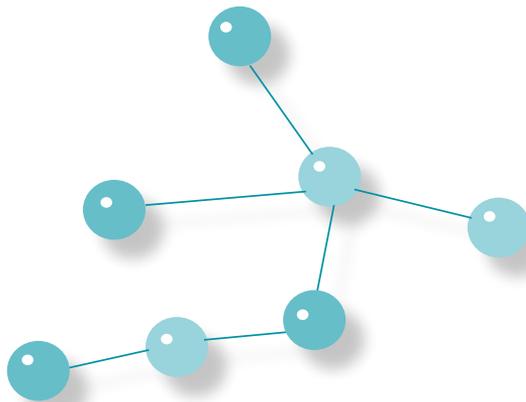


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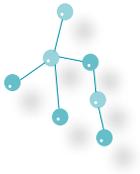
Relevance of Science, Engineering and Technology Training to  
Development challenges in Africa

## ACTION PLAN PRODUCED BY PARTICIPANTS AT

The Second Conference of Vice-Chancellors, Provosts and Deans of  
Science, Engineering and Technology  
(COVIDSET 2007)



Johannesburg, South Africa, 25-27 September 2007



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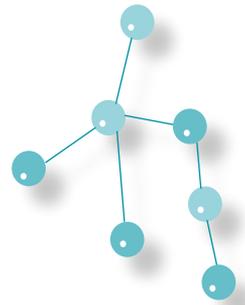
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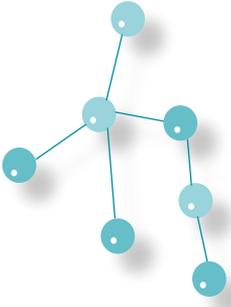
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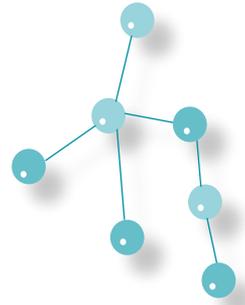
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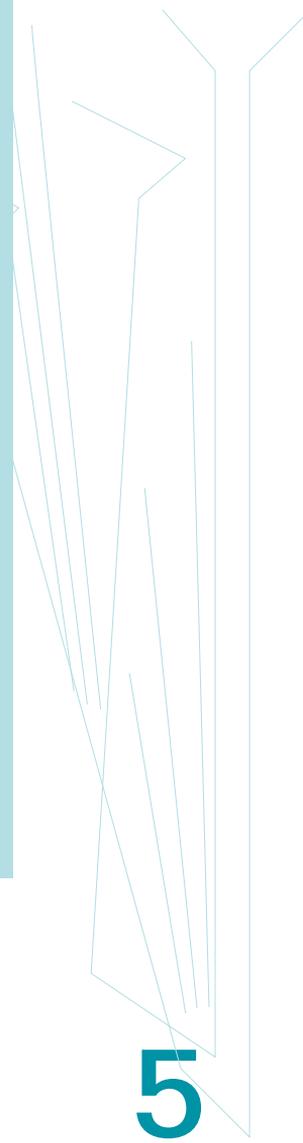


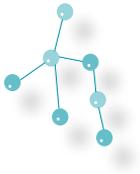


# LIST OF ABBREVIATIONS



ANSTI	African Network of Science and Technological Institutions
COVIDSET 2005	First African Regional Conference of Vice Chancellors, Provosts and Deans of Science, Engineering and Technology
COVIDSET 2007	Second African Regional Conference of Vice Chancellors, Provosts and Deans of Science, Engineering and Technology
EAC	East African Community
ECOWAS	Economic Community Of West African States
ICT	Information Communication and Technology
NEPAD	New Partnership for African Development
R&D	Research and Development
S&T	Science and Technology
SET	Science, Engineering and Technology
SETI	Science, Engineering, Technology and Innovation
UNESCO	United Nations Educational Scientific and Cultural Organisation
IP	Intellectual Property
SSA	Sub-Saharan Africa
MDGs	Millennium Development Goals
GDP	Gross Domestic Product





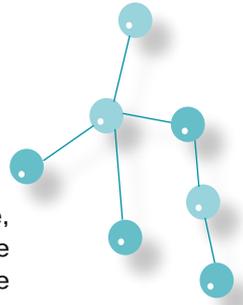
## ACKNOWLEDGMENTS

Several individuals, organizations and institutions contributed in various ways to the success of the meeting and the preparation of this outcome document. We will like to recognize their support. We are particularly grateful to the Directorate of International Cooperation of the Ministry of Foreign Affairs of the Government of Netherlands, The Carnegie Corporation and the International Development Research Centre (IDRC) who provided core support for this conference. The Network also received a grant from the German Academic Exchange (DAAD) to support the alumni of its fellowship programme. Being a project of UNESCO, ANSTI has always received financial support of the latter. UNESCO provided grants to cover costs of various conference activities. The Network would also like to acknowledge the contribution of the International Council for Science (ICSU) who partnered with ANSTI to organize the conference.

The ANSTI Secretariat organized the meeting in collaboration with members of the international and local organizing committee. The Network is very grateful to all the members of the committees especially staff of Tshwane University of Technology whose invaluable service made all the difference.

Finally, ANSTI will like to express its sincere appreciation to Dr. Elijah Omwenga, Director of the ICT Center, University of Nairobi, for serving as rapporteur-general in COVIDSET 2007 meeting and for compiling this report.

# PREFACE



This report summarises the outcome of deliberations on relevance of science, engineering and technology training to development challenges in Africa. The conference held in Johannesburg, South Africa 25-17 September 2007 was the second in a series after the first such held in Accra, Ghana in 2005.

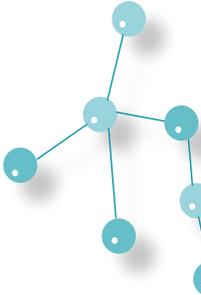
Participants were drawn from various institutions across the region; firstly in their various capacities as leaders of those institutions and also as resource persons to share their experiences with researched presentation in key areas. They included Vice-Chancellors, Deans of Faculties of Science, Engineering and Technology and heads of academic departments from several African universities. Of the hundred and fifty (150) university leaders who participated in this forum, were donor community and agency representatives involved in Higher Education and the promotion of Science and Technology training in Africa.

Unlike in the previous COVIDSET, there were fewer presentations scheduled for the conference. This approach was deliberate in order to give participants more time for deeper and broader discussions to elicit actions and specific objectives for the problems identified. From these deliberations, an action plan was developed for making science, engineering and technology training more relevant to development challenges in Africa. The report presents the problems identified in the four themes on poverty alleviation, infrastructure, environment and health and proposes strategies and actions to deal with them.

The range of problems is wide and therefore we have distilled them into five action points that require regional cooperation with international support. The five actions addressed the appropriateness of the curricula, the inability to apply the acquired knowledge; the decline in the enrolment in science and engineering courses and the status of environmental engineering profession. I hope all the institutions in the region and donors to higher education in Africa will find this report a useful resource.

Joseph G. M. Massaquoi  
Director  
UNESCO Regional Bureau for Science and technology in Africa  
Nairobi, Kenya.

February 2008



## INTRODUCTION

Science, Engineering and Technology (SET) have been the main instruments that have been used in the industrialised world and emerging economies to bring about development. In Africa and some parts of Asia and Latin America, poverty, disease and early death - indicators of underdevelopment - are widespread. Arguably, science, engineering and technology can unlock the great potential of Africa and overcome these challenges. In order to apply SET to solve these problems, we need good training and research institutions which can produce the knowledge and manpower to address the various challenges of national development as contained in the various development initiatives such as the Millennium Development Goals (MDGs), the World Summit on Sustainable Development (WSSD), the Blair Commission Report for Africa, and the New Partnership for African Development (NEPAD) targeted at re-positioning Africa in the world economy.



In an effort to deal with these problems, the UNESCO Regional Bureau for Science and Technology in Africa, working through its project, the African Network of Scientific and Technological Institutions (ANSTI) has designed an African conference series - The Conference of Vice Chancellors, Deans of Science, Engineering and Technology (COVIDSET), where university leaders responsible for science and technology convene to deliberate on these issues and come up with action plans for implementation. Following the success of the first COVIDSET held in Accra, Ghana in November 2005, the organizers of the conference elected to have the conference held after every two years. The Ghana conference focused mainly in making an audit of the state of S&T training in research institutions and the role they can play in the socio-economic development of the region. The 2007 conference, on the other hand, focused on the relevance of science, engineering and technology training to development challenges in Africa. The conference was held in Johannesburg, South Africa 25-27 September 2007.

The conference provided a forum for the discussion of the issues that affect making SET training more relevant to the development agenda in African countries. The following themes were address:

- SET training for poverty alleviation
- SET training and infrastructure development
- SET training and the environment
- SET training and health

Cutting across these themes are the issues of inadequate resources and outdated curricula that hinder proper training to equip graduates for practice across national borders in response to the demands of the global economy. In this regard, the conference recommended alternative resource mobilization strategies and designing curricula that should evolve in response to the dictates of emerging technologies and societal needs.

Through discussion on the question of poverty alleviation and the training involved, it was noted that the fight against poverty to a greater extent depends on the availability of a critical mass of science, engineering and technology (SET) profes-

sionals to spearhead the required interventions. In other words, substantial efforts have to be directed towards building the local capacity to develop, innovate and sustain national development, through SET education and training. Available data and information indicate that it is only those nations which have emphasized SET in their development endeavour that have developed appreciably. Nations which have ignored SET have stagnated or recorded negative development. In order to obtain maximum benefits and impacts in the fight against poverty, SET training has to be properly conducted, and the resulting competences nurtured through science parks, technology/business incubators and innovation systems and clusters.

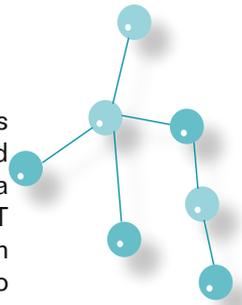
Starting with a review of some key factors in the rapid transformation of emerging economies, the conference re-examined the critical issues in infrastructure development in Africa and in the attainment of the MDGs and economic stability and prosperity. African countries must realize the need for massive investment in equipping a new generation of young, dynamic and talented students with thinking and analytical skills, ICT and basic engineering infrastructures. For, 'without science, engineering and technology, all that labour for development do so in vain', the conference observed.

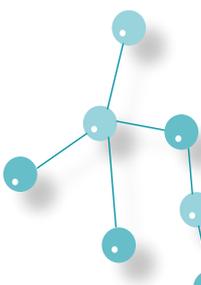
On the question of the environment, participants emphasized the application of a green curriculum approach for SET training programmes at the universities as a vital step towards speedy achievement of environmental sustainability in Africa.

The conference observed that advances in SET and Computing in particular hold great potential in revolutionizing healthcare systems in Africa. There are opportunities for this revolution to take place through e-Healthcare systems. In order to provide ubiquitous healthcare services, efficient infrastructure is highly desirable. A technology that combines the advantages of both Grid Computing and Intelligent Computing for the e-Healthcare service provisioning should be put in place. These opportunities were examined and action points identified.

The discussions also focused on an important subject of African Renaissance that is at the heart of many emerging pressure groups and forums that seek participatory approach to development and research through social, democratic, economic and political emancipation. In line with the observation by President Thabo Mbeki of South Africa, in the African Renaissance Conference held in Johannesburg in September 1998, the question of whether African Renaissance is still a concept or a reality was posed by participants. The conference deliberated these issues and recommended a number of action points for consideration by stakeholders.

This report gives a brief description of the problems that hinder efforts to realise relevant SET training to deal with development challenges. It outlines the strategies and activities that will help ameliorate these problems. The report is divided into three parts. The first part deals with the problems identified within each sub-theme and strategies to deal with them. The second part is a list of actions and their objectives while the last part highlights five (5) priority actions for regional cooperation. The five priority actions given in chapter 4, are grouped under the following headings: Appropriate Curricula; Declining Students enrolment; Application of Knowledge and the Environmental Engineering profession. The report also has an annex which presents a matrix of the action plan.





## 2.0: THE PROBLEMS IDENTIFIED

The first COVIDSET that took place in Accra Ghana in 2005 addressed several problems that included inadequate staffing levels, quality of students, inadequate teaching facilities, funding constraints among others. These issues were tackled within the ambit of a broad theme on revitalizing science and technology training institutions in Africa. Although the theme for the COVIDSET of 2007 was on relevance of science, engineering and technology training to development challenges in Africa, the problems identified and deliberated upon were generally similar to those of the previous COVIDSET. What was different however are the strategies and specific objectives of addressing them in order to serve this new theme. Within the four sub-themes, the participants identified problems that are cross-cutting. These include inadequate funding and out-dated curricula to address the underlying issues that dictate the implementation of various programs such as environmental conservation, HIV/AIDS prevention and poverty alleviation. Other problems addressed relate mainly to policy, curricula, research, collaboration and public-private sector partnerships. We consider these problems in relation to each of the sub-themes for the conference namely; SET training for poverty alleviation, infrastructure development, environment and health improvement. We tackle each of the themes below.

### 2.1 SCIENCE, ENGINEERING & TECHNOLOGY TRAINING FOR POVERTY ALLEVIATION

The problems facing Science, Engineering and Technology Training for poverty alleviation can be grouped into five broad categories: inappropriate curricula and policies that do not sufficiently address the poverty reduction issues, weak university-private sector linkages, weak R&D and application of SETI in economic development, low financing and low student enrolment. Below, we discuss the issues raised and strategies to deal with them.

#### Curricula

The fundamental problem here relates to less focused curricula that do not sufficiently address poverty reduction issues. Participants proposed the need to involve stakeholders both within and outside the universities, with input from considerations from tracer studies' outcomes, in reviewing curricula. The conference further proposed adoption of the Problem-Based Learning (PBL) approach to tackle emerging issues in the society. It was also proposed that training on entrepreneurship, investment and management of resources should be incorporated into the SET curricula.

#### University-Private Sector Linkages

Weak linkages between Universities offering SET programmes and the private sector was identified as an area of concern. As resources from governments

dwindle, universities should foster closer ties with the private sector in order to provide opportunities for resource mobilization. Participants recommended the need to carry out regular studies whose outcomes could form the basis of the kind of interactions required.

## Weak R&D Support

Participants identified weak local industry support for R&D as one of the issues that makes it difficult to develop the local industries. This situation also makes it difficult for locally produced products to be absorbed into the market since their quality is not assured. Participants proposed the need to negotiate for incentives for supporting SET training and more support to develop R&D.

## Financing

Low financing of SET training, and overdependence on external funding has made the quality of SET graduates to be compromised in many institutions. Participants recommended the need to mobilise the private sector participation and lobbying for political will that will help increase government funding.

## Appreciation of the Role of SETI

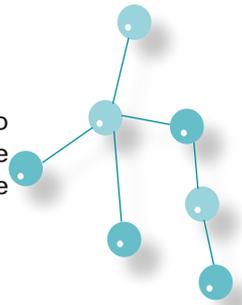
Participants pointed out that there is lack of appreciation by the government, politicians and the public of the role of Science Engineering, Technology and Innovation (SETI), scientists and engineers in accelerating development. In this connection several strategies were proposed to handle the negative perception. These include the need to sensitize and mobilize government support, politicians and the public and to demonstrate that SET is the engine that will drive governments towards industrialisation.

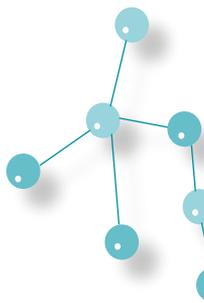
## SET Expertise

Lack of a critical mass of the SET expertise to deal with the needs of the society was identified as an area that needs to be addressed. Participants were of the opinion that there is still a shortage of qualified engineers and scientists needed in the various sectors of the economy. It was proposed that as a way of encouraging more young people to take up the profession, the reward system and incentives for SET expertise needs to be improved. As expansion strategies to train more such staff get underway, there is need to ensure that the quality of the graduates is guaranteed even as such modes of instruction as Open and Distance Learning get institutionalised and embraced.

## Students Enrolments

In order to deal with the problem of poverty in Sub-Saharan Africa (SSA), we need to develop capacity in SET to provide the necessary manpower for industrial growth. However, declining student enrolment trends and low SET graduate output in some SSA countries is an impediment to this objective. Possible causes of this trend were attributed to inadequate teaching of Science and Mathematics in schools, coupled with inadequate laboratories. The conference proposed a





number of strategies - relating to staff, students and decision makers - to help ameliorate the situation. Among them is the need to repackage science courses to make them more attractive while providing incentives for those students that wish to pursue SET studies at schools, colleges and universities. As for staff, the participants recommended the need to recognize and reward SET professionals in the practice and improving the SET operational environment. Administrators of institutions on the other hand should strengthen counseling and guidance mechanisms as well as take steps to invest in developing and retaining human capital in science, engineering and technology areas.

## Policies and Strategies

Lack of suitable policies and strategies on SETI in most Sub Saharan African countries was identified as a weakness in providing quality and relevant education that will contribute to manpower development in these countries. Towards this end, the conference participants recommended the development and implementation of policies that will govern SETI, research publications and intellectual property issues in higher learning institutions.

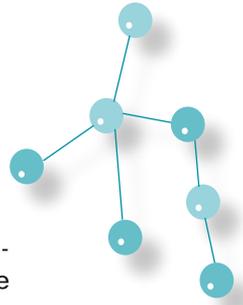
## Application of SETI in Economic Activities

Low application of SETI in economic activities is partly related to the problem of inappropriate curricula identified above. A number of strategies were identified to deal with this issue. The need to adopt problem-based learning will help focus on challenges within the students ecological domain and community. Other possible strategies identified include ensuring that SETI is incorporated in the National Socio-Economic Development Agendas and promoting the use of IP information for technology diffusion.

## The Increasing level of Poverty in Sub-Saharan Africa

The conference participants lamented the increasing level of poverty in SSA and recommended several strategies to deal with the problem. Among these strategies is to ask governments to provide for 100% primary and secondary school enrolments of respective age cohorts while giving provision for 60% of the relevant age groups in tertiary education enrolment. The other strategy is to provide for a 60 to 40 ratio of enrolment in favour of SET in tertiary education institutions while providing incentives for pursuing SET studies at schools, colleges and universities. The conference also recommended that science parks, technology/business incubators and innovation systems and clusters be established.

## 2.2 SET TRAINING AND INFRASTRUCTURE DEVELOPMENT



Participants considered two issues relating to infrastructure. The first is the investment in SET training infrastructure such as libraries and laboratories. The second issue is the training needs for the development and maintenance of general infrastructure such as industrial complexes, road, communication and energy and power systems.

The problems identified in the two categories are discussed below:

### (a) Investment in SET Infrastructure

#### **Low Investment in SET Infrastructure**

Low investment in SET infrastructure comes about due to the high cost of the equipment involved. The situation gets worse as most of the equipment is not adequately maintained. The participants called upon governments to develop policies that will encourage public-private partnerships; through which support for investments in SET infrastructure may come by. The conference recommended strong government commitment towards investing more in SET infrastructure.

#### **Policy on SETI**

Lack of policy in the area of SETI has contributed to the lacklustre support in developing the requisite infrastructure for promoting science, engineering and technology. In this regard, participants recommended that African countries should review their policies on SETI and enforce their implementation.

#### **Political Will**

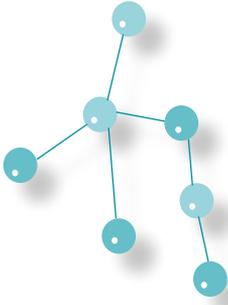
Inability to influence political will to deal with SET infrastructure development was identified as a major problem impeding science and technology training. A strategy to deal with this problem as highlighted in section 2.1 (lack of appreciation of the role of SETI) is to encourage universities to demonstrate that SET is the engine that will drive government towards industrialisation and tangible economic development. This can be achieved through problem-based experiential training approaches.

Other strategies proposed include the need to encourage engineers and scientists to engage in policy making bodies; create more pressure groups such as COVIDSET and to establish engineering standards.

### (b) Building and Maintaining Infrastructure

#### **Inadequate Graduate Training**

Related to inadequate infrastructure is the problem of inadequate manpower in some critical areas. The participants therefore recommended the need to identify these areas and determine requisite critical mass for each of them with a view of setting training targets, including a review of the curriculum, to fill the gaps.



### **Innovation Chain**

Incomplete innovation chain between design and production was identified as a problem that hinders innovative developments. Participants recommended the need to bridge the gap between design and production.

### **Need-oriented Training**

The problem identified is lack of need-oriented training that is more experiential and one that encourages more internship. The conference recommended action to be taken in ensuring that the training being made is more focused and meets economic needs. The necessary infrastructure needs to be developed to support this.

### **Diffusion of Knowledge**

Participants recognised that there exists a gap between knowledge production and its diffusion. It was noted that at times knowledge is produced but its application in solving problems bedevilling the society is below expectations. In this regard the conference proposed a number of infrastructural strategies to help rectify the situation. Among these is the need to develop technology for specialised skills acquisition, enhancing collaboration between SMEs and academia and incorporating entrepreneurship training.

### **Sustainability Challenges**

SET programmes are expensive to run and maintain. Quality education can only be guaranteed if students have access to the necessary teaching resources. Participants therefore recommended the need to supplement the resources with 3rd stream income generation activities such as consultancy and small scale production units.

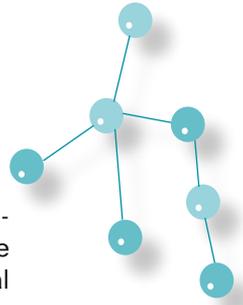
### **Entrepreneurship Training**

There is need to empower students with entrepreneurial skills to make them ready to contribute positively in the application of SET in economic development. In this regard, the conference recommended action in terms of including entrepreneurship courses in the degree programmes in order to give the students the necessary skills. And this of course calls for the necessary infrastructure to be laid.

### **IP and ownership Training**

An important concern identified in higher education in SET is difficulties in handling IP ownership and knowledge. The conference recommended that universities should develop mechanisms of protecting IP rights and encourage governments to enact relevant laws. The participants also recommended the need to share innovations and research outputs among scholars.

## 2.3 SET TRAINING AND THE ENVIRONMENT



There is need to integrate environmental courses in the curricula for SET training. This is vital for the speedy achievement of environmental sustainability in the continent. A number of issues were discussed and strategies proposed to deal with them. We highlight them below.

### Optimal environment Management

Optimal environment management is key to sustainable development. A number of strategies were proposed to ensure that SET training is relevant to this important issue. These include the need to ensure that the SET programmes are localized to the training needs of the society. This will be achieved by making relevant changes in the curriculum right from the secondary school level all the way to university. Also proposed as a strategy to achieve the objective, is the need for enhancing environmental protection through innovative processes that recycle environmental waste. Forests conservation and reforestation efforts should also be encouraged to protect the environment and global warming.

### Curriculum and Environmental Sustainability

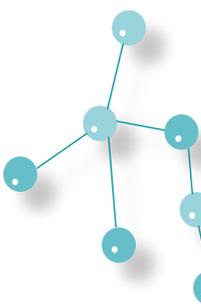
Environmental sustainability is important for effective development of any country. There is need to maintain the green environment and mitigate against climate change. In this regard, participants recommended inclusion of environmental courses that are cross-cutting to all disciplines as a way of inculcating conservation skills to students. Also proposed for action is the need for universities to maintain and sustain environmental dynamics through provision of effective sanitation programmes and green environment around the hostels and the university.

### Environmental Engineering Profession

One of the problems facing environmental conservation is lack of professionalism in the area. Participants proposed action in terms of developing programmes that will strengthen the profession as a discipline. These include developing Bio-safety strategies to be included in the curriculum for all SET based programmes.

### Achieving the Millennium Development Goals (MDGs)

Graduates of liberal Arts programmes lack basic science information and yet they have a responsibility to implementation MDGs that hinge on Science and the Environment. The conference therefore recommended the need to develop basic science courses to be offered to Liberal arts students during the first two years at the university. It was also proposed that basic arts courses too could be developed for science and Technology oriented programmes.



## 2.4 SCIENCE ENGINEERING AND TECHNOLOGY TRAINING AND HEALTH

### HIV/AIDS - Response

Inadequate institutional support to HIV/AIDS pandemic in higher learning institutions was identified as a major problem that needs to be tackled. There is need for deliberate institutional response with leadership commitment including mainstreaming HIV/AIDS into institutional strategic plans. Other actions proposed include the need to accommodate HIV/AIDS into SET curricula design and introducing core common courses for all first year students.

### HIV/AIDS - Indigenous Interventions

Participants observed that there is inadequate response to research-based indigenous response to the HIV/AIDS pandemic. This problem can be solved through promotion of indigenous solutions including the use of indigenous knowledge.

### Collaboration

Participants cited inadequate collaboration among SET role players in terms of healthcare solution provision. It was recommended that multi-disciplinary and multi-sectoral, regional and global collaboration efforts should be encouraged. This should involve e-healthcare solutions as well.

### SET Policy Implementation

Inadequate policy implementation coordination due to poor management structures was identified as a major policy problem on SET training and health. To address this problem, participants recommended the need to strengthen National Systems of Innovation (NSI) to enable adequate response to development challenges at policy level. They also recommended the need to engage SET role players more constructively in policy implementation.

### Health Workforce

Shortage of health workforce in quantity and quality was identified as a problem area in the quest to implement better health-care. This is occasioned not only due to fewer numbers of graduates being produced but also as a result of brain drain. Several actions were proposed to deal with this problem. These include the need to expand access and participation in health education and training, by providing bridging and part-time programmes through e-learning and open and distance education modes of delivery. Retention incentives to the health workforce was also proposed as a way to stem brain-drain.

Lack of expertise on health informatics was also identified as an area that needs improvement. The conference participants recommended the need to mainstream health informatics into the medical schools curricula. This can be achieved by designing continuing education programmes that can be delivered through Open and Distance Education modes.

## Diaspora expertise

It has been noted that there is a large population of African experts in the Diaspora. It is high time that these experts were encouraged to contribute more in building Africa. The conference recommended two strategies to deal with this problem. First, to develop mechanisms that will formalise these experts' contributions in academic, scientific and economic circles and secondly, to urge institutions and various governments to formulate deliberate strategies that will exploit Diaspora potentials.

## Graduate Global Acceptance

The conference observed that there is lack of global / international acceptability of SET graduates in employment opportunities, especially in North America. A strategy to deal with this problem is twofold: to balance training for local needs with global trends and secondly to seek recognition of the academic programmes through accreditation and other related initiatives.

## Funding

Funding is a problem affecting all areas of SET training. In particular, the conference noted that there is over-dependency on public funding resulting in inadequate support to implement programmes. Two strategies to increase the funding base were proposed: the need to develop policies that encourage and attract private sector funding and the need to explore funding potential from alumni.

## Refresher Training

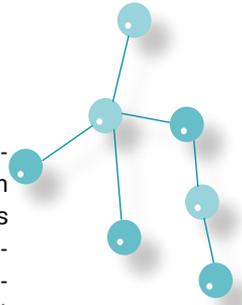
Three factors are critical in ensuring that institutions produce quality graduates in SET training. These are the faculty, the teaching materials and the curriculum, among others. A major concern, quietly spoken about within the stakeholders fraternity, is the fact that some members of the faculty have not kept up with pace in technological developments that have a bearing in the SET knowledge domain. There is need therefore to promote faculty interactions within industry in addition to designing continuing education programmes to upgrade staff skills.

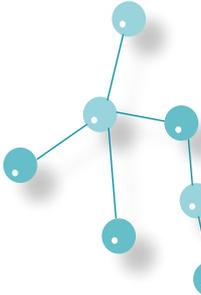
## African Renaissance

Participants benefited from a detailed discussion on the question of African Renaissance and how its pillars of social cohesion, democracy, economic rebuilding and growth have not been embraced in the quest to empower the African people economically. Participants suggested the need to develop strong shared vision on these pillars among the leaders through forums such as African Union, Kneepad, ANSTI and the UN among others.

## Resources

Like in all other themes, shortage of SET teaching and research resources and lack of optimal utilization of the available ones is an issue of concern. Two strategies to deal with this issues were proposed. There is need to broaden resource base beyond government funding and to develop better optimization strategies.





## 3.0: PROPOSED ACTIONS AND THEIR OBJECTIVES

This section outlines the proposed actions and their objectives. Under each issue/problem, we have presented the action that was proposed by participants in the conference. Further details are contained in the matrix of the action plan at the annex. The list is to serve only as a guide for university leaders, decision makers and donors because the actions proposed would apply differently for different institutions and moreover not all actions may be relevant to all institutions. For international organizations involved in regional activities, the next section in this report will highlight the priority actions that can be implemented at that level.

### 3.1 SET AND POVERTY ALLEVIATION

#### Curriculum

The following actions were proposed to make SET curricula more relevant to issues of poverty alleviation.

**ACTION:** *Involve stakeholders in review of curricula.* The objective is to ensure relevance of curricula to societal needs.

**ACTION:** *Carry out regular tracer studies the outcomes of which should form inputs to regular reviews of the curricula.* The objective is to ensure currency and relevance of curricula.

**ACTION:** *Adopt the Problem-Based Learning (PBL) approach.* The objective is to enable students' participation in solving real-life problems in order to facilitate employability of students immediately after graduation.

**ACTION:** *Incorporate training on entrepreneurship, investment and management of resources in SET curricula.* The objective of this action is to ensure proper management of investments and resources. This action will also facilitate self-employment.

#### Private Sector – University Linkages

The following are actions proposed to improve university-private sector linkage.

**ACTION:** *Maintain close contacts and interactions with stakeholders.* The objective is to facilitate appreciation of the importance and the needs of SET programmes in universities.

**ACTION:** *Carry out regular tracer studies whose outcome should form an input to regular reviews of the curricula.* The objective is to get feed-back from stakeholders on relevance of curricula and new requirements that need to be accommodated.

## Weak R&D Support

**ACTION:** *Provide and negotiate for incentives for supporting SET training.* There are two objectives for this action: to attract and motivate industrial support and to promote industrial collaboration in R&D activities.

## Low Financing

**ACTION:** *Mobilize private sector participation and lobby for increased government funding.* The objectives are to attract partnership in SET training and to get higher priority setting in favour of SET training.

## Lack of Appreciation of Role of SETI

**ACTIONS:** *Sensitize govt, politicians and the public; Demonstrate that SET underpins and drives development; Mobilize political will.* The actions are intended to win appreciation of the role of SETI, scientists and engineers in development and to ensure relevance of curricula to addressing poverty reduction issues.

## Lack of SET Expertise

**ACTION:** Improve the reward systems and incentives for SET expertise. The objective of this action is to attract and retain SET experts.

**ACTIONS:** *Expand qualitatively and quantitatively SET training; Introduce Open Distance Learning (ODL) as an alternative / complementary modes of delivery.* The objective is to help improve the number of SET personnel being produced into the job market.

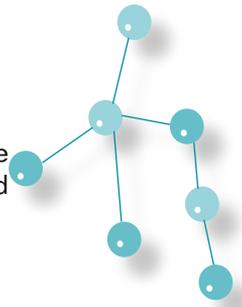
## Declining Student Enrolments

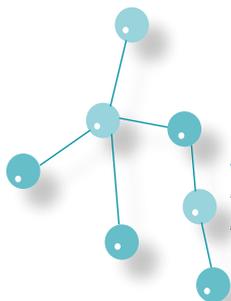
**ACTIONS:** *Improve Teaching of Science, Mathematics in Schools; Provide functional laboratories and equipment; Repackage science course to make them attractive; Provide incentives for pursuing SET studies at schools, colleges and universities.* The above actions are aimed at making science and mathematics in schools attractive, interesting and rewarding.

**ACTIONS:** *Recognize and reward SET professionals in the practice; Improve SET operational environment; Strengthen career counselling and guidance mechanisms; Invest generously in the development and retention of human capital in the areas of SET.* The objectives for these actions are to improve employment prospects and to stimulate economic growth.

## Lack of Suitable Policies and Strategies

**ACTION:** *Put in place policies and Implementation policy strategies on: SETI; Research and Publications; and Intellectual Property (IP).* The objective is to provide a framework and environment for improved SETI and hence economic growth.





## Low Application of SETI in Economic Activities

**ACTIONS:** Adopt Problem-Based Learning; Involve students in solving problems in surrounding communities; Include SETI in National Socio-Economic Development Agendas. The objectives for these actions are to enable student's participation in solving real life problems

**ACTIONS:** Include SETI in national socio-economic development agendas; Promote use of IP Information for technology diffusion. The objectives for these cluster of actions is to ensure relevance and impact of SET training in addressing poverty reduction issues.

## Increasing level of Poverty in Sub-Saharan Africa

The increasing level of poverty in SSA can be checked through a number of actions in SET training as outlined here below.

**ACTIONS:** Provide for 100% primary and secondary school enrolment of respective age groups; Provide for 60% tertiary education enrolment of respective age groups; Provide for 60:40 enrolment in favour of SET enrolment in tertiary education institutions. Objective is to help improve the education level and overall competence of the respective society.

**ACTION:** Provide incentives for pursuing SET studies at schools, colleges and universities. The objective is to stimulate efforts towards improving the SETI competence of the respective society.

**ACTION:** Recognize and reward SET professionals in the practice. These action aims attracting and retaining SET professionals in the industry.

**ACTIONS:** Improve SET operational environment; Establish science parks, technology/business incubators; and innovation systems and clusters. The objective is to stimulate innovativeness, competitiveness, wealth creation and economic growth.

## 3.2 SET TRAINING AND INFRASTRUCTURE DEVELOPMENT

### Intellectual Property and Ownership of Knowledge

**ACTION:** Share innovations and research outputs. The objective is to reduce duplication of efforts.

**ACTION:** Universities to develop mechanisms of protecting IP rights. The objective is to encourage multidimensional / multidisciplinary activities and initiatives.

**ACTION:** Governments to enact laws that protect IPs. The objective is to protect individual rights and encourage innovation.

## Low investments in SET Infrastructure

**ACTIONS:** *Change policies that govern investments in SET infrastructure. To enable higher investments in education through change of policies.*

**ACTION:** *Encourage Public-Private Sector Partnerships. To provide an environment where support for SET can be extended.*

**ACTION:** *Ensure strong government commitments. To ensure sustained financial support that will ensure planned growth that is beneficial to the economy in line with training demands.*

## Inadequate Graduate Training

**ACTIONS:** *Identify critical areas and set training targets for each; Review the curriculum towards making manpower adequate to fill the gaps. The objective for these set of actions is to ensure planned demand-driven growth that is beneficial to the economy.*

## Lack of policy on SETI

**ACTIONS:** *Each country to review its policies on SETI. The objective is to develop policies on SETI and apply them in training.*

## Political will

Inability to influence political will on matters on SETI was identified as a major impediment in entrenching SETI into the national agendas. The following actions were proposed.

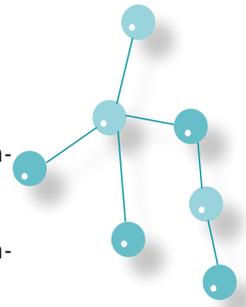
**ACTION:** *Engineers and Scientists to be encouraged to engage in policy making bodies. The objective is to ensure professional influence on matters on SETI.*

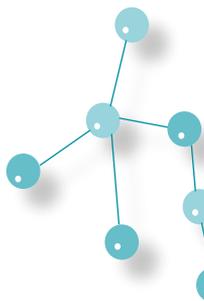
**ACTION:** *Create more pressure groups such as COVIDSET. The objective is to create a forum where SETI issues are discussed and authoritative documents for reference are produced.*

**ACTION:** *Universities to establish engineering standards. The action is aimed at ensuring quality outputs and products with a view of making positive impression on society.*

## Incomplete Innovation Chain

**ACTION:** *Bridge the gap between design and production. There are a number of objectives for this action: To encourage more product design and development initiatives; To do prototyping and small-scale manufacturing; and To enhance specialized / customized training.*





## Need-oriented training

**ACTION:** *Implement focused experiential training programmes.* The objective is to develop career-oriented training.

**ACTION:** *Encourage more internship.* This action will ensure that students gain relevant experience and employment. On the other hand, the SMEs will gain extra capacity from this action.

**ACTION:** *Develop and implement customized short courses to address SMEs training needs.* This action aims at enhancing technical skills of SMEs that will make them globally-competitive.

**ACTION:** *Train rural population on specific SET programmes.* The objective of this action is to disseminate technology to the rural areas.

## Outdated curricula

**ACTION:** *Re-focus R&D; Re-focus curriculum; Encourage partnerships and collaborations with industry.* The objective of these set of actions is to align investments in R&D and technology platforms with future industry needs and strategies.

## Diffusion of Knowledge

**ACTION:** *Develop technology platforms for specialized skills acquisition.* The objectives for this action are twofold: to develop infrastructure (equipment) and human resources to service SME and student needs; and to help develop employable graduates.

**ACTION:** *Enhance collaboration between SMEs and academia.* The objective is to create synergy and closer relationships with employers of students.

**ACTION:** *Incorporate entrepreneurship training.* The objective is to encourage students to develop skills in producing/designing marketable products.

## Employability of Graduates

**ACTION:** *Rejuvenate private-public sector partnerships and a closer relationship in curriculum development.* The objective is to ensure that the graduates produced fit well into relevant needs of the industry.

## Inadequate Resources

Government funding for universities has continued to decrease over time for various reasons such as a shift to commoditization of education and prescriptions from international lenders within the structural adjustment programmes of the early 90's. A number of mechanisms for developing self-sustaining programmes were proposed to deal with this trend.

**ACTION:** *Establish new initiatives such as part-time programmes.* The objective is to maximize the utilization of the expertise.

**ACTION:** *Establish university companies to engage in consultancy and marketable innovative business models.* The objective is to effectively utilize the available resources, human and otherwise, to create wealth for the universities.

**ACTION:** *Establish Industrial parks to market products.* The objective is to create a forum for sharing innovation and hence market products.

## Sustainability Challenges

**ACTION:** *University administrators should generate own resources: to enhance income generation activities.* The objective is to increase income generation opportunities.

## Entrepreneurship Training

**ACTION:** *Include courses on entrepreneurship in degree programmes.* This action will ensure that graduates are quickly absorbed and fit well into the job market.

## Inadequate Equipment

**ACTION:** *Allocation of more funds; Collaboration with industry; Increase networking opportunities.* These actions are aimed at creating an environment where the private sector can take a more prominent role in supporting SET in universities.

## 3.3 SET TRAINING AND THE ENVIRONMENT

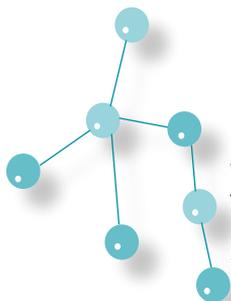
### Lack of Optimal Environmental management

**ACTION:** *Conduct environmental needs assessment.* The objective of this action is to promote access to and improvement of quality of basic education on the environment.

**ACTION:** *Re-orient existing education to address Sustainable Development (SD); Provide relevant training programmes for all sectors to accelerate SD; Carry out effective funding mechanisms for human resource development by the universities.* The objective of these actions is to ensure sustainable exploitation of resources.

**ACTION:** *Develop public understanding and awareness on the importance of the environment.* The objective of this action is to ensure that the environment is natured and protected.

**ACTION:** *Develop and implement proper environmental policies including encouraging forest and botanic gardens development and conservation; ensuring protection of endangered plant species through ex situ conservation; and promoting carbon dioxide sequestering and trade.* The objective of this set of actions is to check global warming trends.



## Curriculum and Environmental Sustainability

**ACTION:** *Mainstream environmental courses in all university programmes; Link students' professional needs with green environment courses.* The objective is to impart skills and knowledge to graduates who will help improve on pollution and sustainable waste management systems at the workplace, and at home.

**ACTION:** *Provide effective sanitation programmes and green environment around the hostels and the university.* The objective of this action is to move towards total environment management.

## Environmental Engineering Profession

**ACTION:** *Develop environmental engineering programme as a profession; Include bio-safety courses in the programme.* The objective of these actions is to inculcate the best practices in the developed countries.

## Implementation of MDGs

**ACTION:** *Develop basic science courses to be offered to Liberal arts students during the first two years at the university; Basic arts courses too could be developed for science and Technology oriented programmes.* The objective is to develop an understanding on the basic contribution of science and technology in national development and hence accelerate the realisation of the MDGs.

## 3.4 SCIENCE ENGINEERING AND TECHNOLOGY TRAINING AND HEALTH

The challenge of quality healthcare services in Africa is daunting. It is estimated that globally about 39.5 million people were living with HIV/AIDS in 2006 but few know whether they are infected or show symptoms of the disease. The conference noted the devastating effects of the disease in the African economies, but as also quick to say the other diseases that are equally a threat should not be ignored. We consider the actions proposed.

### HIV/AIDS Pandemic

**ACTION:** *Need for deliberate institutional response with leadership commitment in the fight against HIV/AIDS.* The objective of this action is to mainstream HIV/AIDS into institutional strategic plan.

**ACTION:** *Mainstream HIV/AIDS into SET curricula design and delivery for continuing students; Introduce core common course on HIV/AIDS for all first year students; Train academic staff on HIV/AIDS integration and teaching approaches.* The objective of these set of actions is to prevent new HIV infection among university staff and students.

**ACTION:** *Promote research into indigenous solutions including use of indigenous knowledge.* The objective is to acquire insights into indigenous solutions to HIV/AIDS.

## Inadequate Collaboration

**ACTION:** *Promote multi-disciplinary and multi-sectoral, regional and global SET collaboration.* The objective of this action is to develop deliberate strategies for collaboration that will galvanise synergies among researchers.

**ACTION:** *Promote collaboration on e-healthcare solution provision.* The objective is to expand opportunities for healthcare provision.

## Policy Issues

**ACTION:** *Strengthen policy implementation coordination and management structure.* The objective is to constructively engage role players in S & T policy implementation.

**ACTION:** *Strengthen National Systems of Innovation (NSI) to enable adequate response to development challenges.* The objective is to provide comprehensive NSI performance monitoring, evaluation and review system.

## Dated SET Curricula

**ACTIONS:** *Establish national and institutional policy/strategy for periodic and timely review of SET curricula and programmes; Evolve institutional mechanism for stakeholders involvement; Establish institutional programme quality assurance mechanism.* The objective of these set of actions is to ensure that SET the curricula is current and address emerging issues.

## Health Workforce shortage

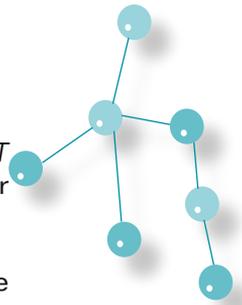
**ACTIONS:** *Increase health workforce graduate targets; Provide bridging and part-time programmes; Exploit e-learning; Provide Open & Distance Learning.* The objective of these actions is to expand access and participation in health education and training programmes.

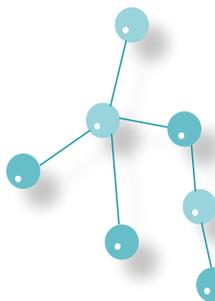
**ACTION:** *Provide workforce with retention incentives.* The objective of this action is to stem brain drain.

**ACTION:** *Mainstream health informatics into medical school curricula and continuing education; Design continuing education programme on health informatics for healthcare workforce by exploiting e-learning and Open & Distance Learning approaches.* The objective of these important actions is to provide for the much needed computing technological absorptive capacity among health workforce.

## Diaspora Expertise

**ACTION:** *Formulate strategy to constructively engage the diasporas.* The objective is to exploit Diaspora potentials in contributing towards the development of Africa.





## Graduate Global Acceptance

**ACTIONS:** Seek entry into the Washington Accord on accreditation; Consider ECSA (South Africa) for qualified programmes in Africa; Promote external programme review of SETI programmes. The objective of these actions is to enable global acceptance of SETI graduates, balancing training for local needs with global needs.

## Funding constraints

**ACTIONS:** Facilitate government policy that encourages private sector funding; Constructively engage private sector to attract funding; Explore funding potentials from alumni. These actions aim at increasing funding base that is less dependent on respective government capitations.

## Refresher Training

**ACTION:** Promote faculty interaction with industry; Design continuing education programme for faculty. The objective is ensure that staff keep current their knowledge and skills.

## African Renaissance

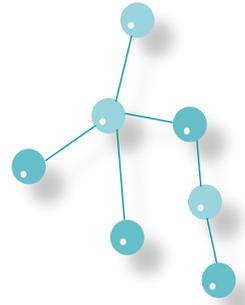
**ACTIONS:** Invest in and carry out interdisciplinary studies on the relationship between SETI and the pillars of an African renaissance: social cohesion, democracy, economic rebuilding and growth; Invest in and develop curricula for SETI students in development studies and African renaissance. The objective of these multi-pronged approaches to the question of African Renaissance is to invest in and create regional centers of excellence on SETI and the African renaissance.

## Resources Mobilization

**ACTIONS:** Broaden resource base through adoption of PPP strategies; Tap into diasporas economy. The objective is to broaden resourcing base beyond dependence on government funding.

**ACTIONS:** Promote utility approach to resource provisioning and utilization; Consider utility grid computing enabled e-Science and e-Healthcare adoption. The objective is to develop resource utilization optimization strategies that will ensure efficiency and effective .

## 4.0: PRIORITY ACTIONS FOR REGIONAL COOPERATION AND INTERNATIONAL SUPPORT FOR RELEVANCE OF SET TRAINING



During the conference, the participants raised many issues and discussed many problems for which possible solutions were identified based on their experiences in their respective institutions. The list of problems was quite long and hence the action plan was elaborate. These actions are listed in the previous section of this report and are intended for the attention of the national institutions and governments. Each institution or country may identify from the list specific problems and associated action inhibiting its ability to make SET training relevant to national development. After such identification, institutions will adopt the proposed action.

There are, however, five (5) problems where participants proposed actions that may benefit from regional cooperation and or the intervention of international organizations. In this section, we highlight such actions.

### Appropriate Curricula

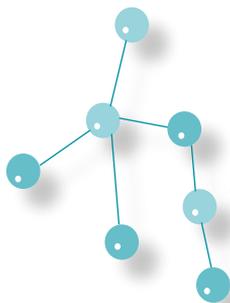
The issue of appropriate curriculum was a fundamental problem affecting the relevance of SET training to all aspects of national development. The proposed actions for international support (and regional cooperation) are as follows:

**ACTION:** *Promotion at the regional level problem-based learning approach.* The objective is to enable students' participation in solving real-life problems in order to facilitate employability of students immediately after graduation. Through regional cooperation and networking, institutions will be able to share experiences and practical examples from this approach.

**ACTION:** *Promotion of best practices/syllabi on training on entrepreneurship, investment and management of resources:* The objective is to introduce entrepreneurship training courses in SET curriculum with a view of empowering graduates to be self-employers.

### Declining Student Enrolments

There is a drop in the percentage of number of students enrolled in SET programmes in most institutions. This affects the availability of SET expertise to address national problems which in turn will make it difficult for SET training to have any impact in addressing socio-economic problems like poverty, disease and environmental degradation. Several actions have been proposed in the previous section to address this problem at the national level. However, some cooperation at regional level will be useful in reversing this decline.



**ACTION:** Support for exchange of experiences among institutional leaders on various policies, strategies and action to improve access to and retention in SET training programmes in the region: The objective of this action will be to make SET training attractive and thereby improve the level of enrolment in SET courses.

### Diffusion/application of Knowledge

There is a gap between knowledge acquisition in the institutions and its application in society. Several graduates are very knowledgeable in the SET but are unable to apply this knowledge to solve national problems especially those relating to the development of small medium enterprises.

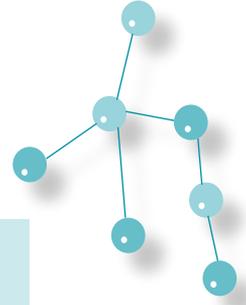
**ACTION:** Support for demonstration projects on technology platforms for specialized skills acquisition and the exchange of information on same: The objectives of this action are two fold: to develop infrastructure (equipment) and human resources to service small and medium enterprise and student needs; and to help develop employable graduates.

### Environmental Engineering Profession

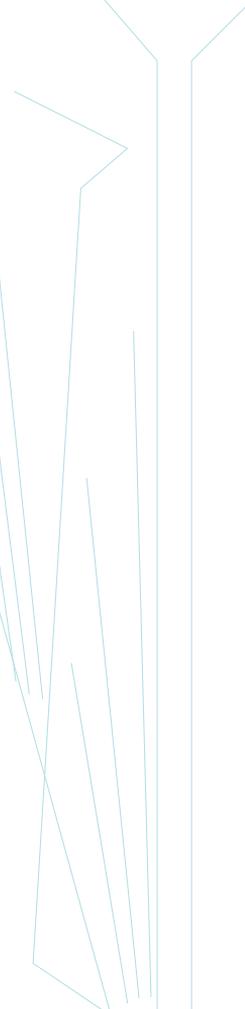
The absence of professionalism in the area of environmental management is one of the problems facing the region. Participants proposed actions that include the development and/or strengthening of environmental engineering as a discipline. At the regional level, it is essential that there is some exchange of information on this issue so as to facilitate the development of relevant curricula.

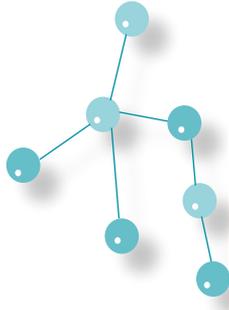
**ACTION:** Promote the development of environmental engineering programme as a profession and include biosafety courses on science programmes: The objective is to facilitate, through exchange visits, regional fora, the inculcation of best practices from developed countries.

# ANNEX I: OUTLINE OF THE ACTION PLAN



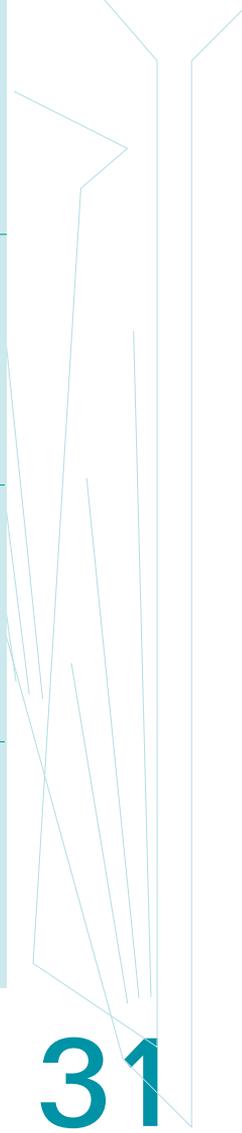
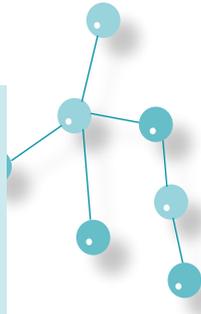
Problems identified	Strategies to address the problem	Actions proposed	Objectives of such actions	Responsible actors	Expected Outcomes
The SET curricula are not sufficiently addressing poverty reduction issues	<ul style="list-style-type: none"> <li>- Employ a participatory approach with stakeholders</li> </ul>	<ul style="list-style-type: none"> <li>- Involve stakeholders in review of curricula</li> </ul>	<ul style="list-style-type: none"> <li>- To ensure relevance of curricula to societal needs</li> </ul>	Universities	Relevant and responsive curricula
		<ul style="list-style-type: none"> <li>- Carry out regular tracer studies outcomes of which should form inputs to regular reviews of the curricula</li> </ul>	<ul style="list-style-type: none"> <li>- To ensure currency and relevance of curricula</li> </ul>	Universities	Graduates more capable of tackling societal problems
	<ul style="list-style-type: none"> <li>- Use real-life projects and scenarios to teach</li> </ul>	<ul style="list-style-type: none"> <li>- Adopt the Problem-Based Learning (PBL) approach</li> </ul>	<ul style="list-style-type: none"> <li>- To enable students participation in solving real life problems</li> </ul>	Universities	More young-sters interested in SETI
	<ul style="list-style-type: none"> <li>- Provide necessary skills in entrepreneurship, investment and management of resources</li> </ul>	<ul style="list-style-type: none"> <li>- Incorporate training on entrepreneurship, investment and management of resources in SET curricula</li> </ul>	<ul style="list-style-type: none"> <li>- To ensure proper management of investments and resources</li> <li>- To facilitate self-employment</li> </ul>	Universities	Graduates interested in and capable of self employment

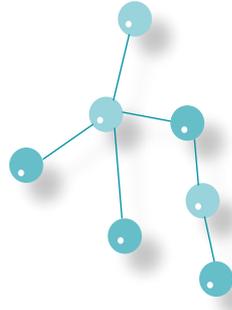




Problems identified	Strategies to address the problem	Actions proposed	Objectives of such actions	Responsible actors	Expected Outcomes
Weak linkage between Universities offering SET programmes with the private sector	<ul style="list-style-type: none"> <li>- Employ a participatory approach with stakeholders</li> </ul>	<ul style="list-style-type: none"> <li>- Maintain close contacts and interactions with stakeholders</li> </ul>	<ul style="list-style-type: none"> <li>- To facilitate appreciation of the importance and needs of SET programmes in universities</li> </ul>	Universities	Improved university-industry linkage
		<ul style="list-style-type: none"> <li>- Carry out regular tracer studies whose outcome should form an input to regular reviews of the curricula</li> </ul>	<ul style="list-style-type: none"> <li>- To get feedback from stakeholders on relevance of curricula and new requirements that need to be accommodated</li> </ul>	-Universities	
Weak local industry support of R&D and /or absorption of R&D products	<ul style="list-style-type: none"> <li>- Develop opportunities that will attract participation</li> </ul>	<ul style="list-style-type: none"> <li>- Provide and negotiate for incentives for supporting SET training</li> </ul>	<ul style="list-style-type: none"> <li>- To attract and motivate industrial support</li> <li>- To promote industrial collaboration in R&amp;D activities</li> </ul>	<ul style="list-style-type: none"> <li>-Universities</li> <li>-Govt</li> <li>-Industry</li> </ul>	Improved support to SETI by Industry

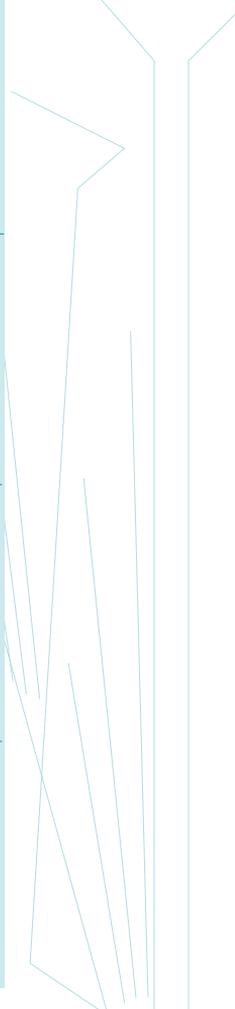
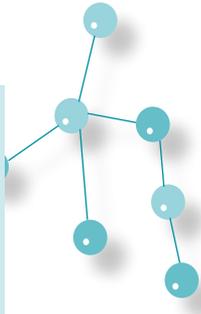
Problems identified	Strategies to address the problem	Actions proposed	Objectives of such actions	Responsible actors	Expected Outcomes
Low financing of SET training, and overdependence on external funding	- Encourage development of other sources of income	- Mobilize private sector participation	- To attract partnership in SET training	Universities Govt	Improved financing of SET training
		- Lobby for increased government funding	- To improve funding of SET training	Universities Industry	
		- Mobilize political will	- To get higher priority setting in favour of SET training	Universities Parliamentarians	
Lack of appreciation (by gov't, politicians and the public) of the role of SETI, and scientists and engineers in accelerating development	- Ensure more visibility of the role of SETI in national development	- Sensitize gov't, politicians and the public	- To win appreciation of the role of SETI, scientists and engineers in development	Universities Industry	Enhanced recognition and appreciation of the role of SETI in development
		- Demonstrate that SET underpins and drives development	- To ensure relevance of curricula to addressing poverty reduction issues		
		- Mobilize political will			

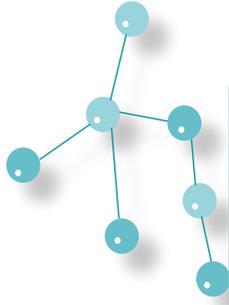




Problems identified	Strategies to address the problem	Actions proposed	Objectives of such actions	Responsible actors	Expected Outcomes
Lack of a critical mass of the SET expertise	<ul style="list-style-type: none"> <li>- Set targets and use multiple modes to implement programms</li> </ul>	<ul style="list-style-type: none"> <li>- Improve reward systems and incentives for SET expertise</li> </ul>	<ul style="list-style-type: none"> <li>- To attract and retain SET experts</li> </ul>	Govt Universities Industry	More students joining SET training and
		<ul style="list-style-type: none"> <li>- Expand qualitatively and quantitatively SET training</li> </ul>	<ul style="list-style-type: none"> <li>- To improve number and quality of SET personnel</li> </ul>	Govt	more SET graduates
		<ul style="list-style-type: none"> <li>- Introduce Open Distance Learning (ODL) as an alternative modes of delivery</li> </ul>		Universities Industry	
Declining students enrolment trends and low SET graduate output in some SSA countries	<ul style="list-style-type: none"> <li>- Strengthen absorption capacities of graduates in the job market</li> <li>- Improve the teaching of Science and SET courses in universities</li> </ul>	<ul style="list-style-type: none"> <li>- Improve Teaching of Science, Mathematics in Schools</li> </ul>	<ul style="list-style-type: none"> <li>- To make science and mathematics in schools attractive, interesting and rewarding</li> </ul>	Govt Universities Industry	More students joining SET training and
		<ul style="list-style-type: none"> <li>- Provide functional laboratories and equipment</li> </ul>			more SET graduates

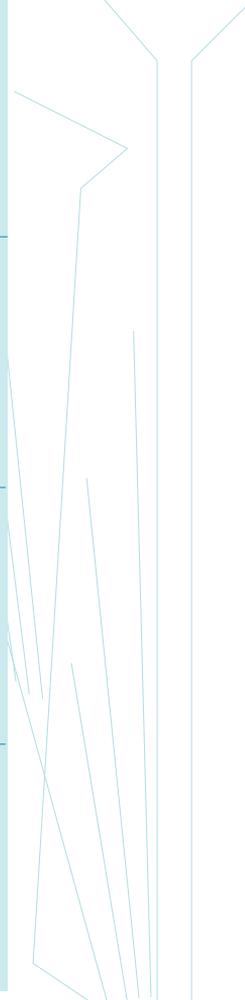
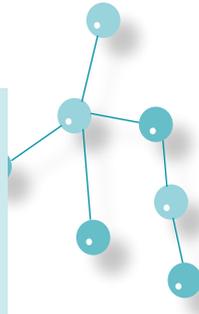
Problems identified		Strategies to address the problem		Actions proposed	Objectives of such actions	Responsible actors		Expected Outcomes
			<ul style="list-style-type: none"> <li>- Repackage science course to make the attractive</li> <li>- Provide incentives for pursuing SET studies at schools, colleges and universities</li> <li>- Recognize and reward SET professionals in the practice</li> <li>- Improve SET operational environment</li> <li>- Strengthen career counselling and guidance mechanisms</li> </ul>					

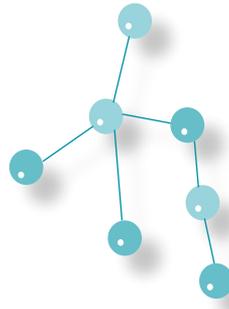




Problems identified	Strategies to address the problem	Actions proposed	Objectives of such actions	Responsible actors	Expected Outcomes
		<ul style="list-style-type: none"> <li>- Repackage science course to make the attractive</li> <li>- Provide incentives for pursuing SET studies at schools, colleges and universities</li> <li>- Recognize and reward SET professionals in the practice</li> <li>- Improve SET operational environment</li> <li>- Strengthen career counselling and guidance mechanisms</li> </ul>			

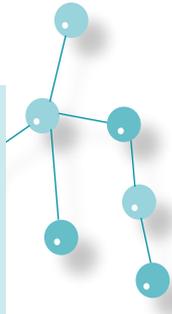
Problems identified	Strategies to address the problem	Actions proposed	Objectives of such actions	Responsible actors	Expected Outcomes
Lack of suitable policies and strategies on SETI in most SSA countries	Encourage development of relevant policies on SETI	Put in place policies and implement policy strategies on: <ul style="list-style-type: none"> <li>- SETI</li> <li>- Research and Publications</li> <li>- Intellectual Property (IP)</li> </ul>	To provide framework and environment for improved SETI and hence economic growth	Govt Universities	Enabling environment for SET development
Low application of SETI in economic activities	<ul style="list-style-type: none"> <li>- Ensure more visibility of the role of SETI in national development</li> <li>- Use real-life projects and scenarios to teach</li> </ul>	<ul style="list-style-type: none"> <li>- Adopt Problem-Based Learning</li> <li>- Involve students in solving problems in surrounding communities</li> </ul>	<ul style="list-style-type: none"> <li>- To improve employment prospects</li> <li>- To stimulate economic growth</li> </ul>	Universities in partnership with Industry	Enhanced SETI applications in socio-economic activities





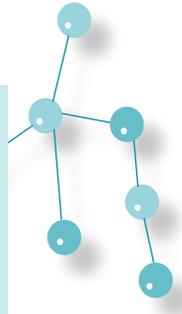
Problems identified	Strategies to address the problem	Actions proposed	Objectives of such actions	Responsible actors	Expected Outcomes
Increasing level of poverty in SSA	<ul style="list-style-type: none"> <li>- Increase enrolment in SET courses to enhance technology-oriented workforce</li> </ul>	<ul style="list-style-type: none"> <li>- Include SETI in National Socio-Economic Development Agendas</li> <li>- Promote use of IP Information for technology diffusion</li> </ul>	<ul style="list-style-type: none"> <li>- To ensure relevance and impact of SET training to addressing poverty reduction issues</li> </ul>		
	<ul style="list-style-type: none"> <li>- Increase enrolment in SET courses to enhance technology-oriented workforce</li> </ul>	<ul style="list-style-type: none"> <li>- Provide for 100% primary and secondary school enrolment of respective age cohorts</li> <li>- Provide for 60% tertiary education enrolment of respective age cohort</li> <li>- Provide for 60:40 enrolment in favour of SET</li> </ul>	<ul style="list-style-type: none"> <li>- To improve the education level and overall competence of the respective society</li> </ul>	Govt in partnership with Private Sector	<p>Enhanced economic growth</p> <p>Reduced poverty levels</p>

Problems identified	Strategies to address the problem	Actions proposed	Objectives of such actions	Responsible actors	Expected Outcomes
		<ul style="list-style-type: none"> <li>- of SET in tertiary education institutions</li> <li>- Provide incentives for pursuing SET studies at schools, colleges and universities;</li> <li>- Recognize and reward SET professionals in the practice;</li> <li>- Improve SET operational environment;</li> <li>- Establish science parks, technology/business incubators; and innovation systems and clusters.</li> </ul>	<ul style="list-style-type: none"> <li>- To improve the SETI competence of the respective society</li> <li>- To attract and retain SET professionals</li> <li>- To stimulate innovativeness, competitiveness, wealth creation and economic growth</li> </ul>	<ul style="list-style-type: none"> <li>- Govt</li> <li>- Universities</li> <li>- Industry</li> <li>- Govt</li> <li>- Industry</li> <li>- Govt</li> <li>- Industry</li> <li>- Universities</li> </ul>	

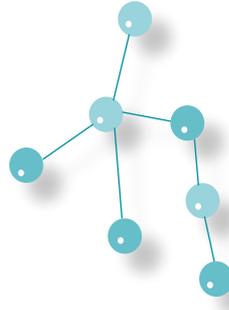


## SUB-THEME B: SET TRAINING AND INFRASTRUCTURE DEVELOPMENT

Problems/issues identified	Strategy to address problem	Actions proposed	Objectives of such actions	Responsible	Expected Outcomes
Lack of protection of IP and ownership of knowledge	Share innovations and encourage governments to enact laws that protect IPs	<ul style="list-style-type: none"> <li>- Share innovations and research outputs</li> <li>- Universities should develop mechanisms of protecting IP rights</li> <li>- GOVs to enact laws that protect IPs</li> </ul>	<ul style="list-style-type: none"> <li>- To reduce duplication of efforts</li> <li>- To encourage multidimensional / multidisciplinary activities and initiatives</li> <li>- To protect individual rights and encourage innovation</li> </ul>	Universities, Governments	IP rights and ownership upheld
Low investments in SET infrastructure	Institutions to justify need for increased investments in SET infrastructure Involve private sector	<ul style="list-style-type: none"> <li>- Change policies</li> <li>- Encourage Public-Private Partnership</li> <li>- Ensure strong government commitment</li> </ul>	<ul style="list-style-type: none"> <li>- To enable higher investments in education</li> <li>- To provide an environment where support for SET can be extended</li> <li>- To ensure sustained financial support</li> </ul>	Governments Universities	More funding for SET infrastructure

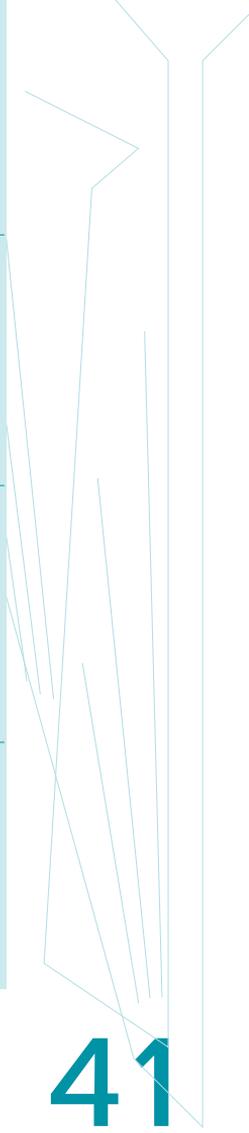
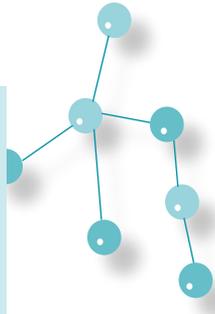


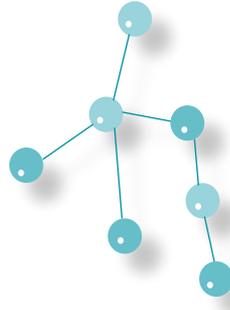
Problems/issues identified	Strategy to address problem	Actions proposed	Objectives of such actions	Responsible	Expected Outcomes
Lack of policy on SETI	Demonstrate the need for SETI policies and develop them	<ul style="list-style-type: none"> <li>- Each country to review their policies on SETI</li> </ul>	To develop policies on SETI and apply them in training on SETI	Institutions and Governments	Policy on SETI
Inability to influence political will	Encourage engineers and scientists to be actively involved in lobbying for more visibility of SETI as an engine for economic development	<ul style="list-style-type: none"> <li>- Engineers and Scientists to be encouraged to engage in policy making bodies</li> <li>- Create more pressure groups/forum</li> <li>- Universities to establish engineering standards</li> </ul>	<p>To ensure professional influence on matters on SET</p> <p>To provide a forum where SETI issues are discussed and authoritative documents for reference produced</p> <p>To ensure quality outputs and products</p>	<ul style="list-style-type: none"> <li>- Engineers and Scientists</li> <li>- Pressure groups and other professional bodies</li> </ul>	The political class appreciates the role of SETI for economic development



Problems/issues identified	Strategy to address problem	Actions proposed	Objectives of such actions	Responsible	Expected Outcomes
Incomplete innovation chain	Identify the chain and set out strategies to bridge gaps	Bridge the gap between design and production	<p>To encourage more product design and development initiatives</p> <p>To do prototyping and small-scale manufacturing</p> <p>To enhance specialised/ customised training</p>	<ul style="list-style-type: none"> <li>- Researchers, Innovators</li> </ul>	Clearly defined innovation chain
Lack of need-oriented Training	Match the needs with the training programmes	<p>Implement focused experiential training programmes</p> <ul style="list-style-type: none"> <li>- Encourage more internship</li> <li>- Develop supportive infrastructure</li> </ul>	<p>To develop career-oriented training</p> <p>To ensure that students gain relevant experience and employment; SMEs gain extra capacity</p>	<ul style="list-style-type: none"> <li>- Universities</li> <li>- Job market (entrepreneurs, employers, etc)</li> </ul>	Well trained, well-suited graduates for the industry

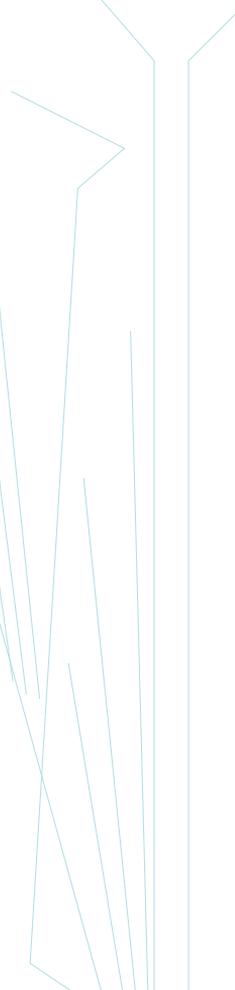
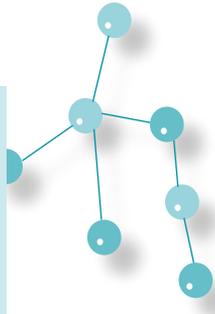
Problems/issues identified	Strategy to address problem	Actions proposed	Objectives of such actions	Responsible	Expected Outcomes
		<ul style="list-style-type: none"> <li>- Customised short courses to address SMEs training needs</li> <li>- Train rural population on specific SET programmes</li> </ul>	<p>To enhance technical skills of SMEs that will make them globally-competitive</p> <p>To disseminate technology to rural areas</p>		
Outdated curricula	Conduct regular and focused curriculum reviews	<ul style="list-style-type: none"> <li>- Re-focus R&amp;D</li> <li>- Re-focus curriculum</li> <li>- Partnerships and collaborations with industry</li> </ul>	To align investment in R&D and technology platforms with future industry needs and strategies		Tailored and reviewed Curriculum

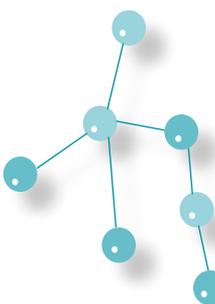




Problems/issues identified	Strategy to address problem	Actions proposed	Objectives of such actions	Responsible	Expected Outcomes
Diffusion of knowledge	Develop and broaden links between industry, training curriculum and the academia	<ul style="list-style-type: none"> <li>- Develop technology platforms for specialised skills acquisition</li> <li>- Enhance collaboration between SMEs and academia</li> <li>- Incorporate entrepreneurship training</li> </ul>	<p>To develop infrastructure (equipment) and human resources to service SME and student needs; To develop employable students</p> <p>To create synergy closer relationships with employers of students</p> <p>To encourage students to develop skills in producing / designing marketable products</p>		Enhanced collaboration between universities and industry
Inability to employ graduates (employability of graduates)	Create balance between needs, curriculum and infrastructure	Rejuvenate private-public sector partnerships and a closer relation-	To ensure that the graduates produced fit well into the needs of the industry	University managers, industry and the private sector	A more employable manpower

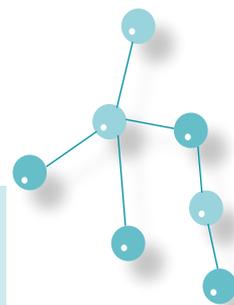
Problems/issues identified	Strategy to address problem	Actions proposed	Objectives of such actions	Responsible	Expected Outcomes
Inadequate resources -Dependency on government funding which is dwindling	Identify and nature other income generation activities	<p>Start new initiatives such as part-time programmes</p> <p>Start university companies to engage in consultancy and marketable innovative business models</p> <p>Start Industrial parks to market products</p>	<p>To maximise the utilisation of the expertise</p> <p>To effectively utilise the available resources; human and otherwise to create wealth for the universities</p> <p>To create a forum for sharing innovation and hence market our products</p>	University managers and faculties	Policy and sustainability
Sustainability challenges	Identify and nature other income generation activities	Generate own resources: enhance 3rd stream income generation activities	To increase income generation opportunities	University managers and faculties	Sustainability and funding



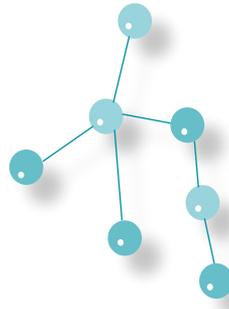


Problems/issues identified	Strategy to address problem	Actions proposed	Objectives of such actions	Responsible	Expected Outcomes
Lack of entrepreneurship training	Develop opportunities for entrepreneurship training	Include courses on entrepreneurship in degree programmes	To ensure that graduates are quickly absorbed and fit well into the job market	University managers	More ready graduates for the world of work
Lack of Equipment	Develop mechanisms for acquiring equipment	<ul style="list-style-type: none"> <li>- Allocation of more funds</li> <li>- Collaboration with industry               <ul style="list-style-type: none"> <li>- PPP</li> <li>- Increase networking opportunities</li> </ul> </li> </ul>	To create an environment where the private sector can take a more prominent role in supporting SET in universities	University managers	More modern equipment acquired

## SUB-THEME C: SET TRAINING AND THE ENVIRONMENT

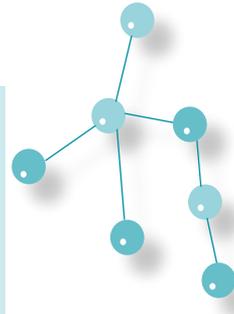


Problems identified	Strategy to address the problem	Proposed Actions	Specific Objective of such the actions	Responsible	Expected Outcomes
Lack of Optimal Environmental management	There is need to change mind-set of the communities and SET programmes should be localized in training for the society needs	Environmental needs assessment	Promoting access to and improvement of quality of basic education	University Managers and Academics Policy makers Community stakeholders Students	Graduates who understand that clean environment is necessary for high productivity at the work place.
	Universities should influence the curriculum at the secondary school level	Re-orienting existing education to address Sustainable Development  Provide relevant training programmes for all sectors to accelerate SD.  Effective funding mechanism for human resource development by the universities.	Sustainable exploitation of resources	University management  Governments	Greater awareness and practising environmental conservation activities



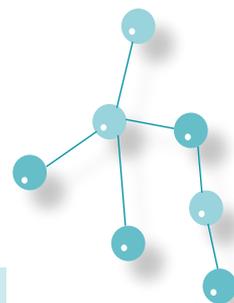
Problems identified	Strategy to address the problem	Proposed Actions	Specific Objective of such the actions	Responsible	Expected Outcomes
	Environmental protection should be enhanced to come up with innovative processes to recycle environmental waste.	<p>Develop and implement proper environmental policies including:</p> <ul style="list-style-type: none"> <li>Encouraging forest and botanical gardens development and conservation</li> <li>Ensuring protection of endangered plant species through ex situ conservation</li> <li>Promoting carbon dioxide sequestering and trade.</li> </ul>	The objective of this set of actions is to check global warming trends	University managers, students	<p>Forest conservation and improvement through reforestation.</p> <p>Reduced production of greenhouse gases, hence reduction in global warming</p>
Curriculum and Environmental Sustainability					

Problems identified	Strategy to address the problem	Proposed Actions	Specific Objective of such the actions	Responsible	Expected Outcomes
	Environmental courses should be cross cutting to all disciplines in order to conserve and maintain green environment and mitigate against the Climate change.  Total environment management involves interdisciplinary issues	Mainstream environmental courses in all university programmes  Link students professional needs with green environment courses	Improve on pollution and sustainable waste management systems	University managers	
	Universities should maintain and sustain environmental dynamics.	Provide effective sanitation programmes and green environment around the hostels and the university	To move towards total environment management	University administrators  Students	

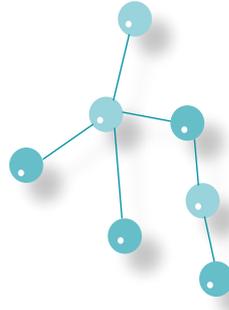




## THEME D: RELEVANCE OF SCIENCE, ENGINEERING AND TECHNOLOGY TRAINING, HEALTH AND INVESTMENT IN THE AFRICAN RENAISSANCE

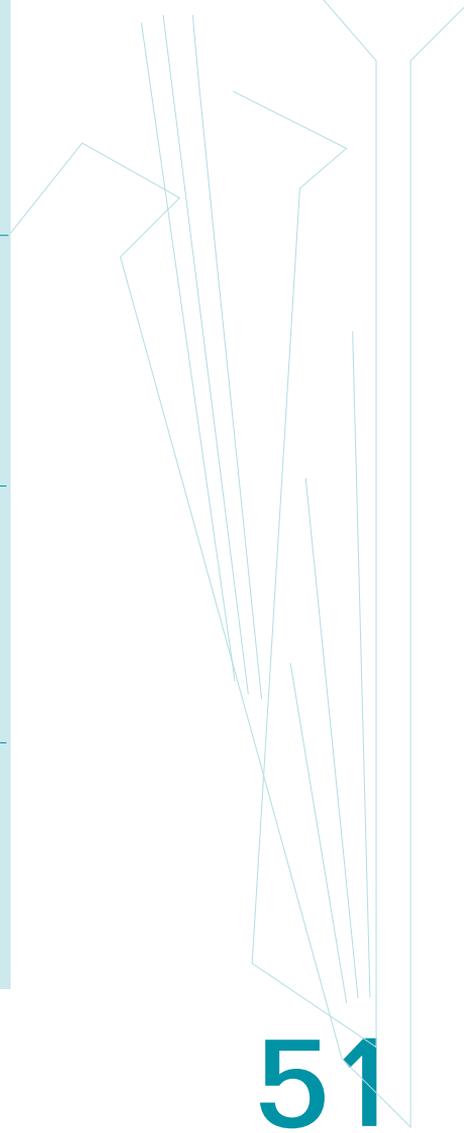
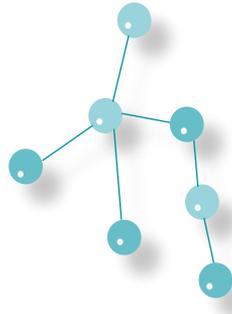


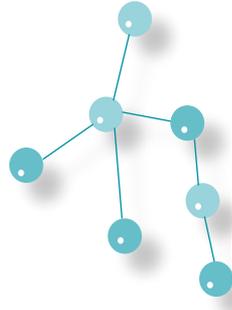
Problems identified	Strategy to address the problem	Actions proposed	Objective of such actions	Responsible actors	Expected Outcomes
HIV/AIDS Issues Inadequate institutional response to HIV/AIDS pandemic in HE institutions	Institutionalize the awareness campaign	Need for deliberate institutional response with leadership commitment in the fight against HIV/AIDS	Mainstream HIV/AIDS into institutional strategic plan	Institutional management	Comprehensive institutional response to HIV/AIDS pandemic
		Mainstream HIV/AIDS into SET curricula design and delivery for continuing students  Introduce core common course on HIV/AIDS for all first year students.  Train academic staff on HIV/AIDS integration and teaching approaches	To prevent new HIV infection among university staff and students.	Institutional management; Faculties with UNESCO and AWSE coordinating in collaboration with HE institutions.	Improved quality of staff productivity and students learning Greater HIV/AIDS awareness among staff and students and production of HIV/AIDS-competent graduates



Problems identified	Strategy to address the problem	Actions proposed	Objective of such actions	Responsible actors	Expected Outcomes
Inadequate research-based indigenous response to HIV/AIDS.	Encourage and support indigenous research activities	Promote research into indigenous solutions including use of indigenous knowledge	To acquire insights into indigenous solutions to HIV/AIDS	Researchers	Indigenous solutions to HIV/AIDS
<b>Collaboration Issues</b>					
Inadequate collaboration among SET role players	Provide opportunities and necessary environment for collaboration	Promote multi-disciplinary and multi-sectoral, regional and global SET collaboration	To develop deliberate strategies for collaboration	Institutional management and faculties	Increased collaborative activities
		Promote collaboration on e-healthcare solution provision	To expand opportunities for healthcare provision.	Relevant faculties, healthcare managers and practitioners	Improved exploitation of e-healthcare solutions in African health systems

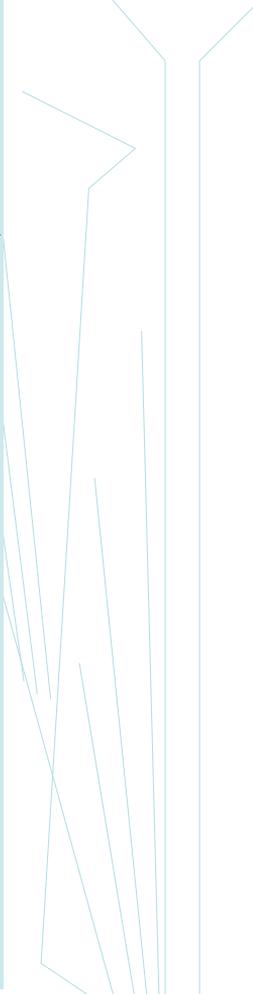
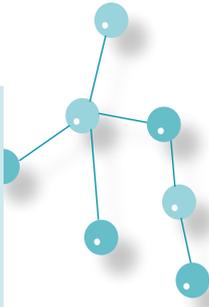
Problems identified	Strategy to address the problem	Actions proposed	Objective of such actions	Responsible actors	Expected Outcomes
<b>Policy/ Strategy Implementation Issues</b>					
Inadequate S & T policy implementation	Develop and support mechanisms for policy implementation on SET	Strengthen policy implementation coordination and management structure	Constructively engage role players in S & T policy implementation	Government and S & T policy implementation stakeholders	Improved implementation of S & T policies
		Strengthen National Systems of Innovation (NSI) to enable adequate response to development challenges	Provide comprehensive NSI performance monitoring, evaluation and review system	NSI stakeholders including Government, HE role players, public and private SET institutions	Strengthened NSI adequately addressing developmental challenges

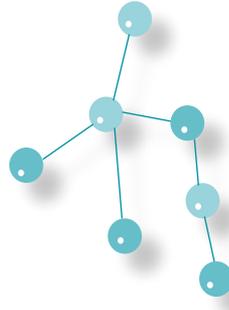




Problems identified	Strategy to address the problem	Actions proposed	Objective of such actions	Responsible actors	Expected Outcomes
<p><b>Curricular &amp; Programme quality Issues</b></p> <p>Dated SET curricula</p>	<p>Institutionalise regular curricula reviews in line with stakeholders expectations</p>	<p>Establish national and institutional policy/strategy for periodic, timely review of SET curricula and programmes.</p> <p>Evolve institutional mechanism for stakeholder's involvement.</p> <p>Establish institutional programme quality assurance mechanism</p>	<p>Need for curricula currency.</p>	<p>Faculties in collaboration with relevant stakeholders</p>	<p>Up-to-date curricula with improved quality of academic programmes and graduates.</p>
<p><b>Health Workforce Issue</b></p> <p>Shortage of health workforce in quantity and quality</p>	<p>Identify, develop and sustain training programmes for health workforce</p>	<p>Increase health workforce graduate targets;</p> <p>Provide bridging</p>	<p>Need to expand access and participation in health education and training</p>	<p>HE management; faculties, Medical professional bodies</p>	<p>Increased quantity and quality of health workforce</p>

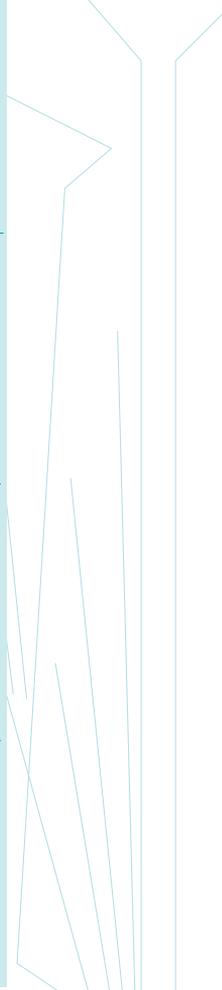
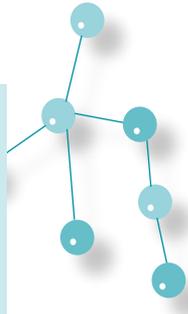
Problems identified	Strategy to address the problem	Actions proposed	Objective of such actions	Responsible actors	Expected Outcomes
	Provide conducive and attractive working environment for health workforce	<p>and part-time programmes;</p> <p>Exploit e-learning</p> <p>Provide Open &amp; Distance Learning.</p> <p>Provide work-force retention incentive</p> <p>Mainstream health informatics into medical school curricula and continuing education;</p> <p>Design continuing education programme on health informatics for healthcare workforce by</p>	<p>programmes</p> <p>Need to stem brain drain</p> <p>Need for Computing technological absorptive capacity among health workforce</p>	HE management and healthcare stakeholders, managers and	Improved e-healthcare acceptance and use in tackling healthcare challenges

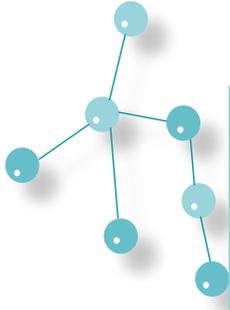




Problems identified	Strategy to address the problem	Actions proposed	Objective of such actions	Responsible actors	Expected Outcomes
		exploiting e-learning and Open & Distance Learning approaches			
<p><b>African Diaspora Issue</b></p> <p>Inadequate exploitation of resource potentials of the African diasporas in advancing HE agenda</p>	Constructively engage the Diaspora in the higher education agenda	Formulate strategy to constructively engage the diasporas	Formulation of deliberate strategy to exploit Diaspora potentials	HE management; Government	Improved exploitation of resource potentials of the African diasporas
<p><b>Graduate global acceptance Issue</b></p> <p>Lack of global acceptability of graduates of (African) Engineering programmes in</p>	Synchronise to the extent appropriate, local standards and benchmarks with international ones	Seek entry into the Washington Accord on accreditation	Need to seek global acceptance of SET graduates, balancing training for local needs	HE management, National accreditation bodies	Global acceptance of African SET graduates.

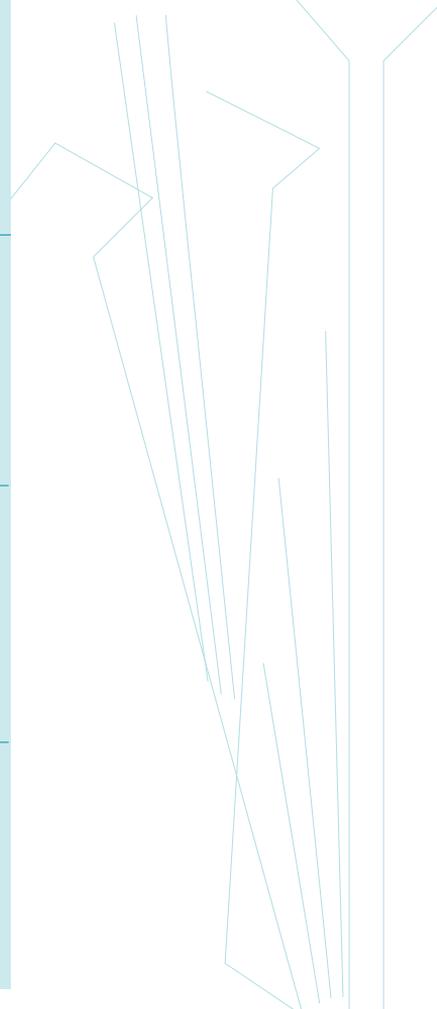
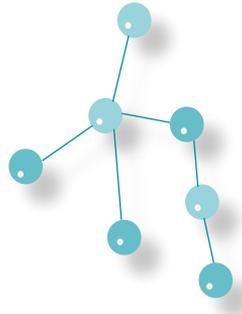
Problems identified	Strategy to address the problem	Actions proposed	Objective of such actions	Responsible actors	Expected Outcomes
<p>employments (especially in the North Americas)</p>		<p>Consider ECESA (South Africa) for qualified programmes in Africa.</p> <p>Promote external programme review of SET programmes;</p>	<p>with global needs.</p>		
<p><b>Funding Issue</b></p> <p>Over dependency on public funding resulting in funding inadequacy</p>	<p>Develop modalities for alternative funding programmes</p>	<p>Facilitate government policy that encourages private sector funding</p> <p>Constructively engage private sector to attract funding</p> <p>Explore funding potentials from alumni</p>	<p>Need to increase funding base</p>	<p>HE management and Faculties</p>	<p>Increased HE funding base</p>

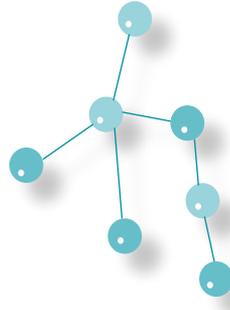




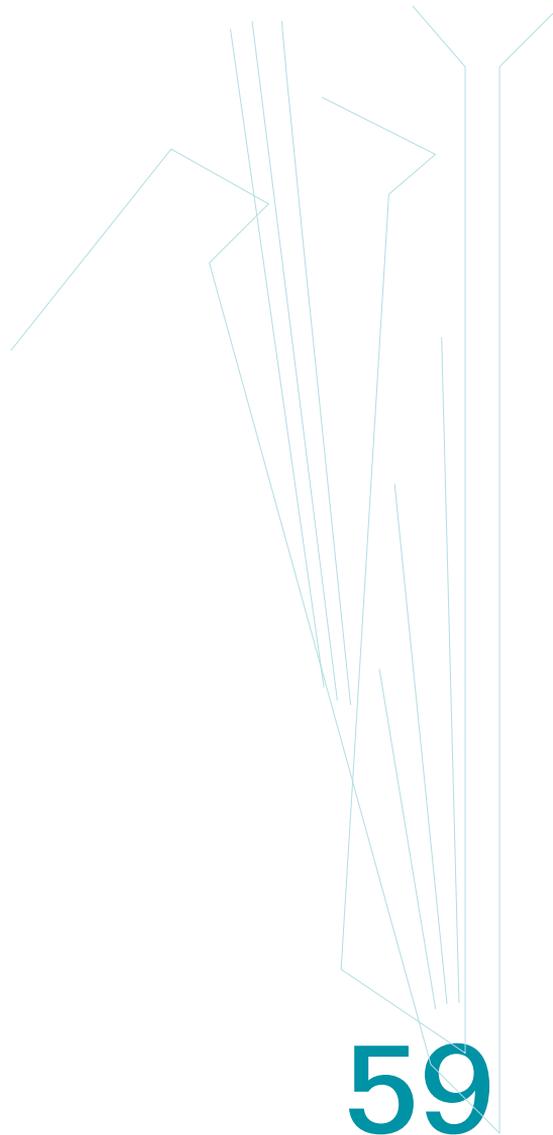
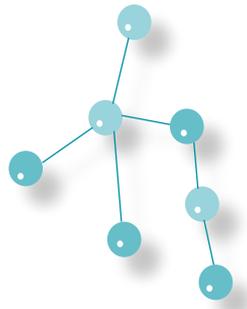
Problems identified	Strategy to address the problem	Actions proposed	Objective of such actions	Responsible actors	Expected Outcomes
<p><b>Faculty Capacity Current Issue</b></p> <p>Dated faculty due to lack of continuing education</p>	<p>Encourage and facilitate re-fresher courses and short professional training programmes</p>	<p>Promote faculty interaction with industry</p> <p>Design continuing education programme for faculty</p>	<p>Need for continuing education of faculty</p>	<p>Provide opportunities to keep faculty current</p>	<p>More SET current faculty;</p> <p>Improved capacity for teaching, research and scholarship.</p>
<p><b>African Renaissance Issue</b></p> <p>Weak vision for Africa to transform herself towards an African renaissance</p>	<p>Reinvigorate and facilitate African Renaissance pillars in relation to SETI</p>	<p>Invest in and carry out interdisciplinary studies on the relationship between SETI and the pillars of an African renaissance: social</p>	<p>Need to strengthen a shared vision for Africa to transform herself towards and African renaissance.</p>	<p>AU, NEPAD, ANSTI, UN and other Development partners</p>	<p>Increase awareness on the vision of an African renaissance and how to achieve it.</p>

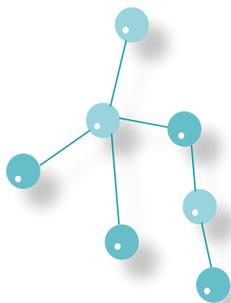
Problems identified	Strategy to address the problem	Actions proposed	Objective of such actions	Responsible actors	Expected Outcomes
		<p>cohesion; democracy; economic rebuilding and growth; important role of Africa in international affairs.</p> <p>Invest in and develop curricula for SETI students in development studies and African renaissance.</p> <p>Invest in and create regional centers of excellence on SETI and the African renaissance.</p>	Need to broaden resourcing base beyond dependence on government funding	Higher Education management, Faculties. AU, NEPAD, ANSTI, UN and other Development partners	<p>Generation of visionary African leaders driving towards an African renaissance.</p> <p>Institutional drivers towards an African renaissance.</p>





Problems identified	Strategy to address the problem	Actions proposed	Objective of such actions	Responsible actors	Expected Outcomes
<p><b>Resource Issue</b></p> <p>Shortage of SET teaching and research resources and lack of optimal utilization of available resources</p>	Strengthen and optimize available resources	<p>Broaden resource base through adoption of PPP strategies;</p> <p>Tap into diasporas economy.</p>	Need for resource utilization optimization strategy	HE management	Improved HE SET resourcing
		<p>Promote utility approach to resource provisioning and utilization;</p> <p>Consider utility grid computing enabled e-Science and e-Healthcare adoption.</p>		HE management, policy makers, relevant public and private institutions and SET of Computing experts.	Optimal resource acquisition and usage acquisition





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