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OACPS R&I PSF

Research and Innovation Policy Recommendation Report for LESOTHO

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Table of content

List of Figures H

List of Tables H

List of Abbeviations i

Glossary of Terms and Definitions K

Executive Summary 1

1 Introduction 5

1.1 Background 5

1.2 Objectives of the document 6

1.3 Structure of the document 6

1.4 Justification for the research and innovation policy 7

1.5 Research and innovation policy framework 8

1.5.1 Science and technology policy and MCST Strategic Plan 8

1.5.2 Higher education policy and Education Sector Plan 9

1.5.3 National Strategic Development Plan with SADC, AU and UN plans 9

2 Main challenges and gaps in the Lesotho R&I ecosystem 10

2.1 Global challenges 10

2.2 Challenges and gaps in the national R&I ecosystem 11

2.2.1 Workforce training programmes 12

2.2.2 Knowledge creation 13

2.2.3 Commercialisation 14

2.2.4 Transition to emerging technologies 14

2.2.5 Absence of National Innovation Agency 17

3 Methodology 18

3.1 Horizontal policy analysis 18

3.2 Stakeholder engagement 21

3.3 Stakeholder analysis and power mapping 22

4 Thematic areas of policy intervention 27

4.1 Tertiary education and workforce training programmes 27

4.1.1 Background 27

4.1.2 Policy statement 27

4.1.3 Priority issues 27

4.1.4 Strategic activities 28

4.1.5 Key performance indicators 28

4.2 Collaborative scientific research and development 29
4.2.1 Background 29
4.2.2 Policy statement 29
4.2.3 Priority issues 29
4.2.4 Strategic activities 29
4.2.5 Key performance indicators 30
4.3 Socioeconomic equality and inclusion 30
4.3.1 Background 30
4.3.2 Policy statement 31
4.3.3 Priority issues 31
4.3.4 Strategic activities 31
4.3.5 Key performance indicators 31
4.4 Indigenous knowledge systems, IP protection and access to R&I information 32
4.4.1 Background 32
4.4.2 Policy statement 32
4.4.3 Priority issues 32
4.4.4 Strategic activities 32
4.4.5 Key performance indicators 33
4.5 Business regulatory environment and access to incentives 33
4.5.1 Background 33
4.5.2 Policy statement 34
4.5.3 Priority issues 34
4.5.4 Strategic activities 34
4.5.5 Key performance indicators 35
4.6 Emerging applications in agriculture, health, ICT, manufacturing and the green economy 35
4.6.1 Background 35
4.6.2 Policy statement 36
4.6.3 Priority issues 36
4.6.4 Strategic activities 36
4.6.5 Key performance indicators 37
5 Establishment of a national R&I Agency 38
5.1 Introduction 38
5.2 Proposed RIA mandate 38
5.3 Proposed RIA structure 39
5.4 Programmes to be implemented 41
5.5 Possible sources of RIA funding 44

6 R&I policy implementation framework 45
6.1 Results-based monitoring & evaluation framework 45
6.1.1 The results chain of the R&I policy 47
6.1.2 The planning, monitoring and evaluation cycle 48
6.1.3 The proposed M&E plan 49
6.1.4 The project design for R&I policy implementation 51
6.2 Mechanisms for financing R&I policy implementation 52
6.2.1 Estimated costs by R&I programmes 52
6.2.2 Potential sources of funding 52
6.3 R&I policy implementation conceptual framework 57
6.4 Stages of R&I policy implementation 58
6.5 Framework conditions for effective R&I policy implementation 62
Bibliography 64

List of Figures

Figure 1	Research and innovation value-chain and ecosystem	11
Figure 2	Horizontal policy analysis	19
Figure 3	Lesotho R&I ecosystem stakeholder map, as developed in July 2021	21
Figure 4	Proposed initial organogram of the R&I Agency	40
Figure 5	Envisaged interrelation of RIA with the R&I ecosystem	42
Figure 6	The results chain for the proposed Lesotho R&I policy	46
Figure 7	The logic model	48
Figure 8	Proposed R&I policy management cycle	49
Figure 9	Proposed M&E plan for implementation of the R&I policy of Lesotho	50
Figure 10	Relationship between programme, project & activity logical frameworks in the implementation of R&I policies	51
Figure 11	Proposed policy cycle for Lesotho R&I policy	57
Figure 12	Stages of the R&I policy implementation	59
Figure 13	Management cycle for R&I policy	61
Figure 14	Representation of the drivers and barriers to the effective implementation of R&I policy	63

List of Tables

Table 1	Lesotho R&I ecosystem stakeholder analysis and power mapping	22
Table 2	Examples of innovation agency models in Africa	43
Table 3	Possible scenarios for RIA funding	44
Table 4	Summarised logical framework for R&I policy implementation	53

List of Abbreviations

ACP	African, Caribbean and Pacific
ASTII	African Science, Technology and Innovation Indicators
AU	African Union
BBCDC	Bethel Business and Community Development Centre
BEDCO	Basotho Enterprises Development Corporation
BERD	Business Enterprise Expenditure on R&D
BoS	Bureau of Statistics
BOU	Botswana Open University
CBR	Country Background Report
CHE	Council on Higher Education
CoE	Centre of Excellence
DST	Department of Science and Technology
FTEs	Full-Time Equivalents
GBARD	Government Budget Allocations on R&D
GDP	Gross Domestic Product
GII	Global Innovation Index
GoL	Government of Lesotho
GTIPA	Global Trade and Innovation Policy Alliance
HE	Higher Education
HEI	Higher Education Institution
HIS	Health Information Systems
I&C	Innovation and Commercialisation
IKS	indigenous knowledge systems
IP	Intellectual Property
IPR	Intellectual Property Rights
IS	Innovation System
KPA	key performance area
KPI	key performance indicator
LDC	Least Developed Country
LNDC	Lesotho National Development Corporation
LRA	Lesotho Revenue Authority
M&E	Monitoring and Evaluation
MCST	Ministry of Communications Science and Technology
MDAs	Ministries, Departments and Agencies
MoET	Ministry of Education and Training
MSMEs	Micro, Small and Medium-sized Enterprises
NRIC	National Research and Innovation Council
NSDP	National Strategic Development Plan
NUL	National University of Lesotho
OACPS	Organisation of African, Caribbean and Pacific States
OBFC	One-stop Business Facility Centre
OECD	Organisation for Economic Cooperation and Development
PCR	Polymerase Chain Reaction
PRR	Policy Recommendation Report
PSF	Policy Support Facility
R&D	Research and Development
R&I	Research and Innovation
RIA	Research and Innovation Agency
RIF	Research and Innovation Fund

RRI	Responsible Research and Innovation
SADC	Southern African Development Community
S&T	Science and Technology
SDGs	Sustainable Development Goals
SEZ	Special Economic Zone
SMART	Specific, Measurable, Achievable, Realistic & Time-bound
STEM	Science, Technology, Engineering and Mathematics
STI	Science, Technology and Innovation
STIP	Science, Technology and Innovation Policy
STISA	Science, Technology and Innovation Strategy for Africa
SWOT	Strengths, Weaknesses, Opportunities and Threats
TAU	Technical Assistance Unit
TED	Technologies for Economic Development
TISC	Technology and Innovation Support Centre
TVET	Technical and Vocational Education and T raining
UIS	UNESCO Institute for Statistics
UN	United Nations
UNCTAD	United Nations Centre for Trade and Development
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational Scientific and Cultural Organisation
WEF	World Economic Forum

Glossary of Terms and Definitions

Citizen science:

Scientific research where the public participates voluntarily with professional scientists and scientific institutions in the scientific process, performed by addressing real-world problems in ways that may include formulating research questions, conducting scientific experiments, collecting and analysing data, interpreting results, making new discoveries, developing technologies and applications, and solving complex problems.

Freedom of scientific research:

The freedom to engage in scientific inquiry, pursue and apply knowledge, and communicate openly. This freedom is inextricably linked to and must be exercised in accordance with scientific responsibility based on high ethical standards and integrity.

Innovation:

The improvement of existing, or the creation of entirely new, products, goods, processes, methods, services, and business or organisational models.

Open science:

An approach to the scientific process that focuses on spreading knowledge as soon as it becomes available, using digital and collaborative technology, expert groups, publications, news and events.

Quadruple helix model:

A model to support research and innovation stakeholders that represent key local actors from government, research and scientific institutions, companies, and citizens, which engage in bottom-up collaborative processes in innovation policy and challenge the traditional top-down policy-making process.

Research:

A systematic scholarly or scientific investigation or inquiry that contributes to new knowledge or enhanced understanding of phenomena with the potential for application that may lead to improved professional practice, inventions, creative works, and other products and services.

Responsible research and innovation:

A cross-cutting approach that aims to make research more inclusive, participatory and ethically responsible. It implies that societal actors (researchers, citizens, policymakers, businesses, etc.) work together during the whole research and innovation process in order to better align both the process and its outcomes with the values, needs and expectations of society.

Executive Summary

This Policy Recommendation Report (PRR) for the research and innovation (R&I) policy of Lesotho consists of a series of strategic recommendations on activities to be undertaken by the Government of Lesotho and its institutions, mainly the Department of Science and Technology (DST) under the Ministry of Communications, Science and Technology (MCST), within the proposed timeframe of 10 years (2022-2032). The realisation of a strong national R&I ecosystem requires efforts from multiple actors in society and other relevant ministries, departments and agencies (MDAs), including tertiary education institutions, non-governmental organisations, urban, rural and remote communities, professional associations and private citizens. Each of these actors has a unique and invaluable contribution to make in the R&I sphere to achieve the goals and objectives articulated in policy statements under the identified thematic areas of this PRR.

Coordination, networking, monitoring and communication between multiple actors in the R&I ecosystem are essential for harmonisation and cooperation in fostering R&I in Lesotho. The establishment of a specialised agency to coordinate national R&I efforts will enable linkages between the various agents and help influence and mobilise more participants. It will also enable actors to pool resources, coordinate efforts to avoid duplications or working in silos, exchange expertise, and significantly increase innovation and research output through a synergistic approach.

The policy recommendations proposed under this PRR, including the policy goals, objectives, strategic activities and key performance indicators (KPIs), have been generated based on sound evidence. The envisaged R&I policy will clearly articulate the role of respective actors in the research and innovation ecosystem, and, most importantly, it will provide the framework for engagement and coordinating efforts among the key actors and stakeholders. These R&I policy recommendations specifically address Sustainable Development Goal (SDG) 3 (good health and well-being), SDG 4 (quality education), SDG 7 (clean and affordable energy), SDG 9 (industry innovation and infrastructure) and Target 9.5, SDG 10 (reducing inequality), SDG 11 (sustainable cities and communities), SDG 13 (climate action) and SGD 17 (partnerships for the goals), the overall integration of which should contribute to a marked difference in attainment of SDG 1 (no poverty) and SDG 2 (zero hunger), which are the greatest inhibitors for the potential development of human capital of a least developed country (LDC).

POLICY FORMULATION APPROACH

The approach adopted for R&I policymaking emphasises that policy recommendations address the fact that societal actors need to cooperate during the whole R&I process to better align functions and outcomes with the values, needs and expectations of society, ensuring that the recommended policy is cutting across the key R&I ecosystem actors. High-quality information was derived from a variety of sources including expert knowledge; existing local, national and international research; existing statistics; a review of research on the topic; stakeholder consultations; an evaluation of previous policies; as well as other relevant national policies, a Country Background Report (CBR) that produced baseline information and data, and other relevant documents.

The approach adopted for policy analysis consisted of:

- a desktop review of previously produced, but not adopted, and current policy documents to develop an overview of the current state-of-play for the Lesotho R&I ecosystem;
- a second layer of analysis that provided the means with which to identify and gather key inputs from all relevant stakeholders through a series of semi-structured interviews and a workshop;
- a third analytical task that was dedicated to the synthesis of stakeholder input from which to develop policy recommendations, and to guide the establishment of a national R&I agency;
- extrapolating respective programmes, projects, outcomes and budgetary requirements for R&I policy implementation and establishing a national R&I agency through the deployment of a rigorous results-based monitoring and evaluation mechanism based on a Logical Framework Analysis.

From the review of the national blueprint on socioeconomic development, which currently is the National Strategic Development Plan (NSDP) II, the existing R&I policies of Lesotho and the outcomes of the stakeholder engagements, together with expert synthesis and analysis, and the grand vision towards which the Lesotho R&I capacity is being directed, take into consideration about 8 expected policy results. This chain of results is summarised into **short-**, **medium-** and **long-term recommendations** as follows:

Short-term recommendations (to start implementing within 1 to 2 years)

I. **Establishment of a national Research and Innovation Agency.** The national R&I Agency (RIA), reporting to Parliament through the Ministry responsible for Science, Technology and Innovation, is recommended to provide a framework for guidance on R&I, undertake mobilisation of research resources and direct the nation's investments in R&I funding. The RIA shall support the local incubators and accelerator programmes at academic institutions and help innovative start-ups and micro, small and medium-sized enterprises (MSMEs) in Lesotho to build innovation capacity and take ideas to market. This shall be done through financial assistance, advisory services, and connections to the available business and R&D expertise.

Medium-term recommendations (to start implementing within 2 to 4 years)

II. **Strengthening of tertiary education and workforce training programmes.** The government will improve the efficiency and effectiveness of workforce training systems so as to respond to the socioeconomic, cultural and development needs of Lesotho. Proposed programmes should improve the relevance of higher education and technical and vocational education and training (TVETs), address the skills mismatch, and improve the quality of education and the overall global footprint of Basotho tertiary education institutions.

III. **Prioritisation of investments in collaborative scientific research and development.** The government will intensify investment in scientific research and development (R&D), and strengthen local innovation and technological capabilities. Proposed programmes should embed the need to develop and strengthen sustainable financing mechanisms, and improve effective collaboration between government, academia, industry and society (quadruple helix model of innovation[1]).

IV. **Improvement of inclusion and socioeconomic equality and equity in R&I.** The government will align and mainstream socioeconomic equality and the inclusion of all marginalised groups to improve the participation of women, girls, herd boys, rural youth, disabled persons and all other disadvantaged persons in science, technology, engineering and mathematics (STEM) education, research and occupations.

V. **Integration of indigenous knowledge systems and management of intellectual property (IP) protection.** The government will mobilise indigenous knowledge systems (IKS) and grassroots innovations, nurture the talent of ordinary citizens outside the education system, and strengthen the effective protection of intellectual property rights and enforcement mechanisms.

VI. **Creation of a conducive business environment for innovation.** The government will improve the regulatory environment (implement accessible incentives and innovative tax measures) in support of innovative start-ups and improve the performance of MSMEs for employment creation.

VII. **Strengthening access to R&I information.** The government will strengthen various institutions' ability to manage their own data, create an open data platform to make non-confidential R&I information easily available, share regular updates on R&I-related activities, and strengthen bottom-up job creation and economic growth.

Long-term recommendation (to start implementing within 4 to 6 years)

VIII. **Adoption of new and relevant emerging technologies.** The government will support the adoption of technologies for emerging applications with a strong focus on technical training to initiate a rapid transition to climate-resilient agriculture, quality healthcare, ICT, manufacturing digitisation and the green economy.

1 To read more on the quadruple helix model please visit Co-shaping the Future in Quadruple Helix Innovation Systems: Uncovering Public Preferences toward Participatory Research and Innovation – Science Direct.

IMPLEMENTATION MECHANISMS

The effective implementation of Lesotho's R&I policy requires careful planning and attention to detail. Key among these are the political and technical considerations in implementing the recommended interventions of the PRR. The political considerations refer to setting a clear vision, mission, guiding principles, securing political buy-in, and managing challenges and opposition in the implementation of the R&I policy. Implementation planning and related technical issues such as legislation or regulations are the responsibility of the implementing agencies.

The policy recommendations should be implemented in four stages. The first exploratory stage prioritises interventions based on available resources and capabilities. Secondly, the planning and resourcing stage to mobilise and schedule interventions. Thirdly, the initial implementation and operationalisation stage with necessary inputs to produce intermediate changes. Finally, a full policy implementation to realise the final policy outcomes. Critically, periodic monitoring, evaluation and reporting are necessary to ensure the policy goals and objectives are realised, in line with identified R&I indicators and relevant SDGs for impact on the R&I policy on national and global development objectives.

A major focus has been placed on institutional strengthening and capacity building at the local level in order to develop human capital and keep the budget manageable. The initial budget requirements for successful implementation of the R&I policy recommendations are estimated at about LSL 655 million[2] over a policy period of 10 years. This translates to about LSL 65.5 million per annum and accounts for about 0.18 % of the current national budget. Possible sources of funding, to supplement the proposed commitment of the government through a dedicated R&I subvention cost centre or line item, include an R&I levy for large businesses and grants, and donations from regional and international development agencies.

2 The Lesotho national currency is the Maloti (LSL). LSL 1 = EUR 0.056 = USD 0.065 at the time of writing

1 Introduction

1.1 BACKGROUND

The Ministry of Communications, Science and Technology (MCST) through the Department of Science and Technology (DST) is mandated to coordinate the formulation and implementation of R&I policies and to create an enabling environment in which technological development will make a meaningful contribution to the Basotho's quality of life. Research and innovation (R&I) have the greatest potential to improve the quality of life in today's modern economy (GTIPA, 2019).

In its efforts to implement NSDP II, the MCST via the DST sought technical assistance from the Policy Support Facility (PSF) service of the Organisation of the African, Caribbean and Pacific States (OACPS). The PSF service is a component of the OACPS R&I programme. It provides policy support through technical assistance to enhance the quality and efficiency of R&I systems in its African, Caribbean and Pacific (ACP) member states. It is a demand-driven policy support service that responds to the requests for national R&I policy reforms and adaptations from high-level authorities within the OACPS member countries. The PSF service covers appropriate services that are based on the country needs.

The PSF service for Lesotho has two main objectives:

- to define the national R&I policy;
- to set the basis for the development of a national R&I Agency.

The main outputs of the PSF service are:

- the Country Background Report (CBR);
- the Policy Recommendation Report (PRR).

The PSF service will contribute to, among others:

- raising the profile of R&I in Lesotho;
- synergising the national R&I system and promoting open science and open innovation;
- enhancing collaboration amongst government, academia, industry and civil society to make R&I beneficial to society;
- improving inclusiveness through mainstreaming socioeconomic equality in STEM and indigenous knowledge systems (IKS);
- the UN's SDGs, the objectives of Science, Technology and Innovation Strategy for Africa (STISA) 2024 and the Agenda 2063: The Africa We Want.

1.2 OBJECTIVES OF THE DOCUMENT

This document details the recommendations that will assist policymakers to develop a national R&I policy by addressing specific challenges and identifying opportunities in the key thematic areas that require policy intervention. It also considers the key issues that will inform the development of a national R&I Agency to coordinate all R&I efforts.

R&I play an essential role in triggering smart and sustainable growth and job creation. To produce new knowledge, research is central to developing new and innovative products, processes and services, which enable higher productivity, industrial competitiveness and ultimately prosperity. It is imperative that any nation that seeks to secure the future of its people and carve out its place in the global arena should focus its efforts on enhancing its R&I capabilities.

1.3 STRUCTURE OF THE DOCUMENT

This document consists of six Chapters arranged as follows:

- **Chapter 1** gives an overview and rationale of the document, its structure, justification for an R&I policy and the related policy framework.
- **Chapter 2** presents the global R&I challenges together with the main challenges and gaps in the Lesotho national R&I ecosystem.
- **Chapter 3** details the methodology employed in the development of the R&I policy recommendations, covering horizontal policy analysis, stakeholder engagement for evidence-based policymaking and the development of a stakeholder power map.
- **Chapter 4** provides an account of the recommended R&I thematic areas that require policy interventions, from background to policy statements, priority issues, strategic activities and key performance indicators.
- **Chapter 5** sets out the basis and addresses the requirements and considerations for the establishment of a national R&I Agency to coordinate R&I in the country.
- **Chapter 6** details the R&I policy implementation framework, based on results-based monitoring and evaluation, logical framework analysis, associated budgetary implications and possible funding mechanisms.

1.4 JUSTIFICATION FOR THE RESEARCH AND INNOVATION POLICY

Innovation is the foundational source of long-term global economic growth and improvements in quality of life and standards of living. Recent policy approaches around the globe have recognised the importance of innovation as a driving force for the economy, supported by new knowledge generated by scientific research and development. To drive economic growth and transform people's lives, innovative ideas, research and developments must be successfully translated into valuable products.

In the past, the role of research, innovation and entrepreneurship in Africa's economies has scarcely been addressed in policy discourse. This has been attributed to a low level of innovations, and a lack of official reporting and statistics. Many of Africa's innovations have traditionally been 'below the radar' and existed in the informal sector. To tap into the opportunities presented by R&I in developing countries, a clearly defined and coordinated innovation system (IS) is necessary (Heilbron et al., 2017). An IS encompasses all institutions and economic structures affecting both the rate and the direction of technological change in society. It facilitates cooperation between agencies and supports individuals working in the R&I ecosystem to initiate, import, modify and diffuse new technologies (Hekkert, 2007).

Countries that undertook the initiative to develop policies and define the scope and operations of their innovation systems are realising socioeconomic benefits. For example, in 2014, countries such as Kenya, Nigeria, South Africa, Tunisia, Senegal and Morocco acquired more than 10 % of their gross domestic product (GDP) from innovation-led sectors, primarily ICT. Innovation spaces, such as Kenya's iHub, have become internationally recognised spaces for innovators and attract significant investment. Exposition events such as DEMO Africa show a variety of innovations built by African innovators. The Kenyan, Nigerian and Eswatini governments have invested in creating special economic zones (SEZs) targeted at science and technology innovation parks (Heilbron et al., 2017).

The global innovation landscape is undergoing drastic transformation at the same time as global challenges are becoming more complex, less predictable and require more urgent action. The COVID-19 pandemic is one example where the challenges facing global economies have shown the need for robust and resilient R&I systems to handle unexpected challenges. In the absence of well-defined policy that is framed to adapt to changing situations, the potential benefits of R&I are not fully realised. It is therefore necessary to have a policy that can guide R&I efforts to where they are needed most (OECD, 2021).

Accordingly, at the 23rd Ordinary Session of the African Union (AU) Heads of States and Government summit, member states adopted a 10-year Science, Technology and Innovation Strategy for Africa (STISA-2024). The strategy supports the AU Agenda 2063, which is underpinned by science, technology and innovation as multifunction tools and enablers for achieving continental development goals. The Government of Lesotho, therefore, seeks to transition to an innovation-led and knowledge-based economy.

The policy period of the science and technology (S&T) policy (2006-2011) of Lesotho expired a while ago, and a new science, technology and innovation (STI) policy is about 10 years overdue. The previous S&T policy had traditionally emphasised the role of advancement of scientific knowledge and skills, as well as the adoption and integration of new technology in Basotho society. However, the important role of innovation and the creation of new knowledge and products available to the market were not emphasised. Innovation on its own changes very fast, and the previous policy was already misaligned with the current national blueprint for socioeconomic development (NDSP II).

1.5 RESEARCH AND INNOVATION POLICY FRAMEWORK

The innovation strategy of any country must coordinate a multitude of disparate policies that aim to foster scientific research, education and skills development, information technology, intellectual property (IP), technology commercialisation, investments, tax, trade, government procurement and regulatory policies in an integrated fashion to drive economic growth (GTIPA, 2019). A snapshot of some relevant policies and strategic plans in Lesotho that must be coordinated and harmonised is provided below with the aim of moving the country towards the achievement of the UN's SDGs.

1.5.1 Science and technology policy and MCST Strategic Plan

The vision of the Lesotho national science and technology policy (2006-2011) is 'to have a prosperous and progressive economy and society that are sustained through intelligent use of science and technology assets by progressive and innovative citizens'. Its mission is 'to transform Lesotho into a modern state, having enough highly skilled, innovative and technologically trained personnel with a competitive science and technology infrastructure to support a growing economy' (DST, 2006).

Although this policy highlighted major challenges and identified suitable strategies to address them, implementation was very low due to limited capacities among R&I implementing agencies and there were too many priorities, which took attention away from a focus on the key R&I challenges and solutions that are relevant to improving the performance of the national R&I systems in Lesotho. There is a need, therefore, for

an updated policy with clear priorities and implementation mechanisms to address issues specific to R&I development in Lesotho. The newly developed MCST Strategic Plan 2020-2022 places emphasis on the enhancement of institutional capacity for R&I as one of its strategies to achieve the planned strategic objectives (MCST, 2020).

1.5.2 Higher education policy and Education Sector Plan

To prioritise issues of R&I in the education sector, the Ministry of Education and Training (MoET) has developed a higher education (HE) policy 2013 (CHE, 2013) and the Education Sector Plan 2016-2026 (MoET, 2016). The policy outlines strengthening R&I in higher education institutions (HEIs) as one of its overarching goals and it gives clear guidance on how to achieve these goals. Some of the policy objectives are to put in place national mechanisms for promoting, supporting and coordinating R&I activities across different sectors, and to promote increased engagement in R&I by students in HEIs.

The Education Sector Plan's strategic objectives include the reform of the national curriculum and assessment system to meet the needs of Lesotho, an improvement to the relevance of programmes offered at HEIs, and training more students in the relevant STEM subjects, with the provision of funds for R&D for technology adoption and innovation in HEIs. This is in line with SDG 4 (quality education) and SDG 9 (industry innovation and infrastructure). There is an urgent requirement to radically transform HE and TVET (technical and vocational education and training) institutions to support the emergence of an entrepreneurial culture. In addition, the MoET needs to partner and work with industry to develop new curricula, and evaluation and assessment processes to address the current skills mismatch. Finally, the MCST must work closely with the MoET to collectively address the key challenges of R&I development in HEIs and TVETs.

1.5.3 National Strategic Development Plan with SADC, AU and UN plans

The National Strategic Development Plan 2019-2023 (NSDP II) prioritises technology and innovation as one of the four main productive sectors that have the potential to create jobs and contribute to inclusive growth (GoL, 2018). NSDP II has the ambitious policy targets of transforming the Lesotho economy from a consumer-driven economy to a producer-based economy led by the private sector. One of its strategic objectives is to improve manufacturing capabilities and move into knowledge-intensive value chains, facilitated through the development of innovation hubs and incubation frameworks to support early-stage start-ups with seed financing, R&D and trade financing.

The national objectives mentioned above are in accordance with those articulated in the AU's Agenda 2063 – The Africa We Want (AU, 2013). The aspiration of Agenda 2063 is 'to have a prosperous Africa based on inclusive growth and sustainable development and to have African people educated and highly skilled with Science, Technology and Innovation (STI) being the bedrock of its inclusive education system'. This is also in agreement with the Southern African Development Community (SADC) protocol on science, technology and innovation (SADC, 2008), STISA-2024 (AU, 2020) and the UN's SDGs (UN, 2015).

2 Main challenges and gaps in the Lesotho R&I ecosystem

2.1 GLOBAL CHALLENGES

Technological innovation has always been at the heart of economic and social development. Today, the global scale and complexity of the challenges facing society make the case to renew attention on STI even more compelling. It is imperative for countries to provide a framework for inter-institutional collaborations in developing STI programmes in all sectors of the economy to meet the basic needs of society. STI play a key role in fostering the further development of productive capacities and provide a path to sustainable socioeconomic development for least developed countries (LDCs).

First, the world is in the midst of a serious economic crisis brought about by a global pandemic (COVID-19), which has exposed limits in the current economic and social systems. STI systems were put under stress but have responded strongly and flexibly. Funding for new research and development initiatives were set up in record time, and innovative solutions quickly emerged and were disseminated. Technology and innovation have proven to be effective means of resuscitating economic activities worldwide.

Second, environmental challenges require wide-ranging changes in patterns of production and consumption. Technological innovation, anchored on scientific R&D, holds the potential to address environmental challenges such as climate change, energy efficiency, food security and natural disasters.

Third, the world is undergoing a profound transformation due to the rate of innovation and technological advancement. New technologies, such as information technologies, have drastically changed the way people interact and societies are structured. Advancements in cutting-edge technologies such as cloud computing, high-performance computing, artificial intelligence, machine learning, manufacturing digitisation, biotechnology and nanotechnology are changing our world and our societies, bringing with them unprecedented challenges and opportunities.

Promoting R&I culture

The relationship between innovative thinking and entrepreneurship has proven their potential to transform our societies in positive ways. The combination of the innovative mind and the entrepreneurial spirit has defined the way our societies work. Promoting the R&I culture is necessary to maintain the trajectory toward sustainable development while ensuring the global competitiveness of countries' economies. To achieve this, the workforce and human capital must be strengthened through education and skills development in pursuit of excellence in scientific research with a focus on the national market in order to foster innovation and entrepreneurial skills.

Environmental challenges and natural disasters

Collaborative and multidisciplinary efforts are required to combat the complexity and transboundary nature of environmental problems such as pollution, resource exploitation and depletion, and the impact of climate change. These environmental challenges, which necessitate nations to work together and develop innovative solutions to reduce the vulnerability of people and nations to natural disasters, energy, food and water shortages, also require more innovative technologies and approaches.

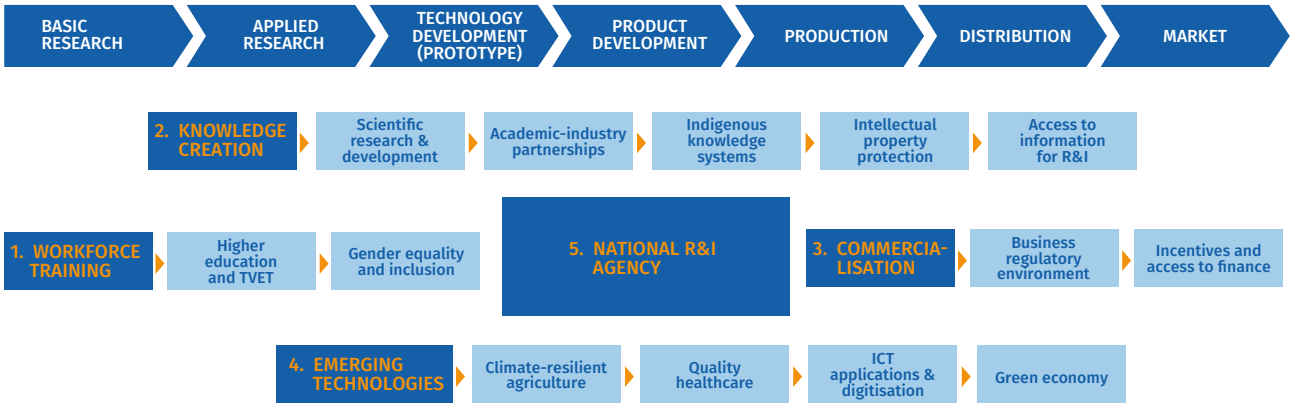
Information technology and security

Information technology, including advancements in communication technologies and fields such as artificial intelligence, is becoming more commonplace. As national security infrastructure and personal information are becoming more digital, they are potentially more vulnerable to threats from actors who wish to cause disruption or theft. It is necessary that precautions and regulatory frameworks be put in place to regulate the advancement of such technologies and minimise the vulnerability of national infrastructures and personal privacy to exploitation. The sophistication of these threats is increasing daily and therefore so should the response by governments and the private sector to such threats through R&I.

2.2 CHALLENGES AND GAPS IN THE NATIONAL R&I ECOSYSTEM

Several challenges and gaps were identified through a systematic approach and analysis of the R&I value chain (linear) and ecosystem (non-linear) as illustrated in **Figure 1**, beginning with basic and applied research, prototyping and product development, incubation and mass production, all the way to product distribution and market access. The identified weak leverage points in the Lesotho R&I ecosystem include human resources and workforce training, knowledge and idea creation, commercialisation, transition to emerging technologies and the need for a central coordinating R&I agency at national level. The major challenges related to these 5 weak leverage points in the R&I ecosystem are briefly summarised below.

Figure 1 **Research and innovation value-chain and ecosystem**



Source: Own elaboration

These challenges and gaps were also identified in the Country Background Report (OACPS R&I PSF, 2021), a baseline study for diagnosing the Lesotho R&I ecosystem through the review of policies and the national strategic development plans, and which also performed a strengths, weaknesses, opportunities and threats (SWOT) analysis.

2.2.1 Workforce training programmes

Tertiary education

Institutions of higher learning and training are critical for the process of knowledge creation and the emergence of a highly skilled workforce. In Lesotho, this sector comprises 3 universities and 12 non-university institutes. The main challenge for the creation of knowledge and an appropriately skilled workforce is that unemployment numbers are high among graduates. This can be attributed to an underdeveloped local business sector, no relationship between the higher education sector and industry, and a mismatch of educational programmes with the economic and social needs of the country. In addition, the private sector reports a shortage of both highly skilled and skilled labour, especially from the STEM fields of study.

Some of the key challenges highlighted in the country's current development plan (NSDP II) include but are not limited to 'low efficiency and effectiveness of public spending on education, skills mismatch, shortage of critical skills such as entrepreneurial skills, medicine, engineering and managerial skills'. It is therefore imperative for Lesotho to strengthen education and skills development programmes to foster innovation. Quality and affordable HE and TVET are key ingredients in achieving sustainable economic growth and inclusive development of Lesotho (in line with SDG 4).

Socioeconomic equality and inclusion

Article 23 section 1(d) of the African Youth Charter states that 'State parties shall guarantee universal and equal access of a minimum of nine years of formal education'. In section 1(e) the article states that 'parties shall guarantee equal access to and completion of vocational, secondary and higher education to effectively address the existing imbalance between young men and women in certain professions'. This is in line with the African Agenda 2063, which says

> *"Africa shall be an inclusive continent where no child, woman or man will be left behind or excluded, based on gender, political affiliation, religion, ethnic affiliation, locality, age or other factors. All the citizens of Africa are actively involved in decision making in all aspects of development, including social, economic, political, and environmental. Women and youth are fully engaged and empowered to play their rightful role in all spheres of life".*

The SADC protocol on STI aims to promote gender equity and equality in the teaching and learning of basic science and mathematics at all levels of the education system. This is in line with SDG 5, which is about achieving gender equality and empowering women and girls.

Priorities 3, 4 and 10 of the Lesotho gender and development policy 2018-2030 focus on gender, education and training; gender, productive resources and employment and economic empowerment; and gender and peace building. While Lesotho has made progress in promoting these gender equality priorities, and, currently, more females than males attend secondary and tertiary education, female students only represent 40 % of the R&D personnel in full-time equivalents (FTEs).

There is also a recognisable shortage of rural youth, herd boys, people with disabilities, and other socially and economically marginalised groups in terms of participation in STEM and innovation-oriented programmes and jobs.

2.2.2 Knowledge creation

Scientific research and development

Research and development are a broad category describing the entity of basic research, applied research and development activities. In general, R&D encapsulates a series of systematic activities that increase knowledge and the use of this knowledge when developing new products, processes or services. Nowadays innovation activities are strongly tied to the concept of R&D as an important driver of socioeconomic growth. Accordingly, and in line with the targets of SDG 9, countries (including Lesotho) have pledged to build resilient infrastructure, promote inclusive and sustainable industrialisation, and foster innovation. Target 9.5 of SDG 9 calls upon countries to encourage innovation and sustainability in order to increase the number of researchers as well as private spending on research and development.

The CBR indicates that the R&D system of Lesotho is minimal, and that gross expenditure on R&D was 0.05 % in 2015, which is lower than the required target of 1 %. Research is mainly concentrated at the National University of Lesotho (NUL) but the country has no clear mechanisms guiding research priorities and funding. Lesotho's R&D personnel amount to only 35 in FTE per 1 million inhabitants. This is 10.5 times smaller than Eswatini's number of R&D personnel, which amounts to 369 FTE per 1 million inhabitants.

HEIs are facing shortcomings in their laboratories and internet infrastructure, and the decreased funding indicates a shift in the MoET's focus over the years, away from the tertiary sector. In terms of research and publications, Lesotho ranks 42nd among African countries, with the main performer being NUL and the government the main funder. In addition, Lesotho holds a very low place in international rankings in terms of scientific outputs and innovation capabilities vis-à-vis 'the number of patent applications made with collaborators from other countries', 'the number of patent applications filed relative to population size' and in terms of 'the prominence and standing of local research institutions'.

If the potential outcomes and contribution of this sector are to be realised, there is an urgent need to renew government commitment and investments in national technology and innovation programmes, including strengthening R&D institutions and programmes (innovation capabilities), as well as increased private sector and international engagements in the development, transfer and adoption of relevant technologies.

Academia and industry partnerships

Academia-industry links are one of the crucial aspects to ensure a good match between manpower supply and demand, relevant knowledge creation and that graduates have the skills that industry needs. The first key performance area (KPA1) of the NSDP II makes references to 'Promoting inclusive and sustainable economic growth and private sector-led job creation'. Target 17.16 of SDG 17 (partnerships for the goals) aims to enhance global partnerships for sustainable development, complemented by multi-stakeholder partnerships that mobilise and share knowledge, expertise, technology and financial resources to support the achievement of the SDGs. Additionally, Target

3 WEF Competitiveness Rankings of Lesotho on its Strategic Intelligence Platform (weforum.org).

17.17 encourages and promotes effective public, public-private and civil society partnerships, building on experience and resourcing partnership strategies.

One of the policy objectives of the 2013 HE policy is to promote and facilitate engagement by students and staff members with entities in both the public and private sectors, and to strengthen linkages between HEIs and local communities. Nevertheless, at the time of writing, interaction between individual HEIs with companies is limited and fragmented. There is a general lack of knowledge creation by industry and the exploitation of research results is random. The expenditures of industry/the private sector on R&D are zero, thus indicating that the business sector is not directly engaged in research and has very limited innovation activity. Business activity is concentrated in labour-intensive sectors with low knowledge intensity, following low-cost strategies with no industrial research support programmes.

Indigenous knowledge systems

Indigenous knowledge is regarded as a unique, traditional and local knowledge existing within and developed around specific conditions of people who are indigenous to a particular locality or geographic area. It is a form of knowledge that covers various aspects of life, including food production, management of natural resources, medicine, forming socialisation and human life, developed as a survival mechanism for specific local communities.

One of the aspirations of Agenda 2063 is to have a prosperous Africa based on inclusive growth and sustainable development. It aspires that 'Africa's agriculture will be modernised and productive, using technology, innovation and indigenous knowledge'. The African Youth Charter, Article 20, section 1(d), encourages state parties to work with educational institutions, youth organisations, media and other partners to raise awareness of and teach and inform young people about African culture, values and indigenous knowledge (AU, 2013).

Indigenous knowledge systems (IKS) have previously been identified as one of Lesotho's science and technology assets; IKS technologies are considered as key products that need more recognition focused on them. The Lesotho indigenous knowledge systems policy (2021) focuses on the formalisation of local community indigenous knowledge in the fields of medicine, agriculture, food and environmental management.

Intellectual property protection

Intellectual property (IP) refers to any creation of the mind that is capable of being protected against unauthorised use by any other person, whether in terms of Lesotho law, or foreign intellectual property law, and includes any rights in such creation. The most well-known types of IP protection are copyrights, patents, trademarks and trade secrets.

The absence of industrial research and low innovation activity results in minimal patenting activity. Since 1980, applicants from Lesotho have filed only 12 patent applications. Of these, 9 were filed in the national patent office in 1995 and 1996 and 3 were filed abroad between 2012 and 2015; a total of 10 were finally granted. Most of the IP activities are centred on the registration of trademarks; 191 trademarks have been registered in the country since 1980. However, a challenge remains in the enforcement of protecting IP as the piracy of content such as music, videos and books persists.

Access to information for R&I

The KPA4 of the NDSP II proposes to strengthen governance and accountability with an emphasis on planning and statistics, international cooperation and access to information. The right of access to information empowers citizens to obtain information related to research and innovation held by public bodies (with limited exceptions). It encompasses a right to request and receive scientific and technical information, as well as an obligation for governments to publish such information proactively.

There is a lack of statistics in the country regarding research and innovation, with critical STI indicators being outdated. Fragmented approaches and a lack of networking, sharing of information and interactions among entrepreneurs prevent the shaping of an entrepreneurial ecosystem.

2.2.3 Commercialisation

Business regulatory environment

Complex requirements or ineffective regulations in the country can stifle innovation and discourage investments, weaken competitiveness and compromise economic growth. Concerning the ease of doing business, Lesotho is ranked 122nd out of 190 countries, but starting a business is among the areas with a higher score for Lesotho, which performs better than the average for sub-Saharan Africa in all sub-criteria. The challenge is slow job creation in the private sector, hence increasing pressure on the public sector to provide employment and increased public expenditure. The survival rate of companies is low with many firms dying after 5 years of operation; the size of the market for modern technologies and innovative products is too small to create a sustainable demand.

Incentives and access to finance

According to the Global Competitiveness Index 2019 by the World Economic Forum (WEF), Lesotho scores very low on the financing of MSMEs and the availability of venture capital. The government's past efforts to set up a partial credit guarantee scheme from 2011 were not very successful as it provided only a small number of guarantees due to the stringent requirements of commercial banks. Despite the increasing number of initiatives for the support of start-ups, the efforts are fragmented with questionable quality and effectiveness. Political instability affects the ability of the governance system to coordinate actions across policy domains, such as international collaborations for resource mobilisation and foreign direct investment.

2.2.4 Transition to emerging technologies

Climate-resilient agriculture

Climate resilient agriculture is an approach that includes the sustainable use of natural resources through crop and livestock production systems to achieve long-term productivity and farm incomes under climate variabilities. This practice reduces hunger in line with SDG 2 (zero hunger). Agenda 2063 states that Africa's agriculture will be modern and productive, using science, technology and indigenous knowledge, and shall have environmentally sustainable and climate-resilient economies and communities in line with SDG 13 (climate action) and SDG 9 (affordable clean energy). In its efforts to achieve this aspiration, the KPA1 of the NSDP II plans to ensure sustainable commercial agriculture, taking cognisance of the impacts of climate change.

Agriculture, together with forestry and fishing, contributes to 4 % of GDP, employs around 60 % of the workforce and constitutes the main

source of income for 70 % of the population living in rural areas. However, increasing temperatures and lower levels of rainfall due to climate change have a significant negative impact on agriculture and food production. Shifting production from the low-value cereals to high-value horticulture could transform the rural economy, creating jobs and raising income in the rural areas. In addition, expanding the existing small research and innovation capacity on areas that are relevant to horticulture would be necessary to contribute to a greater capacity in food security for the country.

Quality healthcare

Quality healthcare systems consist of a network of well-trained healthcare professionals in reliable healthcare facilities with adequate infrastructure. Ideally, emerging technologies, such as recent laboratory equipment, medicines and knowledge generated by on-going research, support these facilities.

The Government of Lesotho, with the assistance of national and international partners, has made significant progress in improving the healthcare system. However, Lesotho faces an aging healthcare system with inadequate service delivery, an insufficient number of facilities, inadequate and aging infrastructure, accessibility challenges and poor technical supervision. Available data from 2010 indicated that there was a total of 372 healthcare facilities serving a population of close to 2 million inhabitants (Mwase et al., 2010).

Government effort has focused on providing adequate healthcare facilities, a trained healthcare workforce, and ensuring the affordability of healthcare and medicines. However, the current healthcare system is under pressure and not advanced enough to deal with emerging medical and public health challenges. There is a need for emerging healthcare technologies and trained laboratory technicians.

Emerging technologies in healthcare such as ICT technologies, advanced healthcare equipment (such as COVID-19 polymerase chain reaction or PCR testing) and medicines offer opportunities to greatly improve the quality of life for patients. By promoting the adoption of emerging technologies, problems caused by inaccessibility, for example patient diagnosis, tracking and monitoring, can be resolved by using innovative approaches such as mobile technology and newly developed medicines to treat illnesses with greater effect. Advancements in health information systems (HIS) and data analytics offer unique opportunities for research by availing a wide range of data and methods for analysis.

Emerging ICT applications and digitisation

ICT has led to important changes over recent decades, transforming value chains and the products of trade goods and services. While SDG 9 encourages innovation and infrastructure improvements including ICT, it also recognises the risk that many people and businesses can be left behind. To address this, Target 9(c) calls for increased access to ICT, striving to achieve universality and affordability.

In Lesotho, there are significant obstacles hindering the uptake of ICT technologies that go beyond the boundaries of R&I policy, such as low competition in the ICT market, slow progress on e-government efforts, weak digital skills in the user base, and the slow uptake of digital technologies and relevant business models by companies. Another obstacle hindering uptake of ICT technologies in the country is the intensified international

competition by other low-cost countries pressing for an increase in productivity and product differentiation.

Emerging green economy

The United Nations Environment Programme (UNEP) defines a green economy as one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities. In its simplest expression, a green economy can be thought of as one that is low-carbon, resource-efficient and socially inclusive. (UNEP, 2012). Lesotho is well placed to begin the transition to a green economy because of its small carbon footprint. However, there is a slow uptake of green technologies and energy efficiency programmes. More effort is needed to direct the country to the uptake of green technologies through technology transfer, research and innovation.

The first and most practical step towards transition is to build capacity in clean energies and waste management (SDG 7 and SDG 11), which is to be supported by designing TVET and university study programmes to align with these goals. However, the ministries responsible should engage and develop a roadmap to identify areas where green and clean technologies can be developed to enable this transition.

2.2.5 Absence of National Innovation Agency

Lesotho's innovation capability ranks 138th due to its low diversity in the workforce, the feeble cluster development, the absence of international collaboration on innovation development, the weak stakeholder collaboration, insufficient R&D expenditure and the inadequate conditions for commercialisation. This fragmentation of approaches and lack of networking, sharing of information and interactions among entrepreneurs prevent the shaping of entrepreneurial ecosystems. Many economies that are successful in R&I around the globe have now articulated national innovation strategies and most have even created special agencies or foundations to maximise the innovation output of their countries' enterprises and organisations (GTIPA, 2019).

Past efforts to create the Lesotho Advisory Commission on Science and Technology, and the Science and Technology Trust Fund (DST, 2006) are still pending. Current plans to establish the National Research and Innovation Council (NRIC) and the Research and Innovation Fund (CHE, 2013) are yet to materialise. The lack of an entity that is specifically responsible for R&I has been identified as a weakness that has to be addressed in this new R&I policy formulation.

3 Methodology

Evidence-based policymaking (Goldman & Pabari, eds., 2020) implies that policy decisions need to be based on, or informed by, rigorously established evidence. In other words, evidence-based policymaking goes beyond the perceptions or aspirations of policymakers for what appropriate public policy should or could be. Consequently, the objective in this intervention is to avoid arriving at policy recommendations that could result in intractable policy outcomes, bearing in mind that the Lesotho R&I ecosystem is currently not robust enough to absorb misplaced notions of 'what is thought to be appropriate'.

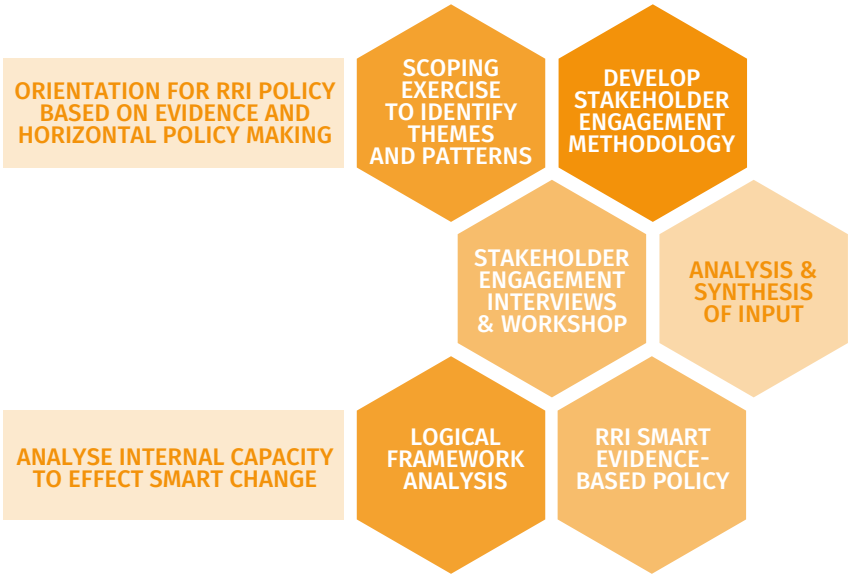
Accordingly, the approach adopted here for R&I policymaking emphasises that policy recommendations address the fact that societal actors (researchers, citizens, policymakers, business, third sector organisations, etc.) need to cooperate during the whole R&I process so as to better align both the process and its outcomes with the values, needs and expectations of society, leading to responsible research and innovation (RRI). The policy recommendations should support constant and ongoing multi-actor and public engagement in R&I, enabling easier access to scientific results across society, and ensuring that gender and ethics are an integral component of the research and innovation content and process, as well as a part of formal and informal science education, all of which ties into achieving the relevant SDGs.

3.1 HORIZONTAL POLICY ANALYSIS

The horizontal approach to policymaking has been incorporated into the methodology to ensure that the process of R&I policy integration cuts across the key ministries/ actors and eventually leads to 'horizontal governance' (AECOM, 2018) in Lesotho. A major concern with cross-cutting policies like this new R&I policy is that key issues are not consistently integrated at all levels of policy frameworks between the involved ministries/ actors. Horizontal policymaking focuses on collaboration and cooperation between all actors of an R&I ecosystem. There is a decreased focus on a traditional hierarchy of those with decision-making powers and a greater focus on the sustainable and tractable outcome of decisions involving new policies. Consequently, after three tiers of horizontal analysis including the internal capacity of the R&I ecosystem (as detailed in **Figure 2**), SMART (specific, measurable, achievable, realistic, time-bound) policy thematic areas were identified.

The analysis evolved in a horizontal manner in line with the adopted methodology, prior to, during and after the country visit (4-12 September 2021) to engage with the relevant stakeholders. At the first layer, the efforts of the expert panel were dedicated to orienting the intervention to good practice in R&I policymaking and a desktop review of the documented attempts at previous policymaking available in the Science, Technology and Innovation Policy (STIP) Review 2010 (UNCTAD, 2010), Science and Technology Policy 2006-2011, the key priority areas of the NSDP II 2019-2023 for Lesotho; and the CBR (OACPS R&I PSF, 2021), which provides a current overview and SWOT analysis of the Lesotho R&I ecosystem and its relevant actors. In order to shore up more analytical

Figure 2 **Horizontal policy analysis**



Source: Own elaboration

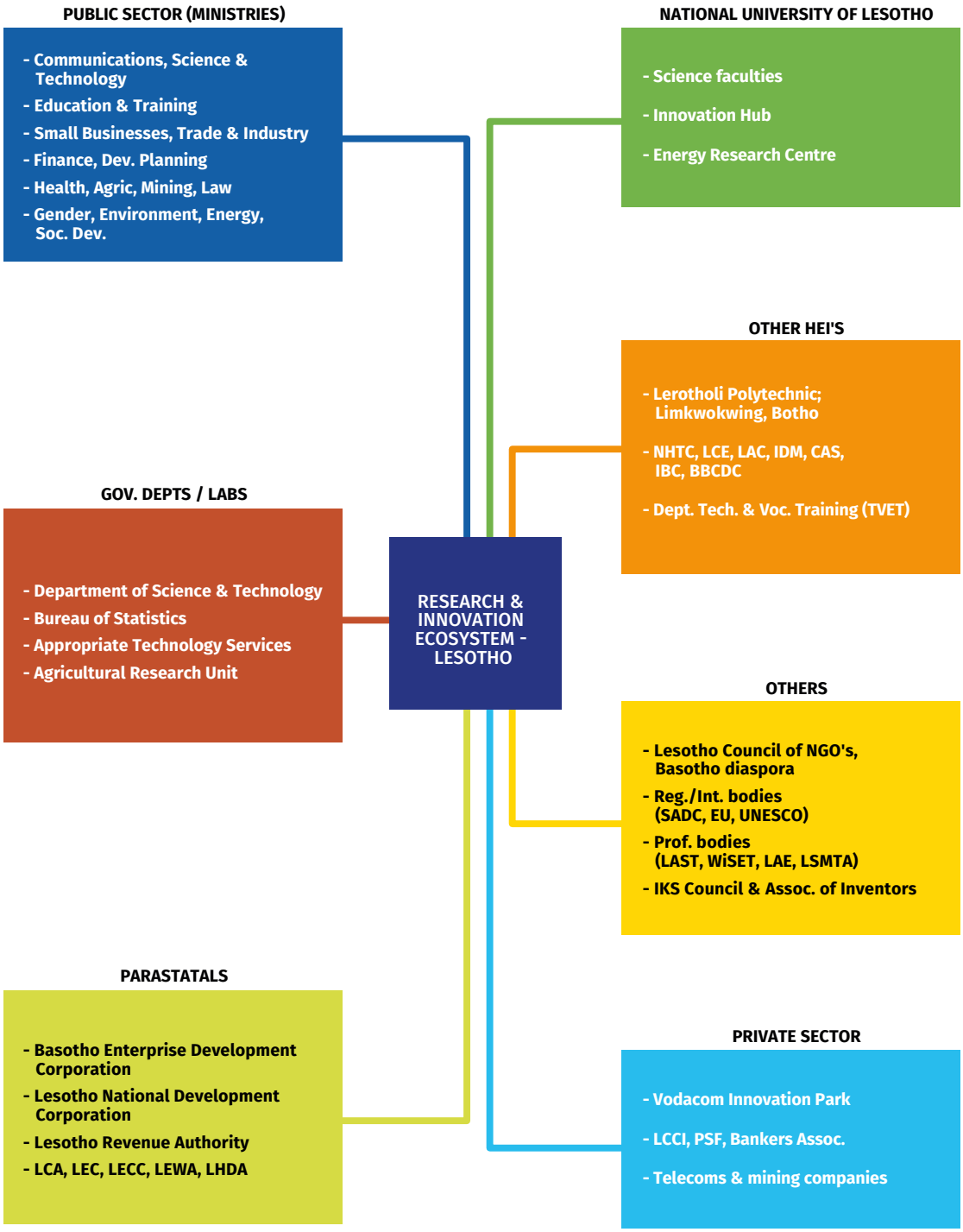
rigour, Meadows Leverage Points: Places to Intervene in a System (Meadows, 1999) ...based on the premise that there are places within a complex system (a corporation, an economy, a living body, a city, an ecosystem) where a small shift in one thing can produce big changes in everything... was applied. This systems analysis tool was deployed to isolate the 5 weakest leverage points in the existing R&I ecosystem extrapolated from the desktop analysis and which could be strengthened so that a policy paradigm shift could occur in:

- workforce training,
- knowledge creation,
- commercialisation,
- transition to emerging technologies,
- the establishment of a national R&I Agency.

These areas of weakness in the existing R&I ecosystem were incorporated into the policy characteristics that defined the policy questions applied to guide the stakeholder engagement exercise.

The second layer of horizontal analysis allowed the expert panel to gather inputs from the relevant and influential stakeholders (as detailed in the stakeholder map of **Figure 3**). The complete list of stakeholders can be found in Annex I to not only provide the 'evidence' from which to guide the policy recommendation process but also to underpin recommendations for the form and financing of the proposed national R&I agency.

Figure 3 Lesotho R&I ecosystem stakeholder map, as developed in July 2021



Source: Own elaboration

3.2 STAKEHOLDER ENGAGEMENT

The stakeholder engagement followed the traditional approaches of stakeholder identification, analysis and power mapping (details are provided in **Figure 3** and **Table 1**) and interviews with those stakeholders who were ranked as having a high influence and impact on policy outcomes and implementation. A series of one-on-one semi-structured interviews were conducted with these stakeholders, along with a workshop where input for the way forward was captured from the other less influential but relevant actors in the Lesotho R&I ecosystem as it currently operates.

Essentially, the key elements of the stakeholder engagement methodology were formulated to follow this sequential logic:

- At the beginning of the exercise, several key documents related to innovation practices and policy across the globe were reviewed, including National Innovation Policies: What Countries Do Best and How They Can Improve (GTIPA, 2019). This document contained several examples of R&I policies that have worked well in many countries, including those that are recognised as LDCs. In fact, some of those policies, based on good practices, were framed around relevant points of reference to form emerging patterns and themes for Lesotho, and from which it was possible to extrapolate some for the R&I 'policy characteristics' referred to earlier. These policy characteristics range from basic research and development of knowledge and practices across the education sector through to products reaching the market (incubation and commercialisation). These emerging patterns and themes taken up in policy characteristics laid the groundwork from which to develop the direction to seek input from the relevant stakeholders to support the process of evidence-based policymaking for R&I.

- Input from the stakeholder engagement was analysed and synthesised to produce policy recommendations (statements, objectives, strategic activities, KPIs), as well as forming the basis for the establishment of the national R&I Agency, based on the trends and themes as captured from stakeholders. Essentially, these statements, objectives, activities and KPIs were formulated based on the following approach to analysis and synthesis of qualitative information:

1. What patterns and themes have emerged?
2. Are there any deviations from these patterns? If yes, are there factors that can help to explain these deviations?
3. Are the results meaningful?
4. Do interesting stories emerge from the responses?
5. Do the results suggest that additional data or information is required?

Finally, the third level of horizontal analysis was designed to support a rigorous evaluation (through logical frame analysis) of the internal capacity for change in the existing R&I ecosystem and the formulation of SMART evidence-based R&I policy recommendations.

3.3 STAKEHOLDER ANALYSIS AND POWER MAPPING

One of the most problematic issues for the implementation of R&I policy that spans across both public and private sectors is the understanding of the interconnections between the diverse parts of complicated ecosystems in the present environments of intense market and technological uncertainty. Consequently, and as stressed frequently in previous sections, each of the actors of the Lesotho R&I ecosystem will need to have a clear and precise understanding of the role it plays and how it facilitates the functioning of the ecosystem. To achieve this goal, each actor will bear responsibility for the timely and successful implementation of the tasks and activities identified as being critical for successful policy implementation as detailed in **Table 1** and **Table 4**.

The MCST will manage and implement the R&I policy. This mandate will be executed through the organisations operating under its auspices and, where necessary, through other relevant organisations. The DST will provide the leadership required to liaise with other ministries and organisations to ensure the successful implementation of the R&I policy. The MCST will work with the institutions and agencies that are the key actors. **Table 1** below details their role, the influence each actor exerts on the input to policy and, most importantly, the power each actor exerts within the functioning of the ecosystem. Whilst each actor has its own mandate or agenda, it is critical that there is total cooperation between actors to achieve horizontal governance in order to realise the overall goal of successful policy implementation.

Table 1 – Lesotho R&I ecosystem stakeholder analysis and power mapping

Stakeholder	Goals and interests	Influence / power	Impact on policy input	Role in R&I ecosystem
Government ministries (public sector)				
Ministry of Communications, Science & Technology (MCST)	National mandate to promote science, technology, and innovation	High	High	Facilitate collaborative government-academia-industry-society partnerships, mobilising support for establishment and funding of a national R&I coordinating agency
Appropriate Technology Services (ATS)	Research, development and application of appropriate technologies	Medium	High	Needs financial support for idea creation, technology adaptation and incubation (prototype), and product development
Ministry of Education & Training (MoET)	Shaping educational curriculum and providing support/ resources	High	High	Supporting higher education / workforce training and R&D; ensuring gender inclusion; shaping curriculum for emerging applications
Department of Technical & Vocational Training (TVET)	Provision of workshops and equipment for training human resources with technical, hands-on and marketable skills	Medium	High	Supporting technical and vocational education / workforce training through several colleges; shaping curriculum for hands-on skills in emerging applications (ICT, cloud computing, digitisation, green economy, etc.)

Table 1 – Lesotho R&I ecosystem stakeholder analysis and power mapping				
Stakeholder	**Goals and interests**	**Influence / power**	**Impact on policy input**	**Role in R&I ecosystem**
Ministry of Development Planning (MDP)	Shaping the national strategic priorities for socioeconomic development (NSDP)	High	Medium	Engaging, supporting, and monitoring the R&I ecosystem for revision / updating of national priorities
Bureau of Statistics (BoS)	System for national official statistics for purposes of economic and social planning, research, public information and international cooperation	Medium	High	Support and hosting of R&I open-data platform
Ministry of Small Business Development (MSBD)	Creating enabling environment for development of MSMEs	Medium	Medium	Facilitating effective business regulatory environment for MSMEs; providing affordable access to finance
Ministry of Trade & Industry (MTI)	Creating enabling environment for industrial, agro-business and commercial development	Medium	Medium	Facilitating effective business regulatory environment and access to finance for larger business entities; providing standards and testing facilities to facilitate foreign trade / access to global markets
Ministry of Health (MoH)	Providing regulatory framework for maintaining standards and safety in indigenous medicines and cosmetics	Medium	Medium	Setting health and safety standards and control mechanisms for promotion of medicines based on indigenous plants, and facilitating their mass production and access to global markets
Ministry of Agriculture and Food Security (MAFS)	Providing necessary resources for sustainable agricultural production	High	High	Facilitate collaborative arrangements and linkages with farmers, academia and research institutions for sustainable and climate-resilient agriculture
Department of Agricultural Research (ARU)	Agricultural research and technology adaptation for various production and climatic conditions	Medium	High	Requires financial support for improved research and technology adaptation and incubation (prototype), and product development and distribution
Ministry of Finance (MoF)	Development of macro-economic policies to support inclusive growth, mobilise and efficiently allocate public financial resources	Medium	High	Policy setting in terms of innovative tax regime and access to finance; crucial for national investment in R&I from the national budget, and support for an anticipated R&I fund
Registrar General Office (IP Office) – Ministry of Law	Registration of legal rights pertaining to patents, trademarks, industrial designs and administration of copyrights	Medium	High	Facilitation of IP protection through availability of various legal tools, and promoting access to international trade and global markets
Ministry of Gender & Youth (MGY)	Works towards the advancement of gender equity and equality, and offers youth training on carpentry and joinery, sewing and knitting, agriculture, bricklaying and plastering, and home economics	Low	Medium	Support for participation of youth, women and girls in the R&I ecosystem (gender equality and youth inclusion); the youth have a dual role of being both intended beneficiaries and primary stakeholders of innovative start-ups

Table 1 – Lesotho R&I ecosystem stakeholder analysis and power mapping				
Stakeholder	**Goals and interests**	**Influence / power**	**Impact on policy input**	**Role in R&I ecosystem**
Ministry of Social Development (MSD)	Facilitates the provision of sustainable social development services that are universally accessible to all poor and vulnerable groups	Low	Low	Support for participation of the poor and the vulnerable groups of society in the R&I ecosystem (social inclusion)
Ministry of Environment & Culture (MEC); Ministry of Energy & Meteorology (MEM)	Adopts policies designed to protect and enhances the natural and cultural environment, and develop renewable energy resources	Medium	Low	Facilitation of the transition to a sustainable and green economy through application of environmentally sound technologies; critical for collaborative partnerships with industry, academia and civil society
Public university				
National University of Lesotho (NUL), Science Faculties	Training and undertaking basic, applied and innovative scientific research and development in agriculture, health sciences, science, technology and engineering	High	High	Requires financial support to improve and strengthen contribution through basic and applied research; needs proactive engagement with industry and other HEIs for problem-solving, knowledge creation and designing of curricula that meet industry needs and prioritises emerging applications
NUL Innovation Hub (NULIH)	Promotes the culture of innovation and entrepreneurship among the university research community and provides support for creation and incubation of spin-offs	High	High	Proven platform for innovation processes and commercialising research and innovative products from the labs through incubation and acceleration; needs financial support for further development, strengthening entrepreneurship and expanding to science parks / industrial parks
NUL Energy Research Centre (ERC)	Developing and/or adapting knowledge and technologies that enable smooth transition to a sustainable energy system (green economy)	High	High	Proven human resource capacity development channel in sustainable energy and relevant research that informs national energy policy; needs collaborative support for green energy technologies in rural communities
Higher education (public and private)				
Lerotholi Polytechnic (LP)	Trains technicians in practical crafts and general engineering programmes, together with commercial education	Medium	High	Vital for technical workforce training; needs support to start engaging in research and development; requires academia-industry linkages
Limkokwing University of Creative Technology (LUCT)	Focuses on training and technology transfer in creative education (multimedia, film, TV & broadcasting, fashion design, etc.)	Medium	High	Specialises in creative workforce training; needs support to strengthen research component; vital for academia-industry linkages
Botho University; Institute of Development Management (IDM); National Health Training College (NHTC); Lesotho College of Education (LCE); Lesotho Agricultural College (LAC); Centre for Accounting Studies (CAS); IBC College; Bethel Business and Community Development Centre (BBCDC)	Other public and private HEIs: concentrating on management, health, teaching, agriculture, accounting, commercial / business studies, technical and general engineering, adoption of renewable energy technologies	Medium / Low	Medium / Low	Form a vital part of human resource training system and could flourish in the presence and support of collaborative academia-industry interrelations to design curricula that meet industry needs

Table 1 – Lesotho R&I ecosystem stakeholder analysis and power mapping				
Stakeholder	**Goals and interests**	**Influence / power**	**Impact on policy input**	**Role in R&I ecosystem**
Parastatals (State-owned entities)				
Lesotho Revenue Authority (LRA)	Setting of innovative tax regime to allow deductions in R&D, innovation support, training and skills development	High	High	Implementation of innovative tax regimes for MSMEs and large companies supporting R&I through academia-industry partnerships; could be critical when operationalising the idea of R&I levy
Lesotho National Development Corporation (LNDC)	Operates a partial credit guarantee scheme covering up to 75 % collateral for businesses to get access to finance through banks	High	High	Supports businesses to access loans through partial guarantee of collateral; it supports companies, firms, projects and individuals primarily manufacturing and high-tech agro-processing industries
Basotho Enterprise Development Corporation (BEDCO)	Offers incubation (workspace, office space, subsidised rentals), entrepreneurship training and youth entrepreneurship programmes	High	High	Already plays a major role in provision of incubation space and entrepreneurship training for MSMEs; can be vital for R&D activities under government-academia-industry-society partnerships
Lesotho Communications Authority (LCA); Lesotho Electricity Company (LEC); Lesotho Electricity & Water Authority (LEWA); Lesotho Highlands Development Authority (LHDA)	Government-owned entities (semi-autonomous parastatals) that operate in communications, energy (electricity) and water	Medium / Low	Medium	Already plays a major role in communications-energy-water nexus to support R&I ecosystem; can also provide financial support for R&D activities under government-academia-industry-society partnerships
Private sector				
Vodacom Lesotho (VCL)	Telecommunications giant that also runs its own Innovation Park, which provides incubation and acceleration programme for budding entrepreneurs, together with business coaching and mentoring	High	High	Already plays a major role in ICT applications (cloud computing, digitisation, virtual teaching and learning) and provision of incubation and acceleration support for innovative start-ups; can also provide financial support for R&D activities under academia-industry partnerships
Lesotho Chamber of Commerce & Industry (LCCI)	Channels of investment opportunities from large enterprises that can foster partnerships and linkages with academia for knowledge creation and encourage curricula that meets industry needs	Medium	High	Critical for government-academia-industry-society partnerships to support basic and applied research, technology development (prototype) and production, distribution and access to market
Private Sector Foundation (PSF)	Focal point for the private sector in its advocacy of policies and to promote the long-term development of a dynamic private sector	Low	Medium	Critical for government-academia-industry-society partnerships to support basic and applied research, technology development (prototype) and production, distribution and access to market
Bankers Association of Lesotho (BAL)	Banking sector association, comprising four main commercial banks (Standard Lesotho, NedBank Lesotho, FNB Lesotho, Lesotho PostBank) and Central Bank of Lesotho	Medium / Low	Low	Can play a major role in terms of provision of affordable access to finance for start-ups and MSMEs; can also provide financial support for R&D activities under academia-industry partnerships

Table 1 – Lesotho R&I ecosystem stakeholder analysis and power mapping				
Stakeholder	**Goals and interests**	**Influence / power**	**Impact on policy input**	**Role in R&I ecosystem**
Econet Telecom Lesotho (ETL); LEC Communications (LECC)	Telecommunication giants with mobile and optical fibre networks / backbones across the country for supporting broadband access	Medium / Low	Medium / Low	Possible to support broadband services to a national R&D network and other ICT applications (cloud computing, digitisation, virtual teaching, learning, etc.); can also provide financial support for R&D activities under academia-industry partnerships
Loti Brick; Lets'eng Diamond Mine; Liqhobong Diamond Mine; Kao Diamond Mine; Mothae Diamond Mine	Brick manufacturing and several diamond mining companies	Medium / Low	Medium	Can play a major role in terms of provision of access to finance for start-ups and MSMEs; can also provide financial support for R&D activities under academia-industry partnerships
Other stakeholders				
Technologies for Economic Development (TED)	Dissemination of appropriate technologies that are environmentally friendly and integrate well into the socioeconomic conditions (renewable energies, sustainable sanitation and climate protection through biodiversity conservation and avoidance of land degradation)	High	High	Advocates of gender equality and inclusion, with strong passion in the promotion of mechanisms and tools for transition to green economy (biogas digesters, wastewater treatment, etc.); very strong advocates of academia-industry-civil society partnerships with international linkages
SADC; EU; UNESCO; NEPAD; AOSTI	Regional and international bodies that Lesotho is a member of and subscribes to their protocols in relation to science, technology and innovation	Medium / Low	Medium / Low	Serve as regional and international entities to promote harmonisation, trade integration and mobility of goods, services, people, and capital / investment within member states
IKS Council; Lesotho Association of Inventors (LAI)	Associations of communities involved in grassroots innovations and various products based on indigenous knowledge systems	High / Medium	Medium	Crucial for mainstreaming grassroots innovations and indigenous knowledge systems; mobilising their transition into innovative products, processes and services that can get into the market
Women in Science Engineering and Technology (WiSET); Lesotho Science Mathematics Teachers Association; Lesotho Academy of Science and Technology (LAST); Lesotho Association of Engineers (LAE), Lesotho Nursing Council (LNC)	Processional bodies advocating for equitable participation of women and girls in STEM, producing young innovative learners through STEM clubs and science fair projects, providing scientific advisory services, fostering and promoting application of engineering	Medium / Low	Medium	Play a critical role in coordinating young learners' project competitions in Arts and STEM; role-model playing for highlighting opportunities in STEM for women and girls; advising government on STI policy development and implementation; cooperate with academia and government on training and research in engineering and nursing practice
Basotho Diaspora	Lesotho nationals living and working abroad (mainly in South Africa)	Medium	Medium	Possess varied professional experience and exposure with possible R&D linkages and remittances to contribute to the socioeconomic development of Lesotho

4 Thematic areas of policy intervention

The NSDP II identifies 'technology and innovation' as one of the four productive sectors that can contribute to the economic development of Lesotho, holding the potential to create thousands of jobs. It also clearly indicates that progress in the other productive sectors of the economy will need to largely rely on technology and innovation for inclusive growth and job creation. The prioritisation of 'technology and innovation' in the NSDP II, however, does not correlate with current commitments in this sector, given the limited investments of 0.05 % of GDP and the lack of mechanisms and guidance for prioritising and funding R&I.

To address this apparent gap together with the key challenges highlighted in the CBR, and to achieve sustainable economic growth and development in line with the NSDP II, Lesotho undertakes to prioritise R&I through relevant policy interventions in the following thematic areas for the next 10 years (2022-2032):

- Tertiary education and workforce training programmes;
- Collaborative scientific R&D;
- Inclusion and socioeconomic equality and equity;
- Indigenous knowledge systems, IP protection and access to R&I information;
- Business regulatory environment and access to incentives;
- Emerging applications in agriculture, health, ICT, manufacturing and green economy.

4.1 TERTIARY EDUCATION AND WORKFORCE TRAINING PROGRAMMES

4.1.1 Background

Quality and affordable tertiary education (HE and TVET) are key ingredients in achieving sustainable economic growth and development in Lesotho. Some of the key challenges highlighted in the country's current development plan (NSDP II (2019-2023)) includes but are not limited to 'low efficiency and effectiveness of public spending on education, skills mismatch, shortage of critical skills such as entrepreneurship skills, medicine, engineering and management skills'. To ensure that tertiary education fits societal and job market needs, the government is seeking to strengthen workforce training programmes and to improve partnerships with industry in order to deliver a more appropriate and relevant level of quality education for all.

4.1.2 Policy statement

The government will support an improvement to the efficiency and effectiveness of workforce training programmes so as to respond to the socioeconomic, cultural and development needs of Lesotho.

4.1.3 Priority issues

1. To address the mismatch between tertiary training programmes and job market requirements.
2. To improve the relevance and quality of TVET and higher education curricula.
3. To improve educational outcomes of TVET and higher education institutions.

4. To ensure qualification frameworks and quality assurance compliance of TVET and higher education institutions.
5. To improve the scientific, technological and entrepreneurial culture of Basotho.
6. To enhance the global competitiveness of Lesotho's TVET and higher education institutions.
7. To contribute towards the achievement of SDG 4.

4.1.4 Strategic activities

1. Conduct regular or periodic market research and skills audits to tailor institutional training programmes to market and societal needs.
2. Carry out annual tracer studies to establish employability and market absorption of graduates.
3. Establish institutional or faculty-industry advisory boards for a periodic review of curricula and appropriate titles of qualifications to keep up to date with industry requirements.
4. Integrate new or modern training programmes in technology and engineering up to postgraduate level for alignment with the fourth industrial revolution.
5. Develop industrial attachments, internship programmes or workplace integrated learning for imparting relevant skills to graduates by including 'employability' as a key indicator for institutional quality assurance systems.
6. Develop and implement mandatory entrepreneurship curriculum across the educational spectrum.
7. Promote TVET for increased numbers in the workforce with hands-on skills.
8. Support science and mathematics training and students' projects from first and second cycles of education.
9. Establish science centres or technology and innovation support centres (TISCs) in the main institutions.

4.1.5 Key performance indicators

1. Number of periodic market research and skills audits undertaken.
2. Number of institutional or faculty-industry committees established.
3. Number of programmes reviewed and updated in line with industry requirements.
4. Increase in training programmes in technology and engineering.
5. Number of TISCs established and operational.

Measure progress towards the achievement of SDG 4 indicators (the UN has identified 10 targets and 11 indicators for SDG 4). These indicators will be detailed in the results-based monitoring and evaluation section, including nationally relevant indicators.

4.2 COLLABORATIVE SCIENTIFIC RESEARCH AND DEVELOPMENT

4.2.1 Background

Lesotho holds a very low place in the international rankings of its scientific outputs and innovation capabilities vis-à-vis 'the number of patent applications made with collaborators from other countries', 'the number of patent applications filed relative to population size' and in terms of 'the prominence and standing of local research institutions'.

If the potential outcomes and contribution of this sector are to be realised, there is an urgent need to renew government commitment and investments in national technology and innovation programmes, including strengthening R&D institutions and programmes (innovation capabilities), as well as increased private sector and international engagements in the development, transfer and adoption of relevant technologies.

4.2.2 Policy statement

The government will intensify investments in scientific research and development, and strengthen local innovation and technological capabilities.

4.2.3 Priority issues

1. To establish a national Research and Innovation Agency (RIA).
2. To establish a national Research and innovation fund (RIF).
3. To implement and sustain public and private sector investments into the RIF.
4. To encourage voluntary contributions, donations and grants into the RIF.
5. To increase the number of local institutions undertaking basic and applied research under the freedom of scientific research.
6. To improve the prominence and standing of local research institutions.
7. To promote R&D linkages and collaborative activities locally and internationally.
8. To facilitate partnerships with government, academia, industry and society (quadruple helix model) for knowledge creation, technology transfer and commercialisation.
9. To facilitate linkages with the Basotho diaspora in various academic and research institutions around the world.

4.2.4 Strategic activities

1. Promulgate an Act of Parliament to set up the RIA and RIF.
2. Set aside annual seed funding for the RIF at a minimum of 0.05 % of GDP.
3. Implement a contributory and tax-deductible research and innovation levy for large businesses towards the fund.
4. Offer tax rebates (reductions) for individuals and other businesses that support research and development.
5. Establish national laboratories and centres of excellence (CoEs) for research and development in priority areas.
6. Create R&D linkages and clusters of innovation through effective government-

academia-industry-society partnerships (quadruple helix model).

7. Make support available for research and development in priority areas through transparent calls for proposals.

8. Develop principles and guidelines on how collaborations should work.

9. Submit an annual plan of individual and collaborative activities or programmes to be supported under the R&I funding.

10. Support existing incubation and accelerator parks and establish new ones.

11. Enhance R&D collaboration with the Basotho diaspora through the signing of memoranda of understanding or cooperation agreements.

4.2.5 Key performance indicators

1. Establishment of RIA and RIF within the first 2 years.

2. Percentage increase in government budget allocation for R&D (GBARD).

3. Percentage increase in business enterprise expenditure on R&D (BERD).

4. Number of R&D programmes supported.

5. Increase in number of R&D local collaborative projects.

6. Increase in number of R&D international collaborative projects.

7. Number of R&I clusters.

8. Percentage increase in scientific publications (index of scientific reservation and promise).

9. Percentage increase in incubated prototypes and/or commercialised products.

10. Number of MoUs or agreements signed with institutions involving the Basotho diaspora.

4.3 SOCIOECONOMIC EQUALITY AND INCLUSION

4.3.1 Background

Lesotho remains committed to the implementation of measures under the United Nations Convention on the Elimination of All forms of Discrimination against Women (CEDAW), the African Union Protocol on the Rights of Women (2003), and the SADC Protocol on Gender and Development (2008). The Lesotho gender and development policy (2018-2030) defines gender equality as the equal enjoyment of rights and access to opportunities and outcomes, including control of resources by women, men, girls, boys and other marginalised groups. Marginalised groups refer to the socially excluded, economically disadvantaged or those groups that have been relegated to the fringes of society due to the rural-urban divide. In other words, in Lesotho, the overall focus is on the attainment of socioeconomic equality and inclusion for all members of society.

The country has made significant progress in several gender dimensions, including leadership, political participation and gender mainstreaming in public policy and policy implementation. However, anecdotal evidence points to a gendered skills development in Lesotho where girls tend to lean more towards disciplines such as social sciences, humanities and craft skills, and are underrepresented in STEM fields, while boys are attracted more towards technical skills and dominate in technical schools. There is also a recognisable

underrepresentation of rural youth, herd boys, people with disabilities and other socially and economically marginalised groups in terms of participation in STEM and innovation-oriented programmes and jobs.

4.3.2 Policy statement

The Government of Lesotho, working in close collaboration with local and international development partners, will align and mainstream STEM education with the Basotho culture to improve socioeconomic equality and inclusion in STEM education, research, and occupations for talented women and girls, rural youth, herd boys, the disabled and other marginalised groups.

4.3.3 Priority issues

1. To improve policy and decision-making processes on socioeconomic equality and inclusion in STI education, research and occupations.
2. To promote socioeconomic equality in STEM education at all levels.
3. To promote socioeconomic equality grounded on good practices for R&I and training.
4. To reduce the socioeconomic bias in academic recruitment, leadership and promotion.

4.3.4 Strategic activities

1. Conduct capacity-building programmes for local stakeholders, including parliamentarians, on STEM and socioeconomic advancement.
2. Audit the socioeconomic responsiveness of STI-related policies, policy instruments and institutions.
3. Collect, analyse, report and monitor STI and socioeconomic disaggregated data on a regular basis.
4. Develop and implement advocacy programmes that promote the equitable participation of all social groups in STEM in primary and secondary education, as well as at tertiary (higher education and TVET) levels.
5. Develop and implement effective strategies together with local and international partners to address stereotypes, social norms and practices that affect girls and women, rural youth, herd boys, the disabled and other marginalised groups in education and research.
6. Design and implement scholarship schemes for all under-represented social groups in STEM.
7. Design programmes and initiatives that identify talent, and encourage and maintain under-represented social groups in STEM study programmes.
8. Develop and implement good ethics governance systems for R&I in higher education, funding agencies and research institutions.

4.3.5 Key performance indicators

1. Annual number of training sessions for policymakers, parliamentarians, board members and executives – CEOs, general managers and financial directors.
2. Number of policies and policy instruments audited.
3. Number of STI and socioeconomic advancement reports published.

4. Number of 'Leave no-one behind' advocacy programmes developed and implemented.
5. Proportion of researchers from marginalised groups (nationally).
6. Proportion of STEM school leavers and graduates from marginalised groups.
7. Proportion of people from marginalised groups in new business start-ups.
8. Proportion of people from marginalised groups in leadership positions in academia and research institutions.
9. Number of people from marginalized groups awarded STEM scholarships.

4.4 INDIGENOUS KNOWLEDGE SYSTEMS, IP PROTECTION AND ACCESS TO R&I INFORMATION

4.4.1 Background

Lesotho has a rich cultural heritage. There are ways of life that have been passed from generation to generation, whether it be treating animal and human diseases, agricultural practices, tool making or behavioural practices. For this traditional knowledge to be successfully regulated and commercialised, efforts to effectively protect it through intellectual property rights (IPR), create safe repositories for preservation and conservation, and establish support programmes for its promotion are overdue.

Lesotho, like other African countries, has realised the importance of indigenous resources and knowledge. It is therefore crucial to exploit this knowledge through commercialisation in order to improve the livelihoods of Basotho indigenous knowledge holders and society at large and so achieve inclusive socioeconomic development.

4.4.2 Policy statement

The government will mobilise indigenous knowledge systems and grassroots innovations, strengthen effective protection and enforcement mechanisms, and create an open data platform for research and innovation (open science) to strengthen bottom-up job creation and economic growth.

4.4.3 Priority issues

1. To coordinate and support IKS activities and grassroots innovations identified as being viable.
2. To nurture the talent of ordinary citizens and those who are outside formal school or higher education catchments.
3. To regulate, control and monitor IKS products and services, and maintain relevant standards.
4. To improve national IPR capacities and capabilities.
5. To improve the capacity of the Bureau of Statistics (BoS) for the collection and dissemination of R&D and STI indicators in liaison with the DST.
6. To enhance the use of real-time data and big data analytics for evidence-informed policy and decision-making.

4.4.4 Strategic activities

1. Establish an open science catchment framework and support centres for those citizens outside the education system who have talents, products and ideas for self-employment.

2. Undertake and fund citizen science projects inside and outside the classroom and laboratory to maximise talent from the wider society.

3. Design and implement a legal framework and regulations with the potential to strengthen IKS systems.

4. Promulgate the Medicines and Medical Devices Control Authority Bill or develop a similar legal instrument.

5. Review and update the current laws to cover IKS, trade secrets, geographical indications and the digital space.

6. Undertake IPR public awareness campaigns and training programmes for the police and the judiciary.

7. Establish new centres, or make existing ones eligible, for the testing and certification of standards for local products, so enabling their export to international markets.

8. Support conservation and propagation efforts, technologies and areas of innovation with comparative advantage for Lesotho, such as medicinal products and cosmetics produced from indigenous plants.

9. Strengthen the various institutions' ability to manage their own data, and make non-confidential information available from respective websites and link it directly with the open data platform (national digital depository under BoS).

10. Develop a legal framework to effect and enforce the data mining and sharing of regular updates on R&I-related information.

11. Establish an open-access local journal for peer review and the publication of new R&I findings.

4.4.5 Key performance indicators

1. Number of IKS and grassroots innovations support centres created nationwide.

2. Number of IKS-related curricular materials developed and implemented.

3. Number of legal and regulatory frameworks developed and enacted.

4. Numbers of personnel authorised/trained on product/service development.

5. Numbers of personnel trained on IP-related management.

6. Number of new IKS products and services launched.

7. Number of institutions with interactive data platforms and relevant information dashboards for open science.

4.5 BUSINESS REGULATORY ENVIRONMENT AND ACCESS TO INCENTIVES

4.5.1 Background

The business environment can be defined as a complex of policy, legal, institutional and regulatory conditions that govern business activities. Along with other private sector development initiatives, the business environment affects the performance of private enterprises in both the formal and informal economies. According to the Global Competitiveness Report 2019, the position of Lesotho in the 'ease of doing business' is ranked 122nd out of 190 countries, and

scores very low on the financing of start-ups and MSMEs and the availability of venture capital. However, an environment conducive to business is one of the pre-requisites for economic growth and poverty reduction.

The country needs improvements to foster the development of an innovative private sector and promote the efficient use of its limited resources by building the requisite entrepreneurial culture. Improving the performance of local investment support institutions to provide more relevant and effective services (ease of access to finance, favourable tax incentives, etc.) for improved MSME competitiveness must be pursued.

4.5.2 Policy statement

The government will improve the regulatory environment in support of innovative start-ups and MSMEs for entrepreneurial culture and employment creation, and implement accessible incentives and innovative tax measures.

4.5.3 Priority issues

1. To reduce the time needed for business registration, registration certificates and licences.
2. To advocate for relief in business-related registration costs.
3. To propose the implementation of tax rebates and tax holidays during incubation.
4. To support start-ups and MSMEs with the appropriate incentives to promote an entrepreneurial culture.
5. To simplify the tax regime and improve user-friendliness.
6. To improve tax compliance and implementation by MSMEs.
7. To encourage investments and business partnerships with the Basotho diaspora.

4.5.4 Strategic activities

1. Widen the One-stop Business Facility Centre (OBFC) services to districts outside Maseru and make them available online.
2. Minimise the existing stringent requirements of the partial credit guarantee scheme (up to 75 % of collateral) for small businesses to de-risk their financing by banks.
3. Investigate the usefulness of non-traditional funding mechanisms such as community financial cooperatives.
4. Create new, and support the existing, innovation hubs for providing incubation facilities and entrepreneurship programmes (workspace, subsidized rental space, youth start-ups and business plan competition, coaching, mentoring, etc.)
5. Run dedicated tax clinics (client education programme) to assist taxpayers in SME accounting systems to reduce the strain on small businesses.
6. Advise businesses on the existing allowance to capitalise start-up costs (depreciated over 4 years).
7. Revise existing revenue legislation to provide tax rebates and tax holidays for businesses during incubation.
8. Revise the carry-over provision for businesses to adjust taxable profit with losses from previous years and cap it to avoid abuse.

9. Encourage businesses to support R&D (including support to academic institutions) and undertake training and skills development programmes as such expenses are tax deductible.

10. Engage with the Basotho Diaspora for business partnerships, via the Diaspora outreach forums in South Africa and other countries.

4.5.5 Key performance indicators

1. Number of districts in which OBFC services are available.

2. Reduction in the turn-around times for business registration and licensing.

3. Number and amount of partial credit guarantee facilities extended to MSMEs and start-ups.

4. Reduction in the approval times for support from the credit guarantee scheme.

5. Percentage increase in cover from the current 75 % of a loan.

6. Number of start-ups incubated per annum.

7. Number of dedicated tax education and advisory clinics per annum.

8. Number of businesses partnering with the Basotho Diaspora.

4.6 EMERGING APPLICATIONS IN AGRICULTURE, HEALTH, ICT, MANUFACTURING AND THE GREEN ECONOMY

4.6.1 Background

Emerging applications in agriculture are centred on adopting new ways of food production by conserving natural resources and managing the impacts of climate change. There is potential for the adoption of emerging technologies to enhance agricultural productivity, such as genetically modified seeds that are drought tolerant, cropping practices that are sustainable, including climate smart agriculture, and advanced management practices like precision agriculture.

Similarly, in the healthcare sector, emerging applications of technology potentially range from advanced techniques for early detection, diagnosis and treatment of ailments to the usage of ICT to facilitate patient monitoring and recovery tracking. Despite efforts from government and development agencies there is a low level of new technologies being adopted in the healthcare sector and low government expenditure, which was recorded at 9.8 % as of 2018 (CIA Factbook, 2021).

Furthermore, ICT has numerous emerging applications capable of driving socioeconomic growth. The main inhibitor for adoption of emerging ICT and its applications is a low user skills base, slow adoption and the cost of the equipment. The manufacturing sector, while supporting most of the labour force, is focused on low-skill and low-technology production processes. This limits the potential for the sector's growth by increasing the mechanisation of production and the value of products along the value chain.

Lastly, global climate action mandates that countries need to transition to sustainable methods of production to reduce pollution emissions and optimise resource recovery. The adoption of renewable technologies and the shift to circular economies can be a vehicle for an effective response to climate risk while supporting socioeconomic development.

4.6.2 Policy statement

The government will support the adoption of technologies for emerging applications with a strong focus on technical training to initiate a rapid transition to climate-resilient agriculture, quality healthcare, ICTs, digitising manufacturing and transitioning to the green economy

4.6.3 Priority issues

1. To implement conservation agriculture and climate-smart methods.
2. To improve the quality of healthcare services and facilities in accordance with global healthcare trends.
3. To promote the use of ICT nationwide and exploit its emerging applications.
4. To promote the use of digitisation and computerised manufacturing technologies for production efficiency and effectiveness.
5. To mount awareness campaigns and community outreach programmes, and advocate for information sharing on the green economy.
6. To support the adoption of low carbon, resource-efficient and socially inclusive technologies that capture and conserve natural capital.

4.6.4 Strategic activities

1. Promote the use of high-yield seeds that are climate and pest tolerant.
2. Support the mapping of soils and soil testing services to the wider farming communities.
3. Maximise the identified advantage in horticulture (especially cash crops).
4. Strengthen research to improve the agricultural value chain, irrigated agriculture, post-harvest mechanisms, fodder production and indigenous chicken (breeds and feeding regimes), among others.
5. Allocate at least 15 % of the government budget to the health sector in line with the national health strategic plan.
6. Strengthen the health system to improve equity and access to essential services and technology.
7. Assist schools and HEIs with ICT systems and internet access costs for open and distance learning, high-performance computing, blended teaching and learning platforms (learning management systems, virtual video-conferencing tools, etc.).
8. Strengthen ICT units of various government departments to facilitate digitisation and the online availability of public services.
9. Establish and support ICT centres in communities for the adoption and use of related applications.
10. Enhance the market-share of manufacturing in international markets by promoting adherence to ecological labelling standards.

11. Encourage the adoption of digital technologies for efficient production processes.

12. Provide resources for training and research by HEIs for the adaptation of sustainable energy technologies to local conditions and policy guidance.

13. Encourage and support TVETs to train more hands-on technicians to implement clean technologies (solar, wind and hydro plants, waste disposal, recycling, etc.).

14. Support incubation centres that facilitate technology transfer and nurture start-ups and small businesses in green technologies.

15. Provide incentives and eliminate or reduce tariffs on certain green energy technologies, waste disposal and recycling for fast growth and job creation.

16. Promote and support a circular economy for efficient waste management and resource recovery.

4.6.5 Key performance indicators

1. Percentage availability of climate-resilient seeds for farmers.

2. Number of soil testing services provided per annum.

3. Number and size of horticulture projects and other climate-resilient agricultural practices established or supported.

4. Percentage increase in equity and access to quality healthcare services.

5. Number of manufacturing firms with ecological labelling accreditation.

6. Number of manufacturing firms with digitised production processes.

7. Market-share of low carbon manufacturing of garment and apparel exports per annum.

8. Number of schools, TVETs and HEIs equipped with ICT systems for virtual teaching and learning, and access to high-performance computing.

9. Percentage of government departments with digitised public services that are also available online.

10. Number of new natural capital technologies identified, developed and implemented.

11. Number of TVET-trained technicians with practical skills for clean technologies.

5 Establishment of a national R&I Agency

5.1 INTRODUCTION

Lesotho's research system is quite small (R&D expenditure ~0.05 % of GDP in 2015), and has no national mechanisms for guidance on research priorities and funding. The country further faces a shortage of local incubators and accelerator programmes essential for a mature start-up ecosystem. In addition, it has been established by the CBR that fragmentation of the duplicative approaches and lack of networking, sharing of information and interactions among knowledge centres and entrepreneurs prevent the shaping of a robust entrepreneurial ecosystem (OACPS R&I PSF, 2021). However, in mature economies, start-ups are backed by applied research, and the innovative thinking of universities and research laboratories acting as knowledge centres. The establishment of a semi-autonomous or independent organisation, council or agency that is specifically responsible for coordinating a framework of research and innovation has been found to be the mainstay of many economies around the world (GTIPA, 2019) and is also recommended for Lesotho, with unanimous support from the main stakeholders.

The national R&I Agency (RIA), reporting to Parliament through the Ministry responsible for Science, Technology, and Innovation (STI), will provide a framework for guidance on RRI, undertake mobilisation of research resources and direct the nation's investments in R&I funding. The RIA shall support the local incubators and accelerator programmes at academic institutions, public labs and national centres of excellence, and help innovative start-ups and MSMEs in Lesotho to build innovation capacity and take ideas to market. This shall be done through financial assistance, advisory services, and connections to the available business and R&D expertise. The goal is to increase the capacity of the Lesotho economy to grow, invest and create jobs, along with creating new businesses and promoting new entrepreneurs.

5.2 PROPOSED RIA MANDATE

The core mandate or role of the RIA should include the provision of financial and non-financial support for research and innovation activities that are coherent with the national development agenda. As articulated by the National Strategic Development Plan (NSDP II) the RIA shall carry out the following:

1. Set up a research and innovation fund (RIF) as an investment and financial assistance programme to provide funding for:

   (a) directed multidisciplinary research in priority areas, a technical workforce or human resource development and capacity building activities occurring at higher education institutions and national laboratories;

   (b) the provision of necessary research and technical infrastructure to facilitate knowledge creation, technological development, and innovation in all fields / disciplines, with an emphasis on scientific and industrial research, including indigenous knowledge systems;

   (c) catalytic partnerships between academia, industry, government and civil society (quadruple helix model) for development and innovations in a wide range of fields addressing societal needs, such as agriculture, health, energy and all

aspects of the natural environment, ICT applications, developing new industry, etc.

(d) citizen science projects that prioritise engagement with grassroots communities for exploiting and enhancing their IKS expertise;

(e) the incubation and acceleration of identified inventions and innovative products, processes and services from academia, national laboratories, innovation hubs and grassroots communities for contributing to job creation and improving the quality of life;

2. Strengthen and coordinate the science, technology, and innovation capacity of Lesotho by having direct links with and promoting the active participation of the main stakeholders in the development and implementation of national STI strategies to avoid silo mentality, duplications and fragmentation of efforts;

3. Urge businesses of all sizes to collaborate with innovation actors, including tertiary and research institutions, to propose bold and ambitious strategies that will transform national innovation ecosystems and develop job-creating clusters;

4. Act as an articulator and promoter of the connection, networking and coordination between the academic and scientific worlds, government, civil society, and the private productive sector (quadruple helix model) so that academic and scientific innovation may have productive uses;

5. Reinforce, connect and network incubators, accelerator programmes, technologies and knowledge emerging from universities, national research laboratories and IKSs with MSMEs;

6. Ensure an emphasis on monitoring, reporting and evaluation of all the supported research and innovation initiatives by different applicants;

7. Support the creation, hosting and maintenance of the R&I open data platform (open-access information portal), in collaboration with the Bureau of Statistics, for ease of access to R&I information through institutional repositories.

8. Host a periodic Research and Innovation Conference and Expo for advocacy in the field of R&I to disseminate new information relevant to innovation and R&I products, services and activities, and support networking opportunities.

5.3 PROPOSED RIA STRUCTURE

The R&I Agency is recommended to be established as an administratively autonomous (semi-autonomous) institution, promulgated by an Act of Parliament, with strong governance structure and sustainable fundraising function, so that it can be independent and be able to self-finance as much as possible, and drive a knowledge economy that is in the best interests of society. For accountability, the RIA shall procedurally report to the Parliament of Lesotho through the Ministry responsible for Science, Technology and Innovation. The RIA shall have the following:

1. A Board of Directors, responsible for governance, oversight and overall strategy, appointed by the Minister responsible for Science, Technology and Innovation, with

terms of up to 4 years each, renewable based on good performance, with a membership composed of:

(a) one representative from the ministry/department responsible for science, technology and innovation, with a minimum qualification at master's level;

(b) one representative from the ministry/department responsible for tertiary education, with a minimum qualification at master's level;

(c) one representative from the ministry/department responsible for national strategic development planning, with a minimum qualification at master's level;

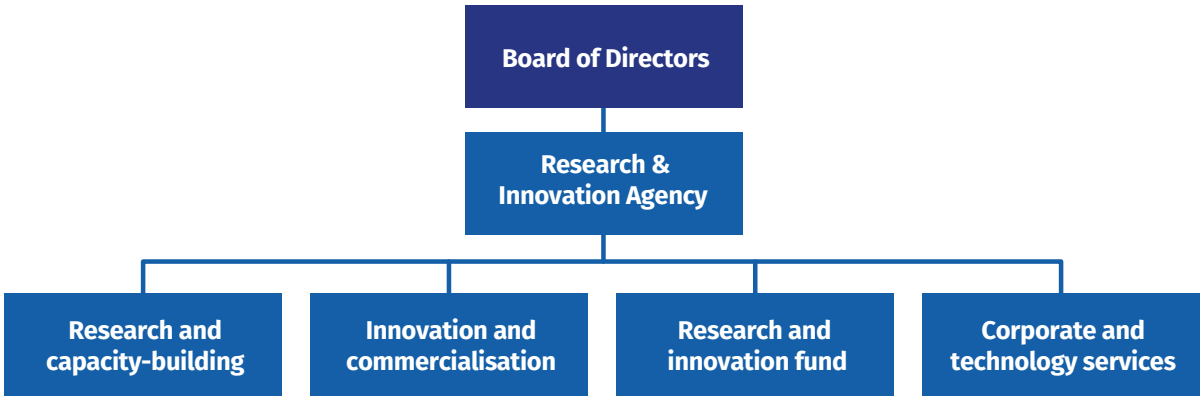
(d) two representatives from the tertiary education sector with the relevant professional skills, proven experience and a record of research and innovation, appointed through a transparent and competitive application process, with a minimum qualification at master's level;

(e) two representatives from the private sector with the relevant professional skills, proven experience and record of leadership and business management, appointed through a transparent and competitive application process, with a minimum qualification of a bachelor's degree;

(f) one representative from the Indigenous Knowledge Systems Council or the Lesotho Association of Inventors, with a minimum qualification of a diploma.

2. The board shall be headed by an appropriately qualified executive director with the relevant professional training and skills, proven experience, and record of leadership and management related to research and innovation, appointed by the Board of Directors through a transparent and competitive recruitment process, who shall become an ex officio member of the board. The executive director shall be the CEO and be eligible for a term of 5 years, renewable, based on good performance.

Figure 4 **Proposed initial organogram of the R&I Agency**



3. Set up a lean, effective and efficient executive management and operational structure (see **Figure 4**) for cost containment, with at least four main functions / departments, consisting of:

   (a) R&D:
   For the coordination and support of relevant R&D activities by various academic and research institutions, including IKS-based initiatives;

   (b) innovation and commercialisation (I&C):
   For the coordination and support of relevant I&C activities by incubators, accelerators, start-ups, MSMEs and larger businesses;

   (c) research and innovation fund:
   For the financial support of approved R&D and I&C activities from points 1 and 2 above and internal finance, human resources and administration;

   (d) corporate and technology services:
   For providing the RIA's corporate secretariat, strategic planning, legal / contract services and ICT systems.

4. Be subsidised by a government subvention through the creation of a R&I Agency Cost Centre, to be catered for in the annual national budget for appropriation by Parliament (with a minimum commitment of 0.05 % of GDP).

5. Institute a R&I levy on large businesses (annual turnover > LSL 5 million) and parastatals at an appropriate and revisable rate of the total revenue (for instance, say at 0.05 % to match the government's contribution), which will be tax deductible, for the sustainability of both the RIA and the RIF.

6. Receive contributions, donations, grants, etc. into the RIF from individuals, public and private institutions, regional and international development agencies, etc., which shall be tax-exempt.

7. Expand its revenues to meet the cost of its operations and use any surplus accrued for the promotion and development of the R&I ecosystem.

8. Prepare proper accounts annually in compliance with international accounting standards for independent external auditing, together with an annual report to Parliament, through the ministry responsible for STI.

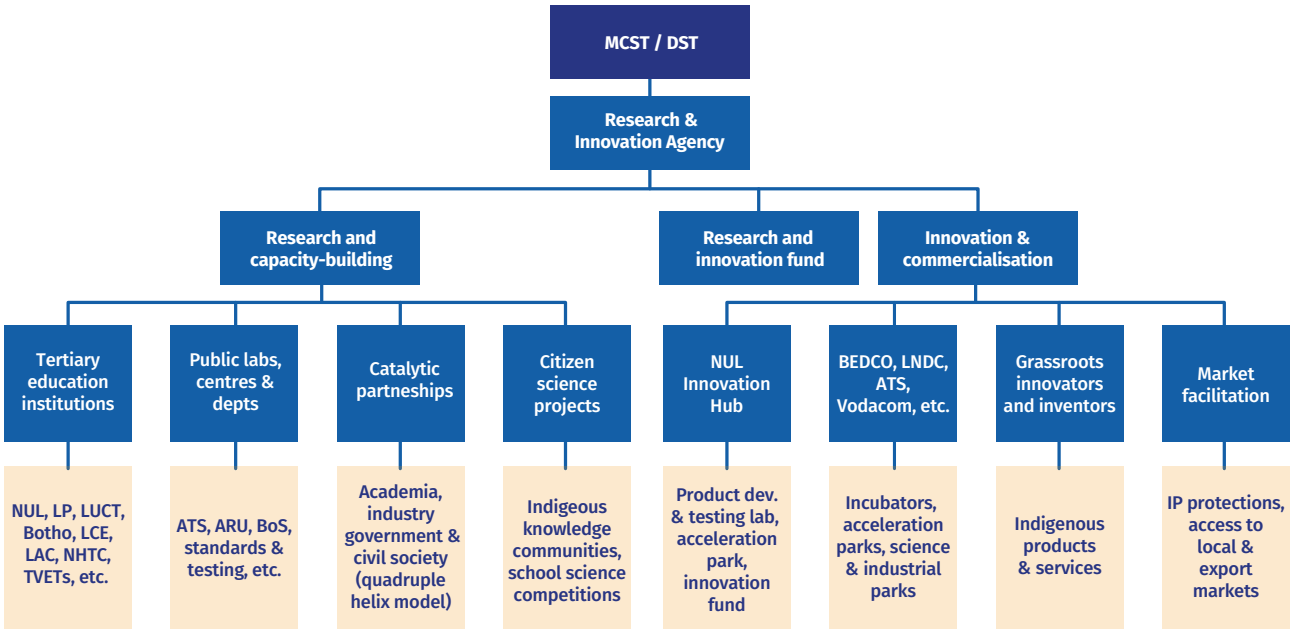
5.4 PROGRAMMES TO BE IMPLEMENTED

The RIA shall provide funding to several programmes that are geared towards making a change in the socioeconomic circumstances of Lesotho through workforce training, new knowledge creation, technology development and adoption, prototyping, production and technology commercialisation as envisaged in **Figure 5**. These include, but are not limited to:

(a) research grants:
annual calls for research proposals in priority areas (in line with the existing national blueprint on socioeconomic development – NDSP);

(b) bursaries and fellowships:
support for graduate and postgraduate (masters and PhD) research students (including a specific quota for marginalised groups researching in STEM);

Figure 5 **Envisaged interrelation of RIA with the R&I ecosystem**



(c) centres of excellence (CoEs): agro-processing, ICT applications, health informatics, renewable energy, climate change, water and sanitation, cloud computing, cyber security, robotics, artificial intelligence, manufacturing digitisation, 4th industrial revolution, etc.);

(d) infrastructure development: facilities and equipment for scientific research and development, product testing and certification, etc.;

(e) technical human capacity development: TVET for a critical mass of hands-on skills development;

(f) citizen science projects: connecting the research community to society, youth (in urban and rural areas), and secondary schools' science competitions (Lesotho Science Mathematics Teachers Association) through open science;

(g) incubators and accelerators: support for innovation hubs, science / industrial parks, etc.;

(h) grassroots innovators: seed funding for investment in IKS, grassroots innovations, out-of-school ideas, etc.;

(i) dissemination activities: meetings, workshops, conferences and expo for the wider scientific community, policymakers, media and society at large, etc.

Examples of some successful national research and innovation agency models in Africa, for continental benchmarking, are summarised in **Table 2**, with the majority of them established by acts of parliament, similar to the recommended case of the RIA in Lesotho. The primary legislation is used to define the agency's governance structure and ensure a clarity of roles, administrative independence, reporting lines and public funding for its perpetual existence and long-term sustainability, which can only be modified or revoked respectively by an amendment act or repeal.

Table 2 – Examples of innovation agency models in Africa

Country	Agency	Establishment	Core Mandate
South Africa	Technology Innovation Agency (TIA)	Technology Innovation Act (Act 26 of 2008)	The TIA is a national public entity that serves as the key institutional intervention to bridge the innovation chasm between research and development from higher education institutions, science councils, public entities, the private sector and commercialisation.
Kenya	Kenya National Innovation Agency (KeNIA)	Science, Technology and Innovation (STI) Act, No 28 of 2013	The core mandate of KeNIA is to develop and manage the national innovation system. KeNIA is therefore responsible for coordination, promotion and regulation of the national innovation ecosystem.
Tanzania	Tanzania Commission for Science and Technology (COSTECH)	Act of Parliament No 7 of 1986	COSTECH is a parastatal organisation with the responsibility of coordinating and promoting research and technology development activities in the country.
Namibia	National Commission on Research, Science and Technology (NCRST)	Research, Science and Technology Act, 2004 (Act no 23 of 2004)	NCRST's mandate is to establish and strengthen a national system that promotes, develops and informs research, science, technology and innovation through effective coordination to realise a knowledge-based society.
Botswana	Botswana Innovation Hub (BIH)	Registered as a company, under the Ministry of Tertiary Education Research Science and Technology	BIH is a company limited by the guarantee to promote innovative ventures with two subsidiaries, namely Botswana Innovation Hub Properties and Botswana Innovation Hub Investments.
Egypt	Technology Innovation and Entrepreneurship Centre, TIEC	Established as an innovation centre in September 2010 under the Ministry of Communications and Information Technology	TIEC's mandate is to stimulate a knowledge-based society by developing strategies, providing facilities, and optimising promotions of innovation and entrepreneurship to provide an intellectual property framework to foster ICT innovation and growth in the local economy.

5.5 POSSIBLE SOURCES OF RIA FUNDING

Three scenarios have been proposed for possible sources of funding to the RIA, as illustrated in **Table 3**, based on annual government subvention providing seed funding for the RIA, matched by the mandatory R&I levy to be charged on state-owned entities and large businesses (turnover > LSL 5 million) as a percentage of their total annual revenues. Grants, voluntary contributions and donations from international and regional development partners and other goodwill shall also be solicited into the RIF.

For the first scenario, which has the lowest funding at the rate of 0.05% of GDP or total revenues, the activity-based expenditure for the RIA is initially proposed to be efficiently and equitably allocated at about 25 % for employee-related costs, 10 % for administration and operational expenses, and 65 % for the programmes to be implemented. Under this scenario, LSL 22.5 million or more would be made available for R&I programmes based on the available figures for 2019, 2020 or 2021.

The second scenario envisages an increase in the percentage of contributions to 0.075 %, making LSL 38 million or more available for R&I programmes per annum.

The third scenario, which is the most preferred and recommended, pegs the annual contributions at 0.1 %, with a possible net effect of about LSL 53.5 million as disposable funding for R&I programmes annually.

Table 3 – Possible scenarios for RIA funding

Funding source	**Scenario 1** @ 0.05 %, in LSL	**Scenario 2** @ 0.075 % in LSL	**Scenario 3** @ 0.1 % in LSL
Government subvention	18 000 000	27 000 000	36 000 000
R&I levy (businesses)	12 000 000	18 000 000	24 000 000
Sub-total (subvention & levy)	**30 000 000**	**45 000 000**	**60 000 000**
Contributions	3 000 000	4 500 000	6 000 000
Total	**33 000 000**	**49 500 000**	**66 000 000**
Agency expenditure			
Employee costs	7 500 000	7 500 000	7 500 000
OPEX	3 000 000	4 000 000	5 000 000
R&I programmes	**22 500 000**	**38 000 000**	**53 500 000**

6 R&I policy implementation framework

6.1 RESULTS-BASED MONITORING & EVALUATION FRAMEWORK

The aim of a results-based monitoring and evaluation (M&E) framework is to generate evidence for informed decision-making at policy level and to provide information for accountability and performance management. The idea of M&E framework is to encourage a shift from a system of input accounting to a results-based accountability. In this regard, the focus of planning, budgeting, reporting and oversight should shift from how things are done to what is accomplished. It also provides the scope to change course, extend activities or discard irrelevant ones during the periodic performance monitoring and evaluation process, if deemed necessary.

The principles of 'managing for results' was especially highlighted in the 2005 Paris Declaration on Aid Effectiveness and reaffirmed in the Accra Agenda for Action in 2008 as part of the efforts to work together in a participatory approach to strengthen national capacities and so reach agreed development objectives and promote the accountability of all major stakeholders in the pursuit of results. From an institutional point of view, the basic purposes of results-based management systems are to generate and use performance information for:

1. accountability reporting to stakeholders,
2. learning and improving performance, and
3. decision-making

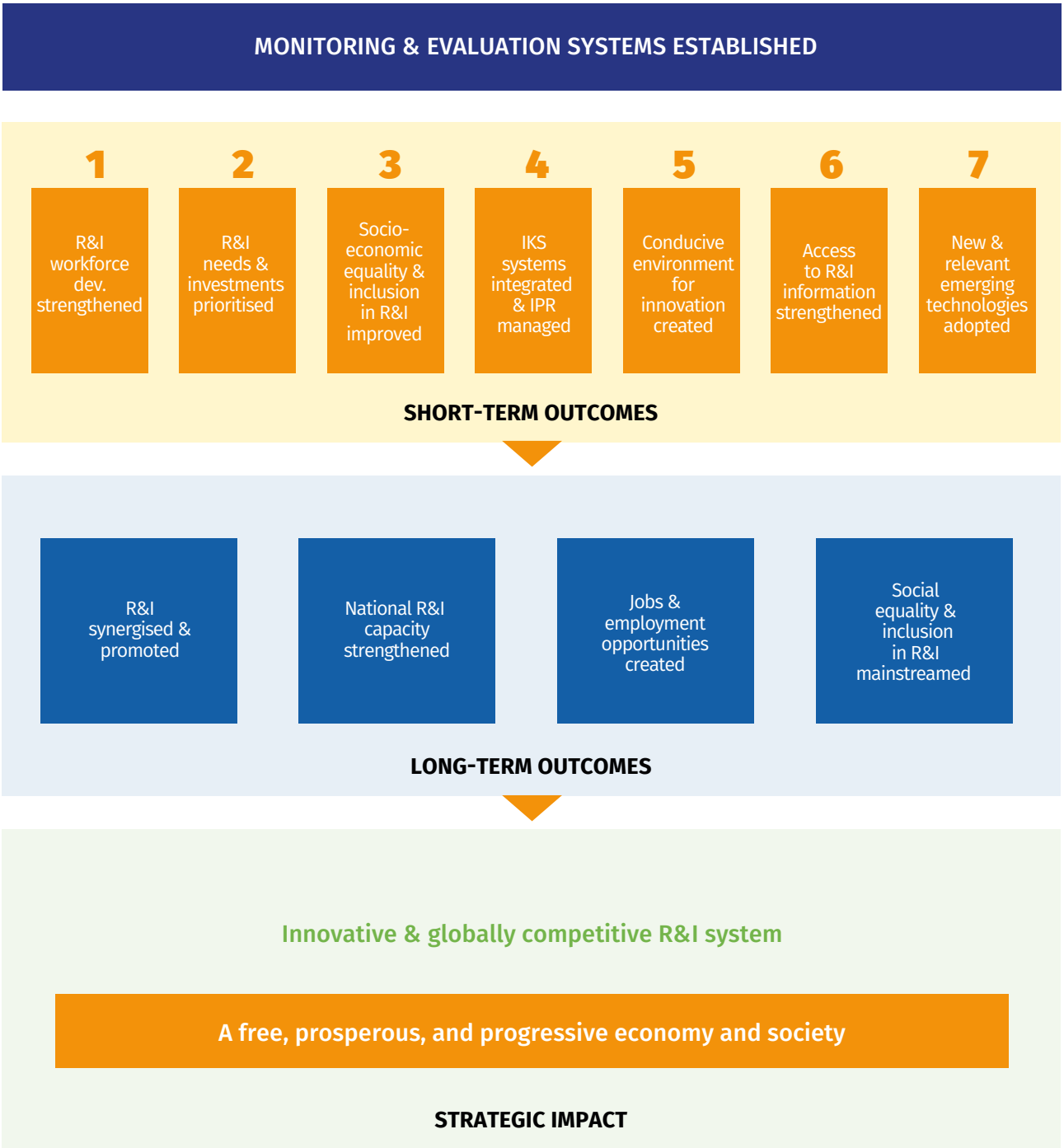
Having decided to adopt the principles of the result-based management to design the monitoring and reporting framework, the priority is to clearly define the results' chain[4], to be able to identify the objectives of future actions and plan activities to reach them. Thus, a proposal for consideration of the MCST is to develop a two-part monitoring and evaluation framework: one that will focus on monitoring Lesotho's performance in key global R&I indicators, the global innovation index and the relevant SDGs highlighted under the KPIs of the thematic interventions; and another dedicated to tracking and monitoring the MCST's achievements, and the DST's in particular. These are realised in the implementation of the national R&I policy following the logic of a results plan or chain of results from inputs to outputs, which will produce intermediate changes and final outcomes to the impact of the R&I policy to national development objectives and the SDGs, as shown in **Figure 6**.

This M&E framework is based on output and outcome indicators, and tries to identify the longer-term changes (or impact) that Lesotho's R&I interventions will produce, linking them to impact indicators that will be defined over time. The output and outcome indicators are derived from the thematic areas of policy intervention, which was generated through stakeholder engagements and a review of R&I policies and development blueprints of Lesotho, including a review of international best practices by the expert panel. This should be subject to a further review of the national team to elaborate key and relevant progress indicators through a comprehensive implementation plan. The M&E framework has three main components:

1. the results' chain,
2. the planning, monitoring and evaluation cycle (management cycle), and
3. the M&E plan.

4 The purpose of the results chain is to build a logical relationship between the expected results at different programmatic levels. It is built on the principle of aggregation of results, which implies that the aggregation of results at one level should make it possible to achieve the expected result of another level.

Figure 6 **The results chain for the proposed Lesotho R&I policy**



6.1.1 The results chain of the R&I policy

The results chain takes into consideration 7 expected results (or short-term outcomes) defined in this document and derived from policymakers in Lesotho during the stakeholder consultations and review of existing policies, other relevant documents and the country background report.

I. Improve the efficiency and effectiveness of workforce training programmes to respond to the socioeconomic, cultural and development needs of Lesotho (**R&I workforce developments strengthened**) to improve the relevance of tertiary and higher education, address the skills mismatch, improve the quality of education and the overall global footprint of Basotho higher education institutions.

II. Intensify investments in scientific research and development and strengthen local innovation and technological capabilities (**R&I needs and investments prioritised**). This also embeds the need to develop and strengthen sustainable financing mechanisms, and improves the effective collaboration between government, research, industry and society.

III. Align and mainstream STEM education with the Basotho culture to improve socioeconomic equality and inclusion in STEM education, research and occupations (**Socioeconomic equality & inclusion in R&I improved**).

IV. Mobilise indigenous knowledge systems (IKS) and grassroots innovations, strengthen effective protection and enforcement mechanisms for intellectual property rights, and create an open data platform for research and innovation to strengthen bottom-up job creation and economic growth (**IKS systems integrated & IPR managed**).

V. Improve the regulatory environment in support of innovative start-ups and MSMEs for employment creation, and implement accessible incentives and innovative tax measures (**Conducive environment for innovation created**).

VI. Support the adoption of technologies for emerging applications with a strong focus on technical training to initiate a rapid transition to climate-resilient technologies in agriculture, quality healthcare, ICTs and manufacturing digitisation, and for the transition to the green economy (**New & relevant emerging technologies adopted**).

VII. Strengthen various institutions' ability to manage their own data, make non-confidential information available on an open data platform (national digital depository under the BoS), and establish an open-access local journal publication of new R&I findings (**Access to R&I information strengthened**).

The idea at the basis of the R&I policy is that to create 'an innovative and competitive R&I system' for Lesotho there are 'intermediate results' to be achieved, such as R&I synergised and promoted, national R&I capacity strengthened, jobs and employment opportunities created, and socioeconomic equality and inclusion in R&I mainstreamed. However, these results can be achieved only if

- the R&I workforce development is strengthened,
- R&I needs & investments are prioritised,
- socioeconomic equality and inclusion in R&I are improved,

Figure 7 The logic model

Source: Own compilation

- IKS systems are integrated and IPR are managed,
- a conducive environment for innovation is created,
- new and relevant emerging technologies are adopted, and
- access to R&I information is strengthened.

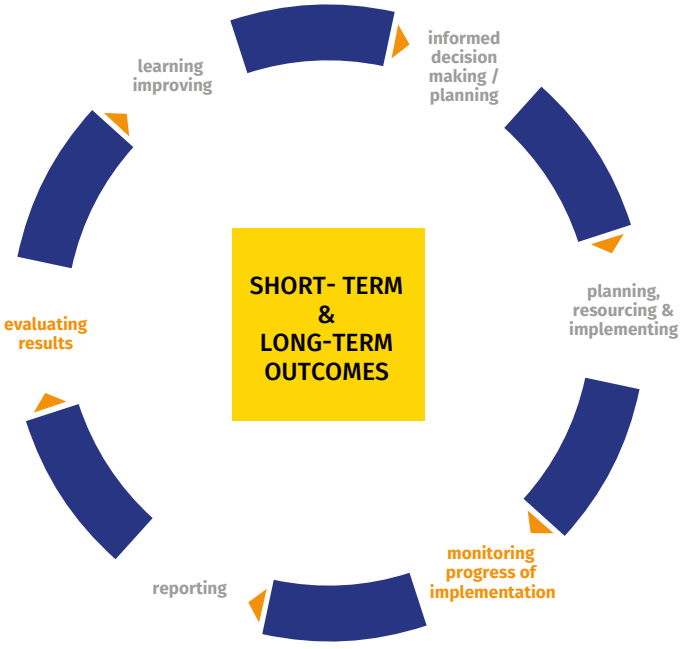
Having clearly defined the goal of the R&I policy and the milestones that have potential for a successful implementation, defining the implementation activities, the necessary resources, procedures, and timelines by the implementing agencies (see stakeholder analysis and power map in **Table 1** and **Figure 3**) will be done with a backward process (i.e. from the expected results to activities and inputs, in order to design the logic model seen in **Figure 7**).

6.1.2 The planning, monitoring and evaluation cycle

As previously discussed in the four stages of implementation, four stages are also involved in a results-based management system and illustrate the steps that must be taken to develop and implement the proposed strategic activities in thematic policy intervention section, as illustrated in **Figure 8**. This cycle begins with planning, which should be considered during the initial exploratory phase of implementation, where the DST/MCST in consultation with relevant partners develop a comprehensive implementation plan based on available evidence and defined expected results. At this stage there is a need to clearly identify the deliverables and the intended changes on the baselines. During this stage, the stakeholders implementing the R&I policy must also put in place a strong M&E system, and it is strongly recommended to establish or strengthen planning units under the DST, develop a detailed M&E work plan, identify the relevant indicators and frequency of measurement, establish review mechanisms (quarterly reviews of progress by senior management team at the MCST), and identify and build the required capacities.

The plan should also integrate mechanisms for both internal evaluation and external independent evaluation in order to improve confidence in the achieved results, and the continuous improvement and adjustment to the initial implementation plans. As alluded to earlier on, the need for creating a conducive environment for sharing experiences, disseminating information, sharing progress and successes, and incorporating feedback in the relevant phases of implementation is strategic to the overall learning and improvement. It is therefore recommended that a strong web-based information portal be created for the MCST, the stakeholders and the public to serve as a conduit for the exchange of relevant information.

Figure 8 **Proposed R&I policy management cycle**



Source: Own compilation

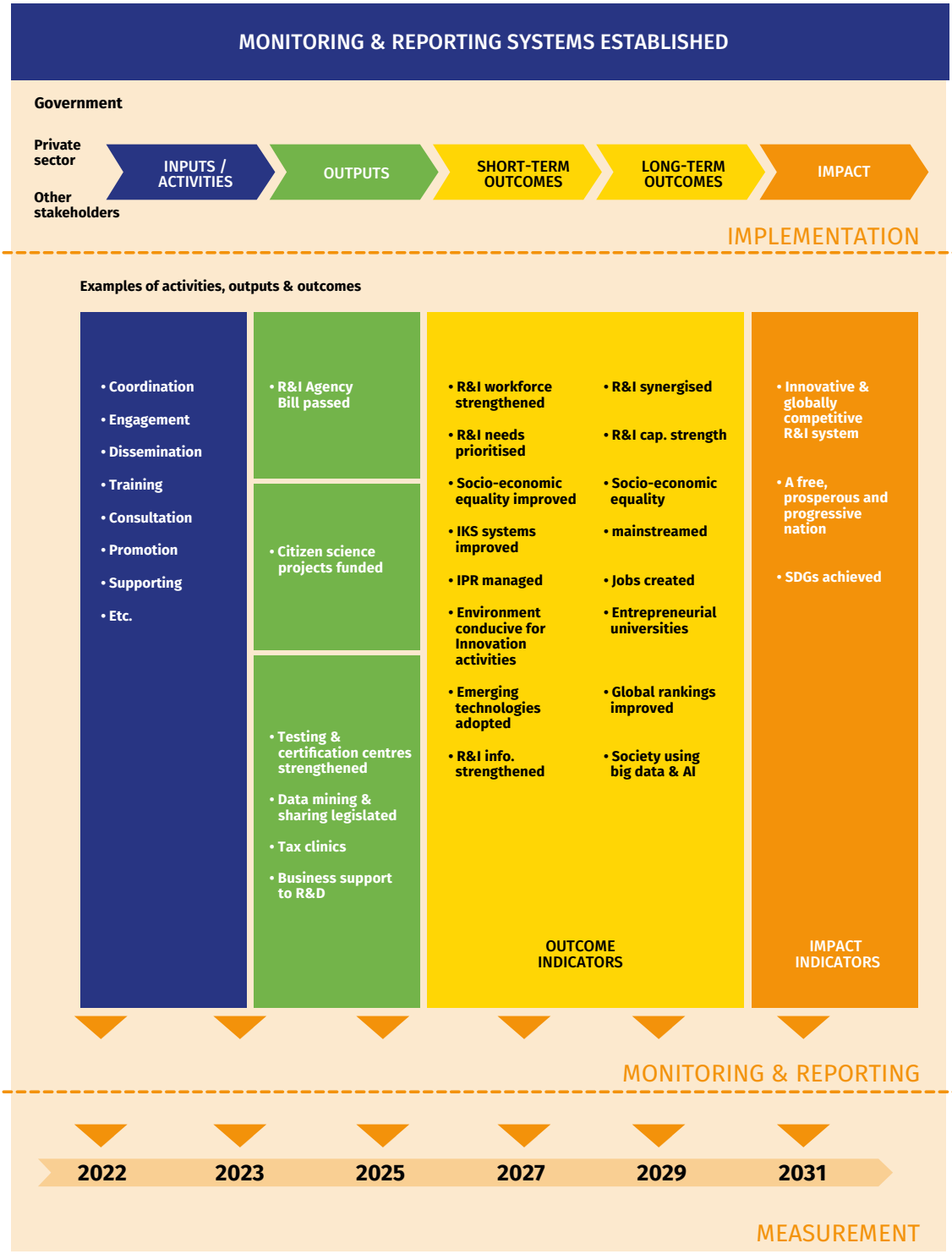
6.1.3 The proposed M&E plan

Considering the links in the hierarchy of objectives, the proposed M&E plan is represented in **Figure 9**. M&E is an asset strategic to assessing the performance of R&I policies and measures undertaken by Lesotho. Without an effective M&E mechanism in place, it is difficult to conduct research and innovation policy evaluations that could inform future policies and decisions regarding national R&I efforts. It is therefore highly recommended that the MCST prioritises the integration of an effective system for the implementation, monitoring and evaluation of national R&I policies. In addition, and beyond the PSF service, the MCST, working with the relevant stakeholders, should lead the process of developing a comprehensive implementation plan to provide an elaborate action plan that includes timelines and procedures to produce the desired outputs identified in this document and so induce the changes envisaged in the short and long term (see **Figure 6** and **Figure 9**).

The MCST in close consultation with relevant stakeholders should develop, elaborate and build consensus on a set of 'progress indicators' to use as 'frames of reference' for monitoring the progress on the implementation of actions to achieve the expected results (outputs, outcomes, and longer-term changes or impact). Each of the outputs and outcome indicators should provide details, including baselines, targets, indicator tracking (by who and when) and sources of verification. These indicators should also be aligned with international STI indicator initiatives such as the African Science, Technology and Innovation Indicators (ASTII), UNESCO Institute for Statistics (UIS) STI Data and the Global Innovation Index (GII), among others.

Figure 9

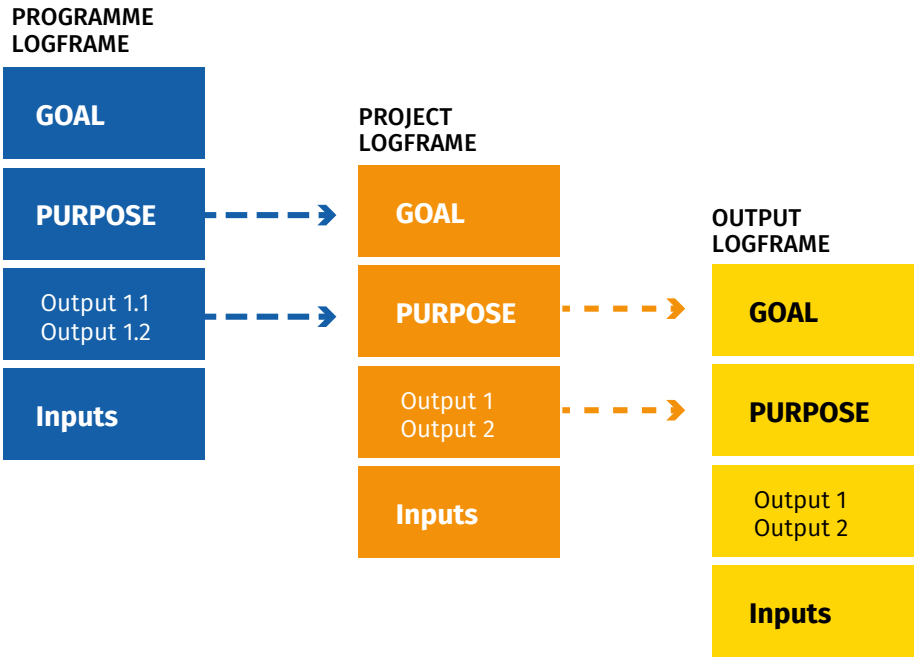
Proposed M&E plan for implementation of the R&I policy of Lesotho



Source: Own elaboration

Figure 10

Relationship between programme, project & activity logical frameworks in the implementation of R&I policies



Source: Own elaboration

6.1.4 The project design for R&I policy implementation

The programme and project design for the implementation of Lesotho's R&I policy should be led by the MCST/DST with support from all the key stakeholders in the R&I ecosystem. This exercise requires a number of managerial and technical skills and must not be conducted by an individual in isolation. Examples have been provided in **Table 4**, but it is best if policy proprietors lead the process of developing a complete logical framework or review and adopt the proposals from this PRR, co-opting members with specific skills in this area.

The MCST/DST could assess and adopt the proposed programme-level activities, of which 7 have been provided in this PRR. Programme-level managers should be identified who could further develop their own logical framework to design detailed programmes. The reason for each programme level would be recorded as the purpose of that programme. In this PRR, the purposes are referred to as 'outcomes' and each of the projects required to achieve the programme's purpose are recorded as 'outputs' of that programme. Each output of a programme (project) should be assigned to a project manager, and the output is regarded as the purpose of that project. The project goals are, therefore, the purpose of the programme it falls under, as shown in **Figure 10**.

6.2 MECHANISMS FOR FINANCING R&I POLICY IMPLEMENTATION

6.2.1 Estimated costs by R&I programmes

The estimated budget for recommended R&I programmes in Lesotho for the next 10 years, starting in 2022, is approximately EUR 36.7 million (which is about LSL 655 million) as presented in **Table 4**. This estimate translates to EUR 3.67 million per year (about LSL 65.5 million per year) and is roughly 0.18 % of the 2021 national budget. It is to be intended as a preliminary indication, while a more precise quantification will be possible when the programmes are transformed into concrete projects by the MCST/DST and the related implementing agencies.

There is a strong need for commitment from the government to successfully implement the R&I policy's 7 recommended programme areas as strategic priorities. With this minimum level of investment, the R&I policy will be able to offer enhanced opportunities to even more researchers and innovators, making a tangible contribution to bridging the research and innovation divide and participation gaps in the country and beyond.

6.2.2 Potential sources of funding

A viable financial landscape is at the core of enhancing the national R&I ecosystem. This is imperative for this R&I policy to function in tandem with other policies (such as the fiscal and industrial policies) of the Lesotho Government in order to attract public as well as private sector contributions to the strengthening and growth of the national R&I ecosystem.

Government's efforts

The government's financial support to establishing the RAI and the RIF is essential to strengthen the R&I ecosystem in the country, by building local institutional capacity and skills development to reduce the heavy reliance on external donations. A firm commitment by the government to promote R&I in the country has to be expressed in terms of annual allocation (GBARD and government expenditure on R&D – GERD) from the national budget (e.g. 0.05 % of GDP). This will be the first step towards affirming its ratification of the SADC Protocol on Science, Technology & Innovation (1 % of GDP by 2010), STISA, etc.

Private sector

To build a robust national R&I ecosystem, local private enterprises should be encouraged to contribute to the RIF. Large businesses and state-owned entities could be incentivised to contribute a compulsory R&I levy (e.g. 0.05 % of annual turnover) that is tax deductible. The private sector should also be encouraged to collaborate with academic institutions and pursue market-relevant research through mutually decided agreements. Furthermore, various collaborative academia-industry-civil society clusters based on the quadruple helix model could be encouraged (manufacturing, ICTs, etc.)

International cooperation and development partners

Other potential funding sources, apart from the government's leading role supported by the state-owned entities and local private sector, can include SADC, the African Union, the European Union via R&I programmes such as ERASMUS+ and HORIZON Europe, the World Bank, UK Research and Innovation, USAID – National Science Foundation, Canadian

International Development Agency, Japan International Cooperation Agency, Korea International Cooperation Agency, Swedish International Development Cooperation Agency, Next Einstein Forum and many others. The recommended national R&I agency should undertake the coordination of funding and the harmonisation of activities.

Table 4 - Summarised logical framework for R&I policy implementation

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
R&I POLICY GOAL			
To contribute to the creation and strengthening of home-grown research and innovation capacities, capabilities and competencies to support and enhance attainment of sustainable socioeconomic and environmental development in Lesotho.	**Measure of goal achievement:** **National capacities for R&I systems, institutions and personnel significantly improved in Lesotho by the end of the 10-year period**	**How do you verify?** • **National STI surveys** • **ASTII African Innovation Outlook Series** • **Global Innovation Index reports**	**Concerning long-term value of R&I policy goals** **Sustained political buy-in over time**
PURPOSE			
To establish and strengthen a well-managed system of scientific and technological research and innovations that contributes to a knowledge-based economy in support of improving the quality of life with equity for the Basotho.	**Conditions that will indicate purpose has been achieved: End-of-policy status** 1. At least 25 % of R&I policy programmes and projects adopted and implemented within 3 years of ratification 2. A national R&I Agency bill passed, and agency established and functional within first 3 years 3. At least 30 % of recommended policy programmes mainstreamed in MDA's activities 4. At least 45 % of R&I policy programmes fully integrated into national and regional planning and programming activities at the end of 7 years of policy life	a. Reforms in R&I activities implemented and documented in national reports b. Annual MCST / DST reports (including R&I Agency reports) c. Reports of R&I studies in Lesotho conducted with stakeholders d. Sectoral reports on R&I services e. Records of national statistics and budget reports	**Affecting purpose to goal link:** i. Availability of adequate funds[5] ii. Strong and long-term political commitment iii. Development of a detailed implementation plan, stakeholder buy-in and integration of R&I programmes iv. Good environment for co-creation and cross fertilisation of ideas v. Availability of adequate political and public support, and willingness for change.

5 If engineering disciplines are going to increase, then new equipment, labs, etc. will have to be funded. Robotics and telecom equipment are very expensive so the issue of how these will be funded needs to be addressed.

Table 4 - Summarised logical framework for R&I policy implementation

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
OUTCOMES			
1) R&I workforce development in HE and TVET significantly strengthened **2) R&I needs and investments prioritised** **3) Socioeconomic equality & inclusion in R&I promoted** **4) IKS systems and IPR management strengthened** **5) Created a productive environment for R&I** **6) The use and adoption of new and emerging technologies promoted** **7) Access to R&I information strengthened**	**Magnitude of outcomes necessary and sufficient to achieve purpose** 1. A national R&I fund established and operational within first 3 years 2. 70 % of faculty in TVET and HEIs obtained doctoral-level qualifications 3. 90 % of new graduates are employed within 3 months of graduation 4. All TVET and HEIs are entrepreneurially engaged (licensed for technology & commercialisation) by the end of the 10-year period 5. At least 20 % of new graduates create new companies each year 6. At least 50 % of R&I infrastructure improved during first 5 years 7. Laws, regulations and instruments in favour of promoting R&I established 8. Capacity for data analytics and management built for all key institutions 9. At least one R&I collaborative project launched annually	a. Government annual budget appropriations b. R&I surveys c. Project documents d. Reports form TVET & HE institutions e. MCST & MoET policy briefs f. MoUs signed g. National statistics reports h. Trade statistics i. World ranking of higher education institutions j. Bibliometric data	**Affecting outcome to purpose link:** i. Development of an elaborate implementation plan ii. Stakeholders buy-in and localisation of plans, programmes and activities, and agreements reached iii. Adequate resources from ministries of finance allocated iv. Consistency and flexibility in approach to STI development encouraged v. Effective cooperation from other ministries and sectors encouraged vi. Local community support tapped vii. Capacity of parliamentarians built
OUTPUTS			
1.1 Developing internships and industrial placement for graduates (€ 450 000) 1.2 The quality & global relevance of TVET institutes and HEIs including employability of graduates improved (€ 450 000) 1.3 Higher education and TVET transformation through entrepreneurship (€ 700 000) 1.4 R&I capacity building for universities and TVETs (€ 1.5 million) 1.5 Research fund for the promotion of collaborative research activities (€ 900 000) 1.6 Citizen science promotion initiative (€ 800 000) 1.7 Capacity building for the use of real-time and big data analytics (€ 700 000) 1.8 Establish national STI observatory (€ 1.5 million)	**Magnitude of outputs necessary and sufficient to achieve outcomes** A. At least 80 % of graduates secure employment during first year of graduation B. 20 % of graduates go on to form companies C. At least 50 % of revenue for TVET institutes & HEIs comes from entrepreneurial activities D. National R&I fund established and operational with first 3 years of policy E. R&I advocacy and national literacy rate significantly improved F. Capacity for data analytics strengthened G. National observatory for R&I established and operational within 5 years of policy **Estimated cost (€): 7 million**	a. Employment statistics b. Registry of companies c. Annual budgetary allocations for TVET institutes and HEIs d. Annual report of TVET institutes and HEIs e. STI literacy survey reports f. STI statistics g. National bibliometric reports and policy briefs **Responsible agencies** 1. MoET, CHE, TVETs and HEIs 2. MCST, industry partners 3. RIA, LRA 4. Other relevant public and private sector bodies 5. Schools and local communities 6. All ministries and government departments, private sector actors	**Affecting outcome to purpose link:** i. Programmes and project components well-coordinated ii. Programme coordination at ministerial level established iii. Adequate financial and human resources provided iv. Programme coordination with relevant international partners and multilateral organisations strengthened v. Learning and performance management systems established

Table 4 - Summarised logical framework for R&I policy implementation

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
2.1 Develop legislation to establish a national R&I agency and R&I fund, including its operation and management (€ 20 000) 2.2 Financial support for the R&I Agency staff and operations (€ 7 million) 2.3 Launch National Foresight Programme on R&I (€ 250 000) 2.4 Promote national academies of science activities (€ 400 000) 2.5 Promote public procurement for innovations (€ 50 000) 2.6 Develop and implement a strong measurement, standards, testing and quality system (€ 280 000)	A. National R&I Bill drafted, reviewed and ratified during 3 years of policy B. National R&I Agency established and operational at least during the first 5 years of the policy C. Government budget allocations provided D. At least 50 policymakers trained on long-range planning and technology foresight E. National academies of science established and supported during first 5 years of policy F. Award at least 50 % of government contracts and technology procurement to local companies G. National Standards Bureau activities strengthened. At least 30 % of local MSMEs are familiar with standards and certification processes **Estimated cost (€): 8 million**	a. Government gazettes b. Annual budget allocations of DST c. MCST annual reports d. Reports from the Academy of Science & Technology e. National innovation surveys f. Financial reports g. National statistics **Responsible Agencies** 1. DST, MCST, MoET, MDP, MoF and Office of Parliamentary Counsel 2. Government of Lesotho, MCST, DST, RIA 3. MTI, MSBD, Standards Bureau, Chamber of Commerce	i. R&I capacity of parliamentarians strengthened ii. R&I capacity of high-level policy and decision-makers strengthened iii. Adequate numbers of staff trained in relevant institutions iv. Provision of adequate human and material resources
3.1 Conduct R&I and socioeconomic equality advancement studies (€ 300 000) 3.2 Develop and implement a socioeconomic equality strategy in R&I (€ 350 000) 3.3 Capacity building of parliamentarians and high-level policymakers (€ 50 000) 3.4 Develop & enact legislation on the strengthening of socioeconomic equality in R&I (€ 30 000) 3.5 Develop & implement 'Leave no-one behind' and R&I advocacy programmes (€ 470 000)	A. National studies on R&I and gender, disability and other marginalised groups' advancement conducted within first 2 years of policy B. Access to equal opportunities provided for both male & female graduates and professionals C. At least 80 % of parliamentarians & 50 % of high-level policymakers trained within first 3 years of policy D. At least 1 'Leave no-one behind' advocacy programme designed & implemented in rural and urban areas annually **Estimated cost (€): 1.2 million**	a. Gender advancement and R&I study reports b. Employment statistics c. Education statistics (disaggregated) d. DST Annual Report **Responsible Agencies** 1. MoET, MCST, MGY and MSD, other relevant ministries and government departments and agencies 2. MGY, MSD, MDP, other relevant ministries, government departments and agencies, NGOs	i. Socioeconomic equality unit established and operational ii. Society willing to abandon negative stereotypes, norms and practices iii. Adequate resources are provided
4.1 Establish technology information support centres (TISCs) in each region (€ 750 000) 4.2 Build national capacities for R&I data and indicators management (€ 1 million) 4.3 Create and support a network of IKS experts, grassroots innovators and professional associations (€ 2 million) 4.4 Strengthen capacities of national offices for IPR management (€ 650 000) 4.5 Design and launch a national IPR advocacy programme (€ 1 million)	A. At least 1 TISC established in each TVET & HE institution across the country during first 5 years of policy B. Effective data management training conducted for at least 100 data officers in various sectors C. Establish, train and support at least 5 professional associations D. Training provided for 10 IP examiners and 5 IP policy experts E. IPR awareness campaign designed and launched **Estimated cost (€): 4.5 million**	a. Annual reports of TVET and HE institutions b. DST/MCST annual reports c. National innovation outlook d. Periodic African Innovation Outlook Reports e. IPR registry f. National IPR statistics **Responsible agencies** 1. MCST/DST 2. HEIs 3. BEDCO 4. IKS Council, LAI	i. IPR experts identified & trained ii. Funds for educational institutions to established TISCs provided iii. Funds provided for data training iv. Professionals are willing to work together v. Multi-stakeholder agreements made

Table 4 - Summarised logical framework for R&I policy implementation

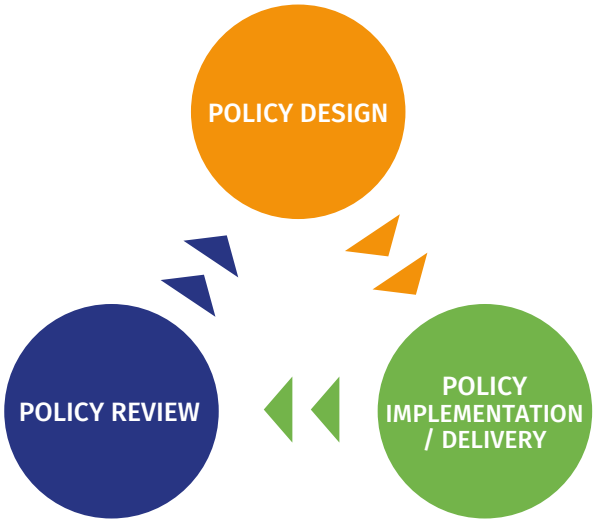
NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
5.1 Extend one-stop business facilitation centre (OBFC) services to other districts (€ 1 million) 5.2 Revise the Partial Credit Guarantee Scheme (PCGS) to cover MSMEs and start-ups (€ 20 000) 5.3 Create new and support existing innovation hubs (€ 4 million) 5.4 Undertake business education and advisory programmes on registration, tax compliance and financial accounts preparation (€ 450 000) 5.5 Revise / amend existing revenue legislation to simplify tax regime (€ 300 000)	A. Provide OBFC services to all 10 districts within 7 years of policy period B. PCGS revised within first 3 years of policy C. Budget vote for supporting innovation hubs created D. Business education and advisory services in all districts provided E. New tax laws promulgated **Estimated Cost (€): 5.5 million**	a. Ministry of trade/ small businesses reports b. Ease of doing business index c. Government budget appropriations d. National gazette **Responsible agencies** 1. MTI, MSBD, MoF, LRA 2. MCST, MoET, RIA 3. Private sector, BAL, LNDC, BEDCO 4. HEIs, TVETs, national labs and centres of excellence	i. Provision of adequate resources ii. Relevant stakeholders adequately engaged iii. MCST budget negotiations for vote allocations well-coordinated
6.1 Establishment of legislative and regulatory framework to support quadruple helix model (€ 50 000) 6.2 Build and strengthen linkages/relationships between local and international R&I actors (€ 1.5 million) 6.3 Annual contribution to establishment of new and maintenance of existing R&I clusters, private sector mentors and other essential support services for spin-offs, start-ups, scale-ups (€ 2 million) 6.4 Establish annual R&I priority areas with particular emphasis on technologies that capture natural capital, green and low-carbon technologies relevant to the Lesotho context (€ 2 million) 6.5 Annual national audit of progress in efficiency of digitalised and computerised public sector services and manufacturing technologies (€ 250 000) 6.6 ICT systems to support open and distance learning (€ 1 million)	A. Laws for promoting quadruple helix model of innovation drafted and enacted B. Smart alliances between local and international R&I institutions established C. A budget vote for supporting spin-offs and start-ups created D. National annual R&I conferences and seminars conducted E. National survey of public sector innovation conducted F. Digital transformation of TVET and HE institutions encouraged **Estimated cost (€): 6.8 million**	a. National gazette b. MoUs signed c. Annual budget appropriations d. Conference & seminar reports and proceedings e. Survey reports f. Annual reports g. TVET & HEIs digital footprint h. TVET & HEIs web presence (webometrics) **Responsible agencies** 1. MoET, MCST, RIA, industry representatives 2. HEIs, TVETs, PSF 3. MCST, MDP 4. Other relevant government departments and agencies 5. Basotho diaspora	i. Relevant sectors engaged ii. Buy-in and ownership secured iii. Adequate funding provided iv. International R&I institutions convinced v. Basotho in the diaspora engaged vi. TVET and HEIs are supported

Table 4 - Summarised logical framework for R&I policy implementation			
NARRATIVE SUMMARY	**OBJECTIVELY VERIFIABLE INDICATORS**	**MEANS OF VERIFICATION**	**IMPORTANT ASSUMPTIONS**
7.1 Annual subscription to relevant academic journal search engines: Jstor, CORE, Science Direct, IEEE, Scopus, etc. (€ 500 000) 7.2 Set-up and maintenance costs associated with national open access R&I data platform (€ 300 000) 7.3 Access to relevant SADC, African Union and international open access R&I data platforms (€ 400 000) 7.4 Annual national R&I fair (€ 1 million) 7.5 Host annual (R&I) conferences to attract international innovation, R&I practitioners and potential regional/ international investment (€ 1.5 million)	A. Support for subscription to peer-reviewed international journals provided annually B. Government budget support for all R&I institutions improved C. Open access to R&I information encouraged. D. At least one national data platform established E. At least one national R&I conference and expo annually F. At least quarterly R&I seminars conducted annually G. A development partner review conducted twice a year **Estimated cost (€): 3.7 million**	a. Annual budget allocations b. Receipts of subscriptions c. Bibliometrics d. MCST/DST reports **Responsible agencies** 1. MoET, MCST, DST, RIA 2. MDP, BoS, other ministries and government departments 3. TVETs, HEIs, national Labs / CoEs 4. Private sector, IKS Council, LAI	i. Sufficient budget allocations provided ii. Universities and tertiary institutions adequately prepared iii. Other relevant stakeholders sufficiently involved
TOTAL ESTIMATED COST = EUR 36.7 MILLION			

6.3 R&I POLICY IMPLEMENTATION CONCEPTUAL FRAMEWORK

Figure 11

Proposed policy cycle for Lesotho R&I policy



Source: Own elaboration

The recommended R&I policy of Lesotho consists of a series of activities intended to be undertaken by the government and its institutions, mainly the DST under the MCST and other relevant ministries, departments and agencies, key private sector and non-governmental organisations to achieve the goals and objectives articulated in policy statements under the thematic areas of this document. Policy implementation sits within the 'policy cycle', which involves policy design followed by policy delivery and then policy review (see **Figure 11**). In practice, however, the lines between these stages in the policy cycle can become quite blurred.

The policy decisions reached in this document, including the policy goals, objectives, strategic activities and KPIs, have been generated based on sound evidence. This high-quality information was derived from a variety of sources, including expert knowledge, existing local, national and international research, existing statistics, a review of research on the topic, stakeholder consultations and an evaluation of previous policies, as well other relevant national policies and other important documents.

From the review of the national blueprint, which is currently the NSDP II, the existing R&I policies of Lesotho and the outcomes of the stakeholder engagements, coupled with expert synthesis and analysis, are the grand vision towards which the national R&I capacity is being directed as elaborated in the implementation logical framework, along with the respective outcomes, activities, indicators and assumptions.

The proposed logical framework matrix does not follow any reasoned sequence of events and activities, in the same way that the implementation of policies in the real world rarely follows any linear path. It is therefore recommended that the authorities in the country, more specifically the DST under the MCST, pay special attention and carefully execute the recommended activities under the four stages of policy implementation provided here beyond the scope of the current OACPS Policy Service Facility.

6.4 STAGES OF R&I POLICY IMPLEMENTATION

The research recommends four key stages in an implementation process, including:

- exploration and preparation,
- planning and resourcing,
- initial implementation and operationalisation, and
- full implementation and systems integration.

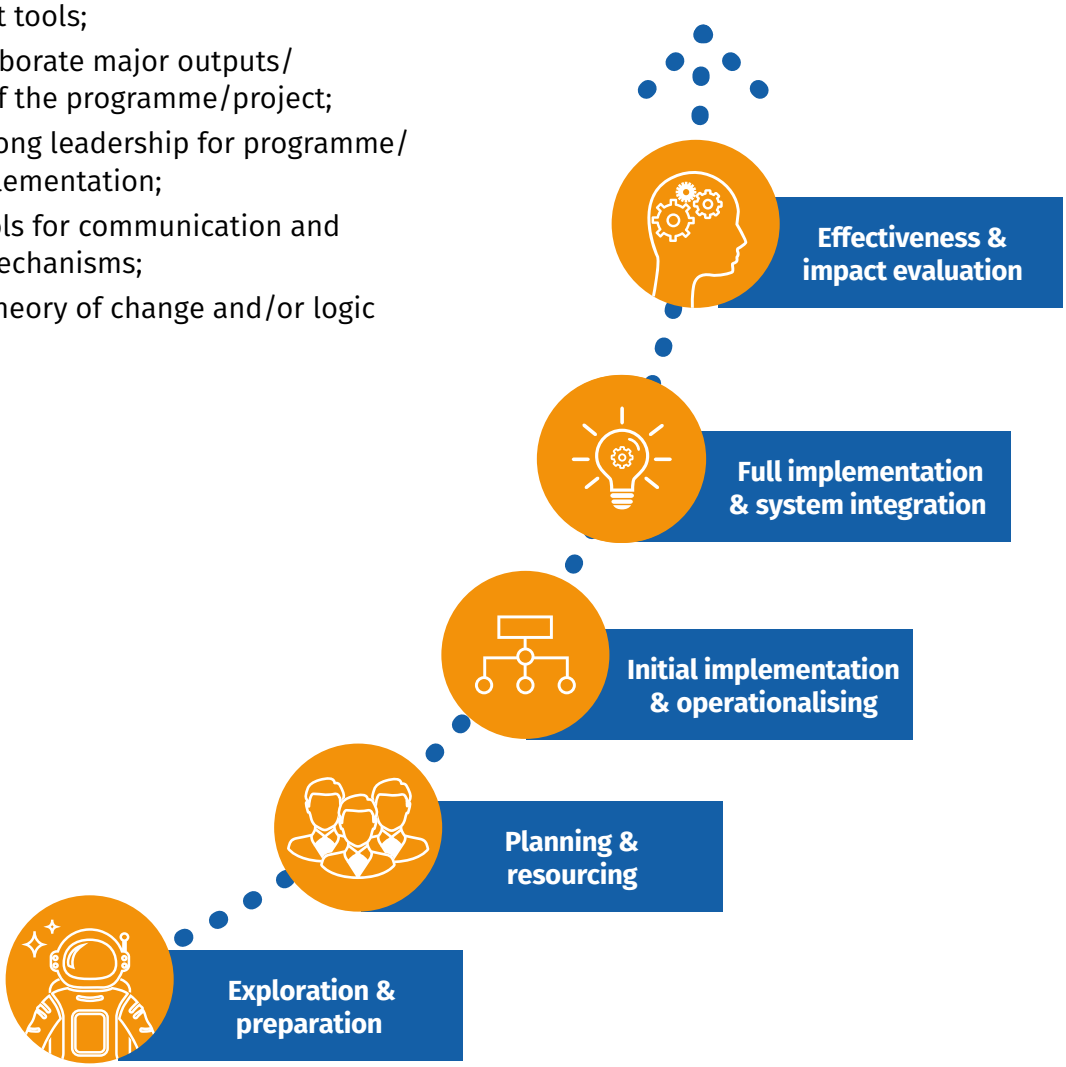
The 'exploration and preparation' stage allows for familiarity with proposed interventions and an assessment of the existing capacities and required resources. During the implementation and operationalisation stage, proposed interventions are implemented for the first time, allowing time and room for review and improvement prior to the full implementation of the intervention. It is highly recommended for those implementing to exercise a great deal of patience going through the four stages sequentially without skipping any, thus ensuring the effectiveness of implementing the proposed interventions. In the paragraphs that follow, concrete recommendations are provided on what needs to be conducted for each stage of the implementation procedure.

During the first stages of implementation, also called the 'exploratory' or 'preparatory' stage (see **Figure 12**), opportunity is provided for prioritisation and deciding what needs to be implemented, based on the available resources and existing capacities. It is also called the key decision-making phase of implementation and requires additional consultation with stakeholders to build consensus and secure their acceptance, create a supportive environment and identify the champions of change. The following activities are recommended at this stage:

- Assess readiness and capacity for implementing specific programmes/ projects;
- Conduct needs assessment and examine the evidence for the specific programme/ project;
- Assess fit (hierarchy of objectives), feasibility (economic, social and environmental) and relevance to local needs;
- Develop and deploy stakeholder engagement tools;
- Identify/elaborate major outputs/ outcomes of the programme/project;
- Develop strong leadership for programme/ project implementation;
- Develop tools for communication and feedback mechanisms;
- Develop a theory of change and/or logic model.

Figure 12

Stages of the R&I policy implementation



Source: Own compilation

During the second stage of the policy implementation, also called the 'planning and resourcing stage' of implementation, careful planning is required to integrate aspects of performance management, distribution of task, assigning responsibilities, creating timelines, developing monitoring mechanisms, securing funding and instituting learning. These are strong foundations for effective delivery. The following activities are recommended during this stage:

- Develop a detailed implementation plan;
- Develop a plan for stakeholder engagement, consensus building and buy-in;
- Identify an implementation team/ committee to guide the process;
- Engage local funding agencies, negotiate for a vote (cost centre or line item) in the annual budgetary allocations;
- Engage local and overseas development partners if funding gaps exist;
- Design a results-based monitoring and evaluation framework or a performance management system, outlining individual tasks and responsibilities;
- Assess the drivers and barriers to implementation;
- Develop and implement a training plan for existing and new staff, and most importantly;
- Develop and integrate a programme/ project sustainability plan.

During the third stage, also called the 'initial implementing and operationalising' stage, when the programme/project is implemented for the first time, attention to detail is required. The implementation plan developed in the previous stages should guide the way the activities are conducted, and the communications tools developed previously should be effectively used during this stage. Implementation often starts slowly, usually with a pilot before it is rolled out to the entire population. During this stage, it is important to increase stakeholder engagement and avoid eroding their courage and enthusiasm.

Relevant documentation and other important information should be widely shared with stakeholders and those responsible for delivery. Hoarding information or creating unnecessary silos can be detrimental at this point. As the implementation plan is used to guide the process at this stage, it should be subject to constant reviews and adjustments to reflect the changing circumstances and contexts. During the third stage, the following activities are highly recommended:

- Maintain effective communication with team/committee responsible for implementation;
- Intensify stakeholder engagements to build consensus and continued buy-in of the programme/project;
- Create opportunities for continuous professional development of staff and other programme/project partners;
- Provide opportunities for coaching and mentoring were necessary;
- Develop and integrate monitoring dashboards (with quality data and feedback loops) to continuously track the implementation progress and timely identify challenges;
- Continuously adapt the plan to the local context and any changing circumstances.

The fourth and final stage of policy implementation is characterised by implementing the key policy interventions. It is at this stage that all the key implementation components and associated programmes and projects have been well established. This

stage is also characterised by the degree of investment in time and other necessary resources to realise the major policy goals, and signals the need to conduct an assessment of the main outcomes of the policy interventions. At this stage, the following activities are recommended:

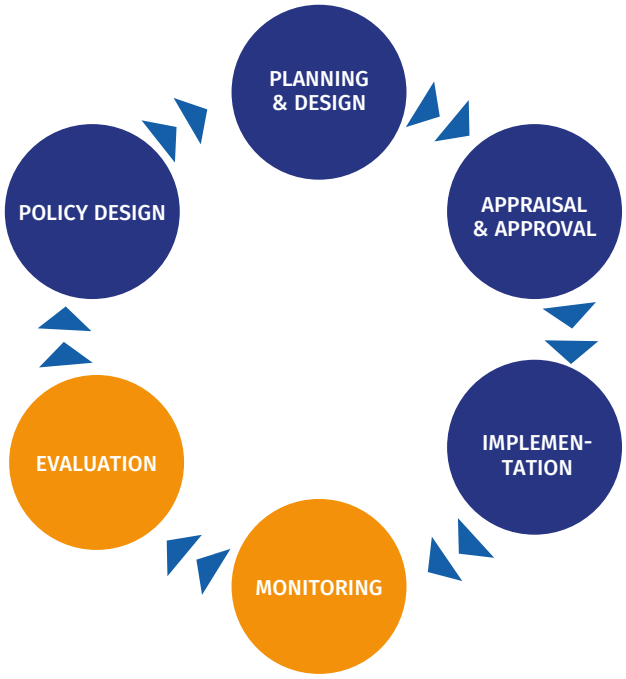
- Reflect on the implementation processes/programmes/projects and learn from the experience;
- Assess programme outcomes and deliverables;
- Evaluate set targets against baselines;
- Identify issues and problematic interventions that need improvement;
- Identify and replicate winning interventions and practices.

In a public intervention, there are six steps in the whole management cycle as illustrated in **Figure 13**. The cycle starts with planning and designing, i.e. to set the goal, objectives, targets, activities and results of the intervention (programme or policy). Then it will be appraised and approved. Following appraisal and approval, it will be implemented, monitored and evaluated. The results of the monitoring and evaluation will provide feedback for the planning and design of the next intervention.

While monitoring is an internal activity that is the responsibility of those who manage the implementation plan and procedures, it involves the continuous or ongoing collection and analysis of data on implementation activities, reviewing progress, and comparing the actual progress with what was initially planned so that adjustments can be made during implementation.

Evaluation on the other hand is a periodic assessment of the relevance, efficiency, effectiveness, impact and/or sustainability of a policy activity or intervention. It also measures the effects of policy interventions and compares them with the goals and objectives of the policy interventions set during the design stage. The logical framework approach has been proposed extensively in this PRR to facilitate the production of an evaluable R&I policy design for Lesotho. There is room, therefore, to clearly define the objectives, and develop a hypothesis and indicators of success at each level of the programme or project hierarchy of the R&I policy.

Figure 13 **Management cycle for R&I policy**



Source: Own compilation

6.5 FRAMEWORK CONDITIONS FOR EFFECTIVE R&I POLICY IMPLEMENTATION

The effective implementation of Lesotho's R&I policy requires careful planning and attention to detail. Care has been taken during the development of this PRR by the expert panel and reference is made to the stakeholder consultations to ensure that key issues that may affect effective implementation are detailed for reference to the DST and MCST, beyond the OACPS Policy Service Facility for Lesotho. Key among these are the political and technical considerations in implementing the recommended interventions (in Chapter 4) of this document. The political considerations refer to setting a clear vision, mission, guiding principles, securing political buy-in, and managing challenges and opposition in the implementation of the R&I policy, which are issues beyond the control of the PSF service.

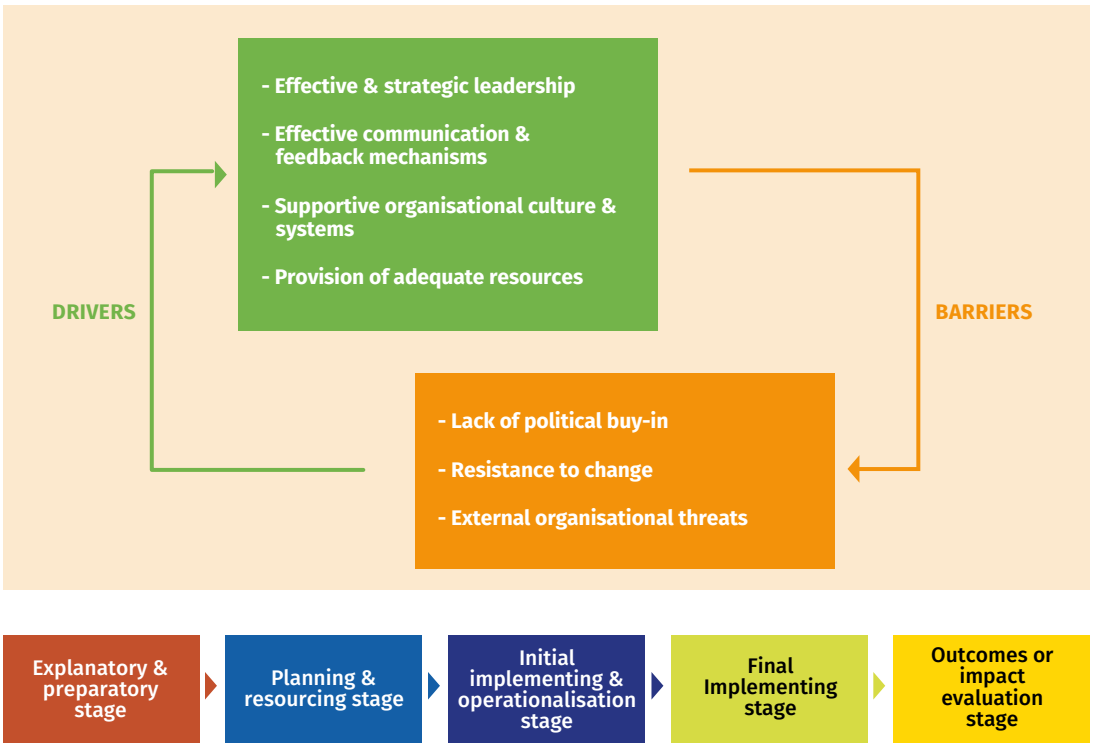
Great attention has been accorded in the process of developing this document to the technical issues vis-à-vis what potentials exist and what works for Lesotho according to data and evidence, but implementation planning and related technical issues such as legislation or regulations are the responsibility of the implementing agencies. Additional recommendations have been provided from existing research on what factors enable or serve as hindrances to effective implementation (see **Figure 14**), which have been provided in this chapter.

The major enabling factors for successful policy implementation are to:

- **secure political buy-in and effective stakeholder engagement.** This ensures that the policy is, overall, in line with government socioeconomic development objectives. Effective engagement with relevant stakeholders ensures building consensus on those cross-cutting issues in the implementation of R&I interventions that affect the mandates of stakeholders other than the ministry responsible for R&I policy. These engagements and realignments are necessary throughout the policy development and implementation phases.
- **provide effective and strategic leadership.** This ensures continuous political buy-in, mobilising resources, maintaining team spirit, staff motivation, conducting periodic functional review of mandates, performance frameworks, programmes and structures. It is strongly recommended that the Government of Lesotho maintains consistency and programme continuity among the selected leaders and staff appointed at strategic leadership positions (i.e. senior government officials) to maintain a fixed tenure of office that is not affected by changes in the country's political leadership.
- **maintain effective communication and feedback mechanisms.** These develop and maintain a focus on building and sustaining strategic relationships between and among relevant stakeholders in the R&I ecosystem. Effective communication is key to share relevant information (risks, wins, milestones, challenges) with stakeholders that can, in turn, provide feedback to correctly keep the implementation progress under constant check. Additionally, maintaining effective and continuous communication with staff contributes to their motivation, trust, reduces resistance to change and creates feedback loops. The establishment/strengthening of a communications unit under the DST with clear terms and mandates is recommended.

Figure 14

Representation of the drivers and barriers to the effective implementation of R&I policy



Source: Own compilation

- **create a supportive organisational culture and systems.** In the form of organisational norms, values, rules, policies and procedures, this culture and systems improve management and the propensity of succeeding with implementing programmes. To ensure an effective implementation of recommended innovations of Lesotho's new R&I policy, these must become intrinsically embedded within the culture of MCST. If the prevailing organisational culture of the MCST is at odds with these proposed mechanistic changes, it would be necessary to unlearn and re-learn through behavioural and attitudinal adjustments. The establishment of a functional performance management and learning system is therefore recommended.
- **provision of adequate resources.** These resources are in the form of appropriately trained staff, including continuous professional development and the staff learning from experience. Additionally, government resources are limited, and R&I agencies will be competing with other priorities for an allocation of resources. These resources are vital to the successful implementation, therefore a comprehensive implementation plan must be prepared and budget negotiations conducted with the Ministry of Finance for the allocation of adequate resources. Selling the R&I policy to development partners will also be vital to meet the current gaps in funding.

Bibliography

AECOM, 'Legislative and Policy Review for the Water Sector in Lesotho', Report Addressing Harmonization of Legislation Challenges Through Cooperative Governance Approaches, EC Multiple Framework Contract Beneficiaries Programme, Project No CRIS 2016/37412/1, 2018.

AU, 'African Youth Charter', 2009; https://au.int/en/treaties/african-youth-charter; accessed 30 September 2021.

AU, 'Agenda 2063: The Africa We Want', 2013; https://au.int/en/agenda2063; accessed 15 September 2021.

AU, 'Science, Technology and Innovation Strategy 2024 – STISA 2024', 2020; https://au.int/en/documents/20200625/science-technology-and-innovation-strategy-africa-2024; accessed 20 June 2021.

BOU, 'Research and Innovation Policy', Centre for Innovation and Research, Botswana Open University, August 2018.

Cadogan, M., 'Using SDGs to Leverage National Intellectual Property Strategies', New Thinking on SDGs and International Law – Policy Brief No 2, September 2019. https://www.cigionline.org/publications/using-sdgs-leverage-national-intellectual-property-strategies/

CHE, 'Higher Education Policy for the Kingdom of Lesotho', Council on Higher Education, November 2013.

DST, 'Lesotho Science and Technology Policy 2006-2011', Ministry of Communications, Science & Technology, 2006.

GoL, 'Lesotho Gender and Development Policy 2018-2030', Ministry of Gender and Youth, Sports and Recreation, Government of Lesotho, 2018.

GoL, 'Lesotho Indigenous Knowledge Systems Policy – Draft', Ministry of Communications, Science & Technology, Government of Lesotho, 2021.

GoL, 'National Diaspora Policy', Ministry of Foreign Affairs and International Relations, Government of Lesotho, 2021.

GoL, 'National Health Strategic Plan 2017-2022', Ministry of Health, Government of Lesotho, 2016.

GoL, 'National Strategy Development Plan (II) 2019/20-2022/23', Government of Lesotho, 2018.

Goldman, I. & Pabari, M., 'Using Evidence in Policy and Practice Lessons from Africa', Routledge, 2020, https://doi.org/10.4324/9781003007043

GTIPA, 'National Innovation Policies: What Countries Do Best and How They Can Improve', Global Trade and Innovation Policy Alliance, June 2019; available at https://www2.itif.org/2019-national-innovation-policies.pdf

Hlophe, T.G., 'Mapping the National System of Innovation in Eswatini', African Review of Economics and Finance, Vol. 10, Issue (2), 2018.

Hekkert, M.P., Suurs, R.A.A, Negro, S.O., Kuhlmann, S. and Smits, R.E.H.M., 'Functions of innovation systems: A new approach for analysing technological change', Technological Forecasting & Social Change, pp. 413-432, October 2007; available at doi: 10.1016/j.techfore.2006.03.002 (pishvaee.com)

Heilbron, M., Leliveld, A. and Knorringa P., 'Innovation as a Key to Success? Case Studies of Innovative Start-ups in Kenya and Nigeria', in Entrepreneurship in Africa (Chapter 4), 2017, pp. 95-122; available at https://doi.org/10.1163/9789004351615_006

Kenyatta University, 'Research and Innovation Policy 2017-2021', Division of Research, Innovation and Outreach, Kenyatta University, 2017.

Mapesela, M.L.E, 'The Basotho indigenous knowledge (IK): Do we understand it well enough to employ it as a tool in higher education teaching?' South African Journal of Higher Education 18(3), May 2005, DOI:10.4314/sajhe.v18i3.25500

MCST, 'Strategic Plan 2020/21-2022/23', Ministry of Communications, Science & Technology, Government of Lesotho, January 2020.

Meadows, D., 'Leverage Points: Places to Intervene in a System', The Sustainability Institute, 1999; https://donellameadows.org/archives/leverage-points-places-to-intervene-in-a-system/; accessed 17 September 2021.

MoET, 'Education Sector Plan 2016-2026», Ministry of Education and Training, Government of Lesotho, August 2016.

NUL, 'Intellectual Property Policy', Innovation Hub, National University of Lesotho, June 2021.

OACPS, 'R&I Policy Support Facility (PSF) Service to Lesotho – Terms of Reference', May 2021.

OACPS R&I PSF, 'Country Background Report – CBR', PSF Service to Lesotho, August 2021.

OECD, 'OECD Science, Technology and Innovation Outlook 2021: Times of Crisis and Opportunity' OECD Publishing, January 2021; https://doi.org/10.1787/75f79015-en

OECD, 'Paris declaration on Aid Effectiveness 2005',
https://www.oecd.org/dac/effectiveness/45827300.pdf

SADC, 'Protocol on Gender and Development', 2008, https://www.sadc.int/files/8713/5292/8364/Protocol_on_Gender_and_Development_2008.pdf

SADC, 'Protocol on Science, Technology and Innovation', 2008, https://www.sadc.int/documents-publications/show/Protocol%20on%20Science%20Technology%20and%20Innovation%20(2008); accessed 5 August 2021.

Takondwa, M., Kariisa, E., Doherty, J., Hoohlo-Khotle, N., Kiwanuka-Mukiibi, P. and Williamson, T., 'Lesotho Health Systems Assessment 2010', June 2010 Bethesda, MD: Health Systems 20/20, Abt Associates Inc. Microsoft Word - Final Lesotho HSA.docx (hfgproject.org).

UNCTAD, 'Science, Technology and Innovation Policy (STIP) Review of Lesotho: An Implementation Strategy', 2010; https://vi.unctad.org/resources-mainmenu-64/digital-library?task=dl_doc&doc_name=500_stip_review_; accessed 20 June 2021.

UN, 'Sustainable Development Goals (SDGs)', 2015; https://sdgs.un.org/goals; accessed 22 July 2021.

UNEP, 'Green Economy – What do we mean by Green Economy?' May 2012, (eds. Fedrigo-Fazio, D. and ten Brink, P.), available at https://wedocs.unep.org/bitstream/handle/20.500.11822/8659/-%20Green%20economy_%20what%20do%20we%20mean%20by%20green%20economy_%20-2012Main%20briefing%202012--Final.pdf; accessed 21 July 2021.

World Bank, 'Business Regulatory Environment', https://www.worldbank.org/en/topic/investmentclimate/brief/business-regulatory-environment; accessed 22 September 2021.

World Economic Forum, 'Global Competitiveness Report 2019: How to end a lost decade of productivity growth', https://www.weforum.org/reports/how-to-end-a-decade-of-lost-productivity-growth; accessed 25 August 2021.

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