2016 STIAS-WALLENBERG ROUNDTABLE ON INNOVATION FOR PROSPERITY
REALISING INNOVATION OPPORTUNITIES IN SUB-SAHARAN AFRICA (SSA)

SARA GROBBELAAR AND SYLVIA SCHWAAG SERGER

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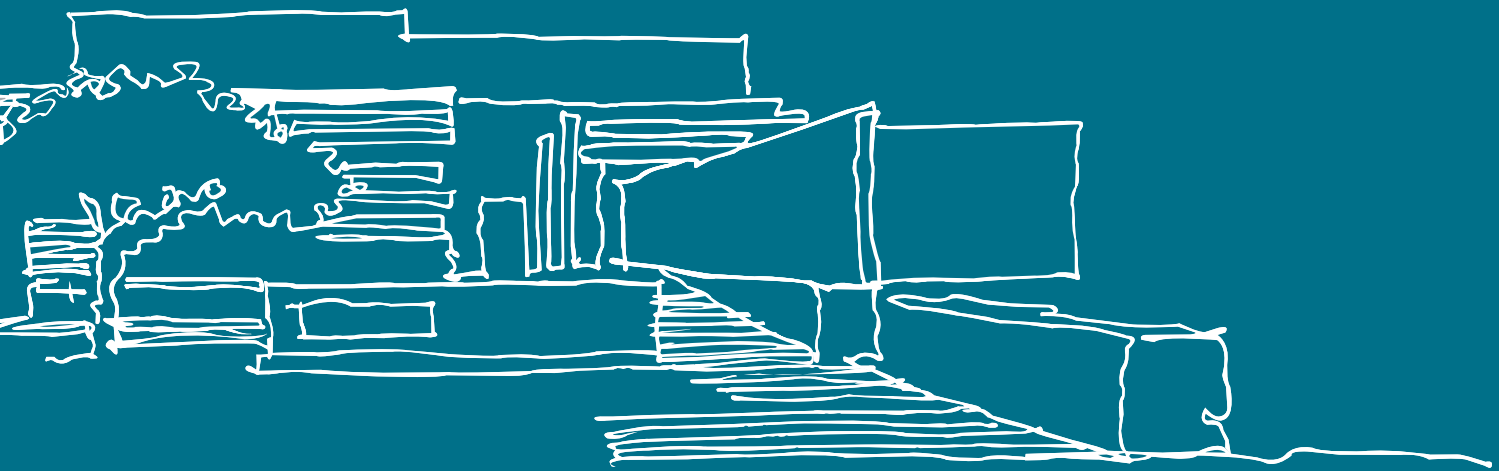
A CREATIVE SPACE FOR THE MIND



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CONTENTS

LETTER TO ROUNDTABLE PARTICIPANTS

Dear participants of the 2016 STIAS-Wallenberg Roundtable on Innovation for Prosperity,

The aim of this report is to serve as background for the discussions during the up-coming Roundtable meeting. By sending this out beforehand, we would like to emphasise the importance of your engagement and interaction as designated participants. Your input and ideas will be of highest relevance in targeting challenges and opportunities related to sustainable innovation-driven growth in Sub-Saharan Africa. After the Roundtable we plan to revise the conclusions section in the report based on your comments in order to provide more concrete policy recommendations.

You will recognise the themes of this report in the outline of the Roundtable programme. However, since many of the issues cover many areas, you will find overlaps and parts that could be discussed at several places in the programme.

Some of you have already provided input in connection with a survey the authors of the report conducted in December 2015. The input received has been extremely valuable in providing deeper insights but also for validating the topics addressed in this report. We have inserted some quotes from the survey throughout the document. The results of the survey will be presented in a separate document.

We will listen and learn as the Roundtable proceeds, and would like to thank you all in advance for participating in this important and interesting endeavour. Special thanks to Sylvia Schwaag Serger and Sara Grobbelaar for their excellent work with this report.

Yours sincerely,

Ms Maud Olofsson
Former Deputy-Prime Minister, Sweden
Wallenberg Foundation representative: STIAS Roundtables

PREFACE

STIAS, in collaboration with the Wallenberg Foundation, will be hosting a Roundtable on Innovation for Prosperity in early 2016 with a focus on bringing together experts and cutting-edge thinkers from around the world to debate the most appropriate pathways towards realising sustainable and inclusive growth opportunities for sub-Saharan Africa.

Recognising innovation and entrepreneurship as key drivers of societal change and progress in economic development, the objective of this document is to suggest a framework for debate on the potential to accelerate innovation-led development in Africa. Admittedly, embarking on such an endeavour is ambitious and it is important to recognise that Africa is a diverse continent with a wide range of possibilities and challenges unique to each region and country.

The idea of this document is therefore not to define or map such issues exhaustively nor to attempt to present a 'one size fits all' proposal to address Africa's challenges and realise growth opportunities. Rather, it is intended to facilitate an informed discussion and highlight relevant themes to be addressed at the Roundtable.

In short, this report aims to assist participants to identify and discuss measures to remedy potential barriers to growth in Africa and to inform thinking on appropriate growth paths and patterns for various contexts within Africa. The report thus presents policy suggestions and aims to provide context for prioritising measures towards achieving these growth paths.

In particular, the discussions and the review of selected literature are meant to be a resource and provide a structure for participants when thinking about their contributions to the Roundtable. The approach taken of discussing growth paths rather than a focus on specific or traditional science, technology and innovation (STI) policy measures is deemed appropriate as the challenge of innovation for prosperity is about interactions in evolving systems, in which different actors participate. The notion of growth paths captures this complexity and enables us to stimulate discussions that revolve around how various measures will contribute to desirable growth paths and how innovation may be supported as an engine of growth on the continent.

The report was written by Sara Grobbelaar and Sylvia Schwaag Serger. The authors would like to thank the Steering Committee for the organisation of the Roundtable for all their support and input (notably Margareta Bergendahl Norell, Pontus Braunerhjelm and Johann Groenewald provided valuable comments at various stages of the report), and they would like to express their particular gratitude to Professor Arie Rip for excellent input and feedback throughout the process.

ABOUT THE AUTHORS

Sara Grobbelaar is a Senior Lecturer in the Department of Industrial Engineering at Stellenbosch University. She also has part-time appointments at the Department of Engineering and Technology Management at the University of Pretoria and the Centre for Research on Evaluation, Science and Technology (CREST), Stellenbosch University (SU). Prior to returning to academia Sara had a long-standing career in consulting at Monitor Group, Frost & Sullivan and independently. Sara has successfully completed in excess of 35 consulting engagements in the government, higher education, not-for-profit and private sectors. Clients and assignment include projects commissioned by the World Bank, United Nations, she has also been commissioned as an innovation systems and evaluation expert by the National Advisory Council of South Africa. Sara has an MPhil in Technology Policy (with distinction) from the University of Cambridge. She also holds a BEng (electronic) (with distinction) (University of Pretoria [UP]), MEng (computer) (with distinction) (UP), PhD in (Engineering) (UP) and a Post Graduate Diploma in M&E methods (with distinction) (SU). Sara's research interests and passions are to think about, research and develop plans for inclusive development through pro-poor value chains and inclusive innovation system for the African continent. Sara has a keen interest in research uptake and impact assessment, systems analysis, systems thinking, strategy, technology management and innovation.

Sylvia Schwaag Serger is Adjunct Professor in Research and Innovation Policy at the University of Lund and Executive Director for International Strategy at the Swedish Government Agency for Innovation, Vinnova. She is also Guest Professor at the Institute for Policy Management of the Chinese Academy of Sciences (CASIPM) and currently serves as Senior Adviser to the Office for Strategic Development in the Swedish Prime Minister's Office. Sylvia holds a MA in International Relations and International Economics from the Paul H. Nitze School of Advanced International Studies (SAIS) at the Johns Hopkins University and a PhD in Economic History from the London School of Economics. She is a member of the Swedish Expert Commission for Research and the Austrian Council for Research and Technological Development. Sylvia has published numerous reports and articles on research and innovation policy and governance. She has been commissioned as expert by the European Commission, the OECD and the World Bank.

EXECUTIVE SUMMARY

The aim of the report is to identify and discuss a number of growth paths that might be explored to promote innovation-driven development in sub-Saharan Africa. The report adopts a broad perspective of innovation, examining framework conditions, fundamental prerequisites, drivers and focal areas for innovation. The report addresses a spectrum of issues and topics ranging from regional and global integration, the promises of inclusive innovation, the priorities and approaches for diversifying African economies, and the role of universities and the state in development. Although some of these themes are not included in traditional debates on innovation, we deem them to be of critical importance when analysing innovation as an engine of growth and for ensuring an environment in which development outcomes are achieved through innovation.

CHAPTER 2: CONTEXTUAL BACKGROUND

Chapter 2 provides a *contextual background* regarding progress made in sub-Saharan Africa in the past decade, and highlights structural or pervasive opportunities for and threats to comprehensive economic development. The goals are to outline the positives by addressing clear improvements and contrast these with major challenges to prosperity and growth.

Sub-Saharan Africa is characterised by great diversity in terms of the functioning and maturity of markets, research and innovation systems, education systems, the institutional environment, economic and political conditions. In recent years, we have seen a positive overall trend regarding governance, economic stability, investment climate and microeconomic conditions. At the same time, however, significant challenges to development remain, particularly regarding the provision and inequality of healthcare and education, but also lack of infrastructure (physical and digital), energy supply, and governance and framework conditions for doing business. A promising development across the continent is that innovation is increasingly recognised as an important tool for driving structural change, strengthening competitiveness and finding solutions for tackling societal challenges. Furthermore, we see a powerful convergence and significant synergies between countries' development agendas and the recently adopted Sustainable Development Goals (SDGs) with both targeting sustainable and inclusive development.

CHAPTER 3: GROWTH PATHS AND PATTERNS FOR SUB-SAHARAN AFRICA

A core purpose of the Roundtable is to facilitate debate on appropriate *growth paths and patterns* in various sub-Saharan African contexts. We therefore aim to develop the arguments based on theory with some attempt to contextualise the suggestions and propose themes under each of these growth paths for further discussion.

Path 1: ***Global and regional economic integration.*** In this growth path a proposition is made that for African economies to develop, and for innovation and entrepreneurship to reach relevant scale and scope, Africa's highly fragmented markets need to become more integrated and competitive value chains need to be developed. We propose a range of themes for the discussion – including reflecting critically on the real need to address fragmentation and flaws in the current process and approach towards regional integration in Africa.

Africa's intra-regional trade remains low compared to extra-regional trade. This means an opportunity exists to further unlock the continent's economic potential. Multi-dimensional and complex reasons explain this situation and we raise the issues of the impact of regional trade imbalances, the effect of asymmetries of power between nations, the dependence on third-country trade, the requirements of the trade environment and general requirements for competitive value chains.

We argue that the realities of being and staying integrated in global value chains have major implications for establishing new and cross-border value chains in Africa. We illustrate this through two case studies namely – the barriers to the development of cross-border value chains in the agro-processing and the automotive industries in the Southern African Customs Union (SACU). These clearly illustrate the impact of regional asymmetries and what that may mean for regional integration. The issue of dependence on extra regional markets and its effect of reinforcing regional asymmetries is discussed.

This situation calls for a rethinking and redesigning of the approach towards regional integration and the search for developing productive capacity and competitive value chains in Africa. We conclude that debates should explore and rethink Africa's place in the global economy, its approach to regional and global integration, the role for trade facilitation, improved supply-side performance and a new role for regional economic powers.

Path 2: ***The promise of inclusive innovation systems.*** Although extreme poverty has decreased internationally, the distribution of wealth is becoming increasingly skewed, with negative consequences for societies, economies and individuals. In this section, we explore a number of issues for developing new growth paths where resource-poor and underserved communities may also benefit from and contribute to innovation and development.

Africa's large informal sector and its significant contribution to growth and employment is a critical aspect when designing policies for inclusive innovation and the achievement of the SDGs. In particular, a systemic policy package for the informal sector is necessary to contribute to a transformational and green industrialisation process. Adequate resources and curricula redevelopment aligned to an industrialisation process and more

broadly to an inclusive sustainable growth path are required for education and skills upgrading for the informal sector, coupled with access to credit, public utilities, and ICTs, at the same time as the macro-economic framework becomes more employment focused, with backward and forward linkages to local economies.

A proposition is made that we also need to consider how best to leverage global players and their value chains while considering how such capacity could aid in creating new approaches and developing new innovation systems to solve local issues. We propose here that embarking on a 'Great Societal Experiment' may provide some answers to how economic powers may start to play a more positive role in regional development, i.e. could regional powers like South Africa become a driver of regional growth by spearheading the development of inclusive innovations and strengthening cross-border value chains? Kenya (COMESA's super power) is a well-known example with many global enterprises setting up R&D labs specifically in ICTs (e.g. Philips) and innovations like MPesa have proven to be a game changer. The issue remains how to scale up and export such innovations effectively and how to ensure that these contribute to development outcomes. Furthermore, new manufacturing methods, such as distributed manufacturing, bring new possibilities to establish manufacturing bases in a wider range of places – closer to where products will be sold and used. Value chains in manufacturing may take on a completely new form and especially through design expertise and appropriate tooling capacity such possibilities may become a reality.

Path 3: ***Diversification and developing knowledge and innovation-driven economies.*** In this section we consider issues related to the diversification of African economies and also the stimulation of innovation and technology-based industries. Specific attention is given to leveraging commodity-based industrialisation as a base from where diversification and competitiveness can be developed in commodity and non-commodity sectors. We explore the importance of manufacturing industries and consider a range of strategies on how government policies may support the development of higher value-added products, new service industries and strengthening technological capabilities in existing industries.

We argue that for sustainable and long-term economic growth and development, a roadmap for growth should acknowledge that commodity-based industrialisation cannot and should not be the only pathway. Not all African countries have resources and, in the long run, even resource-rich countries need to consider the development of innovative and non-resource based industries. We have also raised the issue that alternative manufacturing developments, referred to by some as the third industrial revolution, present opportunities for African countries to overcome restrictions. This is a promising area to explore within the development of STI policy and what this means for how Africa may link into global value chains. The possibility of manufacturing close to markets (consumer goods) may, to some extent, reduce the reliance on imports while processing close to the source of inputs (e.g. agriculture) may allow for value addition.

Path 4: ***Transforming Universities to become 'Engines of Development'.*** The debate on the role of African universities in the development model has a long history dating from the 1960s. However, the role of universities in innovation systems has been examined primarily in a developed-country context. There has been little focus on developing countries where often both universities – as actors and organisations – and their surrounding innovation systems are weak and fragmented. In this discussion, we attempt to transcend the traditional role and discussions of universities in innovation systems.

We consider a range of models of the university as 'tool for development' and then explore how universities in Africa could have a greater impact on communities and contribute to achieving national development goals. We explore potential changes in the form and focus of university functions and how governments may leverage universities to have a greater development impact. This discussion revolves around how universities in Africa could be equipped and developed towards engaging with a wide range of stakeholders and be better aligned towards supporting development outcomes while still pursuing excellence in research and education. With tertiary education in Africa lagging behind other regions, universities have an important role to play in education, but also in contributing to evidence-based policy-making and in producing and disseminating knowledge. Education must be aligned with the needs of the surrounding society and technical and vocational training must not be neglected. High unemployment rates which co-exist with large numbers of vacancies witnessed in many African countries illustrate this challenge.

Path 5: ***The developmental state:*** In recent years there has been a lively discussion of the role of the state in economic development and innovation. Some advocate the state serving primarily an enabling function, with its principal role being the provision of framework and institutional conditions conducive to economic development and innovation. Others assign a more active, interventionist role including driving and directing innovation, procurement, industrial policies, investment and financing, and the identification of prioritised research and education areas.

Path 5 reflects on the current debate regarding the most suitable role for the state in driving and enabling sustainable and inclusive development across sub-Saharan Africa. A combination of market, system and, not least, governance failures have contributed to many of Africa's problems. Many of the challenges and barriers to development identified in the earlier paths will require government action and political will. The question is where governments should focus their efforts and which instruments are most effective in promoting innovation and sustainable development. African countries must find the most suitable policy approaches against

the backdrop of a rapidly changing global innovation landscape, and shifting growth and innovation policy paradigms. This is a challenge and an opportunity: on the one hand, there is no simple best practice to follow; on the other hand, many of the 'game changers', such as the digital revolution, 3D printing, open innovation and easier access and dissemination of knowledge, could provide powerful tools to improve basic service delivery (health care and education), address societal challenges, and open up new business and innovation opportunities to a larger share of the population than ever before.

CHAPTER 4: ASKING THE RIGHT QUESTIONS – TOWARDS A ROADMAP FOR BALANCED GROWTH

This section formulates the big questions we face in considering the various pathways discussed in this document. It brings together the key themes that have emerged from which we propose topics for debate.

We propose a more Africa-centric approach to development that acknowledges existing constraints while developing a new approach and new industries and products appropriate for Africa's needs and future development. But first we need to reflect critically on: Are we stating our challenges correctly and formulating our problem statements adequately? New forms of innovation and their delivery channels present new ways of addressing problems through, e.g. technology bundling. New business models are being developed, and approaches towards support for enabling market-based approaches have come to the fore to improve access to basic services such as healthcare, food and education. These new forms present unique opportunities for developing an Africa-centric approach to development.

REVISITING THE CORE THEMES FOR OUR DEBATE: ASKING THE RIGHT QUESTIONS	
Path 1	When it comes to deeper integration within Africa and globally, the following areas should be highlighted in debates: • Are fragmented markets an issue and, if so, in what way? • Is regional integration a necessary condition for ensuring Africa is not marginalised in the global economy? Are there other ways to develop competitive industries and productive capacities other than addressing the issue of fragmentation through regional integration? • Do we have to fundamentally rethink our approach to regional integration and, if so, in what way? • How should competitive and regionally integrated value chains be developed in Africa? • What is the fate of less-developed countries in regions with super powers? How should we deal with these issues? Is there a role for regional super powers to support development in their poorer neighbours?
Path 2	A key issue here is how innovation policies could tap into the dynamics of the informal economy (often the only economic activity accessible to poor and disadvantaged groups) and help them to become a productive and innovative part of the formal economy. • How can we improve productivity in the informal sector? How can we develop stronger linkages between the informal and formal sectors? Or support the informal economy to become formal? When it comes to developing inclusive innovation, the following areas are important to highlight in the debates: • Is inclusive innovation adequately supported/stimulated in Africa? • Are new design and manufacturing approaches leveraged adequately to develop inclusivity? • What is required to export inclusive innovation to African countries (e.g. MPESA[1] was not successfully exported due to regulatory issues)? • How can we leverage 'what we have' to support inclusive innovation outcomes? • What is the role of Higher Education Institutions and government in supporting the development of inclusive innovation outcomes? • How to experiment with the 'new constellation of actors' and learn from them? • How can we better leverage globalised industries and global players to support the establishment of inclusive innovation systems and programmes on the continent?

[1] M-Pesa (M for mobile, pesa is Swahili for money) is a mobile phone-based money transfer, financing and microfinancing service, launched in 2007 by Vodafone for Safaricom and Vodacom, the largest mobile network

Path 3	We ask a number of key question in this section regarding Africa's dependence on commodities and the need for structural transformation of Africa's economies: • Is African de-industrialising really taking place and how big a threat is it? • What are the greatest challenges facing industrial policy in Africa? • How can African economies overcome the resource curse? Will this assist African economies to become more integrated in global economies? • What capacities are required and what policy frameworks need to be developed to this end? Recent developments in distributed manufacturing and concepts such as 3-D printing and mobile factories may mean that the traditional approaches to industrial development have to be rethought: • The question of new approaches to industrial policy may also be raised here: What are the required new paradigms and practices for thinking about industrialisation in Africa? The question remains how we could develop business models, set up facilities and ensure that private sector players effectively explore how this can be achieved. • The implications of asymmetries and weak regional integration may also be less important should distributed manufacturing and related concepts be leveraged. Regional integration may also be possible through new and non-traditional approaches to developing manufacturing capacity and new linkages into value chains.
Path 4	Through this pathway we consider how universities in Africa could be equipped and developed towards engaging with a wide range of stakeholders and be better aligned towards supporting development outcomes. We ask questions around: • How can government leverage universities better to contribute to development outcomes? • How can universities help to address the skills deficit in Africa? How can Africa increase participation in higher education? • How can universities align their curricula better to address local problems and equip Africans to exploit economic opportunities? • What is the place for vocational training and the development of artisans in the Higher Education system? • How can universities better align teaching, research and engagement activities to have increased impact on local communities? What does this mean for the capacity development that needs to take place in universities? • How can African universities become financially more secure? • How can universities support the strengthening of regional innovation systems?
Path 5	• What should the focus and key instruments of government policies be to promote sustainable and inclusive development? • How can governments promote and empower initiatives and partnerships (national, local, public-private) for inclusive innovation and ensure that successful practices can be scaled up? • How can governments promote policy experimentation while ensuring continuous policy evaluation and learning? • How can governments link or align national priorities, initiatives and policies with the SDGs in a mutually reinforcing and synergistic way? • How can governments promote "initiatives that tap into core business processes and match the public good with private interest" (African Competitiveness Report 2015: 15) • How can governments promote innovation that leads to better and more equitable healthcare and education, raises agricultural productivity and ensures better and more sustainable energy provision and urbanization? • Addressing institutional shortcomings and adverse framework conditions (better functioning of markets, removing barriers to trade, combating corruption, raising competence in the public sector, improving governance and accountability, etc.) versus industrial and interventionist policies to promote specific industries, catalytic projects, big science and the national champions route: what is the right balance?

CHAPTER 1:
INTRODUCTION

"ex Africa semper aliquid novi" (Pliny the elder) – "always something new out of Africa".

STIAS, in collaboration with the Wallenberg Foundation, is hosting a Roundtable on Innovation for Prosperity in early 2016 with a focus on bringing together experts and cutting-edge thinkers from around the world to debate the most appropriate pathways towards realising sustainable and inclusive growth opportunities for sub-Saharan Africa.

Recognising innovation and entrepreneurship as key drivers of societal change and progress in economic development, this document suggests a framework for debate on the potential to accelerate innovation-led growth in Africa. Admittedly, embarking on such an endeavour is ambitious and it is important to recognise that Africa is a diverse continent with a wide range of possibilities and challenges unique to each region and country.

The idea behind this document is therefore not to define or map such issues exhaustively nor to attempt to present a 'one size fits all' proposal to address Africa's challenges and realise growth opportunities. Rather, it is intended to facilitate an informed discussion and highlight relevant themes to be addressed through the Roundtable which aims to identify and discuss measures to remedy potential barriers and to inform thinking on appropriate growth paths and patterns for various contexts within Africa.

It is important to discuss growth paths rather than to think of measures to be taken by specific role players (e.g. Government) as the challenge of innovation for prosperity is about interactions in evolving systems, in which different actors participate. The notion of growth paths captures this complexity and enables us to stimulate discussions that revolve around how various measures contribute to desirable growth paths.

While the growth paths and the items for debate that are offered will be helpful in structuring the discussions in the Roundtable, they are not exhaustive. Furthermore, they are meant to challenge thinking, not to offer a final diagnosis.

In the following sections, we offer a brief outline of the background discussion report.

CHAPTER 2: CONTEXTUAL BACKGROUND

Chapter 2 provides a *contextual background* regarding progress made in sub-Saharan Africa in the past decade, and highlights structural or pervasive opportunities for and threats to large-scale economic development. The goal is to outline the positives by addressing clear improvements and contrast these with major challenges to prosperity and growth.

CHAPTER 3: GROWTH PATHS AND PATTERNS FOR SUB-SAHARAN AFRICA

A core purpose of the Roundtable is to facilitate debate on appropriate growth paths and patterns for various sub-Saharan African contexts. We aim to develop the arguments from theory with some attempt to contextualise the suggestions and propose themes under each of these growth paths for discussion. The focus of the report is to make suggestions on the policy level and to provide context towards prioritising such measures to achieve these growth paths:

Path 1: ***Global and regional economic integration.*** In this growth path a proposition is made that for African economies to develop, and for innovation and entrepreneurship to reach relevant scale and scope, Africa's highly fragmented markets need to become more integrated and competitive value chains need to be developed. We raise the issues of the impact of regional trade imbalances, the effect of asymmetries of power between nations, the dependence on third-country trade, the requirements of the trade environment and general requirements for competitive value chains. We propose a range of themes for discussion – including reflecting critically on the real need for addressing fragmentation, and flaws in the current process and approach towards regional integration in Africa.

Path 2: ***The promise of inclusive innovation.*** In this section, we explore a number of issues for developing new growth paths where resource-poor/underserved communities may also benefit from and contribute to innovation and development. We raise the implications of considering exclusion and inclusion as a process, the nature of inclusive innovation systems, the development of innovation platforms, and the role of government. Finally we touch on how the excluded could be empowered through markets and policies that empower market-based solutions to development.

Path 3: ***Diversification and developing knowledge and innovation-driven economies.*** In this section we consider issues related to the diversification of African economies and also the stimulation of innovation and technology-based industries. Specific attention

is given to leveraging commodity-based industrialisation as a base from where diversification and competitiveness can be developed in commodity and non-commodity sectors. We explore the importance of manufacturing industries and consider a range of strategies on how government policies may support the development of higher value-added products, new service industries and strengthen technological capabilities in existing industries.

Path 4: ***Transforming Universities to become 'Engines of Development'.*** The pressures of a changing world are compelling universities to adapt and respond to issues such as globalisation, the digital revolution and shifts in public policy. These pressures are driving a global transformation of the higher education system. We explore how universities in Africa could have greater impact on communities and contribute to achieving national development goals. This includes exploring considerations towards changes in the form and focus of university functions and how governments may leverage universities to have a greater impact.

Path 5: ***The developmental state:*** In recent years there has been a lively discussion of the role of the state in economic development and innovation. Some advocate the state serving primarily an enabling function, with its principal role being the provision of framework and institutional conditions that enable and are conducive to economic development and innovation. However, in sub-Saharan Africa, a much more active and interventionist role by the state in driving and directing innovation, through procurement, industrial policies, investment and financing, and identification of prioritised research and education areas may be necessary. This is a challenge when the state and relevant institutions are weak. In this pathway we therefore consider what a so-called 'developmental state' could contribute to development.

CHAPTER 4: ASKING THE RIGHT QUESTIONS

Chapter 4 aims to bring together the key themes that have emerged from this document, and summarises the topics for debate identified in Chapter 3. The emphasis is to stimulate debate and not provide an exhaustive list of issues to be considered.

In developing this report, we conducted a Delphi Survey in which around 40 selected experts provided their views on the growth paths identified.[2] The input received has been extremely valuable in providing deeper insights but also for validating the topics addressed in this report. The responses also reflect the diversity of and, sometimes conflicting, views when it comes to how to promote innovation-driven development in Africa. We have inserted quotes from the survey throughout the document to illustrate experts' views. The full survey results will be presented in a separate document.

Finally, we would like to point out that, in this report, we have applied a broad perspective of innovation, examining framework conditions, fundamental prerequisites and drivers as well as focal areas for innovation. This report thus addresses a spectrum of issues and topics ranging from regional and global integration, the promises of inclusive innovation, the priorities and approaches for diversifying African economies, and the role of universities and the state in development. Although some of these themes are not included in traditional debates on innovation, we deem them important when analysing the potential of innovation as an engine of development and for ensuring that an environment is created in which development outcomes may be achieved through innovation.

[2] We should point out that the growth path on universities was added at a later stage and not included in the Delphi Survey. The first round was carried out in November and December 2015 and the second round in January 2016.

CLEAR IMPROVEMENTS IN AFRICA'S ECONOMIC DEVELOPMENT

Africa is currently benefitting from a number of positive developments that together make up an auspicious constellation for significant advancements in economic and social development. In recent years Africa has experienced strong economic growth, with an average growth rate of more than 5% in the past 15 years (World Economic Forum 2015), which is especially impressive when considering the languishing growth rates in many other parts of the world. As a result, in the past decade, Africa has been one of the fastest-growing continents (see Figure 1)

Figure 1: Average GDP growth 2000-2014 (%)[3]
Source: World Bank Development Indicators

In addition to strong economic growth, many countries have witnessed significant improvements in macroeconomic conditions, regulatory reform, and political stability, leading the African Competitiveness Report 2015 to state that "Africa is far more stable and better governed now than at any other time since independence" (p.14) (see also McKinsey 2010).

In recent years, many countries in sub-Saharan Africa have significantly improved their conditions for doing business (World Bank 2013a, African Development Bank 2015a). In the World Bank's annual assessment of 'Ease of Doing Business', of the ten countries which had improved the most worldwide in 2013/14 five were from sub-Saharan Africa (World Bank 2014).

Sub-Saharan African countries have also made clear progress in terms of the UNDP's Human Development Indicators (UNDP 2014). Life expectancy at birth, expected years of schooling and inflation-adjusted Gross National Income per capita have all improved. Between 2008 and 2013 sub-Saharan Africa and South Asia were the two regions which registered the largest improvements in the Human Development Index (ibid). However, this has taken place from a low base with sub-Saharan Africa's human development still the lowest of all the regions in the world.

A further positive trend is the increasing tendency of large multinational firms to locate research and development facilities in Africa (see Table 1).

Table 1: Examples of multinationals' R&D facilities in Africa

Company	Year		Country
DuPont[4]	2013	Africa Regional Technology Center	South Africa
Ericsson[5]	2015	R&D center for Africa	Tunisia
IBM[6]	2013	Global research lab Nairobi	Kenya
	2014	Client Center Johannesburg	South Africa
Nestlé[7]	2009	Abidjan	Cote d'Ivoire
Philips[8]	2014	Research and Innovation Hub	Kenya
Samsung[9]	2015?	Research and development centre	Egypt
Unilever[10]	2002	Unilever Center for Environmental Water Quality (2002), Durban Development Center, Boksburg Development Center	South Africa

Overall, foreign direct investment into Africa has been increasing since 2010, in line with a general shift of foreign direct investment away from developed and towards developing countries. Africa's share of total FDI inflows has grown since 2010 though they continue to be dwarfed by inflows into developing or transition economies in Asia and Latin America and the Caribbean. FDI inflows into Africa amounted to US $54 billion in 2014, or 4.4% of total global FDI inflows, compared with US $681 billion

[3] http://www.economist.com/news/middle-east-and-africa/21638141-africas-growth-being-powered-things-other-commodities-twilight

[4] http://news.agropages.com/News/NewsDetail---11863.htm

[5] http://swenacc.se/businessnews/ericsson-to-open-an-rd-center-for-africa-and-the-maghreb-in-tunisia/

[6] https://www.gsb.stanford.edu/insights/ibms-frugal-innovation-takes-root-africa ; http://www.businessdailyafrica.com/Corporate-News/IBM-opens-its-first-Africa-research-lab-in-Nairobi-on-Friday/-/539550/2058736/-/kdgluoz/-/index.html; http://www-05.ibm.com/za/aic/

[7] http://www.nestle.com/randd/globalnetwork

[8] http://www.newscenter.philips.com/main/standard/news/press/2014/20140321-philips-to-establish-research-and-innovation-hub-in-africa.wpd#.VhuAK03ouM8

[9] http://www.businesskorea.co.kr/news/industry/3793-rd-africa-samsung-electronics-build-first-rd-center-africa

[10] http://www.unilever.se/sustainability/casestudies/water/southafricaresearchingtheeffectsofchemicalsonwaterecosystems.aspx

to developing countries in total – amounting to 8% of developing country FDI in total (UNCTAD 2015). A positive trend is that Greenfield investment is increasingly driven by companies attracted by Africa's growth market potential and strengthening private consumption (*Financial Times* 2015).

Africa is endowed with significant natural resources, human capital, land and space, etc., but it is also burdened with, amongst many things, poor leadership, corruption, weak infrastructure and lack of access to broad-based education.

Delphi Survey response

BUT SIGNIFICANT STRUCTURAL CHALLENGES REMAIN

While Africa has been experiencing a period of strong growth and significant improvements in macroeconomic, regulatory, political and social (as measured by the Human Development Index) conditions, significant challenges remain.

Firstly, while there have been improvements in health and education conditions and in income per capita across the continent, average levels are still among the lowest in the world. Furthermore, high inequality persists within countries in sub-Saharan Africa, driven particularly by extreme inequality in access to healthcare and education, particularly education for girls (UNDP 2014).

Secondly, although a number of countries have considerably improved their conditions for doing business, substantive institutional weaknesses continue to hamper economic development. These include corruption and absence of rule of law, low government efficiency, severely underdeveloped infrastructure (physical and IT), trade barriers and lack of market integration (World Economic Forum 2015). Poorly functioning energy sectors and markets, including widespread lack of access to electricity, are also identified as major obstacles to economic development in Africa (*Financial Times* 2015b).

Thirdly, manufacturing remains very weak in most African countries and there are little signs of emerging industrialisation (Rodrik 2014). Furthermore productivity and competitiveness in agriculture and trade services have not improved significantly. Sceptics argue that the positive development in sub-Saharan Africa in recent decades has largely been driven by China and particularly its increased demand for African raw materials (see Box 'China's presence in Africa'). This, in turn, has overshadowed the need for structural reforms. Thus *The African Competitiveness Outlook 2015* concluded:

> "*In many respects, Africa's competitiveness challenges are the same ones that this Report has been highlighting since it was first published in 1998: these are weak institutions, a persistent infrastructure deficit as explored in detail in the 2013 Report), and low levels of health and education that risk leaving the continent's vast human potential untapped. This sense of déjà vu is of concern because the majority of African economies find themselves in a development stage where these basic requirements will be necessary to establish a solid basis for higher-value-added sources of growth*" (World Economic Forum 2015, p. xiv).

GLOBAL MEGATRENDS IN THE AFRICAN CONTEXT

Africa's development and its policy challenges must be seen against the backdrop of a number of so-called 'megatrends' that are shaping conditions and policies around the world. These include urbanisation, climate change, digitisation, the rise of new manufacturing technologies and globalisation.

Similar to the rest of the world, rapid **urbanisation** can also be witnessed in sub-Saharan Africa. Whereas in 2015, less than 40% of the population in sub-Saharan Africa lived in urban areas, this is projected to increase to 56% by 2050 (United Nations Population Division 2015). In comparison, two thirds of the global population is expected to live in urban areas by 2050, compared to 54% in 2015 (ibid). In Africa, rapid urbanisation – combined with a lack of urban planning or development strategies and overall rapid population growth – has led to the rise of vast slums on the outskirts of African metropoles, such as Lagos (Phillips 2014 and African Development Bank 2015a). Also, in contrast to historical patterns in many other countries and regions, in Africa, so far urbanisation has not been accompanied by increasing industrialisation (ibid). Instead of moving into manufacturing, "[u]rban migrants are being largely absorbed into services that are not particularly productive and into informal activities" (Rodrik 2014: 9). Thus, so far, in many cities and regions in sub-Saharan Africa, urbanisation has further exacerbated already daunting challenges – such as deficiencies in infrastructure, health, education and housing as well as rampant poverty – without affording the benefits often coinciding with urbanisation elsewhere, namely industrialisation and economic development. However, there are examples of countries or cities successfully working to improve living conditions in slums – e.g. Kigali – and to realise urbanisation's potential for social and economic development (Phillips 2014).

Fundamentally rethinking the future of African cities not simply as nodes for accelerated economic growth, but also as socio-cultural centres of human potential that need to be nurtured if the overall goal of development is not merely GDP per capita improvements … a new deal for African cities including the decentralisation of significant regulatory and fiscal powers.

Delphi Survey response

Due to its position and geography, but also its economic structure and level of economic development, sub-Saharan Africa is particularly vulnerable to **climate change** (World Bank 2013b, World Economic Forum 2015). Temperature increases threaten food and other agricultural production, ecosystems, water availability and human health, as well as increasing aridity, the prevalence of droughts, flooding, sea level rises and poverty (World Bank 2013b). While sub-Saharan Africa is one of the regions likely to be most severely affected by climate change, some observers warn that decision-makers in Africa are not factoring climate change into their investment and planning processes (The Guardian 2015, Climate Development Knowledge Network 2015).

Looking at a third megatrend, **digitisation and other advanced technologies**, there are many manifestations and applications of its huge potential benefit for companies, individuals and societies in sub-Saharan Africa. The success of mobile money, the myriads of new apps and social media to serve the needs and interests of farmers, entrepreneurs, civil society and booming IT hubs and incubators in Botswana, Kenya, Rwanda and South Africa, among other places, illustrate that "[t]he digital revolution and other advanced technologies have allowed Africa to leapfrog many of the intervening steps and adapt cutting-edge systems to its own needs" (African Business 2014a: 16). Similarly, the *Financial Times* talks about the "transformative impact" which the internet and social media are having on politics but also on "Africans' livelihoods and wellbeing" (Financial Times 2015c: 7, see also Financial Times 2015d). At the same time, serious deficiencies in ICT infrastructure but also basic access to electricity and weak framework conditions and ecosystems for business and innovation constitute significant obstacles to realising more fully the potential presented by digitisation and other advanced technologies (African Business 2014b). Sub-Saharan Africa accounts for 15 of the 20 countries with the lowest broadband subscriptions per capita in the world and for 16 of the 20 countries with the lowest share of households with internet (ITU and UNESCO 2015). A combination of inefficient government monopolies, highly regulated ICT sectors, underinvestment in infrastructure and lack of a critical mass of people with relevant skills currently prevent many countries in sub-Saharan Africa from reaping more economic and social dividends from the opportunities the digital revolution offers (African Business 2014b, World Economic Forum 2013). Recently, though, more and more countries seem to be mobilising efforts to address these challenges. As of mid-2015, 33 out of 47 countries in sub-Saharan Africa (according to the World Bank definition) had national broadband policies, of which one third were only introduced in 2013 or later (ITU and UNESCO 2015).[11] There are also examples of countries that have successfully pursued long-term, comprehensive and ambitious plans to raise ICT infrastructure and competitiveness, such as Rwanda (African Renewal 2014).

Globalisation refers to increasing flows of people, information, knowledge, goods and services but also to the increasing presence of global value chains (GVCs), where different phases of the production process are located in different countries. The A*frican Competitiveness Outlook 2014* showed that Africa was quite well integrated into GVCs but that there was considerable scope for African countries to capture more value-add such participation (World Economic 2014). As GVCs spread in terms of the number of sectors and activities they cover, countries in sub-Saharan Africa need to ensure that they are attractive to be able to compete for GVC investments. Attractiveness is dependent on ensuring a favourable environment for business, research and innovation, including openness to trade, functioning infrastructure and the availability of relevant skills within the population.

A further aspect of globalisation is the increasing global competition for talent. Sub-Saharan Africa has been suffering from significant 'brain drain' or human capital flight, as many young Africans have left their countries in search of better education and/or career. For most countries in sub-Saharan Africa, in the past decades, the emigration rate of the highly educated has been higher than the total emigration rate (University World News 2013). While net emigration of the highly educated may be seen as a problem for a country in terms of a reduced human capital supply, Africa's large diasporas have also provided a considerable source of capital inflows in the form of remittances. According to the African Development Bank:

Official remittances have increased six-fold since 2000 and are projected to reach USD 64.6 billion in 2015 with Egypt and Nigeria receiving the bulk of flows. They remain the largest source of international financial flows to Africa, accounting for about 33% of the total since 2010. (African Development Bank 2015a: iv)

Furthermore, evidence suggests that remittances provide a relatively more stable source of capital inflows than foreign direct or portfolio investments (ibid). Furthermore they can play a considerable role in spurring investment in local communities, thus driving economic development.

Sub-Saharan Africa differs significantly from most other regions in the world with regard to one important megatrend: Whereas Europe, the Americas and large parts of Asia are faced with an ageing and shrinking population, Africa has the opposite. Given the right conditions, Africa stands to reap huge benefits from what has been called this 'demographic dividend' (sources?).

[11] Out of the countries for which data are available.

WHAT DO THE GLOBAL DEVELOPMENT GOALS MEAN FOR AFRICA?

In 2000, world leaders adopted the United Nations Millennium Declaration in which they committed themselves to what become known as the Millennium Development Goals (MDGs), with a deadline for 2015 to reach these goals. Taking stock in 2015, Africa has made significant progress with primary school enrolment – particularly for girls; promoting gender equality and empowering women – for example by increasing the representation of women in decision making; immunisation coverage; and, reversing the spread of HIV/AIDS (African Union 2014). However, when it comes to eradicating extreme poverty and hunger, reducing child mortality, improving maternal health and ensuring environmental sustainability, Africa is "off track" (UNECA 2015a). Overall, in assessing Africa's achievement of the MDGs, the United Nations Commission on Africa concluded that progress has been "relatively low" (UNECA 2015a: 79-80).

On 25 September 2015, heads of states and government at the United Nations formally adopted the '2030 Agenda for Sustainable Development' which centres around 17 'Sustainable Development Goals' or SDGs. Africa was heavily involved in the drafting of the SDGs at several stages and levels (Brookings 2015). The new global development goals are closely linked to the developmental priorities of most African countries and of the continent as a whole. These goals have been designed taking into consideration the African context and development priorities, and this should ensure that African countries feel a greater ownership of and therefore a commitment towards achieving them (ibid). Africa is also the only continent to have adopted a common position on the MDGs, the 'Common Africa Position (CAP) on the post-2015 Millennium Development Agenda' (African Union 2014). The CAP identified six pillars for Africa's development priorities, namely (i) structural economic transformation and inclusive growth, (ii) science, technology and innovation, (iii) people-centred development, (iv) environmental sustainability, natural resource management and disaster risk management, (v) peace and security and, (vi) finance and partnerships.

Some important lessons from the MDGs can be drawn for the achievement of the SDGs in Africa (UNECA 2015a). Firstly, there are large potential synergies between some of the goals which could be leveraged in a more focused way. Thus, for example, improvement in access to basic services, such as sanitation, can have significant positive effects on maternal health and infant mortality. In particular, economic growth, when it is inclusive and sustained, is one of the most powerful tools to reduce extreme poverty, but also improve gender equality and empower women – in particular when it leads to job creation and improving the provision of basic service delivery, such as healthcare and education (ibid). Government policies and projects in many African countries seem to have had a strong focus on physical infrastructure for service provision, for example by building hospitals and schools. In turn, investments in training and building a skill base necessary for ensuring quality in the provision of basic services such as healthcare and education appear to have been neglected (ibid). Overall, achieving the SDGs will require an approach that integrates the three dimensions of sustainable development, namely economic, social and environmental.

Innovation will be a vital instrument to meet both the SDGs and for Africa's 'transformative agenda', a fact that was acknowledged by identifying science, technology and innovation as one of the six pillars for Africa's development in the CAP (African Union 2014).

The requirements for achieving the SDGs identified in a recent UNECA report are very similar – if not identical – to the requirements for promoting innovation as a driver of inclusive and sustainable growth. They include the following:

1. *Strengthening political leadership and stakeholder participation, which are crucial for own¬ership, commitment, galvanising support, mobilising resources and ensuring accountability.*
2. *Mobilisation of adequate means of implementation. Although external financial resources are required to implement the sustainable development goals, Africa must also take active responsibility for its own development. Measures must be vigorously pursued to enhance do¬mestic resource mobilisation and curb illicit financial flows, attract foreign direct investment and create effective financing structures. Development partners should complement domestic efforts at capacity and technology development through effective international cooperation programmes.*
3. *Promotion of good governance, transparent and accountable leadership, effective institutions as well as responsive and effective global partnerships. This would require appropriate human and institutional capacity-development strategies and programmes. ((UNECA 2015b: xiii).*

GROWING FOCUS ON INNOVATION AS A MEANS OF PROMOTING DEVELOPMENT IN AFRICA

All over the world innovation is increasingly seen as a driver of economic growth and competitiveness, but also as a vital tool to tackle societal challenges and drive systemic change. Countries at different levels of economic development are devising innovation strategies, setting up innovation councils and designing programmes or initiatives aimed at strengthening innovation in their national contexts. The trend can also observed in sub-Saharan Africa. A growing number of countries are establishing Ministries of Science, Technology, Research and Innovation and, as of 2014, at least eight countries in sub-Saharan Africa had national innovation strategies (Angola, Ethiopia, Ghana, Mozambique, Nigeria, South Africa, Uganda, Zimbabwe) (NEPAD 2014).

The growing attention paid to innovation in SSA is also reflected in speeches and declarations made by African leaders. In a speech in June 2015, Kenya's President Uhuru Kenyatta encouraged citizens to "go out and innovate", arguing "[t]here is no reason why Kenya cannot lead the region, and the continent in innovation and entrepreneurship. Our people are no less diligent, no less innovative, than any other".[12] Nigeria's Minister for ICT Omobola Johnson proclaimed in January 2015 that "We have a vision for Nigeria to be the centre of innovation and the ICT hub for Africa and we are working hard to make that a reality"[13] while Nigerian President Buhari declared in August 2015 that "Innovation driven by entrepreneurial individuals is the only hope for sustainable economic and social prosperity".[14]

A further clear manifestation of the growing importance assigned to science, technology and innovation is the 10-year 'Science, Technology and Innovation Strategy for Africa (STISA 2024)' adopted in June 2014 at the African Union Heads of State and Government Summit. The strategy "places science, technology and innovation at the epicentre of Africa's economic development and growth" with the aim of "accelerating Africa's transition to an innovation-led, knowledge-based economy".[15]

Finally, the initiative to compile 'African Science, Technology and Innovation Indicators' (ASTII) – launched in 2007 and which led to the publication of the first 'African Innovation Outlook' in 2011 – is in itself a manifestation of the increasing focus on innovation and innovation policies (NEPAD 2014).[16] In general, international development agencies and programmes have increasingly included innovation promotion in initiatives targeting African countries and regions. Examples include the Southern African Innovation Support Programme (SAIS) initiated by the Finnish Government in 2011, with a focus on Botswana, Mozambique, Namibia and Zambia, SIDA's initiatives to strengthen innovation systems in Rwanda, Uganda, Tanzania and Mozambique, the CDKN (Climate Development Knowledge Network) Innovation Fund financed by the UK Department for International Development (DFID) and the Dutch Government.

While innovation is generally seen as a necessary and essential tool for addressing many of the challenges African countries face, there are also critical voices. Innovation, and particularly technology, has been accused of leading to job losses in countries already afflicted by high unemployment.[17] Some experts also caution against merely importing Western models of innovation, emphasising the need to adjust innovation policies to African contexts but also to draw and build upon Africa's indigenous creativity and knowledge when promoting innovation. Thus, innovation professor Mammo Muchie calls for more "Africa-centred innovation systems", arguing that current education and innovation systems in Africa are 'colonial' in the sense that they neglect and downplay Africa's own innovation culture, languages and successes.[18] Similarly, De argues that current innovation literature fails to capture "the unique features within African countries that may affect the propensity to innovate" concluding that "[t]here is a huge need to study innovation in various African contexts" (De 2014: 2).

[12] http://www.president.go.ke/2015/06/09/lets-go-out-and-innovate-president-kenyatta-urges-kenyans/

[13] http://ja-nigeria.org/speech-by-the-honorable-minister-of-communication-technology-ict-during-the-15th-anniversary-celebration

[14] https://www.facebook.com/permalink.php?id=380792212128703&story_fbid=412458148962109

[15] http://hrst.au.int/en/sites/default/files/STISA-Published%20Book.pdf

[16] This initiative was funded to a large extent by the Swedish International Development Agency SIDA.

[17] http://allafrica.com/stories/201101311859.html

[18] http://newafricanmagazine.com/need-africa-centred-innovations-systems-prof-mammo-muchie/

CHAPTER 3:

GROWTH PATHS AND PATTERNS FOR SUB-SAHARAN AFRICA

This chapter explores possible growth paths that will have the highest chance of success in enabling innovation-led development in the African context. In the proceeding sections we discuss five general growth paths for African nations and also unpack what these will entail. We take care to reflect on the African context for each of these paths but also focus on the theoretical underpinning to provide a base for our suggestions. We have tried to provide a balanced selection of growth paths to reflect different economic theories but also different views of economic development models.

The five growth paths address a wide range of issues and topics ranging from regional and global integration, the promises of inclusive innovation, the priorities and approaches to diversify African economies, the role of universities in development and also the role of the state. Some of these themes are not found in traditional debates on innovation, however, we deem them critical prerequisites and drivers when considering innovation as an engine of development and for ensuring an environment and context in which development outcomes may be achieved through innovation.

The ultimate aim is to reflect critically on these growth paths, and also to provide some suggestions on alternatives and new developments. In this way, irrespective of the debates that emanate from the Roundtable, this document proposes a range of questions and issues that are deemed by the authors to be of high importance to debate and to rethink approaches to social and economic development of the African continent.

PATH 1: GLOBAL (AND REGIONAL) ECONOMIC INTEGRATION

Although admittedly simplistically stated, the rationale for proposing this pathway for discussion is that Africa's markets are highly fragmented and there are many markets with small populations and low per capita income levels of which many are landlocked – leading to low local demand. Many barriers to trade exist in Africa such as poor infrastructure, supply-side constraints, high transport costs, and lack of skills and capital, all of which have a range of implications including difficulties in developing competitive industries regionally and globally. This has immense implications for issues such as private-sector participation, the industry mix of African nations and Africa's position in the global economy.

We critically explore below the theoretical benefits and limitations and also question the current mostly linear and step-wise approach to implementation of the regional economic integration process in Africa (Hartzenberg 2011). We aim to highlight realities and practical difficulties in achieving such outcomes. This leads us to conclude that debates should explore and rethink Africa's place in the global economy, its approach to regional and global integration, the role for trade facilitation, improved supply-side performance and a new role for regional economic powers.

A BRIEF INTRODUCTION TO AFRICA'S REGIONAL INTEGRATION AND AGREEMENTS

Although many African leaders called for regional economic integration in sub-Saharan Africa soon after their countries gained independence, it was only in the 1970s and '80s that economic integration institutions were established. With political unity as the impetus for achieving market integration in order to reach economies of scale, this process could be characterised as being mostly inwardly focused. It failed due to inter alia small and poor domestic markets, high input costs, protectionist trade policies, the failure to meet regional commitments, overlapping regional integration agreements and excessive emphasis on joint public investments (Kritzinger-van Niekerk 2005; Jordaan 2014).

The African Economic Community (AEC) (established in 1994) has as its goal to promote economic integration in Africa. The long-term aim of the AEC is to bring existing economic groupings

Table 2: Groupings and member states of the AEC

Name of grouping/treaty	Member countries	Year of formation	Purpose/remarks
Common Market for Eastern and South Africa (COMESA)	Mauritius, Burundi, Comoros, Congo, Rwanda, Djibouti, Libya, Seychelles*, Egypt, South Sudan, Sudan, Eritrea, Swaziland, Ethiopia, Kenya, Uganda, Zambia, Madagascar, Malawi and Zimbabwe	1994	Aimed to enhance free trade; Lesotho and Mozambique quit in 1997 while Namibia and Tanzania withdrew in 2004 and 2000; Angola suspended membership in 2007
Economic Community of West African States (ECOWAS)	Benin, Guinea, Niger, Burkina Faso, Guinea-Bissau, Nigeria, Cape Verde, Liberia*, Senegal, Côte d'Ivoire, Mali, Sierra Leone, Gambia, Togo and Ghana	1975	Promote economic integration; Mauritania withdrew in 2000
West African Economic and Monetary Union (UEMOA)	Benin, Burkina Faso, Côte d'Ivoire, Mali, Niger, Senegal, Togo and Guinea-Bissau	1994	Aimed to promote common monetary zone, customs union and common external tariff
South African Customs Union (SACU)	South Africa, Botswana, Lesotho, Swaziland and Namibia*	1970	Promote customs union

Source: Kumar, et al. (2014))

into a large single market for Africa – mostly modelled on the creation of the European Union (EU). Table 2 shows the names of major groupings as well as their memberships: COMESA (Common Market for Eastern and Southern Africa), ECOWAS (Economic Community of West African States), SADC (Southern African Development Community) and EAC (East African Community) are the pillars of the AEC.

A brief look at current internal and extra-regional trade flows in Africa shows that Africa's current internal trade flows only make up a small percentage of total trade where most imports and most exports go to advanced economies (see Figure 2)

It is important to also note that recent trends in trade flows (that is imports and exports combined) shows that China is becoming a much more important partner for the continent (see Figure 1). Although the EU27 remains the largest trade partner, trade with Asia has grown by 22% over the period 2012 to 2013 while trade with Europe only increased by 15%. At the same time manufactured goods from Europe to Africa dropped from 32% of the total in 2002 to 23% in 2011.

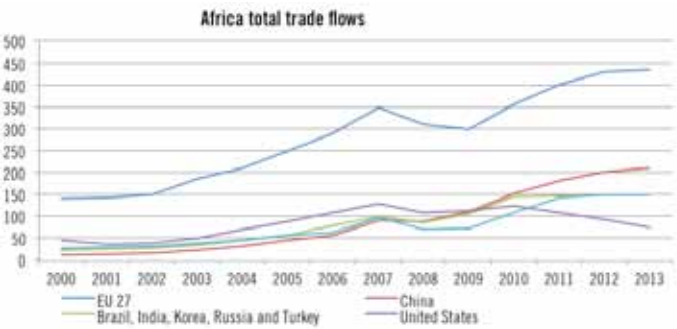

Figure 2: Africa total trade flows with selected global and intra-African partners (2000 to 2013)

Source: African Development Bank Group 2015

China's presence in Africa has not only grown dramatically in recent decades, it has also changed shape (see Box 'China's presence in Africa'). China is now by far Africa's largest trading partner. For 33 out of the 36 largest countries in sub-Saharan Africa , China was one of the top three importers (data for 2013), as well as one of the top three exporting destinations for 21 out of 36 countries[19].

China's foreign direct investment into Africa has been substantial in recent years, growing by 37% per year on average since 2000, with the stock amounting to US $30 billion in 2015, according to the Chinese Ministry of Trade and Commerce[20]. However, both Western Europe and North America still invest more in Africa than China, when looking at total greenfield investments.[21] Traditionally, mining has attracted the largest share of Chinese FDI. In 2011, a little less than one third of FDI went to mining, followed by finance which accounted for one fifth of investments. Construction and manufacturing made up around 15% each.

China's presence in Africa

China's presence in Africa is increasingly focusing on manufacturing, services, energy and IT infrastructure. A number of Chinese companies have been operating in Africa for several decades. Appliance and electronics manufacturer Hisense entered the South African market in 1996. Currently, three out of four of Hisense's manufacturing bases are located in Africa, in South Africa, Algeria and Egypt.[22] Chinese telecommunications equipment manufacturer Huawei established a presence in 1998 by setting up an office in Algeria. In addition to supplying a significant share of Africa's wireless base stations, high-speed mobile broadband network and fiber optic communications, Huawei has created seven training centres on the continent and trained around 30 000 African ICT professionals. It offers scholarships for African students and is cooperating with African universities.[23] According to *The Guardian* (2013), in 2013 there were around 12 000 African students studying in China with support from the Chinese government, "dwarfing scholarship programmes offered to African students by any other country".[24]

The Chinese Ministry of Commerce and Trade (MOFCOMM) has encouraged and supported the establishment of special economic and trade cooperation zones in Nigeria, Ethiopia, Zambia, Mauritius and Egypt to promote and facilitate the establishment of Chinese firms in Africa (Zheng 2015). The zones were set up in 2006 and 2007 and resemble the Special Economic Zones set up within China in connection with the economic opening starting in the late 1970s. Their purpose is to make it easier for Chinese companies to establish themselves in foreign countries, by providing easier access to land and by lowering regulatory barriers, and more generally, to facilitate trade between China and other countries. One of the biggest success stories of these zones is footwear manufacturer Huajian which set up a factory in the Eastern Industry Zone in Addis Ababa, Ethiopia. The plant currently employs around 3000 people, the vast majority of them local (Zheng 2015).

Most recently, at the opening forum of the China-Africa Cooperation Forum summit in December 2015 in South Africa, Chinese President Xi Jinping pledged a total of US $60 billion in financial support to strengthen development in Africa.[25]

Opinion polls indicate that Africans seem to hold a more positive view of China's involvement in their economy than people in Europe, Latin America or Asia although there are critical voices, expressing concern that China is draining the continent of natural resources and gaining 'undue influence' in African politics (Chen, ***et al***. 2015).

[19] Data compiled from http://atlas.media.mit.edu/en/ and African Development Group 2015; see also Appendix A for country information.

[20] http://finance.ifeng.com/a/20151202/14105022_0.shtml

[21] http://www.ft.com/intl/cms/s/3/fea83f20-6c2d-11e5-aca9-d87542bf8673.html#axzz3uOa6T4gL

[22] http://global.hisense.com/about/copr/ci/

[23] http://gb.cri.cn/42071/2014/07/20/5931s4621970.htm and http://www.ce.cn/xwzx/gnsz/gdxw/201512/06/t20151206_7333648.shtml

[24] http://www.theguardian.com/world/2013/jul/31/china-africa-students-scholarship-programme

[25] http://www.nytimes.com/2015/12/05/world/africa/china-pledges-60-billion-to-aid-africas-development.html?_r=0

THEORETICAL BENEFITS/NEGATIVE CONSEQUENCES OF REGIONAL ECONOMIC INTEGRATION

International Trade Theory and New Economic Geography suggest that regional integration facilitates increased returns and increased competition, and may lead to a range of effects that can benefit member countries. These include scale effects (e.g. reducing production costs and consumer prices), increased specialisation and a wider variety of products, as well as accumulation effects that may generate knowledge spillovers and interactive learning. That, in turn, serves to enhance productivity and should (theoretically) increase effective market size. Hence, regional integration may contribute to the attractiveness of specific regions to foreign firms for entering these markets. The European Single Market, but also NAFTA (North American Free Trade Area) are examples of efforts to realise positive economic effects from the reduction of trade barriers and the integration of markets (Jordaan 2014; Kritzinger-van Niekerk 2005; Mattli 1999; Santi, Romdhane & Shaw 2012).

Further potential benefits of regional integration include strengthened coordination and collective bargaining power through regional agreements, improved management of shared natural resources and a reduced threat of conflict between countries. Under the condition that the region may be able to manufacture sufficient substitutes to third-party goods, demand for goods from the region may increase (Jordaan 2014; Kritzinger-van Niekerk 2005; Mattli 1999; Santi, Romdhane & Shaw, 2012).

Also, being part of a global economy is becoming increasingly important as specialisation takes new forms and production is increasingly becoming organised in globally distributed supply chains. Similarly, knowledge regarding global branding, visibility and using digital techniques are also considered a high-priority area.

However, despite these advantages, trade diversion may take place where partners maintain high tariffs to non-members, which could then result in low-cost products from non-members being replaced by higher-cost products from countries with a trade agreement (Kritzinger-van Niekerk 2005; Santi 2012). Hence, trade creation through regional integration may be dwarfed through discriminating trade policies.

Further negative consequences could include reduced tariff revenues, leading to revenue losses for national governments (usually in the short term). Also, indirect costs such as capital flight or brain drain may be incurred. These potential negative consequences could, in some instances, become drivers against economic integration, especially where the impacts are at national rather than at regional level (Kritzinger-van Niekerk 2005; Santi 2012).

LIMITS TO REGIONAL INTEGRATION – A NEED FOR A NEW APPROACH?

With the above stated benefits notwithstanding, indiscriminate application of the regional integration approach needs to be treated with caution. Krapohl and Fink (2013) argue that regional integration is unlikely to change the economic structure of regions but rather reinforces pre-existing patterns of interdependence. They argue that two major factors determine the pathway for regional integration. These are the relative importance of intra-regional versus extra-regional economic interdependence, as well as the economic asymmetry of member states (explained below).

The focus on regional economic integration has been criticised as being modelled on the successes achieved in the EU and is more appropriate for a scenario where real interdependence of economic activity exists and therefore real economies of scale can be exploited through such interdependence and the development of regional institutions.

Opposed to the EU context, the African situation has to deal with stark realities of often strained relationships where regional economic powers (e.g. South Africa for SADC/SACU and Kenya for COMESA) have extra-regional interests that may outweigh the gains of member states. Krapohl and Fink (2013) call such a dynamic a 'Rambo effect', where the dominant power may block or not implement agreements. According to them it is unlikely that such an asymmetric cooperation will succeed, as it will feed a cycle where asymmetries are reinforced. Here the realities of huge asymmetries and the lack of intra-regional independence and the dependence on extra-regional trade is argued by Krapohl & Fink (2013) to be perpetuated.

Case in point, we show in Figure 3 the prominence of South Africa in the percentage of total imports of SADC countries indicating a huge dependence on South Africa for goods. Furthermore, a large proportion of especially Southern African Customs Union (SACU) countries depend on SA for their total percentage of exports (Botswana, Namibia, Swaziland and Lesotho).

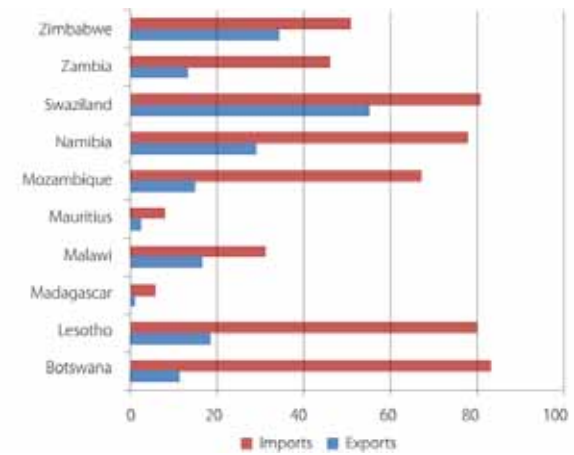

Figure 3: Total country exports to and imports from South Africa as percentage of total

Source: Africa Development Bank

The following two case studies come from a World Bank study conducted in 2014 on examining possibilities for cross-border value-chain integration and the improvement of Trade and Transport Facilitation in in SACU. These case studies allude to the dynamics referred to above and the implications for SACU. More specifically they illustrate the following:

Case study 1 provides insight into the development of an enabling environment and the effects of SA domination within the customs union. Here pathways to regional integration in agro-processing primarily depend on the ability of member countries to overcome factors that hamper efficient production which means production capacities and logistics systems need to be developed as well as the ability to comply with international standards.

Case study 2 explains that for the automotive industry the realities of global competition where extra-regional players allocate production contracts on a competitive basis means that other members of SACU do not have a real opportunity to become integrated in global value chains. This case study explains the dynamic of how regional asymmetries are reinforced.

CASE STUDY 1: A focus on regional value chain integration for agro-processing in SACU

Participation in global agro-processing value chains is determined by the ability to deliver high-quality products to sophisticated markets, while complying with a variety of standards and food safety regulations. Regional value-chain integration would make sense in cases where collaboration enables cost-effective delivery and better positioning relative to niche markets.

The South African industry benefits from varied climatic regions and hence varied production. Its ability to compete more cost-effectively than other SACU partners in a variety of international markets is further enhanced by better access to agricultural inputs, better logistics infrastructure, more sophisticated logistics service providers and more sophisticated local demand conditions. The competitiveness of the Botswana, Lesotho, Namibia and Swaziland (BLNS) members is constrained by an underdeveloped input sector as well as an underdeveloped ability to compete given low local demand conditions.

The agro-processing industry is dominated by large South African retailers. This leads to a protective response by the BLNS members, which, in turn, serves as a driver against regional integration. A limited number of chains exist where processors have been able to establish facilities across the region, thus taking advantage of relative competitive advantages, to deliver into export markets.

From our primary research it can be concluded that pathways to regional integration in agro-processing primarily depend on the ability of member countries to overcome factors that hamper efficient production. These include factors that affect product quality, processing, storage, transport and branding. Regional supply chains need to be located in a way that takes advantage of competitive advantages, and an enabling environment needs to be developed that ensures the ability to comply with international quality and food safety standards. Furthermore, barriers to trade and transport facilitation need to be removed, in order to facilitate integration.

CASE STUDY 2: A forced role as a regional 'Rambo' – The case of the automotive industry in South Africa

Original Equipment Manufacturers (OEMs) in the automotive industry have a requirement that Tier 1 suppliers (as far as possible) are located within five minutes of the plant, which has given rise to the supplier parks trend. This restriction implies that only commodity items can enter the value chain from distant locations.

Therefore the only possible pathway towards establishing an automotive industry is by attracting global OEMs to the country. There are at present no South African-owned OEMS, which implies that extra-regional players determine and allocate production contracts on a competitive basis. This takes place by means of competitive bidding, and South Africa (where the OEMS are based) has very little influence over the allocation and the resulting location of production, apart from improving industry competitiveness.

International competition between production locations is severe, and is driven by the demand to remain cost competitive. This aspect results in specific requirements for production locations such as large domestic markets or proximity to international markets, industry concentration, well-established services around the industry and a strong supplier base. Furthermore, production expertise and technological capacity are required.

While fieldwork indicated that South Africa, in some instances, considered to be the regional 'Rambo' in SACU, it is in practice playing a very small role in the international automotive industry. It is nationally and regionally important in the sense that it is responsible for 8% of South African GDP. However, it only contributes 0.5% of global vehicle production. In spite of its regional dominance, South Africa is therefore in essence 'surviving in global value chains' (Barnes & Morris 2008).

SUGGESTED POLICY CONSIDERATION FOR BECOMING INTEGRATED REGIONALLY AND GLOBALLY

A 2011 World Bank study found that the major pillars of successful economic integration (regionally and globally) remain an **efficient transport and logistics system, easy trade across borders** and the **strength of regional value chains**. While there are a range of opportunities for firms to raise the level of cross-border trade in the SSA region, it is hampered by high costs and the unpredictability of the trade regime. A number of key barriers were identified:

a. Inefficiencies in transport, border management and logistics;

b. Cumbersome fiscal arrangements;

c. Poorly designed technical regulations and standards; and,

d. Non-tariff barriers (NTBs) such as import bans, permits and licensing (World Bank 2011).

In addition, supply chain constraints are recognised as a major impediment to export-led growth. In response to these issues, role players in regional development have come to recognise **Trade and Transport Facilitation** and **Logistics** as an important policy area in development.

Trade and transport facilitation takes place within the context of the realities of global competition and the structure of GVCs and, for that reason, the discussion of the development of pathways to global and regional economic integration needs to be cognisant of these issues (Wilson & Cornell 2012). Implementation of this is typically defined on three fronts: behind-the-border, at-the-border, and between-the-borders:

- At-the-border reforms liberalise the movement of production factors (e.g. capital, labour, intermediate goods and services) and help to develop cross-border production networks;
- Behind-the-border reforms involve mutual recognition agreements on technical standards and business procedures, regional trade agreements, and logistics and transport facilitation initiatives;
- Between-the-borders reforms are critical to address the underlying causes of the high cost and unpredictability of infrastructure, particularly with respect to transport services and power (transport, input factors, energy) (Santi 2012).

Themes for our debate

When it comes to deeper integration within Africa and globally, the following areas should be highlighted in debates:

- Are fragmented markets an issue and, if so, in what way?
- Is regional integration a necessary condition for ensuring Africa is not marginalised in the global economy? Are there other ways to develop competitive industries and productive capacities other than addressing the issue of fragmentation through regional integration?
- Do we have to fundamentally rethink our approach to regional integration and, if so, in what way?
- How should competitive and regionally integrated value chains be developed in Africa?
- What is the fate of less-developed countries in regions with super powers? How should we deal with these issues? Is there a role for regional super powers to support development in their poorer neighbours?

IN CONCLUSION

Concluding from the discussion and case studies above a number of negative reinforcing loops exist.

Firstly, the impact of imbalances in productive capacities and lack of ability to compete regionally leave poorer neighbours dependent on imports from regional economic powers and further afield, resulting in reinforcing regional asymmetries and perpetuating shallow economic integration. A second negative reinforcing loop exists through the observed inability of less-developed countries to establish competitive value chains and production networks, which, in turn, results in uncompetitive local industries and therefore they cannot compete on a regional or global scale. Through these dynamics, regional integration or lowered trade barriers in these cases may result in a threat to local industry, which leads to protectionist trends yet again resulting in reinforcing regional asymmetries and shallow economic integration. In addition to this, ineffective or poorly coordinated Trade and Transport Facilitation (TTF) activities may exacerbate regional asymmetries.

This situation calls for a rethinking and redesigning of the approach towards regional integration and the search for developing productive capacity and competitive value chains in Africa. The reasons for the lack of economic integration on the African continent are multi-dimensional and complex and can be explained through issues such as initial conditions, issues around compensation, real political commitment, overlapping membership, policy harmonisation and poor private sector participation, inefficient transport and logistics systems and barriers to trade across borders.

Inclusive pro/poor innovation will be very helpful to the advancement of Africa … Local initiatives usually have a deeper understanding of the challenges, therefore if they are encouraged and supported they can go a long way … Linking grass root challenges to universities, could be another way boost pro-poor innovation systems, with the participation of both students and faculty to provide feedback or get involved in the innovations.

Delphi Survey response

PATH 2: THE PROMISE OF INCLUSIVE INNOVATION

In recent years, policy-makers have started to pay increasing attention to 'inclusive innovation' sometimes described as "innovation for inclusive development" (IRDC 2011) or "innovation policies for inclusive development" (OECD 2015). Foster and Heeks (2013: 335) define inclusive innovation simply as "the inclusion within some aspect of innovation of groups who are currently marginalized". Most often, the currently marginalised groups are identified as the poor or underserved (e.g. Heeks, Foster & Nugroho 2014).

There are good reasons for focusing innovation policy discussions on the poor. Although extreme poverty has decreased internationally, the distribution of wealth is becoming increasingly skewed with 50% of the world's wealth in the hands of only 1% of the people by 2016 (Oxfam 2015; Piketty 2014). Furthermore,

large portions of the population remain either excluded from economic systems or are included on terms and conditions that perpetuate poverty and inequalities as a result of *inter alia* a lack of education and employment opportunities (Du Toit 2004; Hickey & Toit 2007).

As shown in Figure 4, huge inequalities exist in Africa with South Africa the least equal with 70% of the income distribution to 20% of the population. Super imposed on the income equality distribution for sub-Saharan African countries is the percentage of individuals living below the poverty line. From Figure 4 the high levels of poverty and inequality are evident.

Innovation and innovation policy present only one instrument for combating and alleviating poverty. The poor do not necessarily automatically benefit from innovation, thus there may be no direct correlation between the innovation and reduction in poverty or inequality. In some cases innovations can also increase inequality. Still, business strategies, products and services targeting the poor can be viewed as examples of inclusive innovation. Innovations and innovation policies targeting the 'Base of the Pyramid' (BoP) can create better livelihoods for the poor. This, however, neglects an important aspect of inclusive innovation, where mainstream innovation processes open up to, and are shaped by, non-traditional actors, such as actual or potential users, whether they are poor or not.

A long tradition of user-based and community-based innovation is increasingly recognised as important (Von Hippel 2005). Examples are professional users and athletes (both professionals and amateurs), developing, for instance, new technologies for cycling neither of them may qualify as poor. The market sector is still important for wider production and uptake, but the innovation derives from these non-traditional actors (see Von Hippel 2005). A further example is what is called 'frugal innovation' where new combinations are created to reduce complexity and costs of goods and their production. 'Frugal innovation' had been part of agricultural, community-based innovation all along, but was not always recognised by agricultural experts. To emphasise the contrast with mainstream innovation and the rhetoric of promise around it, Joly, *et al.* (2010) characterised non-mainstream innovation as building on 'collective experimentation'. The poor may not have resources to do dedicated collective experimentation, they focus on survival strategies – but these may be innovative, and be seen as based on collective experimentation

These considerations also indicate the importance of informal processes and the role of the informal sector in economies (in general, and in sub-Saharan Africa in particular).

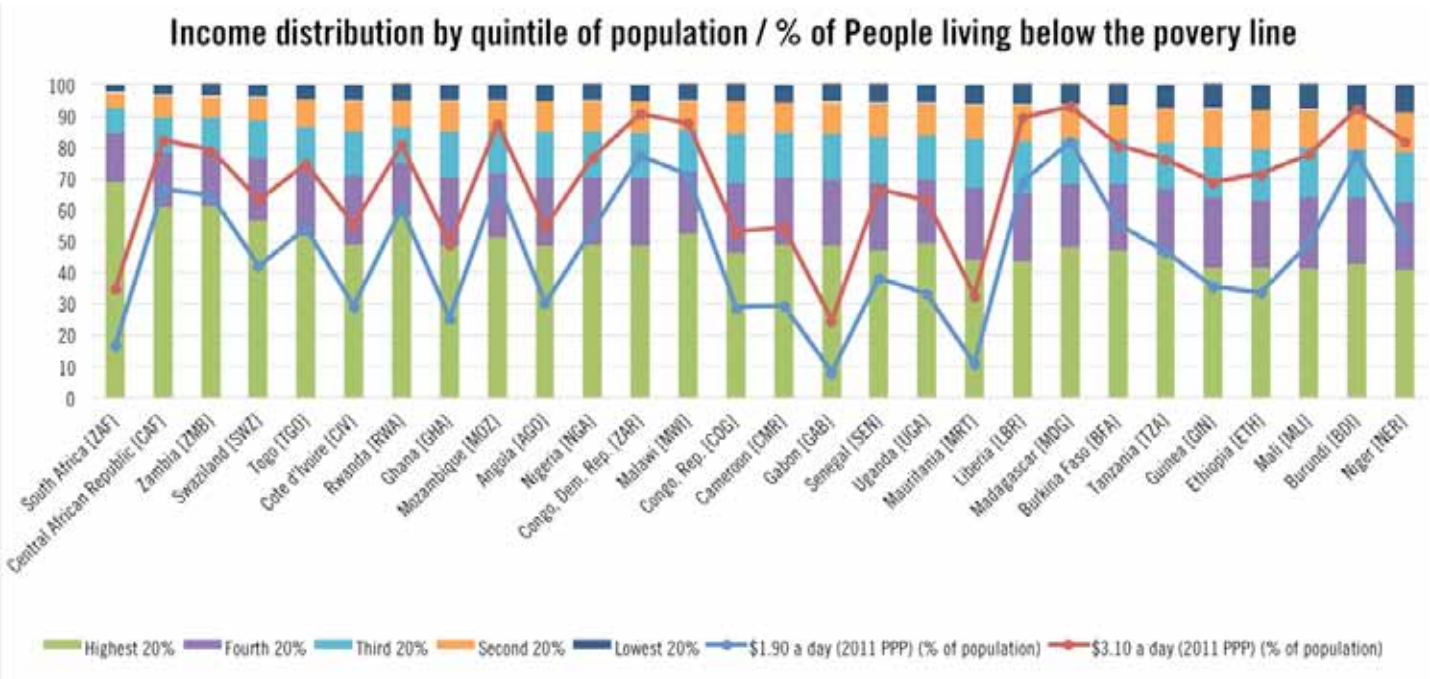

Figure 4: Inequality data: Distribution of income by quintile (sub-Saharan countries)
Source: World Bank data: http://povertydata.worldbank.org/poverty/region/SSA

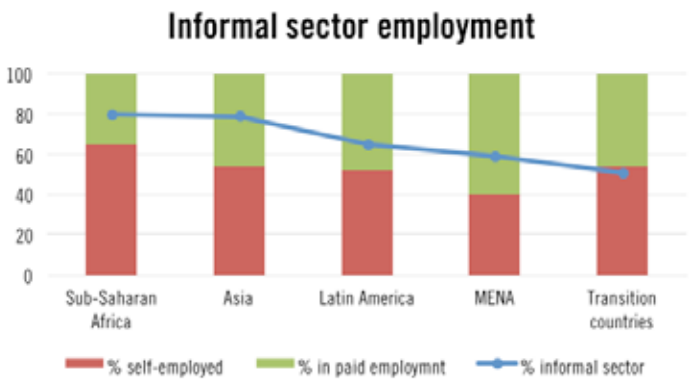

Figure 5: Informal sector employment
Source: OECD 2012

We offer a brief overview of literature on innovation in informal settings in the following box.

Fundamental characteristics of innovation in informal settings

Although data are lacking and limited understanding remains, a few fundamental characteristics have been observed regarding innovation in informal settings (Lizuka 2013):

1. Innovations in informal settings are frequently supported through the strong demand from users to obtain better-quality of life and welfare;
2. A large proportion of the skills in informal settings are acquired outside formal education/training systems;
3. The interaction among informal and formal settings is very limited, and the authors argue that formal networks may benefit from improving the diffusion of knowledge and scaling up knowledge creation in informal settings (Cozzens & Sutz 2012);
4. Howells (2006) identified that intermediary organisations/ actors play an important role in facilitating knowledge diffusion in informal settings. However, limited information is available on how these intermediaries are formed and how they operate;
5. Although exceptions do exist, innovation in an informal setting is characterised by incremental and organisational innovation as non-technological innovations dominate the innovation front (OECD 2005; Cozzens & Sutz 2012), and;
6. Policies to improve the welfare of marginalised populations in informal settings is a very new concept. Further research is required with regard to the local and specific context of knowledge flows and the design and implementation of policies (Kraemer-Mbula & Wamae 2010; Cozzens & Sutz 2012).

A further step, especially within an African environment, is how processes and institutions should be structured and implemented for linking up with informal processes and the informal economy, and thus also integrating the poor on better terms in networks of 'developed society' – i.e. being integrated in a way that does not marginalise them.

Here, attention has to be paid to the vertical links, the commodity chains and supply chain systems that link local livelihoods 'upstream' and 'downstream' to distant and complex networks of economic production and exchange (Du Toit, 2002; Kaplinsky, 2000). Equal attention should be paid to the horizontal linkages, and the ways in which the impact and nature of integration and inclusion into globalised systems are locally mediated (Du Toit 2004).

The value-chain perspective may also be helpful to consider and conceptualise opportunities for inclusive innovation, especially when it does not limit itself to traditionally-defined notions of competitiveness, rents and sources of rent, the supply chain and input-output processes. Such conceptualisation could also include sustainability and innovation objectives in the process. The value-chain approach can then be utilised to support the development of innovative market-based approaches to inclusive innovation. It should acknowledge the more or less globalised nature of value chains, and the realities of competing and surviving in GVCs (discussed in Path 1).

A further helpful approach, which allows for the input of non-traditional actors to be recognised, is the innovation platform. "Innovation platforms are ways to bring together different stakeholders to identify solutions to common problems or to achieve common goals". Such platforms usually involve a group of individuals from different backgrounds and interests (from informal and often also formal sectors) which may include producers, input suppliers, processors, environmentalists, researchers and public-sector players. The goal is to bring these diverse stakeholders together so that they can address challenges and opportunities at various levels. The inclusion of these actors usually refers to the specific value chains in which they operate (DfID, 2014).

Inclusive innovation is a re-packaging of concepts which have been attempted since the seventies. However there are some sectors (specifically energy) where new technologies offer real opportunity to implement pro-poor technologies and enable pro-poor economic activity …
The solution to poverty in particular is political, not technological.

Delphi Survey response

A view on agricultural innovation platforms (International Livestock Research Institute 2013)

The complexities of agricultural issues are huge and involve socio-economic, biophysical and political factors. Innovation platforms have proven to be useful in bringing together a range of stakeholders on various levels to address common problems effectively.

The benefits of innovation platforms can be summarised as:

- Facilitating dialogue and understanding and developing shared visions.
- Engaging with various actors creates a common ownership as solutions are negotiated and developed.
- This is a platform for upward communication with policy makers and government officials.
- By engaging with a wide range of actors the definition of problems and the decision-making process is more informed and democratic.
- Innovation platforms play a capacity development role through the co-development of knowledge but also mutual learning.
- The demand-side for knowledge is stimulated through engagement.
- Innovation platforms may also promote and enable interdisciplinary perspectives and approaches to problems.

Some constraints and limitations to the approach:

- Progress required often depends on continued and long-term participation.
- Implementation may be difficult and require huge investments in time and resources as well as skills.
- The time horizon for implementing innovation platforms is long-term and it may take a long time to develop tangible results which may have implications for securing funding and continued interest.

Having considered all of this, we can consider the role of government. Here an experimental approach towards supporting inclusive innovation projects may provide an ideal learning environment for public sector but also private sector and community organisations about what works for whom, under which circumstances and why. The engagement of government departments beyond those directly involved with STI for example education, health and infrastructure is important, as is a multidisciplinary approach to challenges.

Much focus is traditionally on the supply-side where government's key role is on the funding of research activities. Recently, more emphasis has been placed on the stimulation of the demand-side. Here procurement policies and projects for innovation in development should be highlighted. Some governments use their cities as a test-bed for new innovations and then help to develop local firms to potentially export their solutions to other regions. Such activities have the added effect of stimulating the demand-side – procurement from government as outlined above.

So what is the role for government in inclusive innovation?

The OECD, in a publication entitled ***Innovation Policies for Inclusive Development***, outline a number of channels through which government may approach inclusive innovation policy making:

- Ensuring inclusive innovation is a policy priority and is integrated in the STI policy agenda;
- To secure the involvement and engagement of government departments beyond those directly involved with STI e.g. education, health and infrastructure;
- By supporting the uptake of technology and specifically the use of platform technologies such as mobile telephony which provides a technological basis for a wide range of applications;
- Incentives for research in the inclusive innovation area;
- Financing mechanisms for inclusive innovation projects such as innovation funds have proven to be successful in, for instance, India through a for-profit investment fund for projects that will improve living conditions of the poor;
- Removing regulatory barriers to innovation that may serve the poor (for instance M-PESA was not successful in some markets other than Kenya due to the regulatory environment);
- The development of credit options so that firms that develop innovations may have predictable demand (e.g. micro-saving and micro-credit help poor people to be less vulnerable to income shocks);
- Ensuring that supportive intermediary institutions are developed which may include innovation platforms, engagement platforms (OECD 2015).

Of course, the government can and should take into account what is happening in society, including innovative market-related initiatives. Some examples include:

- New innovative business models, e.g. prepaid telephony and electricity have led to a revolution in these industries and the basis of competition and made it accessible to the poor (Fischer-Mackey 2011);
- Micro-privatisation that leads to cooperation between large and small enterprises – here small enterprises are involved in the delivery of public services (e.g. an electricity company or telephone company collaborating with SMMEs on the retail side) (Fischer-Mackey 2011);
- Market creation and supply chain development as private-sector players can only step in once there are enough sales to run a profitable business, for this reason markets need to be developed and demand stimulated (Heierli 2008);

- Provide access to the poor to participate in value chains – the barriers to entry to value chains may be too high which means that engagement needs to take place at the producer as well as market side. Common approaches here include strengthening business support services, enterprise development and pro-poor marketing (Heierli 2008).

IN CONCLUSION

The concept of inclusive innovation has evolved in response to the limitations and shortcomings of mainstream innovation and innovation policies, particularly also in combating poverty, inequality and exclusion, which are particularly worrying in the context of developing countries. However, mainstream innovation, with its focus on global competitive advantages, remains important, both in terms of its practices and institutions, and in how its promotion frames policy goals. The ongoing attempts to pursue both and even combine mainstream and inclusive innovation can be seen as constituting a Grand Societal Experiment, on top of the concrete societal challenges. Rip (2015) introduced this notion within the context of South African universities aiming to orient themselves towards global competition as well as community orientation, suggesting that there may not be an immediate solution for the combination (thus, it is an experiment), but that it is important to be reflexive in the concrete attempts, and ensure that learning occurs. Exploring how to develop pathways to inclusive development, and considering new and broader constellations of actors to address societal challenges, is the key approach. Kuhlmann and Rip (2015) argue this holds generally, not just in the context of developing countries.

Embarking on such an experiment will entail developing proof-of-concept innovation projects and programmes that involve 'new constellations of actors' including non-traditional actors. These actors will have to engage in new forms of collaborative learning and knowledge production which will require novel approaches to STI policy where traditional top-down approaches will have to be augmented while considering how bottom-up processes could be supported. Rip's challenge raises some interesting suggestions regarding leveraging global players and their value chains and to consider how such capacity could aid in creating new approaches to developing new innovation systems to solve local issues.

For example, the Grand Societal Experiment is a challenge to address the problem of regional economic super powers behaving like 'Rambos'. Economic powers may start to play a more positive role in regional development. For example, could South Africa become a driver of regional growth through spearheading the development of inclusive innovations and strengthening cross-border value chains and what would this entail? Kenya is a well-known example of a regional super power, with many global enterprises setting up R&D labs specifically in ICTs (e.g. Philips) and innovations like MPesa have proven to be a game changer. One issue then is how to scale up and export such innovations effectively and how to ensure that these contribute to development outcomes.

…neither the current innovation policies nor the institutional frameworks are able to be easily adapted to implement an inclusive innovation approach, without considerable remodelling and broader involvement.

The de facto institutions most involved with communities are socially-oriented NGOs and aid organisations with little current linkage to the present 'innovation system' approaches.

Delphi Survey response

There are further examples: New manufacturing methods such as additive and distributed manufacturing bring new possibilities in establishing manufacturing bases in a wider range of places – closer to markets and users. Value chains in manufacturing may take on a completely new form especially through design expertise and appropriate tooling capacity such possibilities may become a reality (See Path 3).

Themes for our debate

A key issue here is how innovation policies could tap into the dynamics of the informal economy (often the only economic activity accessible to poor and disadvantaged groups) and help them to become a productive and innovative part of the formal economy.

- How can we improve productivity in the informal sector? How can we develop stronger linkages between the informal and formal sectors? Or support the informal economy to become formal?

When it comes to developing inclusive innovation, the following areas are important to highlight in the debates:

- Is inclusive innovation adequately supported/stimulated in Africa?
- Are new design and manufacturing approaches leveraged adequately to develop inclusivity?
- What is required to export inclusive innovation to African countries (e.g. MPESA was not successfully exported due to regulatory issues)?
- How can we leverage 'what we have' to support inclusive innovation outcomes?
- What is the role of Higher Education Institutions and government in supporting the development of inclusive innovation outcomes?
- How to experiment with the 'new constellation of actors' and learn from them?
- How can we better leverage globalised industries and global players to support the establishment of inclusive innovation systems and programmes on the continent?

PATH 3: DIVERSIFICATION AND DEVELOPING KNOWLEDGE AND INNOVATION-DRIVEN ECONOMIES

"Africa boasts about 12 percent of the world's oil reserves, 40 percent of its gold, and 80 to 90 percent of chromium and platinum group metals. The continent has vast arable land and timber resources. With the abundance of these resources and the past decade's rising demand for raw materials, African governments are forging new partnerships that are leading to increased infrastructure investments and sharing of skills and technology. But Africa can do better. Instead of relying on exports of raw materials, African countries should add value to their own commodities to promote sustained growth, jobs and economic transformation" (Lopez 2013).

Africa's recent growth – although impressive – has not guaranteed (or automatically led to) social or economic development. Although dismissed by some as a myth (McMillan 2014), the de-industrialisation of Africa has been widely documented (Aryeetey & Moyo 2012). This means that, notwithstanding increasing contributions to GDP from manufacturing (in some countries), financial, telecom and tourism sectors, Africa's economic growth continues to be strongly driven by primary commodity exports (Morris & Fessehaie 2014; Oyelaran-Oyeyinka 2015). As shown in Figure 6, manufacturing value added in sub-Saharan Africa has fallen from 18% in 1965 to 15% in 2010. This illustrates the well-documented stalling of manufacturing in sub-Saharan Africa at present accounting for 11% of overall value added on the sub-continent – much lower than the 30% for ASEAN economies (World Economic Forum 2015).

It has been argued that the reasons for de-industrialisation include weak infrastructure (such as poor roads, congested ports, and poorly developed public transport), the cost of electricity and availability of energy. De-industrialisation in Africa can also partially be explained by a case of 'Dutch Disease' afflicting many African countries. What is meant by this term is that booming commodity prices – largely explained by massive demand from China – drove up exports of raw materials in many African countries and led to currency appreciation. This, in turn, created an environment where it was cheaper to import consumer and other goods than to manufacture them locally. The geographic position of Africa also does not help with many countries being landlocked and relatively far away from major markets reducing their ability to develop domestic manufacturing industries (Morris & Fessehaie 2014; Oyelaran-Oyeyinka 2015).

Asche, et al. (2012) argue that as far as industrial development for African nations is concerned two major issues need to be addressed. Firstly, there is a lack of structural change in these countries' economies and, in general, agriculture has not been modernising. Along with manufacturing that has stalled and, in some cases, is in decline expressed in percentage of GDP, this has as a consequence that industrial performance is lagging. A second issue is, that if we consider export-related indicators, most African countries show a relatively small number of unsophisticated commodities. As shown in Figure 7, there are only a small number of countries in Africa (South Africa, Tunisia, Morocco and Egypt) that have achieved some success in diversification while a large group of these countries has only achieved a low level of diversification and are reliant on less than 10 unsophisticated products that make up 75% of their exports.

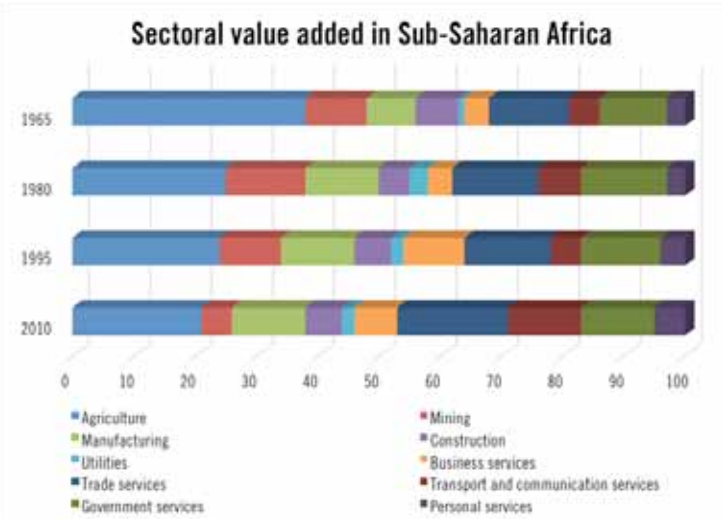

Figure 6: Sectoral value added in sub-Saharan Africa (1965-2010)
Redrawn from World Economic Forum (2015)

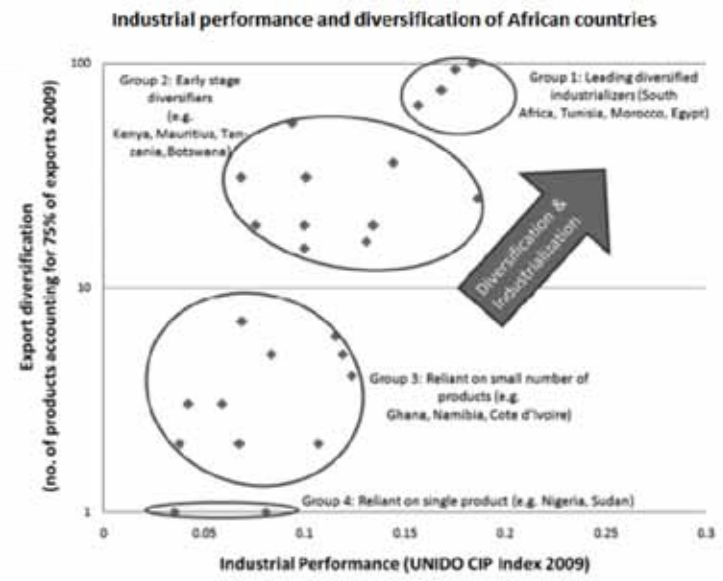

Figure 7: Industrial performance and diversification of African countries
Source: Oyelaran-Oyeyinka 2015

The discussion to follow maps out some suggestions towards how African nations may achieve the structural transformation of their economies. We have been highly selective in the interests of space and time.

GROWTH THROUGH SUSTAINABLE INDUSTRIALISATION AND DIVERSIFICATION

Findings from a study by Imbs and Wacziarg (2003) indicated that as poor countries become richer the tendency is that their economies become more diversified. This expansion of activities in the economy carries on up to a relatively advanced level of development. Rodrik (2004) therefore identifies the ability of a country to expand the number of activities in the economy as key to development success for developing countries. As depicted in Figure 8 the process of economic and industrial development has in general followed a U-shape with slow-growing, low-income countries that trade in less-sophisticated products striving to become richer through diversification into higher value products and later again in the development trajectory start to specialise again.

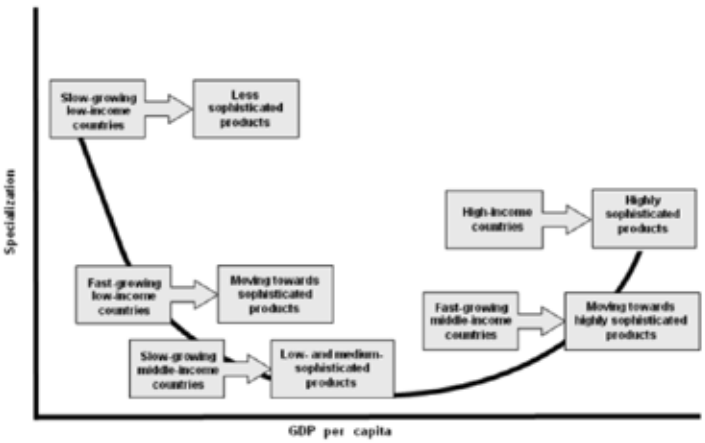

Figure 8: The U-shaped process of Specialisation v Diversification in Economic Development
Source: Oyelaran-Oyeyinka 2015

The proponents of the 'resource curse' concept argue that relative abundance in natural resources could lead to an undesirable form of specialisation and ultimately impede the development of industrial capacity (Frankel 2012; Frankel 2010; Rosser 2006; Oyelaran-Oyeyinka & McComick 2007). However, this notion has been increasingly challenged as in present-day GVCs there need not necessarily exist a trade-off between commodities and industrial development. A commonly held view in the recent literature is that provided that the right policies are in place, commodity-based industrialisation could serve as a base from where diversification and competitiveness can be developed in commodity and non-commodity sectors. Here the key question should therefore be how, instead of 'ignoring' its resources and commodities, Africa can leverage them to promote the development of linkages to manufacturing and services, generate higher value-added natural resource-based products and services, develop manufacturing industries, new service industries and strengthen technological capabilities in existing industries (Oyelaran-Oyeyinka, & McComick 2007; Asche, et al., 2012; Morris & Fessehaie 2014; Oyelaran-Oyeyinka 2015).

"To grow fast, African countries need to shift workers into more productive industries. Their governments need to provide the infrastructure and the incentives for manufacturing firms to set up. Without determined action, they risk another lost decade as the commodity bust deepens." The Economist*, November 2015*

It is important to note that, for sustainable and long-term growth, a roadmap for growth should also acknowledge that commodity-based industrialisation cannot and should not be the only pathway. Not all African countries have resources and, in the long run, even resource-rich countries need to develop innovative and non-resource based industries. Many African economies import vast (and rapidly growing) amounts of consumer goods indicating possibilities for the development of local manufacturing industries to meet strong domestic demand.

The importance of developing manufacturing industries – a required focus for innovation-led growth (Oyelaran-Oyeyinka 2015)

Manufacturing is widely recognised as a key driver for industrial-led structural change of an economy. Innovation-led development also depends to a large extent on dynamic performance in the manufacturing sector. The case for manufacturing as an engine of growth has long been recognised and empirical evidence supports that for developing countries a link exists between industrialisation and per capita income.

The reason for wealth to be linked to industrialisation and a greater share in manufacturing is that productivity in the manufacturing industry tends to be higher than, for say, the agricultural sectors. The pathway towards structural change therefore needs to support a shift of labour and resources from lower productivity activities to higher productivity activities, e.g. from agriculture to manufacturing.

Capital accumulation is an aggregate source of growth and manufacturing is also a quicker way to achieve that, as investment in capital intensive industries rise – the contribution to GDP of manufacturing rises.

Technological change and innovation often also initiates in manufacturing sectors and may diffuse from there to other sectors such as services or agriculture. This then allows for the development of backward and forward linkages and interactions with various sectors and sub sectors – here cluster policies may support the development of such dynamics.

The literature highlights the importance of the right set of policies to support technological capacity development, manufacturing, service industries and upstream/downstream activities eventually driving growth (Morris & Fessehaie 2014). Policy can play a decisive role in strengthening the ability to develop linkages to other sectors through inter alia local content policies and to increase the breadth and depth of local linkages (ibid). Forward linkage policies, such as beneficiation, are subject to similar dynamics where local value addition activities may be expanded. There may also be opportunities to attract foreign direct investments, as firms may want to outsource non-core functions such as IT, auditing, and utilities. In order to achieve these objectives, Morris outlines four strategies for how resource-driven industrialisation may be supported (Morris & Fessehaie 2014):

1. Target the export market by raising barriers to entry through upgrading and certification, and capture the high-end market in developed countries – possibly a strategy that will be successful for fresh vegetables and fruits, and speciality products (coffee, cocoa) (Page, Kaplinsky, 2004).
2. Develop backward linkages to commodity sectors by local firms that supply goods and services to multinationals and the extractive industries. Outsourcing presents a real opportunity. Here, some intervention is required as supplier development is often necessary to meet the requirements of multinationals and extractive companies.
3. Development of natural resource processing industries could be facilitated through attracting lead firms to relocate manufacturing activities to the local environment. Increasing domestic demand could entice foreign firms to locate manufacturing close to market to curb fuel costs and to develop local and regional markets to create further demand.
4. While much attention has been given to the final stages of commodity-based GVCs, considerable opportunity may exist for intermediate manufacturing stages that may be more achievable in the short term such as sawn lumber, cellulose, fishmeal, and preserved fruits. These may provide opportunity for the development of capabilities and to grow market share to achieve scale (Reinhardt, 2000).

Policies therefore need to prioritise value addition, to raise productivity and quality of products while increasing output to achieve scale. The role of government here may include investing in R&D and technology upgrading and transfer. This, however, leads back to the need for domestic markets and local demand to develop such industries possibly in stages and during the early parts to manufacture and export intermediary products to developed economies. Capability development in domestic firms, for example through education and training, therefore need to be prioritised to facilitate the development of linkages with a distinct role for FDI and foreign investors – again targeting the development of competitiveness and encompassing strategies of global enterprises and the realities of competing in GVCs (Morris & Fessehaie 2014; Oyelaran-Oyeyinka & McComick 2007).

A NOTE ON ENTRPRENEURSHIP

Entrepreneurship is a key component of African development. Entrepreneurial activity may take place through entrepreneurial entry of new and superior actors, and/or through innovative entrepreneurial action that take existing business firms up their value chains ("intrapreneurship").

The challenge is to introduce innovative entrepreneurship into economic environments that lack technical, management, marketing and other commercial competences, and the critical supporting institutions (Eliasson & Braunerhjelm 2015). It is therefore necessary to distinguish between change in the environment in which the entrepreneurs operate, on the one hand, and the entrepreneurial capabilities of individual actors, on the other.

Economic growth thus has to be based on particular kinds of industrial knowhow, and take place in entrepreneurial environments rich in supporting infrastructure. Both are improving in SSA but seem still relatively scarce in supply. Particularly important ingredients in fostering an entrepreneurial climate refer to access to finance for new firms and SMEs, and taxes. High and distortive taxes that favour growth through self financing in big firms in traditional markets discourage entrepreneurship and SME growth. A previous less favourable entrepreneurial political climate in SSA has been improved and in some areas largely dismantled due to technological progress and globalisation. Presently, the political concerns centre more on the distributive impact of globalisation.

Entrepreneurship appears in different forms and Eliasson and Braunerhjelm (2015) argue that the following four categories are the most important: (i) Imports of new technology through FDI; (ii) New business establishment; (iii) Innovative recombination of incumbent actors over private equity markets; and, (iv) Social entrepreneurship.

Entrepreneurship is clearly the answer to a large proportion of Africa's poverty challenge. Investing in support structures and education to advance entrepreneurship across the continent is therefore critical and should be a top priority for every government across the region. The focus of NGO and Aid activity on the continent should also be … to create self-sufficient initiatives. Also, quite often governments have a tendency of focusing on the larger infrastructure development projects. However, these projects more often than not only benefit a select few missing the wider multiplier effects often promised

Delphi Survey response

NOVEL APPROACHES TO DEVELOP MANUFACTURING INDUSTRIES

The well-known book by Friedman (2005) entitled The World is Flat, argues that amongst other 'flatteners', ICTs will provide a base for creating a global economy where users anywhere can be connected irrespective of distance, space and geography. This view has been heavily criticised and many have argued that the reverse is true. Economic geographers, economists and policy makers have argued that with the rise of globalisation, regional distinctiveness and regional economic development is central to increased wealth creation and participation in the world economy (Martin 2003, Coyle 2001, Krugman 1997, Scott 1998). Geographical proximity is seen as an important aspect to how knowledge is acquired, accumulated and used (Gust-Bardon, 2012). Location is therefore centrestage in the debate on economic development.

Academic arguments aside, in this section we raise a few interesting developments that may prove to turn conventional wisdom regarding the development of manufacturing industries on its head and, to a large extent, may indeed make the world a bit 'flatter'. Although the arguments raised in the previous paragraph remain valid in the sense of developing linkages into GVCs and that access to input factors and value chains and markets remain important, we raise a few considerations for overcoming the skills shortages and infrastructural shortcomings in Africa.

Digital manufacturing or 3D printing has been around since the 1980s but significant improvements in technology now make it possible to print all kinds of objects like machine parts, tools, household equipment and even clothes. Digital manufacturing has the potential to revolutionise the African manufacturing environment and reduce dependence on imports as this technology becomes more accessible, versatile and cost effective. The side effect of this is that it may create a manufacturing industry that does not rely to such a huge extent on factories, machinery, labour and capital in the way that traditional manufacturing industries do. This may be a way for African countries to become less dependent on imports and, to some extent, to side step the major blockages to structural transformation of their economies.

The emerging concept and practice of **moveable factories** is also interesting. The future potential of supporting sustainable development by incorporating moveable factories with production design techniques needs more attention. Movable factories refer to three types of production facilities that are designed and built for various locations. Much of this depends on the nature of the goods manufactured but also the demand conditions (Fox 2015).

Individual moveable factories: Typically mounted on a truck or in a container which can be moved regularly as the need for a production location changes, for example the processing and packaging of agricultural goods. Such an arrangement reduces the need for infrastructure such as paved roads, logistics and a huge number of journeys and may also help curb suffering of animals and post-harvest losses. Longer-term moveable factories may be setup using containers where the location changes monthly or yearly as, for instance, construction projects are completed. Here sets of moveable factories may be flexibly deployed to setup manufacturing systems. The concept can also be applied with more sophisticated goods such as special foodstuffs with added micro-nutrients; consumer electronics such as computer tablets; medical goods such as implants and prosthetics. However, these require a third form of this type of factory which is deployed when the location will be fixed for several years. This may be useful for erecting production locations where a specific environment needs to be created, for instance, a clean environment to develop micro-electronics (Fox 2015).

Africa can build sustainable and inclusive growth that eradicate poverty only if it can industrialise, especially expanding its small manufacturing sector: It is the manufacturing sector that can provide employment, including that of the marginalised. How this can be done is fully explained in one above, but the starting point should be the agro processing that is low tech in nature and therefore providing employment for many, including the rural poor.

Delphi Survey response

IN CONCLUSION

We expanded the industrialisation argument in stating that for sustainable and long-term growth, a roadmap for growth should acknowledge that commodity-based industrialisation cannot and should not be the only pathway. Not all African countries have resources and in the long run – even resource-rich countries need to consider developing innovative and non-resource based industries. Coordination issues remain such as coordinating capacities to be developed, aligning trade policy and negotiations, and harmonising regional industrial policy which is a core success factor for successful regional integration.

As raised in the second section novel manufacturing developments, some referred to as the third industrial revolution, pose some interesting possibilities for African countries to develop manufacturing industries. These also provide some solutions to environmental sustainability and also to lower the requirement for sophisticated transport systems. Certainly this is a promising area to explore within the development of STI policy and how Africa may link into GVCs. The possibility of manufacturing close to markets (consumer goods) certainly may, to some extent, reduce the reliance on imports while processing close to the source of inputs (e.g. agriculture) may allow for value addition.

Themes for our debate

We ask a number of key question in this section regarding Africa's dependence on commodities and the need for structural transformation of Africa's economies:

- Is African de-industrialising really taking place and how big a threat is it?
- What are the greatest challenges facing industrial policy in Africa?
- How can African economies overcome the resource curse? Will this assist African economies to become more integrated in global economies?
- What capacities are required and what policy frameworks need to be developed to this end?

Recent developments in distributed manufacturing and concepts such as 3-D printing and mobile factories may mean that the traditional approaches to industrial development have to be rethought:

- The question of new approaches to industrial policy may also be raised here: What are the required new paradigms and practices for thinking about industrialisation in Africa? The question remains how we could develop business models, set up facilities and ensure that private sector players effectively explore how this can be achieved.
- The implications of asymmetries and weak regional integration may also be less important should distributed manufacturing and related concepts be leveraged. Regional integration may also be possible through new and non-traditional approaches to developing manufacturing capacity and new linkages into value chains.

Knowledge and innovation should be used to strengthen and increase value-added in agriculture and extraction economies as well as enabling the development of new sectors … The role of universities in providing good education is key.

Delphi Survey response

PATH 4: TRANSFORMING UNIVERSITIES TOWARDS BECOMING 'ENGINES FOR DEVELOPMENT'

Discussions regarding the role of African universities in the continent's economic and social development are not new. A UNESCO conference in 1961 on Development of Higher Education in Africa rang in a development decade entitled the Year of Africa (UNESCO 1961). A decade later a UNESCO workshop on the role of universities in Africa produced a statement that universities must play an increased role in the development of African states (Cloete, *et al.* 2011). During the same time the much lamented 'rate of returns on Higher Education' study by the World Bank advised that the returns on Primary Education were higher than Higher Education (HE), and suggested that development efforts should be refocused (Heyneman 2003). This decision contributed to Higher Education System (HES) being chronically underfunded and becoming even more delinked from the development discourse and their potential role in development (Cloete, *et al.* 2011). Since the 1990s moves were initiated to revitalise African universities.

Before launching into a discussion on the potential role of universities in development, it is helpful to provide some context on educational statistics for the African continent. With 35% of the gross enrolment ratio for secondary level and only 6% at tertiary level, the educational profile of young Africans remains relatively low. Seventeen African countries have literacy rates below 75%, and only 42% of 20-24 year-olds have completed secondary education. Vigorous expansion is forecasted for secondary education to reach 59% of 20-24 year olds by 2030 (African Development Bank Group 2015).

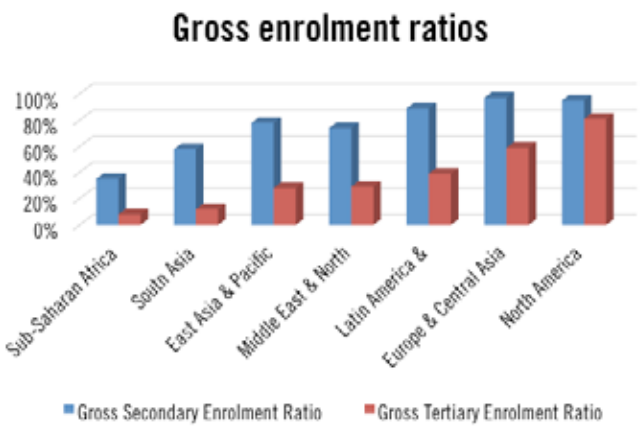

Figure 9: Gross enrolment ratios for secondary and tertiary education in Africa
Source: African Development Bank Group 2015

TRANSFORMING UNIVERSITIES

The pressures of a changing world are compelling universities to adapt and respond to issues such as globalisation, the digital revolution and shifts in public policy. These pressures have a profound impact and are driving a global transformation of the HES (Brennan, *et al.* 2004; Lucas cited in Schreuder 2013). These global developments are also driving new forms and a new focus of traditional functions in the university where, for instance, funding uncertainty is resulting in new activities and a focus on income-generating activities, and knowledge-production processes have become complex, interdisciplinary, networked and socially shared. The sustainability and impact of knowledge production also require new ways of organising the core functions of HE institutions.

The literature cautions that governments, especially in Africa, sometimes expect too much of universities and their impact on transformation objectives, and that this is a risk that needs to be

Linking grassroot challenges to universities, could be a[nother] way to boost pro-poor innovation systems, with the participation of both students and faculty to provide feedback or get involved in the innovations.

Delphi Survey response

managed (Coleman 1986). It is therefore a balancing act to ensure appropriate government support and leveraging political will to implement and use research outcomes, and, on the other hand, to ensure continued autonomy of the HES.

As Cloete, *et al.* (2011) note, the two major roles a university plays as a *tool for development* is a more direct, service-oriented, 'instrumentalist' role, and secondly a role towards an 'engine for development'. The university as an *instrument* has an important role to play in national development but not necessarily through the production of knowledge, but rather on its exchange of expertise, and capacity building. The university as an *engine* refers to an environment where the university is seen as one of the core institutions in the development model. Here the university is seen as a key institution to address complexities in transitioning to a knowledge economy, with a range of functions to develop skills, competencies and to produce applied knowledge (Gibb & Hannon 2006; Clark 2004; Gibbons 1999).

Coupled with the challenge of developing-country universities becoming established as research-intensive institutions is the challenge of being relevant in and having impact on the communities that the universities serve. Many of these institutions, in the African context, find themselves in a rural situation amidst a sea of underdevelopment that is characterised by poverty and desperation. Coleman (1986) suggests factors such as history and socio-political issues, industrial structure, level of development and productivity, participation in tertiary education and the enrolment gap, profile of disease burden in the external environment, service delivery and poverty and income levels all impact on the role of universities.

There are many trade-offs in balancing the corporatisation of university functions with a view to creating financial sustainability. As outlined below (Table 4) the sources of funding for R&D in the HE sector ranges dramatically from one country to the next. For instance, South Africa's R&D is mainly funded by government and business where countries like Ghana, Senegal and Uganda mostly depend on funding from abroad. Such arrangements also have an impact on the alignment of the university with the needs of the external environment greatly affected by the sources of funding and the power relations and expectations of funders. This may have an effect on the extent to which HE is linked to regional development or the level and drivers of responsiveness to labour market demand (Cloete, Bailey and Pillay 2011; Pillay 2011).

Table 3: Common barriers and factors limiting the development role of universities in Africa

KEY FOCUS AREA	PROFILE/CHALLENGES TO RESEARCH UTILISATION (RU) IN SUB-SAHARAN AFRICAN UNIVERSITIES
Institutional climate for research and RU	• Lack of integration and support for research dissemination activity in institutional mission and vision statements, research strategies and policies • Extension and outreach activities not priorities for universities • Career structures and incentive mechanisms do not foster and support RU activities
Knowledge production	• Lack of strong research culture • Heavy teaching workloads • Staff engaged in consultancy • Limited coordination of internal research activities • Deficient infrastructure (e.g. ICT and laboratories)
Internal barriers	• Lack of skills and training among staff for research, stakeholder engagement and science communication • Lack of coordination among different units within the university regarding core functions • Unclear accountability for individual and unit roles and responsibilities in RU activities • Lack of institutional communication and/or marketing strategy • Lack of appropriate funding mechanism to support university functions
Facilitating pull factors	• Poorly understood external stakeholder environment • Lack of understanding among external stakeholders of the research process • Unwillingness among academics to engage with external stakeholders during the planning stages of a project • Lack of structures and capacity among external stakeholders to adopt knowledge • Lack of understanding among external stakeholders of what is available from universities
Evaluation methods	• Limited tracking and evaluation of research impact • Lack of skills and resource capacity to construct and maintain monitoring and evaluation processes

Adapted from Grobbelaar and Harber, 2015

Table 4: GERD by sources of funding (Percentage)

		Business	Government	Higher Education	Private non-profit	Abroad	Other	Total
Countries	Year	%	%	%	%	%	%	%
Burkina Faso	2009	11.9	9.1	12.2	1.3	59.6	5.9	100
Ghana	2010	0.1	68.3	0.3	0.1	31.2	0.0	100
Kenya	2010	4.3	26.0	19.0	3.5	47.1	0.0	100
Senegal	2010	4.1	47.6	0.0	3.2	40.5	4.5	100
South Africa	2010	40.1	44.5	0.1	3.2	12.1	0.0	100
Uganda	2010	13.7	21.9	1.0	6.0	57.3	0.0	100

Source: ASTII survey, 2010

Universities must be able to organise initiatives that are research driven, impact focused and flexible enough to accommodate various levels of society (from children to working class people).

Delphi Survey response

Internal barriers to Africa's universities towards playing a developmental role include a wide range of issues such as a lack of funding, time pressures on staff and uncertainty about funding sources, coupled with difficulties in attracting the best faculty and students (Grobbelaar and Kirkland 2013). Additionally, cultural issues, such as a lack of scholarly focus and leadership, could result in research and teaching not addressing issues relevant to the local environment, or a poor fit between the available academic capabilities and development needs.

The **focus and form of teaching** needs to be reconsidered within the African context with a very high unemployment rate amongst individuals especially those with tertiary education. A closer look at the tertiary educated unemployed reveals that the unemployment rate varies by type of educational degree. A widely cited reason for this is that there exist huge mismatches between the education on offer and what is in demand from employers. This is proved by high vacancy rates despite high employment for instance in Egypt, 1.5 million young people remain unemployed with 600 000 vacancies in the private sector. Even worse, in South Africa 3 million young people remain unemployed with 600 000 unemployed university graduates and 800 000 vacancies (The Economist, 2012, African Development Bank Group 2015). An important additional point to raise is that enrolment on technical and vocational programmes in sub-Saharan Africa has taken on a small and marginal role in the education system with only 5.2% of enrolment in Africa which lags compared to OECD countries (18.6%) and other developing regions, such as Latin America (11.6%) and South East Asia (9.5%) (African Development Bank Group 2015).

African universities could focus specifically on addressing the enrolment gap and widening participation, cooperation with local enterprises and communities for relevant skills development and continuous education (Arocena & Sutz 2007).

As far as the role of the university as **a knowledge producer** is concerned, various factors impact on the intensiveness, form and function of such activities. Here some statistics regarding the expenditure on overall R&D may be instructive. Africa lags on this key indicator with 0.3% on average of its GDP spent on research and development – industrialised countries typically have a target of spending about 2% of GDP on R&D.

The universities, many of which still operate in the 'pre-knowledge revolution mode' are too isolated from the national economic and industrial debate.

Delphi Survey response

Table 5: Gross Domestic Expenditure on Research and Development

Countries	Survey year	GERD (PPP$ M)	GERD (% of GDP)	GERD per capita (PPP$ M)
Burkina Faso	2009	38.1	0.2%	2.38
Egypt	2011	2223.35	0.43%	26.94
Ethiopia	2010	208.74	0.24%	2.51
Ghana	2010	150.2	0.38%	6.16
Kenya	2010	652.0	0.98%	16.09
Senegal	2010	130.5	0.54%	10.50
South Africa	2010	4021.3	0.76%	80.21
Uganda	2010	237.8	0.50%	7.11

Source: ASTII R&D Survey, 2010

The human resources in science indicators also tell the story with an average of 35 R&D staff per million population compared to Brazil's 168, Europe's 2457 and the USA's 4103 (African Development Bank, 2008: 3). Furthermore research outputs in Africa are very low compared to the rest of the world with only 1.5% of the global production of international scientific journals (Adams, King, and Hook 2010: 5).

The nature and level of knowledge production and attempts to strengthen such activities may be an important part of a transformation drive in Africa's universities (Arocena & Sutz 2007). The process of knowledge production and the use of knowledge through multi- and trans-disciplinarily research approaches have implications for the setup of the university and will dictate its structures, systems, groups, channels of knowledge dissemination, and the development of research questions. Consideration should also be given to focusing research activities on developing an evidence-base for policy, advocacy and management (Wilson and Cornell 2012).

The changes in form and focus of the university as far as **engagement** is concerned, have implications for the way in which the university engages with the external environment and the accessibility of knowledge resources in the university to outside players. Such considerations may include having a wide view of extension, leveraging not only staff but also students and community members (Arocena & Sutz 2007). The link with the engagement function into the teaching and knowledge production function is important as having a scholarship-enhancement base which draws on knowledge developed through engagement and infused into core curricula and research agendas is required to overcome the mismatch in skills development, research and the private sector. Such engagement should be supported through the development of sustainable networks and relationships (rather than short-term 'random' interactions) with key development agencies, the private sector and government. This needs to drive a dynamic not only to improve relationships with the external environment, but also to improve accessibility to university resources (Wilson and Cornell 2012).

Also important to consider is the **development of infrastructure** (e.g. intermediary systems and structures, and extension functions) to support outreach and development support. This may include establishing structures such as institutes, centres and units to conduct research and to ensure that societal impacts are facilitated. Such intermediary structures could also include multi-stakeholder initiatives for collaborating with state departments, the private sector or the NGO/CBO sector and playing the role of 'change agents' (Wilson and Cornell 2012).

IN CONCLUSION

In conclusion, the transformation of the university enterprise may be driven through changes in policies, structures, infrastructure and engagement mechanisms within the university. Here are some of the changes that may need to take place (Grobbelaar & Kirkland, 2013):

- Development outcomes should be considered when choosing and allocating funding to projects and project planning;
- Governance mechanisms are needed to ensure synergy between teaching, research and engagement, and to create a learning environment that supports such synergies';
- The university should develop mechanisms for and support staff in developing networks and partnerships with the university's key stakeholders;
- The university should recognise staff engagement activities by means of internal rewards and incentive systems, and consider the inclusion of support for Monitoring and Evaluation (M & E) on projects and systems in the university to track engagement, and share learning and success stories;
- Multi- and trans-disciplinary project initiation platforms should be established for staff working on developmental issues, and to ensure there is a rich and comprehensive approach and common learning between disciplines;
- The university must have a clear code of ethics through which development activities and relationships take place.

In conclusion we outline the key characteristics of the developmental university for Africa in Table 6 overleaf.

Table 6: Key characteristics of the development(al) university

Key characteristics of the development(al) university	
Obstacles and barriers	• Government and political will • University autonomy and the critical function • Competence of staff to support development • The fate of traditional university functions • Stakeholders expecting too much of universities
Key goals and nature of the university	• Depending on the type of development university: social and political objectives integrated in core missions of the university enterprise • University is open and interacts with different groups in society specifically integrated in development planning by government • Role for university in capacity development and transformation and redress, e.g. enrolment gap • Orient teaching and research towards social inclusion and concern • Student and staff involvement in development activities and engagement
Functions of the developmental university	• Excellence in teaching, research and engagement • Transformation focus social, political economically and cultural resulting in changes in universities in terms of curriculum, quality and standards; diversification; access policies, student profiles and experiences; and academic responses to change • ***Teaching focused on*** local relevance, lifelong learning, adult education and entrepreneurial training • ***Research:*** Applied research to assist development and to provide an evidence base for policy and practice • ***Economic and social development:*** agricultural extension, health outreach, adult education, extension classes and the diffusion of knowledge and innovations through the mass media
Policies of the developmental university	• University plans aligned with national development plans • Coordinate activities by strong linkages with external stakeholders • Incentive system to reward staff and students that contribute to development and innovation • Infrastructure to support innovation, outreach and development support (e.g. intermediary platforms and training)

Source: Grobbelaar, 2015

Themes for our debate

Through this pathway we consider how universities in Africa could be equipped and developed towards engaging with a wide range of stakeholders and be better aligned towards supporting development outcomes. We ask questions around:

- How can government leverage universities better to contribute to development outcomes?
- How can universities help to address the skills deficit in Africa? How can Africa increase participation in higher education?
- How can universities align their curricula better to address local problems and equip Africans to exploit economic opportunities?
- What is the place for vocational training and the development of artisans in the Higher Education system?
- How can universities better align teaching, research and engagement activities to have increased impact on local communities? What does this mean for the capacity development that needs to take place in universities?
- How can African universities become financially more secure?
- How can universities support the strengthening of regional innovation systems?

PATH 5: THE DEVELOPMENTAL STATE

The challenges to Africa's development identified in the previous sections, such as lack of regional integration, the large informal economy, and the need to transform universities, will require interventions. This, in turn, will require political will and government action to address underlying market, system or governance failures. In recent years, there has been a growing interest and public debate on how the state can best contribute to strengthening Africa's development in general and its innovative capabilities in particular. In many African countries, the discussion has centred on the notion of a 'developmental state' (see for example Routley 2014). The term has been used to describe a range of roles, attributes or policies a state might assume, possess or pursue in a general striving for economic development. A developmental state may be defined as a state that has both a capacity for and a commitment to development (Routley 2014). Johnson (1982) defined a developmental state as a state that makes economic development its top priority. Leftwich (1995) specified that a developmental state is often a strong state, an active driver of development, identifying a "determined developmental elite", a powerful bureaucracy with "authoritative and pivotal influence in making development policy, commonly at the expense of both political and legislative elites", a "weak and subordinated civil society" and even a degree of "repression" as some of the key elements of a developmental state (pp.405-406). More recently, trial and error and experimentation and learning in policy-making has also been acknowledged as an important component of the

developmental state (UNCTAD 2007 and Routley 2014). UNCTAD (2007) identifies a commitment to a "'development ideology' as a long-term predictable strategy" as a key defining feature of a developmental state (p. 88).

The state is vital and without it there can be no development. But so is the private sector. The key is understanding what the role of each is. At early stages of development basic infrastructure, health, education are vital, but so is governance and the rule of law. Innovation can be stimulated, through various actions, but these are mostly indirect… The developmental state is a much abused concept and can be dangerous, as it assumes that the state knows better than the market what will work and the history of this is of a misallocation of resources, particularly in weak states and where there is capture by vested interests.

Delphi Survey response

The UNCTAD report on economic development in Africa from 2007 entitled *Reclaiming Policy Space: Domestic Resource Mobilization and Developmental States* both captured and reinforced the widespread interest in this concept in Africa. The main argument of the report is that: "addressing market failures in Africa requires developmental States that carry out Africa's development agenda. State action could be organized around the following three main objectives: domestic economic integration, strategic external integration, and effective allocation of resources to achieve clear development goals" (UNCTAD 2007: 96). The report addressed the complexities of a developmental state in an era in which 'good governance' is considered to be important:

> *"A challenge of good macroeconomic management is maintaining macroeconomic stability whilst shifting the economy onto a higher growth trajectory, irrespective of the roles played by the private and public sector. Several conditions are indispensable for such an effective macroeconomic management. These include a pro-investment environment predicated on political stability, policy predictability and consistency, and a robust legal and regulatory framework. A competent and technocratic civil service that is independent from politicians, to prevent undue influence in decision-making, is also important, as are coalitions between the domestic entrepreneurial class and the ruling elite. Equally significant is the oversight role of civil society in preventing abuse and misuse of power and/or state resources, and guarding against state capture by narrow business interests. Obviously, it is both more difficult and critical to fulfil these conditions in a developmental State than in other types of States, considering that the 'trial and error' nature of policymaking in such States might undermine policy predictability and continuity, and increase the vulnerability of the State to capture by the elite." (UNCTAD 2007: 88).*

Critical voices have argued that the developmental state is used 'ex post' to describe a successful state, constituting a problem of tautology (Routley 2014) or that it might be used to describe a state or national government's "predilection to use greater degrees of state intervention and industrial policy as a means of achieving wide ranging priority economic/social policy objectives such as: creating economic growth, decent jobs and reducing poverty levels; spurring rural development, and land reform; as well as improving health/education sectors and public service delivery, and cutting the incidence of crime and disease" (Poon 2009: 2).

The previously cited UNCTAD report cautions that a number of prerequisites or conditions need to be fulfilled in order for the State to be able to "play its rightful role in the process of Africa's development":

> *"Firstly, in a transparent and competitive political system, the elites should reflect the wishes of their populations in their decisions. The legitimacy of the State is an important prerequisite for its empowerment to act responsibly on behalf of the population. Secondly, the State should be able to define and implement development policies with some degree of flexibility. Because there is no formula to achieve development objectives, state actors should be allowed to experiment with policies. Development should be approached as a learning-by-doing process, so some failures are inevitable. Thirdly, training should be at the centre of development policy. Those in charge of development policy should be well trained to properly deal with the problems they are confronted with. The discourse on Africa's poor economic performance has not given this factor due importance. In the past, many choices made with the best intentions later proved to be ineffective. Empowering the State means that those acting on its behalf have the necessary training and objectivity to design and implement policies that address their country's development challenges." (UNCTAD 2007: 98).*

There is, of course, an urgent need for a strengthened state, with the relevant tools to develop the institutions, universities, and school system. Of course there is a need for a developmental state, including democratic and non-corruptive governance.

Delphi Survey response

The interest in the developmental state in Africa is partially explained by a desire to recreate the achievements of some Asian countries – Japan, South Korea and most recently China – where top-down planning and industrial policy is credited with allowing

countries to achieve technological leapfrogging and sustained economic and technological development (see, for example, Routledge 2014 and Poon 2009).[26] These countries had strong states and created national development strategies and plans which were implemented successfully to a large extent.

Too often, the developmental state in Africa leads to patronage, tenderpreneurship and other processes favouring a few, essentially derailing the intent of the planning.

Delphi Survey response

A number of countries in sub-Saharan Africa have adopted national development strategies or plans (see Appendix B), even, if in some cases it was mostly a symbolic assurance of an intention to become a developmental state. Having been 'out of fashion' in previous decades, observers now speak of "the return of national development planning as part and parcel of economic policy and management, complete with national 'visions'" (African Development Bank 2015b).

The question is whether such development strategies are suitable in the African context. Firstly, many conditions in African countries differ fundamentally from reference countries in Asia. Thus, many economies in sub-Saharan Africa are predominantly extraction economies with weak manufacturing bases. Also, they tend not to have strong bureaucracies – both in terms of power and human resources and expertise – which can be observed in some of the Asian examples. In addition, relatively high political instability – combined with a relatively weak public administration – make it difficult for many African countries to formulate and commit to a "long-term predictable strategy" which UNCTAD (2007) identified as an important prerequisite of successful developmental states. Also, observers caution against the danger of being a 'too' interventionist state, arguing that "as is also well-known in Africa, states have a way of turning into the Leviathan – expanding beyond control, and eventually doing more harm than good" (African Development Bank 2015b).

Secondly, some global changes in the nature and landscape of innovation question the advocacy of a strong developmental state. Thus, the developmental state focuses very much on the national level. However, in recent years, and underpinned by numerous examples of success stories, there has been an increasing focus on both the global arena and the role of local communities, cities and regions in driving innovation and sustainable development. In line with this trend, The *African Economic Outlook 2015* focuses on "regional development and spatial inclusion" arguing that:

> *"Indeed, developing the potential inherent in the continent's diverse regions is key to accelerating economic transformation and promoting spatial inclusion. Efforts to tackle regional inequalities through spatial management, infrastructure development and decentralisation have had limited impact. Policy makers must therefore take a fresh look at regional dynamics, such as the fast-changing relations between urban and rural areas. They should focus beyond economic sectors, improve regional statistics and deepen their knowledge of local areas. People and places need to be at the centre of* ***development strategies*** *that create productive jobs, accelerate demographic transitions, invest in education and promote intermediary cities to capitalise on urban/rural dynamics. Financial resources must be scaled up to meet the associated long-term investment needs, in particular by better mobilising domestic resources at local and national levels" (African Economic Outlook 2015:18).*

When discussing the developmental state in the context of innovation, the role of the state might differ between targeted and interventionist initiatives to strengthen innovation in selected sectors, areas, regions, on the one hand, and efforts to improve framework and institutional conditions that might enable and stimulate innovation and entrepreneurship bottom up and in a wide range of areas, on the other. Examples of the former include sectoral and industrial policies, incubators, funding research and training in strategic areas, etc. Examples of the latter include strengthening the rule of law, improving the availability of financing facilities across-the-board (i.e. not just mobilising funding in selected areas), strengthening education systems, promoting regional integration and removing barriers to trade and market entry, combating collusive or monopolistic behaviour, improving conditions for doing business, reducing 'red tape' and combating any 'predatory state' behaviour.

Better governance. Better infrastructure. Better human resource development – in that order. Note that innovation is not high on the agenda. The focus should be on bringing in to employment more people, more machines, etc. – not enhancing innovation; at least at this early stage of development.

Delphi Survey response

The Ugandan Development Plan might be seen as an example of the latter approach to the role of the state:

> *"The state is responsible for ensuring a basic framework of legality, rights and freedom and intervening in the economy to promote economic efficiency, effectiveness, equity and growth. Interventions may be necessary for the following main reasons:*
>
> - *Promoting the right incentives to encourage efficient private production;*
> - *Ensuring that public goods are supplied;*

[26] One early influential book in this context was by Johnson (1982) which looked at the growth, and success, of industrial policy in Japan.

- *Correcting market failures; and*
- *Reducing inequality" (Ugandan Development Plan: 64)*[27]

In contrast, the Ethiopian Growth and Transformation Plan adopts a more interventionist and discretionary approach to the role of the state, identifying specific industries to be supported by the government as well as setting concrete output targets for these sectors and industries. The plan states, for example, how much grain is to be produced by 2015 and how high the gross value of production of the textile and garment industry should be by the end of the plan period.[28] In that sense, the Ethiopian plan shows similarities to China's five-year or medium- and long-term plans. Thus, we can see quite different approaches across sub-Saharan Africa when it comes to the role assigned to the state in driving or enabling development.

In general I support the notion of the developmental state, especially one which acts to reduce inequality.

Delphi Survey response

It is important to realise that a discussion about the role of the state regarding innovation in sub-Saharan Africa should take into account a backdrop of global changes in innovation practices and arrangements, and attempts at reforming governance to respond to systemic challenges in an evolving world. Examples of such global changes include shifts in the location, structure and nature of manufacturing, in new relations between producers and users/consumers and new forms of cooperation between the public and private sector, in the production and dissemination of knowledge and information, as well as the digital revolution and the rise of open innovation. The interest in Grand Challenges – such as pollution, climate change, epidemics, terrorism – is another shift, even if the term itself may become less fashionable.

The focus on the national level, and then on the developmental state, however important as a route to effect changes, may be counterproductive with regard to taking the global changes in innovation into account. A related question is how to engage or enable the private sector to contribute more to sustainable and inclusive development.[29] Also, traditional innovation policies, as referred to in the preceding paragraph, will not be sufficient any more. Alternatives are being proposed, and explored, for example under the heading of Grand Challenges, but it is not clear yet what these will add up to. It is a time of experimentation and learning – so, as noted already, a challenge for the ideology of a strong state.

Themes for our debate

Given the challenges for development in sub-Saharan Africa, combined with global changes in the nature and focus and dynamics of innovation and responding new directions in innovation policy, the following questions arise:

- What should the focus and key instruments of government policies be to promote sustainable and inclusive development?
- How can governments promote and empower initiatives and partnerships (national, local, public-private) for inclusive innovation and ensure that successful practices can be scaled up?
- How can governments promote policy experimentation while ensuring continuous policy evaluation and learning?
- How can governments link or align national priorities, initiatives and policies with the SDGs in a mutually reinforcing and synergistic way?
- How can governments promote "initiatives that tap into core business processes and match the public good with private interest" (African Competitiveness Report 2015: 15)
- How can governments promote innovation that leads to better and more equitable healthcare and education, raises agricultural productivity and ensures better and more sustainable energy provision and urbanisation?
- Addressing institutional shortcomings and adverse framework conditions (better functioning of markets, removing barriers to trade, combating corruption, raising competence in the public sector, improving governance and accountability, etc.) versus industrial and interventionist policies to promote specific industries, catalytic projects, big science and the national champions route: what is the right balance?

[27] https://www.usaid.gov/sites/default/files/documents/1860/National_Development_Plan_2010_11-2014_15.pdf

[28] https://www.imf.org/external/pubs/ft/scr/2011/cr11304.pdf

[29] http://time.com/4052700/un-sustainable-development-goals-africa/

CHAPTER 4:
ASKING THE RIGHT QUESTIONS

Sub-Saharan Africa is characterised by a great diversity in terms of the functioning and maturity of markets, research and innovation systems, education systems, institutional environment, economic and political conditions. However, in recent years, we have seen a positive overall trend regarding governance, economic stability, investment climate and microeconomic conditions. Furthermore, one could argue that there is a convergence between countries' development agendas and the SDGs with both targeting sustainable and inclusive development. Finally, innovation is increasingly identified as an important tool for driving structural change, strengthening competitiveness and finding solutions for tackling societal challenges.

[Of importance is] recognition of user- and community-based or 'collective' innovative experimentation as being around already … and carrying promises for local growth as well as broader development. The role of governments is then to create spaces for such initiatives and their growth, and help through 'nudging'.

Delphi Survey response

Through the five growth paths unpacked in this report we have highlighted a range of issues and potential opportunities with a few areas that stand out regarding how Africa may develop accelerated growth over the next decades.

In Path 1 we pointed out that Africa's intra-regional trade remains low compared to extra-regional trade indicating that an opportunity exists to unlock the continent's economic potential. The continent may be foregoing billions of dollars' worth of trade as the regional markets remain fragmented and cross-border production networks still need to be developed. We have found that multi-dimensional and complex reasons exist for this situation which includes initial conditions, issues around compensation, real political commitment, overlapping membership of regional trade agreements, lack of policy harmonisation, poor private-sector participation, and inefficient transport and logistics systems, as well as other barriers to trade across borders. This situation calls for a rethinking of the approach towards regional integration and the search for developing productive capacity and competitive value chains in Africa.

In Path 2, the promise of inclusive innovation was highlighted. We have argued here that mainstream innovation, with its focus on global competitive advantages, remains important, both in terms of its practices and institutions, and in how its promotion frames policy goals. However, framing the challenge of how to leverage global players and their value chains while considering how such capacity could aid in creating new approaches and developing new innovation systems to solve local issues is an interesting one. We propose here that a Great Societal Experiment is a challenge that may provide some answers to overcome the issues of regional economic super powers behaving like 'Rambos'. This raises a question for how economic powers may start to play a more positive role in regional development, i.e. could regional powers like South Africa become a driver of regional growth through driving the development of inclusive innovations and strengthening cross-border value chains? Also, new manufacturing methods such as distributed manufacturing bring new possibilities in establishing manufacturing bases in a wider range of places – closer to where it will get sold and used. Value chains in manufacturing may take on a completely new form especially through design expertise and appropriate tooling capacity such possibilities may become a reality (See Path 3). Lastly, the large informal sector and its significant contribution to growth and employment is a critical aspect when designing policies for inclusive innovation but also the achievement of the SDG. In particular, a systemic policy package for the informal sector is necessary to contribute to a transformational and green industrialisation process.

In Path 3, we expanded the industrialisation argument in stating that in order to have sustainable and long-term growth in mind a roadmap for growth should also acknowledge that commodity-based industrialisation cannot and should not be the only pathway. Not all African countries have resources and in the long run – even resource-rich countries need to consider developing innovative and non-resource based industries. Certainly novel manufacturing methods is a promising area to explore within the development of STI policy and what this may mean for how Africa may link into GVCs. The possibility of manufacturing close to markets (consumer goods) may, to some extent, reduce the reliance on imports while processing close to the source of inputs (e.g. agriculture) may allow for value addition.

Energy, water, transportation, healthcare and education infrastructure will need to form the foundation of the proposed change in Africa's global economic status.

Delphi Survey response

Path 4, considers how universities in Africa could be equipped and developed towards engaging with a wide range of stakeholders and be better aligned towards supporting development outcomes while continuing to pursue excellence in research and education. We showed here that tertiary education in Africa remains very low with

general educational attainment lagging other regions. Universities have an important role to play in developing and supporting innovation on the continent in terms of training people, contributing to evidence-based policy-making and playing the role of knowledge producers. However, other areas must not be neglected such as technical and vocational training as well as ensuring that education is aligned with the needs of the private sector. The huge unemployment rate along with a large number of vacancies is a testament to this requirement.

Path 5 reflects on the current debate across sub-Saharan Africa regarding the most suitable role for the state in driving and enabling sustainable and inclusive development. A combination of market, system and, not least, governance failures have contributed to many of Africa's current problems. At the same time, many of the challenges and barriers to development identified in the earlier paths will require government action and political will. The question is where governments should focus their efforts and which instruments are more effective in promoting innovation and sustainable development. African countries must find the most suitable policy approaches against the backdrop of a rapidly changing global innovation landscape and shifting growth and innovation policy paradigms. This is both a challenge and an opportunity: on the one hand, there is no simple best practice to follow; on the other hand, many of the 'game changers', such as the digital revolution, 3D printing, open innovation and easier access and dissemination of knowledge, could provide powerful tools to improve the delivery of basic services (healthcare and education), address societal challenges, and open up new business and innovation opportunities to a much larger share of the population than ever before.

To succeed Africa will have to adopt a development path different from that which characterised the present day industrial world.

Delphi Survey response

IN CONCLUSION

We are living in a world where many things are being turned on their head. Scientific knowledge, once dominated by Europe, North America and Japan, is now being generated, disseminated and applied in many different – sometimes unexpected – places and ways. Innovation policy increasingly focuses on addressing societal challenges rather than being dominated by a science-push approach. Students, the marginalised or poor and other disenfranchised groups are viewed as important drivers of innovation. Open source and open data are putting in question the traditional perception of innovation depending on proprietary knowledge. The digital and the manufacturing revolutions are

Africa is in a unique position that its development is often not limited by the status quo or existing infrastructure and previous investments as the developed world experiences, e.g. mobile telephony. It can be seen as a green field or at least brown field site for development. New sustainable and leap-frog technologies can be exploited to the maximum and gain competitive advantage. By providing solutions to African problems and issues of uplifting the poorer sectors, significant markets worldwide can be opened for other developing countries … Africa could be attractive as a test bed for new sustainable technologies, e.g. renewable energy, and thus bring in FDI and partnerships in new solutions.

Delphi Survey response

opening up new markets, unlocking new sources of innovation and creating new opportunities for tailoring production to different scales and locations and rapidly changing demands. At the same time, climate change, pollution and the increasing depletion and scarcity of natural resources and growing inequalities – which are affecting sub-Saharan Africa in particular – are forcing countries, and the world, to rethink and redesign economic models and policies. While these changes pose threats to some vested interests, they present unprecedented opportunities to increase and improve the delivery of basic services, such as education and healthcare, to fight poverty, to strengthen manufacturing, to reform scientific institutions to make them more interdisciplinary, less discriminatory to women and minorities, and more relevant and accessible to their surrounding society, and to provide a new generation and breed of entrepreneurs with technologies, resources and ideas to develop new products and services. The question is how countries in sub-Saharan Africa, and the continent as a whole, are going to utilise the opportunities presented to ensure a more sustainable and inclusive future society and economy.

We propose a more Africa-centric approach to development which acknowledges existing constraints while developing a new approach and new industries and products appropriate for Africa's needs and future development. But first we need to critically reflect on: Are we stating our challenges correctly, i.e. are we formulating our problem statements adequately? New forms of innovation and their delivery channels have new ways of addressing problems through, e.g. technology bundling, new business models are being developed, and approaches towards support for enabling market-based approaches have come to the fore to improve access to basic services such as healthcare, food and education. These new forms present unique opportunities for developing an Africa-centric approach to development.

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APPENDIX A:
KEY INDICATORS

Country	National broadband policy	Year	Internet penetration rate	Pop (m)	Rate out of school children primary school	R&D as % of GDP	Main export countries	Main import countries	Rule of law rank 2014 (0 is lowest)
Angola	yes	2014	26.0%	19.6	16,0%		China, US, India	Portugal, China, South Africa	11
Benin	yes	2010	11.8%	10.5	4,1%		China, India, Nigeria	China, USA, India	35
Botswana	yes	2014	28.4%	2.2	8,6%	0.25%	UK, South Africa, Israel	South Africa, China, Israel	74
Burkina Faso	yes	2013	9.4%	18.9	32,0%	0.2%	Switzerland, China, Mali	France, Cote d'Ivoire, China	35
Burundi	yes	2011	4.9%	10.7	4,3%	0.12%	Germany, Sweden, China	China, Uganda, Belgium-Luxembourg	17
Cameroon	no		11.0%	23.7	5,3%		Portugal, Spain, Netherlands	China, Nigeria, France	19
Cape Verde	yes	2005	40.3%	0.5	1,5%	0.07%			73
Central African Republic	yes	2006	4.0%	5.4	29,0%	0.08%	China, Belgium-Luxembourg, Indonesia	South Korea, Netherlands, Singapore	1
Chad	yes	2007	2.7%	11.6	15,5%		USA, Japan, India	China, France, India	10
Comoros	yes	2014	7.0%	0.8	14,7%				16
Congo	yes	2011	7.1%	4.8	7,1%		China, USA, Angola,	Angola, Gabon, France	13
Congo Dem Rep.	no		3.0%	73.3			China, Zambia, Italy	South Africa, Zambia, China	4
Cote d'Ivoire	yes	2010	22.5%	23.4	24,8%		Ghana, Germany, France	Nigeria, Bahamas, China	30
Equatorial Guinea	yes	2012	18.9%	0.7	42,1%				5
Eritrea	no		1.0%	6.6	59,3%		Canada, China, South Korea	China, Egypt, Germany	3
Ethiopia	yes	2013	2.9%	99.5	13,5%	0.61%	Somalia, Saudi Arabia, China	China, India, Saudi Arabia	39
Gabon	yes	2011	39.9%	1.7		0.58%			36
Gambia	yes	2008	19.0%	2.0	31,0%	0.13%			30
Ghana	yes	2010	19.6%	26.3	8,0%	0.38%	Iran, South Africa, UAE	China, Cote d'Ivoire, USA	59
Guinea	yes	2009	6.5%	11.8	23,6%		India, South Korea, Spain	China, Netherlands, UK	5
Guinea-Bissau	no		4.1%	1.7	30,8%				6
Kenya	yes	2013	63.6%	45.9	13,8%	0.79%	Zambia, Uganda, Netherlands	India, China, Japan	38
Lesotho	yes	2014	12.8%	1.9	19,3%	0.01%			48
Liberia	yes	2010	8.3%	4.2	61,9%		Poland, China, USA	South Korea, China, Poland	21
Madagascar	yes	2014	4.6%	23.8	22,0%	0.11%	France, USA, China	UAE, China, France	25
Malawi	yes	2013	6.1%	17.7	1,9%		Canada, USA, South Africa	South Africa, Mozambique, China	46

Country	National broadband policy	Year	Internet penetration rate	Pop (m)	Rate out of school children primary school	R&D as % of GDP	Main export countries	Main import countries	Rule of law rank 2014 (0 is lowest)
Mali	no		7.0%	17.0	36,4%	0.66%	China, India, Burkina Faso	France, Cote d'Ivoire, China	29
Mauritania	no		12.7%	3.6	24,9%		China, Italy, Switzerland	Hungary, UAE, China	22
Mauritius			60,0%		3,4%	0.18%			79
Mozambique	yes	2006	5.9%	25.3	12,4%	0.42%	South Africa, Netherlands, India	South Africa, China, UAE	22
Namibia	yes	2009	21.2%	2.2	9,3%	0.14%			63
Niger	yes	2005	2.0%	18.0	38,2%		Nigeria, France, Burkina Faso	China, France, India	27
Nigeria	yes	2013	51.1%	181.6	34,3%	0.22%	India, US, Brazil	China, US, Netherlands	12
Rwanda	yes	2006	25.4%	12.7	3,9%		Tanzania, Dem. Rep. Congo, China	China, Uganda, Japan	61
Sao Tomé	no		25.2%	0.2	4,3%				20
Senegal	no		51.9%	14.0	27,2%	0.54%	India, France, Cote d'Ivoire	China, France, Netherlands	54
Seychelles	no		54.3%	0.1	5,3%	0.3%			56
Sierra Leone	n.a.		4.4%	5.9	67,6%		China, Belgium-Luxembourg, USA	China, UK, India	18
Somalia	no		4.7%	10.6			Saudi Arabia, Oman, India	Ethiopia, Oman, India	
South Africa	yes	2013	49.0%	54.8	12,0%	0.73%	China, US, UK	China, Germany, Saudi Arabia	64
South Sudan	no		15.9%	12.0	59,3%		China, Pakistan, Costa Rica	Uganda, Pakistan, China	
Sudan	yes	2012	25.8%	36.1	45,3%	0.3	China, Saudi Arabia, Japan	China, India, Egypt	10
Swaziland	no		27.1%	1.4	21,4%				46
Tanzania	yes	2004	14.9%	51.1	18,1%	0.38%	South Africa, India, China	India, China, Switzerland	39
Togo	planning		5.7%	7.6	7,0%	0.22	Lebanon, Ghana, Burkina Faso	Belgium-Luxembourg, China, Netherlands	19
Uganda	yes	2009	32.1%	37.1	6,2%	0.48%	Kenya, Dem. Rep Congo, Sudan	India, China, Kenya	40
Zambia	yes	2006	18.0%	15.1	11,0%	0.28%	Switzerland, China, Dem. Rep. Congo	South Africa, Dem. Rep. Congo, China	47
Zimbabwe	yes	2005	47.5%	14.2	11,0%		South Africa, China, Mozambique	South Africa, UK, China	4

Sources: http://www.internetworldstats.com/stats1.htm, UNESCO UIS, http://atlas.media.mit.edu/en/, http://info.worldbank.org/governance/wgi/index.aspx#reports

APPENDIX B:

GOVERNMENT DEVELOPMENT PLANS AND STRATEGIES

Table 6: Examples of countries in Sub-Saharan Africa with national development plans

Country	Development plan or strategy (year adopted)	Description
Benin	Growth and Poverty Reduction Strategy 2011-2015 (2011)	The development objectives are: (i) accelerated economic growth; (ii) infrastructure development; (iii) strengthened human capital; (iv) good governance; and (v) balanced and sustainable regional development http://documents.worldbank.org/curated/en/2011/08/14920002/benin-joint-staff-advisory-note-third-poverty-reduction-strategy-paper
Botswana	National Development Plan 10 (2010) Vision 2016 (1996)	Pillars of Vision 2016: • An educated, informed nation • A prosperous, productive and innovative nation • A compassionate, just and caring nation • A safe and secure nation • An open, democratic and accountable nation • A moral and tolerant nation • A united and proud nation http://www.vision2016.co.bw/vision-content.php?vid=30 http://www.nationalplanningcycles.org/sites/default/files/country_docs/Botswana/ndp_botswana.pdf
Republic of Congo	National Development Plan 2012-2016	Two key pillars: 1. Modernise the country 2. Industrialise the country https://www.imf.org/external/pubs/ft/scr/2012/cr12242.pdf
Côte d'Ivoire	National Development 2012-2015	Aim is to transform the country into: • a haven of peace, security, social cohesion and well-being • an economic powerhouse in the sub-region • an country of hard-working and disciplined people with moral values • a country with a culture of excellence, where merit is promoted in fairness • an environmentally friendly tourist country • an internationally-acclaimed financial centre. Quantitative targets: • GDP growth ca. 10% on average • Reduce poverty rate by half • Achieve MDG s for 2015 'or get as close as possible' • Create one of the best business climates in Africa • Be one of Africa's leading countries in governance and rule of law. http://www.imf.org/external/pubs/ft/scr/2013/cr13172.pdf
Ethiopia	Growth and Transformation Plan 2010/11-2014/15	fostering broad-based development in a sustainable manner to achieve the MDGs….Key goals include: • rapid economic growth • double agricultural production, food security in Ethiopia for the first time • increased contribution from the industrial sector, particularly sugar, textiles, leather products and cement • increase foreign exchange reserves and the Birr is to depreciate by five per cent against the dollar each year • the roads network should increase from 49,000 km to 64,500 km by 2015 • power generation capacity will increase from the current 2,000 MW to 8,000 MW, and the number of customers from the current two million to four million by 2015 • construction of 2,395 km of railway line • achievement of all Millennium Development Goals (MDGs). https://www.imf.org/external/pubs/ft/scr/2011/cr11304.pdf

Country	Development plan or strategy (year adopted)	Description
Gabon	Strategic Plan for an Emerging Gabon	A three-pronged strategy that seeks to leverage industry, sustainable natural resource management, and services. http://www.worldbank.org/en/country/gabon/overview#1
Lesotho	National Strategic Development Plan (2012) Vision 2020 (2002)	Pursue high, shared and employment generating economic growth, develop key infrastructure, enhance the skills base, technology adoption and foundation for innovation, improve health, combat HIV and AIDS and reduce vulnerability, reverse environmental degradation and adapt to climate change, and promote peace, democratic governance and build effective institutions http://www.worldbank.org/en/country/lesotho/overview#1
Madagascar	2015-2019 National Development Plan	improving governance, promoting economic recovery, and expanding access to basic social services. http://www.worldbank.org/en/country/madagascar/overview#1
Namibia	Fourth National Development Plan (NDP4) (2012)	Key goals: economic growth, job creation and increased income equality. This is to be achieved through industrial policies, combating poverty, improved education, health, infrastructure and business environment. http://www.worldbank.org/en/country/namibia/overview#1
Rwanda	Second Economic Development and Poverty Reduction Strategy (EDPRSII)	Highest priority is growth acceleration and poverty reduction through five thematic areas: economic transformation, rural development, productivity and youth employment, and governance accountability. http://www.worldbank.org/en/country/rwanda/overview#1
Sao Tome	Second Poverty Reduction Paper 2012-2016	Focuses on four pillars: • Promoting good governance and public-sector reform; • Supporting sustainable and inclusive economic growth; • Enhancing human capital and extending basic social services; and • Reinforcing social cohesion and social protection, particularly for vulnerable population groups. http://www.worldbank.org/en/country/saotome/overview#1
Senegal	Emerging Senegal Plan (2014)	Aims to increase productivity in public and private sector; three focal areas: • structural transformation of the economy and growth; • human capital, social protection and sustainable development; • governance, institutions, peace and security. http://www.afdb.org/en/countries/west-africa/senegal/senegal-economic-outlook/
South Africa	National Development Plan 2030 (2013)	The Plan aims to ensure that all South Africans attain a decent standard of living through the elimination of poverty and reduction of inequality. The core elements of a decent standard of living identified in the Plan are: • Housing, water, electricity and sanitation • Safe and reliable public transport • Quality education and skills development • Safety and security • Quality health care • Social protection • Employment • Recreation and leisure • Clean environment • Adequate nutrition http://www.sanews.gov.za/south-africa/national-development-plan-unpacked
Uganda	National Development Plan 2010/11-2014/15 (2010)	The theme is "Growth, employment and socio-economic transformation for prosperity" – 8 strategic objectives: • Increasing household incomes and promoting equity • Enhancing the availability and quality of gainful employment • Improving stock and quality of economic infrastructure • Increasing access to quality social services • Promoting science, technology, innovation and ICT to enhance competitiveness. https://www.usaid.gov/sites/default/files/documents/1860/National_Development_Plan_2010_11-2014_15.pdf

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