financial liability derecognised and the consideration paid and payable is recognised in profit or loss.

Effective interest method

The effective interest method is a method of calculating the a mortised cost of a financial instrument and of allocating interest income or expense over the relevant period. The effective interest rate is the rate that exactly discounts estimated future cash receipts or payments (including all fees and points paid or received that form an integral part of the effective interest rate, transaction costs and other premiums or discounts) through the expected life of the financial instrument, or, where appropriate, a shorter period, to the net carrying amount on initial recognition.

BOTSWANA INSTITUTE FOR TECHNOLOGY RESEARCH AND INNOVATION
SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (CONTINUED)
31 March 2017

CRITICAL ACCOUNTING ESTIMATES AND JUDGEMENTS

The preparation of financial statements in conformity with IFRS requires the use of certain critical accounting estimates. It also requires management to exercise its judgment in the process of applying BITRI's accounting policies. These areas involving a higher degree of judgment or complexity, or areas where assumptions and estimates are significant to BITRI's financial statements are disclosed.

Estimates and judgments are continually evaluated based on historical experience and other factors, including expectations of events that are believed to be reasonable under the circumstances.

The estimates and underlying assumptions are reviewed on an on-going basis. Revisions to accounting estimates are recognised in the period in which the estimate is revised if the revision affects only that period, or in the period of the revision and future periods if the revision affects both current and future periods.

Key sources of estimation uncertainty

The most significant estimates and assumptions made in the preparation of these financial statements are as follows:

- the calculation of bad debts provision;
- the assessment of impairments and the calculation of the recoverable amount of assets;
- the determination of useful lives and residual values of items of plant and equipment; and
- the calculation of any provision for guarantees, claims, litigation and other legal matters.

BOTSWANA INSTITUTE FOR TECHNOLOGY RESEARCH AND INNOVATION
NOTES TO THE FINANCIAL STATEMENTS
31 March 2017

1. NATURE OF BUSINESS

Botswana Institute for Technology Research and Innovation is an entity with a registration number CO2012/8667. The primary objective is to conduct needs based research and development in focused areas of national interest and deliver high standard technology solutions that maximise the beneficiation of local resources through both institutional and collaborative programmes.

2. REVENUE GRANT

	2017 P	2016 P
Grants received	87,310,740	58,337,430
Transfer from Deferred revenue grant (note 12)	1,880,922	1,961,857
Amortisation of Capital grants (note 11)	6,646,737	1,634,487
Transfer from deffered revenue grant (note 11)	(7,993,046)	-
Transfer from deferred revenue grant - disposal of property, plant and equipment	58,524	860,612
Transfer from capital grant - disposal of property, plant and equipment	272,299	-
	88,176,176	**62,794,386**

3. INTEREST INCOME

Bank deposits	155,349	174,646

4. OTHER INCOME

Gain on disposal of property, plant and equipment	144,860	-
Sundry income	314,166	174,314
Rental income	964,202	816,425
	1,423,228	990,739

5. (DEFICIT)/SURPLUS FOR THE YEAR

In addition to the amounts disclosed in Notes 1, 2, 3 and 4 above, the (deficit)/surplus for the year is stated after taking into account the following:

Auditors' remuneration		
- current provision	200,000	227,360
Depreciation of property, plant and equipment	11,102,373	4,845,364
Key management's remuneration	5,792,511	5,390,517
Loss on disposal of property, plant and equipment	-	433,705

6. TAXATION

Under the provisions of the Income Tax Act (Chapter 52:01) Second Schedule, the Institute is exempt from income tax"

BOTSWANA INSTITUTE FOR TECHNOLOGY RESEARCH AND INNOVATION
NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)
31 March 2017

7. PROPERTY, PLANT AND EQUIPMENT

	Buildings	Leasehold Improvements	Plant and Machinery	Computers
COST	**P**	**P**	**P**	**P**
At 1 April 2016	77,060,693	-	1,370,575	1,608,598
Additions	1,072,440	973,381	1,301,644	4,723,432
Disposals	-	-	-	-
At 31 March 2016	78,133,133	973,381	2,672,219	6,332,030
Additions	3,377,922	-	576,170	2,909,191
Disposals	-	(973,381)	-	(143,521)
At 31 March 2017	81,511,055	-	3,248,389	9,097,700
ACCUMULATED DEPRECIATION				
At 31 March 2015	506,199	-	77,377	186,330
Charge during the year	1,551,047	-	191,835	1,055,641
Disposals	-	-	-	
At 31 March 2016	2,057,246	-	269,212	1,241,971
Charge during the year	1,575,928	-	284,939	2,184,656
Disposals	-	-	-	(104,282)
At 31 March 2017	3,633,174	-	554,151	3,322,345
Net book value				
31 March 2015	76,554,495	-	1,293,198	1,422,268
Net book value				
31 March 2016	76,075,888	973,381	2,403,007	5,090,059
Net book value				
31 March 2017	77,877,882	-	2,694,238	5,775,355

The original buildings, which were donated to the Institute, were capitalised at their valuation in 2014. An equivalent amount was recognised in the deferred revenue grant reserve.

BOTSWANA INSTITUTE FOR TECHNOLOGY RESEARCH AND INNOVATION
NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)
31 March 2017

Software	Furniture & Fittings	Laboratory Equipment	Cell phones	Motor Vehicles	Total
P	P	P	P	P	P
-	497,084	9,480,902	18,297	3,516,502	93,552,652
2,367,399	1,452,794	33,899,318	-	2,131,427	47,921,835
-	-	-	-	(977,380)	(977,380)
2,367,399	1,949,878	43,380,220	18,297	4,670,549	140,497,107
478,784	3,846,940	40,268,322	-	1,073,076	52,530,405
-	-	-	(14,398)	(479,755)	(1,611,055)
2,846,183	5,796,818	83,648,542	3,899	5,263,870	191,416,457
-	21,342	-	13,148	234,596	1,038,992
274,156	167,548	920,344	4,234	680,559	4,845,364
-	-	-	-	(116,768)	(116,768)
274,156	188,890	920,344	17,382	798,387	5,767,588
741,015	671,269	4,712,895	-	931,671	11,102,373
-	-	-	(13,678)	(167,394)	(285,354)
1,015,171	860,159	5,633,239	3,704	1,562,664	16,584,606
-	475,742	9,480,902	5,149	3,281,906	92,513,660
2,093,243	1,760,988	42,459,876	915	3,872,163	134,729,520
1,831,012	4,936,659	78,015,303	195	3,701,207	174,831,851

BOTSWANA INSTITUTE FOR TECHNOLOGY RESEARCH AND INNOVATION
NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)
31 March 2017

	2017 P	2016 P
8. INVENTORIES		
Work in progress	1,558,395	2,409,288
Work in progress relates to the Seding Lights project which had not been completed at year end. No inventories are encumbered or pledged as security.		
9. TRADE AND OTHER RECEIVABLES		
Trade receivables	333,599	170,396
Staff advances	20,660	9,000
Prepayments	252,765	2,881,307
Other receivables	436,689	236,066
	1,043,713	3,296,769
Provision for doubtful debts	-	-
	1,043,713	3,296,769
Trade receivables comprise rental income billed to Estate Construction which had not been paid. Management considers these amounts to be recoverable based on past performance		
10. CASH AND CASH EQUIVALENTS		
Call account	69,325,035	97,728,258
Current account	17,240	-
Credit card account	12,472	-
Petty cash	3,000	2,768
	69,357,747	97,731,026
Overdraft	-	(2,607,988)
	69,357,747	95,123,037
11. CAPITAL GRANT		
Balance at beginning of year	51,487,248	12,813,915
Transfer from development grants - addition to property, plant and equipment	49,203,892	40,307,819
- Projects (note 13)	49,203,892	40,307,819
Transfer from recurrent grant - current + prior years	7,993,046	-
Amortisation of capital grant - depreciation of property, plant and equipment	(6,646,737)	(1,634,487)
Transfer to revenue grant - disposal of property, plant and equipment	(272,299)	-
Balance at end of year	101,765,150	51,487,248

BOTSWANA INSTITUTE FOR TECHNOLOGY RESEARCH AND INNOVATION
NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)
31 March 2017

12. DEFERRED REVENUE GRANTS

	2017 P	2016 P
Balance at beginning of year	75,006,146	77,828,615
Revenue grants received during the year	-	-
Transfer to statement of comprehensive income (note 2)	(1,880,932)	(1,961,857)
Transfer to revenue grant - disposal of property, plant and equipment	(58,524)	(860,612)
Balance at end of year	73,066,690	75,006,146
Current	1,862,022	2,095,920
Non-Current	71,204,668	72,910,226
	73,066,690	75,006,146

The deferred revenue arises as a result of the residential and commercial properties and motor vehicles which were received from the Government of Botswana in December 2014. The current portion is the amount to be a mortised to the income statement in the next financial year.

BOTSWANA INSTITUTE FOR TECHNOLOGY RESEARCH AND INNOVATION
NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)
31 March 2017

	PROJECT FUNDS 2017	1 April 2016 P	Income P	Transfer to capital grant P
13.	Laboratory equipment	30,903,549	-	(31,221,383)
	HQ Building	4,318,443	-	(1,231,251)
	Satellite Offices set up (ICT Associates	-	-	-
	Programme)	6,654,972	-	(651,628)
	KSBB	23,818,242	10,639,484	(1,368,184)
	Climate Change	1,574,054	1,950,288	(1,168,694)
	Coal To Liquid	1,569,157	-	(230,311)
	Seding Lights	18,481,550	23,926,000	(1,097,619)
	Science in Society Project	464,128	-	-
	Water Filtration	444,302	-	(170,132)
	Diagnostics	629,995	1,960,000	(1,102,587)
	Air filtration	596,676	-	(12,163)
	Dynamic Spectrum wireless broadband		-	-
	network on television white space (TVWS)	1,925,870	-	(1,187,236)
	Design & Prototyping	1,355,000	100,000	(2,620,958)
	Energy Management	324,102	-	-
	Renewable Energy Technologies	822,554	-	(331,374)
	Software and Mobile Applications	-	-	(173,997)
	Smart Systems Technologies	-	100,000	(1,127,028)
	Lab Equipment (Building Material Science)	-	1,752,498	(1,156,998)
		93,882,594	**40,428,270**	**(44,851,543)**

2016	1 April 2015 P		
HQ Building	5,332,332	7,700, 000	(3,194,362)
Laboratory Equipment	8,723,029	51,894,750	(279,674,00)
Satellite Offices set up	8,215,686	4,700,000	(1,457,718)
KSBB	-	30,346,296	(298,957)
Climate Change	3,738,38	1,276,744	-
Coal Plant	-	-	-
Seding lights	2,760,820	20,885,864	(380,281)
Science in Society Project	-	500,000,00	(106,102)
Water Filtration	-	860,00.00	-
Diagnostics	-	1,270,000	-
Air filtration	-	760.000	-
Television white space (TVWS)	-	2,000,000	-
Design Equipment	-	1,355,000	-
Energy Management	-	475 000	-
Renewable Energy Technologies	-	865 250	-
Coal to Liquid	-	4,020,000	(2 075,985)
	25,405,705	128,908,904	(35,480,805)

BOTSWANA INSTITUTE FOR TECHNOLOGY RESEARCH AND INNOVATION
NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)
31 March 2017

Transfer to capital Work in progress P	Capital Expenditure P	Operating Expenditure P	Impairment P	Transfer to other projects P	31 March 2017 P
(2,291,667)	-	(1,378,911)	-	4,000,000	11,588
(366,085)	-	175,620	-	-	2,896,727
-	-	-	-	-	-
-	-	(4,287,830)	-	-	1,715,514
(5,525,121)	-	(5,116,699)	-	(10,000,000)	12,447,722
-	-	(805,324)	-	-	1,550,324
(25,277)	-	(596,274)	-	-	717,295
-	-	(6,039,086)	-	486,000	35,756,845
-	-	(479,100)	-	15,000	28
-	-	(896,080)	-	700,000	78,090
-	-	(1,440,641)	-	-	46,767
-	-	(25,957)	-	-	558,556
-	-	-	-	-	-
-	-	(518,872)	-	-	219,762
-	-	(681,590)	-	2,100,000	252,452
-	-	(127,928)	-	-	196,174
-	-	(156,904)	-	499,000	833,276
-	-	(118,558)	-	300,000	7,445
-	-	(714,854)	-	1,900,000	158,118
-	-	-	-	-	595,500
(8,208,150)	**-**	**(23,208,988)**	**-**	**-**	**58,042,183**

(1,736,696)	-	(3,782,831)	-	-	4,318,443
(1,370,706)	-	(3,761,25)	-	-	30,903,549
-	-	(4,802,996)	-	-	6,654,972
(1,921,002)	-	(4,308,095)	-	-	23,818,242
-	-	(76,528)	-	-	1,574,054
-	-	-	-	-	
-	-	(4,784,853)	-	-	18,481,550
-	-	(35,872)	-	-	464,128
-	-	(390,596)	-	-	444,302
-	-	(640,005)	-	-	629,995
-	-	(163,324)	-	-	596,676
-	-	(74,130)	-	-	1,925,870
-	-	-	-	-	1,355,000
-	-	(150,898)	-	-	324,102
-	-	(42,696)	-	-	822,554
(215,135)	-	(159,723)	-	-	1,569,157
(5,243,539)	-	(19,707,671)	-	-	93,882,595

BOTSWANA INSTITUTE FOR TECHNOLOGY RESEARCH AND INNOVATION
NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)
31 March 2017

13. PROJECT FUNDS (CONTINUED)

Cumulative: 2017	Total Income P	Total Transfer to capital grant P	Transfer to capital Work in progress P
Laboratory Equipment	78,418,750	(68,669,685)	(7,899,349)
HQ Building	15,600,000	(6,908,217)	(2,187,845)
Satellite Offices set up (ICT Associates Programme)	15,046,000	(2,538,204)	-
KSBB	32,485,780	(2,168,414)	(7,749,156)
Climate Change	3,727,032	(1,168,694)	-
Seding Lights	47,297,864	(1,477,899)	-
Science in Society Project	515,000	-	-
Water Filtration	1,560,000	(276,234)	-
Diagnostics	3,230,000	(1,102,587)	-
Air filtration	760,000	(12,163)	-
Dynamic Spectrum wireless broadband network on	-	-	-
television white space (TVWS)	2,000,000	(1,187,236)	-
Design & Prototyping	3,555,000	(2,620,957)	-
Energy Management	475,000	-	-
Renewable Energy Technologies	1,364,250	(331,374)	-
Coal to Liquid	4,020,000	(2,306,296)	(240,412)
Software & Mobile Applications	300,000	(173,997)	-
Smart Systems Technologies	2,000,000	(1,127,028)	-
Laboratory Equipment (KSBB)	1,752,498	(1,156,998)	-
Total Development Grants	214,107,174	(93,225,983)	(18,076,762)

Cumulative: 2016			
HQ Building	15,600,000	(5,676,966)	(1,821,760)
Laboratory Equipment	74,418,750	(37,448,302)	(5,607,682)
Satellite Offices set up	15,046,000	(1,886,576)	-
KSBB	31,846,296	(800,230)	(2,224,035)
Climate Change	1,776,744	-	-
Coal Plant		-	-
Sedding lights	22,885,864	(380,281)	-
Science in Society Project	500,000	-	-
Water Filtration	860,000	(106,102)	-
Diagnostics	1,270,000	-	-
Air filtration	760,000	-	-
Television white space(TVWS)	2,000,000	-	-
Design Equipment	1,355,000	-	-
Energy Management	475,000	-	-
Renewable Energy Technologies	865,250	-	-
Coal to Liquid	4,020,000	(2,075,985)	(215,135)
	173,678,904	(48,374,441)	(9,868,612)

BOTSWANA INSTITUTE FOR TECHNOLOGY RESEARCH AND INNOVATION
NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)
31 March 2017

Capital Expenditure P	Total Expenditure P	Total Impairment P	Transfer to other projects P	31 March 2017 Balance P
(83,093)	(1,755,036)	-	-	11,587
-	(3,607,211)	-	-	2,896,727
(97,935)	(9,223,693)	-	(1,470,655)	1,715,513
(576,721)	(9,823,052)	279,285	-	12,447,722
(25,875)	(982,139)	-	-	1,550,324
-	(11,533,774)	-	1,470,655	35,756,846
-	(514,972)	-	-	28
-	(1,205,676)	-	-	78,090
-	(2,080,646)	-	-	46,767
-	(189,281)	-	-	558,556
-	-	-	-	-
-	(593,002)	-	-	219,762
-	(681,590)	-	-	252,453
-	(278,826)	-	-	196,174
-	(199,600)	-	-	833,276
-	(843,581)	87,584	-	717,295
-	(118,558)	-	-	7,445
-	(714,854)	-	-	158,118
-	-	-	-	595,500
(783,624)	(44,345,491)	366 869	-	58,042,183

-	(3,782,831)	-	-	4,318,443
(83,093)	(376,125)	-	-	30,903,549
(97,934)	(4,935,863)	-	(1,470,655)	6,654,972
(576,721)	(4,706,353)	279,285	-	23,818,242
(25,875)	(176,815)	-	-	1,574,054
-	-	87,584	87,584	-
-	(5,494,688)	-	1,470,655	18,481,550
-	(35,872)	-	-	464,128
-	(309,596)	-	-	444,302
-	(640,005)	-	-	629,995
-	(163,324)	-	-	596,676
-	(74,130)	-	-	1,925,870
-	-	-	-	1,355,000
-	(150,898)	-	-	324,102
-	(42,696)	-	-	822,554
-	(159,723)	-	-	1,569,157
(783,623)	(21,136,503)	366,869	-	93,882,595

BOTSWANA INSTITUTE FOR TECHNOLOGY RESEARCH AND INNOVATION
NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)
31 March 2017

	2017 P	2016 P
14. TRADE AND OTHER PAYABLES		
Trade payables	1,696,263	1,288,653
Staff accruals	10,035	12,117
Other payables and accruals	1,373,819	1,558,959
	3,080,117	2,859,729

15. PROVISIONS	Leave provision P	Gratuity provision P	Total P
Balance at beginning of year	3,521,741	2,718,966	6,240,707
Additional provision raised	2,808,980	5,408,547	8,217,527
Payments	3,234,219)	(3,499,630)	(6,733,849)
Balance at end of year	3,096,502	4,627,883	7,724,385

16. FINANCIAL INSTRUMENTS	2017 P	2016 P
Categories of financial instruments		
Financial assets		
Loans and receivables (including bank balances and cash)	71,939,195	103,428,083
Financial liabilities		
Other financial liabilities	10,804,502	9,100,436
Interest received on loans and receivables	155,349	174,646

Capital risk management

The capital of the Institute comprises accumulated funds and project funds. Management actively manages capital to ensure that the Institute remains a going concern in the foreseeable future.

Currency risk

The Institute is not exposed to movements in the foreign currency as they have no bank balances in foreign currency nor receivables denominated in foreign currency. There is no active foreign currency risk management process adopted by the Institute mainly because expenditure is incurred in Botswana Pula currency.

BOTSWANA INSTITUTE FOR TECHNOLOGY RESEARCH AND INNOVATION
NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)
31 March 2017

16. FINANCIAL INSTRUMENTS (CONTINUED)

Interest rate risk

Financial instruments that are sensitive to interest rate risk are bank balances on call whose interest rates are linked to the prime lending rate. If interest rates were 1% higher while all other variables were held constant the surplus for the year would increase by P693, 250 (2016: P977, 283) opposite effect. At end of the reporting period the following balances were held in call accounts with reputable financial institutions.

	2017 P	2016 P
Interest bearing financial assets	69 325 035	97 728 258

Liquidity risk

The Institute is funded in advance every quarter by the Government of Botswana. The Government of Botswana is committed to this arrangement due to the Institutes national significance.

Credit risk

Credit risk refers to the risk that a counter party will default on its contractual obligations resulting in financial loss to the Institute.

BOTSWANA INSTITUTE FOR TECHNOLOGY RESEARCH AND INNOVATION
NOTES TO THE FINANCIAL STATEMENTS (CONTINUED)
31 March 2017

18. RELATED PARTY TRANSACTIONS

Remuneration of key management personnel

Key management personnel are individuals with significant influence in the day to day operations of the Institute. The management considers the Chief Executive Officer, Executive Director - Technologies, Executive Director - Natural Resources & Materials, Director - Research & Partnerships, Director - Finance & Operations and Director - Human Capital to be the only members of key management personnel remunerated by the Institute.

	2017 P	2016 P
Short term benefits	5,792,511	5,390,517

19. CONTINGENT LIABILITIES

There are no contingent liabilities in the current financial year.

20. EVENTS AFTER THE REPORTING DATE

The Board of Directors are not aware of any matters or circumstances arising since the end of the financial year, not otherwise dealt with in these financial statements that would have a significant effect on the operations of the Institute or the result of its operations.

BOTSWANA INSTITUTE FOR TECHNOLOGY RESEARCH AND INNOVATION

DETAILED INCOME STATEMENT

for the year ended 31 March 2017

	2017 P	2016 P
INCOME		
Revenue grant	88 176 176	62 794 386
Interest income	155 349	174 646
Other income	314 166	174 314
Rental income	964 202	816 425
Gain on disposal of property, plant and equipment	144 860	-
	89 754 753	63 959 771
EXPENDITURE		
Advertising	1 241 308	569 378
Auditor's remuneration - current year provision	283 360	227 360
Bank charges	112 795	107 231
Board fees	90 905	68 894
Cleaning	957 964	618 949
Computer expenses	661 383	571 986
Consultancy fees	1 524 962	311 281
Depreciation of property, plant and equipment - Operational assets	4 581 957	3 210 754
Depreciation of property, plant and equipment held under capital grant	6 520 294	1 634 487
Directors' remuneration (allocation to Institute)	5 792 511	5 390 517
Insurance	819 741	758 595
Internet rentals and service	1 155 858	955 142
Legal fees	158 494	2 731 719
Loss on disposal of property, plant and equipment	-	433 705
Miscellaneous expenses	6 651	10 518
Medical aid	1 771 942	1 357 520
Motor vehicle expenses	476 878	354 226
Office refreshments	636 853	395 965
Postage	43 385	16 436
Printing and stationery	508 484	609 488
Recruitment expenses	141 811	37 969
Rent and utilities	1 775 303	958 682
Repairs, maintenance and renovations	3 690 976	2 233 525
Security	1 658 453	1 449 413
Social activities	617 969	308 693
Staff costs	47 736 154	36 711 811
Subscriptions	1 297 064	1 110 084
Subsistence and perdium	1 709 462	879 588
Telephone expenses	995 273	1 239 158
Training	372 111	30 000
Travel	1 388 158	767 340
Uniform	47 816	63 116
Consumables and workshop supplies	1 268 905	-
Workshop and seminars	2 678 583	2 059 853
	92,723,763	68,183,384
OPERATING (DEFICIT)/SURPLUS FOR THE YEAR	(2 969 010)	(4 223 613)

BITRI

BOTSWANA INSTITUTE FOR TECHNOLOGY RESEARCH AND INNOVATION

PHYSICAL ADDRESS

Head Office
Maranyane House
Plot No. 50654, Machel Drive
Gaborone, Botswana

POSTAL ADDRESS

Botswana Institute for Technology Research and Innovation
Private Bag 0082
Gaborone, Botswana

CONTACT US

Tel: +267 360 7500
Fax: +267 360 7624
Email: communications@bitri.co.bw
Web: www.bitri.co.bw
BITRI **@BITRI1640**