
EDUCATION 5.0

Doctrine for the Modernisation and Industrialisation of Zimbabwe through Education, Science and Technology Development to achieve Vision 2030

INDUSTRIALISATION

ZIMBABWE

Ministry of Higher and Tertiary Education, Science and Technology Development
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INDUSTRIALISATION
To achieve Vision 2030 of Zimbabwe being a middle-income economy, the performance of the Higher and Tertiary education sector will be under the spotlight to deliver goods and services through Education, Science and Technology Development. The sector must perform a critical part in addressing the skills needs of tomorrow's workforce and developing our knowledge economy through improving overall skills, entrepreneurship and technology. Our Higher and Tertiary Education should be able to operate within the heritage philosophy to bring about development in Zimbabwe.

As the knowledge economy develops, the quality of Zimbabwe's workforce will increasingly depend on the excellence, relevance and agility of our Higher and Tertiary Education, Science and Technology Development sector. To this end, my government has approved a policy to avail 1% of the Gross Domestic Product (GDP) towards Research and Development, thus providing an enabling environment for innovation to cause a modernised and industrialised economy. There is, therefore, need to adopt a running doctrine to deliver Vision 2030.

The establishment of Innovation Hubs, Industrial and Technology Parks infrastructure will provide a conducive environment for Government, the private sector, academia, and other stakeholders to operate in for development, transfer, adaptation, adoption and commercialisation of technology relevant to our national socio-economic needs across all sectors.

The economic climate in which our higher and tertiary education, science and technology development operates at present is very different from previous years and highlights, more than ever, the need to develop the necessary skills and competencies in the workforce, stressing the value of education for national economic development.

I would encourage the higher and tertiary education, science and technology sector to work in collaboration with all stakeholders, including business and industry, to meet the ambitions set out in Vision 2030.

His Excellency, President Emmerson D. Mnangagwa
STATEMENT BY THE MINISTER

The vision of the Ministry is to deliver a competitive, industrialised and modernised Zimbabwe through heritage based higher and tertiary education, science and technology development.

The Ministry aims to develop and deliver a higher and tertiary education system that generates knowledge, which results in Goods and Services. Traditionally, Education in Zimbabwe has not resulted in any direct development of industries. In other words, there has been a disconnect between knowledge gained in the HTE system and the local environment as the HTE system seemed to be concentrating on exotic application domains.

The Ministry particularly uses science and technology to advance the delivery of Goods and Services aimed at industrialising and modernising Zimbabwe. The main principle underpinning the ministry's programmes is that knowledge that does not result into goods and services is knowledge that is not useful at all in advancing Zimbabwe's strategic vision of becoming a competitive, industrialised and modernised nation by 2030.

The Ministry's programme implementation philosophy is Heritage Based philosophy anchored on two pillars: (1) Higher and Tertiary Education (HTE) 5.0 and (2) Science and Technology Development. Our philosophy of Heritage Based Education Science and Technology Development, uses the most cutting-edge competitive knowledge from anywhere in the world but applied on the local environment for purposes of producing relevant goods and services. Our aim is for Education, Science and Technology Development to cause industry not vice versa.

The Ministry of Higher and Tertiary Education, Science and Technology shall fight poverty through an education system that produces goods and services. The Zimbabwe of our dreams is a peaceful, violence-free, and a nation free of preventable diseases that uses competitive knowledge from the world over but on local resources. Tomorrow is a future, which we construct today; and we are constructing it, brick by brick through an Education, Science and Technology Development system we all desire.

Prof. dr. A. Murwira

Minister of Higher and Tertiary Education, Science and Technology Development
PERMANENT SECRETARY STATEMENT

The Ministry of Higher and Tertiary Education, Science and Technology Development doctrine set out the guiding principles and values for the higher and tertiary education, science and technology development sector to facilitate Government's Vision 2030 of transforming Zimbabwe into an upper-middle-class economy. The guiding philosophical underpinning of the doctrine is heritage-based development which emphasises that development should be rooted in our natural environment endowments.

The philosophy of heritage-based development shall permeate through education, science and technology development, in order to deliver relevant goods and services that satisfy the aspiration of industrialisation and modernisation of the economy for the nation to attain middle-income status by 2030.

The role of universities and other institutions of higher education in economic growth, technology transfer and generation of new knowledge is universally accepted. The interlinkages of our institutions of higher learning both in research collaborations and credit transfer to enable student mobility as guided by the Zimbabwe National Qualifications Framework shall be key in turning the higher and tertiary education, science and technology development sector into an export product.

The philosophy shall ensure that Zimbabwe develops an outward-facing and engaged higher and tertiary education, science and technology system, with strong links to industry, community and the global economy. A collaborative effort through the National System of Innovation shall turn this vision into a reality.

Prof. F. Tagwira
Secretary for Higher and Tertiary Education,
Science and Technology Development
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1 EXECUTIVE SUMMARY

The Ministry is responsible for: (1) Higher and Tertiary Education and (2) Science and Technology development, as well as (3) their linkage to deliver a competitive, industrialised and modernised Zimbabwe using a heritage based philosophy.

This document highlights the Doctrine that provides a guiding Philosophy for Education 5.0 and Industrialisation giving the principles that will be guiding our higher and tertiary education, science and technology system. This document derives from cabinet approved programmes between December 2017 to date, His Excellency’s inauguration speeches of 24 November 2017 and 26 August 2018, as well as State Of The Nation Addresses of 20 December 2017 and 20 September 2018 respectively, which highlighted a new development thrust anchored on scientific innovations. The underlying principle is that, Education which does not produce goods and services is not relevant at all. Our Science shall be driven by the National Science Technology Innovation System (NSTI). The product of our science and technology shall be Innovation and Industrialisation. The overall implementation strategy to Education 5.0 and for Science and Technology development is a Programmatic approach.

The Ministry is implementing Education 5.0; teaching, research, community service, innovation and industrialisation to move the nation forward towards attaining the status of a middle-income economy by 2030. The Ministry is determined to deliver a heritage based human capital development, capitalising on Zimbabwe’s comparative advantage of human and natural resource endowments.

HERITAGE BASED PHILOSOPHY
2. HERITAGE BASED PHILOSOPHY

2.1 Heritage

Heritage refers to the natural endowments of Zimbabwe; flora, fauna, water, minerals and human resources. The underlying principle is an education, science and technology system that produces goods and services useful to the economy based on heritage. In addition, heritage based education, science and technology development is delivered conscious of the environment it seeks to transform.

World over, nations have achieved and sustained significant economic prosperity using a heritage based philosophy to national development. For example, Saudi Arabia has a heritage of oil and has developed its economy around the oil heritage. Brazil has a heritage of rainforest and has developed its economy around rainforest heritage. Mauritius has heritage of the oceans and has developed its economy based on the marine heritage. Germany's growth was based on coal, because it was locally available. Zimbabwe therefore shall use its agricultural, climatological and mineral heritage for national development. Our Heritage Based philosophy shall use cutting-edge, competitive, universal scientific and technological knowledge for production of quality goods and services.

Figure 1: Zimbabwe's Natural Heritage
2.2 Purpose of the Doctrine

The doctrine provides the guiding principles to enable Higher and Tertiary Education Science and Technology Development Sector achieve vision of a middle income economy by 2030 and beyond. This doctrine is firmly anchored on the principle of a Heritage Based Philosophy for Education 5.0 and Industry.

Zimbabwe is adopting an education system that imparts knowledge, which is suitable for exploitation of locally available resources for its transformation to an industrialised and modernised economy. Teaching and learning focuses on local environment and locally available materials to develop the economy based on such resources. Zimbabwe is endowed with a good climate, agricultural land, minerals, flora and fauna. Therefore, Zimbabwe does not have a shortage of material for orienting the education system, towards the efficient, sustainable exploitation of these resources for national development.

Figure 2:
Zimbabwe’s Mineral Heritage
Figure 3: Heritage Based Science and Technology
UNLOCKING THE POTENTIAL
The Higher and Tertiary Education in Zimbabwe has traditionally been focused on three missions which are teaching, research and community service (consultancy), an analogous of Education 3.0. However, in order to deliver a competitive, industrialised and modernised Zimbabwe, the Ministry has adopted two additional missions that is Innovation and Industrialisation effectively reorienting Education 3.0 to Education 5.0.

Government of Zimbabwe's vision on Education 5.0 entails that graduates should be equipped with skills acquisitions that empower them to become innovative towards societal development through transformative science and technology knowledge application that delivers goods and services. Education 5.0 is restructuring the higher and tertiary education sector to deliver universities and college training institutions focused on five missions:

- Teaching
- Research
- Community Service
- Innovation
- Industrialisation

Education 5.0 is centred on the Heritage based philosophy in shaping future technology through innovation and industrialisation.

3.1.1 Teaching

We shall use our local environment in our teaching and learning. Our education system shall make technology simple and be understood, for concepts can be expressed in any language.
3.1.2 Research

Research and Development is the engine for bringing new ideas and innovations.

Figure 4: Students Conducting Research

3.1.3 Community Service

To sustain the competitive position among world higher and tertiary education systems, there is need to radically improve the relevance to development of the educational community. Thus, our education has to be oriented to achieve this goal.

3.1.4 Innovation

Innovation is the bridge between knowledge produced in lecture rooms, laboratories and Industrial production. In Innovation Hub, processes involved include: (1) legal services (2) marketing services and (3) Product specific technical services.
3.1.5 Industrialisation

From the innovation hub, certified prototypes are relayed to the Industrial Park. Thus, the Industrial park is the last stage for production of goods and services.

![Diagram showing stages 1.0 to 5.0 with Education 3.0 and Education 5.0 highlighted]

**Figure 5: Summary of Education 5.0**

3.2 Steps to Achieve Education 5.0

This process will be anchored on a robust framework with the following pillars:

- Programme infrastructure
- Promotion infrastructure
- Physical infrastructure
- Financing infrastructure

3.2.1 Programme Infrastructure

Our education must have predictable order and be transparent to itself in order to be trusted by the outside world. To achieve this, we are implementing the Zimbabwe National Qualifications Framework through Statutory Instruments; SI 132, SI 133 and SI 137 and SI 140 of 2018.
The Ministry's educational programmes going forward shall be informed by the outcomes of the National Critical Skills Audits; allowing the identification of specific training programmes and prioritisation of education and training, therefore assisting government to develop comprehensive strategies to achieve the industrialisation and modernisation agenda.

Figure 6: Human Capital Development for Industry 4.0, Shutterstock.Com

3.2.2 Promotion Infrastructure

This framework ensures promotions and elevations to position grades amongst staff in Higher and Tertiary education institutions are standardised. This reduces variability in competencies of lecturers in the same grade but located at different institutions.

Figure 7:
Academic Promotion Grades
3.2.3 Physical Infrastructure

The Ministry shall engage investors to develop state of the art infrastructure for Higher and Tertiary Education Institutions through Public, Private Partnerships (PPPs), Build Operate and Transfer (BOT) and Build Own Operate and Transfer (BOOT) arrangements. The government shall execute the vision of University Towns; University Cities and Colleges, modern accommodation infrastructure, shopping malls in universities, wi-fi, as well as constructing more Innovation hubs. Our aim is to cultivate an inspiring environment for nurturing our students.

Figure 8: University of Zimbabwe Innovation Hub Architectural Design

Figure 9: University of Zimbabwe Innovation Hub under Construction.

3.2.4 Financing Infrastructure

The Government of Zimbabwe realised the need to provide a sustainable funding mechanism for students, one that maximises quality without overburdening the student/parent or guardian. The government shall adopt the **Higher and Tertiary Educational Loan Support Facility** to address inter-alia the plight of students who were failing to pay their outstanding fees. The Facility will be offered through local and international financial institutions.
The philosophy of Heritage Based Development will guide the Ministry in its quest to advance Science and Technology for industrial development. Science and Technology shall be applied to advance the delivery of goods and services aimed at industrialising and modernising Zimbabwe. The envisaged products of Science and Technology Development are Innovation and Industry. Prioritised focus on the following programs shall be implemented:

4.1 Geospatial, Aeronautical and Space Science

The establishment of the Zimbabwe National Geospatial and Space Agency (ZINGSA) streamlines aerospace and outer-space use, through providing a regulatory framework as well as coordination and collaboration of Space activities with other nations. The Agency shall design and conduct research and development initiatives that promote advances in Geospatial Science and Earth Observation, Space Science, Space Engineering, Aeronautical Engineering, Astronautical Engineering, Satellite Communications Systems, Global Navigation Satellite Systems (GNSS), Land Positioning Systems, Unmanned Aerial Vehicles (UAV) and launch Satellites.

![ZINGSA Logo](image)

**Figure 10: ZINGSA Logo**

4.2 Information Communication and Technology

We shall develop the High Performance Computing (HPC) Programme for research and development to significantly contribute to the nation’s attaining middle-income economy by solving problems and deriving benefits from opportunities existing in the critical economic sectors of the country, such as agriculture, weather and climate research, engineering, life sciences, space science and technology, and other complex computing applications.
The government shall expand the HPC capacity ten times the initial installed capacity. In addition Virtual and Augmented Reality technology centre shall be developed. Many other applications will be developed.

Figure 11: Augmented Virtual Reality in Health and Entertainment

4.3 Energy and Minerals Research

The energy and minerals research programme is composed of the following sub-programmes:

i. Petrochemical

ii. Fertiliser

iii. Steel Products

The programme focuses on providing the nation with alternative forms of sustainable energy through carrying out research and development work on alternative sources of liquid fuels. The main focus is on the abundant local coal and coal bed methane gas resources. The programme seeks to substitute the importation of liquid fuels, industrial and medical gases as well as fertiliser by designing, constructing and running a plant of the Coal-to-Liquid Fuels process and Coal to Fertiliser plant. The nation shall realise an annual estimated saving of US$1.4 Billion on liquid fuels and allied petroleum products through import substitution on completion of the plant that will target production of 8 million litres/day liquid fuels and allied petroleum products.

Figure 12: Coal to Liquid Fuel Plant
The programme seeks to secure local supply of fuel, which is not subject to international fuel price fluctuations. The programme also seeks to value-add and beneficiate the local iron ore resources to produce steel.

4.4 Biotechnology

The Genomic Technologies programme shall be used to address national health delivery challenges:

4.4.1 in the effective treatment of HIV,
4.4.2 new-born screening for inherited diseases,
4.4.3 forensic DNA for crime investigation,
4.4.4 Plant Tissue Culture Technologies.
4.4.5 Cattle reproductive technologies for the improvement and restocking of national herd.

Figure 13: Artificial Insemination Semen Straw Filling Machine at CUT

The Cattle Reproductive Technologies Research Programme significantly contributes to national food security and enhancing the nation's regional and international competitiveness in beef production. The programme shall increase the use of cattle reproductive technologies to improve national cattle breeds and aid the restocking of the national herd.
Emerging technologies are critical to solving the global challenges facing the world, and thus better techniques are needed for their management, to create policy and educate professionals to commercialize and govern them.

There is no doubt that rapid technological advances are changing the nature of work, not just in terms of the jobs that we do, but the way we do them, who we work with, the systems that manage us, and how we plan for the future.

**Figure 14: Demonstration of IoT, sylog.fr**
INNOVATION HUBS AND INDUSTRIAL PARKS
The Government's thrust is to develop a new economy driven by science and technology. The thrust targets industrialising the economy subsequently creating employment and improving people's lives. The programme will develop disruptive, innovative capacities to harness new ideas that translate to high-quality goods and services. This programme will also capitalise on Special Economic Zones (SEZs) in the establishment of Industrial Parks linked to Higher and Tertiary Education Institutions in Zimbabwe.

5.1 Innovation Hubs and Industrial Parks

The innovation hubs and industrial parks will foster industrialisation and modernisation to improve the quality of life of Zimbabweans. We shall develop and deploy technology through encouraging technology transfer at our Innovation Hubs and Industrial Parks to move away from just being consumers to active participants in the production chain. The objective is to industrialise the economy, in the process create jobs, and improve the standard of life of Zimbabweans.

Figure 15: Coal to Liquid Fuel Plant
"Economies are transformed by knowledge, knowledge which can be converted into goods and services". In this regard, the first destination is the establishment of Innovation Hubs, which shall enable active knowledge transfer between researchers and business experts, on the one hand, and industry as well as government on the other hand. Innovation hubs are sources of our Technology. Innovation hub is where technology will be born.
5.1.2 Industrial Parks

The Industrial Parks shall act as production centres for successful incubated innovation goods and services from Higher and Tertiary Institutions, Techno-Entrepreneurs and business shall be transformed into commercial goods and services. All prototypes from Higher and Tertiary Institutions must go for manufacturing in the Industrial Parks under establishment at the country's ten (10) provinces. Cabinet has approved that 6 to 20 hectares of land be allocated by each local authority for purposes of establishing Industrial Parks. The Government of Zimbabwe shall fund establishment of the Industrial Parks to facilitate Education with five missions: (1) teaching (2) research (3) community service (4) innovation and (5) industrialisation; i.e. Education 5.0. and shall also facilitate investment in industrial parks.

Figure 18: Industrial Park

The Industrial parks shall ease the establishment of small and medium enterprises (SMES) as well large enterprises so as to allow cross learning best practises from fellow adjacent techno-entrepreneurs within the park amongst other benefits.
NATIONAL SCIENCE & TECHNOLOGY INNOVATION SYSTEM

PROGRAMMATIC APPROACH
Our Science has to be driven by the National Science Technology Innovation System (NSTI). The National Science Technology Innovation System (NSTI) shall be the implementation strategy for Science and Technology Development in Zimbabwe. NSTI in essence outlines the pathway through which knowledge flows and how it must be managed. The Government of Zimbabwe shall continue to implement the NSTI system through recognising the different roles of Government, Funders, Distributors of Funding as well as Researchers in Science and Technology development. The Research Council of Zimbabwe is key in the disbursement of research funds whilst the Zimbabwe Academy of Sciences shall pursue cutting edge research for Science and Technology Development. The NSTI in essence outlines the pathway through which knowledge flows and how it is managed to produce goods and services for the industrialisation and modernisation of Zimbabwe.

The diagram below is a schematic outline of the NSTI system for Zimbabwe

![Diagram of NSTI System]

Figure 19: The Science Technology and Innovation System of Zimbabwe – A schematic view
6.2 Programmatic Approach

The overall implementation strategy for Education 5.0 and Science and Technology Development shall be a **programmatic** approach.

A programmatic approach has products in sight therefore avoiding confusion in the implementation of mandate. In addition, it ensures that initiatives are coherent towards a specific goal with clear outcomes in mind. In a programmatic approach, we are motivated by not forgetting why we started in the first place. In fact, we must never forget why we started.

Figure 20: Programmatic Approach

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