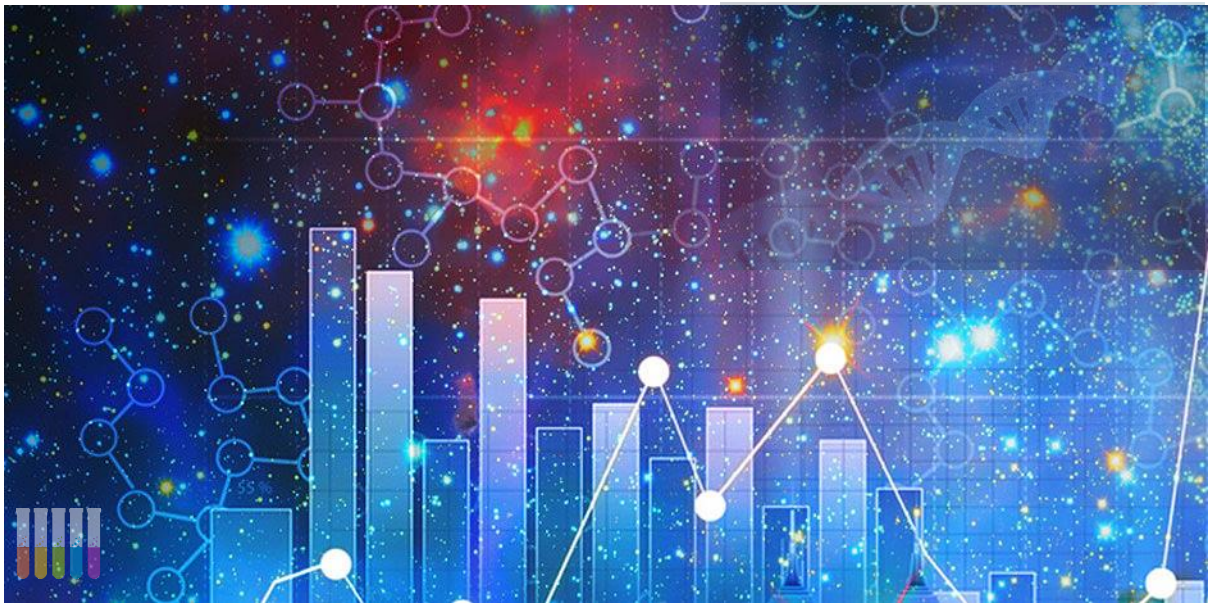
UNESCO/SADC SCIENCE, TECHNOLOGY, AND INNOVATION (STI) TRAINING PROGRAMME FOR HIGH-LEVEL STI OFFICIALS (2021)



Contents

1. INTRODUCTION

The shift of the global growth and development agenda to the Sustainable Development Goals (SDGs) reference framework has brought to the fore the requirement for integrated planning at national, regional, and global levels. This reference framework incorporates policy spheres such as economic and social development, environmental science, governance, and geopolitical relations, as well as science, technology, and innovation (STI). From the perspective of this framework the traditional approach to STI planning in most countries may be too limited and compartmentalised, and a re-evaluation of the role of STI policy within the context of national, regional, and global policy formulation and governance is now mandatory. This requirement for integrated planning may be more pronounced in the case of STI planning in developing economies.

The scope of this training programme is to impart an awareness and an understanding of a comprehensive approach to STI planning grounded in an integrated political economy approach to development planning. This approach erodes the sharp dividing lines between policy domains which tend to be all too common a constraint on effective STI policy design and implementation. The modules presented in this training programme have been designed to cover the core aspects of this integrated approach to STI planning.

2. OBJECTIVES

In most sub-Saharan countries, most high-level officials who are engaged in the drafting of STI policy and in executing its implementation do not normally have a background of formal training in systems of innovation theory. This is possibly the major obstacle in addressing the policy deficit outlined in the previous section. This training programme is designed to address this deficiency and has the following main objectives in mind:

i) Imparting an understanding of the socio-economic impact of STI;
ii) Highlighting sustainability issues, including environmental sustainability, as a cross-cutting concern;
iii) The emphasis on the inter-relatedness of STI policy with all the other policy domains of economics, social development, labour relations, conservation political rights, regional and continental integration, and international relations;
iv) The appropriate measurement of the national system of innovation;
v) The assessment of the viability of national systems of innovation;
vi) Understanding economic integration as the transition from national, to regional, and to continental systems of innovation; and
vii) Understanding of the various aspects of Monitoring and Evaluation of STI policy and system performance

The overall aim of the training programme is to educate successive cohorts of parliamentarians and high-level officials across the African continent in the nature and policy implications of the systems of innovation approach to development. The main consequence of this programme would be to shift the location of STI policy and governance towards the core of national and regional development planning.

The training programme will be delivered through the **UNESCO Chair on African Integration and Innovation**, at the Tshwane University of Technology, Pretoria, South Africa, in collaboration with **SADC** and **UNESCO**.

3. PROGRAMME STRUCTURE

The programme will consist of six modules which will each run over two weeks. The focus of the modules will be on the theoretical underpinning of STI policy, primarily within a system of innovation framework. The common structure across these modules will be as follows:

i) Formal lectures will be presented towards the beginning of the first week (4 hours). At the end of the lectures, assignments will be set for the participants in preparation for the following week.

ii) Towards the middle of the second week the participants will put up individual country presentations related to the topic of the formal lectures (3 hours), followed by a group seminar and discussion on the specific topic and its general applicability across the SADC region (3 hours).

iii) Overall, the time engagement per module from participants, including time required for preparation/pre-reading, and preparation for presentations and seminars, is estimated at 40 hours.

Note
Participants will be provided with the formal presentation before the start of the module. Prescribed readings, and the 'Recommended readings' with links are available on the web.

4. DELIVERY SCHEDULE

The programme will be offered over five months, commencing in July 2021. The teaching schedule will be as follows:

Module 1: Monday, 13th September – Friday, 17th September
Module 2: Monday, 20th September – Friday, 1st October
Module 3: Monday, 11th October – Friday, 22nd October
Module 4: Monday, 25th October – Friday, 5th November
Module 5: Monday, 8th November – Friday, 15th November
Module 6: Monday, 22nd November – Friday, 3rd December

5. MODULES

Module 1: The system of innovation framework for STI policy

Presenter: Rasigan Maharajh

Module 1 Meetings

Monday, 6 September: Formal Presentation (4 hours), 10:00 – 12:00 and 14:00 – 16:00
Wednesday, 15 September: Country Presentations, 10:00 – (10 minutes for each country). One speaker for each country to present key issues for the country.
Friday, 17 September: Group Seminar, 10:00 – 12:00

Rationale

Science, Technology, and Innovation are now universally acknowledged as significant contributors to socio-economic, political, and ecological development. The more traditional domains of science and technology have featured variously as either stand-alone policies, or as components of either education or industrial strategies in many countries of our contemporary world system. Science policies have tended to encourage the generation of scientific workers, and the scholarly production of knowledge through the testing of falsifiable hypotheses. Technology policies have largely been more pragmatically orientated and tended to mainly emphasis research, development, and the transfer of technological knowhow.

Innovation when defined as 'creative destruction' offers the possibility of enjoining science and technology whilst not excluding other sources such as societal dynamics and political determinations into a formidable tool for public goods and services. The framing of National Systems of Innovation (NSI) offers a general conceptual framework within which STI policies are formulated, designed, implemented, and assessed in relation to outputs, outcomes, and impacts across ecological, economic, political, and social domains.

This module covers the history of economic thought and the evolutionary history of the NSI conceptual framework. The module traces the expansion of its application across the international division of labour and its application in countries at different stages of development. The various definitions of systems of innovation are elaborated and a clear distinction is made between the narrow and broad versions of the approach.

Structure

Formal presentation

This module is mainly theoretical and draws on the history of economic thought. The module introduces key aspects of the main debates about the role of science and technology in innovation and development. The module also links innovation to contemporary challenges confronting the ecology, economy, governance, and society.

The module combines the critique of mainstream (neo-classical) economic theory and especially, equilibrium modelling. It proceeds to chart the history of evolutionary economics and the construction of the national systems of innovation framework. After providing some case-studies and other empirical evaluations of the performance of NSI's, the module concludes by exploring some of the emergent knowledge frontiers in STI policy studies.

Two two-hour lectures will be presented in Week 1. The first lecture will cover the broad history of economic thought to locate evolutionary economics and innovation studies within the wider literature. This can be periodised as from prehistory until the end of word war 2. The second lecture picks up the narrative from the era of decolonisation and extends across the post-/ neo-colonial economic histories of development with an orientation largely devoted to the global South with a particular focus on the continent of Africa. In this lecture, we will also cover the experiences of utilising the NSI perspective in shaping our contemporary conjuncture which can be characterised as combined, uneven, yet common development.

Individual presentations

All participants are expected to prepare and submit a presentation on their respective country experiences in STI policy. This submission is due at the end of Week 1. At the beginning of Week 2, the participants will present individual country overviews (maximum of 10 minutes each) on the history, current policy frameworks, and prospective challenges for STI. It is estimated that this session will not exceed 2 hours.

These presentations will be followed by an hour-long open seminar which will be collated from the individual country overviews to forge tentative prospects for collaboration, cooperation, and integration in a regional context.

Outcomes

By the end of this module, participants are expected to understand:

- The history of economic thought on STI
- The political economy of STI
- Policy and strategy implications of STI

Readings

A. Prescribed

IERI. 2014. Revisiting some of the Theoretical and Policy Aspects of Innovation and Development, IERI 10th Anniversary Working Paper, at Revisiting some of the Theoretical and Policy Aspects of Innovation and Development | ieri.

Lastres, Helena Maria Martins. 2017. Development, Innovation, Sustainability and Policies: Chris Freeman's Legacy, GLOBELICS Working Paper No. 2017-02, at (99+) (PDF) Development, innovation, sustainability and policies: Chris Freeman's legacy | Helena M M Lastres - Academia.edu.

Nelson, Richard R. 2020. A Perspective on the Evolution of Evolutionary Economics, Industrial and Corporate Change 29(5): 1101–1118, at Nelson_EconDevfromEvoEconTheory.pdf (policydialogue.org).

B. Recommended

Dosi, Giovanni; Freeman, Christopher; Nelson, Richard R.; Silverberg, Gerald; and Soete, Luc. (eds.). 1988. Technological Change and Economic Theory, Pinter, London.

Lundvall, Bengt-Åke (ed.). 1992. National Systems of Innovation. Towards a Theory of Innovation and Interactive Learning, Pinter, London.

Nelson, Richard R. and Winter, Sidney G. 1982. An Evolutionary Theory of Economic Change, Harvard University Press.

Module 2: Measuring Activities in Innovation systems including knowledge generation, transfer, protection, and indicators for policy development, monitoring and evaluation

Presenter: Fred Gault

Module 2 Meetings

Monday, September 20, Formal Presentation (4 hours), 10:00 – 12:00 and 14:00 – 16:00
Includes assignments for the group seminar to take place on September 29

Thursday, September 23, Country Presentations, 10:00 – (10 minutes for each country). One speaker for each country to present key issues for the country and, the REC of which it is apart.

Wednesday, September 29, Group Seminar, 10:00 – 13:00
Presentations and discussion of key issues and consideration of a group report dealing with the issues discussed.

Rationale

Introduction

The national system of innovation, for policy purposes, was introduced in Module 1 and a distinction was made between the narrow and the broad version of the approach. In this module, the focus is on the statistical measurement of innovation, and innovation activities, within a systems framework. It presents the narrow approach briefly and then goes on to the broader approach and a discussion of how the measurement of innovation is changing, and with it, the development of indicators that may influence innovation policy and the behaviour of the innovation system.

The narrow approach focusses on the formal generation of knowledge (research and development), its transfer (publication, citation of publications), protection (copyright, patents, trademarks, trade secrets …) and indicators resulting from statistical measurement such as R&D expenditure and human resources allocated to R&D. Targets can be set on Gross domestic Expenditure on R&D performance (GERD) as a percentage of Gross Domestic Product (GDP), the GERD/GDP ratio. A key question is how do narrow indicators, such as GERD/GDP, inform policy development intended to promote jobs and growth, or sustainable development. To go beyond this, an understanding of a system is required.

For this discussion, a system consists of actors engaged in activities and linkages between the actors bounded by what have been called 'institutions' or 'rules of the game'[1] or framework conditions. The system gives rise to short term outcomes and longer term impacts and the policy challenge is to influence how the system functions. As the topic is systems of innovation, the definition of innovation is introduced

Definition of innovation

Innovation is defined and its components presented in the fourth edition of the Oslo Manual (OECD/Eurostat 2018). In the previous three editions of the Oslo Manual it was acknowledged that innovation happed everywhere but only in the fourth edition was a general definition of innovation provided which was applicable in all economic sectors as defined by the System of National Accounts (SNA). This does not mean that ongoing measurement of innovation in the business sector, as presented for a selection of African countries in the three African Innovation Outlooks, is any less important but it does bring into the analysis innovation activities in other economic sectors

Breadth of application

The Oslo Manual started with goods producing firms in 1992, added service producing firms in 1997 and moved from product and process innovation to include organisational change and market development innovation in 2005. In the fourth edition of Oslo there is more emphasis on people, and their capacity contribute to innovation, than in previous manuals. The provision of skilled people throughout innovation systems is a challenge for Africa.

Digital economy

Over the last decade, there has been a rapid change in where and how innovation happens as products and processes become more digital, as do the logistics for transferring product innovation to users who are then able to combine the product innovation with other products and processes which are also digital. Understanding innovation in the digital economy is an important part of understanding the innovation system.

Restriction

The Minister is not interested in the fact that 56% of firms in a particular industry are innovative. What matters is whether the outcome of this innovation provides jobs and economic growth, or the extent to which the innovation is inclusive, or sustainable, or green. This can be measured if restrictions are applied to the measurement of innovation.

Wider discourse

Not all innovation is covered by the Oslo Manual, with or without restrictions. Examples are social innovation and innovation resulting from indigenous knowledge. There is no single

[1] North, D. (1990), Institutions, Institutional Change and Economic Performance, Cambridge: Cambridge University Press.

definition which supports statistical measurement. There are definitions which provide the basis for discourse, but not for measurement.
A topic not prominent in innovation systems discussion is innovation in the informal sector, but it is present and part of the innovation system

Measurement and policy in the African Union
Response to STISA 2024
Influence of Agenda 2063

Structure

Formal presentation
The presentation develops the points in the Rationale and poses questions to participants. Issues will be considered at the level of countries, with emphasis on SADC, and possible paths for the development of statistical measurement.

Individual country presentations
The participants will prepare individual country presentations (10 minutes each) related to the topic of the formal lecture.

Group seminar - the prospects for statistical measures of the SADC system of innovation.
Drawing on the issues addressed in the formal lecture and on the points raised by the country presentations, the seminar will cover the main topics related to statistical measurement and the use of the resulting indicators to support the development of innovation policy, and the monitoring and evaluation of implemented policy

Based on discussion with the participants, the possibility of a group report, being drafted by the participants, on the statistical measurement of innovation and innovation activities in SADC, and in member countries, will be considered.

Outcomes

By the end of this module, participants are expected to have an understanding of:

- The statistical measurement of innovation and innovation activities in both the narrow and broad version of a system of innovation.
- The use of statistical indicators to develop innovation policy.
- The need for highly qualified workers to support statistical measurement.
- The use of statistical indicators to monitor and evaluate policy that has been implemented.

- Implications for the statistical programmed required to support understanding of systems of innovation.

Readings

A. Prescribed

[Participants are not expected to read all of the material in the texts provided. They are expected to read selectively keeping in mind the issues raised in Module 2, the implications for their country, and for their REC(s).]

African Union (2014), Science, Technology and Innovation Strategy for Africa, STISA 2024, Addis Ababa: African Union. [Read CH 7 on monitoring an evaluation and consider it from a country level and a REC level]
https://au.int/sites/default/files/newsevents/workingdocuments/33178-wd-stisa-english_-_final.pdf

African Union (2013), Agenda 2063: The Africa We Want
https://au.int/en/document/36204-doc-agenda2063popularversionenpdf

Gault, F. (2010), *Innovation Strategies for a Global Economy, Development, Implementation, Measurement and Management*, Cheltenham, UK and Northampton, MA, USA: Edward Elgar and Ottawa: IDRC.
https://www.idrc.ca/en/book/innovation-strategies-global-economy-development-implementation-measurement-and-management
[Look at innovation systems in CH 2.]

Gault, F. (2018*), Defining and measuring innovation in all sectors of the economy*, Research Policy, 47, 617–22.
https://www.sciencedirect.com/science/article/pii/S0048733318300076

Gault, F. (2020*), Measuring Innovation Everywhere, The Challenge of Better Policy, Learning, Evaluation and Monitoring* Cheltenham, UK and Northampton, MA, USA: Edward Elgar.
https://www.elgaronline.com/view/9781789904550.xml
[Read the introduction and anything else that may interest you]

B. Recommended

African Innovation Outlooks, I, II, and III
AU-NEPAD (2010), African Innovation Outlook 2010, Pretoria: AU-NEPAD.
http://www.hsrc.ac.za/uploads/pageContent/8073/June2011_NEPAD_AIO_2010_English.pdf
[Is your country present? If yes, which institution was responsible for the data?]

NPCA (2014), *African Innovation Outlook II*, Pretoria: NEPAD Planning and Coordinating Agency.
https://www.un.org/africarenewal/sites/www.un.org.africarenewal/files/AIO_2_Final%20Product%5B2%5D.pdf
[Is your country present? If yes, which institution was responsible for the data?
Read Chapter 5 for bibliometric indicators]

AUDA-NEPAD (2019), African Innovation Outlook 2019, Pretoria: AUDA-NEPAD
https://au.int/en/documents/20200213/african-innovation-outlook-iii
[Is your country present? If yes, which institution was responsible for the data?]

Manuals
OECD (2015), *Frascati Manual 2015, Guidelines for Collecting and Reporting Data on Research and Experimental Development*, Paris: OECD Publishing.
https://www.oecd.org/publications/frascati-manual-2015-9789264239012-en.htm
[Note the Table of Contents and what the Manual covers]

OECD/Eurostat (2018), *Oslo Manual 2018: Guidelines for Collecting, Reporting and Using Data on Innovation*, Paris: OECD Publishing and Luxembourg: Eurostat.
https://www.oecd.org/science/oslo-manual-2018-9789264304604-en.htm
[As for Frascati but look at the general definition of innovation in para. 1.25 and then the business sector definition in para. 3.9]

Examples of related work from the Council of Canadian Academies
CCA (2018), *Competing in a Global Innovation Economy: The Current State of R&D in Canada*, Ottawa: Council of Canadian Academies. [This is one of a series of evaluations of Canadian science and technology, and of Canadian innovation. It deals with the formal development of knowledge (R&D), the transfer of that knowledge (publication, citations, training), and the protection of the knowledge (patents, copyrights, trademarks and trade secrecy. Read the Executive Summary and consider whether such a process has a place in your country or your REC.]
https://cca-reports.ca/cca-reports/

CCA (2013), *Innovation Impacts: Measurement and Assessment*, Ottawa: Council of Canadian Academies. [This deals with innovation and its impact. Read the Executive Summary and anything else of interest. See it as a case study of how to approach impact measures.]
https://cca-reports.ca/cca-reports/

Related texts
Gault, F. (2014), *Where are innovation indicators, and their applications, going?* UNU-MERIT Working Paper 2014-055, Maastricht: UNU-MERIT, 19 pp.
[www.merit.unu.edu and find publications. Search on Gault, then 2014. Glance at the text.]

Gault, Fred (2008), Science, Technology and Innovation Indicators: Opportunities for Africa, *African Statistical Journal*, Vol. 6, 141-162.
https://www.afdb.org/fileadmin/uploads/afdb/Documents/Publications/African.Statistical.Journal_Vol6_3.Articles_6.ScienceTechnologyInnovation.pdf

C. Source Statistical Material

[The question to ask about the scoreboards is how many indicators are based on statistical measures of innovation.]

EU Innovation Scoreboard 2020
https://ec.europa.eu/growth/industry/policy/innovation/scoreboards_en
Global Innovation Index (2020) *Global Innovation Index 2020*.
https://www.wipo.int/global_innovation_index/en/2020/
OECD Science, Technology and Innovation Scoreboard 2018
https://www.oecd.org/sti/scoreboard.htm

Module 3: STI and Inclusive Development

Presenter: Erika Kraemer-Mbula

Module 3 Meetings

Monday, 11 October: Formal Presentation (2 hours): 9:00-11:00
Tuesday 12 October: Formal Presentation (2 hours): 9:00 – 11:00
Wednesday, 20 October: Country Presentations, 14:00hrs – (10 minutes for each country). One speaker for each country to present.
Friday, 22 October: Group Seminar, 9:00 – 11:00hrs

Rationale

Science, Technology, and Innovation have been generally regarded as significant contributors to socio-economic development. Policy makers in developing countries, however, are presented with a dilemma: should they focus on addressing the pressing social challenges related to poverty, unemployment and social exclusion, or focus instead on boosting economic growth? One of the arguments made by this module is that these are not mutually exclusive objectives, and that innovation can serve as a tool to achieve socially inclusive development.

Meeting this objective is not easy, since most innovations are not designed to improve the lives of the poorest, the vulnerable and marginalised communities. At the same time, a significant amount of innovative activity takes place in the ever-growing informal sectors that operate outside of formal channels, which remains unrecognised. For innovation efforts to be inclusive they must not only reach but also *include* the poor and marginalised populations in the innovation process. This requires shifting the rationale of STI policy from an "economic growth" logic to a "distributive" logic.

This module discusses the role of innovation in addressing the inclusive and sustainable development, also highlighting that achieving environmental sustainability is not separate from achieving social and economic inclusion. The reading list includes critical perspectives on innovation and inclusive development goals, encouraging deeper thinking.

Structure

Formal presentation
The module will start by providing an overview of the role of innovation in addressing social challenges, with a specific focus on the African context. Then it will discuss a range of

definitions of innovation related to inclusion and approaches to innovation policy for inclusive development, presenting the main debates in the literature and practice.

The module will provide an opportunity to discuss various approaches to undertaking science, technology and policy for inclusive development drawing on case studies from across the world.

Individual presentations

The participants will prepare individual country presentations (10 minutes each) identifying policy approaches and policy programmes that support innovation for inclusive development in their country. Each country presentation will include a basic analysis of the strengths, challenges and broader opportunities emerging from the identified policies and programmes.

Group project – report on NSI's and STI in the Region

Drawing on information generated in the formal lecture and utilising the inputs from the individual presentations, participants will write a group report identifying opportunities for regional collaboration and innovation policy alignment to achieve inclusive development outcomes in the region.

Outcomes

By the end of this module, participants are expected to be able to:

- Critically assess a range of current issues and debates relating to innovation and inclusive development.
- Identify some of the key strategies for supporting the inclusive development in the context of Africa.
- Have a critical understanding of the challenges associated with implementing innovation policies to support inclusive development.

Readings

A. Prescribed

Soares, M. C. C., Scerri, M., & Maharajh, R. (2014). The co-evolution of innovation and inequality. Inequality and Development Challenges, 1-19 at Inequality and Development Challenges | IDRC - International Development Research Centre.

Arocena, R., & Sutz, J. (2012). Research and innovation policies for social inclusion: an opportunity for developing countries. Innovation and Development, 2(1), 147-158.

B. Recommended

Chataway, J., Hanlin, R., Kaplinsky, R., 2013. Inclusive innovation: An architecture for policy development. In: IKD Working Paper No. 65, at Inclusive innovation: an architecture for policy development - UCL Discovery.

Kraemer-Mbula, E. and Konte, A. (2016). Innovation policy and the informal economy: toward a new policy framework, in The Informal Economy in Developing Nations: Hidden Engine of Innovation? Cambridge University Press, Cambridge.

Foster, C., & Heeks, R. (2013). Conceptualising inclusive innovation: Modifying systems of innovation frameworks to understand diffusion of new technology to low-income consumers. The European Journal of Development Research, 25(3), 333-355, at datastream (manchester.ac.uk).

Paunov, C. (2013). Innovation and Inclusive Development: a discussion of the main policy issues. OECD Science, Technology and Industry Working Papers, 2013(1), at 5k4dd1rvsnjj-en.pdf (oecd-ilibrary.org).

Module 4: The Viability of Systems of Innovation

Presenter: Mario Scerri

Module 4 Meetings

Monday, 25 October: Formal Presentation (4 hours), 10:00 – 12:00 and 14:00 – 16:00
Wednesday, 3 November: Country Presentations, 10:00 – (10 minutes for each country). One speaker for each country to present key issues for the country.
Friday, 5 November: Group Seminar, 10:00 – 12:00

Rationale

The main aim of this module is to ground STI planning within a political economy context in order to enhance the effectiveness of STI planning in the developmental agenda. To this end a comprehensive theoretical framework is developed to enable an appraisal of the state of systems of innovation and their evolutionary prospects.

The evaluation of the performance of systems of innovation is normally based on conventional science, technology, and innovation indicators. This effectively reflects the narrow version of the system of innovation, which can be termed a system of science and technology. The evaluation of a national system of innovation from a broad perspective, as discussed in Module 1 of this programme, is a much more difficult undertaking since it is less amenable to quantitative measures. However, as experience has shown, the focus on the narrow version of the national system of innovation without the consideration of the strong interrelationships between the STI sub-sector and the whole of the economy has severely restricted the understanding of the national system of innovation[2] and impaired the design and implementation of STI policy. This handicap is even more pronounced in the case of developing economies where the structural transformation of the economy is integral to sustainable development.

In this module the theoretical framework for the assessment of the viability of a specific system of innovation is developed from the perspective of the broad version of the system of innovation approach. This framework can be used to evaluate the state of health of specific national systems of innovation. It can also be used to assess the prospects for a meaningful transition from a group of national systems of innovation to a regional system of innovation.

[2] For example, Lundvall (2016: 224) says that *'(w)ithout a broad definition of the national innovation system encompassing individual, organizational and interorganizational learning, it is impossible to establish the link from innovation to economic growth*'.

Structure

Formal presentation

This module develops the concept of viability as a general theoretical framework for the assessment of systems of innovation, at the national and the regional levels. The presentation draws out the key elements of a comprehensive theoretical framework for the evaluation of the state and performance of systems of innovation. This framework, which goes considerably beyond sectors directly related to science and technology, draws out the core elements of systems of innovation and is then used to develop a taxonomy of systems in terms of viability categories and thresholds. This evaluation framework is used to assess the prospects for a viable SADC system of innovation.

The presentation starts off with a revisiting of the broad version of the system of innovation approach which was developed in Module 1. It then proceeds to discuss the various constituents of a broad version of the system of innovation. These include the accumulation regime, political governance systems, human capabilities, the structure of the economy, and STI governance. These various strata of the national system of innovation are then used to derive a rationale for different levels of viability, from fragile, through viable, to evolving systems of innovation. Finally, some indications are drawn about the prospects for the emergence of a viable regional system of innovation comprising a number of national systems.

Individual country presentations

The participants will prepare individual country presentations (10 minutes each) related to the topic of the formal lecture, drawing on the evaluation criteria developed there.

Group seminar - the prospects for a SADC system of innovation.

Drawing on the issues addressed in the formal lecture and on the preliminary indicators of the individual country presentations, the seminar will aim at developing a preliminary comparative analysis of the viability status of each national system of innovation within SADC. The envisaged outcome of this seminar will be to develop the parameters of an evaluation taxonomy for a comparative analysis of national systems of innovation within SADC.

Outcomes

By the end of this module, participants are expected to have an understanding of:

i) The broad version of the system of innovation approach
ii) Accumulation regimes and systems of innovation
iii) Governance systems
iv) Human capabilities and the learning economy
v) STI governance models
vi) Evaluation guidelines for the broad national system of innovation

vii) Evaluation guidelines for the prospects of the transition to regional systems of innovation

viii) Policy implications

Readings

A. Prescribed readings

Amin, Samir (1974) 'Accumulation and Development: A Theoretical Model.' *Review of African Political Economy* 1: 9–26, at http://patrimoinenumeriqueafricain.com:8080/jspui/bitstream/123456789/677/1/Accumulation%20and%20development%20a%20theoretical%20model.pdf

Gregersen, Birgitte, and Björn Johnson (1997) 'Learning Economies, Innovation Systems and European Integration.' *Regional Studies* 31 (5): 479–490, at https://www.researchgate.net/publication/24087278_Learning_Economies_Innovation_Systems_and_European_Integration.

Kim, Hyungkee (2007) 'The Knowledge-Led Accumulation Regime: A Theory of Contemporary Capitalism.' *IRLE Working Paper No. 158-07*, at http://irle.berkeley.edu/workingpapers/158-07.pdf.

Leydesdorff, Loet (2005) 'The Triple Helix Model and the Study of Knowledge-Based Innovation Systems.' *International Journal of Contemporary Sociology* 42 (1): 1-16, at https://www.researchgate.net/publication/279407151_The_Triple_Helix_Model_and_the_Study_of_Knowledge-based_Innovation_Systems_Int_Journal_of_Contemporary_Sociology_421_2005_12-27

Robeyns, Ingrid (2005) 'The Capability Approach: a Theoretical Survey.' *Journal of Human Development*, 6 (1): 93-114, at https://www.academia.edu/2856290/The_capability_approach_a_theoretical_survey

Scerri, Mario (2021) 'The Viability of Systems of Innovation.' *Innovation and Development,* 11(1): 135-150, at (12) (PDF) The viability of systems of innovation (researchgate.net).

Stewart, Frances (2013) 'Capabilities and Human Development: Beyond the individual—the critical role of social institutions and social competencies.' *United Nations Development Programme Occasional Paper 2013/03*, at http://hdr.undp.org/sites/default/files/hdro_1303_stewart.pdf

B. Recommended readings

Boyer, Robert, and Yves Saillard (1995) *Régulation Theory: The State of the Art*. London and New York: Routledge.

Kuhlmann, Stefan, Philip Shapira and Ruud Smits (2010) 'Introduction. A Systemic Perspective: The Innovation Policy Dance', in Ruud Smits, Stefan Kuhlmann and Philip Shapira (eds.), *The Theory and Practice of Innovation Policy*, Edward Elgar: Cheltenham, UK and Northampton, MA, USA, pp. 1-22.

Lundvall, Bengt-Åke (ed.) (2016) *The Learning Economy and the Economics of Hope*. London: Anthem Press, at https://www.cambridge.org/core/books/learning-economy-and-the-economics-of-hope/19BA313C72A5B038E182F25F1FA0AC30.

Scerri, Mario (2019) 'Human Capabilities and the Evolutionary prospects for Systems of Innovation in Sub-Saharan Africa', *IERI Working Paper WP2019-002*, DOI: 10.13140/RG.2.2.24874.47046, at https://ieri.org.za/publications/human-capabilities-and-evolutionary-prospects-systems

Sen, Amartya (1999) *Development as Freedom*. New York: Anchor Books.

C. Source Statistical Material

Fund for Peace (2020) *Fragile States Index*, at https://fragilestatesindex.org/analytics/

Global Innovation Index (2019) *Global Innovation Index 2019*, at https://www.globalinnovationindex.org/gii-2019-report

Module 5: The Regional and Continental Perspective

Presenter: Mario Scerri

Module 5 Meetings

Monday, 8 November, Formal Presentation (4 hours), 10:00 – 12:00 and 14:00 – 16:00
Wednesday, 17 November, Country Presentations, 10:00 – (10 minutes for each country). One speaker for each country to present key issues for the country.
Friday, 19 November, Group Seminar, 10:00 – 12:00

Rationale

In the early days of independence in Africa, political leaders such as Kwame Nkrumah in the late 1950s and Julius Nyerere in the 1960s realised that the postcolonial map of Africa, largely the historical outcome of the 1885 Berlin Conference, did not augur well for the viability of the emerging national economies in Africa. They saw integration across the continent as the only guarantor of the political integrity and the sustainable economic development of the newly independent African states. This agenda was mostly frustrated, due to a multiplicity of reasons, until its resurgence with the transition of the Organisation of African Unity into the African Union and the agreement on the African Continental Free Trade Area.

This module takes up from the previous one on the viability of systems of innovation and the main objective of this module is to examine and assess the prospects for regional continental integration in Africa from a broad system of innovation approach. This theoretical lens may enable a better understanding of the progression of national systems of innovation through various types of integration agendas towards regional and continental systems of innovation. At the end of the module students should be able to identify and evaluate the policies which are conducive to regional integration. The main areas which are covered progressively in this module are (i) the evolution of national systems of innovation in postcolonial Africa, (ii) the prospects for integration through a system of innovation perspective, with a particular focus on SADC, and (iii) policy implications.

Structure

Formal presentation

The main scope of this presentation is to translate the development of African economies and the progress towards integration on the continent into the analytical language of systems of innovation. The presentation starts off with a periodisation of the evolution of African

systems of innovation, using a modes of innovation framework[3]. This periodisation is located within the context of the globally dominant mode of innovation in order to identify critical divergences. It then proceeds to explore the argument for the continental and sub-continental regional integration of systems of innovation in Africa. It will look at the various degrees of integration on the continent and draw out their implications for the development on inclusive national and regional systems of innovation. This is followed by an overview of regional economic communities (REC) in Africa, with a comparative analysis of their performance since their inception. Finally, there will be a discussion of the regional integration of systems of innovation within SADC.

Individual country presentations

The participants will prepare individual country presentations (10 minutes each) on the progress towards the integration of each member country within the narrow SADC system of innovation.

Group seminar - the prospects for a SADC system of innovation.

Drawing on the issues addressed in the formal lecture and on the preliminary indicators of the individual country presentations, the seminar will cover the main issues which should be considered for the sustainable transition from national systems of innovation across the region to a functional SADC system of innovation. The SADC policy framework will be assessed in terms of its suitability for this transition.

Based on discussion with the participants, we will explore the possibility of a group report being drafted by the participants on the viability prospects for a SADC system of innovation.

Outcomes

By the end of this module, participants are expected to have an understanding of:

i) A periodisation of the postcolonial era in Africa from a modes of innovation perspective.
ii) Evaluation guidelines for the prospects of the transition to regional systems of innovation;
iii) An assessment of the state of integration of systems of innovation within SADC.
iv) Policy implications.

[3] See Scerri (2013; 2014; 2017) for an elaboration of the concept of modes of innovation as it will be used in this module.

Readings

A. Prescribed readings

Guilherme Júnior, Manuel (2015) 'Comparison of Regional Economic Communities in Africa – The Case of SADC.' *WAI-ZEI Paper No. 22-2015*, at https://www.zei.uni-bonn.de/dateien/wai-zei-paper/wai-zei-paper-no.-22_guilherme-1.

Hartzenberg, Trudi (2011) 'Regional Integration in Africa.' *World Trade Organisation Staff Working Paper ERSD-2011-14*, at http://ssrn.com/abstract=1941742.

Makki, Fouad (2015) 'Post-Colonial Africa and the World Economy: The Long Waves of Uneven Development.' *Journal of World-Systems Research*, 21 (1): 124-146, at http://jwsr.pitt.edu/ojs/jwsr/article/view/546/558.

Mapuva, Jephais and Loveness Muyengwa-Mapuva (2014) 'The SADC regional bloc: What challenges and prospects for regional integration?' *Law, Democracy and Development*, 18: 22-36, http://www.scielo.org.za/pdf/ldd/v18/02.pdf.

Scerri, Mario (2013) 'Modes of Innovation and the Prospects for Economic Integration in Africa.' *Africa Insight*, 43 (3): 80-99, at https://www.researchgate.net/publication/260038844_Modes_of_Innovation_and_the_Prospects_for_Economic_Integration_in_Africa.

Tavares, Rodrigo and Vanessa Tang (2011) 'Regional economic integration in Africa: impediments to progress?', *South African Journal of International Affairs*, Vol. 18, No. 2, pp. 217-233, at https://www.researchgate.net/publication/254357378_Regional_economic_integration_in_Africa_Impediments_to_progress.

Young M. Crawford (1986) 'Nationalism, Ethnicity, and Class in Africa: A Retrospective', *Cahiers D'études Africaines*, 26 (103): 421-495, at https://www.persee.fr/docAsPDF/cea_0008-0055_1986_num_26_103_1711.pdf.

Young, M. Crawford (2004) 'The End of the Post-Colonial State in Africa? Reflections on Changing African Political Dynamics', *African Affairs*, Vol. 103, No. 410, pp. 23-49, at https://www.researchgate.net/publication/31131424_The_end_of_the_post-colonial_state_in_Africa_Reflections_on_changing_African_political_dynamics.

B. Recommended

Bayart, Jean François (2000) 'Africa in the World: A History of Extraversion', *African Affairs*, Vol. 99, pp. 217-267, at https://www.researchgate.net/publication/31442100_Africa_in_the_World_A_History_of_Extraversion.

Fanon, Franz (1962) 'The Pitfalls of National Consciousness', *The Wretched of the Earth*, reprinted (1985) Suffolk: Penguin, at https://www.marxists.org/subject/africa/fanon/pitfalls-national.htm.

Ndomo, Atieno (2009) 'Regional Economic Communities in Africa: A Progress Overview', *Study Commissioned by GTZ*, Nairobi.

Scerri, Mario (2003) 'The Prospects for Regional Innovation System(s) Within Sub-Saharan Africa', Mammo Muchie, Bengt-Åke Lundvall and Peter Gammeltoft (eds.), *Putting Africa*

*First: The Making of African Innovation System*s. (Denmark: Aalborg University Press) reprinted in Piyushi Kotecha (ed.) *The Challenges of Regional Integration and its Implications for Higher Education* (SARUA Leadership Dialogue Series – Vol. 1 Number 2 2009).

Scerri, Mario (2012) 'Economic Integration in Africa – The Systems of Innovation Approach', Mammo Muchie, Olusanya Osha and Matlotleng Matlou (eds.), *The Africana World: From Fragmentation to Unity and Renaissance* (South Africa: Africa Institute of South Africa).

Scerri, Mario (2014) 'Modes of Innovation and the National Systems of Innovation of the BRICS Economies', *STI Policy Review*, 5(2): 20-42.

Scerri, Mario (2017) 'Modes of Innovation and the Prospects for Economic Development in South Africa and Tanzania', Stefan Kuhlmann and Gonzalo Ordóñez-Matamoros (eds.), *Research Handbook on Innovation Governance for Emerging Economies: Towards Better Models*, (Cheltenham, UK; Massachusetts, USA: Edward Elgar).

Uzodike, O. (2009) 'The Role of Regional Economic Communities in Africa's Economic Integration Prospects and Constraints', *Africa Insight*, Vol. 39, No. 2, pp. 26-42.

C. Source Statistical Material

- Guide to RECs in Africa: https://www.un.org/en/africa/osaa/peace/recs.shtml
- African Union website: https://au.int/
- NEPAD website: https://www.nepad.org/
- SADC website: https://www.sadc.int/
- Africa Regional Integration Index: https://www.integrate-africa.org/rankings/
- UNCTAD (2019) *Key Statistics and Trends in Regional Trade in Africa*, New York: UNCTAD, at https://unctad.org/en/pages/PublicationWebflyer.aspx?publicationid=2447
- UNCTAD (2016) *AFRICAN CONTINENTAL FREE TRADE AREA: Advancing Pan-African Integration - Some Considerations*, UNCTAD/WEB/DITC/2016/5, at file:///C:/Users/mscer/Downloads/1200_african_cont%20(1).pdf.

Module 6: Planetary Boundaries, SDGs and STI

Presenter: Rasigan Maharajh

Module 6 Meetings

Monday, 22 November: Formal Presentation (4 hours), 10:00 – 12:00 and 14:00 – 16:00
Wednesday, 1 December: Country Presentations, 10:00 – (10 minutes for each country). One speaker for each country to present key issues for the country.
Friday, 3 December: Group Seminar, 10:00 – 12:00

Rationale

As human society advances further into the 21st century of the common era, its global population has grown to 7.8 billion people and it occupies nearly all the territories of the planet. The pathway towards its current population size and spread has been contested and challenged as the world system can currently be characterised as combined but uneven. Whilst enjoined through various multilateral institutions, human society remains largely organised into national entities and has pursued a variety of developmental objectives that sought to improve the quality of life of its citizenry. The consequences of these anthropocentric developmental trajectories include massive biodiversity reductions, environmental degradation, and accelerated climate change.

This module locates the overall discussion on STI policy within the global developmental context. The module introduces the conceptual framework of Planetary Boundaries (PB) as a mechanism to account for the ecological impact of human and social development. Adjunct to the PB's, is the work by the International Geophysical Union around changing the geological age to reflect the impact of human activities, ie. the Anthropocene. Following these wide debates, the module then shifts to concentrate on social responses to the biophysical constraints on development.

The design of the Millennium Development Goals (MDGs) by the United Nations (UN) is explored and the performance of African economies in line with the MDGs is briefly assessed. The rationale for the transition to the Sustainable Development Goals (SDG) and their design in light of the complexity of the global environmental crisis follows. The issue of climate change in the 21st century and beyond, with its implications for industrialisation and development is then discussed with respect to appropriate national, regional, continental and global STI policy. The draft AU Strategy on Climate Change will be examined will be discussed with this framework.

Structure

Formal presentation

This module is focused on the planetary biophysical capacity to sustain life and the cumulative impacts generated by humanity in its development. The presentation begins with an assessment of the Anthropocene and covers the long run process of the expansion and dispersal of human societies across the planet. Following this introduction, the presentation shifts to the social responses to the looming ecological catastrophe and follows the sustainable development process including the Earth Summit in 1993 until the 25th Conference of the Parties to United Nations Framework Convention on Climate Change of 2019. The third section of the presentation provides details of the Planetary Boundaries and Ecological Footprints as the main forms of quantifying developmental constraints on development. The concluding section of the presentation is devoted to possibilities for mobilising STI in advancing the SDGs and enabling a just transition to the world we want and need.

Individual country presentations

The participants will prepare an individual country assessment for presentation (10 minutes each) of progress towards the SDGs and the contribution of STI towards their achievement.

Group seminar - Prospects for a just transition to an ecologically safe developmental trajectory

Utilising the individual country assessment, the group will draft a tentative and prospective study on the opportunities and treats for a just transition to an ecologically safe developmental trajectory. This draft report will evaluate the current situation against the African Union' strategy on Climate Change.

Outcomes

By the end of this module, participants are expected to have an understanding of:

i) The Discourse on the Anthropocene
ii) Planetary Boundaries
iii) Sustainable Development Goals
iv) Policy and Strategy implications for STI

Readings

A. Prescribed

AU. 2014. African Strategy on Climate Change, African Union, Addis Ababa, at AU Strategy on Climate Change.pdf (pitt.edu).

Hickel, J. 2020. The sustainable development index: Measuring the ecological efficiency of

human development in the Anthropocene, Ecological Economics, 167(106331): 1-10, at (99+) (PDF) The Sustainable Development Index: Measuring the ecological efficiency of human development in the Anthropocene | Jason Hickel - Academia.edu.

Maharajh, R. 2015. The Metabolic Rift, Anachronistic Institutions and the Anthropocene, SPANDA Journal, 6 (1): 1-10, at (99+) (PDF) The Metabolic Rift, Anachronistic Institutions and the Anthropocene | Rasigan Maharajh - Academia.edu.

O'Neill, D.W. et al. 2018. A good life for all within planetary boundaries. Nature Sustainability 1, 88-95. DOI: 10.1038/s41893-018-0021-4, at A good life for all within planetary boundaries (unibe.ch).

Ripple, W.J. et al. 2019. World Scientists' Warning of a Climate Emergency, BioScience, 70 (1): 8–12, at World Scientists' Warning to Humanity: A Second Notice | BioScience | Oxford Academic (oup.com).

UNDESA. 2019. The Future is Now: Science for Achieving Sustainable Development, Department of Economic and Social Affairs, United Nations, New York, at https://sustainabledevelopment.un.org/content/documents/24797GSDR_report_2019.pdf.

B. Recommended

FCFA. 2019. The current and future climate of central and southern Africa, Uncertainty Reduction in Models for Understanding Development Applications, Future Climate for Africa.

Maharajh, R. and Mario Scerri. 2011. Economic Growth and Human Development Challenges for Science, Technology and Innovation in Africa," Chapter 2 in African Union [editor] African Innovation Outlook 2010, African Union, Addis Ababa

UNDESA. 2020. Sustainable Development Outlook 2020: Achieving SDGs in the wake of COVID-19: Scenarios for policymakers, Department of Economic and Social Affairs, United Nations, New York.