

SOKOINE UNIVERSITY OF AGRICULTURE



**INFORMATION AND
COMMUNICATION TECHNOLOGY
POLICY**

2nd Edition

**As Approved by SUA 133rd Meeting of the Council
on 27th March 2014**

FOREWORD

The SUA ICT Policy and Guidelines was formulated in 2002 to guide the identification, promotion and appropriate utilization of ICT at SUA by ensuring that ICT applications are integrated into the planning and implementation of University functions. Since then, the SUA ICT Policy and Guidelines has enabled SUA to accomplish several ICT improvements, including infrastructure, systems, content, programmes and human resource development. However, since the formulation of this Policy and Guidelines in 2002, several technological, institutional and structural changes that affect ICT development at SUA have occurred globally, nationally and within the University. Consequently, a number of gaps have been noted in the course of implementing the Policy. In view of this, the SUA ICT Policy and Guidelines (2002) has been revised to fill the identified gaps and capture emerging ICT-related issues that are relevant to the University.

The revised ICT Policy will enable SUA achieve excellence in academic and administrative services through the development and use of ICT applications and services. The Policy is organized into four chapters. Chapter One introduces ICT applications in education, provides an overview of the University, describes the results of an ICT situational analysis and describes the rationale for the policy review. Chapter Two provides the policy justification, vision, mission and policy objectives. Chapter Three gives the focus areas, policy statements and strategies. These fall under ten categories namely ICT infrastructure and services, integrated management information systems, ICT security, content development, skills development, e-learning, e-resources, ICT standards, e-waste management, and sustainability of ICT. The final chapter presents the framework for policy implementation as well as its monitoring and evaluation.

It is worth noting that the formulation of this policy involved a number of stakeholders. We would like to thank all those who contributed to the revision of this Policy. The shared vision, mission and objectives clearly defined in this Policy will be realized only if various actors play their roles effectively.

Prof. Gerald C. Monela
Vice Chancellor
March 2014

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ABBREVIATIONS

ERRIS	Examination Result Release Information System
ICT	Information and Communication Technology
IP	Internet Protocol
LAN	Local Area Network
M&E	Monitoring and Evaluation
MUCCoBS	Moshi University College of Cooperatives and Business Studies
SNAL	Sokoine National Agricultural Library
SUA	Sokoine University of Agriculture
SUASIS	Sokoine University of Agriculture Student Information System
TCP/IP	Transmission Control Protocol/Internet Protocol
TERNET	Tanzania Education and Research Network

DEFINITIONS OF KEY TERMS

Bandwidth describes the amount of data a network can transmit in a certain period of time, usually expressed in bits per second.

Cloud computing is a model for enabling access to a shared pool of configurable computing resources such as storage, applications, and services that can be rapidly provisioned and released with minimal management effort or service provider interaction.

E-resources are information resources that users access electronically including, but not limited to electronic journals, electronic books and other Web-based documents.

Free Open Source Software is computer software that anyone is freely licensed to use, copy, study and modify in any way. In addition, the source code is openly shared, which encourages people to voluntarily improve the design of the software.

E-waste describes discarded electrical or electronic devices that have become waste because they cannot be upgraded or repaired for re-use. E-waste includes computers and their accessories, mobile phones, television sets and other electrical equipment.

Information and Communication Technologies (ICT) comprise a diverse set of tools, systems, applications and services used for production, processing, storage, transmission, presentation and retrieval of information by electronic means.

Institutional repository is an online database for collecting, preserving and disseminating the intellectual output of an institution. The database includes materials such as journal articles (particularly preprints), theses and dissertations, research reports, course notes and other academic documents.

Internet is the world-wide collection of private and public router-based networks that are interconnected via gateways and exchange points, which all utilize the TCP/IP protocol.

IP address is a set of protocols developed to allow cooperating computers to share resources across a network.

Local Area Network (LAN) is a computer network that spans a relatively small area such as a single building or group of buildings.

Management Information Systems are information systems that facilitate the management of corporate functions.

CHAPTER ONE

BACKGROUND INFORMATION

1.1 Introduction

Information and Communication Technologies (ICT) comprise a diverse set of tools, systems, applications and services used for production, processing, storage, transmission, presentation and retrieval of information by electronic means. ICT encompass a wide range of rapidly-evolving and increasingly-converging technologies including hardware, software, networks, audio-visual systems and associated applications. The capacity of ICT is growing exponentially, whereby computers and other devices become increasingly powerful; transmission capacity increases; and software applications make it easier to create multimedia resources.

ICT has increasingly become an integral part of today's educational system throughout the world. This is mainly because information and communication are at the very heart of any educational system. ICT has the potential to support many educational functions, such as teaching and learning, research and scholarship and management and administration. These technologies enhance the sharing of information; increase collaboration among students, academicians and administrators; enhance provision of distance education; and have resulted in new forms of pedagogy. In higher education, ICT has been broken into 4 broad categories: 1) subjects (e.g. computer studies); 2) tools to support other subjects (e.g. computer-based learning); 3) educational management tools (e.g. student information systems); and 4) platforms for information sharing. Hence, the transformation of higher education must be coupled with the effective application of ICT in teaching, learning, research, outreach and administration. In order to respond to these demands, higher education institutions need to realign their practices to information age standards by adopting ICT as important tools for enhancing efficiency and effectiveness.

The pedagogical and economical forces that drive universities to mainstream ICT in their functions include greater access to current information; interactive teaching and learning environment; synchronous learning; lessening of high workloads; and increased student to teacher ratio. In addition, ICT provides pedagogical improvement through the use of presentation programs and tools such as computer simulation software. ICT can also improve cost-effectiveness through its ability to reach distant students and in greater numbers. Generally, ICT provide an array of powerful tools that can transform isolated, teacher-centred and text-bound classrooms into rich, student-focused and interactive environments. In addition, the current workplace environment requires graduates to be ICT literate regardless of their fields of study. As universities develop and expand the use of ICTs in their activities, they are strengthening their capacity to enhance the quality of education and respond to new development challenges.

In order to remain competitive in the increasingly globalized world, universities require stability in their ICT environments. The ideal ICT requirements of a modern university include efficient and sustainable network infrastructure; sufficient computing facilities and related accessories; reliable bandwidth; network centers with uninterruptible power supplies, backup-facilities and physical protection; and data recovery centres. It is also necessary to computerize core university functions by establishing integrated information systems for teaching and learning; library services; human resources; records management and financial and procurement services. With the increasing demand to employ ICT in all aspects of university activities, it is important to equip staff and students with the right skills, which enhance their ability to manage and utilize these tools. In addition, with the increase of e-waste generation there is need for frameworks to mitigate the consequent threat to the environment.

1.2 Sokoine University of Agriculture: Overview

The Sokoine University of Agriculture (SUA) was initially established by Act No.6 of 1984 out of the former Faculty of Agriculture, Forestry and Veterinary Science of the University of Dar es Salaam. Following the enactment of the Universities Act in 2005, SUA was granted its Charter in March 2007, although it came into force retroactively from 31st December 2006. Currently, SUA has four campuses, namely the Main Campus and Solomon Mahlangu Campus in Morogoro as well as Mazumbai and Olmotonyi campuses located in Tanga and Arusha regions respectively. SUA has one constituent college - the Moshi University College of Cooperatives and Business Studies (MUCCoBS) - located in Kilimanjaro region. The University has four faculties, two institutes, three centers, two directorates and the Sokoine National Agricultural Library (SNAL). SUA's Vision is *to become a centre of excellence in agriculture and allied sciences* and its Mission is *to promote development through training, research, and delivery of services*.

In achieving its vision and fulfilling its mission, SUA adheres to eleven core values: *academic excellence; academic integrity; academic freedom; effectiveness; efficiency; integrity and accountability; participatory management; development responsibility; social and corporate responsibility; equality and social justice; and professional and ethical behaviour*.

1.3 ICT Situational Analysis

The SUA ICT Policy and Guidelines (2002) has enabled the University to accomplish several ICT developments that support academic and administrative functions. These developments include establishment and maintenance of the University's Local Area Network (LAN); establishment of computer laboratories; design and maintenance of the University Website; increasing bandwidth from 128kpbs in 1996 to 40 Mbps in 2014; partial computerization of library services, student records, and financial services; teaching of ICT courses; establishment of ICT-related certificate, diploma and degree programmes;

establishment of the Department of Informatics as well as development and maintenance of software (e.g. the Sokoine University of Agriculture Student Information System (ERRIS), SUA Student Information System (SUASIS) and E-learning System). The Policy has also enabled the University to recruit, retain and develop ICT personnel and integrate ICT-related courses into all degree programmes. Most importantly, the SUA Corporate Strategic Plan (2011 - 2020) recognizes the importance of ICTs in supporting university activities and dedicates 10% of SUA internally-generated funds to improving ICTs.

Other ICT-related strengths at SUA include the existence of the University Computer Centre; developed standalone systems in various units; growing ICT literacy, expertise and awareness in the University; and increased demand for ICT services across the University. There are also opportunities, such as the upcoming implementation of a nation-wide fiber optic cable network; proliferation of new technologies that can lower ICT costs; increased availability of open source applications; and the availability of a national ICT policy that promotes and guides ICT development in the country.

Notwithstanding these strengths and opportunities, SUA also faces several ICT-related challenges and problems. These include inefficient local area network; aging ICT facilities; inadequate computer laboratories; insufficient computers; lack of integrated information systems; slow Internet connectivity; insufficient office and laboratory space for ICT activities; unreliable power supply; inadequate ICT personnel; lack of high capacity servers; inadequate ICT security systems; inadequate local content on the Web; financial constraints; and low usage of electronic information resources by stakeholders. Other challenges include high costs of bandwidth; increasingly-sophisticated ICT-related security risks, threats and attacks; and the rapidity of technological developments. In addition, electronic waste (e-waste) is currently the fastest growing waste stream, and it contains toxic components such as lead, mercury and cadmium. Improper disposal of electronic waste pollutes the environment with hazardous toxins, thereby causing widespread health risks and environmental degradation.

1.4 Rationale for ICT Policy Review

The SUA ICT Policy and Guidelines was formulated in 2002 with the aim of guiding the identification, promotion and appropriate utilization of ICT at SUA. The Policy aimed at ensuring that ICT applications are integrated into planning and implementation of the University mission to improve the quality of activities. However, since the formulation of the SUA ICT Policy and Guidelines in 2002, several technological, institutional and structural changes have occurred globally, nationally and within the University that have influence on ICT development at SUA. Globally, there have been phenomenal ICT developments in terms of availability, emergence and obsolescence of technologies. There are also technological convergences that increasingly blur distinctions between different types of ICT. At the national level, there are key policies guiding ICT developments, including the National ICT Policy (2003) and the National Information and Broadcasting Policy (2003). There are also sectoral policies, such as the ICT Policy for Basic Education

(2007), and ICT-related legal provisions and regulations that are reviewed periodically. The Tanzania Education Network (TERNET) was created to provide an electronic network that connects all Higher Education Institutions (HEIs), research facilities and teacher colleges in the country.

At SUA, the University Charter (2007) and the SUA Corporate Strategic Plan (2011 – 2020) are among the new frameworks that have influence on ICT developments. Increased University population in terms of staff and students as well as establishment of new programmes (particularly ICT-related programmes) also causes demand for higher quality and more diverse ICT services. The revised Policy will guide the development and appropriate utilization of ICT at SUA. This Policy will also enable SUA to harness the potential of ICT to provide high standard services to students, staff and the wider community.

CHAPTER TWO

POLICY JUSTIFICATION, VISION, MISSION AND OBJECTIVES

2.1 Justification

This Policy is expected to improve the quality of teaching, learning, research and outreach at the University using modern approaches enabled by ICT. From pedagogic and other perspectives, ICT will enhance staff-students, staff-staff and students-students interactions; reduce staff workloads; prepare SUA graduates for knowledge-based work environments; enhance access to electronic information resources and library services; and increase the visibility of the University's research output, among many other benefits. The Policy is also intended to increase efficiency and effectiveness of the University's administrative functions. This Policy aligns with the Corporate Strategic Plan (2011 - 2020), which advocates for the use of ICT to increase efficiency, cost effectiveness and competitiveness. The Corporate Strategic Plan targets to have in place an effective and efficient ICT system for enhancing training, research, outreach, consultancy and management functions. This Policy is also consistent with various policy frameworks in Tanzania that call for integration of ICT in education systems.

Achieving SUA's vision and mission, which embody the objectives of this Policy, depends on the presence of several critical success factors at the national and institutional levels. The critical success factors at the national level include the availability of favourable ICT policy and regulatory frameworks, particularly those for the education sector. The University is required to closely align its ICT practices to national ICT policies and regulatory environment in order to take advantage of them. At the institutional level, critical success factors include stakeholders' commitment to ICT developments, particularly willingness of the top management; adequate funding of ICT; efficient procurement process; and the willingness and capacity of staff to create ICT-responsive curricula.

2.2 Policy Vision, Mission and Objectives

2.2.1 Vision

SUA utilizing excellent ICT solutions

2.2.2 Mission

To fully integrate ICT into training, research and delivery of services

2.2.3 Objectives

To achieve the goal of this Policy, the University shall:

1. Improve and maintain reliable ICT infrastructure
2. Develop and maintain integrated management of information systems
3. Promote widespread use of ICT in academic and administrative functions
4. Acquire, deploy, use and dispose of ICT products in ways that ensure environmental

sustainability

5. Ensure compliance to standards in the management and use of ICT
6. Establish, implement and maintain appropriate ICT security measures
7. Promote the development and dissemination of local content using ICT
8. Develop, acquire, manage and promote utilization of electronic information resources to support teaching, learning, research and outreach
9. Ensure that the university community is adequately equipped with the requisite skills to enable them fulfill their duties
10. Ensure sustainable use of ICT

CHAPTER THREE

FOCUS AREAS, POLICY STATEMENTS AND STRATEGIES

3.1 Overview

This chapter presents the focus areas, policy statements and strategies necessary for effective implementation of policy objectives.

3.2 ICT Infrastructure and Services

3.2.1 Issues

- i. Limited and unreliable ICT network infrastructure
- ii. Insufficient computers and related accessories
- iii. Aging ICT facilities
- iv. Slow Internet connectivity
- v. Inadequate ICT personnel
- vi. Unreliable power supply
- vii. Limited funding of ICT matters

3.2.2 Policy statements

SUA shall endeavour to:

- i. Develop and maintain efficient and effective LAN to meet increasing Internet requirements
- ii. Acquire and maintain sufficient computers to meet the needs of the increasing staff and student population
- iii. Provide an efficient and effective intercom telecommunication system within the University
- iv. Regularly update ICT hardware and software to keep up with the changing technology environment
- v. Improve and manage Internet services to meet ever-increasing requirements
- vi. Build and maintain institutional capacity for managing ICTs effectively
- vii. Ensure availability of power backup and stabilizer mechanisms to increase the availability Internet services and protect ICT equipment
- viii. Maintain a broadcast facility to support the University mission

3.2.3 Strategies

- i. Expand and improve LAN to reach all University locations
- ii. Provide regular maintenance to ICT facilities and network infrastructure
- iii. Acquire sufficient computers for staff and students
- iv. Maintain and improve the available broadcast facility
- v. Prepare and broadcast programmes to promote teaching, research and extension
- vi. Increase Internet bandwidth from time to time to meet ever-growing demand
- vii. Develop and implement bandwidth management strategies
- viii. Maintain the telephone system
- ix. Recruit, develop and retain highly-quality ICT personnel

- x. Acquire and install high-capacity renewable power backups, voltage stabilizers and smoke detectors

3.3 Integrated Management Information Systems

3.3.1 Issues

- i. Availability and Reliability of standalone, partially computerized information systems
- ii. Inefficiency and ineffective information flow
- iii. Inconsistency of students and staff information across the University
- iv. Duplication of data caused by multiple data entry points
- v. Low adoption of ICT in academic and administrative functions

3.3.2 Policy statements

SUA shall endeavour to:

- i. Develop and maintain integrated management information systems to support all academic and administrative functions
- ii. Increase the use of ICT in the implementation of University functions
- iii. Ensure interoperability of information systems across the University

3.3.3 Strategies

- i. Acquire, install and maintain integrated management information systems for all academic and administrative services
- ii. Train staff and students to use information systems relevant to their activities
- iii. Promote the use of ICT for academic and administrative functions
- iv. Acquire, develop and implement information systems that are capable of communicating and exchanging data.

3.4 ICT Access, Use and Security

3.4.1 Issues

- i. Unsecure ICT systems and institutional data
- ii. Lack of reliable data backup and recovery mechanisms
- iii. Inadequate ICT security procedures
- iv. Inadequate ICT disaster recovery plans and mechanisms
- v. Inadequate terms and conditions for using University ICT facilities

3.4.2 Policy statements

SUA shall endeavour to:

- i. Protect ICT systems and institutional data
- ii. Establish data backup and recovery mechanisms
- iii. Develop proper ICT security procedures and disaster recovery plans
- iv. Ensure that ICT facilities and services are used by authorized individuals depending on their work and study requirements
- v. Ensure that ICT facilities and services are used to carry out legitimate activities

3.4.3 Strategies

- i. Establish access levels, rights and privileges for different categories of ICT users
- ii. Acquire and install protective software for detecting and defending ICT equipment, systems and content against malicious software
- iii. Develop and implement appropriate backup and recovery mechanisms for institutional data
- iv. Develop and implement ICT security procedures
- v. Develop and implement ICT disaster recovery plans and mechanisms
- vi. Locate all ICT equipment in physically secure areas
- vii. Define terms and conditions of using University ICT facilities and services for different categories of users

3.5 Content development

3.5.1 Issues

- i. Inadequate quality and out of date content on the University website
- ii. Many units in the University have incomplete or missing webpages on the University website
- iii. Lack of skills among stakeholders for uploading content on the web
- iv. Most locally generated content is not widely accessible
- v. Laxity in providing relevant web content by some stakeholders

3.5.2 Policy statements

SUA shall endeavour to:

- i. Maintain a comprehensive University website that has webpages for all units
- ii. Ensure that the content of the University websites is relevant, accurate, consistent and up-to-date
- iii. Equip stakeholders with relevant skills for uploading content on the website
- iv. Develop and maintain institutional repositories for locally generated content
- v. Ensure continuous uploading of locally generated content into institutional repositories
- vi. Empower units to regularly upload relevant content to the website

3.5.3 Strategies

- i. Each unit in the University shall develop and maintain a comprehensive webpage
- ii. Train designated staff from various units across the University on website design and content management
- iii. Promote online publication of academic works by the University community
- iv. Develop and maintain institutional repositories
- v. Deploy and maintain a robust content management system

3.6 ICT Skills Development

3.6.1 Issues

- i. Most staff and students have low ICT skills

3.6.2 Policy statements

SUA shall endeavour to:

- i. Equip staff and students with appropriate ICT skills

3.6.3 Strategies

- i. Train all students in relevant computer application courses during their studies
- ii. Train all staff from regularly in order to equip them with up-to-date ICT skills

3.7 E-learning

3.7.1 Issues

- i. Low usage of ICT to enhance teaching and learning
- ii. Lack of e-learning system in the University
- iii. Lack of quality and up to date content for e-learning

3.7.2 Policy statements

SUA shall endeavour to:

- i. Integrate ICT in teaching and learning activities
- ii. Promote the use of e-teaching and e-learning

3.7.3 Strategies

- i. Establish e-learning system in order to enhance teaching and learning
- ii. Establish and maintain relevant infrastructure (e.g. Video Conferencing Facilities) to enhance teaching and learning
- iii. Equip lecture halls and laboratories with up-to-date e-learning facilities
- iv. Promote the use of e-learning and other ICT tools and services in teaching and learning activities

3.8 Electronic Information Resources

3.8.1 Issues

- i. Low usage of electronic information resources
- ii. High costs of subscription to online scholarly databases

3.8.2 Policy statements

SUA shall endeavour to:

- i. Promote utilization of e-resources to support academic purposes
- ii. Integrate information literacy into the University curricula in order to enhance utilization of e-resources
- iii. Mobilize and allocate financial resources for subscribing to online databases
- iv. Address contextual and technical issues related to low utilization of e-resources

3.8.3 Strategies

- i. Raise awareness about e-resources among various categories of users

- ii. Equip staff and students with information literacy skills
- iii. Increase allocation of financial resources for subscription of online resources
- iv. Encourage the utilization of open access e-resources

3.9 ICT standards

3.9.1 Issues

- i.* Unguided procurement and installation of ICT equipment and software in the University
- ii.* Use of ICT specifications as informal or “de facto standards”
- iii. Lack of awareness on appropriate ICT standards among stakeholders

3.9.2 Policy statements

SUA shall endeavour to:

- i. Develop guidelines on ICT standards in the University
- ii. Promote acquisition of hardware and software that comply with institutional, national or international standards
- iii.
- iv. Ensure that the use of the University ICT is consistent with the principles and values that govern the use of other University facilities and services
- v.
- vi. Promote compliance to institutional, national or international standards on ICT

3.9.3 Strategies

- i. Develop and implement guidelines on ICT standards
- ii. Raise awareness on ICT standards

3.10 E-waste management

3.10.1 Issues

- i. Lack of safe e-waste disposal procedures
- ii. Lack of public awareness on the need for proper e-waste treatment
- iii. Absence of infrastructure for appropriate e-waste management

3.10.2 Policy statements

SUA shall endeavour to:

- i. Establish clear guidelines on e-waste management
- ii. Raise stakeholders’ awareness on the sustainable management of e-waste
- iii.* Dispose e-waste in a manner that is sustainable and safe for the environment

3.10.3 Strategies

- i. Formulate and implement guidelines for management of e-waste
- ii. Plan and implement e-waste awareness activities
- iii. Provide space, equipment and other support systems for management of e-waste
- iv. Ensure the use of sound technologies to minimize e-waste generation

3.11 Sustainability of ICTs

3.11.1 Issues

- i. High costs of hardware, software and bandwidth
- ii. Rapid obsolescence of hardware, software and services
- iii. Rapid emergence of new hardware, software and other ICT applications
- iv. High rate of ICT personnel turnover
- v. Inadequate financial resources for ICT development

3.11.2 Policy statements

SUA shall endeavour to:

- i. Develop and institutionalize relevant strategies for funding ICT development
- ii. Adopt and institutionalize cost-effective strategies for acquiring and managing ICTs
- iii. Acquire and maintain ICT hardware and software to catch up with the dynamic ICT environment
- iv. Ensure recruitment, development and retention of adequate ICT personnel

3.11.3 Strategies

- i. Mobilize and allocate adequate financial resources for ICT development
- ii. Adopt and use the Free and Open Source Software
- iii. Employ consortia and cloud computing approaches for acquisition of ICT services
- iv. Recruit, develop and retain adequate ICT personnel

CHAPTER FOUR

IMPLEMENTATION, MONITORING AND EVALUATION

4.1 Organization and Mandate

The implementation of the SUA ICT Policy shall be institutionalized within the organizational structure of the University. The SUA Computer Centre shall lead the coordination and implementation of the Policy. The Computer Centre was established in 1993 as the University arm responsible for teaching, research and consultancy in computer applications for agriculture, veterinary medicine, forestry and allied sciences. A policy implementation plan that identifies activities to be performed, required resources, time frame and the responsible stakeholders shall be developed. Therefore, the Computer Centre shall translate the Policy into implementable programmes and play a leading role in their implementation. The Computer Centre shall also advise and assist all units and stakeholders across the University on issues related to ICT. The Director of Computer Centre shall report to the Computer Centre Board on all Policy matters, and the Board shall report the same to the University Senate for approval, and where necessary, for onward transmission to the University Council.

4.2 The Role of the Computer Centre Board

The Computer Centre Board shall have the following mandate:

- i. Overseeing the implementation of the policy
- ii. Approving the policy implementation plan
- iii. Reporting the implementation of the Policy to the University Senate
- iv. Advising on changes needed for the ICT Policy

4.3 The Role of Other Stakeholders

The success of the SUA ICT Policy depends on cooperation from every member of the University community. Therefore, stakeholders shall be responsible for integrating ICTs into their activities. Each unit across the University shall be responsible for uploading their own content into the website. A change management approach shall be employed to ensure thoughtful planning and implementation of ICT issues is performed with the involvement of stakeholders affected by ICT changes. Stakeholders shall be consulted regularly to support and facilitate the effective implementation of the policy.

4.4 Monitoring and Evaluation (M&E)

Implementation of the SUA ICT Policy depends upon effective Monitoring and Evaluation (M&E) mechanisms to assess the implementation of strategies and achievement of policy goals and objectives. The Computer Centre Board shall work with other stakeholders in monitoring and evaluating policy activities. Relevant indicators shall be developed and be made available to enable stakeholders at all levels monitor and assess ICT development activities on a regular basis.

4.5 Review and revision of the SUA ICT Policy

An evaluation of the outcomes of this policy will provide information on the extent to which the policy is being implemented and the progress being made in achieving Policy objectives. An overall policy review will be undertaken after every five years or earlier, as need arises.