MINISTRY OF EDUCATION

TITLE: ROLE OF SCIENCE, TECHNOLOGY AND INNOVATION (STI) IN THE REALISATION OF MW2063

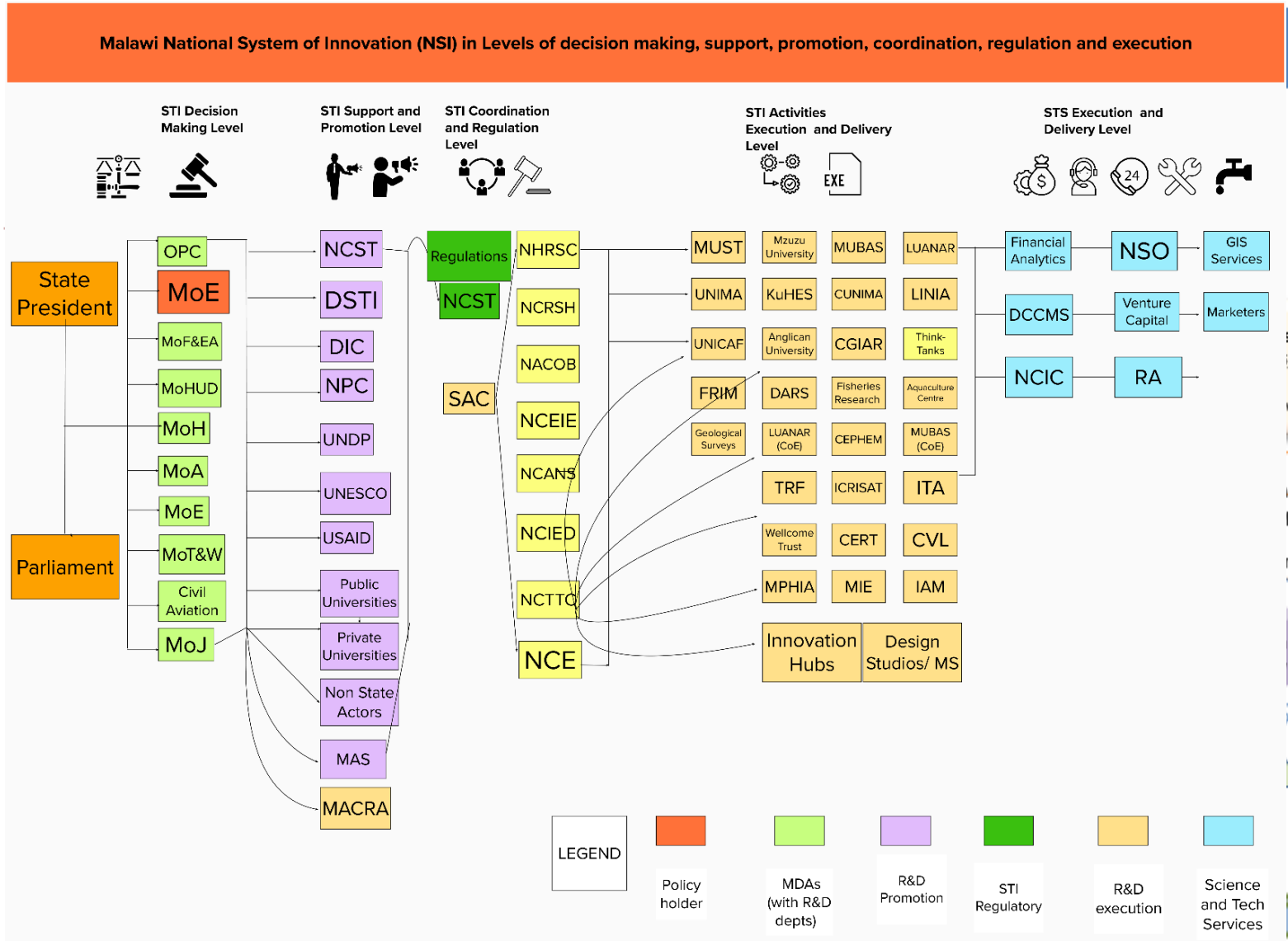
NOTE BY: ASSOCIATE PROFESSOR CHOMORA MIKEKA

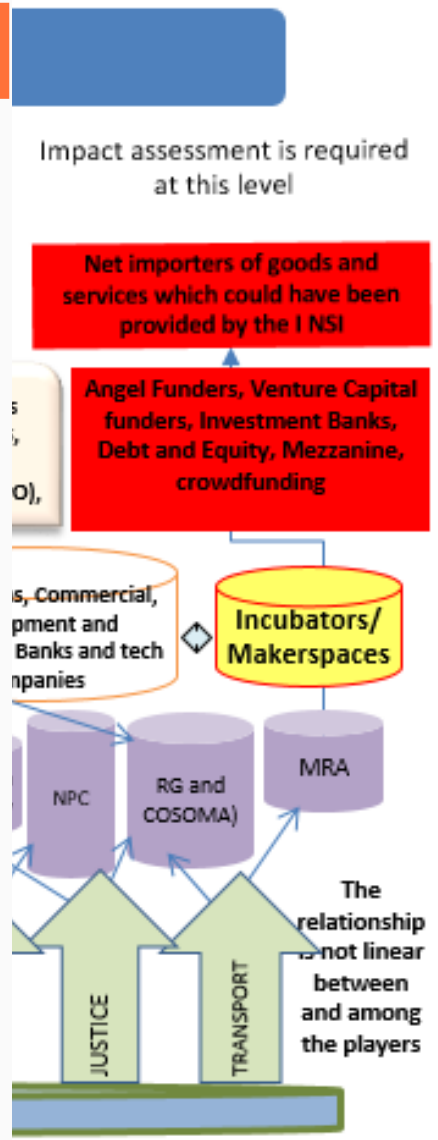
DIRECTOR OF SCIENCE, TECHNOLOGY AND INNOVATION

OUTLINE

- EDUCATION AS A CONSTITUTIONAL PROVISION
- THE SPEAKER AND THE ORGANIZER, 20 YEARS AGO
- HUMAN CAPITAL STATUS: INDUSTRIAL REVOLUTION AND SOCIETY EVOLUTION REFLECTIONS
- ARTS, STEM, ICT AND 2.5% STI COUNTRY STATUS
- NEED FOR DISRUPTIVE APPROACH TO THE FORMULATION OF NATIONAL STI POLICY (NSTIP) DOPED WITH EMERGING TECHNOLOGIES
- CURRICULA CHANGE, HCD, INNOVATION & OPEN HARDWARE

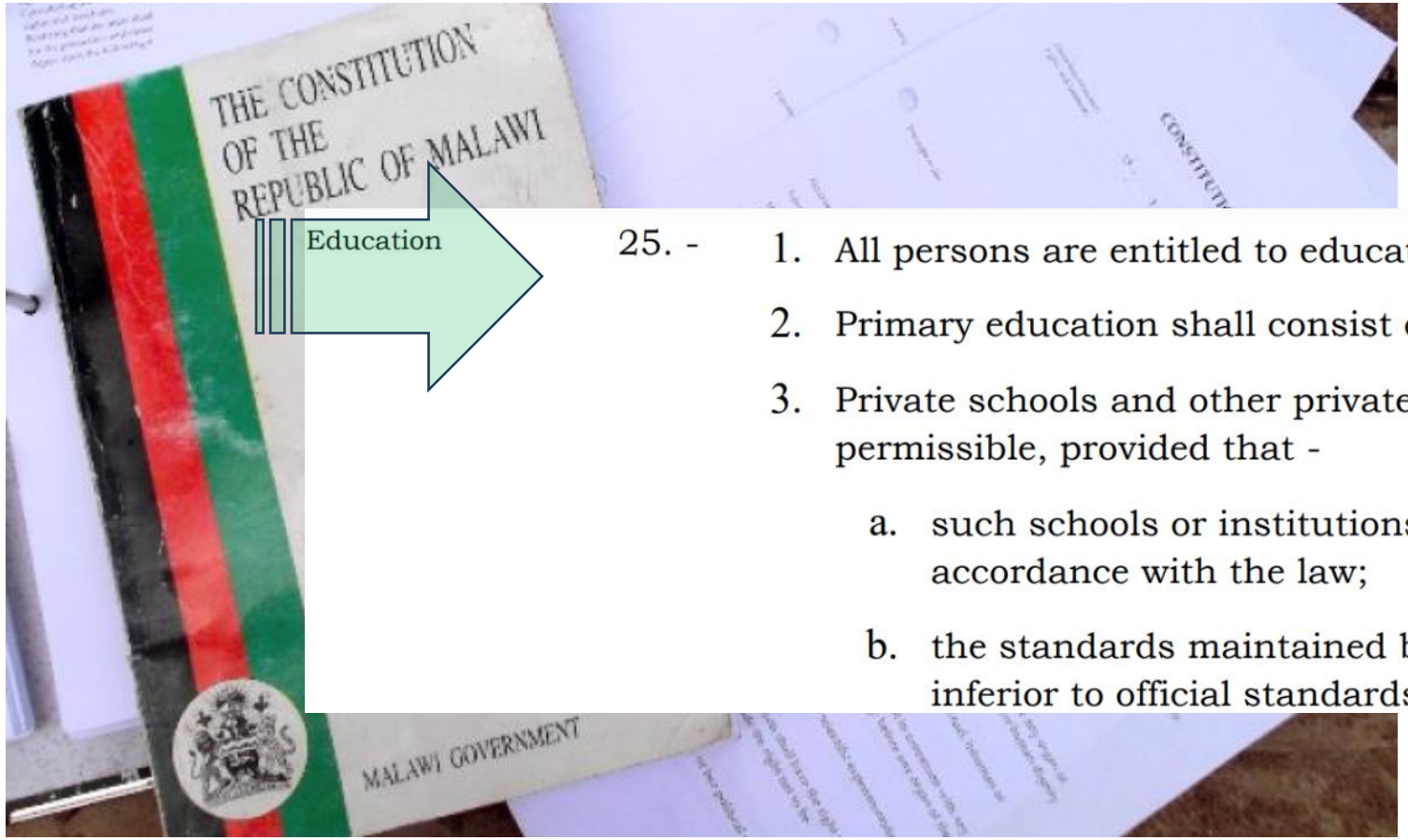
MALAWI GOVERNMENT MDAs AND GROWING INNOVATION ECO-SYSTEM





EDUCATION AS A CONSTITUTIONAL PROVISION

https://www.malawi.gov.mw/index.php/resources/documents/constitution-of-the-republic-of-malawi



Education

25. -

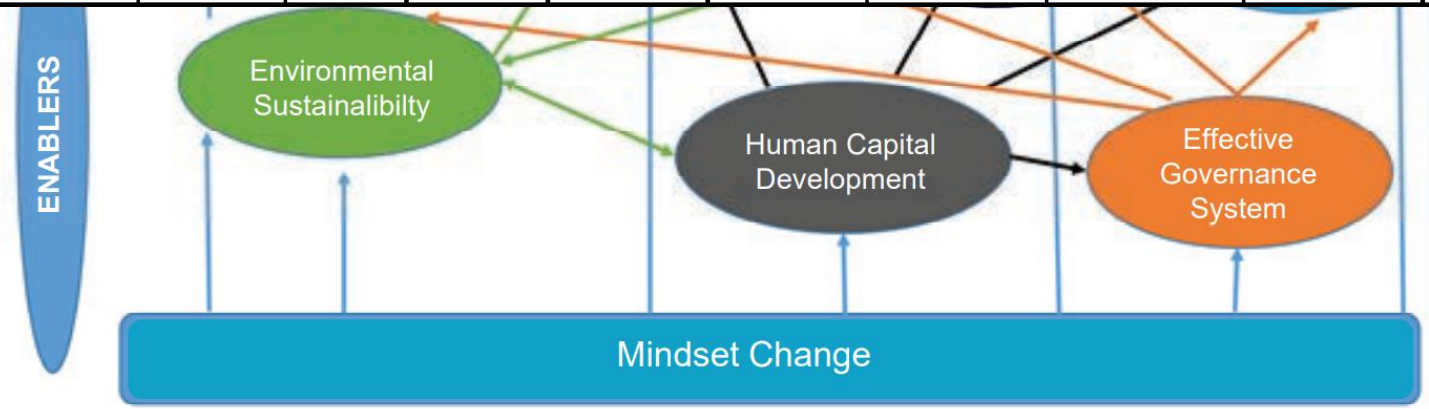
1. All persons are entitled to education.
2. Primary education shall consist of at least five years of education.
3. Private schools and other private institutions of higher learning shall permissible, provided that -
   a. such schools or institutions are registered with a State departm accordance with the law;
   b. the standards maintained by such schools or institutions are n inferior to official standards in State schools.

THE 2063 NATIONAL DEVELOPMENT BLUEPRINT THEORY OF CHANGE BIDS FOR INLCUSIVE WEALTH CREATION AND SELF-RELIANCE

Inclusive Wealth Creation and Self-reliance

Lower middle-income status by 2030

Research, Science, Technology and Innovation			**5,650.00**	**97,808**	**96,208.00**	**35,785.00**	**35,706.00**	**35,100.00**	**35,120.00**	**31,000.00**	**31,000.00**	**31,000.00**	340,477
Increased innovations in industriali zation	Establish Centers of excellence for critical industrial sector areas, including mining	2023-2030		6,908.00	4,000.00	5,575.00	5,600.00	5,100.00	5,120.00	1,000.00	1,000.00	1,000.00	GoM, DPs, PPP
	Construct and rehabilitate minerals testing laboratories	2021-2022	5,000.00	5,150.00	-	-	-	-	-	-	-	-	GoM, DPs, PPP
	Re-design education curriculum to incorporate requisite skills needed for the fourth industrial revolution	2021-2024	200.00	103.00	104.00	105.00	-	-	-	-	-	-	GoM, DPs



Education attainment (% of the population aged 25 years and above that completed at least secondary education) from 8.9% to 15%

Life expectancy improves from 63.8 in 2020 to 71.9 in 2030

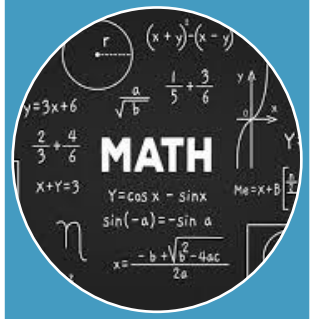
50% of the population accessing electricity in 2030 from 12.4%

44% of roads bitumised from 30.6%

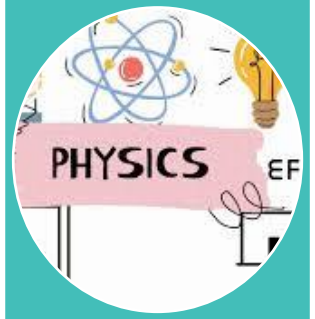
Deforestation decelerates from 1.6% to 0.91%

CURRICULUM REDESIGN: 7 DSTI PROPOSED SUBJECTS FOR PRIMARY

Languages (English, Chichewa, Swahili, Italian, Japanese, Chinese, French)



Mathematics (Arithmetic, Algebra, Geometry) and Calculus



Philosophy, Physics & Electronics

Coding and Emerging Technologies for Health & Nutrition, Industrialization and Urbanization

Creative Arts, Life Skills, Digital Creation, Tourism, Business, Procurement, Supply Chain and Logistics

Precision Agriculture, Farm Machinery and Mechanization

Mining Science, Technology and Innovation (Mini-STI)

- A call for application was advertised – for 5 days
- 1,126 applications were received
- 28 participants selected
- LESSONS
  - High demand
  - There's a gap which the project will fill and so should this curricula

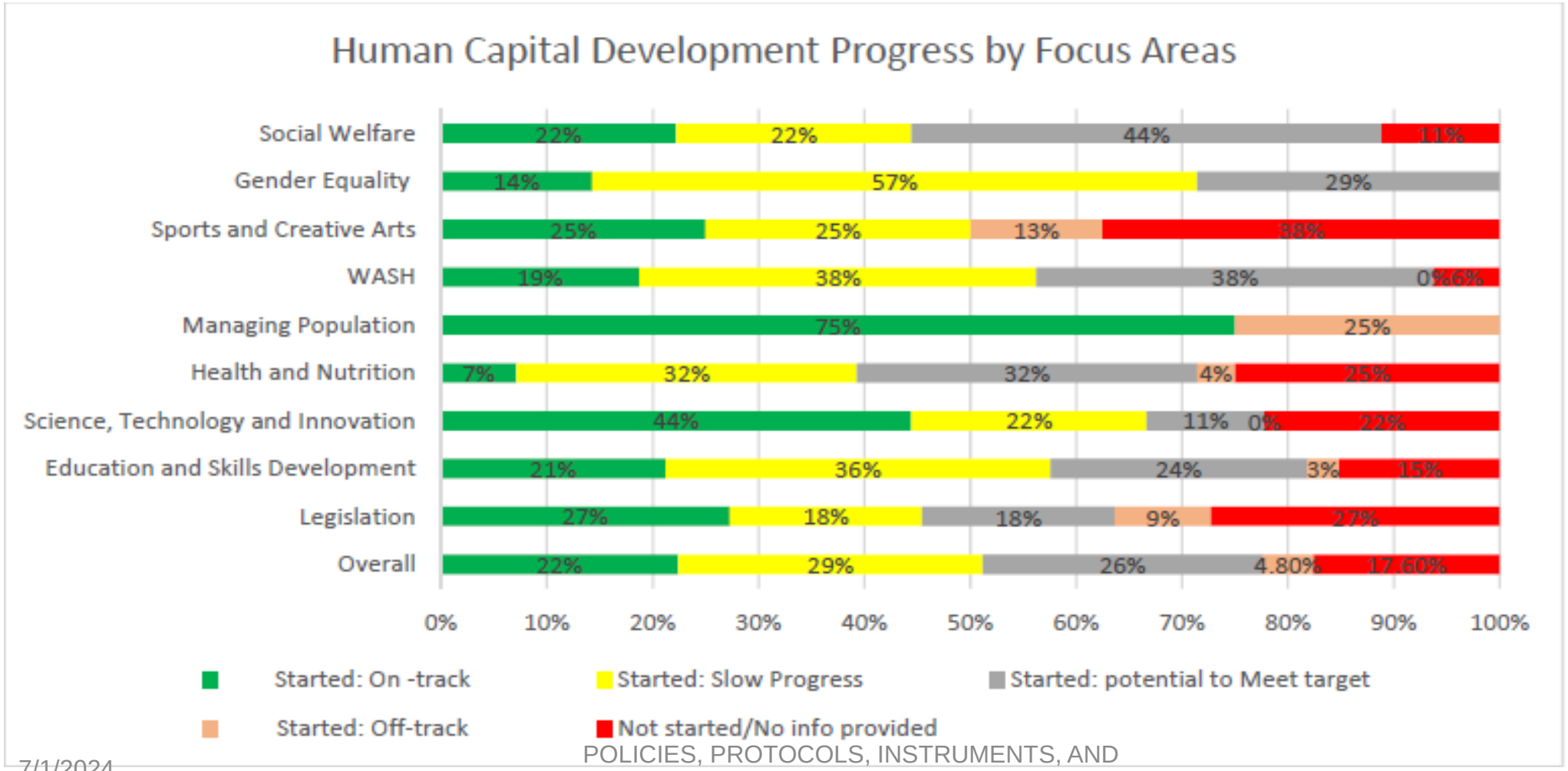
OPEN HARDWARE AND SOFTWARE BOOT CAMP RESULTS - IMOSYS

- Empowering Girls and narrowing the gender gap in tech. The Girls Can Code and IMOSYS Coding Bootcamp in Malawi was a transformative initiative aimed at equipping girls with open hardware solutions. This was done with support from Malawi Government, Irish Embassy and UN Women.

Bridging the Gap : Empowering Girls in Tech

COUNTRY CONTEXT/HC STATUS: ENABLER #5

IMPLEMENTATION STATUS



3 SELECTED FOCUS AREAS & WHY?

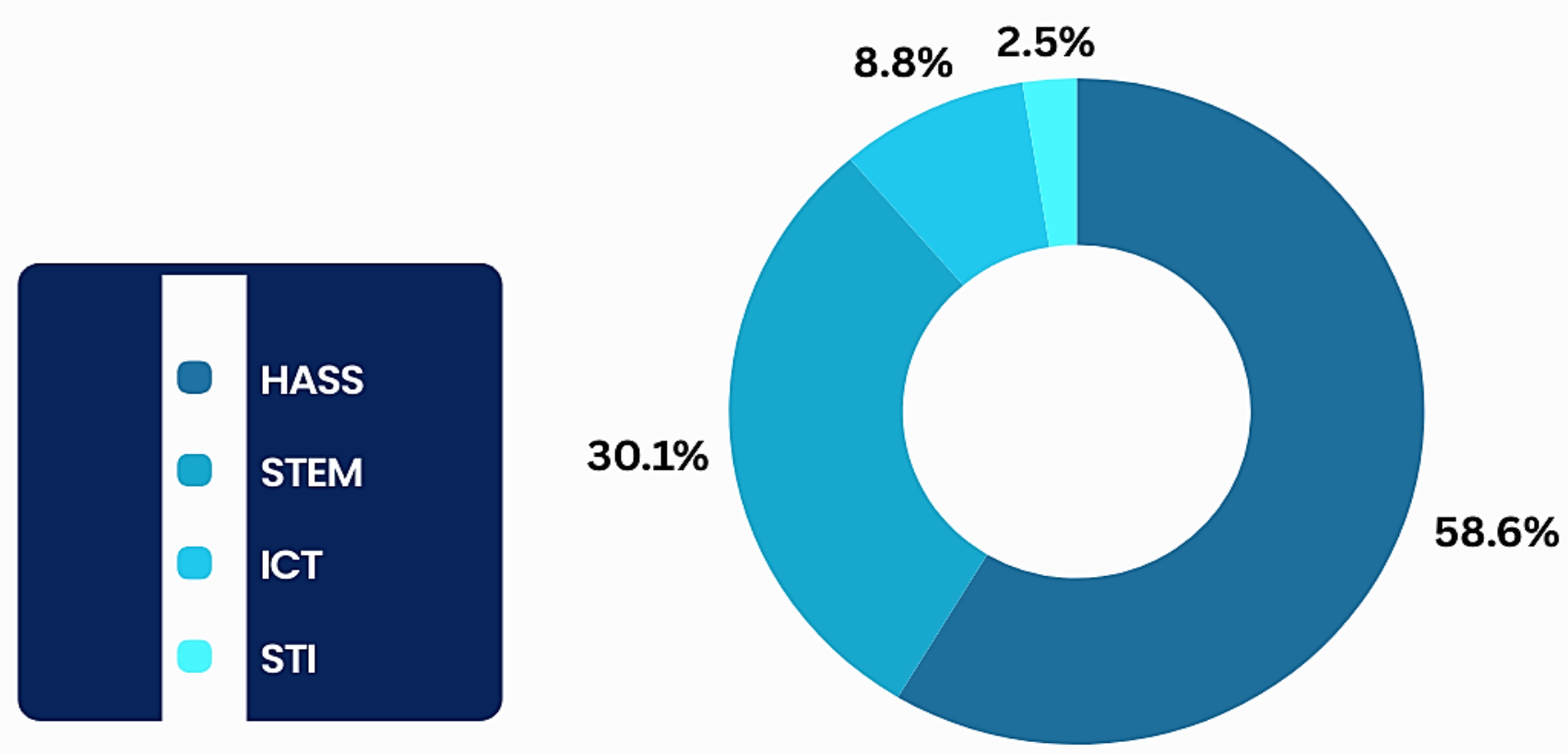
1. **Education & Skills Development, STI and Health & Nutrition** among the MIP-1 game changer interventions of human capital development;

2. Issues of technology and skills development for job creation are the new trajectory Malawi is taking; and

3. These **3 F/Areas** have a multiplier effect- If **research and investments** are done in technology, education and skills development and health and nutrition, their impacts are likely to trickle down to the other sectors as well.

Malawi Tracer Study Results of Graduates from HEIs

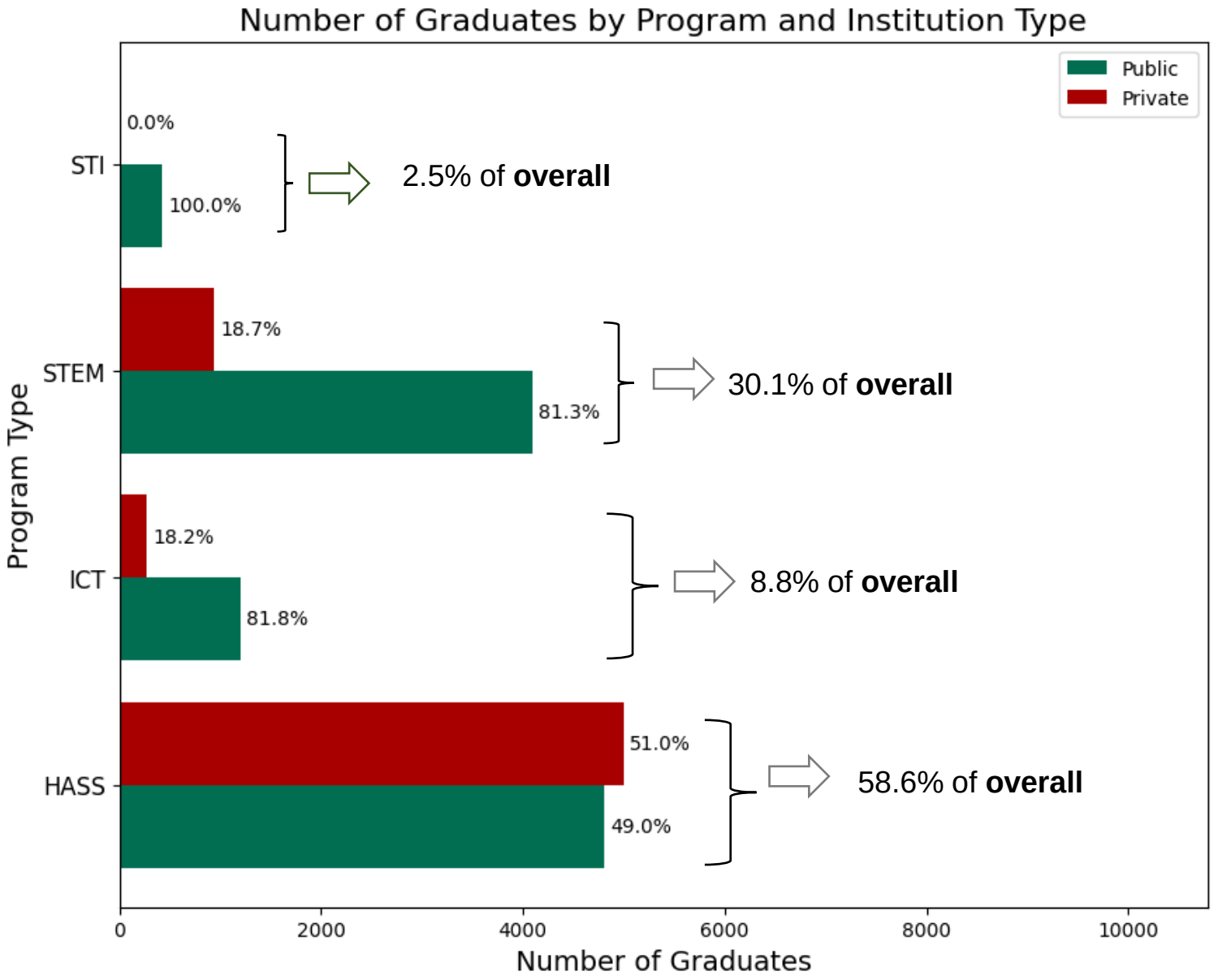
In 2022, there were 16,735 graduates across tertiary institutions who provided data for this study.



- 30.1% graduated in STEM degree programs, 2.5% in STI-related disciplines, and 8.8% in ICT.
- Within STEM, 4% were in engineering, manufacturing, and construction, 7.6% in agriculture, forestry, fisheries, and veterinary, and 1.3% in Mathematics and Statistics.

Results

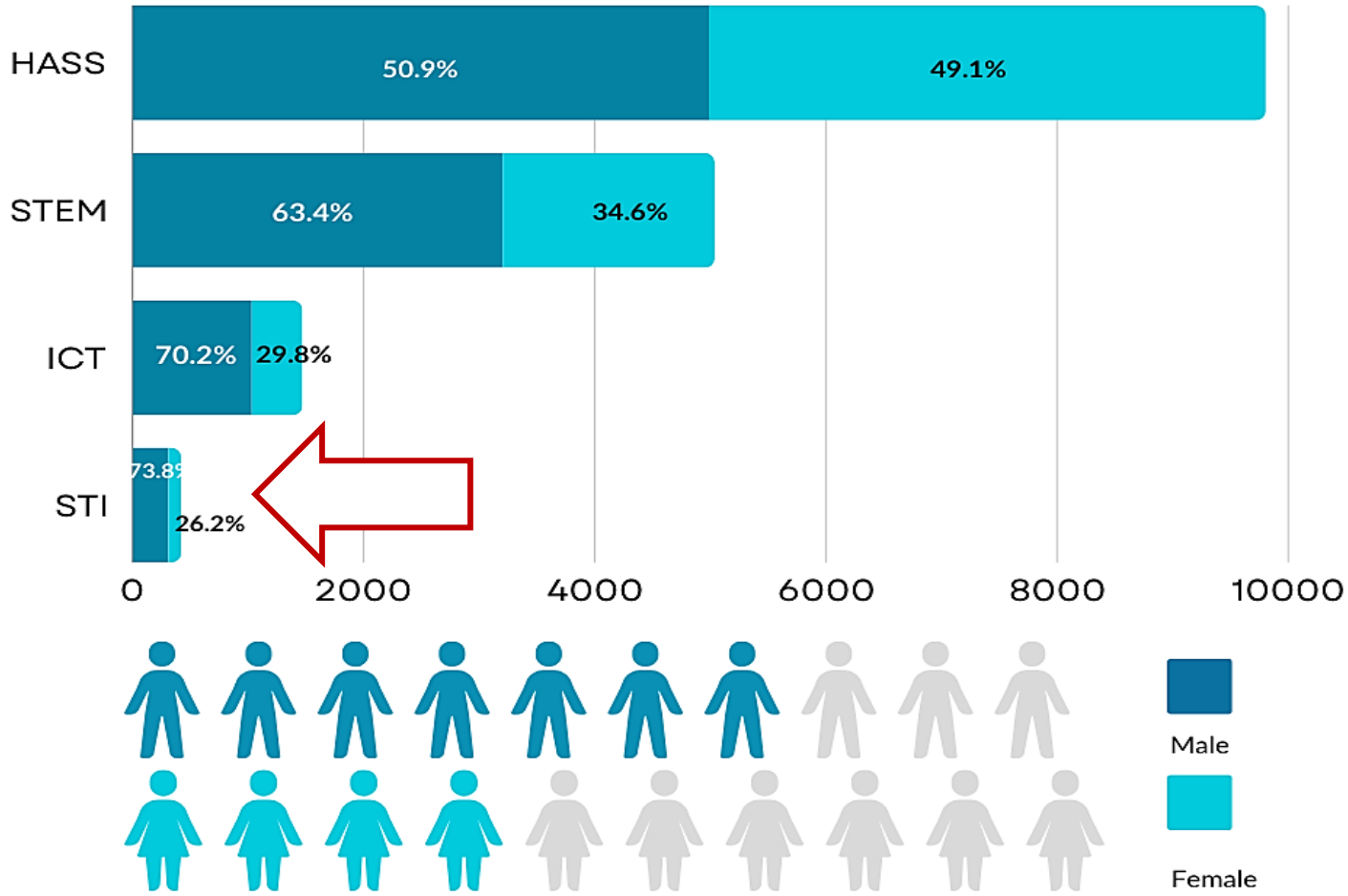
- Public institutions dominate in the production of graduates in the STEM field, contributing 4,097 individuals (81.3%), compared to the 940 graduates from private institutions. Similarly, in ICT, public institutions are responsible for 81.9% of graduates, significantly overshadowing the 267 graduates from private institutions.
- **Only public institutions provide STI programs**



Results

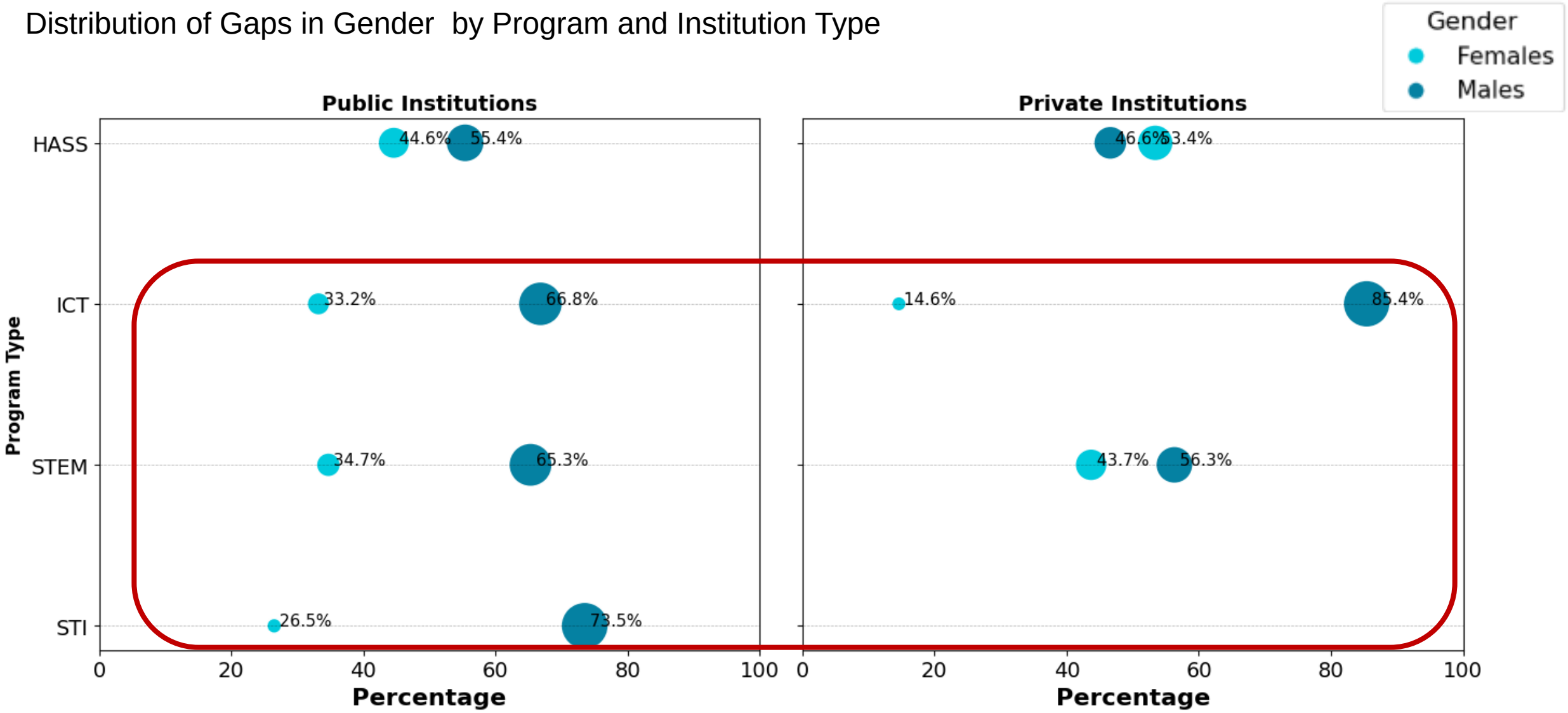
Distribution of program types by gender

- Apart from the Arts and Humanities programs (HASS), male graduates dominate their female counterparts in STEM, ICT and STI. e.g. of the graduates in STI-related disciplines, 73.8% were male and 26.2% were female. We see a similar picture in ICT



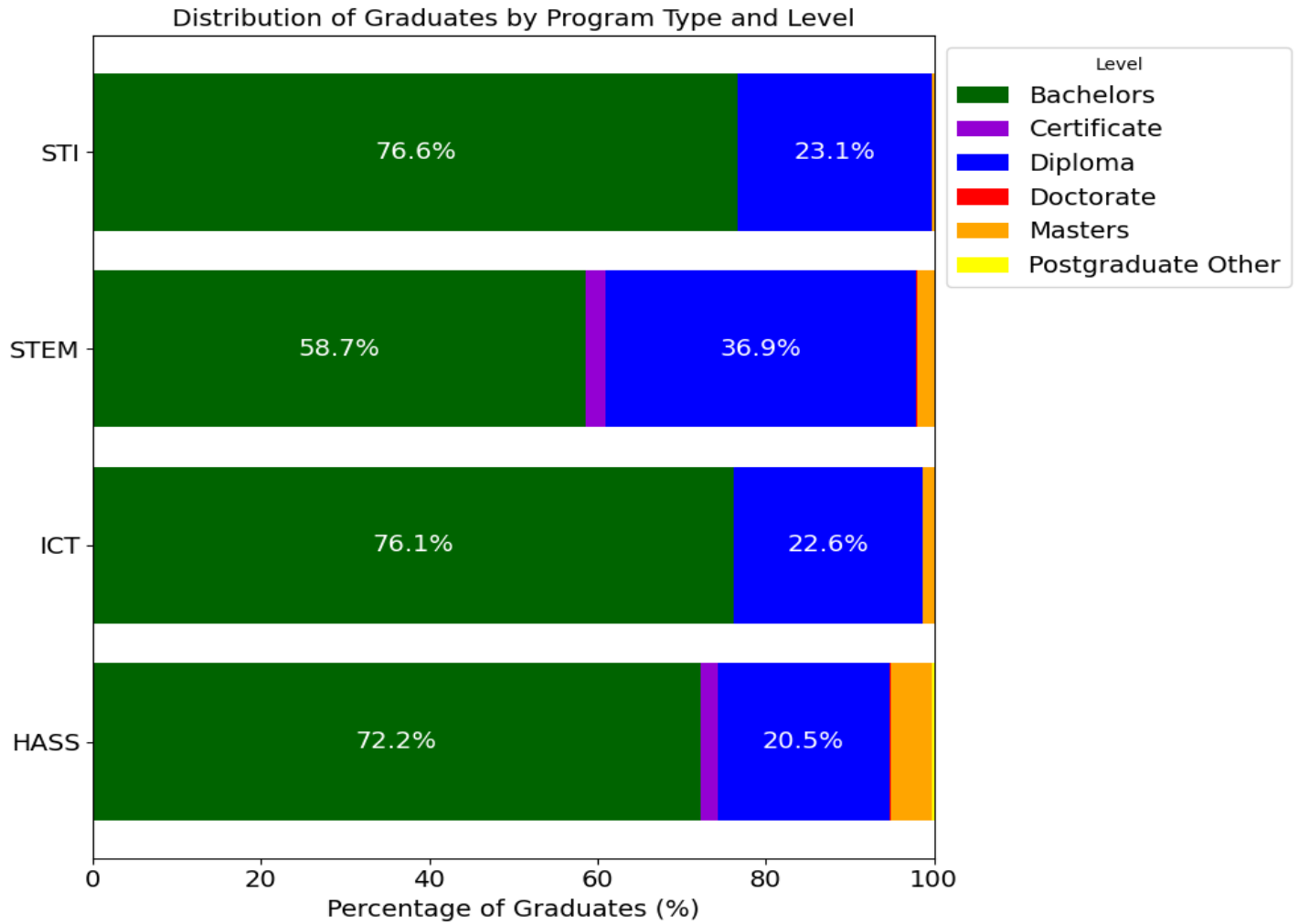
Results

Distribution of Gaps in Gender by Program and Institution Type



Results

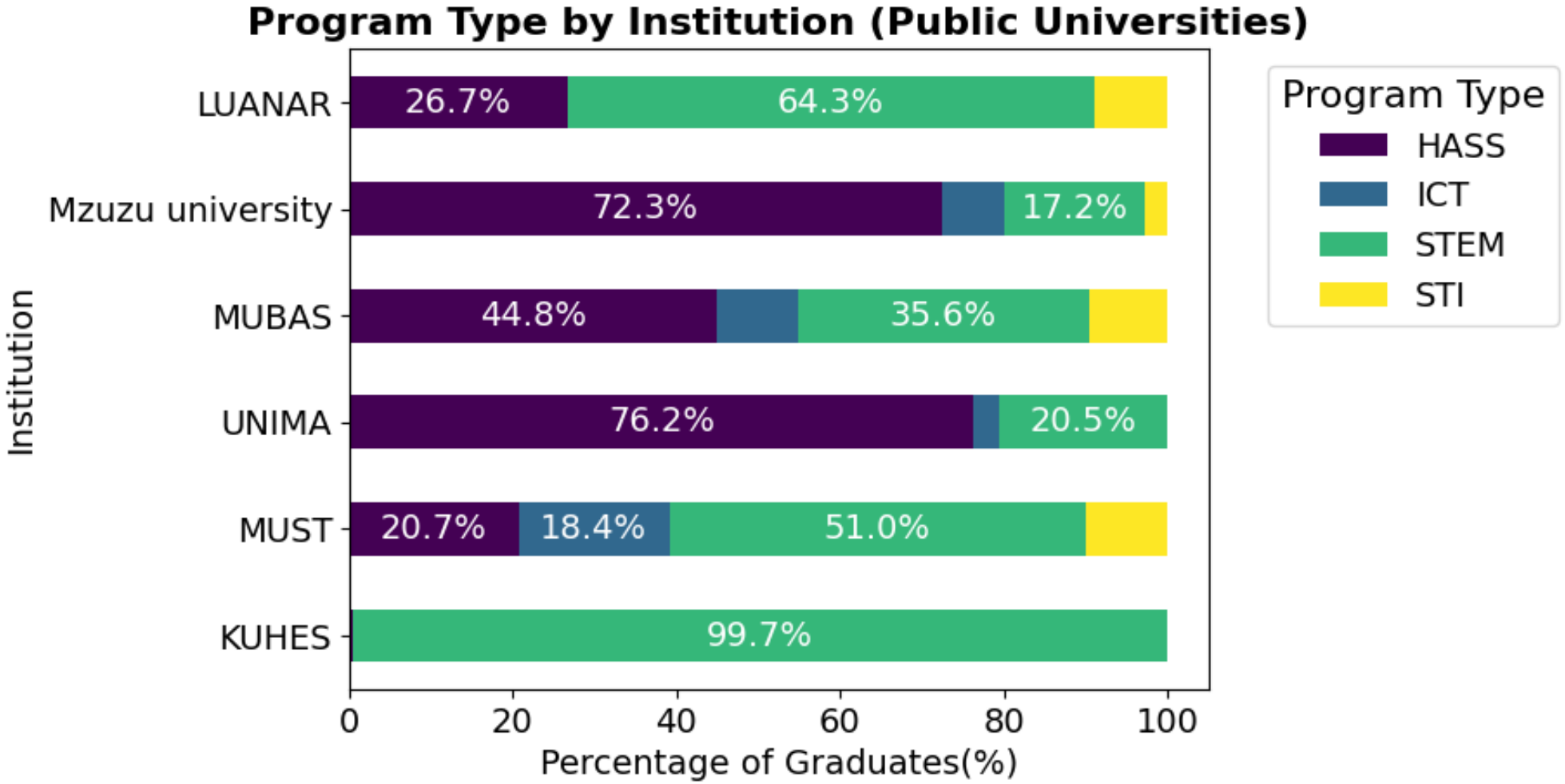
Distribution of program types by gender education level and program type



There are more bachelor degrees being obtained across programs followed by diplomas. There are fewer postgraduate degrees.

Results

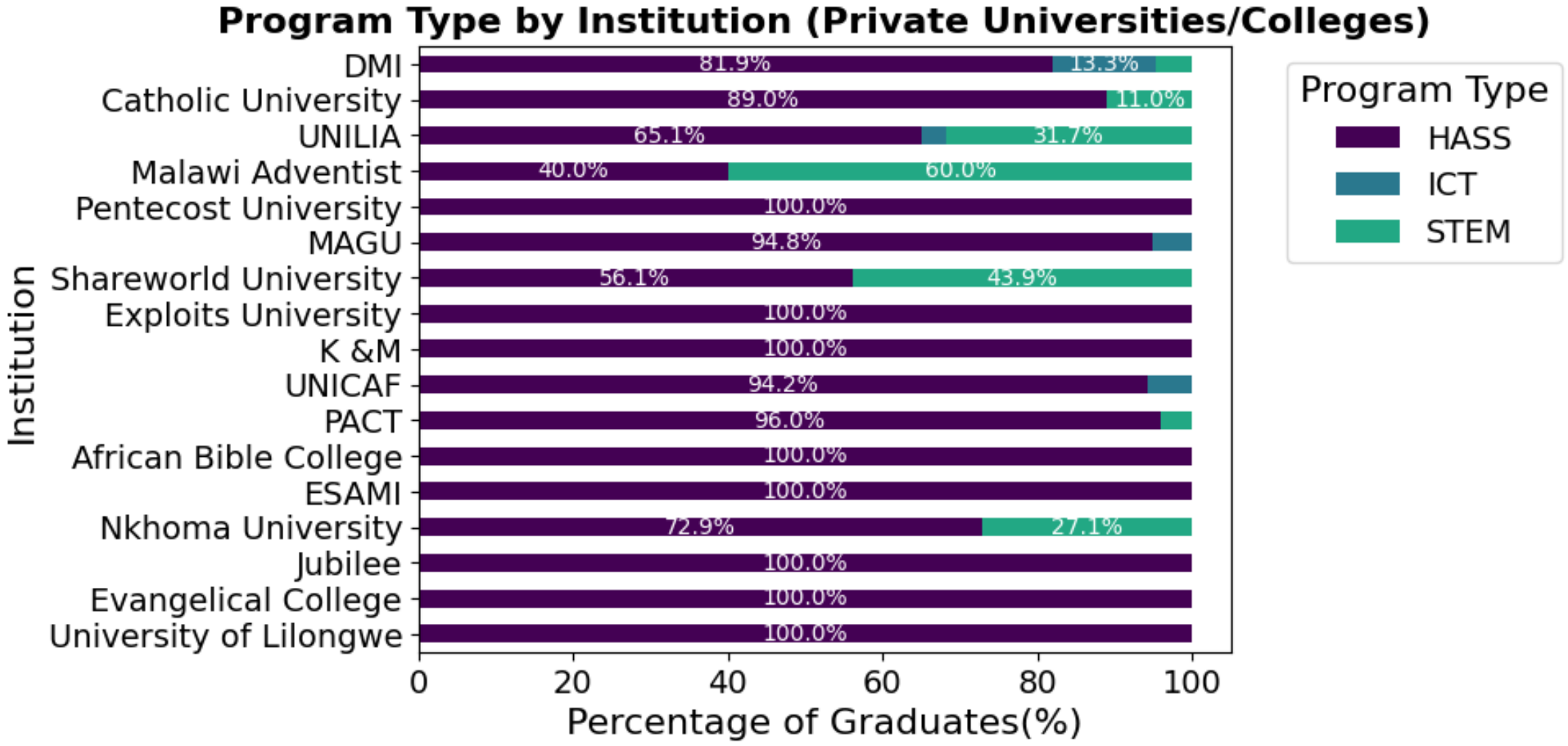
Distribution of program types across specific institutions



Across the major public universities, less than 10% of the courses offered are regarded as STI

Results

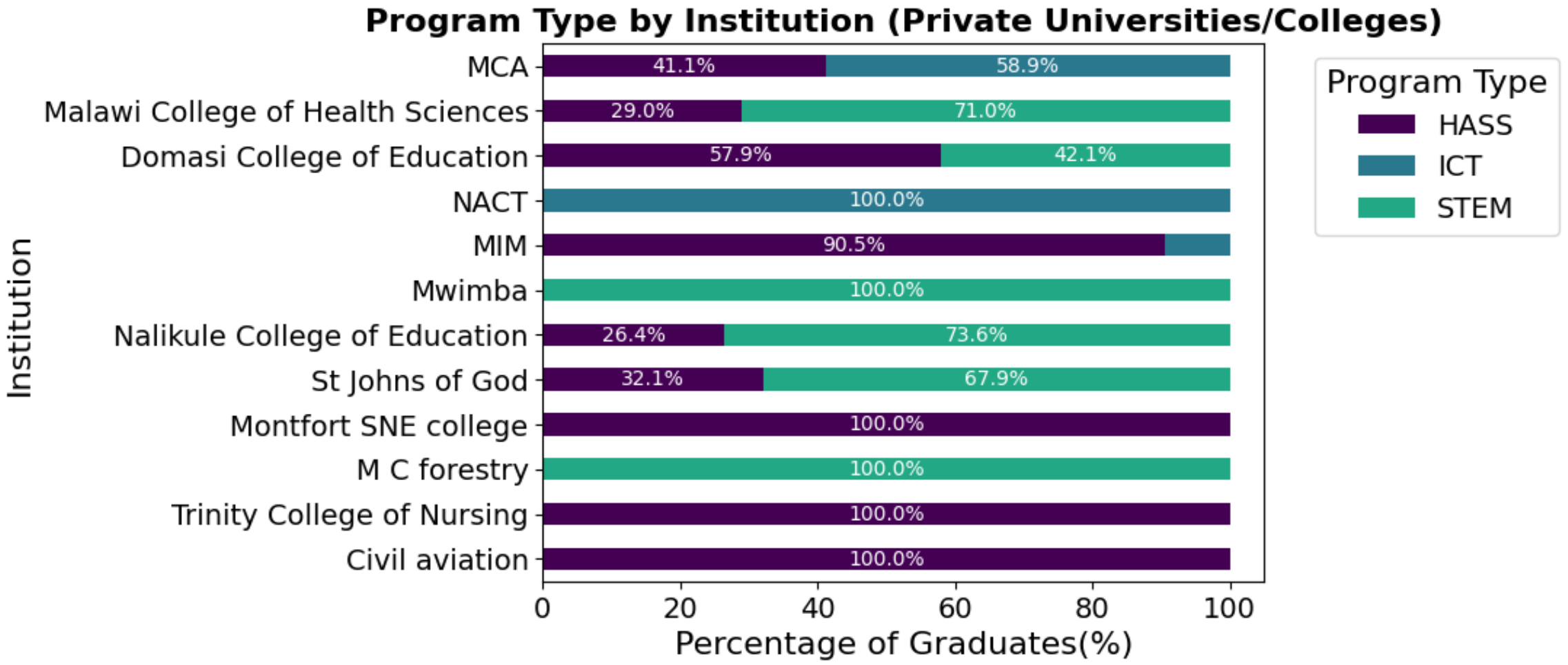
Distribution of program types across specific institutions



Across the private universities and colleges, HASS courses dominate

Results

Distribution of program types across specific institutions



Across the private universities, HASS and STEM courses dominate

Recommendations

Little progress towards establishing STI programs across institutions. Use the new NSTIP to promote existing and creating of new STI programs to align with Vision 2063 objectives for innovation-led growth.

Strengthen initiatives to address gender disparities and increase female participation in STEM, ICT, and STI programs.

Increase funding opportunities for master's and doctoral students to Encourage bachelor's graduates to pursue advanced studies

Invest in upgrading research facilities to support master's and doctoral research in STEM, ICT, and STI fields.

Foster collaboration between educational institutions both (public and private), industry partners, and research bodies.

Establish mentorship programs to support master's and doctoral students in their academic and professional development.

Implement monitoring and evaluation mechanisms to assess the effectiveness of interventions and make necessary adjustments.

Special Thanks to the:
Directorate of Science and Technology and Innovation (DSTI) – Ministry of Education, Malawi Government
All Universities who provided data
FemAnalytica (Edith Milanzi and Thokozani Kumwenda-Kayira)

DEVELOPMENT OF THE NATIONAL SCIENCE, TECHNOLOGY AND INNOVATION POLICY (NSTIP) IN MALAWI

Multiple Policy Frames for con: Policy Making Process is Iterative

13. Principles of National Policy

The State shall actively promote the welfare and development of the people of Malawi by progressively adopting and implementing policies and legislation aimed at achieving the following goals:

(5) Rural Life

To enhance the quality of life in rural communities and to recognise rural standards of living as a key indicator of the success of government policies.

(Schot & Steinmueller, 2018)

Process (technical committee, cabinet, parliament approvals)

PPAs FOR THE MALAWI NATIONAL SCIENCE, TECHNOLOGY AND INNOVATION POLICY (NSTIP)

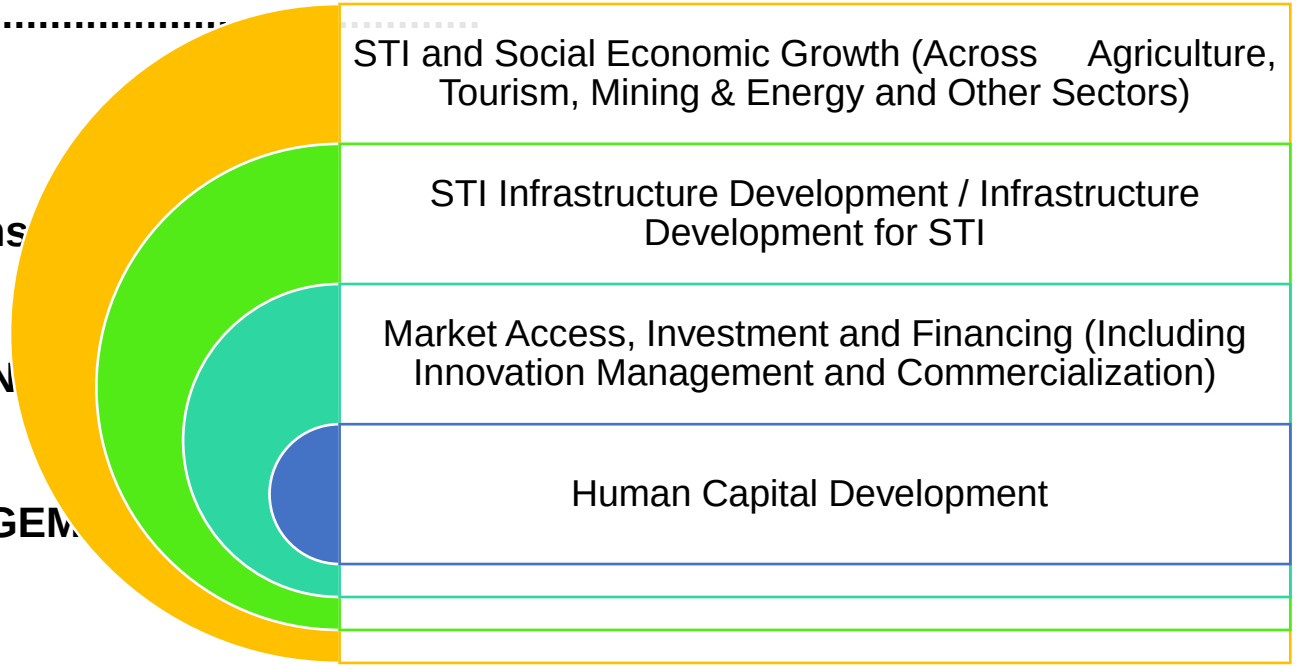
- ✓ TRADIONAL POLICY FORMULATION CIRCLE-OPC (MALAWI)
- POLICY FRAMEWORK DOCUMENT
- **Title**……
- ✓ **Foreword**
- ✓ **Preface**
- ✓ **List of Acronyms and Abbreviations**

1.0 INTRODUCTION

2.0 BROAD POLICY DIRECTION

3.0 POLICY PRIORITY AREAS

4.0 IMPLEMENTATION ARRANGEM



EMERGING TECHNOLOGIES OPTIONS FOR OPEN HARDWARE

voanews.com/a/us-universities-help-malawi-establish-first-ai-center-/7310638.html

3/20/24, 2:00 PM US Universities Help Malawi Establish First AI Center

AFRICA

US Universities Help Malawi Establish First AI Center

October 13, 2023 10:53 PM By Lameck Masina

A student at Malawi University of Science and Technology explains artificial intelligence products to education minister Madalitso Kambauwa Wirima. (Lameck Masina/VOA)

(AI) In Health Care

5-WINDOW MATRIX FOR CURRICULA DELIVERY TESTED TECHNOLOGIES (TIKWERE, NOTESMASTER, MiLab, DSTI-BOOK, INSPIRE-LEARN)

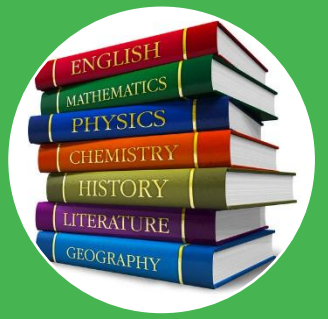
ON AIR: RADIO AND TV

PYTHON GNU RADIO & TV

ONLINE: INTERNET

+ IoT CLIMATE SENSING AND EWS AT EACH SCHOOL VIA MAREN

OFFLINE: DIGITAL LIBRARIES

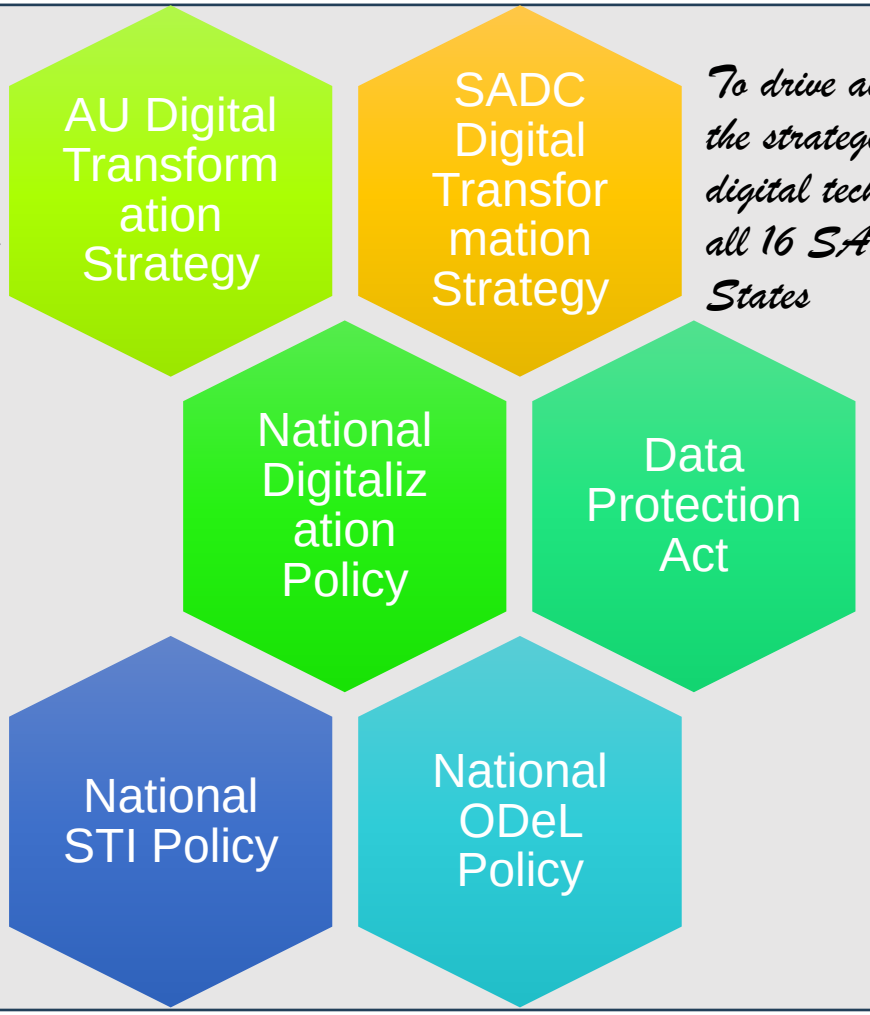


PRINT: BOOKS

LOW-END MOBILE PHONES/INSPIRE-LEARN: USSD CODE, BULK SMS, VOICEMAIL, INTERACTIVE

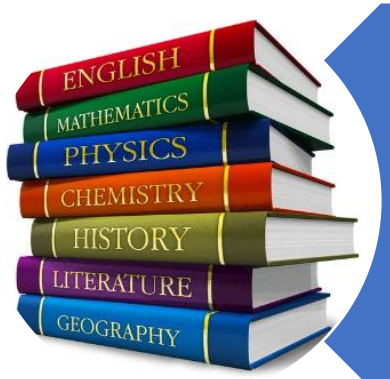
THERE IS NEED FOR RESEARCH AND INVESTMENT: RETOOL/RESKILL THE TEACHER, NEW PEDAGOGY (TECH PEDAGOGY), NEW OR REPURPOSED CLASSROOMs, CYBER-SAFETY, TLMs & O&M

Provide schools and other educational institutions with technology equipment and, where possible, broadband Internet connection.



To drive and accelerate the strategic adoption of digital technologies in all 16 SADC Member States

TARGET TEACHER AND LEARNER POPULATION



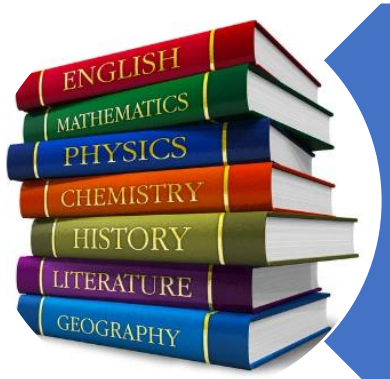
18,811:- Sec School Teachers

85,402:- Primary School Teachers

485,650:- Secondary School Learner

5,298,456:- Primary School Learners

TARGET SCHOOLS POPULATION

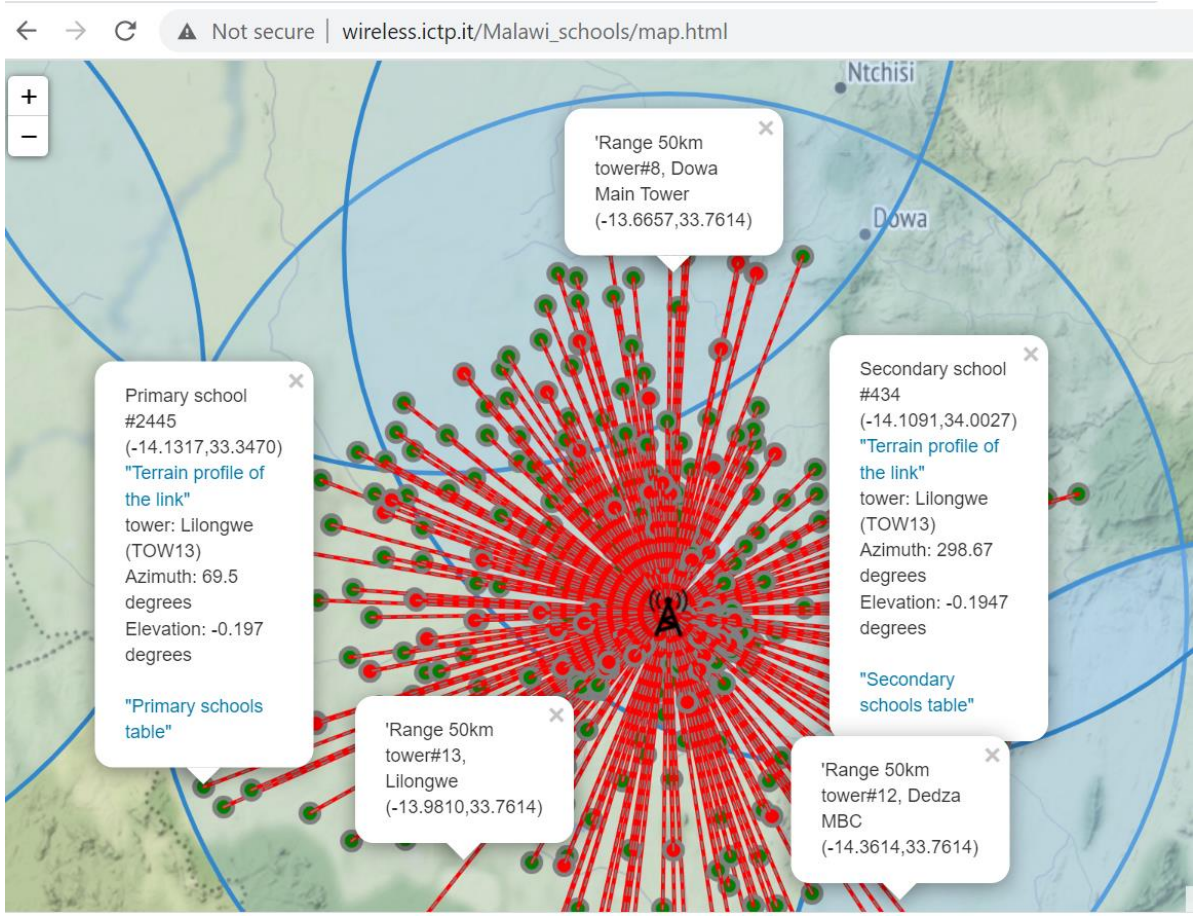


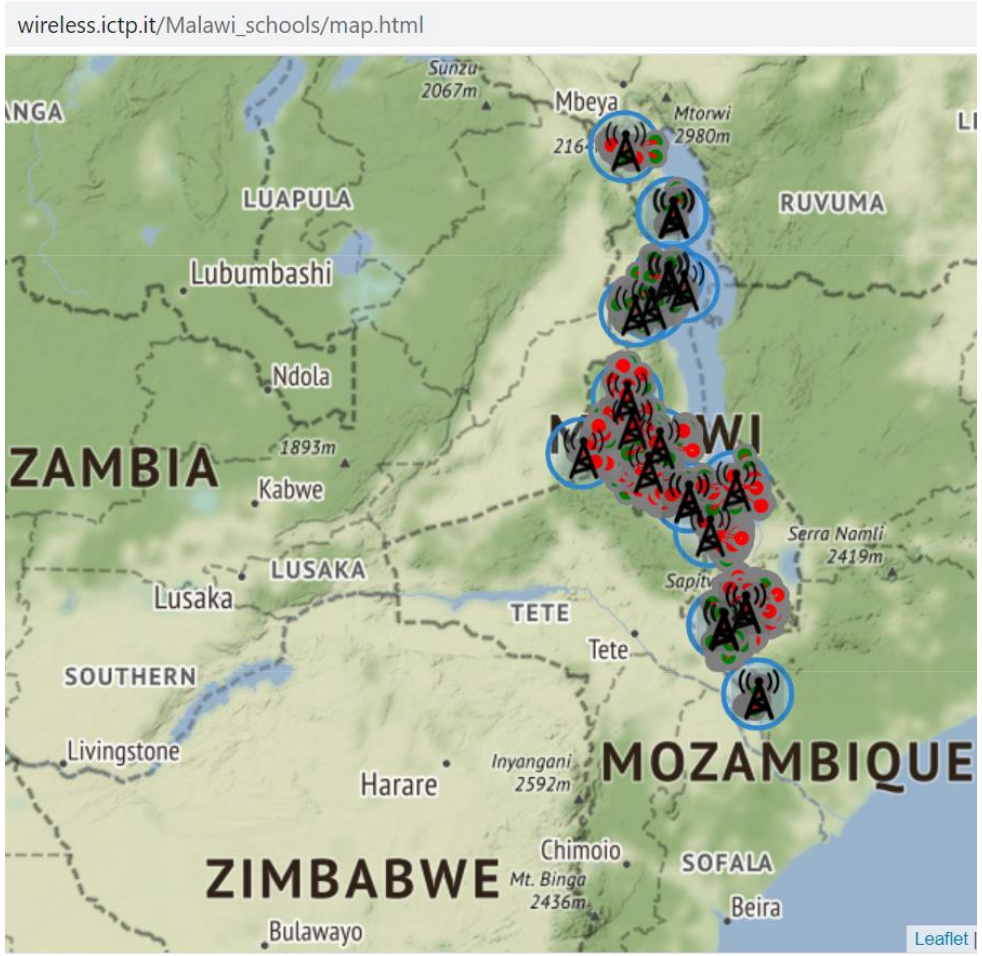
1,774 Secondary Schools

6,954 Primary Schools

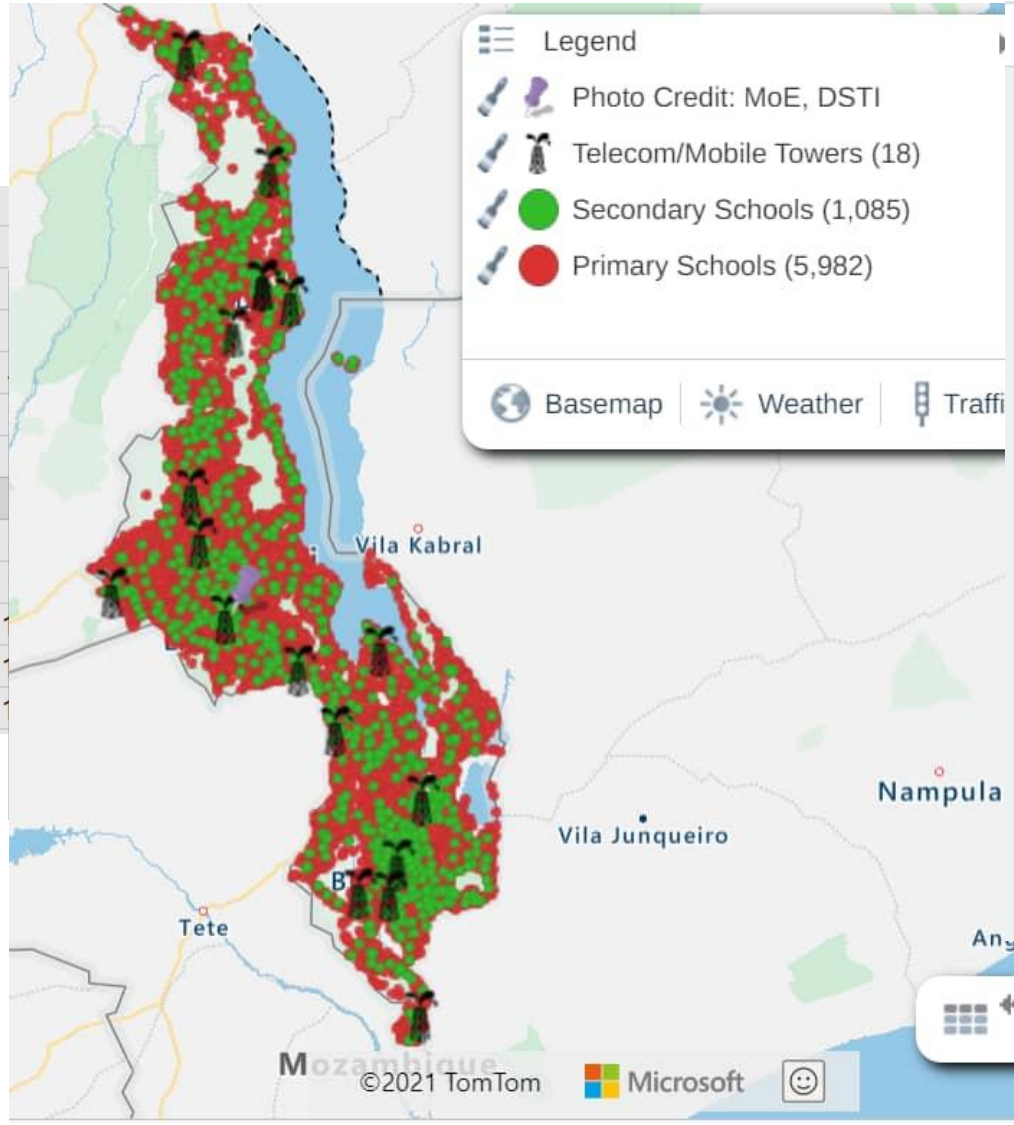
Map for Schools Connectivity with Link Terrain Profiles

http://wireless.ictp.it/Malawi_schools





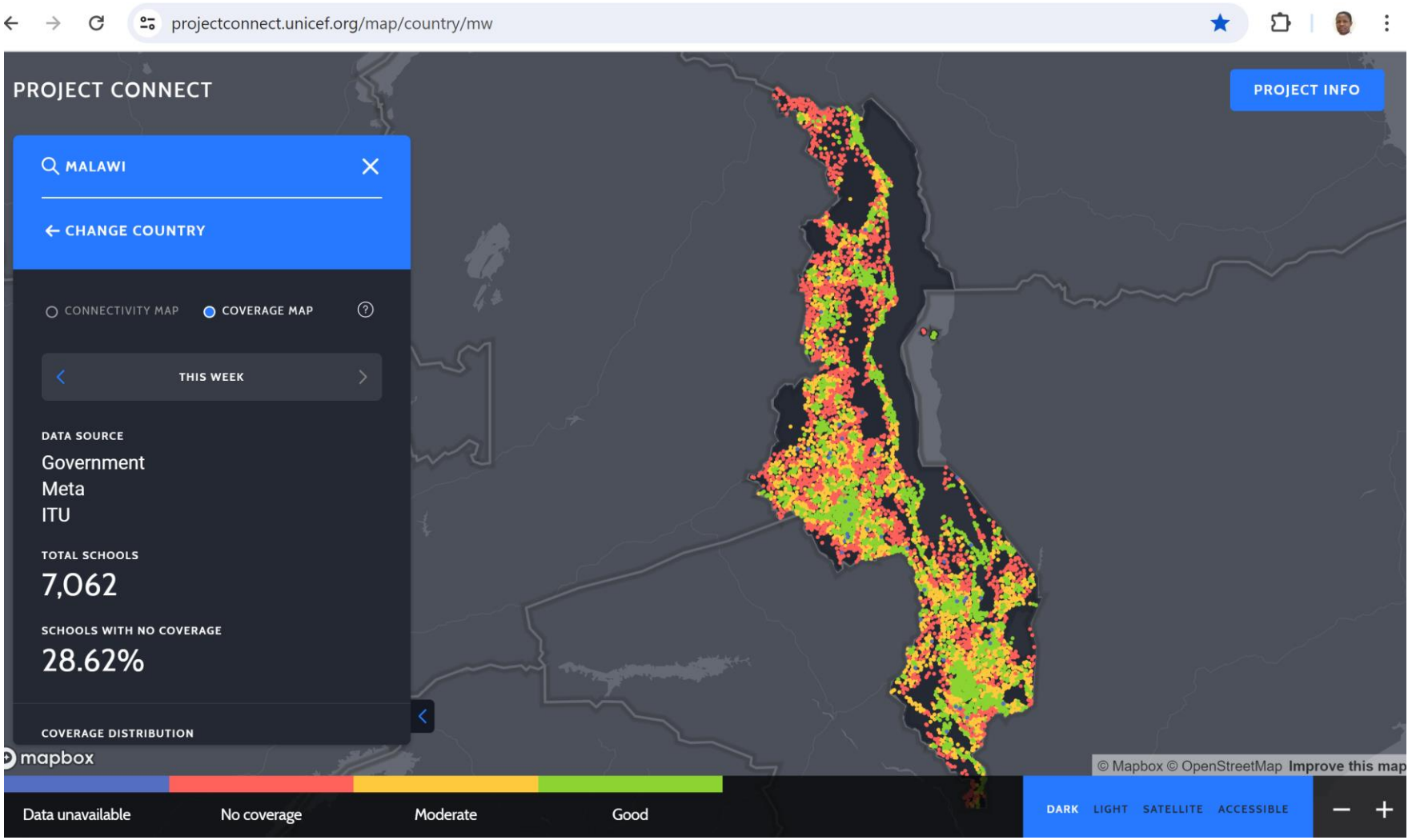
Internet Connectivity Solution Pathway: A Noble Call for Support, Register Now with Ministry of Education to Connect a School



globalpartnership.org/where-we-work/the-gambia

- **radio, mobile and television educational programming**
- **providing educational packets** with a priority for the most vulnerable communities
- training teachers to deliver education content across **distance learning platforms**
- **providing specialized support** to children with disabilities through phone check-ins, remote psychosocial support and relevant materials (braille)
- **an online platform** to serve as a repository for all learning materials
- **internet routers** and radios for schools
- **school meals** for families with school children
- clean schools and refurbished **health facilities**
- **an accelerated learning program** so students can catch up, including psychosocial support to students and teachers
- **a public awareness campaign** that promotes good hygiene and handwashing in school, including critical messaging around health, safety and learning both during the COVID-19 crisis and after when children return to school.

MAPPING OF SCHOOLS IN MALAWI



LOW COST WEATHER STATIONS

EXPERIENCE FROM THREE PROJECTS

SCIENCE, TECHNOLOGY AND INNOVATION UNIT

More than 30 workshops on IoT

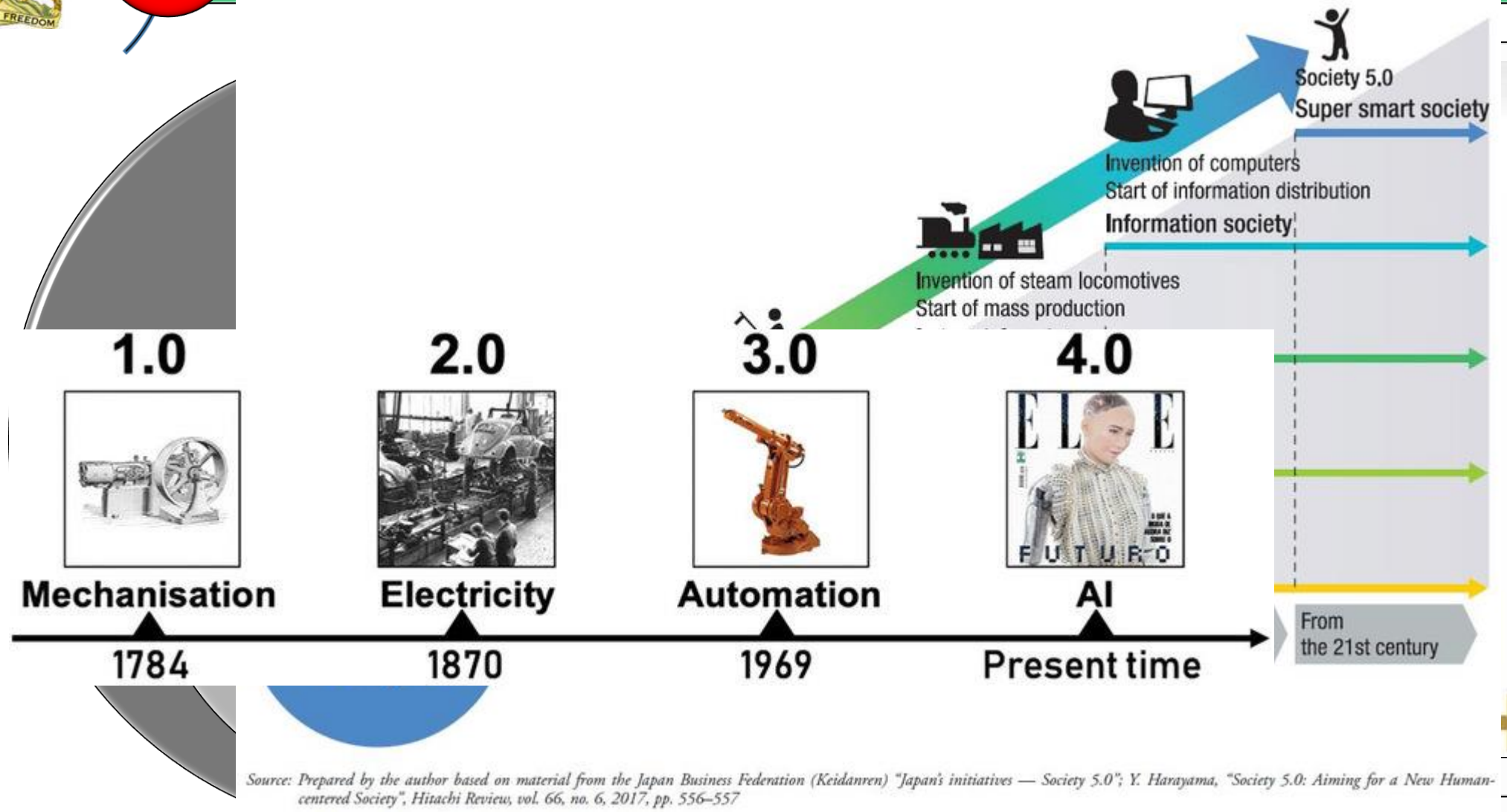
Centre of Excellence in IoT for ITU

Projects with UNDP, ITU, UNECA

Over 100 scientific publications

#1 request: more weather stations

CONCLUSION: CURRICULA CHANGE TO CAUSE EDUCATION, SOCIETY AND INDUSTRY TRANSFORMATION FOR WEALTH



Source: Prepared by the author based on material from the Japan Business Federation (Keidanren) "Japan's initiatives — Society 5.0"; Y. Harayama, "Society 5.0: Aiming for a New Human-centered Society", Hitachi Review, vol. 66, no. 6, 2017, pp. 556–557

PROOF OF POSSIBILITY: OPEN SOFTWARE SOLUTIONS: FLORENCE MWALWANDA- UNIVERSITY OF MALAWI

- Florence Mwalwanda is a proud graduate with a Bachelor’s Degree in Computer Science from the University if Malawi. She is honoring her skills as a software developer intern at the university of Malawi under a project called CRAFS.

- Her passion lies in Data Science and analytics,where is enjoys exploring the endless possibilities of data

Open Hardware and Software for Girls

- Besides coding Florence is a fierce advocate for girls in STEAM.

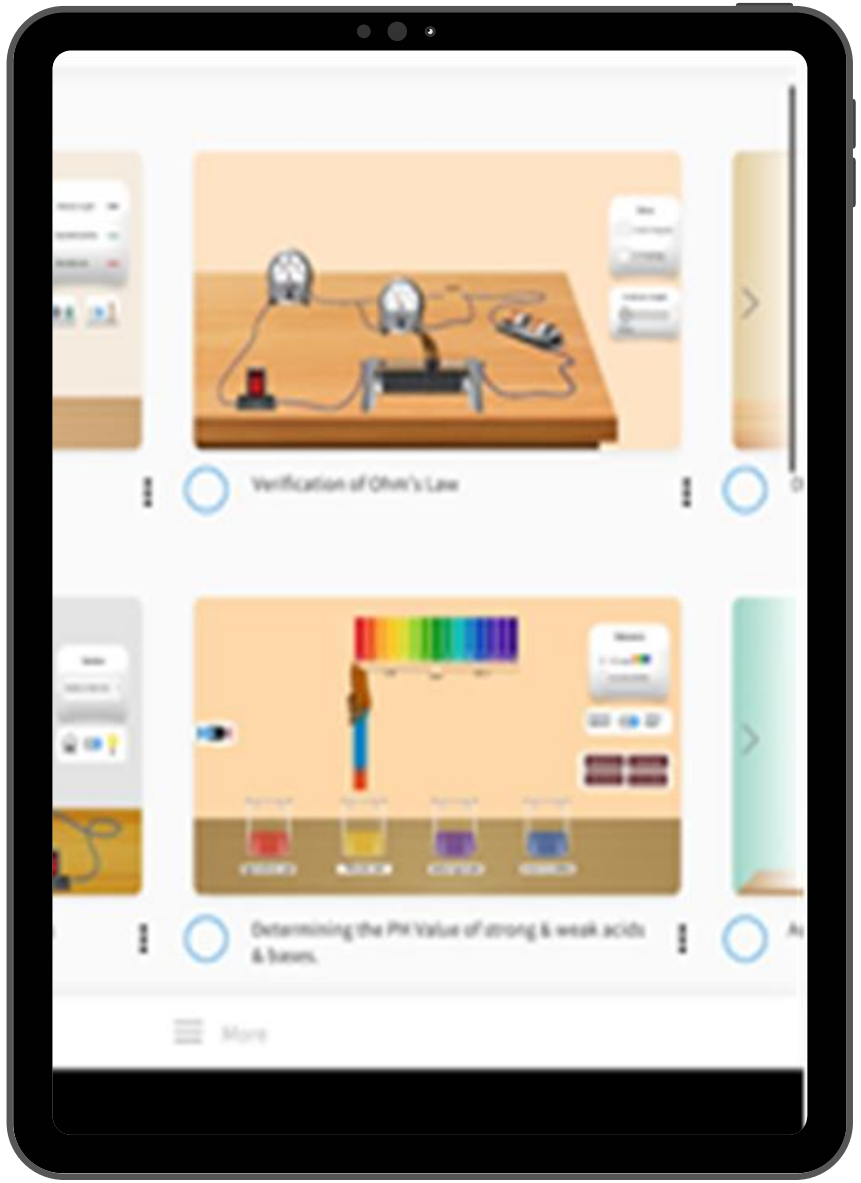
- Having walked the path from mentee to mentor, she has had an incredible journey in empowering other young women in STEAM fields.

PROJECTS UNDER DSTI-MOE

- MILAB
- FM RADIO KIT – MALAWI VS CHINA
- HPC

MiLab

Virtual Science Labs



2nd April 2023

Presentation by DSTI- Malawi Ministry of Education

MiLab
Objectives

IT and digital technologies to promote teaching and learning in secondary schools

Virtual science labs to transform learning of STI

Cooperation and support in digital transformation among stakeholders

Our Motivation

01

Lack of laboratory facilities
Only 39% available

02

Loss of learning due to COVID-19

03

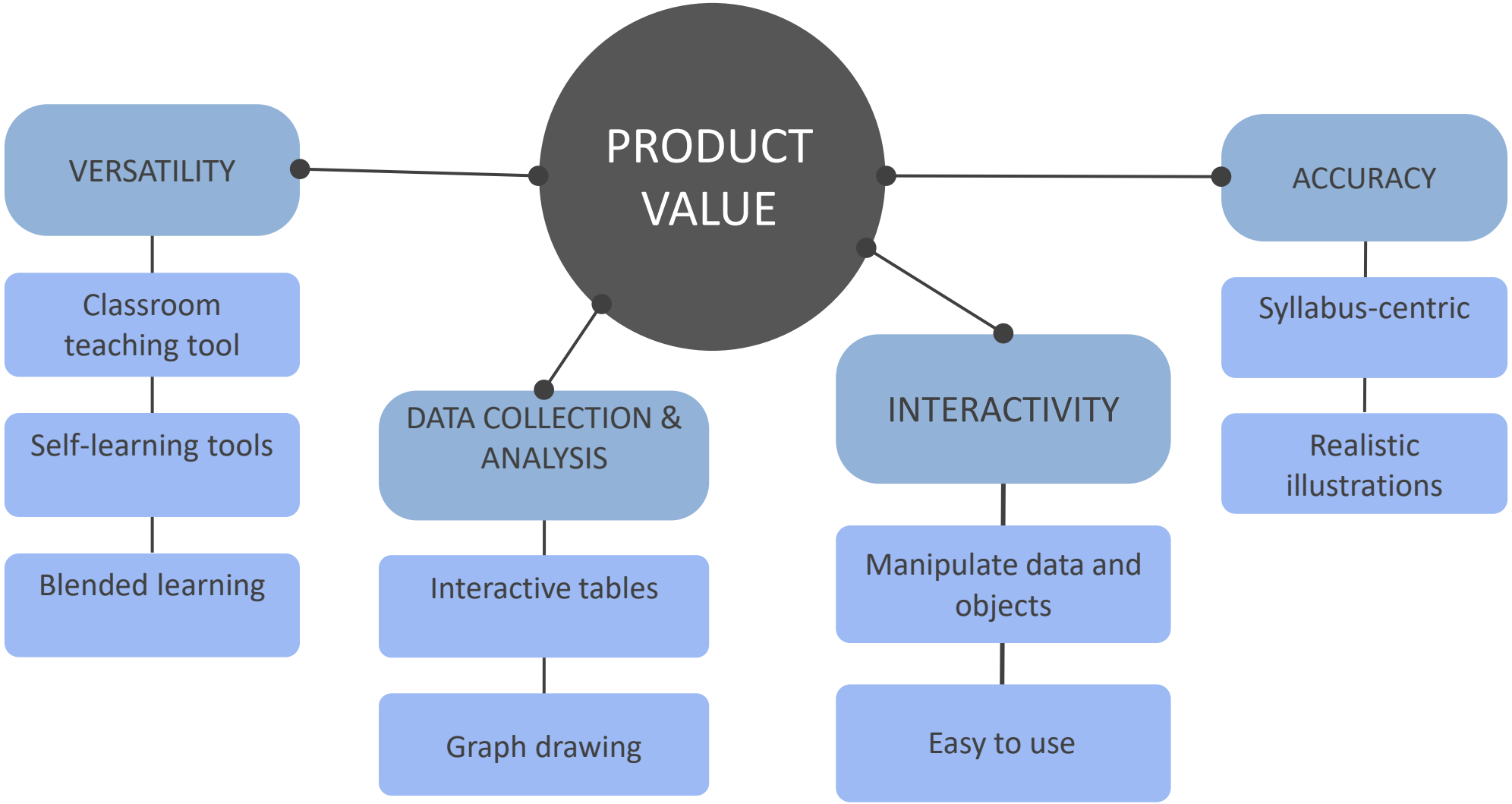
Inadequate skills to conduct experiments

Inequality of access to teaching and learning resources

04

Poor performance in national exams in Science Subjects

Value Proposition



MiLab
Ministerial statement

- SIGNING OF MOU BETWEEN IMPLEMENTING PARTNERS
- PROCUREMENT OF DIGITAL GADGETS
- INCLUSION OF DISABLED STUDENTS VIA UNDP
- INSTALLATION OF MILAB AND TRAINING TO TEACHERS AND STUDENTS
- DEVELOPMENT OF JUNIOR AND SENIOR INTERACTIVE WORKBOOKS
- MANEB TO MONITOR DEVELOPMENT, ROLL-OUT AND UTILIZATION
- APPEALTO STAKEHOLDERS, INLCUDING HONOURABLE MEMBERS OF PARLIAMENT TO PROMOTE MILAB

THE NATIONAL LAUNCH OF MiLAB

MZUNI UNIVERSITY

14th October, 2022

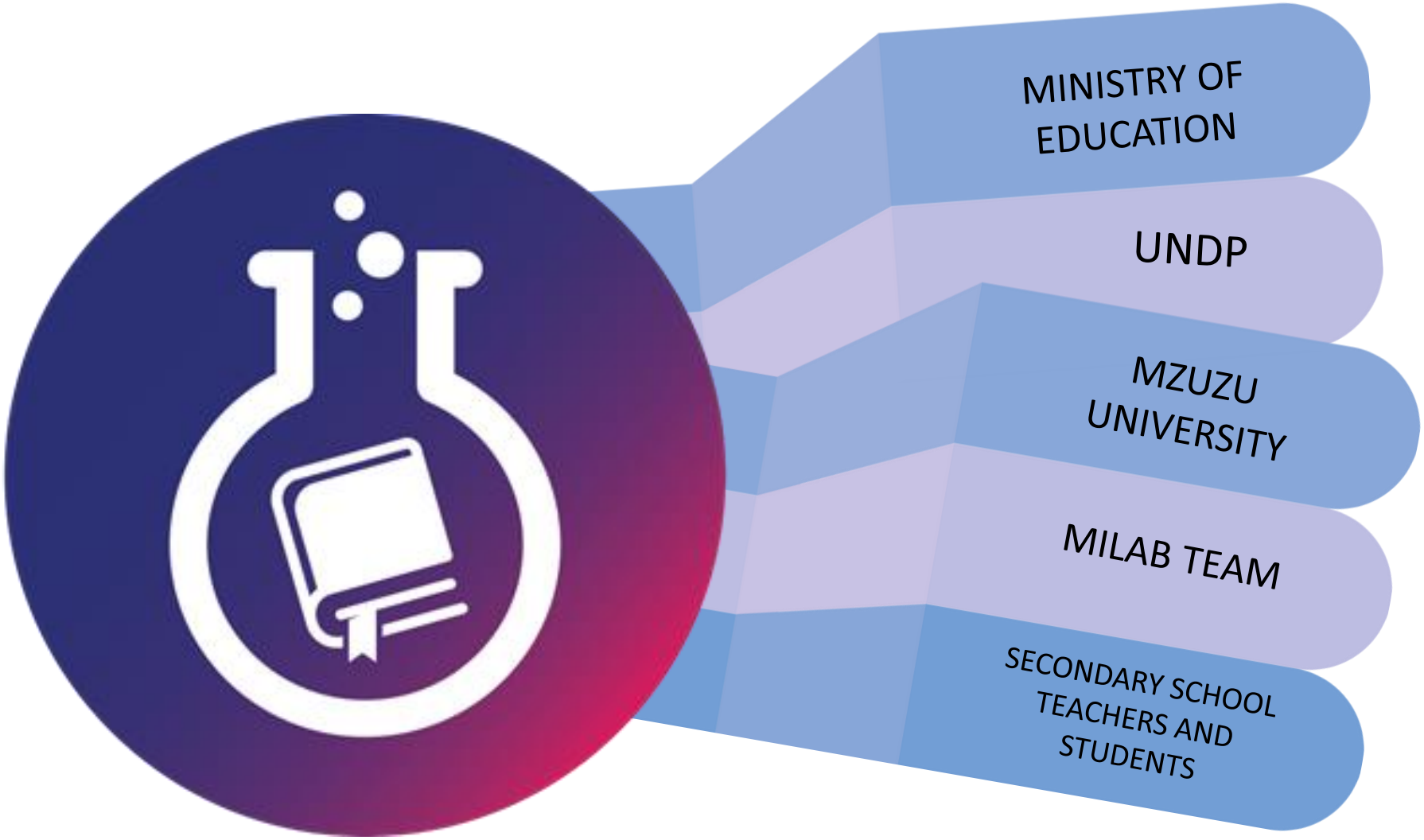

MiLab
nce Labs: Access to
Education For All
MZUZU UNIVERSITY
UNI
UNDP
United Nations
Development
Programme
MALAWI
www.mw.undp.org

MiLab

Fit-for-purpose test

MiLab

Special thanks



NATIONAL ROLLOUT BEGINS

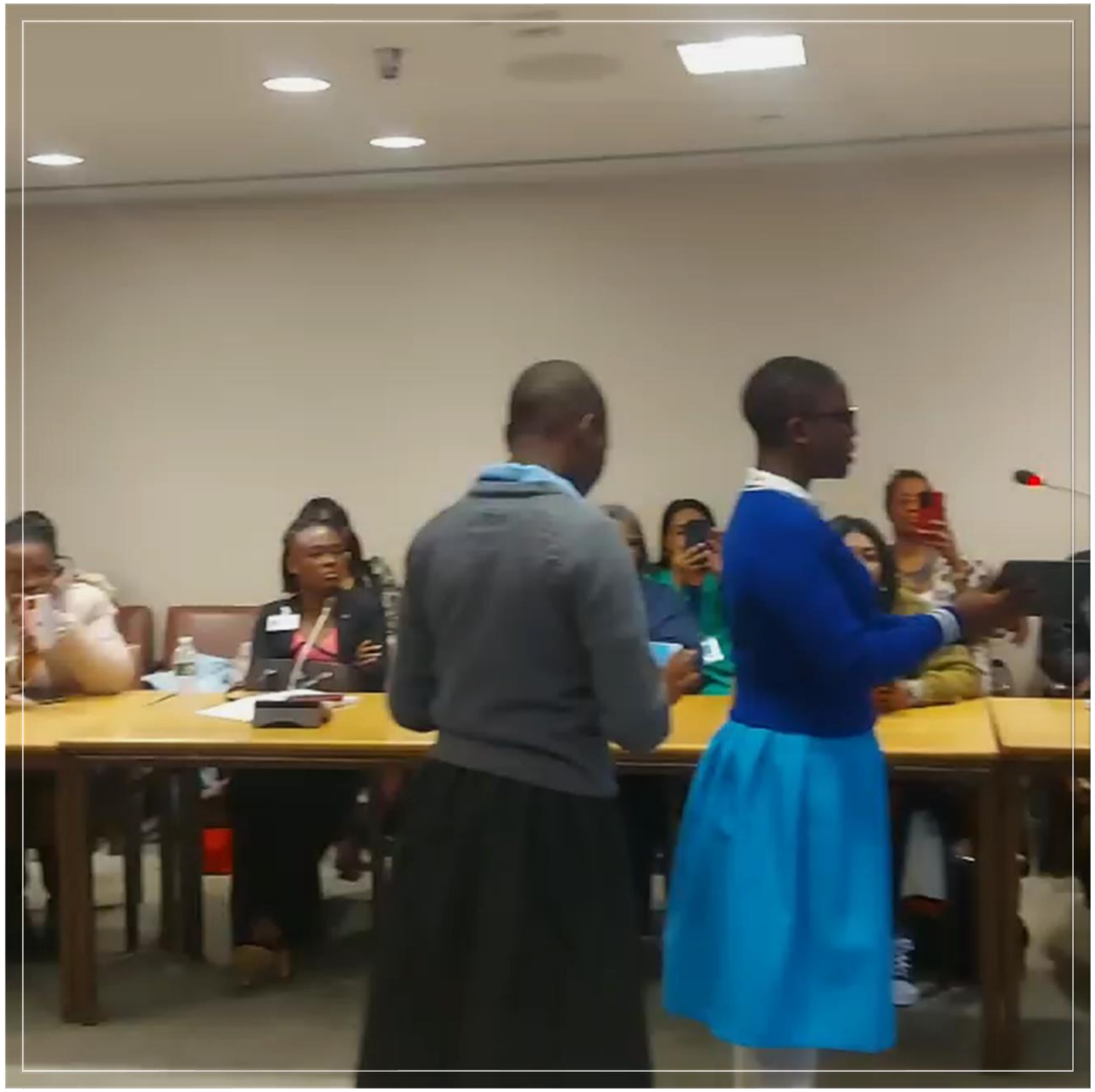
- Dzaleka CDSS
- 500 tablets provided by UNHCR

19TH DECEMBER, 2022

DEMOSTRATION OF MILAB IN NEW YORK

16th March, 2023

BLESSINGS ZIMBA – MARY MOUNT SEC SCHOOL
GRACE BAULENI – LUWINGA SECONDARY SCHOOL



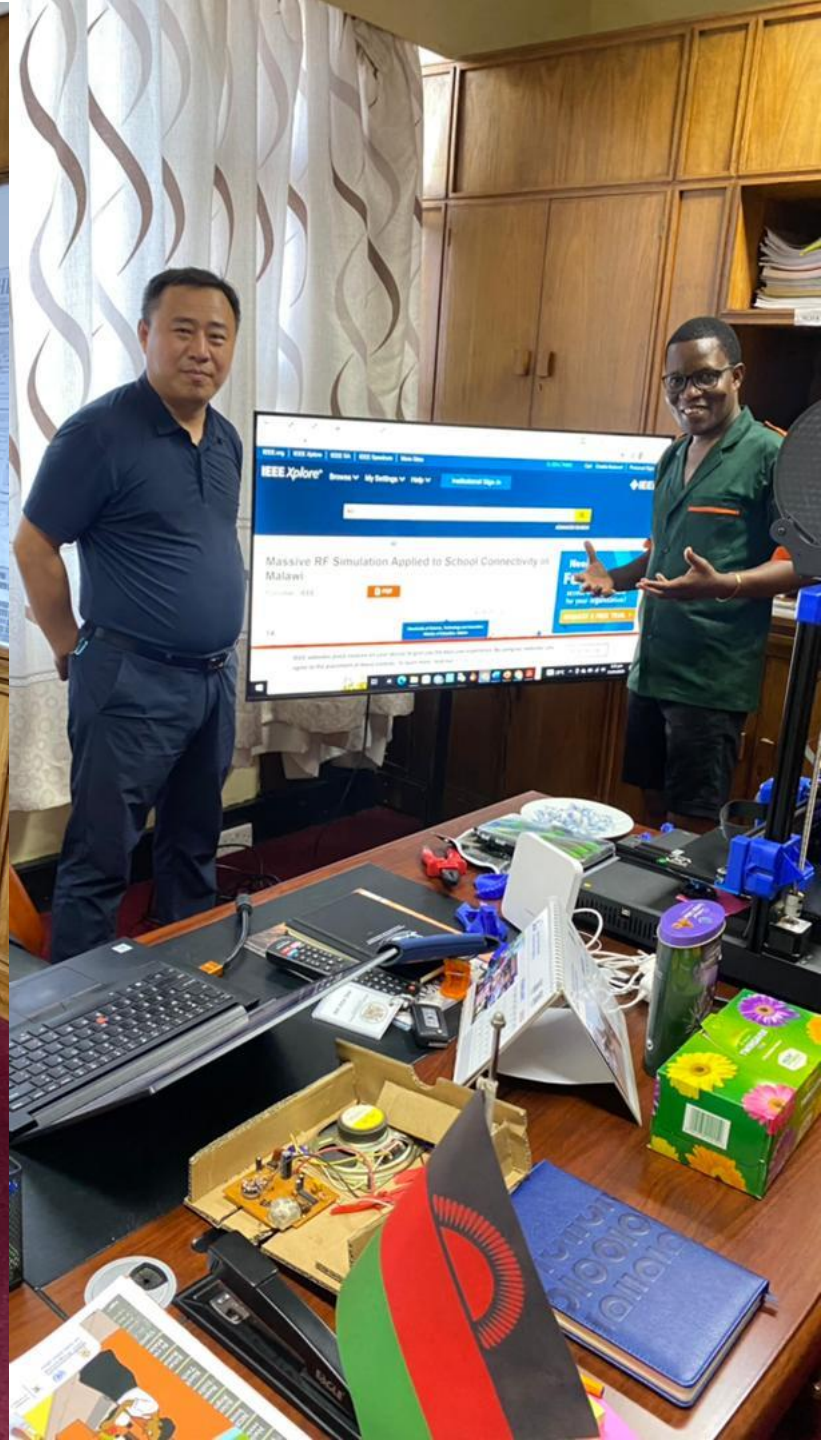
DEMONSTRATION OF MILAB IN NEW YORK

By

GRACE BAULENI
BLESSINGS ZIMBA

DSTI EDUCATIONAL RADIO KIT

Malawi Vs China



FM RADIO KIT

BY CHINESE MAKER

CHARLES LIU –MAKER OF THE CHINESE RADIO KIT VISITING DSTI OFFICE

FM RADIO KIT

BY CHINESE MAKER

TESTING RADIO KIT MADE BY CHARLE LIU


ADVANCED
MANUFACTURING
We are a digital manufacturing startup company
Blantyre, Malawi. Our goal is to accelerate Auto
Industrialisation through the development of sm
VR
Argumented/ Virtual
Reality
3D

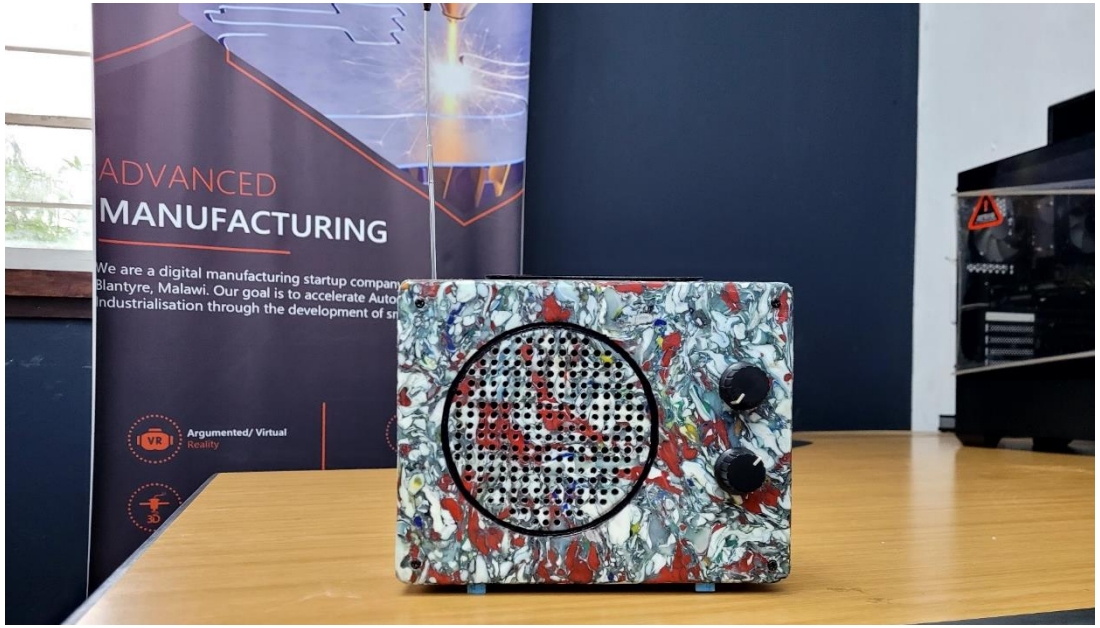
FM RADIO KIT

BY DSTI & QUBIX


Various Colors

RADIO KIT MADE FROM RECYCLED PLASTIC WASTE

DSTI/Qubix Radio



Components price

- Casing = MK8,000
- Nobles (x2) =MK2,000
- Charging system = MK8,000
- Rechargeable Li-ion Battery = MK2,000
- FM Circuit = MK14,400

Total Amount = MK34, 400

DSTI

QUBIX ROBOTICS

Bill of Material

Radio Circuit, Charging system and Casing

NAME OF THE ITEM	VALUE OF THE ITEM	NO. OF ITEMS REQUIRED	PRICE PER ITEM (MK)	TOTAL PRICE (MK)
Capacitor	47uF	2	200.00	400.00
Capacitor	2200uF	1	700.00	700.00
Capacitor	220uF	1	200.00	200.00
IC	CD2003GP	1	500.00	500.00
IC	TDA2822M	1	500.00	500.00
Ceramic capacitor	224	1	200.00	200.00
Ceramic capacitor	107C	1	200.00	200.00
Ceramic capacitor	104	3	200.00	600.00
Ceramic capacitor	102	1	200.00	200.00
Ceramic capacitor	332	1	200.00	200.00
Resistor	1Kohms	1	200.00	200.00
Rheostat	B 50 K	1	700.00	700.00
Tuning capacitor	-	1	800.00	800.00
Speaker	3W 4ohms	1	3900.00	3900.00
PCB	-	1	1500.00	1500.00
Battery carrier	-	1	2500.00	2500.00
Aerial	-	1	1500.00	1500.00
Grand Total Cost for Components				**14,400.00**

- Plastic casing = MK8,000
- Nobles (2x) = MK2,000

Total = MK24,000

Including Charging system

- Charging system = MK8,000
- Rechargeable Li-ion battery = MK2,000

Sub-Total = MK34,000

[Plus Mini solar panel = MK10,000]

Total Amount = MK44,000

QUBIX ROBOTICS

TO SUPPORT THE LAUNCHED NATIONAL RESEARCH AGENDA (NRA)

Introduction
HPC

On 2nd June 2022 Malawi joined the world in the provision of in-country High Performance Computing Services.

The facility is expected to support the execution of large-scale simulations used in cases where it would be practically impossible to physically observe phenomena or it would be quite dangerous for humans to observe things.

- Such areas include drug discovery, the occurrence of earthquakes and other natural disasters as well crash tests of cars.

The infrastructure is hosted by the Malawi Research and Education Network (MAREN)
MAREN was established by Public Universities to facilitate connectivity and value-added services for the research and education sectors of the country.

The next slides provide information on the various activities that have been undertaken so far in relation to the HPC facility.

HPC Development

15-Jun-21	Approval of the SADC Cyber Infrastructure framework by the SADC Ministers of Education and Training, Science, Technology and Innovation.
Feb-Mar 22	Call for the expression of interest to host the HPC System in Malawi where MAREN submitted its expression of interest and through a competitive process it was chosen as the host.
Feb-Mar 22	Choice of MAREN as the hosting institution for the HPC facility.
11-13 May 22	Site visit to MAREN by SADC secretariat, DSTI and CHPC team.
31 May – 3Jun 22	Deployment of the HPC system with the support of additional software installations 3 Jun 22 by the CHPC team

HPC Development (cont…)

The information below provides a chronological list of key events from inception to date.

- 22-26 Aug 22 Capacity building for one of the system administrators for MAREN with administrative support from the MoE.
- Sep-22 Online capacity building training workshop organized by the CHPC.
- 12-Oct-22 Visit by Liverpool School of Tropical Medicine and Malawi Liverpool Welcome Trust (HPC common ground engagement)
- 7-13 Jan 23 Engagement with the DNA Sequencing LAB team. KUHeS is building a DNA sequencing laboratory. The activity requires high computing power. The team has opted to use the HPC hosted at MAREN. Owing to their challenges with the internal network, MAREN is re-working on better design to connect the site as well as improve a few segments of the internal network

HPC Development (cont…)

The information below provides a chronological list of key events from inception to date.

- March – May 2023 Engagement with HPC South Africa on:
  a) capacity building for the MAREN technical staff responsible for the facility
  b) Policies and guidelines on HPC Use.
- March – Sept 2023 Inclusion of HPC facility operation in the strategic plan of the organization.
- April – Sept 2023 Develop policies for governing the HPC facility.
- March 2023 Update the HPC operating system to the latest version.
- September 2023 Sign the facility hosting agreement with National Data Center management.
- March – Aug 2023 Employ an Infrastructure Engineer responsible for operations of the facility, to work hand in hand with the Network Engineer.

OPERATIONALIZATION OF THE HPC FACILITY

Given the benefits associated with the facility, MAREN intends to roll out the HPC facility utilization to all academic and research institutions to improve their computing requirements.

As a way of enhancing the utilization of the facility, MAREN has planned a number of activities and interventions aimed at enriching the technical expertise and management of the system.

This includes collaboration engagements with other facilities currently hosting similar facilities as well as conducting workshops to build the capacity of the academic and research institutions on how they can use the facility. The table below summarizes some of the major planned tasks in line with the operation and management of the facility.

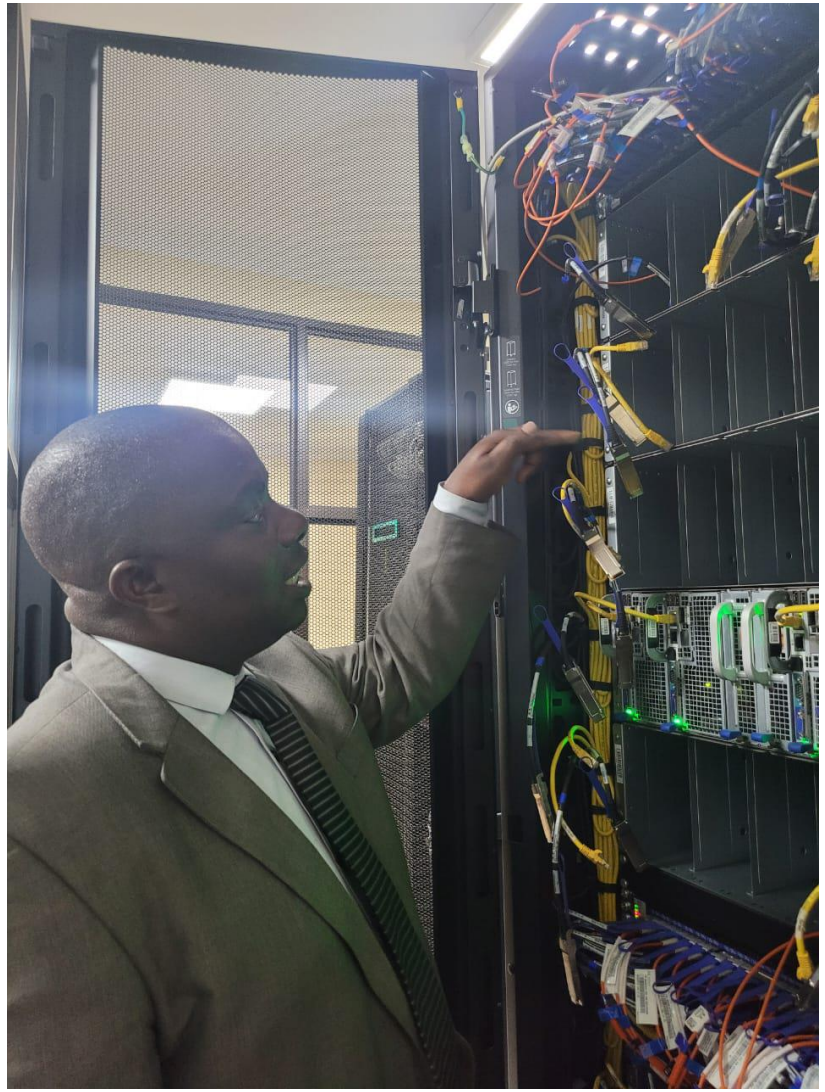
OPERATIONALIZATION OF THE HPC FACILITY

Given the benefits associated with the facility, MAREN intends to roll out the HPC facility utilization to all academic and research institutions to improve their computing requirements.

As a way of enhancing the utilization of the facility, MAREN has planned a number of activities and interventions aimed at enriching the technical expertise and management of the system.

This includes collaboration engagements with other facilities currently hosting similar facilities as well as conducting workshops to build the capacity of the academic and research institutions on how they can use the facility. The table below summarizes some of the major planned tasks in line with the operation and management of the facility.

MAREN
Malawi Research
And Education Network



Director of Higher Education (DHE) Visit to HPC

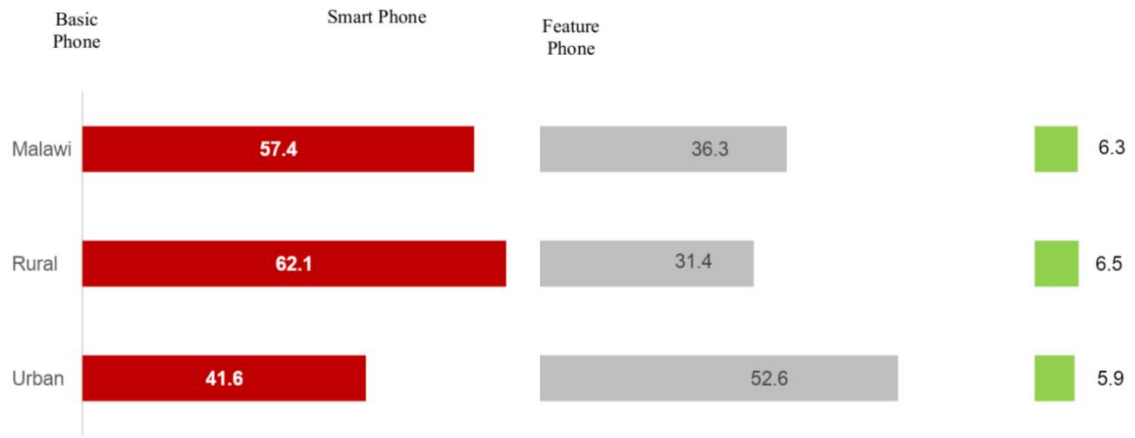
HPC at the National Data Centre

MAREN
Malawi Research
And Education Network

THANK YOU ALL, ENJOY HARDWARE AND SOFTWARE CAPE TOWN

Ownership by type of Mobile phone

Proportion of Individuals Owning a Mobile Telephone by Type of Mobile Phone , and place of residence



Majority of the population (57.4 percent) own a basic phone