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# THE AFRICAN TECHNOPOLITAN

A MAGAZINE OF THE AFRICAN CENTRE FOR TECHNOLOGY STUDIES (ACTS)

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## AFRICA'S LAST BEST CHANCE FOR DEVELOPMENT

Dr Cosmas Milton Obote Ochieng,  
Executive Director, ACTS

■ **GETTING AFRICA  
READY FOR THE  
"DIGITAL" SDGS**

**Ban Ki-Moon,**

Secretary-General, United Nations

■ **LESSONS FROM EAST ASIA  
FOR AFRICA'S ECONOMIC  
TRANSFORMATION**

**Dr Elsje Fourie,**

University of Maastricht

■ **GROWTH AND STRUCTURAL  
TRANSFORMATION IN SUB-  
SAHARAN AFRICA**

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World Bank Group

■ **DOES AFRICA REALLY WANT  
YESTERDAY'S FUTURE?**

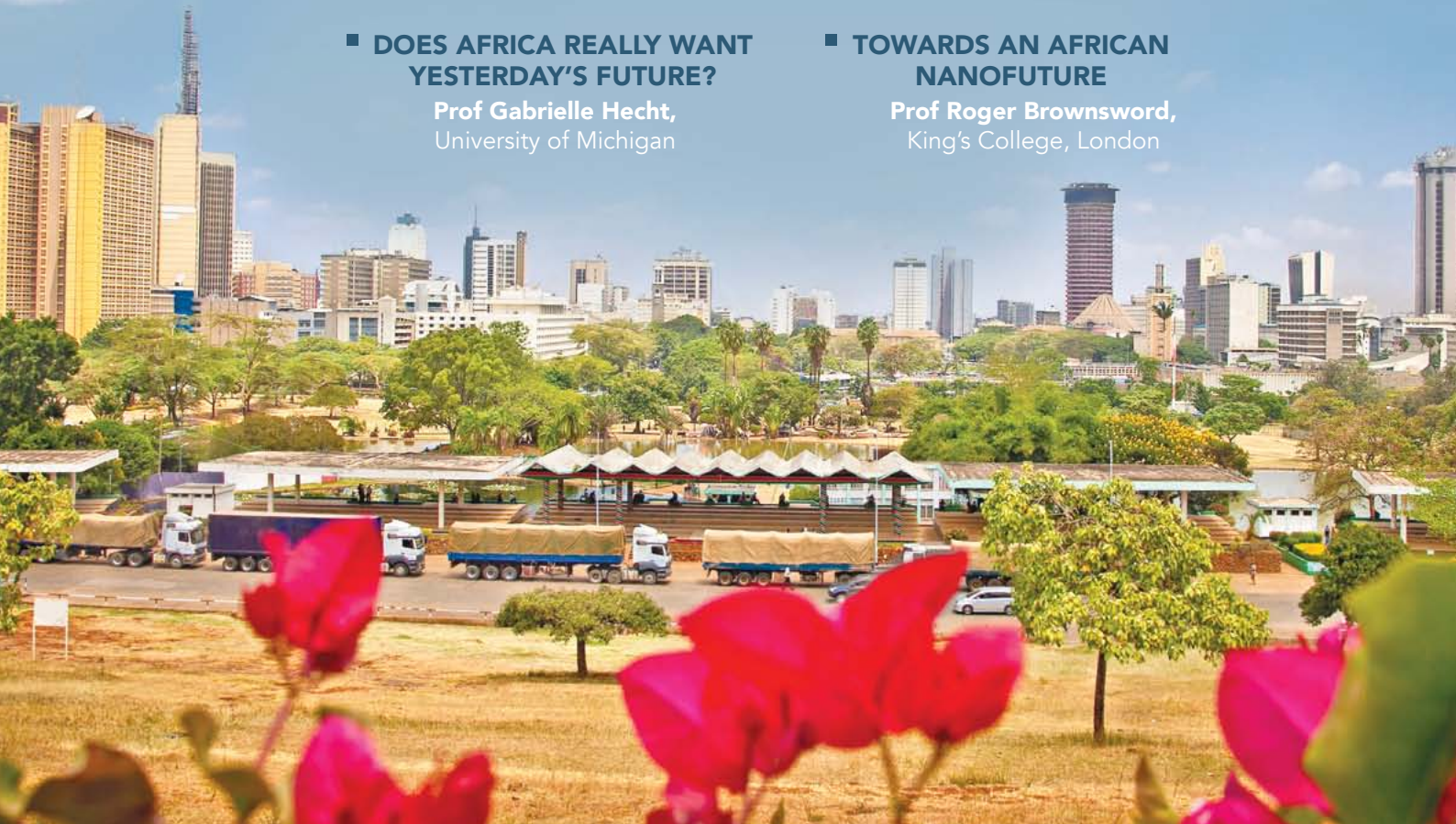
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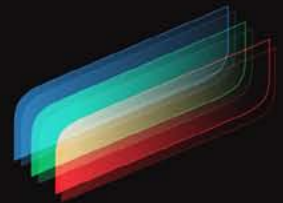
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■ **TOWARDS AN AFRICAN  
NANOFUTURE**

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# AFRICA'S LAST BEST CHANCE FOR DEVELOPMENT

Dr. Cosmas Milton Obote Ochieng

Executive Director, African Centre for Technology Studies

“ Only put off until tomorrow what you  
are willing to die having left undone ”

**Pablo Picasso**

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**A fundamental development problem in Africa is the widespread lack of credible ‘catching up’ economic development strategies. A majority of African countries lack the ‘institutional capabilities’ (i.e. policy, managerial or administrative capacities) needed to harness the continent’s ‘latecomer advantages’ for accelerated development.**

Latecomer countries in economic development have the potential to grow faster than ‘forerunner’ or already developed economies. Latecomers do not have to re-invent the wheel. They can imitate, adopt or modify the production methods, technologies, organizations or institutions of forerunner countries to climb the ladder of economic and technological development relatively quickly. Such imitation or emulation often results not in just replication but also in innovation (whether technological, institutional or organizational) leading to a relatively quick transition in national comparative advantage from labour-intensive to capital and technology-intensive industries.

However, catching up does not happen automatically. Put differently, economic development is not inevitable. It is contingent upon a number of factors which include national ‘policy choices’, institutional capabilities and/or bureaucratic competence (i.e. leadership and governance). A country must develop capacity to absorb new technologies, accumulate or attract capital, and participate in global markets. Writing in the *Journal of Economic History* in 1986, Moses Abramovitz put it this way: “Countries that are technologically backward have a potentiality for generating growth more rapid than that of more advanced countries, provided their social capabilities are sufficiently developed to permit successful exploitation of technologies already employed by the technological leaders”.

With the exception of Britain which led the way in the First Industrial Revolution, every single country that has industrialized since has deployed some form of a catching up strategy. This includes latecomer countries in Europe, Asia and Latin America. Different countries have evolved different institutions to play different roles

in their catching up strategies. The catching up strategies of Germany, Russia, Japan and to a lesser extent South Korea, focused on harnessing the most technologically dynamic industries of the day (e.g. iron, steel, heavy and chemical industries, automobiles and electronics) and leapfrogging the forerunners in size of plants, enterprises and investments. This was essentially a ‘catch up and overtake’ strategy.

The catching up strategies of Singapore, Taiwan and Malaysia focused less on direct competition with forerunners but on harnessing globalization by attracting foreign capital in the form of multinational companies (MNCs) and then upgrading MNCs’ products and services through fiscal and labour policies, human capital development and first class infrastructure. Germany, then a ‘moderately backward country’ in a schema used by Alexander Gerschenkron, used ‘universal banks’ to finance its industrialization programme. In the same schema, Russia, then ‘an extremely backward country’ with virtually no private sector, the state took the lead in the formulation, implementation and financing of the catching up industrialization strategy. In Japan and South Korea, the ‘developmental state’ in conjunction with the Keiretsu (Japan) and the Chaebols (South Korea) took charge of the strategy. The ‘developmental state’ also led the catching up strategies in Singapore, Taiwan and Malaysia.

While the Japanese catching up strategy was mostly financed through domestic resource mobilization, the South Korean strategy was partly financed through foreign debt.

Virtually every successful latecomer country started from an ‘initial condition’ characterized by a relative lack of capital or skilled labour or both.

But each found ways to overcome these obstacles. All successful latecomer countries were determined to go after ‘dynamic comparative advantage’. They were not content to play second fiddle in terms of industrial development. Once they embarked on the catching up strategy, each, with laser-like single mindedness, directed all their national resources, energy and talent towards this sole objective. They would acquire whatever ‘capabilities’ they needed to, through whatever means necessary, but this goal had to be achieved.

There was a lot at stake. Economic backwardness is a threat to national security. This was particularly the case in the 19th century and the early part of the 20th century, as nearly all African countries found out through the encounter with colonialism. The more industrialized a country, the more likely it wielded greater military strength. Similarly, the more industrialized a country, the more likely it was capable of combating the impacts of potentially devastating health and natural hazards. Catching up was a matter of social progress, human wellbeing and the survival of nation-states. National prestige, economic or even military jingoism were certainly part of the equation in some countries, but these were secondary rather than primary motivations. It is easy to forget now that apart from water, Japan has hardly any natural resources. Taiwan is a tiny island, Singapore is a tiny city-state, and until the early 1960s, South Korea was not only an agricultural based economy, but one of the poorest in the world.

Arguably, the world has been relatively more peaceful since 1945. Nevertheless, economic backwardness remains a threat to national security, human welfare and social progress in the 21st century. The devastating impact of the recent Ebola outbreak

in West Africa made this obvious. Not that a reminder was necessary. Millions of lives lost to recurrent famines, droughts, floods, Malaria, HIV/Aids, tuberculosis, cholera and any number of easy-to-control disease epidemics in Africa over the last fifty years should have made this obvious a long time ago. Yet 47 percent of the African population lives in extreme poverty, 23 million of Africa's primary school-age children attend classes hungry, and one in four Africans is undernourished. (All these figures refer to Sub Sahara Africa). 620 million people in Africa lack access to grid electricity and 730 million rely on inefficient forms of cooking. More than one-third of the continent's population lacks access to safe drinking water.

These facts and figures alone suffice to make economic development a matter of the highest national urgency in every African country. Consider that Africa has 60 percent of the world's uncultivated arable land and sufficient energy resources (in the form of untapped hydro-electric, solar and wind power, for example) to meet its energy needs. Moreover as Prof G.B.A. Okello writes in this Magazine, existing medical applications could prevent up to

63 percent of all infections in Africa. The natural resources and technologies needed to solve many of Africa's development problems (i.e. food, nutrition, energy and water insecurities; poor public health, etc.) already exist. Many countries had long solved many of the development challenges currently facing Africa by harnessing fewer natural resources and relatively more 'rudimentary' technologies and institutions than are currently available or potentially available (through import, adoption, imitation, or modification) to many African countries. Africa's primary 'development deficit' lies in its limited 'social or institutional capabilities' (i.e. competent administration, leadership or governance) to effectively harness available natural resources, technologies and innovations (institutional, organizational/managerial, etc.) for accelerated development.

Climate change threatens to make things worse for the continent. If the rise in the average global temperature remains effectively unconstrained by 2050, the impacts of climate change might make the African development effort much harder from that point onwards. Given its current 'development conditions'

(the best in a generation) and potential 'ecological conditions' from 2050 onwards (potentially the worst in several generations), the next 30 year window is probably Africa's last best chance for development. This is much earlier than anticipated by Africa's collective long term economic blueprint, the African Union's Agenda 2063.

African countries could still develop even if global temperature rises remain effectively unconstrained by 2050. But who is the African leader or citizen who is willing to gamble the continent's future on this slim chance? Why would they choose the worst of all possible development conditions over the best of all possible ones? Rhetorically speaking, African leaders of all stripes claim the pursuit of national development as their topmost priority. In practice though, the 'policy choices' or 'development strategies' embraced by many of them amount to betting their countries' futures on the worst of all possible development conditions over the best. Few African countries have the necessary 'development strategies' to seize this once in a generation opportunity to achieve economic or even sustainable development. ■



**In spite of the need for a 'fierce urgency of now' in African development, and despite the preponderance of catching up strategies in global economic development, only five African countries (Mauritius, Botswana, South Africa and to a lesser extent Ethiopia and Rwanda) can claim to have formulated and implemented credible catching up development strategies.**

Unsurprisingly, these are the countries with the most interesting development stories out of the continent over the last three decades. The ambition, scope and

scale of effort in each country has varied. Mauritius and Botswana have been the most ambitious and most successful. A democratic developmental state

has led the effort in both countries. The state has also led the catching up effort in South Africa although the character of that state is complex. South Af-



rica has been a democratic state since 1994 but the country has a long history with industrial policy dating back to the apartheid regime.

A different type of ‘state’, increasingly labelled as the ‘Kigali/Addis Ababa Consensus’ is leading the effort in Ethiopia and Rwanda. There is not enough space here to unpack this ‘Consensus’ but for the purposes of this argument, it has taken the form of state led investments in infrastructure and ‘mega’ projects (Ethiopia) and enhancing ‘social capabilities’ in Rwanda: by strengthening institutions, fighting corruption, reducing bureaucratic red tape, attracting foreign capital, investments in human capital and enhancing the country’s ‘absorptive capacity’ with specific reference to information and communication technologies (ICTs).

The recent spate of (‘mega’) infrastructure development in Africa while laudable, should be viewed with caution. Much of it exists outside clear or coherent national development frameworks. It is not clear to what extent this is geared towards simply making resource extraction and shipment out of the continent relatively cheaper and faster and cheaper for today’s largest consumers of Africa’s raw materials. African countries would still benefit from this, but there are limits to factor driven economic de-

velopment of this kind - predicated on little if any value addition. (There are still limits to factor driven development even with value addition, but coupled with technological and other innovations, this can work: see the experiences of Australia, USA, Norway or even the UK). As Prof Sangman argues elsewhere in this Magazine, Africa has experienced a version of infrastructure induced factor driven development before. Colonial investment in infrastructure was principally aimed at reducing the costs of resource extraction from Africa. Nevertheless, it did catalyse some level of development in countries such as Kenya, Zimbabwe, Ghana and Nigeria. Ultimately, this approach to development doesn’t work. It does not lead to

the creation of ‘dynamic national comparative advantage’.

It is a measure of the lack of a ‘fierce urgency of now’ in African development that not only are there only five countries with credible catching up development strategies, but a majority of African countries lack development strategies in the first place. What passes for development ‘strategies’ in many African countries are wish lists of worthy goals, with no clear ways and means or ‘capabilities’ to bring about their realisation. A number of African countries have pursued a raft of ‘development strategies’ since independence. These include: Health for All by the year 2000; Universal Access to Safe Water and Sanitation for All by the year 2000; Industrialization by the year 2000; Poverty Reduction by the year 2015; and Structural Adjustment Programmes (SAPs).

For the most part, these were merely wish lists of worthy goals or in the case of SAPs, some unworthy goals too (e.g. weakening state capacity; under investments in public education and health). Few countries marshalled the ‘social or institutional capabilities’ needed to realize these goals. Consequently, few of these ‘strategies’ achieved their aims. In the history of global economic development, Africa has had an un-usually high rates of failure of ‘development

planning and mobilising resources to efficiently and effectively bring about a desired end, objective or solution to a problem. A catching up development strategy can be defined as a national economic ‘game plan’ that allows a latecomer country to develop relatively quickly by emulating, learning from and capitalizing on the economic conditions created by forerunner countries. A catching up development strategy is based on the proposition that the process of national economic development for latecomer countries interacts with, and partially derives from, advanced economies. Akamatsu Kaname, a leading Japanese economist in the 1930s through the 1970s, maintained that it was impossible to study the economic growth of developing countries without looking at the mutual interactions between developing and developed economies.

In the classic case of the Japanese and East Asian economies, increasingly explained (somewhat controversially) by Akamatsu Kaname’s Flying Geese development theory, the latecomer developing country starts the ‘catching up’ process by adopting from the developed country ‘strategic’ labour intensive industries (through foreign imports, local or foreign capital, infant industry protection and other forms of state support) which it initially produces for its own domestic market. As soon as it perfects this, the latecomer country begins to produce these same products for the export market (ultimately with national capital, some of which is used to provide state support such as export subsidies, which are gradually phased out as the industry matures or attains global competitiveness).

In this game of ‘catching up’, any state support or protection is offered to those industries that are viewed as capable of acquiring comparative advantage (i.e. ‘sunrise industries’ or ‘leading sectors’). It is seldom given to industries incapable of attaining comparative advantage (i.e. ‘sunset industries’). (It is important to note that the phrase ‘industries incapable of achieving comparative advantage’ does not necessarily refer to ‘old’ industries. As Cambridge economist Ha-Joon Chang has argued in much of his writing on industrial policy, in Japan for example ‘SDI cartels’ or cartels for structurally-depressed industries’ were granted to declining industries on condition that they upgraded their technologies and phased out obsolete capacities. Chang also argues that the Industrial

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development of this kind - predicated on little if any value addition. (There are still limits to factor driven development even with value addition, but coupled with technological and other innovations, this can work: see the experiences of Australia, USA, Norway or even the UK). As Prof Sangman argues elsewhere in this Magazine, Africa has experienced a version of infrastructure induced factor driven development before. Colonial investment in infrastructure was principally aimed at reducing the costs of resource extraction from Africa. Nevertheless, it did catalyse some level of development in countries such as Kenya, Zimbabwe, Ghana and Nigeria. Ultimately, this approach to development doesn’t work. It does not lead to

strategies’. Many of the now developed countries made ‘mistakes’ en route to their ‘development’. Austria and Italy (among latecomers in Europe); China (Great Leap Forward of 1958-1962); and Brazil (import-Substitution industrialization of the 1950s through the 1970s) all made ‘mistakes’. However, they were able to learn from their ‘mistakes’ (i.e. ‘policy experimentation’). All ably re-oriented their strategies to ultimately achieve their desired goals. With the exception of Botswana, Mauritius and South Africa, this is not the case in much of Africa.

Strategy, understood in its Greco-Roman sense (stratēgia/strategia/stratēgēma/stratagem), is the art of

Development Law in South Korea enabled some declining industries such as textiles to receive temporary support (e.g. subsidies for equipment upgrading and exemption from anti-trust law) as long as they achieved technology upgrading targets). Through this process, a latecomer country improves the quality of its products to the extent that it becomes a global leader, sometimes displacing the original producer of the product or technology. The latecomer country then adopts the next suitable industry or technology and repeats the same process over and over again to create a rapid process of national economic development.

To simplify a complex story (and several different but often interrelated strategies), this overall strategy or 'set of strategies' might be called import-substitution-cum-export promotion-cum-structural-upgrading. It entails a sequence of structural changes in industrial development from consumer to capital goods and/or from "crude and simple goods to complex and refined goods" in the words of Akamatsu Kaname. The Flying Geese theory describes a catching up strategy whereby countries gradually move up in technological and economic 'ladder' by following in the pattern of those just ahead of them. Much like a group of geese flying in an inverted 'V' formation that reportedly achieve up to 70 percent energy saving over a goose flying solo, this strategy allows latecomer countries to develop relatively quickly relative to forerunners.

The lead goose in this theory is the most technologically and economically advanced country. Since at least the Second World War, that has been the United States. African countries keen to follow in the footsteps of the more recently successful Asian countries, might do well to remember this. There is a lot to learn from China for example, but African countries should not forget that China itself is emulating the 'Lead Goose'. The Flying Geese Theory is far from static or linear. Its entire logic is predicated on the dynamic interactions between latecomer and forerunner countries. The model does not dictate that latecomer African countries must of necessity 'follow', 'emulate' or capitalise only on the economic conditions created by the 'geese' nearest to them.

There are very good reasons why African countries might want to emulate development strategies of the newly developed economies in Asia. Approached strategically, there can be more to 'South-South' cooperation than the quaint but materially worthless rhetoric of 'political solidarity' and 'moral support' (usually against democracy and human rights). One advantage that latecomers have over forerunners is the ability to avoid the mistakes of forerunners. The South Korean, Taiwanese, Singaporean and Malaysian development models may have succeeded in their ultimate aims but they were not flawless. 'Crony capitalism' and a 'development first, democracy later' mentality constituted two of their most common mistakes, at least in the early years.

There is no compelling reason why African countries must replicate these, although, generally speaking, these appear to be two of the features of these development models that have found most favour in a number of African countries. Not that African countries needed to transplant or to import these from Asia - many of them long ago perfected these instincts themselves.

There is also much that African countries can learn from the early 'forerunner' economies including the UK, Germany, US, France, Japan, Australia, Finland, Norway, Sweden and Denmark. Such lessons might include how to harness natural resources for economic development or how to 'develop' without them. They might also include how to create innovation or knowledge based economies, or generally, how to effectively play the catching up game. Nowadays, some of these countries recommend different strategies from the ones they employed during their industrialisation process. The key to learning from 'forerunner' countries is to focus on the strategies they deployed at the time of their industrialisation or currently employ and not necessarily on what they say. For reasons of ideological and disciplinary hegemony, some of the forerunner countries are likely to recommend a raft of 'free market' or 'neoliberal' approaches which, in the context of catching up specifically or economic development generally, amount to a 'Relax, Kick Back and Do Nothing Strategy'. ■



**This was not the strategy that many of the forerunner countries followed when they were developing. The original Lead Goose, Britain, did render this misleading advice to early latecomers, most notably to America.**

**H**owever, no successful latecomer country in Europe, North America or Asia took this advice seriously. For the better part of the last three decades, however, this has been the overriding principle of development policy and practice in Africa. With the exception of Mauritius and Botswana – and to a lesser extent, South Africa, Ethiopia and Rwanda - few African coun-

tries have made a decisive break from this approach to development. Often, this approach is presented as ‘technical’, ‘neutral’ or ‘non-ideological’. The implication is that this approach is probably and unquestionably superior to alternative approaches to development.

Firstly, there is nothing non-ideological or apolitical about economic choices or priorities. Attempting to divorce economic policy from ethics is problematic because economic policy impacts the well-being of different groups of people (and the environment) differently. Economic choices, including this approach, are inherently value laden and ideological. More importantly, the goal of development policy is to achieve desired social, economic and ecological ends. It is not to beatify economics as a value free science. The beatification of economics as a value free science cannot be the goal of development policy. If this is a worthy exercise at all, (and I am not sure that St. Matthew, the Patron Saint of accountants, bankers, tax collectors, financial analysts, stockbrokers and presumably economists, would agree that it is), it belongs in university economics departments, not African ministries of finance and economic planning or central banks.

Secondly, this approach is fundamentally flawed. Capital accumulation can be an effect or result of economic growth, rather than its cause. Structural change or economic transformation, as Joseph Schumpeter argued way back in the 1930s, is brought about by technological, organizational/institutional and managerial innovations or breakthroughs that result in brand new

development, a superior one is rooted in learning technological capabilities and co-evolving best-fit organizations and institutions. It is also the latest demonstration that industrial policy matters in economic development. Different technologies, sectors and products matter because they entail different learning opportunities, different income elasticity of demand, different opportunities to innovate, and different opportunities to contribute to economic development. Therefore, prioritization matters. Time matters. Social capability or national commitment matters.

The dominance of neoclassical economic thinking in African development primarily explains the continent’s lacklustre approach to development strategy. A development strategy encompasses three things: priority setting (i.e. strategic choices); timeframe; and national commitment or ‘social and institutional capabilities’ (ways and means of mobilizing resources to bring about its intended aims, goals or objectives). Few development strategies in Africa possess these ingredients. Often (a) economic theory or ideology is conflated with development strategy; (b) a wish list of goals or aspirations is given a perfunctory timeframe; and (c) governmental backing is mistaken for ‘institutional capabilities’. Is it any wonder that very few of these strategies have succeeded?

An underlying theory or ideology is a necessary but an insufficient ingredient in a national development strategy. Clear ways and means of mobilizing resources needed to bring about desired outcomes must be established. A theory or ideology must be un-packed



damental development problem in Africa. Firstly, he correctly notes that few ‘development strategies’ in Africa entail much priority setting. “Development plans will have 150 priorities. Actually only five can realistically be done in a term”. (<http://www.tonyblairoffice.org/speeches/entry/tony-blair-speech-rethinking-leadership-for-development>). Blair then goes on to make a far more interesting and revealing statement when he attributes Africa’s lack of development prioritization to a ‘lack of capacity’. “Prioritisation is hard when resources are scarce. And with capacity around them so low, they end up trying to do everything themselves. With the additional demands of diplomacy, international meetings and social/political events, with precious little time spent on priorities. Their governments do not have the capabilities to support them as they need. The capacity to implement, track and monitor performance isn’t there”.

This statement is more loaded, misleading and revealing than it first appears. The statement reveals a number of flaws in the general mind-set in African development. Blair is blinded by the same ‘Kick Back, Relax and Do Nothing’ theoretical framework that has governed much of the development policy discourse in Africa over the last three decades. Prioritization might be hard, but surely, by necessity, it must be the first order of business when resources are scarce. Economics, by definition, is about scarcity and choice. Lionel Robbins defined the subject as “the science

“ **Attempting** to divorce economic policy from ethics is problematic because economic policy impacts the well-being of different groups of people (and the environment) differently. ”

products and services which replace older ones. The state can, and has done a lot to catalyse these types of innovations in any number of now developed countries. The Chinese development experience is just the latest in a long list of examples to demonstrate that while there are many successful paths to de-

into strategic choices that are backed up by requisite policies, institutional competencies and financial, technological, human and other resources.

In a speech on ‘Rethinking Leadership for Development’, Tony Blair - perhaps unwittingly - put his finger on the fun-

which studies human behaviour as a relationship between given ends and scarce means which have alternative uses.” Paul Samuelson defined economics as the “study of how societies use scarce resources to produce valuable commodities and distribute them among different people.”

Blair’s identification of lack of capacity as a serious constraint to economic development in Africa is not in dispute. It is his sympathetic approval of the deployment of this limited capacity all over the place, rather than on a few strategic priorities, that is contentious. Blair’s sympathetic attitude reprises an old argument in development policy debate. The debate reached its ‘climax’ with the publication of the World Bank’s East Asian Miracle: Economic Growth and Public Policy in 1993 and the counterarguments that followed it. This World Bank publication, in attempting to diminish the role of industrial policy in the economic development of East Asian economies (Japan, South Korea, Taiwan, and Singapore) made a number of questionable claims.

Firstly, the report claimed that while industrial policy might have been practiced widely in East Asia, empirically, it made little difference to the production structure or the productivity performance of these economies. Secondly, the report argued that notwithstanding its impacts in East Asia, industrial policy would not be helpful to developing countries of today because of changed domestic and international conditions. Thirdly and more crucially for the purposes of our argument, the report argued that developing countries lack effective domestic institutions (i.e. competent, relatively incorruptible bureaucracies) needed to implement industrial policy as was practised in East Asia. Blair’s sympathies appear to mirror this general line of argument.

The problem with this argument, as many opponents of the East Asian Economic Miracle have long observed, is not that many developing countries, including those in Africa, lack competent bureaucracies. Few would challenge that claim. Rather, the problem is two-fold: Firstly, ‘ca-

pabilities’ whether technological, institutional or organizational (i.e. bureaucratic) are acquired and acquirable (and destructible), often faster than so called development or economic experts expect. They are not handed down by divine providence or guaranteed by history or tradition. An important part of ‘capabilities acquisition’ occurs through ‘learning by doing’. As Eleanor Westney demonstrated in *Imitation and Innovation: The Transfer of Western Organizational Patterns to Meiji Japan*, there is (a) learning-by-doing in administration as in production and (b) technologies, institutions and organizations are all subject to imitation and innovation. Emulation itself produces innovation, not just replication. Countries are just as subject to, and perhaps sometimes need, ‘organizational revolution’ (i.e. bureaucratic transformation of the institutions of public life) as they might need technological revolution. Westney argues that Meiji Japan not only adopted and adapted Western industrial machines but also emerging Western organizational models (e.g. legal, education and banking systems; a national police force, navy and army; the postal service, political parties, professional societies and newspapers). The Japanese even had a slogan for this technological and organizational adoption and adaptation: ‘Japanese spirit, Western technology’.

Responding to this ‘capabilities’ argument in the late 1990s, Ha-Joon Chang reminded everyone that the South Korean bureaucracy was infamous for its incompetence and nepotism as recently as the 1950s. Chang noted that until the late 1960s, South Korea was sending its bureaucrats to be trained in Pakistan and the Philippines. It was “only through continuous efforts at civil

service reform, and not as a result of history and tradition” that the country managed to create a competent and relatively clean civil service.

The problem with Blair’s sympathetic posture is that it reinforces the assumption that whatever level of capacity Africa happens to have is used relatively more effectively when spread over ‘everything’ as opposed to when directed at selective national priorities. To be sure, Blair does not go as far as to endorse the argument in the East Asian Economic Miracle report which implied that the closer an economic system was to a *laissez faire* ideal, the easier it was to run. That is what an economy without any prioritization at all would look like. But he doesn’t explicitly reject this argument either, which leaves his position at least from this single speech relatively closer to the position embodied in the East Asian Economic Miracle report.

That would be problematic. As Ha-Joon Chang has argued in a series of devastating critiques of the East Asian Economic Miracle report “more market-oriented economic systems are not necessarily easier to construct and run than more interventionist systems”. For one thing, well-functioning markets also require institutional prerequisites as much as well-functioning policies although the institutional prerequisites might be different (e.g. efficient capital markets and contract law and effective dispute resolution mechanisms without which market transactions costs would be high). For another, successful free market economies “will require highly capable private sector bureaucracies that can successfully manage large and complex firms”. (See Chang, H-J. 1993. *The Political Economy of Industrial Policy in Korea*, Cambridge Journal of Economics, vol. 17, no. 2. 41 Chang, H-J. 1994. *The Political Economy of Industrial Policy*, London and Basingstoke, Macmillan. Chang, H-J. 1995. *Explaining ‘Flexible Rigidities’ in East Asia* in T. Killick (ed.), *The Flexible Economy*, London, Routledge. Chang, H-J. 1997. *Luxury Consumption Control and Industrialisation in East Asia*, mimeo. a background paper prepared for Trade and Development Report, UNCTAD)

Inadequate capacity is one reason African



countries should engage in serious development 'strategizing' or priority setting. While few will dispute that many African countries lack competent bureaucracies, as I will argue momentarily, Africa's capacity problems are sometimes overrated and self-inflicted. After all, one seldom hears of these types of problems within private and civil society sectors in Africa or among the cadre of African professionals who work with global financial institutions such as the IMF, the World Bank, the UN system and all manner of aid agencies. A number of 'graduates' of these institutions have gone on to lead their countries (e.g. Allasane Ouattara of Cote D'Ivoire, Ellen Johnson Sirleaf of Liberia, Mbingu Wa Mutharika of Malawi and Cheick Modibo Diarra of Mali) or key critical ministerial docket (e.g. Ngozi Okonjo-Iweala of Nigeria, Goodall Gondwe of Malawi, Akinwumi Adesina of Nigeria, etc.). Not to mention the vast talent pool of the African diaspora. Tony Blair himself alludes to this in the same speech: "There's a new generation of African leaders – in politics, business and civil society who are anxious to take the destiny of their nations into their own hands. We should encourage and support them. That's the challenge for the international community".

That there are African governments with 150 priorities in their development plans speaks to the paucity of proper development strategies on the continent. Sure, institutional capacity is a problem. So is the dominance of the 'Relax, Kick Back and Do Nothing' neoclassical mentality in much of what constitutes 'the establishment' in African development: ministries of finance and economic planning, central banks, bilateral and multilateral devel-

opment institutions, many economics departments and parts of the private sector. Following the triumph of the 'Washington Consensus', many African countries bought into – or were forced to buy into – the (neoclassical) economic theory and ideology that the state need not 'intervene' in pursuit of economic development since this process happens quasi automatically through automatic increases in a country's capital to labour ratio. According to this school of thought, long term growth is input-driven incrementally and marginally. In this mind-set, national prioritization or 'development strategizing' is either superfluous or counterproductive: the invisible hand of allegedly efficient markets is a superior mechanism for sorting out competing development priorities. All a country needs to do is undertake effective macroeconomic management and 'good governance' or a series of political and legal measures that would ensure both social peace and economic stability – a key mandate of Blair's own Africa Governance Initiative.

While the idea that Africa lacks capacity to prioritize its development goals might be preposterous, it is not unique to Tony Blair. It is widely shared within the development establishment in Africa and beyond. Otherwise, why would Africa outsource much of its policy making to regional and international development banks and/or bilateral and multilateral development and aid agencies? Notice the difference between 'outsourcing' of economic policy making function in some African countries and the approaches to 'capabilities acquisition' strategies employed by Japan and South Korea. While both went for nothing less than 'technological revolution', Meiji Japan went so far as to seek 'organiza-

tional revolution'. It is not that outsourcing of policy making does not work or that 'good governance' based initiatives such as those promoted by Blair's Africa Governance Initiative are not helpful. Both strategies might or might not work depending on individual circumstances. The fundamental problem is that notwithstanding their merits, these initiatives are simply not adequate to the task. The development challenge facing many African countries requires technological and organizational, if not institutional, revolutions. While these will require the participation of many agents both within and outside Africa, ultimately, they will not succeed without strategic priority setting and national commitment on the part of African countries.

Tony Blair suffers from the same ideological blind spot that afflicts many African leaders and technocrats. Blair assumes that Africa has the right development agenda. "Assume good faith; usually the correct assumption nowadays. Assume the right vision; often the case". Blair goes on to make this claim: "Many of the leaders I know in Africa – and elsewhere – will work 18 hour days, 7 days a week". I hate to disagree with Tony Blair. I spent more than a decade in Blair's Britain and witnessed firsthand not only his skilful transformation of the UK into a 'kinder, gentler country', but also his personal commitment to international development. Let's just say that many African citizens I know would probably request Mr Blair to pass along this message, courtesy of Tracy Chapman: *'I'd like to please give Mr President my honest regards. For disregarding me'*. ■



## NOT RECOGNIZING TIME AS A 'SCARCE' RESOURCE

**This was not the strategy that many of the forerunner countries followed when they were developing. The original Lead Goose, Britain, did render this misleading advice to early latecomers, most notably to America.**

A strategy should be time bound. Its desired objectives should be achieved or achievable within a specific time frame. This is partly because a strategy is built on fundamental assumptions (e.g. technological and demographic trends) that are sensitive to time. In spite of this, time is seldom treated as a 'limited' or 'scarce' resource in African development. Since 2000, one would be hard pressed to find an African country with a 'Five-Year National Development Plans'. 'Development Planning' went out of fashion with the triumph of the 'Washington Consensus' in the 1990s. Nowadays, in a triumph of wishful thinking over hard-nosed development strategizing, one is more likely to come across

national and continental development ‘Visions’ with much longer time frames than 5 years: 20, 30 or even 50 (e.g. AU Agenda 2063; AU Mining Vision 2050; any number of National Vision 2020s, 2030s or 2040s).

The temporal boundedness of a 5-Year National Development Plan had an implicit ‘developmental social contract’ between government and citizen embedded in it. A government could still promise what it could not deliver, but at some risk to its legitimacy, prestige, credibility or mandate. The newly fashionable ‘national visions’, awash in long lists of worthy goals, have little, if any, in-built accountability mechanisms. This is not to criticise long term planning (very much needed in Africa) or to claim that such ‘visions’ don’t work (Malaysia’s Vision 2020 worked just fine). The point is to highlight the difference between a ‘substantive national vision’ and a wish list of worthy goals with an arbitrary timeframe attached to it.

To be successful, a development strategy must enjoy some level of national consensus, broad-based support or degree of national legitimacy and ownership that transcends theory, ideology presidential term limits and other nationally polarising issues. This is likely to ensure that long term strategic development goals are pursued to their desired ends regardless of changes in government or ideology. This was the case with the catching up strategies of many latecomer countries (Germany, USA, Russia/Soviet Union, Japan, Singapore, Taiwan, South Korea, China, Malaysia, etc.). In spite of internal differences, these countries rallied around their catching up development strategies, often drawing from their ‘best and brightest’. By contrast, many African development strategies, policies or practices have been predicated on excluding entire regions, ethnic groups and especially, Africa’s ‘best and brightest’. Many political regimes in Africa have been too insecure and too obsessed with regime survival to put national development priorities first. The lack of a competent civil service in much of Africa is partly a deliberate creation of politically weak and insecure regimes, who then have the chutzpah to use the ‘lack of capacity’ argument as a reason for why their countries are poor.

With the exception of Mauritius and Botswana, national consensus or commitment to development priorities has been rare in Africa. Commitments by governments of the day are often conflated with national commitment or broad based consensus. In a continent mostly governed by ‘governments of the few, by the few and for the few’ or patron-client politics based on an ideology of ethnic competition, governmental backing

and national commitment can mean two different things. While regime stability and longevity has ensured some level of policy consistency in some countries, as the experiences of Felix Houphouet-Boigny’ Cote D’Ivoire and Mobutu’s Zaire (Democratic Republic of Congo) have shown, regime stability or longevity is a poor substitute for national consensus or commitment.

Africa-wide development policy making through the African Union/NEPAD (e.g. AU Agenda 2063, AU Mining Vision 2050 etc.) and the internationalization of development policy making (e.g. Millennium Development Goals/Sustainable Development Goals) was supposed to solve for some of these problems. Unfortunately, sometimes they reinforce these same problems by (a) sharing in the listing of ‘worthy goals’ in-

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stead of hard-nosed development strategizing (b) conferring legitimacy on governments that cynically embrace the rhetoric rather than the substance of these agenda. Before the continent defaults to another long list of worthy goals and long term visions for which its leaders have neither the intentions, will, nor wherewithal to achieve – and for which its citizens have no ability, inclination or the necessary life expectancy to hold governments to account, it might do well to critically reflect on its substantive development opportunities and challenges over the next 30 years.

The national, continental and international visions might as well be the right ones. However, it is going to take more than a wish list of goals or visions for Africa to achieve economic development. Africa faces a unique set of opportunities and challenges over the next 20-30 years. The opportunities include the conditions created by the most recently developed economies, including most notably, China: the influence of its un-orthodox economic development model; its demand for (African) natural resources; its search for new destinations of its ‘outward’ foreign direct investment, etc. They also include conditions created by forerunner economies, especially the confluence between glo-

balization, the information revolution, and a number of technologies whose applications have the potential to yield significantly large social, economic and ecological dividends in Africa: information and communication technologies (ICTs); biotechnology and bioinformatics; biomedical sciences and biomedical engineering; materials, nanotechnology; 'green' and 'low carbon' technologies, et cetera. Over the next 20 to 30 years, Africa faces not only a 'youth bulge' but also an increasingly educated and technologically savvy population. If harnessed effectively, the information revolution and the youth bulge could result in a 'double development dividend': demographic and digital.

the impacts of climate change. Both adaptation and mitigation can be costly (see Munang and Mgendi in this Magazine). Robert Mendelsohn, examining the entire global economy, argues that the greatest threat that climate change poses to long-term economic growth is from potentially excessive near-term mitigation efforts. (See Robert Mendelsohn, 2009. Climate Change and Economic Growth, Commission on Growth and Development, Working Paper No. 60). One need not agree with this assessment to recognize that economic development within the context of climate change entails additional costs and warrants national strategic thinking and prioritization.

and harmony – something the Chinese Communist model also practised in different ways until fairly recently).

China is both an opportunity and a challenge in terms of Africa's development. The opportunities it presents have been highlighted. There is not enough space here to go through the potential challenges it poses to Africa's development. Suffice it to say that the current structure of trade relations between China and Africa might not be conducive to Africa's long term development, especially the continent's efforts aimed at economic diversification. Low cost Chinese exports to Africa, especially in clothing, apparel, textiles and other labour intensive sectors, have



The continent also faces a number of challenges. Perhaps the most significant of these is the expected impacts of climate change. Many African countries will confront an economic development imperative that has to be met within a context of rising temperatures and uncertainty about trends in precipitation. The implications of all of this on water supplies, crop productivity, food security, disease incidence and the resilience of physical and social infrastructure could be considerable. While many economists hold that climate change is unlikely to substantially slow overall economic growth in Africa over the next two decades, most agree that if global greenhouse gas emissions remain unconstrained by 2050, the impacts of climate change are going to become more pronounced as a factor in African development from that point onwards.

The implication of all of this is that African countries have a very small window of opportunity within which to develop and also to make the necessary investments in climate smart and adaptable agriculture, energy, cities and resilient infrastructure needed to cope with

The second challenge to African economic development is a changing development landscape. Some of the tools used rather effectively by many of the now developed countries might not be available to African countries due to changes in international trade rules and the impacts of climate change. As Jean Claude argues elsewhere in this Magazine, even technology can be a double edged sword in African development. The same technologies that have the potential to catalyse economic growth and transformation in Africa, might also, under different circumstances, work against the interests of the continent in this respect. Information and communications technologies and 'big data' could be harnessed to accelerate economic development in the continent or they could be harnessed to impede such development. For example, by enabling conspicuous consumption or consumption of luxury goods, they might displace local production and destroy local manufacturing capabilities. (South Korea did impose controls on the consumption of luxury goods when it was 'developing' not only to save foreign exchange but also to preserve social peace

been depressing or displacing African production, in the very sectors that some African countries have been trying to develop a comparative advantage in. Because of the many Chinese industrial 'clusters' and the numerous (cumulative) benefits that clustering confers, many labour intensive businesses are unlikely to divest out of China even if labour costs (i.e. wages) were to rise in China. Africa would have to be a lot more creative, innovative and strategic to wrest the control of labour intensive industries from China. Overall, Africa needs a more sophisticated China engagement policy. It would be naïve for African countries to view China simply as an 'opportunity'. China is both an opportunity and a challenge. A serious catching up development strategy in Africa would seek to harness China's rise for Africa's development whilst mitigating the negative impacts of that rise.

A clear eyed look at both advanced economies and recently successful latecomers would give African countries a comprehensive picture of potential opportunities and challenges. Development is not linear. There is no compel-

ling reason why African countries must not seek to harness high technology and knowledge intensive industries for their development. This is the fastest growing sector of the global economy today. It is the most dynamic technology of the day in the context of Africa's development. The leading 'geese' in many of the knowledge or technology sectors are still 'forerunner' economies.

Effective applications of some of these technologies could have far reaching impacts on some of Africa's long running development challenges: agricultural productivity, food and nutrition se-

curity; water security; access to energy; public health, disaster risk preparedness and resilience; climate change adaptation and mitigation. Many African countries have already identified some of these technologies as 'strategic' to their development:

- Information and communications technologies (ICTs)
- Biotechnologies and bioinformatics
- Energy technologies
- Biomedical technologies
- Materials, Nano science and nanotechnologies
- Nuclear technologies

As Gabrielle Hecht warns in her arti-

cle elsewhere in this magazine though, some of these technologies, especially nuclear, might be 'yesterday's future', with considerable costs and challenges even in the 21st century. Whatever leading sectors or technologies that individual African countries might 'select', they would do well to remember that technological innovation is a necessary but insufficient condition for economic development. For it to be successful, it needs to be accompanied by compatible organizational and institutional innovation. Governance matters. Organizations also matter. ■



## THE AFRICAN DEVELOPMENT CLOCK IS TICKING

**T**hat requires countries to set strategic priorities, treat time as a limited resource and make the most of all of Africa's human, natural and financial resources. African governments need to look 'inward' as much as they look 'outward'. They should stop their obsession with what others can do for Africa and preoccupy themselves with the question of what Africa can do for itself. African citizens might do well to heed the advice of John F. Kennedy to Americans: "ask not what your country can do for you, ask what you can do for your country". Thabo Mbeki put this best in African terms: "Surely, there must be politicians and business people, youth and women activists, trade unionists, religious leaders, artists and professionals from the Cape to Cairo, from Madagascar to Cape Verde, who are sufficiently enraged by Africa's condition in the world to want to join the mass crusade for Africa's renewal". Thabo Mbeki SABC, Gallagher Estate, 13 August 1998.

Ultimately, Africans – leaders, academics, peasants, scientists, teachers, nurses, artists, traders, engineers, lawyers, businesspersons, whatever - bear a moral, legal and political

responsibility for the continent's development. That is the essence of independence, sovereignty and territorial integrity. Ceding the role of development policy making and practice to a select group of people - economists, 'technocrats', politicians, international development banks, 'development partners' or NGOs - is an abdication of moral, civic and political responsibility. It constrains national innovation. It does not engender national commitment. Individual African citizens – scientists, economists, lawyers, academics, businesspersons and philanthropists – are beginning to realize this. Some have founded their own mathematical schools or engineering universities to nurture and unleash the continent's scientific, engineering and technological talent. Others have started 'African Schools of Economics' or public policy think tanks to open up the continent's policy space to intellectual, methodological and ideological contestation.

While these initiatives are laudable, they are far from sufficient. What is needed is a new social contract anchored in economic development. It is time for the continent to formulate and implement credible catching up development



*There are no 'miracles' in economic development. Economic development is an entirely rational and practical process. It is driven by technological, organizational and institutional innovations.*

strategies. Nothing less would yield the many worthy goals embedded in many of the continent's development documents. Millions of people cannot continue to die of easily preventable and curable diseases. Nobody should die of hunger and famine in the 21st century. This generation of Africans must not die and leave the continent underdeveloped. Enough already. 50 years of independence should be worth at least this much.

Economic development is possible. Country after country has demonstrated this over and over again, in region after region, over the last 150 years. In almost every case, it always seemed impossible until it was done (hence the 'German Economic Miracle', 'East Asian Miracle', 'Miracle on the Han River', 'Mauritius Miracle', etc.). In many ways, the history of the world over the last 150 years is a history of economic development. This is a point worth emphasizing in Africa, a continent long plagued by widespread cynicism and an 'impossibility complex' mentality – notwithstanding occasional bouts of Afro-optimism such as the current 'Africa rising' narrative. It is also important to note that with the exception of Britain, every single country that has industrialized has faced its share of sceptics and naysayers. Africa commands no monopoly here.

There are no 'miracles' in economic development. Economic development is an entirely rational and practical process. It is driven by technological, organizational and institutional innovations. There is a reason Ha-Joon Chang keeps saying that the South Korean development experience was led by engineers - not economists. It is engineers who build the products and services (e.g. infrastructure, equipment, tools, machines etc.) whose applications ultimately lead to food, energy and water security; public health and sanitation; waste disposal and environmental clean-up; sustainable transport, climate adaptation and mitigation, etc. Arguably, no profession has made greater contribution to global economic development and poverty reduction than engineering. However, as engineers such as Bernard Amadei have warned, 'good engineering' needs 'good policy' for development to work. 'Good engineering' cannot substitute for 'bad policy'. In the absence of 'good policy', engineering can exacerbate the

impacts of 'bad policy'. For example, engineering solutions that do not take into consideration underlying social, economic and political conditions are ultimately unsustainable. The process of economic development requires economists, engineers, doctors, sociologists, anthropologists, et cetera. In many African countries, economists (typically of the neoclassical school of thought) tend to have an outsized role in this process. This might be counterproductive. At any rate, it does not amount to making the most of a country's 'best and brightest'.

In spite of considerable and often heated and ideologically tinged debates, we know quite a bit about the process of economic development. As examples of all successful latecomer countries show, economic development requires the creation of 'dynamic comparative advantage'. Any country can acquire any 'capabilities' by invention, innovation, imitation, diffusion, transfer, evolution or creative destruction.

The state, markets, civil society, politics and culture (or collectively, institutions) as well as policy, technology, innovation, and leadership (i.e. political will) all play a central role in this process. As Irma Alderman has argued: "The development process entails continual, coordinated change in many aspects of the economy, society and polity: production patterns and technology; social development; economic, social and political institutions; and patterns of human development. Creative evolution, redirection and destruction constitute the essence of successful economic development". [http://www.un.org/esa/ffd/wp-content/uploads/2007/11/20071116\\_IrmaAdelman.pdf](http://www.un.org/esa/ffd/wp-content/uploads/2007/11/20071116_IrmaAdelman.pdf)

It follows from the foregoing that economic development is not inevitable. The African (sustainable) development clock is ticking. The time for the continent to put in place its development strategies is now. The time for leadership in African economic development is now. The time to harness science, technology and innovation for accelerated sustainable development in Africa is now. This is no time to Kick Back, Relax and Wait for the Invisible Hand of the Market to Work its Magic for African Development. ■



# GETTING AFRICA READY FOR THE "DIGITAL" SDGS

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THE SECRETARY-GENERAL,  
United Nations



**Africa has made great progress in the past decade, saving and improving lives on an unprecedented scale. The United Nations has supported the African development agenda in a number ways, including by working closely with the African Union and the New Partnership for Africa's Development (NEPAD).**

**A**frican leaders have been strong proponents of using science, technology and innovation as one of the pillars of their efforts to achieve the Millennium Development Goals, the framework that has guided us since the year 2000. It was Liberian President Ellen Johnson Sirleaf and the co-Chairs of the Post-2015 High Level Panel that first stated the need for a “data revolution” in sustainable development. Last year, my Independent Expert Advisory Group on the Data Revolution -- with strong representation from Africa -- highlighted various ways in which new technologies can assist ([www.undatarevolution.org](http://www.undatarevolution.org)), and noted that “Data are the lifeblood of decision-making and the raw material for accountability. Without high-quality data providing the right information on the right things at the right time to the right people; designing, monitoring and evaluating effective policies becomes almost impossible”. The work of the Committee of Experts on the African Data Consensus, supported by the UN Economic Commission for Africa, has also been a further important contribution ([www.uneca.org/datarevolution](http://www.uneca.org/datarevolution)).

As a result of the efforts to monitor the MDGs, we know much more about the state of the world and of Africa in particular. But huge data and knowledge gaps remain. With the imminent adoption of a post-2015 development agenda, including a set of Sustainable Development Goals, investments in data systems must be a priority as Africa and the world pursue economic transformation for inclusive development. And given the breadth and depth of the new agenda, traditional statistics will need to be complemented by and, eventually, integrated with non-traditional statistics.

Some claim that the data revolution will only increase the digital divide between developed and developing countries, since the latter do not have the necessary technology to benefit. Others argue that the revolution will happen mainly in continents like Africa, which has experienced an exponential increase in the use of information and communications technologies and is not bound

by traditional ways of generating and using data. Research conducted by the UN Department for Economic and Social Affairs for the Global Sustainable Development Report 2015 (<http://sustainabledevelopment.un.org/globalsdreport.html>) shows that African countries are already using ICTs to collect and disseminate data in ways not seen in wealthier countries: birth registrations through mobile phones and SMS; the monitoring of medicine stocks; the mapping of water points; the assessment of land potential and vulnerability; and reporting on disease outbreaks such as Ebola.

Geospatial technology is also part of the picture, and has been used to take agricultural and population censuses, to compile land information and to monitor the flow of the River Nile. Several African countries have launched their own satellites.

The potential of big data – massive data sets from satellite images, social media, online commercial transactions and cell phone records, among others – has generated much discussion. Africa is lagging behind in this area, but not necessarily for lack of availability of big data, as cell phone records are becoming a massive data source across the continent. Some of the applications are showing promising results. Cell phone records have been used to produce estimates of poverty, literacy rates and food expenses; to determine travelling patterns to better manage public transportation; for malaria prevention and for estimating population flows to inform the Ebola response in West Africa. Privacy concerns and confidentiality issues must be addressed as African countries take advantage of these new possibilities.

These and other novel approaches are laying the basis for effective monitoring of the Sustainable Development Goals in Africa. It will be crucial to move from mostly ad-hoc exercises implemented in one or a few African countries, to more systematic undertakings. In addition, many of the applications have been produced by researchers and experts from developed countries, and it is unclear if enough knowledge is being transmitted and capacity is being built for African

countries to continue these applications on their own in the medium and long term.

For a successful monitoring of the SDGs in Africa, two factors will be key. First, each country will have to make a frank assessment of what its data needs are and identify which innovations can better respond to those needs. Second, strong domestic political commitment will be needed to bring together the necessary financial, human and technological resources. Countries will also need access to independent advice on new technologies and tools and their relative strengths and drawbacks. The international community should be encouraged to create a catalogue of innovations with users' reviews to inform countries on different alternatives. Such a catalogue could also provide information on the extent to which freely available innovations are an adequate substitute for commercial ones.

My Global Pulse initiative has been helping the United Nations improve data literacy since 2009. Global Pulse brings together partners from academia, public sector and business to explore new ways to monitor and plan development programmes by leveraging big data. The Global Pulse innovation lab in Kampala models new approaches to better monitor the effects of epidemics, natural disasters and other problems that affect the people of Uganda and elsewhere. Kampala is just one of several booming data, technology and innovation communities in Africa, among which are the UNICEF Innovation Hub and the iHub in Nairobi. Indeed, many mobile technology innovations, including mobile money, were born in Africa, and have global potential.

Access to the latest science, technology and innovations will be crucial to monitor and achieve the Sustainable Development Goals. The United Nations looks forward to supporting the people of Africa in realizing our shared goals of peace, development, human rights and lives of dignity for all. ■

*\*Ban Ki-Moon is the Secretary General of the United Nations*



# LESSONS FROM EAST ASIA FOR AFRICA'S ECONOMIC TRANSFORMATION

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**Keen observers of sub-Saharan Africa will have lately noticed a marked increase in expressions of interest in East Asian 'models' of development among the region's policymakers.**

**W**ith increasing frequency, policymakers from states as diverse as Nigeria, South Africa and Senegal are mooted plans to draw lessons either from individual countries in East and Southeast Asia or from the region as a whole. Often, the developmental state in particular is evoked as a model that can be abstracted from its geographical origins and implemented in a new locale. When Rwandan President Paul Kagame recently referred to his country as the 'Singapore of Africa' and pledged to emulate the late Lee Kuan Yew's efforts to transform Singapore into one of the world's wealthiest and most modern states in the space of two generations, he was therefore echoing similar pronouncements from leaders across the continent.

In the midst of such discourses, it is often difficult to understand what these East Asian models actually look like when they 'land' on African soil. What influence do they actually have on policy and practice? Why are certain models chosen over others? In attempting to answer these questions, my own research has focused on two very different cases, namely Kenya and Ethiopia. Drawing on analysis of key policy documents, as well as on over 90 interviews with business

leaders, politicians, bureaucrats and community representatives, I found that certain groups of influential Ethiopians and Kenyans have indeed attempted to draw concrete lessons from East Asia's own history of rapid and transformative economic development. Despite significant differences between the two cases, leaders from both countries view this region as the best contemporary example of state-guided modernisation, in which technocratic elites insulated from societal and political pressures were able to use rapid economic growth, physical infrastructure and market-friendly industrial policy to drive forward an ambitious project of societal transformation. The result has been policies such as Kenya's Vision 2030 and Ethiopia's Growth and Transformation Plan, both of which aim to adapt elements of East Asia's 'successes' to local contexts.

East Asian lessons can, if suitably indigenised, have a positive impact in countries such as Ethiopia and Kenya. However, my findings have also indicated a number of gaps and misunderstandings in the lesson-drawing process. The development stories of most high-performing Asian economies centre on the structural transformation that both fuelled and flowed from these countries' eco-

nommic growth. In countries like South Korea, Taiwan and China, many scholars agree, investment in the agricultural sector and reform of the land tenure system led to spill overs in technology and labour that facilitated the creation of a manufacturing sector. In turn, this industrialisation created the revenue and widespread employment that enabled investment in public goods such as universal education and healthcare.

Despite this emerging scholarly consensus, many African policymakers seem to believe that they can circumvent this step in their emulation of East Asia. The late Meles Zenawi expressed great interest in loosely following the East Asian experience of structural transformation, and, as my research has demonstrated, was able to successfully disseminate this message throughout the ruling party. To this end, Ethiopia's strategy of Agricultural Development Led Industrialisation (ADLI) was formulated in the 1990s with the experiences of South Korea and Taiwan in mind. As in these countries, ADLI has entailed significant investments in agricultural extension, defined by the World Bank in 2004 as "the delivery of information inputs to farmers"; it has also entailed a prioritisation of rural infrastructure and smallholders that has

been unusual in Africa. Yet ADLI is being increasingly abandoned in favour of a new policy of large-scale commercial agriculture, in which foreign investors lease large tracts of land and produce commodities for the export market. According to the Oakland Institute, an area roughly the size of France has already been leased in this manner, with an area twice this size earmarked for future investment. Instead of creating the kind of smallholder-oriented, pro-poor development that will free labour and technology for the creation of an industrial sector, this is likely merely to lead to the displacement of peasants and the growth of a precarious informal sector. Structural transformation works best when the domestic agricultural and industrial sectors are closely linked, and such developments sever that link.

One argument in favour of commercial farming in Ethiopia holds that it was only permitted to occur once ADLI had been shown to be ineffective. And indeed, Ethiopia's rural productivity is still woefully low, more than two decades after the introduction of ADLI. In Ethiopia, however, all land remains state-owned, depriving farmers of incentives to invest in the land on a long-term basis. In addition, the ruling party maintains a tight grip on farmers through the kebele system, making extension services and access to resources such as fertiliser conditional on political support. This again is contrary to the East Asian experience: in both South Korea and Taiwan, agricultural development really took off only once rural reforms allowed smallholders to purchase and cultivate their own plots of land. This has not, of course, been the case in China, but even there those peasants from Xiaogang village who famously inspired Deng's reforms in 1978 by breaking free from party strictures were rewarded, not punished, for their efforts. This strongly suggests that smallholders need land, investment from the government, and the freedom to decide how best to use these resources in order to aid structural transformation.

Kenya, too, is missing an opportunity in its emulation of East Asia. Virtually all of the foreign advisors who sat on Mwai Kibaki's elite advisory body, the National Economic and Social Council (NEC), hailed from East Asia. It was this region that NEC used as inspiration in putting together Vision 2030, which aims to transform Kenya into a middle-income country much in the same way that Malaysia's Vision 2020

was held to have done since 1991. But Kenyan technocrats' two preferred models in East Asia—Malaysia and Singapore—are hardly the region's best examples of structural transformation and pro-poor agricultural development. As a tiny port city, Singapore never had to face the challenge of incorporating a large, poor, rural population into its economy. This stands in marked contrast to Kenya, where, according to the World Bank, three-quarters of the population makes at least some part of their living from agriculture. Relying on Singapore as a model carries the risk of exacerbating the urban bias from which Kenya has been suffering since the colonial era; it also threatens to privilege a service sector in which economic growth is often jobless and which benefits mainly the urban elite. As the example of India cautions us, rapid economic growth without structural transformation can leave vast swathes of a country behind. With the best efforts of Kenyan technocrats, parts of Nairobi may conceivably one day resemble Singapore, but what of the rest of the country?

Malaysia does have a large rural population, but it, too, has not achieved the kind of broad-based development associated with the East Asian developmental states. While Malaysia has been successful in diversifying its economy and improving the living standards of large numbers of its citizens, its agricultural sector remains highly dependent on a small number of exported cash crops. In 2005, a full 63% of agricultural land use was given over to the cultivation of palm oil. This creates problems with food sufficiency—Malaysia must import many dietary staples.

Malaysia's use of cash crops also relies on a landholder/estate model of agriculture that does not necessarily lead to effective poverty alleviation. It may do so if revenues from this sector are channelled back into social programmes and invested in poor areas. This has happened to some extent in Malaysia, but inequality persists. The GINI coefficient is considered by many to be one of the most reliable measures of inequality within a country. According to the CIA World Fact book, Malaysia's GINI coefficient in 2009 was actually higher than Kenya's in 2008, translating into greater inequality in the former. Much of this wealth divide is also an urban-rural divide, and the country's large population of migrant farm labourers—many of whom are often employed illegally and face very harsh conditions—is particu-

larly affected. If even Malaysia's agricultural model faces such problems, is it really suitable for Kenya, which already grows cash crops like coffee, tea and flowers on large estates and has a far worse track record of wealth redistribution?

It is understandable that Kenya's leaders would seek out models—Singapore with its strong service sector, Malaysia with its mixed economy and commercial approach to agriculture—that already resemble their own country in many ways. It is equally understandable that Ethiopia's ruling party should try to balance its longstanding emulation of South Korea, China and Taiwan's agricultural development-led industrialisation with the new opportunities offered by foreign investors. Singapore and Malaysia may have other, more specific lessons for Kenya. And Ethiopia would indeed not be able to emulate its preferred East Asian models wholesale, as important elements of Taiwan, China and South Korea's land reform processes stem from rather specific historical circumstances.

These considerations notwithstanding, current trends are taking both Ethiopia and Kenya further along the path towards the large-scale commercialisation of agriculture and therefore away from the classic East Asian model, even as leaders in each country ironically profess to be looking to this region for lessons. African policymakers may decide that this classic model is too difficult to follow, given the continent's own historical legacy and structural constraints. Or they may decide to focus on the key aspects of this model, even if outcomes will necessarily not be identical. There is no getting away from the fact, however, that these key aspects entail initial investments in smallholder agriculture and rural development, long before manufacturing becomes a priority and even longer before the service sector receives attention. There can be no 'Singapore of Africa', 'South Korea of Africa', or 'Japan of Africa'—if this indeed is what Africans from all walks of life want—without this essential ingredient. ■

\* For a more detailed discussion of findings, see: E. Fourie. 2015. "China's Example for Meles' Ethiopia: When development 'models' land?". *Journal of Modern African Studies* 53(3) (forthcoming in August); also E. Fourie. 2014. "Model Students: Policy Emulation, Modernization and Kenya's Vision 2030". *African Affairs* 113(453), pp. 540-563.

# GROWTH AND STRUCTURAL TRANSFORMATION IN SUB-SAHARAN AFRICA

Punam Chuhan-Pole  
World Bank Group



**Two decades of strong economic expansion have raised expectations of Africa's emergence. But to achieve this, African countries will need to accelerate growth and economic transformation, and make growth more inclusive.**

## Africa's rise

Sub Saharan African countries have been enjoying two decades of sustained economic expansion. The region's economy grew at an average annual rate of 4.4 percent in 1995-2014, comparable to that of the rest of the developing world. This growth performance represents a remarkable turnaround from the sub-par pace of expansion (annual growth of less than 1.5 percent) of the previous 20 years. A notable feature of Africa's growth is that it has been broad based, although there is considerable cross-country variation, with resource-rich countries growing substantially faster than non resource-rich countries. Thanks to robust growth, the region's aggregate output has more than doubled in real terms since 1995, and was over \$1.6 trillion in 2013. Recent re-basing of national accounts in several large countries, such as Ghana and Nigeria, suggest that the region's actual GDP might be undercounted by a substantial amount.

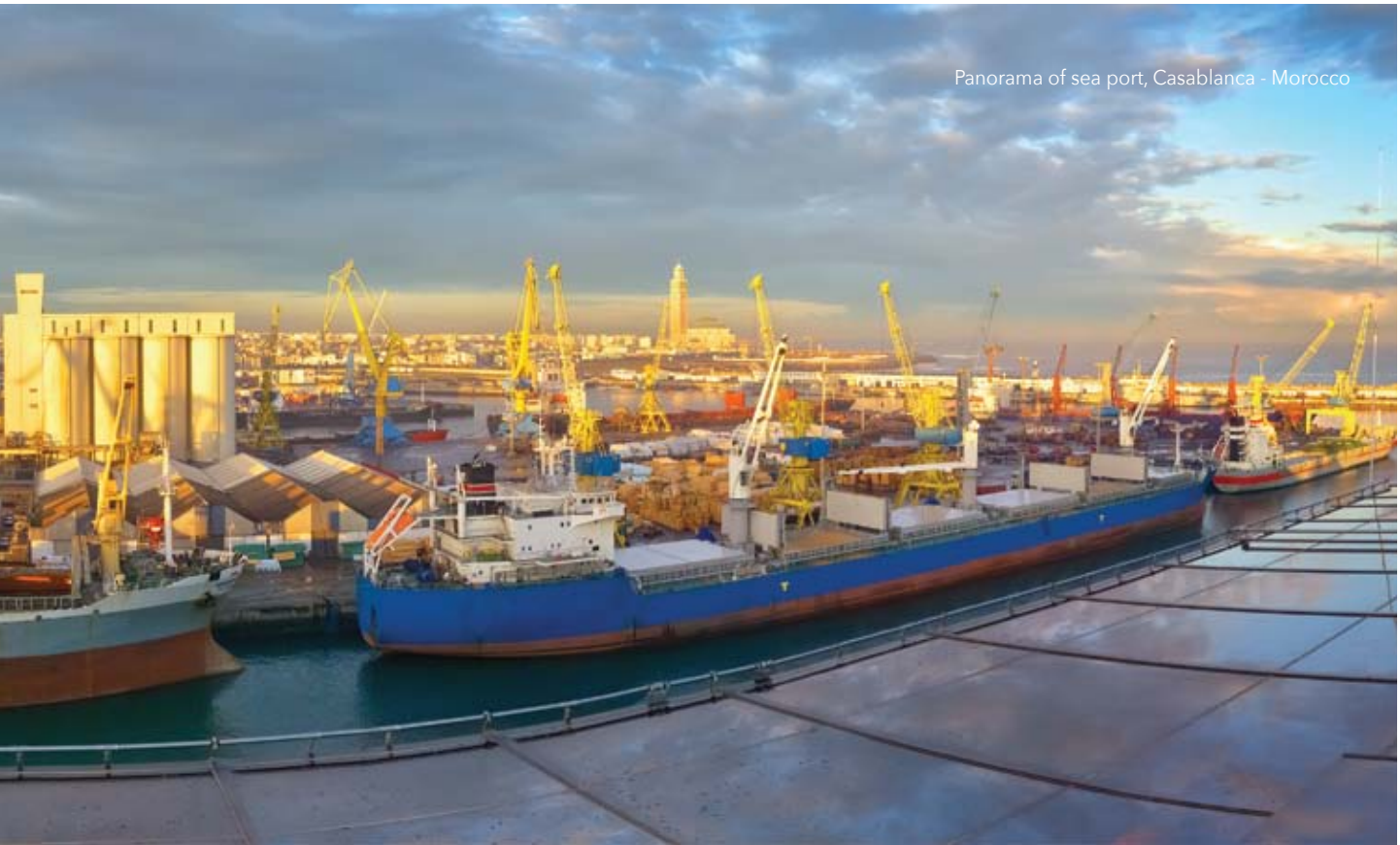
Overall, the region now boasts 22 middle-income countries, and by 2025, another 10 countries could join these ranks (Devarajan and Fengler 2013). Africa's middle-income countries are home to over 40 percent of the region's population and account for around 80 percent of its output (Chuhan-Pole 2014). Reflecting the dynamism of the region, a handful of African countries—Ghana, Kenya, Nigeria, Senegal, and Zambia—have joined the ranks of the so-called frontier markets or the next set of emerging markets.

## The quality of growth raises some concerns

Looking beyond GDP growth, there are some less impressive aspects of Africa's growth story. First, on a per capita basis, output growth has been far from stellar. Rapid population growth (2.65 percent a year), underpinned by fertility rates that are the highest of any developing region, has translated into a moderate pace of per capita GDP growth, aver-

aging 1.8 percent a year in 1995-2014. This is a much slower pace than the 4.4 percent growth rate for the economy as a whole. Thus, measured in real terms, per capita income has only increased by 40 percent during this period.

While Africa's 20 years of sustained output growth have reversed the income decline of the lost decades of the mid-1970s to the mid-1990s, the pace of per capita output growth has been below that of other developing countries. In short, on a per capita basis, growth did not converge to the average for other developing countries. Again, there is variation across the region's countries, with resource-rich countries posting much higher per capita income growth than non resource-rich countries. Overall, however, convergence of income levels with emerging market and more developed economies will require a substantial acceleration of per capita income growth.



Second, despite sustained growth, which is central to moving people out of poverty, poverty has remained stubbornly high in Africa. The incidence of extreme poverty (using the international standard of under \$1.25 per day on 2005 PPP basis) fell from nearly 60 percent in 1993 to around 47 percent in 2011. Moreover, because of population growth, the number of people living in poverty actually increased to nearly 420 million in 2011. The pace of poverty reduction in Africa has been too slow, and lagging relative to other regions. Consequently, the region has achieved only 35 percent of the Millennium Development Goals poverty target of halving the proportion of people living in extreme poverty (between 1990 and 2015), while globally this target has already been met. The region is also lagging on non-income welfare measures—such as child and maternal mortality—of the MDGs. Progress on human development outcomes needs to be ramped up to converge with levels in more developed countries.

Weak progress on poverty reduction is partly due to rapid population growth, which slowed output expansion in per capita terms (as explained above), and partly because growth itself has not sufficiently benefited the poor. The pace of poverty reduction depends not only

on the rate of economic expansion but also, critically, on how the gains from growth are distributed. Indeed, the estimated average growth elasticity of poverty in Africa is -0.7, compared with the developing country average of around -2.0 (Christiaensen, Chuhan-Pole, and Sanoh 2014). This means that growth in Africa has one-third the impact on reducing poverty, compared to growth in other developing countries.

Third, Africa's pattern of growth has been uneven across sectors, and it has been associated with little structural transformation. Historically, development has been underpinned by structural transformation out of agriculture and into modern sectors such as manufacturing. But Africa's structural transformation process has been different, with a shift out of agriculture and into services (mostly in the informal sector), and bypassing manufacturing. Understandably, Africa's pattern of growth has raised concerns over the sustainability of this growth.

### **Pattern of growth and structural transformation**

Two decades of rapid growth have transformed the economic structure of the regional economy and shifted the sectoral composition of output. A de-

composition of this growth by broad sectors—agriculture, industry, services—shows that the fastest-growing sector was services, which includes wholesale and retail trade, banking, transport, and public services. According to Africa's Pulse (volume 10), per capita growth of this sector averaged 2.6 percent per year in 1995-2011. Growth of the industry sector was much lower at 1.7 percent, while agricultural per capita growth lagged substantially at 0.9 percent. A closer look at the industry sector, which includes mining, manufacturing, construction, and utilities, suggests that industrial growth has largely been driven by natural resources. Manufacturing has scarcely taken off in the region. Spurred by the region's resource boom, industry has, thus, contributed 25 percent to the cumulative growth in GDP per capita during this period; services contributed the most with 62 percent, and agriculture's contribution was a paltry 13 percent.

Disparities in sectoral growth rates have changed the structure of Africa's economies, with some unexpected trends. The share of the services sector in output has grown, and that of agriculture has declined. Africa's Pulse (Volume 10) finds that between 1995 and 2011, the relative size of the services sector has

grown from 49 percent of GDP to 55 percent. A troubling trend, however, is the decline in industry's share in GDP, from 33 percent to 30 percent over this period. Within the industry sector there are divergent trends. Specifically, the share of "other industry" (which includes mining) has risen sharply, thanks to the region's boom in natural resources, while the share of manufacturing shrank to under 10 percent. There are some exceptions to the regional trend of gain in services sector's share and declining shares of agriculture and industry. For example, in Mauritania, the Republic of Congo, and Guinea, industry (which is heavily reliant on extractives) accounted for all of the cumulative growth since 1995. In a few

countries, such as Burundi, Liberia, and the Central African Republic, agriculture has been the largest driver of growth. While the growing importance of services in the region is not exceptional, Africa's pattern of growth differs from that in other developing countries in notable ways. One important difference is that per capita growth in industry in other developing countries is much higher than in Africa, and comparable to the pace of expansion in services. This has translated into a rising share of industry in output in these countries. In addition, manufacturing has maintained its share in output in other developing countries. Africa's exports also show little evidence of diversification, reinforcing the narra-

tive of limited structural transformation. Typically, as poor countries develop, there tends to be a diversification of exports away from commodities and toward better quality of existing products or new products. This diversification supports structural transformation. But Africa's exports remain concentrated in a narrow set of products. Moreover, the region remains heavily reliant on resource-based exports, and the share of primary commodities in total exports is high, at 75 percent. Within primary commodities, fuels and metals have gained share and agricultural commodities have declined. In addition, the number of new products that have been exported remains low. A changing economic structure is likely

in farming and small household enterprises. In other developing countries, by contrast, labor is more evenly distributed across sectors, with agriculture accounting for under 40 percent of employment.

### Is Africa's growth momentum sustainable?

Africa's pattern of growth raises concerns about the sustainability of growth. The process of structural change in Africa has been different from that of other countries, and not the kind of transformation that was expected. According to the standard literature on structural transformation, as economies develop, there is a reallocation of resources across sectors, causing labor to shift from low-productivity sectors and jobs to high-productivity ones. For poor countries, this has typically meant a shift out of traditional sectors and activities such as agriculture to modern sectors such as manufacturing—as in East Asia's growth take-off. By contrast, the experience of African countries has been one of declining shares in GDP of both agriculture and manufacturing. While the services sector—formal and informal—has been absorbing workers and capital in most countries, much of the growth in services has been in low-productivity activities in the informal sector.

The overall lack of industrialization in Africa's boom has raised concerns over the sustainability of this growth. There is much debate on whether sustainable

growth in the region requires a shift in favor of manufacturing, or whether such growth can be achieved by moving up the quality ladder in sectors where countries currently enjoy a comparative advantage. An example of the latter would be moving from a mere production of raw materials to both production and processing of these raw materials. Advances in information communication technology suggest another potential path to sustainable growth—that is, a shift into high-productivity modern services (such as software development, call centers, and outsourced business processes), as experienced by India.

Analysis of labor productivity growth for 16 countries for the period 1995-2009 finds that the shift in labor across sectors accounted on average for around half of the overall growth in labor pro-



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to impact jobs. For developing countries, this means that the share of agriculture generally declines with rising GDP per capita and that of services and industry increases. Evidence on trends in employment and jobs in Africa suggests that labor share in agriculture has declined and that the movement of workers has been out of this sector and into services, not manufacturing (de Vries et al. 2012, and McMillan and Harttgen, 2014). Notwithstanding these shifts, nearly 60 percent of Africa's workers continue to be employed in agriculture, even though this sector accounts for less than one-sixth of output (Africa's Pulse Volume 10). Moreover, agriculture employs an overwhelmingly large number of poor workers (nearly 80 percent). Overall, most Africans continue to earn livelihoods in the traditional economy or the informal sector—non wage jobs



ductivity during this period (McMillan and Harttgen 2014). The remaining was from intra-sector productivity improvements. Of course, there is substantial variation in the contribution of structural change to productivity across countries. For instance, in Mauritius, most of this growth was from productivity gains within the modern services sector, and not from intersectoral reallocation of labor. In Uganda, shifts out of agriculture into non farm activities in both rural and urban areas accounted for all of the growth in labor productivity (Christiaensen and Kaminski 2014). Some countries actually experienced a decline in labor productivity. Overall, the results suggest scope for growth from intersectoral labor reallocation, as well as from moving to the productivity frontier within sectors.

### **The challenge of more inclusive growth, and the role for structural transformation**

Sustainable development requires both rapid and inclusive growth. While Africa's growth has been strong, slow poverty reduction implies that this growth has not been very inclusive. But is structural transformation out of agriculture, in particular to more manufacturing and modern sectors, the answer? For growth to be inclusive, first and foremost, this means that growth will need to take place in the sectors and places where the poor are enabling the poor to make a larger direct contribution to growth. In particular, this means raising productivity in sectors that provide a livelihood for the poor. Since poor people are generally concentrated in rural areas and are engaged in agriculture, promoting growth in agriculture is an obvious place to start.

Agricultural productivity is disappointingly low (though improving) in Africa, and well below levels in other developing regions. Lifting agricultural productivity is a priority, and there is considerable potential for public policy in terms of improving access to and functioning of agricultural input and output markets; bringing better irrigation services and production techniques to farmers; and strengthening rural infrastructure. An appreciation that not all agricultural growth is equally poverty reducing, is relevant to the policy debate on poverty reduction. For example, growth that positively affects smallholder staple crop productivity as opposed to exports has been found to be more poverty reducing (Diao, Thurlow, and Fan 2012). Undeniably, robust evidence will need to in-

form the policy debate and choices.

But boosting agricultural productivity alone will not suffice. It will be important to foster processes that enable occupational shifts from lower-productivity jobs to higher-productivity ones. In short, it will be important to promote rural income diversification, that is, nonagricultural rural activity. Evidence suggests that jobs that are generated nearby to agricultural activity—that is, in the rural economy, either on the farm, or in rural and secondary towns, are particularly effective in reducing poverty (Christiaensen, De Weerd, and Todo 2013). A recent World Bank study on youth employment in Africa (Filmer and Fox 2013) concludes that the region's jobs will continue to be in the informal sector for some time. Since "informal will be normal" in many of the region's developing countries, public policy in these countries will be well served by focusing on lifting productivity of informal household enterprises, especially through investments in rural public goods, such as education, health, transport, electricity, and ICT.

Finally, Africa needs to grow its modern sector—both manufacturing and services. African manufacturing is constrained by a number of well-known structural factors. Among these are: an acute skills gap of labor, and the need to build human capital for the 21st century; infrastructure deficiencies, especially access to reliable and affordable electrical power; high transport costs and trading costs, which weigh heavily on the region's competitiveness; and costly market regulations that discourage completion. All these factors weigh down heavily on the competitiveness of Africa's manufacturing sector.

Growth and structural change will disrupt livelihoods of some, and gains may be spread unevenly. To make growth more inclusive will, thus, also require redistributing the gains from growth taking place elsewhere for the benefit of the poor. There is much scope for doing this in mineral-rich countries, where extractive activities have little backward linkages with the local economy. Social safety nets and cash transfers can be effective in redistributing the gains from growth. Although social protection mechanisms have increased in number and size, there is substantial variation in scope and coverage across African countries. Clearly, redistribution alone will not suffice to eliminate poverty and boost shared prosperity. This will re-

quire high and sustained growth.

In conclusion, Africa's emergence requires accelerating growth and making this growth more inclusive. As we discussed above, there is much scope for policy to address the key constraints to sustainable development. ■

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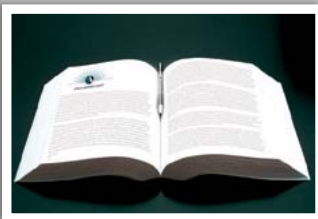
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# SOME LESSONS FROM SOUTH KOREA'S DEVELOPMENT EXPERIENCE



## Introduction



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The South Korean economic development story is of great interest to many developing countries. Until the early 1960s, South Korea was among the poorest countries in the world. Arguably, its 'initial development conditions' were worse than those of many countries in Sub Sahara Africa (SSA). Over 60 percent of its population lived below the poverty line and its life expectancy was 57 years. Agriculture constituted more than 40 percent of its GDP and employed 60 percent of its labour force.

However, within a generation, the country had transformed itself into a 'Newly Industrialized Country (NIC). From an agricultural based economy in the 1960s, the country is today a technology and knowledge driven economy. By 2014, South Korea had become the 13th largest in the world. Its GDP per capita stands at USD 28,739.

### Korea's 5 Major Export Commodities in 2014(US\$ billion)

Year	Electronics goods	Automobile	Computers and Machinery	Chemical Products	Shipbuilding
2014	138.23	73.3	63.0	52.4	46.7
2010	110.8	53.4	52.0	32.6	38.3

Source: Korea Statistics Office (2015)

**H**ow did she do it? The government of Park Jung Hee launched the country's structural transformation strategy in 1962 with the first Five-year Economic Development Plan. A labour-intensive, export-oriented industrialization (i.e. e.g. textiles, light industries) and poverty eradication topped the agenda of this plan. The plan sought to promote exports in selected strategic industries. This included the establishment of performance targets (e.g. exports, technological upgrading). The first five year development plan was succeeded by successive 5-year development plans, each focusing on different priority industries. The 1973-1978 Development Plan (Heavy Chemical Industrialization) focused on the promotion of heavy and chemical industries. Capital intensive industries such as iron and steel, chemical, shipbuilding, and automobile were given priority in the 1970s. Investments went into the manufacture of steel, non-ferrous metals, machinery, shipbuilding, electronics and chemicals. The government introduced special interest loans, export subsidies and other tax incentives for export industries. The Korean strategy has been characterized as 'Outward Looking or Export Oriented Industrialization (EOI). The export sector has been a driving force of South Korea's

development. Earnings from exports allowed the country to import industrial raw materials, capital goods and foreign technologies. The country transitioned from exporting mainly primary products such as minerals (in the 1960s) to low technology, labour intensive products such as textile in the 1970s and to more to more sophisticated industrial products (e.g. semi-conductors, ICTs) from the 1980s onwards. Many of the industries that were promoted under this policy remain competitive today. These include: petrochemicals, iron, steel and ship building, and automobile industries are some of the best examples. (Consider that South Korea does not have oil for example).

The Korean economy became more liberalized and integrated into the world economy in the 1990s. The country joined the OECD in 1996. The Asian financial crisis of 1997 marked a temporary departure from the country's core economic policy. The country turned to the IMF for a financial 'bail out' and a number of large conglomerates went into bankruptcy. After the Asian economic crisis, the country strengthened its capacity to compete in the international market by focusing more on the knowledge-based economy.



## Korea's Annual Trade Growth in 2000-14(US\$ billion)

Year	Export	Import	Balance
2000	172.2	160.5	+11.8
2004	254.2	224.5	+29.7
2008	363.5	323.1	+22.0
2012	547.9	519.6	+28.3
2014	572.7	525.5	+47.2

Source: Korea Statistics Office (2015)

### Lessons for Africa?

In about the same time that as many African countries have been independent (i.e. since the early 1960s), South Korea has transformed her economy from low technology, labour intensive industries to capital intensive industries and finally to high technology and knowledge intensive industries. Along the way, it has managed to create a highly skilled labour force, a vibrant private sector and a highly competent civil service. Along the way, it managed to eradicate poverty. What can Africa learn from this experience?

### A strong public sector

There are lessons that African countries could learn from the South Korean development experience. First of all, effective policy formulation and implementation requires strong and competent public institutions, beginning with a strong, development minded or oriented state and a merit based bureaucratic system. The public sector must be able to formulate and to implement fiscal, monetary and other macroeconomic policies that are sound, stable and forward looking. Implementing a development or industrial policy requires strong and competent institutions (there are multiple interests to weigh, after all). Political stability is critical because without it, there can be no macroeconomic stability or certainty.

Secondly, investing early in skilled labour force is important. It is particularly important to invest in science, technology and research and development. South Korea's current global competitiveness in high technology industries can be traced back to its investments in education, science, technology and R&D beginning in the mid-1960s.

Thirdly, a 'balanced growth' approach or simultaneous investments in both agricultural and industrial sectors, urban and rural areas, large scale industries and small and medium size industries might help in creating vital inter-sectoral linkages and accelerate poverty reduction. In the 1970s, the Republic of Korea introduced the Saemaul Undong Movement. The Saemaul Undong was a community driven movement that contributed to poverty reduction in rural communities through agricultural production, communal empowerment and regeneration, and women's participation in economic development. South Korea did not start out with a strong or even competent state and or public institutions. It built one from the early 1960s onwards. It is possible for African countries to build strong, competent, and development oriented public institutions.

### A strong private sector

With government support and a diverse set of incentives the private sector in South Korea was able to produce quality products for the international market. The private sector has to be the driving force of economic development in Africa. African governments must find ways to create conditions that enable the private sector to play a pro-active role in economic development. Social and physical infrastructure and a skilled labour force, are key in this process. While Africa may not be able to replicate all the industrial policy tools used by South Korea (due for example to WTO induced changes in global trade rules) there are still many instruments they can use to provide the 'incentivize' businesses to invest in national priority sectors. South Korea manipulated its

domestic market to create, protect and incentivize its private sector (i.e. Chaebols) to play a positive role in its economic development. Some of the tools available to South Korea might not be available to many African countries today. Nevertheless, they can still do a lot to promote the growth of a vibrant private sector and to co-opt them in the national development process.

### Social and environmental protection

Trade unions faced tight regulations in South Korea until the late 1980s. Environmental protection regulations also came relatively late in the Korean development experience. There is no reason why African countries should replicate these trends. Both might be critical to political stability, poverty reduction and sustainable development although this will depend on the nature of the relationship between the state, unions and the private sector.

### China

The economic development of China has been a boon to the South Korean economy. The rapid growth of the Chinese economy has allowed a number of South Korean businesses to expand into China, especially after the 2008 global financial crisis. A number of South Korean companies have moved their manufacturing facilities to China. Presently, China is South Korea's largest trading partner and South Korea is China's third largest. Obviously, Africa cannot replicate South Korea's trading successes with China. Nevertheless, the large size of the Chinese market and its un-orthodox development policies present potentially good opportunities for Africa's development. ■



# CHINA

## THE 'ONE BELT, ONE ROAD' INITIATIVE

Daniel Poon

United Nations Conference on Trade and Development (UNCTAD)

**China's "going out" strategy formally began in the early 2000s with the broad objective of promoting the foreign expansion of Chinese firms to improve resource allocation and international competitiveness.**

China's annual outward FDI flows have grown from around \$2bn in the late 1990s, to \$101bn in 2013. This still only represents 7.2 per cent of annual global FDI outflows in 2013, but the world economy could be on the cusp of the next phase in China's foreign policy - a more active Chinese participation in global economic governance. In 2014, a Deutsche Bank report argued that with the pace of domestic growth and investment slowing, China is expected to continue generating large current account surpluses that will enable it to shift from its reputation as the "factory of the world" to that of the "investor to the world". In the context of weak global economic growth, "how the world absorbs China's large current account surpluses will define the next round of economic expansion", the report concluded.

This is the context within which one must view initiatives such as the China-led Asian Infrastructure Investment Bank (AIIB) and the New Development Bank (NDB). Both initiatives, viewed by some as potential rivals to existing

financial institutions such as the World Bank and the Asian Development Bank (ADB), represent China's emerging 'Plan B' for revamping the global development and financial architecture. Whereas 'Plan A' mainly pursued reforms within pre-existing global institutions and processes, 'Plan B' seeks to use a mixture of cooperation and competition to facilitate changes that better reflect the growing economic heft and interests of emerging economies.

This could signal a shift from the orientation of past Chinese regimes that generally sought a low profile in foreign relations, preferring to focus on domestic development instead. One of Deng Xiaoping's most striking foreign policy maxims was, "never become a leader". The advent of China-inspired multilateral financial institutions could usher in a new phase in China's foreign policy: one where China is actively learning to lead in the Asia region and beyond. The AIIB and the Silk Road Fund (SRF) are key financial instruments of a broader Chinese initiative known as "One Belt, One Road". The One Belt, One Road Initiative (IBIR) seeks to promote Asian

regional economic cooperation and integration primarily through investments in infrastructure: railways, air routes, ports, roads, power plants and refineries.

For other developing countries, however, there is even more at stake in China's growing interest in international economic governance. The China's economic development model has been predicated on the strategic use of unorthodox development policy tools including: industrial policy, state banks and enterprises, capital controls, stable and competitive exchange rates and low interest rates. Though industrial policy tools remain pivotal to the process of economic development and structural transformation, such tools are often off-limits for many other developing countries due to the prevailing development 'orthodoxy' of many of their development partners. That leaves China, through its Chinese inspired multilateral financial institutions, with an excellent opportunity to champion industrial policy as an effective tool in economic development. Should it decide, it could significantly re-orient economic doc-

trine in many developing countries by steering its investments and foreign aid towards industrial policy. In using an array of industrial policy tools, China is piecing together the ladder of development that was “kicked away” (to use Ha-Joon Chang’s apt phrase) by today’s developed countries. China’s economic development model may serve as an immediate and pragmatic example for other developing countries to follow. The ‘One Belt, One Road Initiative’

(IBIR)

The 1B1R strategy was first articulated by President Xi Jinping in successive trips to Southeast Asia in 2013 when he raised the idea of a ‘Silk Road Economic Belt’ and the ‘21st Century Maritime Silk Road’. In the latest version of the initiative, the overland ‘Belt’ includes three directions: from China to central Asia and Russia, then on to Europe; from China to central Asia, heading

south through the Middle East and on to the Persian Gulf and the Mediterranean Sea; and from China to Southeast Asia, onward to South Asia and the Indian Ocean. The maritime ‘Road’ starts from Chinese eastern ports, towards the South China Sea, onward to the Indian Ocean and then to Europe. A branch of the maritime ‘Road’ also extends south-east from the South China Sea to the South Pacific Ocean (see Map 1).



**Map 1. Geographic Contours of the “One Belt, One Road” Strategy**  
 Source: China Daily, 15 April. See, [http://europe.chinadaily.com.cn/business/2015-04/15/content\\_20435638.html](http://europe.chinadaily.com.cn/business/2015-04/15/content_20435638.html)

Fifty seven countries (including China) are founding members, and are expected to complete negotiations over its Articles of Agreement by late June 2015 – with operations to begin by year-end. China and 20 countries signed an MOU last October to establish the AIIB, to be based in Beijing. Thirty-six have since become founding members (Table 1). To become a founding member, a country had to submit a formal “confirmation letter” to China. This had to be approved by the existing members (although not all applicants followed this process). The application deadline for founding members was March 31. Countries applying after this date will be “regular” AIIB members. The list of founding members was finalized on April 15.

**Post-MOU AIIB Founding Member Countries, 2014-2015**

- |                |                      |
|----------------|----------------------|
| Indonesia      | Denmark              |
| Maldives       | Australia            |
| New Zealand    | Finland              |
| Saudi Arabia   | Russia               |
| Tajikistan     | Kyrgyzstan           |
| Jordan         | Sweden               |
| United Kingdom | Iceland              |
| France         | Portugal             |
| Italy          | Iran                 |
| Germany        | United Arab Emirates |
| Luxembourg     | Malta                |
| Switzerland    | Spain                |
| Turkey         | Egypt                |
| South Korea    | Norway               |
| Austria        | Israel               |
| Netherlands    | South Africa         |
| Brazil         | Azerbaijan           |
| Georgia        | Poland               |

Last October, the Ministry of Finance (MoF) stated that founding members agreed that shareholding will be allocated according to a member country's GDP size. This makes China the largest shareholder in AIIB, although China has stated that it is not seeking to be the "lone, big shareholder" with a 50 per cent stake. The creation of AIIB regional offices and senior management appointments will be subject to further consultation and negotiation. China is the standing chairman of the negotiators' meetings, to be co-chaired by the member country hosting the event. Also, an interim multilateral secretariat has been established to support the work of the institution, headed by Chinese economist Jin Liqun.

### **Silk Road Fund: a Key South-South Financial Building Block?**

In President Xi's speech at APEC in November

2014, he formally announced China's plans to establish the SRF with \$40bn for investment in countries along the 1B1R initiative in infrastructure, natural resource development, industrial and financial cooperation, and other related projects. Xi stressed that China seeks to do more than just build roads and bridges, but to enhance "inter-connectivity" in the Asia-Pacific region in five key areas: policy, infrastructure, trade, finance, and people. By February 2015, Xi confirmed that AIIB's main role is to provide financing for building infrastructure in Asia and the 1B1R.

Little is known about the SRF, but Chinese media have reported it will be capitalized by four state agencies: State Administration of Foreign Exchange (SAFE), China Investment Corp. (CIC), China Export-Import Bank (China Exim Bank), and China Development Bank (CDB). The SRF was officially registered on December 29 2014 in Beijing and held its first Board of Directors meeting on January 6th, 2015.

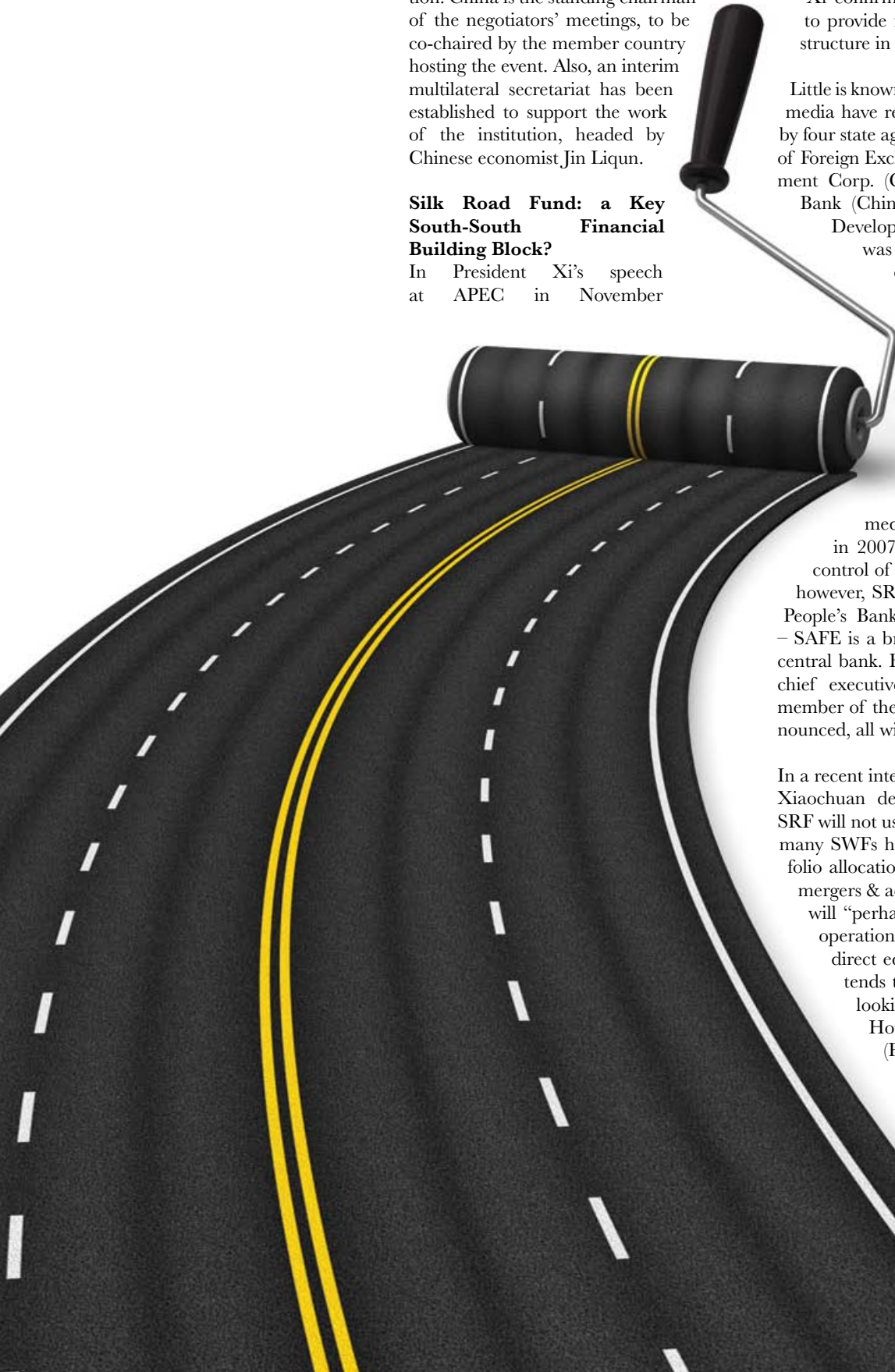
SRF could be viewed as China's latest sovereign wealth fund (SWF) initiative and has been referred to as the "second CIC" in some Chinese media. The CIC was created in 2007 and put under managerial control of the MoF. This time around, however, SRF appears to have a distinct People's Bank of China (PBoC) imprint - SAFE is a branch of the PBoC, China's central bank. By early February, the SRF's chief executive, general manager, and a member of the board of directors were announced, all with a PBoC background.

In a recent interview, PBoC governor Zhou Xiaochuan declared that at present the SRF will not use the SWF concept, because many SWFs have a clear investment portfolio allocation among stocks, bonds, and mergers & acquisitions, whereas the SRF will "perhaps concentrate more on co-operation projects" - particularly on direct equity investment. Zhou contends that there are many projects looking for equity investment.

However, many private equity (PE) firms have short investment horizons of 7-10 years.

There is thus, a need for longer-term infrastructure investment funds.

Zhou hopes that others will look at SRF as a kind of PE invest-





tor, but with a longer time horizon of 15 years or more for returns.

Zhou also highlighted how the SRF will work with other Chinese state financial institutions in a selected project equity and debt financing. Though he said that competition can never be ruled out, he stressed that cooperation would take the form of joint equity investments by SRF and other investors in a needed project, at which time China Exim Bank and CDB could follow with loans for debt financing. CIC could also partially participate in equity investments. The SRF and AIIB could cooperate in arranging both equity and debt financing. Add in the NDB, and a constellation Chinese led South-South development finance institutions begins to take shape.

### A Fine Balance

Though Zhou also suggested that experiences of China Exim Bank and CDB will have a beneficial impact on the future development of SRF, many observers believe striking a balance between political and economic interest will be the biggest challenge facing the 1B1R initiative. For example, in looking at some of China's previous domestic regional infrastructure building plans, some analysts believe that many did not meet their goals because "financial returns were not the key investment concern".

Perhaps more tellingly, Finance Minister Lou Jiwei argued that in learning from existing multilateral banks' experience, the AIIB will have strict but practical safeguard policies in order to reduce costs and improve operating efficiency. According to Deputy Finance Minister Shi Yaobin, existing multilateral institutions have continuously improved safeguard policies and have made important reforms. He argued that strictly speaking, there are no "best practices", only "better practices". For Zhao Changhui, a risk analyst at China Exim Bank, 1B1R-related projects should meet at least three conditions: ability to finance large scale transnational infrastructure projects; projects should go beyond infrastructure to include value-added manufacturing sectors such as petroleum and steel refining; projects must be firmly founded on multilateral consensus. Others, like Zhu Jiejun of Fudan University's BRICS Research Centre, called for greater consideration of localization in related projects and cooperation with host-country development banks. Even President Xi, during his APEC speech, suggested that countries could cooperate on financial support through regional, industry, or project-specific subsidiary funds.

### Never become a leader?

The 1B1R initiative is arguably China's attempt at learning to lead in the Asia-Pacific region, using its development model as a guide. In his APEC speech, Xi offered a metaphor to explain the initiative: "if 'One Road, One Belt' can be regarded as the two wings of Asia's take-off, then interconnectivity is like the arteries and veins of the two wings." It might be tempting to view China's growing interest in global economic governance from the old Cold War mindset. However, it would be more pragmatic to look at these new Chinese inspired multilateral financial institutions as mechanisms for facilitating the provision of much desired public goods in the form of infrastructure financing – a hugely unmet need in much of the developing world. Indeed, Chinese-led financial institutions have not ruled out the possibility of cooperating and co-financing projects with existing multilateral institutions.

Though industrial policy tools remain pivotal to the process of economic development and structural transformation, such tools are often off-limits for many other developing countries due to the prevailing development 'orthodoxy' of many of their development partners.

The new China-led financial institutions like the AIIB, the NDB, and the SRF remain works in progress. However, it is possible to envision their potential roles as part of an emerging constellation of 'South' led development finance institutions, more sympathetic to development ideology in many developing countries. Chinese development assistance has had its problems in some developing countries. These new 'instruments' will have their limitations too. Nevertheless, they provide an additional window for developing countries to leverage the much needed resources for their development.

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# HARNESSING APPLICATIONS OF LIGHT FOR SUSTAINABLE DEVELOPMENT

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**People throughout the world and across history have always attached great importance to light. We see this in cultural symbolism, myths and legends, and in the many ways that studying the science of light and applying it in practical applications has shaped the societies in which we live.**

**P**eople throughout the world and across history have always attached great importance to light. We see this in cultural symbolism, myths and legends, and in the many ways that studying the science of light and applying it in practical applications has shaped the societies in which we live. Light is central to our planet and our existence. On the most fundamental level- through photosynthesis- it is light from the sun which drives life itself; in our daily lives, the light-based technologies of photonics give us applications such as internet communications, modern manufacturing, the fabrication of computer chips, and medical imaging.

In recognition of the importance of light in so many areas of life, the United Nations has proclaimed the year 2015 as the International Year of Light and Light-based Technologies. This International Year has grown from an initiative of a large consortium of many different partners together with UNESCO, and its overarching objective is to raise worldwide awareness of how important the science and technology of light is for humankind, and the many ways in which photonics provides solutions to problems of global importance.

The world today faces many urgent challenges, such as providing food to a growing population; developing clean

sources of energy that can promote growth whilst having low carbon footprint; improving education; reducing poverty and inequality; improving healthcare and quality of life for all. These challenges are of course addressed in the proposed Sustainable Development goals which are expected to frame governmental actions relating to the United Nations Post-2015 Development Agenda. But as discussions of these goals gathers pace in the countdown to their adoption, it is the ideal time to recall that one of the central messages of the International Year of Light is that light science and technologies provide practical and cost-effective solutions to meet many of these challenges.

In what follows we provide an overview of the many ways in which light science can aid sustainable development. The examples below are of course not exhaustive, and a selection of further reading is provided. But we hope that the selection of applications we have chosen highlights just in how many ways light-based technologies can lead to practical solutions that can extend social, medical, and energy generating benefits to billions of people in the world today.

## **Agriculture and Farming**

The food and agriculture sector is essential to sustainable development. Indeed,

ending hunger, ensuring food security, and promoting sustainable agriculture are key objectives of the Sustainable Development Goal targets. In many developing countries, agriculture is also the backbone of the economy, and is a key for long-term and inclusive growth due to its strong multiplier impact on other sectors.

Light-based technologies can play an important role in improving agriculture and farming through the area of agri-photonics. Lasers and imaging sensors on planes can be used to map soils and crop density, and reflectance data from vegetation can be used to determine very specific information such as the amount of nitrogen present in plants. Lasers and telescopes can be used to monitor evaporation and guide decisions on irrigation, and with appropriate lighting, vegetables and fruits can be grown indoors outside of their normal season, opening up possibilities for crop-cultivation year-round, even in inhospitable regions.

## **Climate Science**

Developing countries are at the front-line of human-induced climate change over the next century. According to the IPCC Fifth Assessment Report, throughout the 21st century climate change is expected to lead to increases in ill-health in many regions, and especially in developing countries with low income. Rural areas are expected

to experience major impacts on water availability and supply, food security, infrastructure and agricultural incomes, including shifts in the production areas of food and non-food crops around the world.

Light-based technologies are critical for monitoring and predicting the consequences of climate change. They are extensively used to map radiation emitted from the Earth's surface using radiometers, scanners and sensors placed in satellites orbiting our planet. These measurements are transmitted to ground stations where the data is converted to images that provide information on ocean currents or global carbon-dioxide distribution. Of course, mitigating the effects of climate change will also rely heavily on light-based technologies in the field of renewable energy as described below.

### Communications

The visible light that we can see is only a small part of the spectrum of electromagnetic radiation that finds important and widespread use in modern society. It is invisible microwave electromagnetic radiation that is used in mobile telephone communications and satellite networks, and it is the invisible light from infrared lasers that carries the pulsed signals of optical information under the oceans and across continents via the optical fiber infrastructure of the Internet.

The importance of communications for development is stressed by the UN Broadband Commission for Digital Development, who have recently stated how access to mobile devices (phones, tablets and e-readers) with broadband internet connectivity can bring quality education to people everywhere, especially in the world's poorest or most isolated communities. Although it is technology such as fibre to the home (FTTH) that is being emphasized in many developed countries, it is mobile broadband that is perceived as the most practical solutions for many developing countries. The International Telecommunications Union (ITU) reports that mobile broadband is the fastest growing technology in history - mobile phone subscriptions now exceed the world's total population, and active mobile

broadband subscriptions exceed 2.1 billion! Significantly, most of this progress has taken place in developing countries, which account for 82% of net additions of new Internet users globally in the last five years. The UN Broadband Com-

Rural areas are expected to experience major impacts on water availability and supply, food security, infrastructure and agricultural incomes, including shifts in the production areas of food and non-food crops around the world.

mission and the ITU are pushing hard to ensure that mobile broadband can fulfil its potential to improve education and development.

This was expressed eloquently by ITU Secretary-General Houlin Zhao during the 11th meeting of the UN Broadband Commission in February 2015: "For the first time in history, mobile broadband gives us the chance to truly bring education to all, regardless of a person's geographical location, linguistic and cultural frameworks, or ready access to infrastructure like schools and transport."

### Education and Training

In addition to the use of light-based technologies to improve educational infrastructure, light science is an ideal subject to stimulate interest in STEM (science, technology, engineering, mathematics) subjects in a classroom context. This has been recognized for many years by UNESCO, the UNESCO Category I Centre ICTP (International Centre for Theoretical Physics) and the International Society for Optics and Photonics (SPIE) who have developed a global programme on Active Learning in Optics and Photonics (ALOP). Inquiry-based, or active learning encourages students to construct the knowledge from their own observations, guided by a facilitator whose role it is to lead them from observation to discovery.

This is on contrast to the normal classroom scenario in which the teacher lectures and the students passively absorb as much information as they can, which, by itself, is known to be inadequate in developing correct conceptual understanding of the underlying physics. ALOP modules have been developed for many subjects, from the basics to the

advanced: Geometrical Optics, Lenses and Optics of the Eye, Interference and Diffraction, Atmospheric Optics, Optical Data Transmission and Wavelength Division Multiplexing. In many cases the cost of material is low, and courses can be adapted to many diverse cultures.

ALOP courses are not aimed at students, however, but are focused on teachers – "training the trainers." This is an essential part of the philosophy, and indeed since

2004, ALOP workshops have reached over 1,000 teachers from 55 developing countries in Africa, Asia and Latin America. The participants are typically lecturers in universities as well as some secondary school teachers of physics. Follow-up activities, in which trained trainers train others locally are an important part of the strategy and this has been very successful in a number of regions around the world. ALOP workshops also provide practical examples of how Interactive Lecture Demonstrations using light-technologies can be used in large classes.

One example involves image formation and serves to also illustrate how significant learning gains can be achieved with low-cost materials and without "black-box" solutions which can sometimes be counter-productive. For instance, a cylindrical lens can be designed from a transparent plastic container jar filled with water, using a 9V battery and flashlight bulb as light source.

### Energy and Lighting



Credit: SolarAid/Kat Harrison

When one thinks of harnessing light-based technologies for sustainable development, renewable energy through solar power would likely be the first thing that came to mind for most people. After all, many developing countries have abundant solar energy resources (insolation), and the use of solar energy is ideally-suited to providing an off-grid energy supply as a sustainable alternative to the diesel generators which would otherwise be used.

There remain many challenges to address, but research is advancing rapidly in the underlying physics and materials science, the development of storage technologies, and in optimising and comparing the technologies of photovoltaics and solar thermal collection. Although the economics of deployment in the energy sector can be complex, the International Energy Agency encapsulated the issues well in its 2011 report when they stated explicitly that solar energy "...will increase countries' energy security...enhance sustainability, reduce pollution, lower the costs of mitigating climate change, and keep fossil fuel prices lower than otherwise. These advantages are global. Hence the additional costs of the incentives for early deployment should be considered learning investments."

Closely coupled to the availability of energy is the availability of lighting. With no reliable source of light, many people in developing communities depend on kerosene lamps for light, which has been estimated to lead to the death of over a million people every year. Providing clean, efficient forms of lighting to developing communities is not only important for health reasons - it is also vital for productivity. Families in rural communities rely on work to provide for the most basic needs of their family, but working hours can be limited due to scarce lighting after sunset. The majority of children in developing countries are also expected to work during the day to help provide for their family. With no, or inadequate, light at night, children are deprived of an education. Although longer term solutions will require clear policies on renewable energy on the regional level, many industries and NGOs and other associations are working on the ground to promote the use of portable solar-powered high-brightness LED lanterns in regions where there is little or no other reliable source of light.

A low power LED lighting system can give children in developing regions

enough light to read, helping them with their schooling.

### Healthcare and Medicine

Optical technologies play a key role in medicine from simple diagnostics and monitoring, to advanced treatment options and research. Photonics appears in very simple and widespread devices: clip-on pulse oximeters use the transmission of light from an LED through a finger to measure oxygen saturation and heart rate, and ear thermometers use infrared light detectors to provide a safe and reliable measurement of body temperature. Imaging and surgery have been revolutionized with the use of endoscopy and laparoscopy, and light-based technologies and lasers find important uses in many medical procedures including neurosurgery, dermatology, dentistry, vision correction, heart surgery, and reconstructive procedures. Many light-based therapies have also proven effective for detecting and treating cancer. One example of a light-based technique to treat cancer is photodynamic therapy, where a patient is given a nontoxic photosensitive drug that is absorbed by cancer cells. During surgery, a light beam is positioned at the tumour site, which then activates the drug to become toxic to targeted malignant cells.

In developing countries, there are of course many challenges in ensuring the best healthcare treatments are available, but the advanced technology of the smartphone promises huge potential to revolutionise medicine in low-resource areas. Such technology-based mobile health can take many forms. For example, a specialised mobile app and lens adapter can convert a smartphone into a device that can take diagnostic-quality images of cataracts. The resulting image can then be sent by email to a remote expert for evaluation and recommendation for treatment, and the ability to geotag results with built-in GPS facilitates record-keeping for field workers. Other examinations possible with a smartphone include retina screening, depth of field tests, colour vision testing, and visual acuity. Beyond testing vision, adaptations to turn smartphones into microscopes are allowing for detection

of parasites in blood or stools.

There is, of course, much work to be done in moving from demonstration to large-scale uptake, but the smartphone is one of the most advanced technological devices ever made, with state-of-the-art imaging and communications built-in. It is clear that it has tremendous potential as a portable mobile laboratory. Recent years have seen dramatic strides in the field of telemedicine in general, the use of telecommunication and information technologies to provide access to medical services that would often not be consistently available at a distance. The smartphone may well be showing the way towards the democratization of healthcare in developing countries.

### Vision and Seeing



*Symon from Zomba Malawi trying new glasses provided by the one dollar glasses initiative.*

*(Credit: Wolfram Cüppers)*

People in developed countries take eyeglasses and good vision for granted. However, worldwide estimates of those who suffer from uncorrected defective eyesight range from the 100's of millions to over a billion adults and children! Far more than just an "inconvenience," the worldwide lack of eyeglasses to correct vision prohibits people from working and taking care of their families and has a negative effect on children's schooling and study. In fact, one 2012 study estimated the loss in GDP due to uncorrected vision was US\$ 202 billion annually!

Looking at this objectively, it may seem hard to understand – after all, eyeglasses are a 13th century (!) optical technology, and techniques for their inexpensive mass production have existed for

decades. But it is also easy to see how bottlenecks can arise with testing, prescription and distribution. A number of NGOs and industries are therefore working on complementary approaches to solve these problems. One approach uses fluid filled lenses where a user can self-adjust the eyeglasses, allowing a very convenient way to select the appropriate correction. Another idea uses low cost prefabricated lenses and a compact bending machine to create frames from spring steel; this approach can also encourage the establishment of sustainable businesses producing and selling these glasses in local communities.

### Water Quality

Water is essential to human health. Despite impressive gains made over the last decades, billions worldwide still suffer from health problems due to the lack of clean water. Although much progress has been made in the use of conventional treatment processes, there is a continuous need for the development of new and complementary technologies to produce high quality water, especially in developing areas. Photonics technologies can significantly help in this regard by improving both water quality assessment and access to clean sources of water. For instance, low-cost water treatment systems powered by solar panels can decompose organic pollutants in water, and solar-powered well pumping has proven to be a sustainable, low-cost solution to provide drinking and irrigation water in off-grid locations in drought-prone regions. Research is also ongoing into the development of LED-based potable systems for point of use purification.

### Conclusion

Light-based technologies are pervasive in the everyday lives of people living in affluent areas of the world, but it is our hope that this series of examples illustrates the many applications that can have a real impact on sustainable development. It is appropriate here to quote from the message of Ban Ki-Moon in his message to the Opening Ceremony of the International Year of Light held in Paris on 19-20 January 2015: “As we strive to end poverty and promote shared prosperity, light technologies can offer practical solutions to global challenges.”

In concluding, it is perhaps worth recalling that when the laser was invented in 1960, it was described as a “solution looking for a problem.” Today, however, lasers are part of the everyday lives of billions of people living in affluent areas of the world, from driving the undersea global telecommunications network to the daily tech of barcode scanning at the supermarket. The last decades of research in advanced photonics has created many new technologies that provide practical solutions to problems in developing countries, but a bottleneck has arisen because the scientists and engineers working on the technologies are very often simply not aware of what these problems are. On the other side of the coin, it is often the case that political decision-makers as well as those working in developing regions are just not aware that these solutions may exist. The International Year of Light asks the scientific community to work to



*The message from Ban Ki-Moon being read at the Opening Ceremony of the International Year of Light at UNESCO HQ in Paris on 19 January 2015 (Credit: Dan Curticapaen)*

bridge this gap in knowledge and understanding, and it is our hope that this article takes a positive forward step in achieving this. ■

### Further Reading

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### Author Biographies

*John Dudley (@johnmdudley) is Professor at the University of Franche-Comte in Besancon, France. He has published over 500 contributions in journals & conference proceedings, and delivered over 120 invited talks at major conferences. He regularly speaks on topics including: his own research in nonlinear optics; global research trends in photonics; extreme events in nature; public outreach & education; career development. He is Fellow of OSA, the IEEE and the European Optical Society. He served as the President of the European Physical Society for a two year term from April 2013-March 2015, and currently chairs the Steering Committee of the International Year of Light & Light-based Technologies 2015 (IYL2015).*

*Jorge Rivero González (@jorgegrivero) is a science communicator working at the European Physical Society (EPS) as the EPS IYL 2015 Outreach Officer. He is also editor of the IYL2015 blog. Before that he spent four years living in Munich while he was doing his PhD in Astrophysics at the University Observatory Munich. Since 2009 he is a member of the GalileoMobile project, a science education programme that brings astronomy closer to young people around the world, and has given him the possibility to share the wonders of astronomy with children in Bolivia, Peru and Brazil in 2009 and 2014.*

*Joseph Niemela (@joeniemela) is a senior researcher at the Abdus Salam International Center for Theoretical Physics (ICTP) in Trieste (Italy). Niemela conducts research in fluid dynamics and low-temperature physics, heads the ICTP Office of External Activities, organizes the annual ICTP Winter College on Optics, and serves as the global secretariat for IYL2015. He has a PhD in physics from University of Oregon (USA).*



# SOLAR LED SOLUTIONS CAN END LIGHT POVERTY IN AFRICA

Harry Verhaar,  
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**The United Nations Educational, Scientific and Cultural Organization (UNESCO) has proclaimed 2015 as the International Year of Light. This global initiative brings together a broad-based consortium of stakeholders – including scientific societies and unions, educational institutions, technology platforms, non-profit organizations and private-sector partners.**

ts aim? To raise awareness of the power of light-based technologies in solving global challenges in energy, education, agriculture, public infrastructure and health.

Over 1.2 billion people around the world – one in five – are trapped in light poverty as they do not have access to electric light. In Africa, 65% of the population lives off the grid. Like food and water, light is a fundamental necessity that no one should be denied. Without artificial light, life grinds to a halt at sunset. Communal life stops, children are unable to study, and businesses are forced to close.

Most of those affected resort to kerosene lamps and candles to light their homes and businesses. But these very basic light sources claim the lives of 1.5 million people every year through respiratory illnesses and fires – the same number killed annually by HIV-related diseases. In Kenya, for example, 75,000 people, mostly women and children, get sick or even die every week as a direct result of inhaling smoke from kerosene lamps, wood fires and candles.

“And all this at a time when, elsewhere in the world, we’re learning how to print human organs, exploring self-driving cars, and recently landed a spacecraft on the surface of a comet more than 500 million kilometers away,” says Eric Rondolat, CEO of Philips Lighting. “The time has come for the world to recognize this inequality and unite to end light poverty and its stranglehold on human development. Especially when it could so easily be consigned to history by technology readily available today”

### **Solutions immediately to hand**

Light poverty affects huge parts of Africa, Asia and South America. In South Sudan, for example, as few as 1.5% of the population have access to electric light. The obvious solution might appear to be for affected countries to invest in electrical grids and power plants

to provide a reliable energy supply – and thus lighting – to all their citizens. In many countries, however, electrical grids are not viable due to the geographic and financial constraints of linking hundreds of remote communities. And yet, that is no reason for us to throw in the towel: innovative solutions are available, here and now.

Solar-powered LED lighting technology, for example, can provide light at a fraction of the cost of running kerosene lamps, without any of the health, safety or environmental dangers – or the need for major investment in infrastructure. A single solar-powered LED lantern uses zero energy and can fill a room with clean, electric light

working in the evening, safer and more practical. The Philips LifeLight Home lighting system even includes a USB port for solar-powered phone charging, thereby offering the dual benefit of light and connectivity.

“Today an estimated 560 million Africans live without electricity,” says Mary Kuria, General Manager, Philips Lighting East Africa. “For these people night-time means either darkness or the flickering light of a candle or kerosene lamp. However the disadvantages of kerosene lanterns are many, including safety, health risks and high costs. And the light output of these lanterns is so low as to make visibility for practical activities almost

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The time has come for the world to recognize this inequality and unite to end light poverty and its stranglehold on human development. Especially when it could so easily be consigned to history by technology readily available today

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for a one-off cost of \$10-20, compared to the \$50 annual fuel bill of running a kerosene lamp.

Reflecting its mission to improve people’s lives through meaningful innovation, Philips has expanded its portfolio of solar lighting solutions with the launch of Philips LifeLight, a range of 100% energy-efficient solar-powered LED lighting designed for homes in off-grid rural and semi-urban communities. The range was developed by the Nairobi-based Philips Africa Innovation Hub, a center for developing innovations specifically “in Africa, for Africa” in the areas of healthcare, lighting and healthy living. These lights make daily activities, such as studying or

impossible. Using the energy of the sun to power lighting solutions can make a true difference to people’s lives.”

Solar-powered technology is also a feature of Philips’ innovative fan-driven biomass cook stove (Jiko), which can reduce smoke and carbon monoxide emissions by more than 90% compared to an open fire, thus reducing the health risks of indoor cooking. The electric fan is powered by a long-lasting rechargeable battery that can be charged by connection to the mains or a 10 W solar panel.

### **Bringing whole communities to life at night**

On a larger scale, energy-efficient

LED luminaires and solar panels can be combined to produce sustainable lighting in public places, again without the need for costly infrastructure. These Community Light Centers (CLCs) – roughly the size of a small football pitch – are relatively inexpensive, easy to install and maintain, and far more reliable than electrical grids, which regularly suffer from outages in remote areas. Enabling healthcare services and businesses to operate after sunset, as well as encouraging sports and other social activities, these centers allow communities to thrive after dark. By the end of 2015 Philips will have installed 100 of them in rural Africa, where some 500 million people do not have access to electric light.

In the Democratic Republic of Congo, where those without electricity spend 20-30% of their household income on kerosene to light their

global level, that figure stands at 19%. It has been calculated that approximately half of a city's energy bill goes on lighting – for public offices, schools and outdoor environments. We can make significant savings – on average 40% – simply by switching to energy-efficient lighting technologies. On a global level the potential savings amount to €128 billion in reduced electricity cost and 670 million tonnes of avoided CO2 emissions. If fully realized, that would represent a significant contribution in the fight against global climate change.”

Another advantage of using solar-powered LED technology, in this case for street lighting, is that it can be connected to smart lighting controls and software in fully integrated city-wide solutions. This offers substantial benefits such as further energy efficiencies (up to 80% compared to conventional lighting), increased safety and greater control of the lighting. For example, if there is no movement on the road, the lights dim or switch off. If there is movement, they switch on. And if there is an emergency situation, the light can be made brighter.

With connected LED lighting, lamp poles have the potential to become a form of digital real estate, providing additional functionalities and services which help to create safer, more efficient and more appealing urban environments, promote commerce and tourism, and attract inward investment. Technology like this offers African countries a very real opportunity

to leap-frog developed countries in the race toward full digital functionality and connectivity.

#### **Cost no object**

The cost of installing (solar-powered) LED-based public lighting can be recovered quickly from the savings on the reduced energy consumption. What's more, there are new performance-based business models and financing mechanisms that offer solutions involving little, if any, up-front cost.

For example, Philips has developed a new concept to deliver 'lighting as a service'. Typically, business customers pay only a service fee for the light they actually use, while Philips retains ownership of the fixtures. For the duration of the contract, the company installs, maintains and upgrades the lighting system as needed. And it re-uses, refurbishes or recycles the equipment at end-of-life, thus closing the materials loop. Cities around the world are embracing this capex-neutral, risk-free model.

There's more to light than meets the eye. Lighting can perform many other functions beyond the illumination of offices, shops, streets, etc. For instance, Philips has developed a range

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Solar-powered LED lighting technology, for example, can provide light at a fraction of the cost of running kerosene lamps, without any of the health, safety or environmental dangers – or the need for major investment in infrastructure.

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homes, Philips has recently completed the installation of solar-powered LED lighting in homes, streets, hospitals and Community Light Centers as part of a corporate giving/employee engagement initiative – the Philips Gift of Light project.

#### **Urbanization – opportunity and challenge**

It is not only off-grid rural and semi-urban communities that stand to gain from the adoption of (solar-powered) LED lighting technology. Far from it. A century ago around 10% of the world's population lived in cities. By the start of the 21st century this figure had risen to over 50%, and by 2050 over two thirds of us will be living in cities. We are also seeing this trend across Africa. Urban growth and transformation on this scale offers tremendous opportunities for economic and social development, but it also presents huge challenges, for example with regard to energy.

#### **Energy-efficient connected lighting**

“In Africa, lighting is thought to consume around 15% of the total electricity output of an industrialized economy like South Africa,” says Harry Verhaar, Head of Global Public & Government Affairs at Philips Lighting. “On a



of products specifically for horticulture. These LED lighting fixtures make use of specific wavelengths of light to stimulate and steer crop growth, thereby boosting local food productivity. The company has also developed a water purification solution that treats water with ultraviolet light to kill bacteria.

still needed on this subject, but the results of the investigations so far provide proof in concept that LED lamps can be customized to avoid specific areas of the spectrum that could have adverse environmental consequences, while still providing light for indoor use.

### **Huge opportunity for Africa**

1.3 billion people out of light poverty would not only end this stranglehold on economic, social and cultural development, but would also give a huge boost to global GDP,” says Philips Lighting CEO Eric Rondolat. “Political will, combined with entrepreneurial drive, can snuff out this injustice and create a brighter future if cemented by a com-



And in another exciting development, Philips Research in the Netherlands has been involved in investigations, led by Prof. Travis Longcore of the University of California, aimed at reducing the number of insects an LED bulb attracts while still delivering white light. Many insect species, such as sand flies and mosquitos, are attracted to light. Different insects are sensitive to particular combinations of wavelengths, which means that the type of bulb you use can actually increase the risk of catching insect-borne diseases. More research is

The potential benefits of solar LED lighting for Africa extend way beyond functional illumination. In India, studies indicate that improved electricity supply for lighting in Assam correlated to a 17% increase in literacy rates of people over the age of 6.

And the economic argument for installing solar-powered LED systems in the worst-affected communities is as compelling as the humanitarian obligation: access to light is a catalyst for growth in the areas that need it the most. “Lifting

mon purpose.”

And so, as we celebrate the International Year of Light and everything that light can do, it is time for governments, cities and businesses to embrace the technology that is already available – and deliver lasting positive change to communities currently blighted by light poverty across Africa. ■



# DOES AFRICA REALLY WANT YESTERDAY'S FUTURE?

Prof. Gabrielle Hecht  
University of Michigan

Four years after Fukushima, enthusiasm for nuclear power is back, spreading across – and connecting – the African and Asian continents. China, whose nuclear ambitions exceed all others, barely missed a beat: emitting assurances of safety and regulatory upgrades, it quickly resumed construction on what may become the world's largest nuclear fleet.

In India, local protests delayed the launch of the Kudankulam plant, but the first reactor is now operational and the government has just signed new agreements on nuclear cooperation with France and the US.

Desperate for more electricity, many African states are eager to follow suit. From South Africa to Niger, from Ghana to Kenya, atomic enthusiasm is gaining momentum. Uranium producers such as Niger and Namibia talk about transcending their colonial past by beneficiating their own raw materials. South Africa sidesteps its apartheid past, invokes earlier nuclear achievements, and insists it will build next generation reactors. Some non-uranium producing countries are even more zealous, issuing tenders and signing cooperation agreements with Russia or China (and sometimes both). Across the continent, energy ministers and entrepreneurs

wax eloquent about nuclear power's potential to create jobs, provide baseload electricity for industrial development, power homes, drive the economy, and ultimately catapult their nation to 21st century modernity.

## How can nuclear bring all these goodies?

Through cheap power, proclaim the enthusiasts. Insisting that the most developed countries around the world relied on atomic energy to achieve their present modernity, the publicity director for Kenya's Nuclear Electricity Board quoted 19th century electricity guru Thomas Edison: "we will make the cost of electricity so cheap that only the rich will burn candles." An official at Ghana's Ministry of Energy and Petroleum went a step further: nuclear energy, he enthused, "would be so cheap that we would not even have to price electricity."

Such scenarios are presented as visions of Africa's techno-future. But the dreams are as old (and tired) as the nuclear age itself. In his 1953 "Atoms for Peace" speech to the United Nations, US President Dwight Eisenhower called for experts to apply atomic energy "to the needs of agriculture, medicine, and other peaceful activities," adding that "a special purpose would be to provide abundant electrical energy in the power-starved areas of the world." The following year, the chairman of the US Atomic Energy Commission predicted that "our children will enjoy in their homes electrical energy too cheap to meter."

That phrase has become legendary for its sheer absurdity. Not a single nuclear operator has forgone metering and charging for electricity use – not even in France, whose state-run utility provides

75% of the nation's electricity. Indeed, a 2010 paper in the journal *Energy Policy* shows that French nuclear construction costs actually exhibit a negative learning curve: unlike other well-established technological systems, the costs of building nuclear power plants escalate over time. As recent proclamations show, however, the "too cheap to meter" idea has not lost its rhetorical appeal.

### Of Dreams and Damages

Of course, seven decades into the atomic age, even the zealots know they must acknowledge the dangers of their dreams. After all, the world has seen spectacular reactor accidents in the US (1979), the Soviet Union (1986), and Japan (2011). The first and smallest of these took fourteen years and nearly \$1 billion to clean up. Chernobyl costs are notoriously difficult to evaluate and still accumulating three decades after the accident, but \$300 billion (in 1990 dollars) is a commonly used figure. According to inflation calculators, that's equivalent to around \$550 billion in 2015 – higher than the GDP of Nigeria, Africa's largest economy. (Nigeria figures prominently among the continent's nuclear aspirants, having recently signed a co-operation agreement for 4 reactors with Rosatom.) As for Fukushima, no one really knows how much Japanese taxpayers will end up paying for the cleanup. Credible, conservative estimates range from \$100 to \$250 billion, and most agree that it will take at least four decades. Lesser-known – but still significant – accidents have occurred in Argentina, Brazil, Canada, France, Switzerland, and the United Kingdom. The UK gets the frequency prize, with at least six accidents.

Nuclear promoters aren't stupid. They know they have a public relations problem. So they pad their triumphalist techno-talk with reassuring promises: Parliaments will create regulatory authorities. Rules will be written, procedures followed, plants licensed, dangers monitored. The International Atomic Energy Agency (IAEA) will help; some even claim that the IAEA will monitor their reactors. The words of one highly placed Kenyan official typify this approach: "Without being bold, man could have not landed on the moon. We must emulate what others have done in the past and the present to be where they are. Kenya would successfully implement the nuclear energy by borrowing safety from countries which have used the energy for decades. We will observe the rules." Kenya would thus

follow "stringent global nuclear regulations."

History, however, teaches us that it's not that simple. Enthusiasts talk as though nuclear were a first-order infrastructure, a base for other forms of industrial development. But in order to work at all – let alone as promised – nuclear power depends on the smooth interoperability of many other infrastructures. These include electric grids (whose transmission lines need to be able to handle the 1000 MW reactors that Rosatom and other companies are trying to sell), good roads (to support the transportation of huge pieces of equipment), robust regulation (to manage the complex risks), and strong maintenance systems, among many others.

Consider regulation. It's not enough to create an agency and make rules. Mounting and running adequate regulatory infrastructures has proved particularly challenging, not the least because the experts best qualified to assess safety in nuclear plants are those who have helped to build and operate them. Even leading nuclear countries such as the US, France, and Japan, with large pools of scientific and engineering expertise, have a "revolving door" problem, as individuals move back and forth between industry and regulatory jobs. The Fukushima accident is partly attributable to deliberate regulatory negligence (which

is the IAEA is a regulatory body. Yes, global media often refer to the agency as the world's nuclear policeman or regulator, but this betrays a fundamental misunderstanding of its character. The IAEA has neither the funding, nor the capacity, nor the authority to make and enforce rules. It can provide technical assistance and advice, but those are only the first steps in crafting effective regulation. Since its inception in 1957, the IAEA's primary mission has been the promotion of civilian atomic energy. That's the mission the agency is fulfilling by conducting Integrated Nuclear Infrastructure Review (INIR) missions in Kenya, Morocco, and Nigeria this year. In the words of IAEA Director General Yukiya Amano, the missions "are part of the comprehensive package of assistance which the IAEA provides to help ensure that even the most challenging issues in introducing nuclear power can be successfully dealt with." INIR missions aim less at assessing whether a country can sustain a nuclear power programme than at midwifing such programme into existence.

Atomic enthusiasts rarely discuss the problem of liability. Yet this issue is central to all cooperation agreements. For example, South Africa's agreement with Russia makes absolutely clear that South Africa would pay for all damages in the event of an accident. South African media outlets expressed outrage when



**Yes, global media often refer to the agency as the world's nuclear policeman or regulator, but this betrays a fundamental misunderstanding of its character.**



some just call "corruption") stemming from this very tension. Effective regulation requires complex technological systems, including instrumentation, laboratories, a large pool of trained scientists and engineers, and much more. It's also expensive. And in order to be credible, it must be state funded.

As for "stringent global nuclear regulations," let's be clear: there are none. There are only recommendations. Nor

these terms became public. But such liability clauses are common. India alone attempted to enforce a law that would hold suppliers responsible for damages resulting from defective equipment. This deterred foreign firms from submitting reactor tenders. Undermining its own law, India has devised a complex insurance scheme, designed to pay for damages from coffers alimented in part by premiums paid by operators, and in part by the Indian state itself. Parallel

public-private liability arrangements prevail everywhere; no private insurer has proved willing to underwrite nuclear power plants. The IAEA has facilitated international conventions that could provide supplementary compensation, but at best these only kick in after states themselves pay very substantial damages. One way or the other, governments can expect to disburse crippling sums in the event of an accident.

### Africa's nuclear history

Like so many other techno-future dreams, African atomic enthusiasm (whether by Africa's elites or by the Asian, American, or European corporations seeking business there) bubbles along by ignoring large parts of the continent's nuclear history. When enthusiasts do invoke the past, they typically limit themselves to a discussion of research reactors, as though this represents the continent's only real engagement with the nuclear world. Consider this opening to a 2011 IAEA report, authored by members of the African Regional Cooperative Agreement:

"In 2009, Africa passed a milestone of fifty years of involvement with nuclear technology, dating from the initial criticality of the Democratic Republic of Congo's TRICO I research reactor at the University of Kinshasa. Egypt and South Africa soon followed, signaling a continental commitment to providing researchers, scientists, students and industries all across African access to modern nuclear analytical techniques and capabilities."

In this framing, Africa's nuclear history began in 1959, when the Kinshasa reactor went critical. Nuclear countries are those with reactors – other technologies don't count. In addition to the three countries mentioned in the quote, this rendition of African nuclearity includes only Algeria, Ghana, Libya, Morocco, and Nigeria.

Origin stories often have political utility. This one aims to bolster arguments in favor of building power reactors on the continent. But as with any history,

we must also ask what is left out of the lineage.

African places have been involved in the global history of nuclear things since the early 20th century, when the Shinkolobwe mine in Katanga furnished Marie Curie with radium for her experiments. That same mine provided pitchblende (extremely high-grade uranium) for the Hiroshima bomb, and continued to supply the US military throughout the 1950s. Meanwhile, the post-World War II atomic frenzy sent geologists to South Africa and Rhodesia in search of fuel for the UK's atomic bomb programme. France also headed south, finding significant uranium deposits

today's atomic enthusiasm – we need a broader vision of Africa's nuclear history.

### How did uranium lose nuclearity?

Let's revisit the creation of the IAEA in 1957. Because apartheid South Africa was a major supplier of uranium to the British and American weapons programmes, it was included as one of the 12 countries involved in designing the agency's governing statute. One important question involved determining which countries would secure permanent seats on the IAEA's Board of Governors. This was a technopolitical issue, which involved taking both technical "advancement" and political geogra-



in Madagascar, Gabon, and Niger. In return for allocating a portion of capital to host nations (typically 25-30%), French-owned companies continued to exploit these mines after independence. Throughout the second half of the 20th century, uranium mines in Africa provided fuel for weapons and reactors in North America, Europe, and East Asia.

For much of their history, however, these mines were not treated as fully nuclear sites. National regulatory agencies – when they existed at all – did little to monitor radiation exposure among mineworkers. Indeed, for many decades the IAEA itself didn't treat uranium ore and yellowcake as nuclear materials whose circulation required monitoring. In order to understand why this was the case – and how it matters for assessing

phy into account. Knowing that international opposition to apartheid would prevent its election to the board by the membership at large, South Africa lobbied hard to be appointed as the representative from the so-called Africa and Middle East region. On the strength of its uranium production, South Africa won the seat.

Barely a decade later, however, uranium mines lost their nuclear status. The IAEA's 1968 safeguards document specifically excluded mines and mills from the classification of "principal nuclear facility." The 1972 safeguards document further excluded uranium ore from the category of "source material." International authorities thus did not consider uranium as nuclear until it became feed for enrichment plants or

fuel for reactors.

Excepting uranium ore and yellowcake from the category of nuclear things meant that mines and yellowcake plants were formally excluded from the Nuclear Non-Proliferation Treaty's (NPT) safeguards and inspection regimes. Uranium's nuclearity plummeted because several uranium-producing countries—including apartheid South Africa—actively lobbied for such an exclusion starting in the late 1960s. South Africa, for one, now had other nuclear facilities and didn't need mines to qualify as a “nuclear” nation.

Denuclearization was driven by the desire to commodify. Freedom from direct inspections opened the possibility of

macy, rather than subjects of corporate negotiation.

Inspired by the Organization of Petroleum Exporting Countries' (OPEC) 70 percent increase in the price of crude oil in 1973, Diori sought similar leverage over the price of uranium. In 1974, he tried to emulate OPEC's model with the help of Gabon, France's other main uranium supplier. Niger's representatives argued that “the content of uranium transcended commercialism.” They reasoned that if Niger could contribute to the exceptional nuclearity of France, then surely France could make exceptional contributions to the economic development of Niger—notably, by paying a price for uranium that reflected its political, nuclear significance.

In response, the French delegation sought to denuclearize uranium by insisting on the banality of the market. Drawing upon IAEA definitions of what did and didn't count as a nuclear material—and upon various market devices that uranium mining corporations and international agencies used to convert uranium into a sellable commodity—the French insisted that the only possible way to determine the value of uranium was to treat it like an ordinary market commodity.

Trilateral discussions were interrupted when Diori was ousted by a military coup in April 1974. His successor, Seyni Kountché, went for a different sort of market arrangement. Kountché negotiated an agreement that entitled Niger to sell—directly and independently—a proportion of yellowcake output equal to the percentage of its capital holdings in the mining companies. This in turn freed Niger to develop a customer list that included Libya, Iraq, and Pakistan, all of which were willing to pay for the nuclear value of uranium.

Those customers dried up in the 1980s, however, as worldwide prices for uranium began to plummet. Large multinational mining companies rode out the storm by stockpiling yellowcake until prices rose. Unable to afford storage costs, Niger returned full control over sales and pricing to the French companies. Disputes resurge regularly, however, as successive Nigérien governments struggle to obtain higher prices for the country's yellowcake.

#### **Yesterday's modernity**

Grand promises of modernity accompanied the launch of uranium extraction in Niger, especially around the con-

struction of Arlit, the mining town built to house company employees. Yet Niger consistently ranks at or near the bottom of the United Nations Human Development Index. For over a decade, Nigérien civil society has probed this paradox, elucidating the social, economic, health, and environmental dimensions of uranium mining. In 2003, Aghir In'Man, a local NGO started by an employee of the Somair uranium mine, invited scientists from a French NGO to measure radiation levels in Arlit. They found radioactive scrap metal in market stalls, where it was being repurposed for cooking pots and washbasins. Contaminated water flowed from community taps throughout town. Water used to protect unpaved roads against high desert winds left uranium residues. As these findings became public, more NGOs formed, including a “publish what you pay” organization focused on issues of financial transparency and accountability.

These observers conclude that obstacles to building regulatory capacity in Niger are compounded by widespread corruption. For decades, they insist, uranium revenues flowed primarily into fancy buildings in Niamey and private bank accounts of government officials. Under these circumstances, could any Nigérien state agency maintain the independence required for credible expertise? Niger's Centre national de la radioprotection (CNRP), a state regulatory body for radiological hazards, was not established until 1998 — three decades after the launch of the first uranium mine. Over a decade later, one of its officials noted ruefully that the CNRP still didn't possess instruments that could measure radon levels. Anticipating two such detectors to arrive soon, he nevertheless expressed faith in the expertise and transparency of radiation protection at the mines. Needless to say, NGOs in Arlit do not share his confidence that two radon detectors suffice to monitor some of the world's largest uranium mines.

Niger's history with uranium is not unique. When communities in eastern Gabon learned about the efforts of the Nigérien NGOs, they too solicited help mapping out radioactive contamination in the region around Mounana, where a French-owned company mined uranium from 1957 to 1999. A team of scientists, doctors and lawyers went to Mounana in 2006, where they took independent environmental readings and interviewed nearly 500 former mine employees about their health and work experience. Most employees reported

## Throughout the second half of the 20th century, uranium mines in Africa provided fuel for weapons and reactors in North America, Europe, and East Asia.

treating uranium (in yellowcake form) not as an exceptionally nuclear thing that had to be carefully monitored, but rather as a banal commodity like any other—one that could (in principle) be bought and sold without government or international oversight. This had direct consequences for the pricing and marketing of African uranium.

#### **The price of non-nuclearity**

Consider Niger, currently the world's fourth largest uranium producer. When he came to power in 1960, Hamani Diori, Niger's first postcolonial president, sought to maximize the benefits of deposits discovered by the French in order to secure his nation's sovereignty over its natural resources. Diori got two successive French presidents to acknowledge, in writing, the special significance of uranium-related transactions. This enabled him to discuss uranium revenues and prices as matters of state diplo-

no formal training on radiation or radon-related risks and no feedback on their monthly dosimetric readings. The Gabonese state had done nothing to monitor working conditions or occupational health. One former medical doctor testified that company clinicians had no training in uranium-related occupational health and that the company's radiation protection division consistently refused to transmit dosimetric readings to the medical division. Residents displayed a range of symptoms, but their illnesses remained undiagnosed and untreated.

In response to the ensuing public relations scandals, Areva – France's nuclear parastatal – promised to install “health observatories” in Gabon and Niger. Two of the French NGOs involved in the 2006 investigations agreed to participate in a joint committee that would name experts to oversee the observatories, define protocols for data collection, analyze results, and make proposals to improve the environment at the sites. But other NGOs were skeptical that the agreement would result in prompt, effective remediation. Even less promising was the fact that no residents or workers were included, a striking oversight given how little Nigérien and Gabonese workers trusted the state.

Indeed, the observatories were a far cry from the remediation and compensation demanded by local employees. In mid-2011, the doctor in charge of examining former workers in Gabon told a radio producer that she couldn't reach any conclusions because she didn't have national databases—most notably, cancer registries—against which to compare the health of former workers. The families of two French employees who had worked in Niger and Gabon have been awarded damages by French courts. So far, however, no Africans have received compensation.

Mounana residents did obtain a modest victory in 2011, when Areva agreed to demolish 200 houses with extremely elevated radon levels. At the time of their construction in the 1970s, these houses had served as emblems of a new Gabonese modernity, complete with electricity and running water. They'd been built using uranium mine tailings – a practice also followed in the US in the 1950s and 1960s during a construction boom in Grand Junction, Colorado. In the 1970s, just as the Mounana houses were going up, the ones in Grand Junction were being torn down because of

their high radon levels. It would take another forty years for Gabonese citizens to learn that they'd been served yesterday's modernity.

A brief return to South Africa shows that such issues were not confined to small countries, or to Francophone areas. As we saw, the apartheid government initially argued for the nuclearity of uranium in order to secure a seat on the IAEA's governing board. That did not mean, however, that uranium counted as a nuclear material for regulatory purposes within the country. South African uranium occurred in the same ore matrix as gold. This made it easy to deny its nuclearity, and indeed most of the men who worked the uranium-rich shafts – whether black or white – did not know that they were extracting radioactive ore. Before 1999, South African mines implemented no special protections against radiological hazards, despite numerous studies documenting extremely high radon levels in some shafts.

The battle to regulate radiation exposure in South African mines lasted for decades, spanning the apartheid and post-apartheid periods. The mining industry fiercely opposed the very principle of classifying any mine shaft as a “nuclear” workplace. Drawing on the appearance of good recordkeeping offered by apartheid-era systems of influx and labor control, mine operators argued that the workforce of black miners was so transient that no individual could have received dangerous levels of radon exposure. This occluded the fact that many men returned yearly, engaging in repeat contracts for periods of 20 years or more.

In 1994, the year of South Africa's accession to democracy, a government commission was established to investigate the full range of health and safety hazards in South African mines. It estimated that some 10,000 mineworkers had radiation exposures above internationally recommended limits. Mining companies argued that remediation would drive up costs and force shaft closures, putting tens of thousands out of work just as they'd finally obtained political freedoms. Companies lost the argument, and in 1999 the National Nuclear Regulator gained purview over South Africa mines.

Nevertheless, problems surrounding the transparency of monitoring results arise repeatedly. There are no mechanisms in

place to address the health concerns of mineworkers exposed in the past. And across the Rand, mine tailings — rife with radioactive rubble and other toxins — now serve as home to people displaced by profitable industrial development. In sum, South Africa has not dealt adequately with its current nuclear legacy. Nevertheless, its government is eager to create new nuclear futures.

### Why Cling to Yesterday's Future?

The liability costs for radiation exposure while mining uranium in Niger, Gabon, and South Africa are tiny compared to the damages that would be incurred even by a moderate reactor accident, not to mention one on the scale of Chernobyl or Fukushima. We can hope that operators have learned enough that those particular scenarios wouldn't recur. But it would be a serious error to conclude that we can prevent any reactor accident. This is because accident prevention isn't a matter of abstract knowledge. At a minimum, it requires interlocking, well-maintained infrastructures, effective regulation, and constant technopolitical vigilance. And even that is unlikely to suffice. Thirty years ago, sociologist Charles Perrow argued that the social and technological complexity of nuclear systems produced non-linear interactions that were impossible to fully predict or prevent. Unfortunately, he has been proven right time and time again.

African countries have been at the forefront of mobile technologies, showing that widely distributed communications and financial systems are possible without the crippling investment and maintenance expenses of national grids. Why not do the same for energy technologies? It's time to focus on innovation, not emulation. Investing in distributed wind and solar power systems would place African countries at the forefront of a new energy revolution. Given the availability and lower cost of such options, does Africa really want yesterday's future? ■

*\*Gabrielle Hecht is professor of History at the University of Michigan and director of its Programme in Science, Technology, and Society. She recently served as associate director of UM's African Studies Center. Her 2012 book, *Being Nuclear: Africans and the Global Uranium Trade* was published jointly by MIT Press and Wits University Press, and won several awards. She is currently beginning a book about technology and power in Africa.*



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# TOWARDS AN AFRICAN NANOFUTURE A REGULATORY APPROACH

Prof. Roger Brownsword, King's College London

## The Vision of an African Nanofuture

**H**ow is the vision of an African nanofuture to be realised?

While nanotechnologies are spoken about as being 'relatively low cost', there needs to be investment in both the underlying science and the technology itself, and policymakers need to be persuaded that the investment represents good value for money. In some places, it will be easy to make the case. For example, in the Ministerial Foreword to the *UK Nanotechnologies Strategy: Small Technologies, Great Opportunities (2010)*, we read that the government is determined "to develop the nanotechnologies industry while protecting the health of consumers and employees and avoiding damage to the environment." The challenge is to make the case for an African nanofuture.

If policymakers are persuaded that investment in nanotechnologies is prudent, then it is equally important that the vision of a nanofuture is also socially acceptable. New technologies are invariably 'disruptive'; and there is no reason to think that the application of nanotechnologies would not have disruptive effects—for example, there might be economic and social impacts (e.g. some jobs might disappear, but others might be created; some disturbance to traditional customs, practices and values might occur).

Even if these disruptive effects are anticipated, their impact should not be underrated. Moreover, there might be unanticipated effects. What, some might ask, if a swarm of malign nanobots escapes our control leading to the kind of scenario depicted in Michael Crichton's novel, *Prey? What if the devel-*



*opment of nanotechnologies proves to be catastrophic?* It is at this point that we need to think about creating the right kind of regulatory environment for an African nanofuture.

### Getting the Regulatory Environment Right

Regulators, whether they are operating as national lawmakers or as industry standard-setters, face formidable challenges as new technologies emerge. In the early days of the development of a technology, it might well be unclear whether special regulatory measures will need to be introduced—and, if so, what those measures should be and who should have the responsibility for their introduction. At national legislative level, the difficulty with rapidly emerging technologies is that there is no easy way of keeping the law connected to the technology and its applications. Although the law might be expressed in ways that fit well with the understanding of the technology and its applications at the date of enactment, things can rapidly move on—as we have seen,

for example, in Europe with information technologies and data protection law. Moreover, if the responsibility for setting the regulatory framework is left to the scientists and technologists themselves, this may make for better connection but there are obvious questions about the legitimacy of the process and the accountability of the regulators.

These problems are compounded where there are many different views about the acceptability of a particular technology. In Europe, the

regulatory framework for biotechnologies has been deeply contested by different value constituencies. On the one side, there has been a strong emphasis on the potential health care benefits that should flow from a deeper understanding of human genetics; on the other side, there has been a concern that this focus on the potential benefits will lead to the compromising of human dignity. Similarly, in relation to GM crops and GM food, while on the one side there has been an emphasis on the potential benefits together with reliance on the science that suggests that the technologies are safe, on the other, opponents are nervous about safety and express concerns about both the dignity of humans and the dignity of the environment.

### A Four-Stage Regulatory Approach

It is constantly said in relation to nanotechnologies that the mistakes made in relation to biotechnology should not be repeated. Nevertheless, avoiding these



mistakes is far from straightforward. I suggest that an African nanofuture policy might be taken forward by regulators in four inclusive stages. At the first stage, the task is to make sure that the community is comfortable with the project, that there is a social licence that authorises the research, development, and application of nanotechnologies. At the second stage, an appropriate precautionary strategy for the initial research and development of nanotechnologies needs to be put in place; and, moreover, there needs to be debate about which lines of development would best serve the public interest. At the third stage, there need to be appropriate ex ante regulatory measures that determine whether nanoproducts, nanomedical devices, and so on, are put into circulation; and there need to be ex post monitoring and compensatory measures. Finally, the regulatory scheme of incentives, including patent law, will need to be fine-tuned so that the regulatory environment supports and encourages those nanotechnologies that are most urgently required. We can say a little more about each of these four stages.

### **Informing, Educating and Debating**

The first stage is one of informing, educating, and debating nanotechnologies. Although nanotechnologies have been current for some time and although there are many nanoproducts in circulation—for example, in clothes and sports equipment, in cosmetics and surgical dressings—this is still a technology that has a relatively low profile. It cannot be assumed that everyone will be familiar with the language of nanotechnologies—with nanoparticles, nanofibers, nanotubes, Buckyballs, and the nanoscale itself—let alone have a view about whether their development and application would be a good thing. In the United Kingdom, a first step in public information was taken in a well-known report in 2004 from the Royal Society and the Royal Academy of Engineering, *Nanoscience and Nanotechnologies: Opportunities and Uncertainties*.

This was a good starting point but, as the report makes clear, public engagement on the possible use of the technology has a long way to go. Even in the UK, the authors of the report found that ‘awareness of nanotechnologies is currently low’ (7.2.3, para 19); and it follows that any assessment of public attitudes is problematic. Accordingly, one of the recommendations made in the

report is for investment in public dialogue, this to be taken forward by both government and industry (7.6, para 49). Interestingly, the report also argues for a more strategic look at new technologies, bringing together ‘representatives of a wide range of stakeholders to look at new and emerging technologies and identify at the earliest possible stage areas where potential health, safety, environmental, social, ethical and regulatory issues may arise and advise on how these might be addressed’ (9.7, para 32). There is much good sense in these remarks—remarks that find several echoes in the more recent report from the Nuffield Council on Bioethics on *Emerging Biotechnologies: Technology, Choice and the Public Good (2012)*—and they might offer some helpful pointers for structuring the first stage towards an African nanofuture.

### **Initial Precaution**

At the second stage, the regulators need to put in place a precautionary approach to the initial research and development of nanotechnologies. Famously, Principle 15 of the Rio Declaration provides: ‘Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing such [precautionary] measures.’ Of course, where the underlying science is well understood and where there are reliable risk assessments of the particular technologies, there is no need for Africa to reinvent the wheel. However, where there are new lines of proposed research and development, precaution is required—and, it needs to be borne in mind, that some critics will argue not simply that the costs of investing in nanotechnologies will exceed the benefits but that, because of the uncertainties surrounding the technology, the risks might prove to be catastrophic.

In the face of this, it seems reasonable to insist that regulators should strive to maintain a responsible and rational approach. However, precautionary approaches are frequently accused of being irrational because they focus in a one-eyed way on the need to avoid a particular set of adverse consequences at the expense of ignoring the adverse consequences of making a precautionary intervention (See, e.g., Cass R. Sunstein, *Laws of Fear, Cambridge University Press, 2005*) Clearly, it is irrational to assess the options in such a one-sided way; that simply will not do. However, where there is no way of knowing what the risks are, it seems prudent to proceed in small steps (as with contained use) and

to do so only where (assuming that regulators get it wrong in deciding whether or not to run the risk) the ensuing negative outcome is the least unacceptable relative to the interests of regulatees.

Ideally, the application of this principle should be guided by the reasonable views of the public. In the absence of a clear public steer, a plausible assumption is that, whilst a community might be willing to forego the benefits of a raft of inessential consumer products (nano-coated tennis balls, golf clubs, and the like), it would be reluctant to forego the benefits that nanotechnologies promise to generate in such areas as health care and environmental improvement. For, relative to the needs of agents, products of the latter kind are a higher priority. This suggests a spectrum of agent needs with, at one pole, those needs that are essential for basic human flourishing and, at the other, those needs that are inessential.

With regard to products that lie at or near the essential end of the spectrum of agent needs, the priority is to encourage research and development together with a responsible approach by producers so that knowledge as to the type, scale and extent of possible hazards and risks is made known. As for products that lie at or near the inessential end of the spectrum of agent needs, members of the community would want to know which kind of interests are at risk. If such products might represent a threat to life, regulators should consider applying a prohibition; but, where the risk that is believed to be associated with a product is less serious, regulators might take a more relaxed approach. Judgments of precaution cannot be coherently acted on in isolation; comparative judgments of proportionality also need to be made.

It bears emphasising that scientific and technical experts hold no special brief to speak for the priorities and preferences of their communities. As a report prepared for the Washington-based Project on Emerging Nanotechnologies puts it, the public needs to be engaged in two capacities: first, as citizens, members of the public are stakeholders in assessing the larger social and ethical risks associated with nanotechnology; and, secondly, as potential consumers of nanotechnology products, members of the public need to be able to make informed choices (J. Clarence Davies, *Managing the Effects of Nanotechnology*).

## Regulating Circulation and Use

This takes us to the third stage: the conditions on which nanoproducts and nanodevices should be cleared for circulation in the consumer marketplace or in health care. Here, we should distinguish between *ex ante* and *ex post* provision. *Ex ante*, regulators seek to ensure that consumer products and medical procedures are reasonably safe; *ex post*, they seek to ensure that consumers and patients who are injured by dangerous products or procedures are fairly compensated; and, in an ideal world, they try to bring together *ex ante* and *ex post* provision in a coherent scheme of protective and corrective regulation. However, even in highly developed regulatory regimes, novel nanotechnologies are likely to expose a number of weaknesses in existing provision as a result of which some fine-tuning and clarification of the regulation will be necessary.

*(See Albert C. Lin, "Size Matters: Regulating Nanotechnology" (2007) 31 Harvard Environmental Law Review 349, at 361-374 (for the view that US regulatory provisions are inadequate); and, generally, Trudy A Phelps, "The European Approach to Nanoregulation" in Nigel M de S Cameron and M Ellen Mitchell (eds), Nanoscale (Hoboken, NJ: Wiley, 2007) 189.)*

One policy question is whether nanoproducts should be subjected to some *ex ante* regulatory review, or whether they should be simply allowed to circulate subject to whatever *ex post* regulatory provision (in contract law, tort law and product liability law) there is. In most communities, the default rule will be that prevention of injury is to be preferred to compensation for injury; and the logic of this is that *ex ante* regulatory controls should be applied to nanoproducts. Without the requisite regulatory clearance, nanoproducts should not go to market; and, once they are in circulation, there need to be robust compensation and insurance schemes in place where products prove to be dangerous.

The *ex-ante* regulatory review track for nanomedicines and nanomedical devices is likely to be more complex. First, there is the basic research to be undertaken; secondly, the new nanomedicines and devices need to be trialled in humans; and, thirdly, there needs to be formal approval for clinical application. Where researchers have a nanomedicine that they think might be effective and sufficiently safe to try in humans, they would need approval

for the trial. Where clearance is given for a trial, there remain a number of detailed questions about the terms on which the trial is conducted. Even if we assume that participation must be voluntary and on an informed consent basis, this leaves open questions about the scope and nature of liability to participants if there are adverse incidents. For example, does it matter whether the particular nanomedicine is a high or a low priority? What if participants are paid for their participation? Where a nanomedicine goes through the trial stage successfully, it will be presented for a further round of regulatory clearance, this time for application in clinical practice. Where regulatory clearance is given, we can expect that these novel nanomedicines will not be administered to patients except on an informed consent basis. However, this again leaves many issues of regulatory detail to be settled in particular, concerning the scope and nature of *ex post* liability.

## Incentivisation

Finally, there is the fourth regulatory stage, that of targeted incentivisation, particularly (but not exclusively) through the patent regime. On the face of it, patent law is well intended. However, in practice, patents attract mixed reviews. While some defend patents, arguing that without the monopoly incentive and protection against infringement there would be significantly less investment in innovation, others accuse patents of denying millions of people in the developing world access to essential drugs. To this, we can add the familiar problems of patent clusters and thickets, not to mention the activities of patent 'trolls', all distorting the operation of the intended scheme of incentives. Standing back from these details, the overarching principles are clear. According to Article 27 of the Universal Declaration of Human Rights (UDHR): (1) Everyone has the right freely to participate in the cultural life of the community, to enjoy the arts and to share in scientific advancement and its benefits. (2) Everyone has the right to the protection of the moral and material interests resulting from any scientific, literary or artistic production of which he is the author.

But, how are we to do justice to both limbs of Article 27? With the best regulatory will, how can the interests of innovators be protected (as human rights) when the benefits of inventions are to be shared (also as a matter of human rights)?

Possibly, we can find more satisfactory initiatives outside the patent regime. A number of imaginative ideas are in circulation—put forward by, amongst others, Thomas Pogge and James Love—including proposals for a Health Impact Fund (HIF), patent pools, prizes, and a Medical Research and Development Treaty. The difficulties associated with these proposals should not be underestimated. Even so, if nation states are to honour their human rights commitments, the obvious thing is for them to become more proactive and more focused by continuing to fund public sector research and development as well as the mechanisms for transferring the benefits to those who are most needy.

## Conclusion

In the news recently, we read that researchers have discovered that, if carbon nanoballs are added to the insulation plastic used in high-voltage cables, this could result in enormous efficiency gains in the power grids of the future; that, by using palladium nanoparticles as a catalyst, harmful nitrate can be removed from drinking water; and that a chip with nanowires coated with antibodies can be used to extract and analyse cancerous cells. Developments of this kind might well play some part in an African nanofuture. ■

*\*Prof Roger Brownsword is Professor of Law at King's College London, where he was the founding director of TELOS (a research centre that focuses on technology, ethics, law and society), an honorary professor at the University of Sheffield, and a visiting professor at Singapore Management University. He has published more than a dozen books, including (in the area of regulation and technology) Rights, Regulation and the Technological Revolution (OUP, 2008), Regulating Technologies (Hart, 2008) (co-edited with Karen Yeung), and Law and the Technologies of the Twenty-First Century (co-authored with Morag Goodwin) (CUP, 2012); and he has more than 200 papers in edited collections and law reviews. He is the founding general editor of the leading European journal, Law, Innovation and Technology. Professor Brownsword has acted as a specialist adviser to parliamentary committees dealing with stem cells and hybrid embryos. From 2004-2010, he was a member of the Nuffield Council on Bioethics; and, currently, he is Chair of the Ethics and Governance Council of UK Biobank.*



# NANOTECHNOLOGY FOR WATER TREATMENT IN AFRICA

J Catherine Ngila\*, Adedeji Adelodun,  
Richard Nthumbi and Vyom Parashar  
University of Johannesburg

**Today, almost one-fifth of the world's population lack access to safe drinking water. Although about 71% of the earth is covered by water, 97% of this is salty sea water which is unsuitable for drinking.**

Only 3% is fresh water, the bulk of which is distributed in icecaps and glaciers (79%) and as groundwater (20%), leaving a mere 0.03% as the only readily accessible water for domestic and agricultural use. Each year, the number of people dying from water-related diseases is more than 5 million, globally. Access to clean water has been singled out as the most important global crisis of the 21st century by the World Health Organization (WHO), United Nations International Children Education Fund (UNICEF) and the United Nations (UN).

Annually, more than one billion people depend on the use of potentially harmful sources of water for domestic purposes. The importance of water, sanitation and hygiene for both health and development has been reflected in the outcomes of a series of international policy documents. These include the International Conference on Primary Health Care, held in Alma-Ata, Kazakhstan (former Soviet Union), in 1978; the 1977 World Water Conference in Mar del Plata, Argentina, which

launched the water supply and sanitation decade of 1981–1990; the UN Declaration on the Millennium Development Goals (MDGs) and the World Summit for Sustainable Development held in Johannesburg in 2002. Most recently, the UN General Assembly declared the period from 2005 to 2015 as the International Decade for Action, Water for Life.

Access to safe drinking-water is essential to health. It is also a basic human right. It has been shown that investments in water supply and sanitation can yield net economic benefits, since the reductions in adverse health effects and health care costs outweigh the costs of investments in water infrastructure. This is true for major water supply infrastructure, as well as for water treatment systems in the homes. Improvements in access to safe water also tend to favour the very poor, meaning that these type of investment can be an effective strategy for poverty alleviation.

## **Traditional Methods of Water Purification in Africa**

In Africa, rural communities are often

more affected by lack of access to safe drinking water compared to urban residents.

Many women in sub-Sahara Africa still walk long distances to fetch water for domestic consumption.

In most African countries, waterborne diseases are common in communities where access to potable water is low. Traditional methods of water filtration are not always effective. With the aid of local heating systems such as firewood, coal and charcoal, the boiling method is popularly believed to be the most efficient, arguably yielding total decontamination after a few minutes of continuous boiling.

## **What is Nanotechnology?**

Nanotechnology is the manipulation of matter on an atomic, molecular, and supramolecular scale. It is a science, engineering or technology conducted at the nanoscale, which is about 1 -100 nanometers. Nanotechnology refers to a broad range of tools, techniques and applications that involve materials of infinitesimal sizes used either for

biological, chemical or engineering and physical applications. Nanotechnology centers on the design, characterization, production and application of materials, devices and systems by controlling shape and size on the approximate scale ranging from a few to hundreds of nanometres in diameter (1-100 nm where, 1 nm = 10 Å or 10<sup>-9</sup> m).

Nanomaterials come in form of particles, sheets or wires that have nanosize in at least one dimension. They have some unique physicochemical and surface properties that lend themselves to novel uses. This is mainly due to the large surface area to mass ratio. The large surface area enables effective interaction of components. Examples of these interactions include adsorption, catalysis and pore behaviour.

### New Technologies for Water Treatment

With the advent of nanotechnology and its potential applications in water purification, scarcity of safe drinking water in Africa could still be a thing of the past. Treatment of high volumes of wastewater containing low concentrations of pollutants is becoming increasingly important as discharge regulations are now more stringent. Most of the past efforts have focused on the removal of higher concentrations of pollutants by employing the more traditional and yet expensive adsorbent/ion-exchange materials.



**Figure 1:**  
Can we use nanotechnology to treat wa-

ter in Africa?

### Desalination of Sea Water by Nanofiltration and Reverse Osmosis in Florida, USA



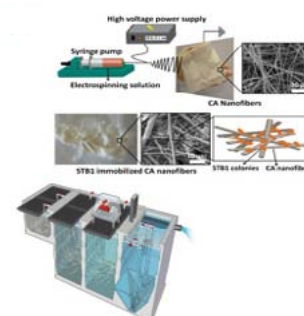
Nanotechnology in use: showing Four - stage nano-filtration membrane units. Delivering high-quality water for Dania Beach, Florida, USA, to meet stringent disinfectant by-product (DBP) rules. The city of Florida partnered with CDM Smith Company on a new treatment process-based expansion. The new designed nanofiltration & reverse osmosis plant expected to accommodate at least 20 to 30 years of growth and development. African countries can borrow a leaf from Florida USA nanofiltration systems

### Nanotechnology for Water Purification

New approaches are continually being examined to supplement traditional water purification methods. Nano-enabled technologies are being intensely explored to play a significant role in water treatment as more attention is being given to the development of filters and media that can take advantage of the the properties of nano-materials to remove contaminants from water. Water purification using nanotechnology exploits nanoscopic materials such as carbon nanotubes, electrospun cellulose and chitosan and alumina nanofibers for nanofiltration of water. The water purification technology also utilizes the existence of nanoscopic pores in zeolite filtration membranes, as well as nanocatalysts and magnetic nanoparticles.

Nanosensors, such as those based on titanium oxide nanowires or palladium nanoparticles are used for analytical detection of contaminants in water samples. Efficiency, durability and cost are the three key factors that influence the design of many of these technologies.

Nanomaterials for water filtration: (a)



electrospinning setup to produce nanofibers using cellulose acetate CA, biopolymers; (b) Packed nanofibers in water filtration cartridges.

### Types of Water Pollutants

The three main categories of water contaminants are heavy metals, persistent organic pollutants, and microorganisms. Heavy metals include: lead (Pb), mercury (Hg), arsenic (As), cadmium (Cd), zinc (Zn), copper (Cu) and chromium (Cr). Persistent organic pollutants (POPs) include halogenated solvents, polychlorinated biphenyl (PCB), trichloroethene (TCE), trichlorinated biphenyl (TCB), dichlorodiphenyltrichloroethane (DDT) and their metabolites. Common microorganism include bacteria such as Escherichia coli (E. coli) and Vibrio cholera (V. cholera).

Heavy metals pollution is arguably the most researched aspect of water pollution from a chemical perspective. The control of heavy metals using flocculation, ion exchange, precipitation or reverse osmosis have proven expensive. Disposal of the resulting sludge adds to environmental degradation. Efficient

and inexpensive materials for the removal of toxic metal ions is a growing area of research. Filtration materials in the nanoscale dimension have been shown to be more effective than macro-dimension materials. Membrane filtration has shown promise.

### Membrane filtration for water purification

Water purification by physical separation with the aid of membranes and filters are the most explored. Membranes or filters act as a physical barrier and selectively reject substances bigger than their pores, and so remove harmful pollutants and retain useful nutrients present in water.

Membrane filters can be divided into two general categories:

- a) Permeable (micro-filtration and ultra-filtration)
- b) Semi-permeable (nano-filtration and reverse osmosis).

Microfiltration and ultrafiltration processes are applied when the purpose is to eliminate suspended solid particles whilst nano-filtration and reverse osmosis (RO) are processes used to eliminate salts dissolved in water. The impurities that nanotechnology can tackle depend on the stage of purification of water to which the technique is applied. It can also be used for removal of sediments, chemical effluents, charged particles, bacteria and other pathogens. Apart from toxic trace elements, viscous (oily) impurities can also be separated from water, during purification using nanotechnology.

Currently, many water treatments include micro- and nanoscale processes, but are not considered as nanotechnology as they are produced conventionally. When produced via nanotechnology-driven approaches, all aspects of the membrane can be refined and optimised to include smaller and more

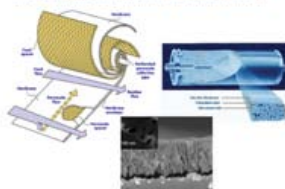
uniform sized pores and more reactive membranes. The filters and membranes (see below) are made from a variety of nanomaterials including carbon nanotubes (CNTs), nanoporous ceramics (clays), dendrimers, zeolites, nanofibres and nanosponges. Multi-use filtration systems could be developed to detect, separate out, and/or detoxify a contaminant. It is anticipated that in the near future, such membranes and filters will become commonplace in detecting and removing viruses from water.

### Carbon nanotubes (CNTs)

#### Membrane filters

Nanofiltration membranes made from CNTs and cellulose acetate biopolymers are capable of removing water pollutants such as metals, organic compounds and microorganisms.

Mechanism of membrane water filtration

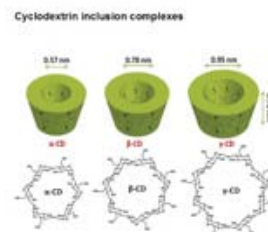


### Biopolymer and synthetic polymer membranes filters

Cellulose as one of the most abundant biopolymers has been investigated for use in removal of water pollutants by utilizing the hydroxyl groups on its surface. Its performance can be increased by adding functional groups which have a higher complexing capacity. Cellulose nanofibers, produced by electrospinning and deacetylation of cellulose acetate provide an adsorbent material which has a high surface area and high pore density. For example the cyclodextrin polymers have cavities that capture pollutants (see below). When grafted with functional groups, the materials show improved capacity for removal of heavy metals from waste streams and

polluted waters.

Carbon nanotubes (CNTs) can remove almost all kinds of water contaminants including turbidity, oil, bacteria, viruses and organic contaminants. Although their pores are significantly smaller, CNTs have been shown to have an equal or a faster flow rate as compared to larger pores, possibly because of the smooth interior of the nanotubes. Comparatively, nanofibrous alumina filters and other nanofiber materials also remove negatively charged contaminants such as viruses, bacteria, and organic and inorganic colloids at a faster rate than conventional filters. While the current generation of nanofilters may be relatively simple, it is believed that future generations of nanotechnology-based water treatment devices will capitalize on the properties of these new nanoscale materials.



The process involved in developing nanofiltration membranes; (a) chemical reaction to produce a polymer; (b)



shapes of a polymer with cavities capable of scavenging pollutants;

## Nanotoxicity Concerns

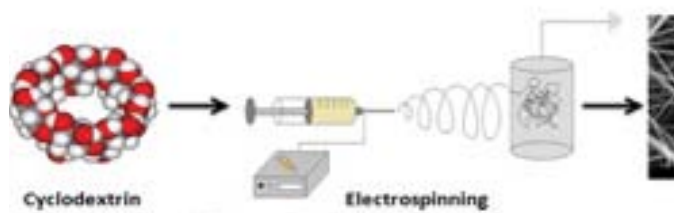
(c) electrospinning the polymers to produce nanofibers.

Apart from membranes and filters, other nano-engineered materials useful for water purification include (i) nanocatalysts and magnetic nanoparticles, and (ii) nanosensors for detecting pollutants in water. Nanocatalysts are particles with catalytic properties that can chemically break down POPs (Persistent Organic Pollutants) and render them harmless. Nanocatalysts have the potential to treat contaminants at very low levels, especially where current treatment techniques are ineffective or very expensive. Magnetic nanoparticles have large surface areas relative to their mass and easily bind with chemicals. Their ability to bind with contaminants, such as arsenic or oil, which can be easily removed using magnetic nanoparticles, make nanomaterials an appealing solution for water treatment.

### Nanocatalysts for removing pollutants in water

Nanotechnology is being used to develop small and portable sensors with enhanced capabilities for detecting biological and chemical contaminants at very low concentration levels in water bodies. The development of low-cost potable nanosensors has provided minute yet highly efficient detectors for monitoring changes in water quality. This provides real time information which enables scientists and civil engineers to accurately administer required water treatment solutions.

Nanosensors for detecting pollutants in water



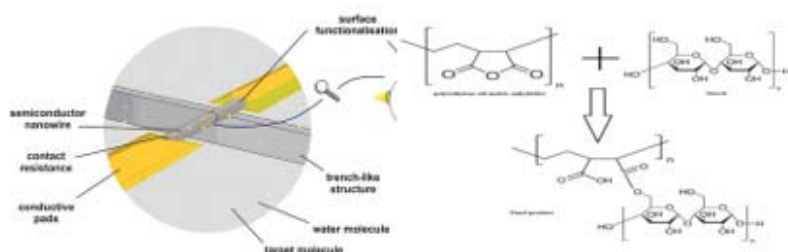
There are genuine toxicity concerns with regards to nanotechnology. Notwithstanding its potential applications highlighted above, like all technologies, nanotechnology comes with potential risks and uncertainties. For example, some researchers have found that the level of risks associated with nanomaterials could be higher relative to those associated with its macro-scale counterparts. This is because the surface area to volume ratio of nanoparticles make them more reactive than the bulk materials.

Nanotoxicology- focuses on environmental exposure, hazard, and risk of applied nanostructured materials.

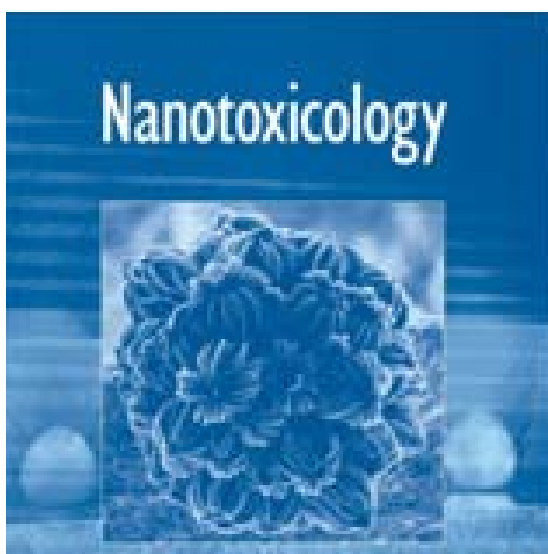
Water purification based on nanotechnology has not yet led to any human health or environmental problems but some research suggests that further studies into the biological interactions of nanoparticles should be carried out. For instance, it has been that fullerenes were found in the brain of rats after prolonged exposure. Likewise carbon nanotubes were found to accumulate in vital organs in fish after exposure. Because of lack of adequate and authoritative toxicity effects based on prolonged exposure findings, there is need to tread with caution and carry out more research to address these safety concerns.

### Summary and Future Outlook

Clean water is essential to human health and is a critical feedstock in a variety of key industries. Nanomaterials have a number of key physicochemical properties that make them particularly attractive as sorbents for water purification. Generally, nanoparticles have relatively large surface areas than bulk particles. Nanomaterials provide unprecedented opportunities to develop more efficient water-purification catalysts and redox active media due to their large surface areas and sizes, shape-dependent optical, electronic and catalytic properties. Nanomaterials are also being used to develop chlorine-free biocides through functionalization with chemical groups that selectively tar-



get key biochemical constituents of waterborne bacteria and viruses. Nanomaterials can be



grafted with various chemical groups to increase their affinity toward a given substance. They can also serve as high capacity/ selectivity and recyclable ligands for toxic metal ions, radionuclides, organic and inorganic solutes/anions in aqueous solutions.

In the near future, we anticipate that nanomaterials will help solve challenging water purification problems including: (i) desalination of brackish water; (ii) recovery of valuable and toxic metal ions from membrane concentrates thereby facilitating brine disposal; (iii) development of chlorine-free biocides; and (iv) the purification of water contaminated by toxic pollutants such as perchlorate, pharmaceuticals, chiral compounds and endocrine disrupting compounds (EDCs). We envision that nanomaterials will become critical elements in industrial and public water purification systems. We anticipate that the rural communities will have access to low cost cartridges to purify water for domestic consumption. The development of smart membranes with biofilm-resistant surfaces and embedded sensors/actuators that can automatically adjust membrane performance and selectivity by the year 2020, is a key long-term goal of the Desalination and Water Purification Roadmap prepared by the US Bureau of Reclamation and Sandia National Laboratories. We anticipate that nanomaterials will be key components of these technologies.

The development of visible light-activated titania (TiO<sub>2</sub>) nanoparticles could have a significant impact on water supplies. Furthermore, silver oxide (Ag<sub>2</sub>O) has great potential to degrade bacteria and other microorganisms in water. The controlled release of titania nanoparticles into surface waters exposed to sunlight, could significantly reduce organic carbon load through oxidative photochemical degradation.

### The Future goal

It will be an achievement if the rural community can have water filtration unit in every household!

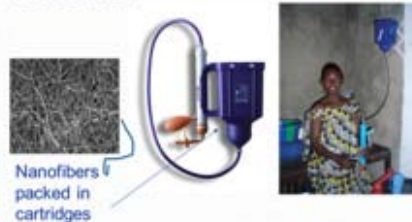


Figure 12: Nanofibers packed in cartridges as water purification units can be used by rural communities to deliver high quality water.

Nanotechnology is the next big thing in the technological revolution. Africa should seek to harness applications of this technology to address some of its development challenges, including but not limited to water security. In this respect, the continent should invest in world class research centres and centres of excellence in nanotechnology research, equipped with state-of-the art labs, equipment and infrastructure.

#### Further reading

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*\*Prof Catherine Ngila is currently the Head of Applied Chemistry Department at the University of Johannesburg. Her analytical/environmental research work focuses on water pollution monitoring, developing analytical methodologies for detecting metal pollutants and other chemical substances including their speciation analysis, in water. She is currently investigating nanocomposite electrospun fiber sorbents and nanocomposite membranes for removal of pollutants in contaminated drinking water and wastewater effluents. Prof Ngila is a member of various chemical societies including: American Chemical society Royal Society of Chemistry, South Africa Chemical Institute and Kenya Chemical Society.*

# A POLICY MASTER CLASS



Nanotechnology for  
Development (Nano 4D)  
Policy Ethics, Law  
and regulation.



## ■ Course Objectives

- To provide participants with a comprehensive interdisciplinary overview and understanding of nanotechnology as a key transformative technology
- To examine potential applications of nanotechnology for sustainable development in Africa
- To examine ethical, legal, policy and economic opportunities and challenges to the generation, commercialization, uptake and use of applications of nanotechnology in Africa

## ■ Course Outline

- Foundational Concepts of nanotechnology
- Nanotechnology policy and Regulation: Opportunities and challenges in Africa.
- Nanotechnology, Uncertainty and Risk Governance
- Nanoethics
- Nanotechnology for development: Application for the green economy and for achieving the sustainable development goals (SDGs)
- The economics and business of Nanotechnology: Commercialization, markets and Financing

## ■ Resource Persons

**Prof Roger Brownsword**, Professor of Law, King's College London and Chair of the Ethics and Governance Council of the UK Biobank

**Prof Erastus Gatebe**, Chief Research Scientist, Kenya Industrial Research and Development Institute (KIRDI)

**Dr Guillermo Foladori**, Professor, Autonomous University of Zacatecas, Mexico

**Dr Berhanu Tulu**, Head, Nanotechnology Research Center, College of Natural and Computational Science, University of Gondar

**Dr Hailemichael Teshome Demissie**, Senior Research Fellow, African Centre for Technology Studies (ACTS)

## ■ Target Participants

### Target participants (Max.30)

There are no prerequisites for this course. It should be of interest to regional and national policy makers (across sectors), University faculty and researchers (across the natural, social, economic and political sciences), the private sector, civil society, national and international governmental and non-governmental organizations.

Certificates will be awarded to participants.

## ■ Fee Structure:

**International:** 2000 USD covering tuition, accommodation, airport transfers, meals and refreshments, training materials, social events (Excluding air tickets)

**National:** 1000 USD covering tuition, accommodation, meals and refreshments, training materials, social events

### To apply:

Please send your CV and cover letter to: Dr Hailemichael Demissie ([h.demissie@acts-net.org](mailto:h.demissie@acts-net.org)) by July 15th, 2015. For more information please

visit: <http://www.acts-net.org/media-centre/press-releases/178-nanopolicy-master-class>



# BIG DATA AND THE RISE OF AFRICAN CONSUMERISM

Jean-Claude Bastos de Morais  
Founder, African Innovation Foundation  
and the Innovation Prize for Africa.

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**Africa's economic potential should be great news for every stakeholder, particularly its historically disenfranchised people. Indeed, the high level of investment and subsequent job creation has given rise to a new generation of African consumers with more spending power than ever before.**

**T**his presents the tantalizing prospect of a robust, healthy, virtuous cycle of domestic growth and a healthy local supply chain. As domestic and regional consumption grows, so too is interest from international retailers – and where retailers go, so too do analytics. The rise of ‘big data’ as a marketing and business development tool remains controversial in the West – so what will happen in such virgin territory as Africa? How will African governments and citizens respond to their data being mined? How will the growing hunger for material goods affect the continent's rich cultural identity?

The scale of change itself is staggering. Research and analysis is being conducted by many parties in order to make sense of what is happening to the African consumer. A recent report by McKinsey's Africa Consumer Insights Center entitled ‘The rise of the African Consumer’ illustrates the dramatic speed of growth: between 2000 and 2010, Africa's private consumption grew by \$568 billion. The impact of this surge in spending has been outlined in a recent article in *The African Executive* magazine, which suggests that 90,000 small locally owned shops in Kenya have been replaced by around 230 supermarkets. It seems that – perhaps unsurprisingly – multinational retailers are flocking to the continent; building mega-malls and driving prices of big, aspirational brands ever-lower. A piece of research carried out by the African

marketing and research agency, Youth Dynamix, claims that 39% of Kenyan youths aspire to own an iPhone and 32% a Blackberry; indicating a thirst for international brands. And, like their western counterparts, young Africans are buying on-line.

Africa's virtual footprint is rising steadily

Current statistics show that only 1% of all retail sales in Africa are online, compared to around 14% in the UK (Ernst & Young, November 2014) – but year-on-year growth is high and set to grow exponentially. According to the latest MasterCard Worldwide Online Shopping Survey, internet access grew by 3600% from 2000 – 2012. In Q2 of 2014, the continent had 297,885,898 internet users (Internetworldstats.com). This represents 26.5% of the total population. In Nigeria 70.3 million people use the internet, roughly 40 per cent of the population, with Egypt and South Africa with 46.2 and 24.0 million users respectively. Other African countries in the top ten are Kenya, Morocco, Madagascar, Malawi, Mali, Sudan and Tanzania.

The growth in internet access in Africa is creating ever-more space for online retail, providing more ways for more consumerism to reach more people. This phenomenon is already taking hold: one of the region's largest online retailers, Jumia, has exploded on to the market in only eighteen months. It now stocks 100,000 separate items at its main

# \$568 BILLION

BETWEEN 2000 AND 2010, AFRICA'S PRIVATE CONSUMPTION GREW BY \$568 BILLION

Source: McKinsey - The rise of the African Consumer

THIS TREND IS SLOWLY **DISPLACING LOCAL MSMEs AND INCREASING YOUTH DEMAND FOR INTERNATIONAL BRANDS**



## 90,000

SMALL LOCALLY OWNED SHOPS HAVE BEEN REPLACED BY AROUND 230 SUPERMARKETS

Source: The African Executive



## 39%

OF KENYAN YOUTHS ASPIRE TO OWN AN IPHONE

Source: Youth Dynamix



## 32%

OF KENYAN YOUTHS ASPIRE TO OWN AN BLACKBERRY



## AFRICAN CONSUMERS ARE STARTING TO SHOP ONLINE

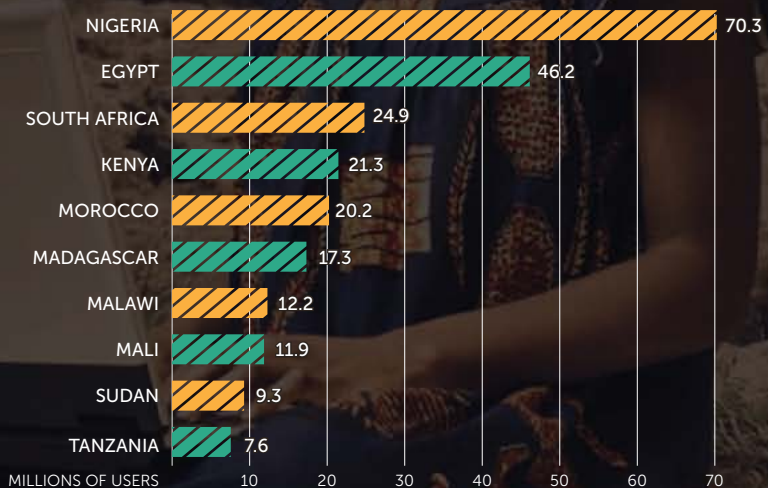
AT PRESENT ONLY 1% OF ALL RETAIL SALES IN AFRICA ARE ONLINE – BUT YEAR-ON-YEAR GROWTH IS HIGH AND SET TO GROW EXPONENTIALLY

Source: Ernst & Young

## AFRICA'S VIRTUAL FOOTPRINT IS GETTING STRONGER

THIS LEADS TO **INCREASED EXPOSURE TO DATA MINING BY PROFIT-DRIVEN MULTINATIONALS**

### AFRICA TOP 10 INTERNET COUNTRIES 2014 Q2



Source: Internet World Stats - [www.internetworldstats.com/stats1.htm](http://www.internetworldstats.com/stats1.htm)  
297,885,898 Internet users in Africa estimated for June 30, 2014  
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INCREASED EXPOSURE TO DATA MINING **CALLS FOR MEASURES TO PROTECT THE AFRICAN CONSUMER**



**INFORMED CONSUMERISM**



**PROTECTION OF CULTURAL IDENTITY**



**INCREASED REGULATION FOR ETHICAL DATA MINING**

warehouse, boasts seven others and has a delivery fleet of over 200 vehicles.

These two ingredients – online shopping and mass online activity – not only present Africa with the challenge of adapting to a western-style consumerism but it presents them with the new issue of privacy. Whether it is online shopping, using social media or browsing the internet; Africans are now equally as vulnerable to big data as the rest of the world. African policymakers and citizens need to examine and understand what big data is and what it is being used for. At the very least, understanding the issue enables governments and citizens to start to make decisions about how they navigate cyberspace. Education has to be at the heart of it.

#### **The Importance of Informed Consumerism**

For several years western countries and citizens have debated the pros and cons of data-mining. Human rights activists hold governments and big business to account, lobbying for regulatory protection. Public awareness campaigns and media coverage have made people more aware that they can control how their online life is tracked by disabling cookies or using VPNs. For those that care, there are ways to control who is watching us. In Africa, where the internet revolution is playing catch up, policymakers also need to get up to speed and work hard to make consumers aware that every page they click, every item they search for online and every page visited on Facebook will have direct repercussions on their future online presence. They also need to understand how big data differs from conventional data capture and what this means for society.

Big data itself is a term that most laymen in any part of the world won't understand. However it is a development that is already revolutionizing the way companies target and speak to new and existing customers. Big data analytics is exciting for businesses because it enables them to handle vast volumes of data that was previously too random to make sense of. It means that they can form a much more nuanced way of

selling to customers. They are already gaining a much clearer understanding of what we look at and why; where we are travelling and what our budget is for a hotel or car rental; what interests we have from the books we read to the shoes we wear and movies we go to see. These data processing systems bring together vast quantities of data, forming algorithms that allow companies to understand us intimately.

“  
**Big data is manna from heaven for multinationals and, as virgin retail territory, Africa is there for the taking.**  
”

Big data is manna from heaven for multinationals and, as virgin retail territory, Africa is there for the taking. The danger is that African populations may be too caught up in the excitement of their retail revolution to notice – or understand – how their data is being used. Informed consumerism, which includes understanding the prevalence of data mining, can help African consumers hold on to their cultural identity and avoid outsiders dictating how African consumers should shop, dine and travel.

Crucially, it will also help Africans to make their own decisions about whether to buy African or not – rather than blindly chase international brands to the possible detriment of their own

manufacturing industries. Several decades of globalization in the west have led to a resurgence of buying locally because those countries – the UK for example – have seen their home-grown industries fall victim to cheaper goods from abroad. It is now a badge of pride to ‘buy British’. African citizens have an opportunity to leapfrog domestic decline by making informed choices. Africans have the ability to learn from the mistakes of the West and arm themselves with the knowledge that big data may be leading them towards economic decline.

Africa is perhaps even more vulnerable than western nations. Many African countries do not have strong manufacturing industries – but it so desperately needs them. Africa so keenly needs to nurture domestic innovation. The retail boom presents three main problems: firstly, an influx of international retailers threatens to wipe out small local traders who cannot compete on cost. Secondly, the purchasing of non-African goods could diminish the local supply chain, causing job losses and a contraction in the countries productivity – not to mention a decline in local manufacturing and an increasing reliance on imports. Thirdly, online activity gives rise to even more big data, persuading African consumers to purchase even more international brands. This may create an ever increasing cycle of blind consumption of global brands to the detriment of local business. And for Africa, such a scenario could be disastrous.

The cultural dimension is also under threat from the consumer boom and big data. Africa is already being flooded with aspirational brands and the new generation is hungry for technology and western goods. If Africa continues to move in the same direction as the mature economies, they face the prospect of building towns and cities that begin to resemble the high-streets of the Western world – streets lined with the same fast food outlets, cheap clothes and retailers that have spread around the world taking market share, shutting down local retailers and changing the cultural landscape. What follows next



# KCB offers Leadership in Mobile money ecosystem

Innovations continue to take centre stage in the banking industry, with customers being spoiled for choice. Thanks to ICT, the latest wave is in the form of KCB M-Pesa, a partnership between Safaricom and the country's largest bank, KCB. As the biggest lender by assets, KCB is keen to double its customer numbers in the next one year, riding on its new proposition in partnership with Safaricom-KCB M-Pesa. As at the end of 2014, KCB had 4.1 million customers, according to the latest bank reports. In particular, KCB's earnings report indicates that the lender has a target of hitting 10million customers in the next 12 months.

The KCB M-Pesa account launched on 10th March 2015 is already helping KCB in fast tracking the adoption of mobile banking and growing its retail customer base cost effectively. Under the program, KCB M-Pesa users will have access to loans of between Sh50 and Sh1 million repayable within one to six months. Borrowers will repay the loans at interest rates of four, nine and 12 percent over periods of one, three and six months respectively.

"In the last one year, KCB has seen its customer transactions with M-Pesa triple to Sh125 billion, while the volume of transactions has grown from 10,000 a day to 100,000," said KCB's Group CEO, Joshua Oigara at the launch of the new product. "We see the partnership with Safaricom as a game-changer in the financial services sector. For us, such partnerships are meant to make financial services more accessible to the general population. This is a crucial part of our effort to make serious progress in addressing the deep poverty experienced by millions of citizens across the East African region and beyond, many of whom remain outside the formal financial system," he said. The growth in KCB's mobile transactions over the past year will provide the necessary impetus to grow KCB's new M-Pesa loans program, allowing the bank to expand its loan book among retail customers. To achieve this ambitious feat, KCB intends to leverage on mobile phones and agency banking, enabling KCB to increase its profitability and turnover, while managing the cost of operations.

With the new KCB M-Pesa product, subscribers can also place money in fixed deposit accounts that earn them interest of between three and six per cent per annum for periods of between one and 12 months.

"Once a customer subscribes to the new product, their credit worthiness that will inform their loan uptake, will be dependent on their repayment history and their amount of savings," said Bob Collymore, Safaricom's CEO.

## FREQUENTLY ASKED QUESTIONS (FAQs)

### What is KCB MPESA Account?

KCB M-PESA Account is a paperless mobile based bank account that will be offered exclusively to KCB and M-PESA registered customers. KCB M-PESA Account will have zero minimum balance and will provide customers with the ability to:

- Borrow loans with facility fee ranging from 2% to 4% per month
- Save from as little as KShs.1 and earn interest of 2% p.a.
- Save for a fixed period of time (Fixed Deposit Account) or Target Savings Account where you save little by little for a set period and earn interest from 3% to 6% p.a.
- Place standing orders from:
  - M-PESA to KCB M-PESA Account.
  - M-PESA to Fixed Savings or Target Savings Account.
  - KCB M-PESA to Fixed or Target Deposit Account.
  - Transfer money in and out of the KCB-M-PESA Account at no charge

### Who does the product target?

The KCB M-PESA Account is intended for all KCB and M-PESA registered customers who discern to save or borrow short-term loans, to enable them address various financial causes.

### What are the requirements to have a KCB M-PESA Account?

To get a KCB M-PESA Account, you will need to:

- Be a registered Safaricom M-PESA customer.
- Have an active Safaricom M-PESA account.
- Hold any one of the following Kenyan National ID, Kenyan Passport, Alien ID, Diplomatic ID(Registered on IPRS), Military ID.

### How do I register for this specific account?

- Dial \*844#
- Accept Terms and Conditions.
- You will receive an SMS with your PIN
- Dial \*844# to access the KCB M-PESA Account Menu and the system will prompt you to change PIN

### How do I make a deposit into the account?

- Dial \*844# and enter the KCB M-PESA Account PIN
- Select Deposit From M-PESA
- Enter Amount
- Confirm transaction.

### How will I withdraw from the account?

Customers can only make withdrawals from KCB M-PESA Account via M-PESA using the steps:

- Dial the USSD CODE \*844# and Enter the KCB M-PESA Account PIN
- Select "Withdraw" to M-PESA
- Enter Amount
- Confirm payment.
- Other KCB M-PESA Account
  - Enter Mobile number
  - Enter Amount
  - Confirm payment

### How will I qualify for a loan?

Customers will be allocated a loan limit upon opting into the KCB M-PESA Account. Loan amounts will be depended on M-PESA history and usage of KCB MPESA Account. Not all customers will qualify for loans immediately.

### How do I request for a KCB M-PESA Account loan?

- Dial \*844# and enter the KCB M-PESA PIN
- Select "Loan" then "request loan" and enter amount.
- Select the preferred period( 1,3 and 6 months)
- Funds will be transferred to your KCB M-PESA Account.

### What are the interest rates range?

- 30 day loan at 4% per month
- 90 day loan at 3% per month
- 180 day loan at 2% per month

### How to check your loan limit and what determines it?

Immediately on dialing \*844#, one is presented with a loan limit. The loan limit is determined by one's activity levels generated from their history usage on both their M-PESA/ Safaricom and KCB M-PESA Account

### How do I pay back my loan?

- Loan can be paid in full or in installments from both KCB M-PESA account and M-PESA.
- Dial USSD code \*844# and enter KCB M-PESA PIN.
- Select "Loan" then "Pay loan."
- Select payment from either KCB M-PESA account or M-PESA.
- Enter Amount to pay.

Regulated by the Central Bank of Kenya



# KCB | mPESA ACCOUNT

**DIAL \*844#**

Get a loan with interest as low as 2%.\*



Regulated by the Central Bank of Kenya

\* Terms and conditions apply.



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# A NEW CLIMATE ECONOMY FOR AFRICA

**Russell Bishop**, Senior Economist, Global Commission on Economy and Climate

**Dr Firew Bekele Woldeyes**, Associate Research Fellow, Ethiopian Development Research Institute (EDRI)



**T**he Global Commission on Economy and Climate was set up to examine whether it was possible to achieve lasting economic growth while also tackling the risks of climate change. It published its findings in September 2014 in its inaugural publication *Better Growth, Better Climate: The New Climate Economy* report. Seven countries established the fully independent Commission and research for the report was coordinated between eight global research institutes. The former President of Mexico Felipe Calderón chairs the Commission and the commissioners are former heads of government and finance ministers, and leaders from economics, business and finance. Africa is represented on the Commission through Luísa Diogo (former Prime Minister of Mozambique), Ngozi Okonjo-Iweala (former Finance Minister of Nigeria), and Trevor Manuel (former Finance Minister of South Africa). In addition, Ethiopia acts as a commissioning country and the Ethiopian Development Research Institute is a research partner. The Commission

was also advised by an Economics Advisory Panel, which again had African representation through Benno Ndulu (Governor, Central Bank of Tanzania). The resounding conclusion of the *Better Growth, Better Climate* was that countries at all levels of income have the opportunity to build lasting economic growth at the same time as reducing the immense risks from climate change. This will be made possible by structural and technological changes unfolding in the global economy and opportunities for greater economic efficiency. The capital for the necessary investments is available, and the potential for innovation is vast. What is needed is strong political leadership and credible, consistent policies.

The next 15 years will be critical, as the global economy undergoes a deep structural transformation. It will not be “business as usual”. The global economy will grow by more than half, a billion more people will come to live in cities, and rapid technological advance will continue to change businesses and lives.

Around US\$90 trillion is likely to be invested in infrastructure in the world’s urban, land use and energy systems. How these changes are managed will shape future patterns of growth, productivity and living standards.

The next 15 years of investment will also determine the future of the world’s climate system. Climate change caused by past greenhouse gas (GHG) emissions is already having serious economic consequences, especially in the more exposed areas of the world. Without stronger action to peak and then reduce global emissions in the next 10-15 years, it is near certain that average global warming will exceed 2°C, the level the international community has agreed not to cross. On current trends, warming could exceed 4°C by the end of the century, with extreme and potentially irreversible impacts. Any delay in reducing emissions makes it progressively more expensive to shift towards a low-carbon economy by building up GHG concentrations and locking in the stock of high-carbon assets.



African countries will also change substantially over the next 15 years. The continent's future economic growth does not have to copy the high-carbon, unevenly distributed model historically taken by other parts of the world. There is now huge potential for African countries to act in their self-interest by investing in greater efficiency, structural transformation and technological change in three key systems of the economy: cities, land use and energy.

- Cities are engines of economic growth. They generate around 80% of global economic output, and around 70% of global energy use and energy-related GHG emissions. How the world's largest and fastest-growing cities develop will be critical to the future path of the global economy and climate. But much urban growth today is unplanned and unstructured, with significant economic, social and environmental costs. As pioneering cities across the world are demonstrating, more compact and connected urban development, built around mass public transport, can create cities that are economically dynamic and healthier and have lower emissions. Such an approach to urbanisation could reduce urban infrastructure capital requirements by more than US\$3 trillion over the next 15 years.
- Land use productivity will determine whether the world can feed a population projected to grow to over eight billion by 2030 while sustaining natural environments. Food production can be increased, forests protected and land use emissions cut by raising crop and livestock productivity through new technologies and comprehensive approaches to soil and water management. Restoring just 12% of the world's degraded agricultural land could feed 200 million people by 2030, while also strengthening climate resilience and reducing emissions. Slowing down and ultimately halting deforestation can be achieved if strong international support is combined with strong domestic commitment to forest protection and rural income development.
- Energy systems power growth in all economies. We are on the cusp of a clean energy future. Coal is riskier and more expensive than it used to be, with growing import dependence and rising air pollution. Rapidly falling clean energy costs, particularly

of wind and solar power, could lead renewable and other low-carbon energy sources to account for more than half of all new electricity generation over the next 15 years. Greater investment in energy efficiency – in businesses, buildings and transport – has huge potential to cut and manage demand. In developing countries, decentralised renewables can help provide electricity for the more than one billion people without access.

Across all these systems, three “drivers of change” need to be harnessed to overcome market, policy and institutional barriers to low-carbon growth. These include improving action in three areas (i) raising resource efficiency, (ii) providing investment for infrastructure and (iii) stimulating innovation in technologies, business models and social practices. For example resource productivity can be improved by removing fossil fuel subsidies. While global subsidies for clean energy only amount to around US\$100 billion, subsidies to polluting fossil fuels are now estimated at around US\$600 billion per year. Phasing out fossil fuel subsidies can improve growth and release resources that can be reallocated to benefit people on low incomes. But African countries are showing leadership – phasing out fossil fuel subsidies has been successfully demonstrated in Ghana, Kenya, and Namibia through progressive policy reform.

Well-designed policies in these fields can make growth and climate objectives mutually reinforcing in both the short and medium term. In the long term, if climate change is not tackled, growth itself will be at risk. In addition, better growth provides benefits of greater energy security, less traffic congestion, improved quality of life, stronger resilience to climate change and environmental protection, and reduced poverty.

To achieve better growth and reduced climate risk requires global leadership, including from Africa. The report proposes a 10-point Global Action Plan of key recommendations. This asks decision-makers to:

- Accelerate low-carbon transformation by integrating climate into core economic decision-making processes. This is needed at all levels of government and business, through systematic changes to policy and project assessment tools, performance

indicators, risk models and reporting requirements.

- Enter into a strong, lasting and equitable international climate agreement to increase the confidence needed for domestic policy reform, provide the support needed by developing countries and send a strong market signal to investors.
- Phase out subsidies for fossil fuels and agricultural inputs and incentives for urban sprawl to drive more efficient use of resources and release public funds for other uses, including programmes to benefit those on low incomes.
- Introduce strong, predictable carbon prices as part of good fiscal reform and good business practice, sending strong signals across the economy.
- Substantially reduce capital costs for low-carbon infrastructure investments by expanding access to institutional capital and lowering its costs for low-carbon assets.
- Scale up innovation in key low-carbon and climate-resilient technologies, tripling public investment in clean energy R&D and removing barriers to entrepreneurship and creativity.
- Make connected and compact cities the preferred form of urban development, by encouraging better managed urban growth and prioritizing investments in efficient and safe mass transit systems.
- Stop deforestation of natural forests by 2030 by strengthening the incentives for long-term investment and forest protection, and increasing international funding to around US\$5 billion per year, progressively linked to performance.
- Restore at least 500 million hectares of lost or degraded forests and agricultural lands by 2030, strengthening rural incomes and food security.
- Accelerate the shift away from polluting coal-fired power generation, phasing out new unabated coal plants in developed economies immediately and in middle-income countries by 2025.

The first six recommendations provide the conditions necessary for a strong and credible framework to foster low-carbon and climate-resilient investment and growth. The last four point to vital opportunities for change which can drive future growth and lower climate risk in cities, land use and energy systems.

The Commission will publish its second

report in July 7th entitled Seizing the Opportunity: Partnerships for a Better Growth, Better Climate. This will explore the role of international collaboration in delivering economic growth and reducing climate risk

### Unlocking the power of Ethiopian cities

One of the areas that are important for building a New Climate Economy in Africa is harnessing the power of future African cities. Today a little over half of the world population lives in cities and it is expected that the number of people living in urban areas is going to increase rapidly. Most of the increase is expected to take place in developing countries. The expected scale of urbanization presents an opportunity that can play a vital role not only in improving growth but also for the environment and quality of life in general. Ethiopia, relative to more developed countries, is currently at a low level of urbanisation, as one in five people live in urban areas. As the Ethiopian economy grows, so will the rate of urbanization, which presents a vast challenge to policymakers. In light of this, the Ethiopian Development Research Institute and the Global Green Growth Institute in collaboration with the Global Commission on Economy and Climate has recently carried out a study to strategically align economic planning, urban development, and environmental issues in Ethiopia. This study “Unlocking the Power of Ethiopian Cities” was published in February 2015.

The report outlines a new “spatial framework” for assessing and maximising the contribution that cities can make to achieving economic, social and environmental objectives, including outlining and assessing a range of alternative urbanisation pathways. The report sets out an approach where stakeholders in Ethiopia can bring together the national development plan (i.e. the five

year Growth and Transformation Plan (GTP)) with a national spatial structure to benefit from the urban dividend and avoid the lock-in effects from poorly managed urbanisation. This approach will be of use to other low-income countries as they grapple with similar issues. The analysis highlights the need to explicitly link Ethiopia’s economic, environmental and spatial strategies. This involves identification of strategic growth corridors linked to targeted economic functions, the number and hierarchy of urban centres, and the infrastructure demands that support this including power, water, information and transportation.

#### A 5 step spatial economic framework

The spatial framework proposed in the study works through five stages of analysis and planning that can be repeated in line with successive planning cycles (i.e. Ethiopia’s next 5 year economic planning periods GTP II, the GTP III).

- Objectives and situation analysis. The starting point to assess future urbanisation needs is a strong understanding of context. The analysis undertook an assessment of the current macroeconomic context within which urbanisation is taking place in Ethiopia, including a review of existing development goals, economic growth and urbanisation patterns and urban policy. The Government of Ethiopia has outlined a vision to achieve lower middle income country (LMIC) status by 2025.

In present terms, this would reflect an increase in today’s GDP to \$1,045 per capita. Experience around the world indicates that such rapid development would also be accompanied by rapid urbanisation. At around 19% currently, urbanisation in Ethiopia is low, and is much lower than the sub-Saharan Africa average. The Ethiopian Urbanisation

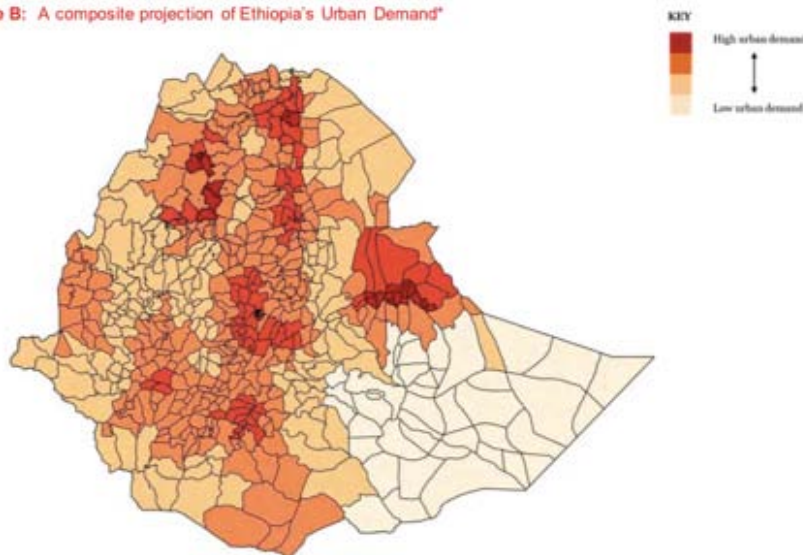
Review by the World Bank indicates that urbanisation will reach 30% before 2030. The capital city Addis Ababa is currently the only Metropolis city, attracting population from all parts of the country and acting as an economic and political hub. However, the expected rate of urbanisation can lead to the emergence of secondary cities that would reduce the primacy of Addis Ababa as the major urban centre.

- Urban demand model. Provided that the economy is expected to grow rapidly (around 9% per year) and associated fast urbanisation will follow, there is a need to identify the possible “hotspots” for urbanisation. Using Geographical Information Systems (GIS) and secondary data sources, the analysis provides a spatial analysis of the suitability of the country for urban development. The suitability for urban development is derived from the existing urban structure, physical constraints and likely economic activity. Urban areas do not emerge overnight and will be influenced by the pre-existing national urban system. The second consideration examines the presence of physical constraints such as the availability of sufficient water supply (both surface and groundwater) to meet population and industrial needs. It also looks into vulnerability to natural hazards to account for the risk of issues such as earthquakes. Lastly, the economic opportunities in terms of proximity to resources such as mineral and agricultural production and access to transport system have been taken into account. In total, the analysis was conducted through 35 different GIS layers (from topography, groundwater availability and mineral resources to planned special economic zones, proposed rail systems and universities).

Figure A: The ‘spatial economic framework’ for determining the most effective urbanisation strategy



Figure B: A composite projection of Ethiopia's Urban Demand\*



\* Composite map of 35 weighted datasets showing areas where urban demand and physical suitability is high. See main report for individual layers.

### Benchmarking and scenario development.

It is important to learn from the historical urbanisation paths of other countries to understand possible pathways. The analysis plots Ethiopia's options for urbanisation against the historical experiences of a range of successfully urbanising countries to determine lessons learnt. The study then references a selection of comparator countries that have previously urbanised and developed economically from a starting position similar to Ethiopia's now. The case studies summarise the characteristics of that development and the choices made to shape this transition and identify good and bad practice in policy and decision making and consider how this can provide learning for Ethiopia. The selection criteria for the comparator countries relied on the importance of agriculture, a large and growing population, devolution of power to the sub-national level and low urbanisation rate. Accordingly, three countries were selected to provide a range of approaches and experiences to urban development: South Korea, Colombia and Vietnam.

Experience from the case study countries suggests that a network of cities is needed to provide back-up to Addis Ababa and reinforce economic growth and development. The model of a primary city and supporting cities has worked in both the Korean and Colombian contexts with an example of a larger primary city (Seoul) and smaller primary city (Bogota). The correct selection and designation of growth poles to counterbalance Addis is critical. Select-

ing too few growth poles throughout the country or those that are already well developed may limit the ability to divert growth away from Addis. To promote regional cities, Ethiopia could consider public-private partnerships, investment in infrastructure and the establishment of favourable conditions for foreign investment to drive growth in these new urban centres. Rural-urban linkages are also critical. Simultaneous rural development can drive and reinforce the success of urban development and minimise regional income/wealth disparities. Stimulating economic growth in new centres has appeared more successful than policies seeking to limit growth in large, dynamic and growing cities such as Addis. The development of an integrated national transport infrastructure, particularly to connect growing urban areas, is also important. The connectivity of urban centres by high capacity road or rail networks encourages the efficient and effective movement of goods and labour.

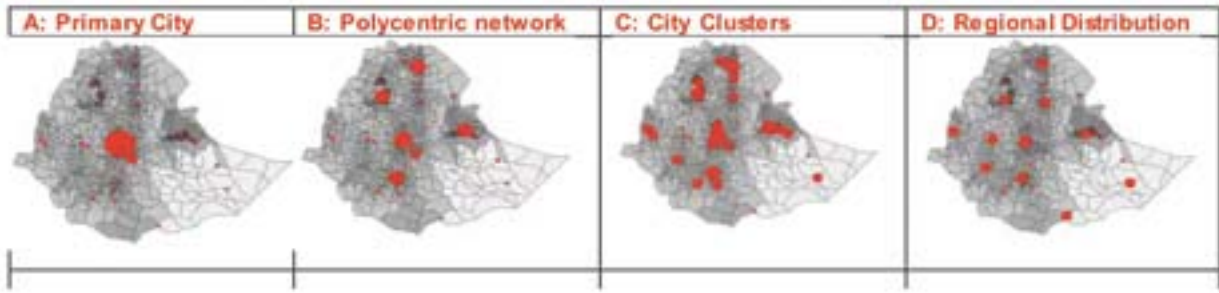
### Options analysis and preferred spatial scenario.

Using the international benchmarking data and wider experience and literature, the report then develops a range of quantitative scenarios for Ethiopia's urbanisation, each of which displays the hallmarks of a particular development pattern experienced elsewhere. In addition to a Business-as-Usual (BaU) scenario, four alternatives for Ethiopia's urbanisation are presented. These scenarios are:

- A Business-as-Usual (BaU) scenario: Here the analysis suggests Addis

Ababa continues to grow but in an unplanned and reactively managed way. There is high rural migration into the city and informal settlements appear as a consequence.

- Primary city scenario: Addis Ababa continues to grow into a dynamic, multi-functional and cosmopolitan megacity. The GTP is still delivered but largely driven by industry and services based in Addis Ababa, as well as foreign investment directed into the city and special economic zones surrounding the city.
- Polycentric city network scenario: A network of regional secondary cities emerges to support Addis Ababa. Addis Ababa retains national political and administrative duties and remains the largest urban area in the country but the other cities appear as dynamic and growing cities on the international scene.
- Clustered cities scenario: Large and dynamic metropolitan areas develop in two clusters: one in central Ethiopia around Addis Ababa and one in the north of the country.
- Distributed cities scenario: Addis Ababa devolves greater power to the regions and regional capitals take on many of the urban functions that Addis Ababa formerly held. Political and administrative functions are delivered by regional cities and industrial and service activity can be found in all these cities. Operating relatively independently of each other, there is limited specialisation with all cities performing similar functions.



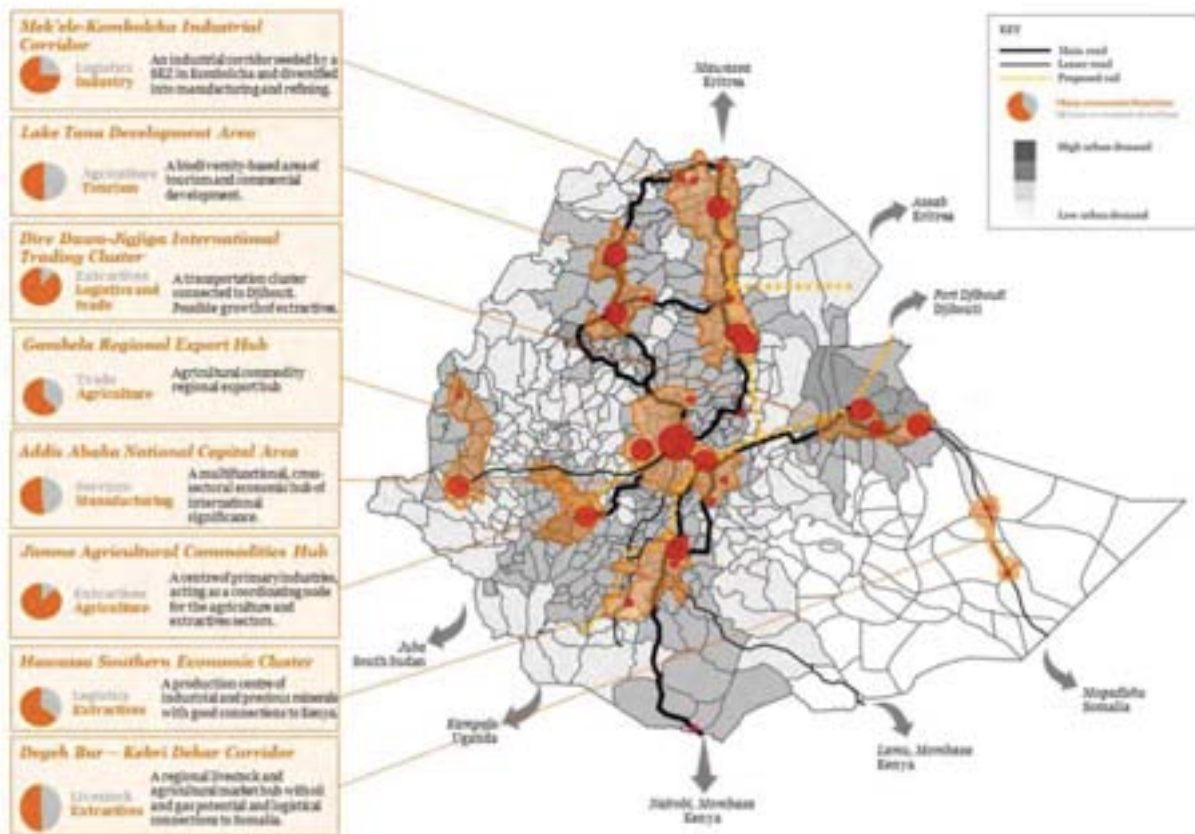
Each of these scenarios is analysed against 16 performance areas that are nested under four main drivers of growth. Each is an attribute of the spatial plan that can be compared between scenarios (e.g. low carbon, competitiveness or rural-urban linkages). This analysis helps to display the relative trade-offs and choices around urbanisation that Ethiopia will have to make. Learning from these reference scenarios, the report creates a preferred hybrid

scenario which brings the best of each reference scenario and combines it with the national constitutional, cultural and policy context.

The preferred scenario is constructed by balancing the strengths of each of the test scenarios and is based on multiple urban centres clustered (poly-clustered) into planned development areas and corridors, but only to the extent that there is underlying urban

demand and suitability. This prevents overdevelopment of less suitable areas and is a balanced model of expansion. A total of eight cluster development areas are identified with high potential. These clusters are diverse in economic rationale and function. Because not all development clusters are needed today, nor would their parallel development be affordable, further analysis is needed on the most effective sequencing of economic clusters and corridors.

**Figure D: Recommended spatial scenario for Ethiopia's urban development**



- **Implementation planning.** Urban issues are the responsibility of the Ethiopian Ministry of Urban Development, Housing, and Construction. However, implementing effective and well-designed cities goes well beyond the mandate of one ministry, and requires cross-sector planning involving multiple stakeholders. This needs to take place across the authorities responsible for key infrastructure – including energy, water and transport, but also agriculture, trade and logistics, industry, the emerging private sector and micro, small and medium enterprises. This coordination was not a focus of the report but any effective govern-

ment planning requires governance, finance and deep capacity, so these issues require further attention. The report is seen as a first step for Ethiopia to link urban, economic and environmental issues at an early stage of development. The Government's progressive outlook seeks to harness opportunities and avoid many of the disadvantages that rapid unplanned urbanization can create.

#### **Conclusion**

All African countries are grappling with the challenge of how to improve the welfare of their people. In the next 15 years, the continent should experience rapid growth. In many countries, struc-

tural transformation of economies will pull millions out of poverty and ensure a base for continued prosperity. At the same time there will be huge advancements in energy infrastructure, agricultural productivity and development of cities. Driven by national interests, African countries can choose a low-carbon, resource efficient, and climate resilient development pathway. The Global Commission on Economy and Climate has identified actions that can be taken across all income levels to achieve better growth while simultaneously reducing climate risk. The challenge is on the implementation of these actions. ■





# 'SMART CITY' APPROACHES TO SUSTAINABLE DEVELOPMENT

Nicholas You

## WHEN AND HOW DID CITIES BECOME “NOT SMART”?

**The idea behind ‘smart city’ approaches has been in existence for a long time. Planners, utopians and visionaries have, throughout ancient and modern history, proposed holistic visions of what should or could constitute economically productive and socially harmonious societies.**

**M**any of these ideas and ideals were formulated in Europe starting in 17th century during the First Industrial Revolution. Their proponents ranged from artists, architects, engineers, scientists to philosophers. They had considerable influence on contemporary urban planning which distinguishes itself from previous planning praxis by attempting to address concomitantly social, economic and aesthetic concerns within a cohesive spatial or physical layout or design. Modern urban planning, or its British version known as “town and country planning” and its French concept of “urbanism” were rooted in and conceived as multi-disciplinary approaches to societal development. The social and environmental ravages of the industrial

revolution, the great depression and the world wars across much of industrialized Europe, Japan and North America led to an overarching concern by the early 20th century with social equity and environmental health. This gave rise to two policy streams that dominate contemporary urban planning and development to this day: social or affordable housing and infrastructure, especially roads, drainage, water and sanitation.

At the risk of oversimplification, urban planning practice in the so-called developed world, for a variety of political and administrative reasons became far removed from the day-to-day running of a city. Slowly but surely city administrations were divided into sectors, namely housing, infrastructure and mobility, water and sanitation, energy, health and

social services. While cities continued to plan, mostly in the form of long-term master plans, the day-to-day running of the city became the realm of “silos” each specializing in a given field, each developing its own norms and standards, contract procedures and procurement processes. These ‘silos’ would be further reinforced with the advent of computerization as each department tended to choose a different hardware and software system. The end result was twofold: (i) further compartmentalization, and (ii) incompatible systems making the sharing of data and information difficult at best.

### **Towards a new urban development paradigm?**

During the last decade or so, the growing necessity for making cities more liv-

able and sustainable so as to become more competitive has compelled many municipal and metropolitan administrations to re-examine their internal modus operandi and to search for new business and governance models and new partners to help bridge the 'silos'. This necessity arises from several discrete but inter-related issues.

One important issue is that operating a city according to "silos" is very wasteful. Single-purpose urban management practice results not only in duplication of effort, but also in competing demands for renewable as well as non-renewable resources such as energy, water, land and eco-systems. One compelling example is the way contemporary cities consume fresh water. The average urban denizen requires less than 5 litres of potable water per day to drink and cook. Yet the average urban denizen that has access to piped water supply and so-called modern sanitation flushes in excess of 75 litres of potable water down the toilet every day and uses another 90 to 150 litres of drinkable water to wash clothes, bodies, homes and offices, dishes and cars, and to water plants. Simple economics would dictate that it would be far more cost effective to give each urban denizen 25 litres of bottled water per week for drinking and cooking purposes and to have our piped water system consist of clean but less than drinkable quality recycled water. Given the energy and resource costs of extracting, treating, transporting and piping water of drinkable standards to our major metropolises, the current consumption pattern of water seems un-smart.

Another important issue is the realization that truly sustainable and resilient urban development requires very close collaboration across sectors and departments. A case in point is that all urban public services consume energy, land and water. Effective resource efficiency would dictate that all these services and the people and businesses that use them operate in tandem and use a coherent set of performance benchmarks. In reality, as most of us experience on a periodic basis, the provision of public services is not only rarely coordinated but in many instances, public service departments work in splendid isolation of one another. The very nature of public procurement exacerbates this problem. Concessions for water, gas, electricity, waste collection, public transport, traffic management and parking are awarded individually by different departments

and often for different jurisdictional areas, for different contract durations and with very narrowly defined performance indicators.

Few, if any, cities have achieved the optimal degree of integration, but many are trying and the literature abounds with references to "smart city" and "big data" approaches to solving urban problems and to help meet challenges that are looming on the horizon. The purpose of this article is to help unpack these approaches by looking at recent "best practices" in the implementation of "smart city" solutions. These peer-reviewed practices are drawn from the Guangzhou International Award for Urban Innovation – a biennial award co-sponsored by UCLG and Metropolis devoted to recognizing outstanding initiatives in striving for urban sustainability. More specifically, the solutions reviewed in this paper originate from different regions and contexts in the hopes of drawing some useful observations regarding what smart city approaches can do for a city and its inhabitants, and what constitutes ideal conditions for such approaches.

#### **Putting people first**

Rio de Janeiro, Brazil is a city of more than 6.5 million people with a complex geography and strong social and demographic pressures. Lying in the tropical storm belt, Rio has been hit hard by repeated Atlantic storms pounding the city. This especially affects the mostly low income settlements commonly referred to as favelas that are located on the high slopes surrounding the metropolis and are prone to devastating landslides. Following a vicious storm in 2010, the mayor of Rio de Janeiro convened a special task force with one single objective: to come up with plans to ensure no more deaths from landslides. This led to the establishment of an Emergency Centre that brought together, for the first time, data gathering and information sharing between departments that heretofore never worked together: departments for planning, meteorology, sub-soil analysis, mapping, housing, health, population distribution and density.

Today, the Centre operates 24 hours a day. It is staffed by officials from 30 city departments that continuously share data and information and solicit information from citizens. This Centre has become a global model showing the benefits that can be derived from collaboration, alignment and data sharing

across city departments. Since the facility went on-line, employing some of the latest information communication technology and weather forecasting systems, there have been no deaths caused by landslides. Traffic emergency time response has been reduced significantly as citizens are alerted about traffic snarl ups and accidents and redirected to least congested routes. Data gathered for the Centre also enables the identification of neighbourhoods with higher dengue fever infection rates, allowing for health services to implement preventative measures in a timely manner. In planning the facility, Rio officials visited 'Alert Centres' in Madrid, Seoul and New York. Rio has also since forged co-operation with Johannesburg as it plans a similar system.

Hangzhou China: Eighty percent of the nearly 9 million residents and commuters living and working in Hangzhou China identified traffic congestion as one of the top priority issues. This led the City to launch China's first public bicycle project. This bike sharing system serves some 280,000 users daily and works in tandem with the city's extensive bus system to provide users of the bus and metro systems with a last mile solution. In the centre of the city, bike docking stations are less than 400 meters apart and located in close proximity to bus and metro stops.

Run by the Hangzhou Public Bicycle Development Company, the system uses data analytics and crowd sourcing from mobile phone applications as two key instruments. Data is shared across all departments dealing with traffic management and public transport. Users can phone in their request for bikes and there is a free hotline support. The busiest stations are staffed by people who provide a wide array of assistance and information. User feedback pertaining to use and usability of the system, monitoring of real time trends, issues, problems and suggestions is managed by a local university. This has led to a unique management system that is designed to overcome the most frequent problem areas of bike sharing systems: service points; getting bikes to where they are needed when they are needed; responsive hot-line support; repairs; and implementing users' recommendations for the continuous improvement of the system.

The system is unique in that it operates without government subsidies. Other than the initial start-up capital, the

company raises significant private funds through by selling advertising space on the bike docking station kiosks. This bike-sharing programme has inspired many other cities in China and may well mark an ironic turning point in bicycle use in China's recent history – from the country with the most bicycle users 30 years ago to the country with most cars and traffic jams today.

#### **Future-proofing cities**

Linköping, Sweden is a city of 150,000 that has a bold goal: to become an absolutely carbon neutral city by 2025. Creating a

Municipal Council has been collecting food waste as the main substrate for producing biogas which is used for running the city's buses and for the production of bio-fertilizer for organic food production. The Environmental and Quality Programme for Vallastaden was approved in 2013. Vallastaden is conceived as an eco-village where everything is within easy reach and social interaction is stimulated by making it simple to move around on foot or by bicycle. Finally, the former industrial area of Östra Valla has been earmarked for sustainable redevelopment. It is a business

Nitrogen and phosphorus emissions from treated wastewater have decreased by 60 percent and 35 percent respectively since 2001. Nitrogen dioxide concentrations in the urban environment have fallen from 29 to 8µg/m<sup>3</sup> since the late 1980s. The number of kilometers driven per vehicle/year has decreased from 13,000 to 12,000 km over 10 years while there has been a 50 percent increase in new "green car" registrations. 56 percent of all the electricity used is produced locally from renewable sources helping to achieve a 25 percent reduction in CO<sub>2</sub> emissions between 1990 and 2010. In the words of the mayor of Linköping, the City Council's road to these impressive results came about as a result of broad-based collaboration and partnerships with residents, employers, universities, the private sector, other cities and national and international networks, all sharing their data and information across sectors and helping the city monitor its progress in achieving its goal.

The City of Gwangju, Korea has taken a different and highly innovative approach to climate change mitigation. Five years ago, it initiated a programme to engage citizens in voluntary carbon-saving steps. Gwangju's Carbon Bank System currently involves 330,000 households, representing 62 percent of the city's population of 1.48 million. The Carbon Bank System calculates reduced amounts of carbon dioxide through voluntary energy-saving efforts by households and turns them into points. The Carbon Bank involves the active participation of the Korea Electric Power Corporation, the Gwangju Metropolitan Waterworks Authority and Hae Yang City Gas. All three provide data to the system based on participating households' consumption. Gwangju City calculates the reduction in greenhouse gas emissions and turns the amount into points. These points are then credited to the electricity, gas, and water bills of the participating households.

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The next 15 years will be critical, as the global economy undergoes a deep structural transformation. It will not be "business as usual". The global economy will grow by more than half, a billion more people will come to live in cities, and rapid technological advance will continue to change businesses and lives.

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carbon-neutral municipality is a never-ending process. Linköping Municipality and companies operating in the region have assumed a leading role in formulating policies, goals and guidelines. They have also led by example in using renewable fuels in vehicles; specifying energy and climate criteria for procuring goods and services; developing green IT solutions and communicating climate and environmental issues to employees and residents. Municipal property companies are also making existing schools, homes, care homes, offices, sports and cultural facilities more energy efficient. People living and working in Linköping are given continuous information owners about energy use. Three main areas of focus of the initiative are energy, sustainable living and local economic development. Since 2012, the

incubator for small and medium-sized enterprises and serves as a platform for entrepreneurship and innovation, and a testing ground for sustainable solutions in environmental technology.

Since 2009, energy consumption in municipal premises has fallen by 5 percent. It is estimated that by 2029 it will have fallen by 15 percent. New buildings use approximately 25 percent less energy than prescribed by national guidelines. In 2012, primary energy use in the district-heating system was 373 GWh compared with a figure of 1287 GWh for final energy consumption. An investment of 1 billion Swedish kronor in a new CHP plant that comes online in 2016 will further reduce the use of fossil fuels. Annual per capita waste has fallen from 305 to 208 kilos since 1992.



This innovation has two effects: it provides citizens with a tangible means of seeing their actions reflected in terms of CO2 reductions (the common good) and on their utility bills (personal benefit). It also represents a major step in terms of public policy by tying together water, electricity and gas. This bridging of “silos” is perhaps one of the most important hurdles to be overcome when striving for low-carbon urban management and development. Through such an integrated system, the city can analyze and evaluate how different actions in different areas affect the total equation of GHG emissions and what areas need greater focus to continue to progress towards lowering the carbon footprint of the city. Since inception of the programme in 2008 GHG emissions have decreased each year, most recently by 135,000 tons.

Between 1995 and 2009, the city of Melbourne, Australia and its population of just over 4 million people suffered extreme hot weather resulting in severe drought, water shortages and heat waves that killed several hundred people. The immediate response of the city was to plan a 90 percent reduction in potable water use. This included cutting irrigation support to the city’s urban forests and a plan to remove 40 percent of the city’s trees. Ironically, this solution underestimated the value of green spaces and ecosystem support services that are critical to climate change mitigation. Realizing the need for a more strategic long-term strategy, in 2010 the city appointed a new Urban Landscape Team. The team produced an integrated open space and urban forest strategy. Since 2010, forty million dollars have been invested in related initiatives including urban forests and shrubbery; green space and rain water harvesting; permeable paving and protection of waterways; and wetlands. The goal is to cool the city by 4 degrees Celsius and thus lower energy use for cooling. 15,000 trees have been

planted, 40 streets retrofitted to improve permeability, and one of the world’s first in-road storm water harvesting system started.

The Darling Street Storm Water Harvesting Scheme is one of the flagship projects of this initiative. It is a world first in combining a number of known storm water treatment technologies into a single space efficient and cost effective approach in the treatment and reuse of storm water. The scheme uses underground elements to reduce the surface

offers financial savings in ongoing maintenance costs estimated to be one tenth of traditional WSUD costs by shifting from a predominantly manual labour component to a mechanized cleaning system. Secondly, the social benefits include increased landscape amenity, greater community awareness and confidence in WSUD technological solutions, and mitigation of the Urban Heat Island effect. The environmental benefits include substantial improvements in storm water quality and thus reduced demand on Melbourne’s



footprint by 90 percent. This is important as land use in a mature urban setting can lead to very high costs of and time-consuming legal procedures for land acquisition. By concentrating the treatment into a central location, the capital and operational cost have also been greatly reduced from the typical rain-gardens approach. It also allows for reuse to occur by including a bio-filtration system.

The system has provided economic, social and environmental benefits. Firstly, the economic benefits of this project include a more cost effective method for achieving storm water quality targets that is up to 75 percent cheaper than traditional Water Sensitive Urban Design (WSUD) approaches. The project also of-

water storages for irrigation, improved water supply to parks and gardens, and reduced flow of run-off into waterways.

Due to the success of the Rainwater Harvesting System in Darling Street, the City of Melbourne is delivering two more storm water harvesting schemes following the Darling Street approach namely at Fitzroy Gardens and at Birrarung Marr. These will be the first of a suit of harvesting schemes envisaged for the municipality. These and other initiatives have been possible due to two factors. The first factor was a four year citizen’s engagement programme that sought to educate and mobilise citizens to not only support innovation in climate adaptation but to become its chief protagonists. The second was the close collaboration

and sharing of a single objective across departments dealing with water, waste water, storm water drainage, parks and gardens, planning and infrastructure. While the city of Melbourne provides the bulk of the funding, regional and federal tiers of governments have also contributed. Other partners include the universities of Melbourne and Victoria for related research; and the media for public awareness.

### People, partnerships and environmental goals

In 2005 the City of Hamburg, Germany decided to embark on a socially-inclusive approach to zero-carbon urban development. A pilot project was established for the redevelopment of the Wilhelmsburg neighbourhood of the City by hosting the International Building and the International Garden Show (IBA). An “IBA Partnership” was established which brought together private companies and the local community. As a result, over 70 projects were developed around 3 themes including cities and climate change.

Wilhelmsburg has 55,000 inhabitants living on an island in the Elbe. It is particularly vulnerable to flooding. It is also an ethnically diverse and low income community with a physical environment affected by industrial and transport infrastructure. The projects are based on maximizing the use of local energy resources (i.e. energy savings and energy efficiency) and harnessing technology opportunity to accelerate local economic development. The aim is achieve 100 percent local renewable energy supply by 2025 and 100 percent renewable heat by 2050, making the Elbe island carbon neutral.

The IBA is also a unique in its governance structure as it is incorporated as a limited liability company. It thus has a certain amount of independence from classic administrative hierarchies and can act more like a private enterprise. Additionally, IBA organized an official “IBA-partnership” with about 150 companies and institutions and it has included the inhabitants in numerous workshops and fora. Less bureaucracy and political interference allowed the IBA to set ambitious targets and to mobilize partners. Already scheduled projects will ensure that 54 percent of heat production and 14 percent of the overall energy demand will be renew-

ably produced by the end of 2015. The IBA Hamburg Model and the Climate Protection Renewable Wilhelmsburg’s strategy has made the City of Hamburg one of the frontrunners when it comes to socially inclusive and environmentally sound urban development. The IBA is sharing the knowledge generated with other partner Cities and is currently scaling up the Wilhelmsburg pilot to other parts of the city.

Smart City Bristol U.K. is a collaborative programme between the public sector, business and community. The main aim is to use smart technologies to help meet the ambitious city target to reduce CO2 emissions by 40 percent by 2020 from a 2005 baseline, as well as other social and economic objectives for its more than 430,000 inhabitants. The programme was launched in 2011 and focusses on ‘Smart Energy, Smart Transport and Smart Data’. It includes pilot projects such as smart metering, smart grid, electric vehicles and open data, alongside permanent initiatives such as a Traffic Control Centre and a Freight Consolidation Centre.

A distinctive trait of Smart Bristol lies in the city’s collaboration with companies (notably, micro-electronic, environmental technology and creative/digital companies) who are working with communities to make them smart. Smart City Bristol is about putting its more than 430,000 people at the heart of a smart city rather than technology. It is how people interact with technology that helps inform behavioural change and help the City to achieve its aims. Smart City Bristol is also evolutionary, in that it builds upon the lessons learned from previous projects to inform new ones.

Accomplishments thus far include:

- Securing an additional £7m in funding for Green Capital activity.
- Becoming one of the inaugural 100 Resilient Cities, a pioneering initiative funded by the Rockefeller Foundation.

- Achieving the 20% energy reduction target as part of 3e Houses
- Decrease in energy consumption by schools and council offices as part of the ‘smart spaces’ project.
- Increased awareness and engagement with climate change issues via



smart city projects in general.

Bristol is already the most energy and waste-efficient major UK city, and it is planning to meet future needs by managing resources even more efficiently. Smart City Bristol has contributed to the image of Bristol as a centre for innovation and a leader in adoption of ‘smart’ solutions to city-level problems. According to the Mayor of Bristol, the key to Bristol’s success lies in the empowerment of its citizens. Citizens played a major role in choosing the technological solutions according to their priorities. This requires first and foremost a commitment to “educate” the public so that they are properly informed of the issues and their policy implications. It also requires that the city administration empower its citizens and trust its citizens to make important but nonetheless informed decisions.

### Conclusion

New technology and new ways to collect and analyse data can contribute significantly to making our urban infrastructure and services more effective and efficient. For the first time in history,

we can begin to envisage city planning and management as a truly holistic endeavour by using data and information from a myriad of sources and across departments and jurisdictions for problem identification and solving. What transpires, however, from the above case studies is that the key ingredients to a

ing new meaning to the concept of public-private partnerships. All three cases represent a radical departure from conventional regulatory and control functions. Melbourne has succeeded in bringing together different departments and three tiers of government to focus on a single objective – ‘cooling the city’

Meeting this objective meant a combined approach to energy and water, the former to lower the heat sink effect and the latter to overcome drought and help green the city. This involved a reversal of an initial policy of cutting down trees, as one of the single biggest consumers of water, to planting more trees to help cool the city. Meeting this objective, however, meant new approaches to water planning and management and the full integration of water management within parks and gardens, land-use planning, infrastructure design and technology. The case of Gwangju represents an equally radical departure from traditional public-private partnerships. While the three ‘silos’ of gas, electricity

and water are still operating independently, a commercial bank acts on their behalf to provide a unified approach to billing. The bank helps the three utilities to present their bills in such a way that the consumer can see the collective impact on CO2 emissions of their individual and household efforts to save water, gas and electricity. This effort is, in turn, translated into a personal benefit in terms of reduced monthly utility bills.

The City of Hamburg also provides a new approach to public-private partnership with the establishment of a limited liability company to plan, design and implement an urban regeneration project for an entire district which is home to a sizeable low-income population. This business model is far from being the outsourcing of planning and design or providing development rights for a real-estate operation; it represents an integrated approach to fiscal planning, land use planning, housing, infrastructure and services. The set up not only leverages resources from public, private and civil society sectors, it also ensures policy continuity over several electoral

periods.

These and other examples show that a “smart city” is made up of three forms of ‘intelligence’: human intelligence through an empowered user or consumer; collective intelligence through new forms of collaboration and partnerships that help break down traditional silos; and digital or machine intelligence through the use of new information-intensive technologies and applications. The challenge for many emerging economy cities lies in removing the barriers that prevent “smart city” approaches from becoming reality. The first barrier is to putting people at the centre of problem identification and solving. This means engaging citizens in all aspects of project planning, design and implementation. The “smart city” requires first and foremost a well-informed and engaged citizenry.

Removing the second barrier requires cities to unleash the potential of entrepreneurs to create new applications that will render the use of infrastructure and services more effective and more efficient. Local government need a regulatory space in which networks of users and service providers have free and unhindered access to information and data and are allowed to come up with original solutions to city problems. Dozens of cities around the world which have removed the barriers of access to information and eased regulatory regimes have witnessed the quasi-spontaneous development of applications that change the way people use and provide public services, manage traffic and mobility, improve safety and security, generate their own energy, and reduce the transaction costs for everything from water, electricity, gas, and waste management.

The last barrier is the governance barrier that separates local government administration and bureaucracy from both its citizens and from businesses that prevent new business models from emerging, new ways of doing old things, and new forms of partnerships. Local governments need to review their roles and responsibilities. They might want to transition from a command and control, monopolistic service provider to a true facilitator that enables people and businesses to find innovative ways of improving quality of life and livelihoods.

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successful smart city are people, partnerships and participation.

The Emergency Centre in Rio de Janeiro almost looks like something out of a sci-fi movie as a wall of screens display real time information and their analysis from hundreds of sources. But what makes this Centre an unparalleled success is its DNA, namely a single objective of saving lives. The Centre now deals with dozens of day-to-day operations of the city, but it has remained people-centred and user-focused. The same goes for the Hangzhou bike-sharing system. In the case of Bristol, the city has gone out of its way to empower its citizens to make decisions regarding which solutions and technologies are best suited to meet their current and future needs. This goes well beyond simply informing citizens or inviting them to voice their opinions in town hall meetings and the like. It is putting citizens in the driver’s seat in city planning.

Partnerships are a critical factor for success of smart city planning. In the cases of Melbourne, Hamburg and Gwangju, city administrations are giv-



# EAST AFRICAN CITIES EMBRACE CCTVS FOR PUBLIC SAFETY

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**The rise of terrorist groups such as Al Shabaab and organized criminal gangs has resulted in terrible loss of life and property in East Africa. For Kenyans in particular, internal security has become a major public policy concern following recent terrorist attacks (e.g. Westgate Mall in September 2013, Mpeketoni, in June 2014, and Garissa University College in 2015).**

**A**l Shabaab has also carried out attacks in Uganda and has threatened attacks against a number of East African countries. Partly in response to terrorism and other organized crimes, East African countries are exploring 'smart' ways of dealing with threats to internal security. Among the tools major cities (Nairobi, Kampala, Kigali, Dar es Salaam) have resorted to are Closed Circuit Television Cameras (CCTV) and related IP-based surveillance cameras. CCTV is the generic term used for a wide range of video surveillance technologies. While traditional CCTV systems produce images that can be monitored using multiple screens, IP-based digital devices store data which can be saved to discs and other storage devices and/or transmitted to different computer networks. The key difference is that CCTVs are about cameras connected in closed loops with images transmitted to a central site. East African countries are moving away from analogue videotapes that have limited storage capabilities and are increasingly integrating their surveillance systems with their emerging IT infrastructure. So far, the degree of ambition and sophistication varies among these countries.

## **Kenya**

In developed countries, surveillance cameras are common in most business premises, malls, casinos, banks, and a

good number of central business districts. Many developed economies also have installed cameras or systems that recognize vehicle number (license) plates and monitor traffic movements in busy places. The main purpose of installing CCTVs in major cities is to enable real-time monitoring of events at key installations and premises. Many CCTC systems are linked directly to and or management by the police and other security services.

Following growing threats to public safety and security, Kenya has invested in CCTVs in key cities and towns. The main contract for the provision of the CCTV system was awarded to Safaricom, a company partly owned by the British telecommunication giant, Vodafone. Safaricom experts were contracted to set up a National Integrated Public Safety, Communication and Surveillance System. It is reported that Safaricom subcontracted Huawei, a China-based telecommunication corporation to install part of the system. The procurement system has been a subject of controversy on the account of lack of transparency.

Safaricom claims that the Integrated Public Safety, Communication and Surveillance System is an intelligent security solution. It would support law enforcement to effectively coordinate and deploy resources in response to threats

to national security. Based upon LTE security communications network, the CCTVs would not be run on Safaricom's commercial network.

Kenya spent about Kenya Shillings 15 billion for installation and purchase of at least 2,000 cameras in selected cities. Nairobi and Mombasa cities kicked off the role out of the CCTV project. The Nairobi CCTV control room was set up at a government facility in the middle of the city. It has 80 screens and 51 cameras. A back up system is to be manned by the Nairobi County government.

## **Uganda**

The first generation of sophisticated public CCTV cameras was installed on selected routes in Kampala in 2007 - in time for the November Meeting of the Commonwealth Heads of State (CHOGM). More recently, CCTV cameras were installed in Kampala Metropolitan Area following an order from President Yoweri Museveni. The Uganda government highlighted the fact that in the case of the April 15, 2013 terrorist bombing of the Boston Marathon, the first source of information was from CCTVs. The government also cited the July 2005 terrorist attacks in London, observing that police were able to trace the culprits with the help of CCTV footage. The Ministry of Internal Affairs and the Uganda Police contracted a Chinese firm to pro-

cure and install surveillance systems on streets and nine major routes ostensibly to combat terrorism and crime.

### **Rwanda**

Rwanda's ICT platforms are among the best in Africa. The country has integrated its traffic control system with its surveillance cameras. The country has also linked its CCTV cameras to its ATM Bank machines. Through an ATM monitoring system, alerts can be triggered when damages and theft occur. The system is capable of sending alerts in the case of power vault failure, theft or breaches to software. Images capture facial features of culprits, amounts of money stolen, and card holders accepting cash.

### **Tanzania**

The private sector embraced CCTVs earlier than the public sector. But when the government embraced surveillance technology, its plan was among the most impressive in the region. The government sought to boost its security credentials through installation of CCTV cameras in various areas. Among the targets were the country's roadways and transportation hubs. Tanzania's concern for monitoring the highways had more to do with tackling road accidents than perceived threats from terrorism. CCTV cameras were also installed in eight major cities including Dodoma, Moshi, Mwanza, Mbeya, Zanzibar, Tanga, Arusha and Dar es Salaam. The leadership of Dar es Salaam became increasingly attracted to the idea of CCTVs after the terrorist bombing of the US embassy in 1998.

The Tanzania Intelligence Service and cabinet approved the installation of CCTV cameras in the city's Central Business District (CBD), and along Kilwa, Old Bagamoyo and Morogoro Roads. The second phase targets the cities of Arusha and Mwanza.

The Ministry of Home Affairs argued that installation of CCTV cameras would help curb crime. In May 2014, Minister Chikawe told parliament that the government would privatize the sector to enhance efficiency. The Tanzania project involves the ministries of Works, Transportation, Urban Planning as well as local governments and individual citizens. The Ministry of Home Affairs is the lead agency.

### **Pros and Cons of CCTVs**

The attraction to CCTVs is understandable. Cameras with night vision

capabilities can help in fighting crimes that occur in the dark or poorly lit areas. Robust CCTV cameras have advanced zooming and tracking elements and are also capable of transmitting images over the internet for onward transmission to multiple analysts. This can make it easier to have an integrated national security and response system. Some CCTV cameras can be operated by motion activated sensors, most of which will, if prompted, easily recognize and match facial features.

However, CCTVs are not a substitute for police patrols, or for the provision of streetlights in urban centers. CCTVs rank behind physical police presence and well-lighted streets in deterring crime. It would be a mistake for policy makers in East Africa to treat CCTVs to complement other security methods and tactics. CCTV cameras and associated technologies such as red-light cameras, aerial cameras, public surveillance, dashboard and body cameras work best if law enforcement have the necessary administrative capacity to administer and utilize them. That capacity includes ethical management in contracting and servicing, data analysis, archiving, retrieval, and reporting.

CCTVs are components of technology transfer, which require substantial retooling to fit local administrative cultures. Without these competencies, data generated from CCTVs might not count where it matters most (i.e. in judicial litigation).

### **Privacy and the emerging surveillance societies**

As East Africans seek to harness CCTVs for improved security and public safety, concerns about privacy and the emergence of a surveillance society are increasingly voiced. In Kenya, some members of parliament questioned the effectiveness of the CCTV surveillance platform when Kabete MP was killed in the central business district of Nairobi and the CCTV appeared to be of no immediate assistance to the police in tracking down his killers. Doubtful lawmakers felt that the CCTV system was not worth the money that had been invested in it.

Others have been more concerned about the privacy implications of the CCTV platforms. Surveillance cameras add to the increasing collection of person data by public and private sec-

tor not only in East Africa but globally. Arguably, the legal framework for the protection of civil liberties and for the implementation of surveillance platforms such as CCTVs in African cities is weaker compared to that in many established democracies. For countries still struggling to establish democratic societies, some worry that these platforms can be abused or rather used to curtail personal freedoms and liberty.

A robust legal framework is needed to strike the right balance between security and privacy concerns. It is not clear that many East African countries have such robust frameworks. Such a framework would include clear guidelines on who holds and or has access to CCTV footage, under what conditions and for how long. It would also include regulations on the security of the platforms and the data they hold and on mechanisms for sharing the data.

There are also administrative challenges. System analysts and administrators must have the capacity to utilize the data generated from the CCTVs. Video analytics can be a complex exercise. In a single year, more than 50,000 hours of recordings are possible. Yet, the volume and variety of data collected must be properly managed and processed. This requires effective organizational management that is often lacking in many public institutions in Africa. With CCTVs generating billions of terabytes of data, there must be effective and secure means to collect, store and process this data, if and when needed. Without appropriate management and skills in video analytics and organizational management, data will not be helpful to street-level and anti-crime policy implementers.

Lack of professionalism has been identified in the procurement, installation, administration and use of the CCTVs in all the four East African countries. Emerging evidence suggests that in much of East Africa, so far CCTVs have been primarily used in a reactive fashion: mostly forensic rather than pre-emptive purposes. Arguably, effective forensics work can also serve a pre-emptive function, but CCTVs can be harnessed as a proactive, crime prevention tool. For example, it is possible to use CCTVs creatively to fight corruption although this does not yet appear to be an explicit function of any of the CCTV platforms in the four East African countries. ■



# RISK ASSESSMENT, HAZARD MITIGATION, AND DISASTER RESPONSE IN AFRICA

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## Background

**A**frica's economic development is expected to take place within the context of ecological challenges (e.g. environmental pollution and degradation, natural and human induced hazards, impacts of climate change). Africa can ill afford the costly and antiquated development approach of the past: 'economic growth first, environmental clean-up later'. The environmental problems in India and China (e.g. severe air and water pollution, among others) should serve as a useful lesson for Africa's development planners and thinkers.

The African landscape has been subjected to human-induced, long-term environmental deterioration. In both rural and urban areas, slash and burn practices and deforestation have caused depletion of the rich top soil, among other ills. Further degradation of the African ecosystem or 'natural capital' is likely to constrain the much desired economic growth, even before the impacts

of climate change are factored in.

The continent is highly vulnerable to natural and human-induced disasters. According to the World Bank, Sub-Saharan Africa has been subjected to more than 1000 natural disasters during the last four decades. These disasters are expected to significantly increase in intensity and occurrence (<http://go.worldbank.org/UO0ESIRF10>). Major urban centres in the economically fast-growing countries of Africa are approaching or have exceeded their 'carrying capacities' as a result of a number of population growth, chronic poverty and growing rural-urban migration. The result is significant environmental stress, which is manifested in different ways in different places. The impacts of climate change will amplify this environmental stress, with potentially significant implications for Africa's economic development, political stability, social order and peace.

## Natural hazards in Africa

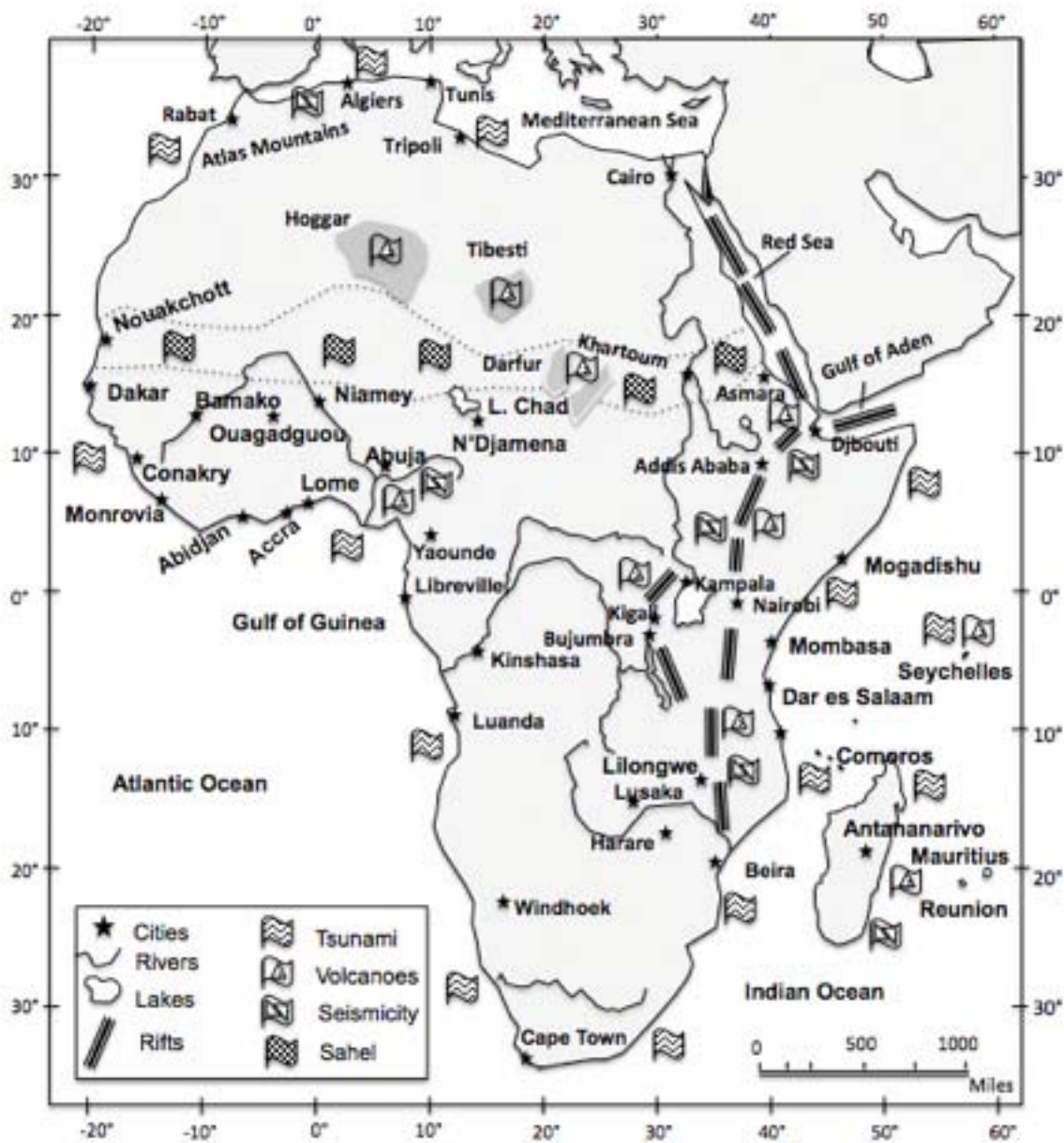
The major natural hazards in Sub-Saharan Africa in the past have been hydro meteorological (e.g., drought, cyclones, flooding) and geological and tectonic (volcanoes, earthquakes, tsunamis, etc.) in origin. Different parts of the continent are potentially at risk from different types of natural hazards although some regions face multiple risks.

- Hydro meteorological: The Sahel region is a narrow strip of land along the southern margin of the Sahara Desert from Dakar to the Red Sea. It is prone to protracted droughts and sporadic dust storms (Map 1). The major decadal severe droughts and famine in eastern Africa (e.g., Ethiopia, Somalia, Sudan, Kenya, etc.) in 1974, 1984, 1994, 2002, and in 2011 affected millions of people, livestock and the environment.
- Volcanism and earthquakes along the eastern Africa Rift system: The eastern Africa Rift extends from the

Afar Depression of Djibouti, Eritrea, and Ethiopia in the north to Kenya, Uganda, DR Congo, Rwanda, Burundi, Tanzania, and Malawi in the Lakes Region of eastern-central Africa, and to Mozambique and South Africa in the southeastern part of the continent (Map 1). The Nyiragongo eruption in 2002 partially destroyed the town of Goma in the DRC and displaced more than 350,000 people. The Ol Doinyo Lengai volcano in Tanzania and several recent eruptions of lavas and ashes from the Afar Rift of Ethiopia and Eritrea pose constant threats to population centers and to the environment.

- Volcanoes, earthquakes and tsunamis: Coastal lowlands along the eastern continental margin of Africa from Somalia to South Africa and nearby islands (i.e., Madagascar, Comoros, Mauritius, Reunion, and Seychelles) in the western part of the Indian Ocean are always at risk

(Map 1). The most recent tsunami generated by the Sumatra, Indonesia earthquake of December 2004, greatly impacted the region. Moreover, most North African countries located along the Nubia Plate boundary are prone to earthquakes and tsunami hazards.



Map 1. The map shows the major urban centres of Africa and the regional locations of potential natural hazard occurrences. The major natural and human-induced hazards that have and are likely to impact most, if not all nations in Africa are as follows.

I. NATURAL PHENOMENA: HAZARDS AND DISASTERS	
Processes	Hazards
1. Geological/tectonic	Volcanoes
	Poisonous gases (SO <sub>2</sub> , CO <sub>2</sub> , H <sub>2</sub> S, CH <sub>4</sub> , etc.)
	Earthquakes
	Landslides
	Tsunamis
	Lahars/debris flow/flooding
	2. Hydro meteorological
	Floods
	Extreme heat and heat waves
	Droughts/famine
	Wildfires
	Dust storms
3. Biological hazards	Epidemics/pandemic
	Pest infestation
II. HUMAN-INDUCED HAZARDS AND DISASTERS CIRCUMSTANCES	
1. Atmospheric (Anthropogenic impacts)	Air pollution
	Gas flaring
	2. Water (surface and groundwater) contamination
	Municipal/sewer
	Irrigation outflow
	Industrial/manufacturing waste water
3. Fires	Forest lands, slash and burn
4. Land	Toxic-waste dump/expired chemicals
	Solid waste and sewage
	Mining dump and erosion
	Deforestation, erosion, dust storm
5. Societal conflicts and terrorism	Armed conflicts, genocide, mass migration, failed states, etc.
	Biological threats
	Chemical threats
6. Technological hazards	Hazardous materials



## Hazard mitigation and response in Africa



The International Council for Science Regional Office for Africa (ICSU-ROA) has prepared a science plan for mitigating major natural and human-induced hazards and disasters in Sub-Saharan Africa (<http://www.icsu.org/africa>). The plan focuses on assessing and managing geological hazards through the use of remote sensing. It also focuses on hydro-meteorological hazards and disasters with special emphasis on the Sahel region. The plan also focuses on flood management in major river basins.

The World Bank has established a disaster risk management (DRM) team for Sub-Saharan Africa based on the Hyogo Framework for Action (HFA). The HFA is a global framework for disaster risk reduction and management. The Bank's initiative builds on the African Union's Regional Strategy for Disaster Risk Management ratified in 2004. This regional strategy seeks to:

- Enhance risk and vulnerability assessment across sectors using ad-

vanced early warning sensors and monitoring systems.

- Promote awareness of natural and human-induced hazards and disasters and support policy and institutional building for DRM.
- Provide resources to mitigate and reduce risk factors.
- Expedite preparedness with contingency planning, including catastrophic risk financing tools.
- Rehearse emergency responses and readiness with respect to provision of assistance during post-disaster events.

### Independent initiatives

In addition to the international efforts described above, a number of scientists from Africa, Europe, and the United States have embarked on concerted efforts through collaborative research, training and mentoring to increase natural hazards preparedness in Africa. In 2002, a comprehensive assessment - 'Geoenvironmental Hazards and Dis-

asters in Africa' - was carried out at a workshop in Nairobi, Kenya. In 2009, an 'Advanced Workshop on Evaluating, Monitoring, and Communicating Volcanic and Seismic Hazards in East Africa' was held at the Abdus Salam International Center for Theoretical Physics (ICTP) in Trieste, Italy. More than 80 scientists and students from 30 countries in Africa, Asia, North and South America, and Europe attended. About half of the participants were from Africa.

The meeting was full of promise and energy. Participants developed action plans to tackle volcanic, seismic, and other natural hazards in Africa. The workshop ended with an ambitious action plan to support immediate and long-term needs of African geoscientists, especially in research, infrastructure, and education. The meeting recommended the creation of regional data centers, Sub-Saharan volcano and earthquake observatories, and the establishment of a geohazard PhD and

MS programme at an African University.

Addis Ababa University (AAU) in Ethiopia was selected to be the hub for the geohazard PhD programme. By 2012, the AAU team had developed a curriculum for the Geohazard PhD Programme. It was a robust and well-integrated interdisciplinary programme. Unfortunately, due to lack of adequate resources, the programme failed to take off although the initiative had a lot of potential. It would have complemented ongoing international efforts (e.g. ICSU-AOR, the World Bank Africa DRM initiatives). The need for it is as strong today as it was in 2009. Missed opportunities like this should not deter African professionals and friends of Africa from renewing efforts to establish regional or national centres for disaster risk mitigation and preparedness.

Disaster risk reduction and management is critical to the future of economic development in Africa. Natural hazard mitigation seeks to reduce the risks of catastrophic impacts through careful planning, effective regulation of land use, and building procedures especially in large metropolitan areas. Poor land use planning, especially in urban areas and bad development decisions are likely to lead to catastrophic destruction of life and property.

In any case, there will be natural and man-made hazards and disasters in the future. Heightened awareness through education at local, regional, and national levels and advocacy for safer and sustainable developments can make a huge difference in disaster risk management. In the long-term, the successes of the national, regional, and continental initiatives will depend on whether African countries can train, recruit, and retain skilled experts on natural hazard and disaster risk assessment and mitigation. Political commitment and action plans are required to develop functional institutions that are capable of assessing potential threats from natural and human induced hazards.

### What should African countries do?

- Each country should formulate a nationwide plan and strategy that empowers local experts - national geological surveys agencies, universities, and emergency services - to develop databases of all potential natural and human-caused hazards at the local, district, provincial, and national levels.
- At the regional level, countries that are likely to be affected by similar hazards and disasters should coordinate and integrate their resources. Regional economic, developmental, and security organizations could play key roles in facilitating such collaboration.
- At the continental level, the Department of Human Resources, Science, and Technology of the African Union should play a vital role as a coordinator of the various national and regional and international efforts in this area.

The most important long-term option is to establish at least two Africa-based higher-education (i.e. PhD) centres to provide hydro meteorological and geological hazard studies and training. One of these centres could replace the failed geohazards PhD Programme at Addis Ababa University. The broad interdisciplinary prospectus that was prepared for the geohazard programme could be modified to include courses related to volcanoes, earthquakes, landslides, and tsunamis within the eastern African rift, the Cameroon Line, the islands and coastal lowlands along the western parts of the Indian Ocean, and North Africa. The Sahel region of West Africa would be an ideal location for training future experts in hydrometeorology and related hazards. These two programmes would lay the foundation for long-term capacity building in hazards and disaster risk mitigation and management in Africa.

The worldwide web provides a wealth of information on all kinds of natural and human-induced hazards and disaster management. These are mostly prepared by the developed world ([www.fema.gov/pdf/areyouready/basic-preparedness.pdf](http://www.fema.gov/pdf/areyouready/basic-preparedness.pdf)).

However, the basic guidelines are universally applicable:

- Developing emergency plans,
- Collecting and assembling disaster supply kits,
- Learning where to seek shelter from hazards,
- Identifying rural/urban community warning systems and evacuation routes,
- Knowing relevant information from community and school plans,
- Learning what to do for specific hazards, and
- Practicing and maintaining emergency plans,
- Establishing communication networks (i.e., mobile phone, social media, radio, TV, etc.).

If Africa is to achieve sustainable growth and development, it will need to develop and implement an effective hazards and disaster risk and mitigation strategy. Ultimately, effective implementation of such a strategy will rely on skilled local expertise. It is time for the continent to invest in building capacity in this area. ■

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# CLIMATE RELEVANT INNOVATION-SYSTEM BUILDERS (CRIBS)

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**For developing countries, the promise of access to new climate technologies (including low carbon energy technologies and technologies for adapting to climate change) has always been a key motivation for engaging with UN climate negotiations.**

**S**ub-Saharan Africa is a region whose aggregate greenhouse gas emissions are minimal but whose potential growth in emissions through ambitious economic development plans, and whose vulnerability to the impacts of current and future climate change, are significant. The region also has an urgent need to deal with the low levels of access to modern energy services, an issue faced by two in every three people in the region – and an issue that access to low carbon energy technologies has a high potential to address (as highlighted by the UN’s Sustainable Energy for All initiative).

For these reasons, the potential support that UN climate policy could provide to African countries in funding initiatives

that enhance access to, and development of, new climate technologies is highly significant.

In this short article, based on grounded research with partners in Africa, India and China, we articulate a concrete policy proposal for extending the existing United Nations Framework Convention on Climate Change’s (UNFCCC) Technology Mechanism to make it work for Africa. The proposal has the potential to make a real, long term difference to African countries’ access to, and development of, climate technologies. We propose the implementation of CRIBs (Climate Relevant Innovation-system Builders) – centres based on the ground in African countries as an extension to the existing Climate Technology Centre

and Network (CTCN) under the UN-FCCC Technology Mechanism.

In an earlier edition of the African Technopolitan, Professor Stefan Schepers wrote about the value of building “Innovation Ecosystems” in African countries as the key means through which to boost science, technology and innovation and ultimately economic growth and broader human development across Africa. CRIBs, as a policy mechanism, is designed to do just this. Rather than “Innovation Ecosystems” we refer instead to “National Systems of Innovation” – an accepted term in the scientific literature and one which can explain the economic success of many different countries across multiple different socio-cultural and environmental

contexts in both the Global North and South.

Our hope is that African negotiators will take this CRIBs proposal and run with it as one of their key demands at the forthcoming UN climate negotiations in Paris in December 2015.

One of the most powerful boosts to addressing climate technology transfer and development under the UNFCCC came in October 2014 at a meeting convened by the Technology Executive Committee (TEC) on strengthening National Systems of Innovation in developing countries. This briefing suggests some key points for how the UNFCCC architecture could be extended in order to strengthen National Systems of Innovation in order to achieve more transformative rates of climate technology transfer and development via the development of CRIBs.

#### **Our key policy recommendations are for:**

- Long term funding to establish and run CRIBs under the UNFCCC as an extension to the CTCN
- Support to help countries design and establish CRIBs under the UNFCCC
- CRIBs to be demand-driven by Parties
- CRIBs to be housed within existing institutions in developing countries
- CRIBs to feed requests to the CTCN via National Designated Entities (NDEs)

#### **The problem with current policy: Hardware financing**

It has long been recognised under the UNFCCC that the Convention should provide developing countries with support to mitigate and adapt to climate change, and to develop along low carbon, climate resilient trajectories. One of the ways the UNFCCC is supposed to help this to happen is by supporting the transfer and development of climate technologies (technologies for climate change mitigation and adaptation). However activities under the Convention have failed to deliver at anything like the speed or scale needed. So why hasn't it worked?

Research with our partners in Africa, India and China demonstrates a core reason is the current policy fram-

ing of the problem as one requiring 'hardware financing'. Climate technologies are more expensive than conventional technologies, so market mechanisms – e.g. the Clean Development Mechanism (CDM), Global Environment Facility (GEF) funded efforts – help pay for technologies which might not otherwise be affordable.

But these approaches ignore the most important prerequisite for countries to be able to absorb new technologies: technological capabilities.

#### **Sowing seeds**

Technological capabilities are like soil in a garden. Without initial efforts to nurture the soil's fertility, scattering seeds (bits of technology hardware) is unlikely to lead to a flourishing garden (technological change and development). Moreover, commercial gardening contractors (technology investors) are unlikely to invest effort in sowing seeds in infertile gardens in the first place.

Hardware financing mechanisms, therefore, serve to reinforce the comparative advantages of different countries. The majority of investment from the CDM, for example, went to countries with comparatively high levels of existing technological capabilities such as China (60%) and India (11%). Africa as a whole only received 3% and sub-Saharan Africa even less. The CDM also tended to fund established, close-to-market technologies rather than nurturing the development and uptake of new technologies.

#### **How National Systems of Innovation can help**

So how do countries develop the technological capabilities they need to attract technology transfer and development? The key, according to decades of research in the field of Innovation Studies and more recent work on Socio-Technical Transitions, is to focus on nurturing National Systems of Innovation (NSIs).

NSIs can be understood as the gardens within which the fertile soil is to be nurtured. They provide the context within which all processes of technology development, transfer and uptake occur. NSIs encompass the network of actors (firms, universities, research institutes, government departments, NGOs) within which

innovation occurs, and the strength and nature of the relationships between them.

The idea of nurturing the NSIs would begin to address the problem that hardware financing can't fix. It could underpin more sustained and widespread transfer and development of climate technologies. As such, it provides a powerful new focus for international policy.

#### **A change in thinking: from gardens to gardeners**

Innovation System Builders, key actors (individuals or institutions) who link actors and institutions up across niches of climate technology activity, are pointed to in the above literatures. These are the gardeners who, wanting their garden to prosper, prepare fertile ground for leaps ahead in technological capability development. Policy efforts could seek to fulfil the role of Innovation System Builders.

By convening the NSIs workshop, the TEC – responsible for overseeing implementation of the UNFCCC's Technology Mechanism – has signalled its interest in this powerful way forward for UN climate policy.

#### **What happens now?**

The TEC will further consider NSIs in 2015, according to its 2014/15 work plan. Nurturing NSIs will take effort and capacity, more in some countries and regions than others. Looking at the coverage of existing mechanisms under the UNFCCC (mostly via the CTCN) and related initiatives – including the World Bank's Climate Innovation Centres (CICs) and the various Development Bank initiatives funded by the GEF – we have a clear picture of where the gaps are.

Table 1 illustrates the coverage of existing mechanisms against the key policy goals which should direct efforts at innovation system building. It disaggregates between national and international networking and adds an additional row to signify whether NSI building is an explicit part of any of their remits at present. From the swathe of yellow we can see that it would be possible, with incremental revisions to the existing remit of most of these initiatives, to integrate NSI building across their activities.

Table 1 – Coverage of existing policy mechanisms against key elements of building National Systems of Innovation

Goal	CTCN	CIC	ADB	EBRD	AfDB	IADB
Explicit Innovation System Building focus?	P	P	P	P	P	P
Build networks (intl.)	Y	Y	Y	N	Y	Y
Build networks (national)	P	Y	Y	N	P	Y
Share learning	P	N	P	N	P	P
Shared visions	P	N	P	N	P	P
Support experiments	P	N	P	P	P	P

**Key**

CTCN - Climate Technology Centre and Network; CIC – Climate Innovation Centres; ADB – Asian Development Bank ; EBRD – European Bank for Reconstruction and Development; AfDB – African Development Bank Group; IADB – Inter-American Development Bank.

**Y • Yes – within existing remit**

**P • Potential – within, or with incremental changes to, existing remit and institutional structure**

**N • No – outside remit**

**How can it work?**

What needs to change in order to make this work? Under the UNFCCC, the key delivery mechanism is the CTCN. The TEC could make a recommendation to the UNFCCC Conference of the Parties (COP) for a new approach here. But the CTCN lacks capacity on the ground in Africa, and, indeed, in developing countries more generally. The CTCN’s National Designated Entities (NDEs) are generally staffed by civil servants with only a small proportion of their time allocated to the NDE role.

The creation of CRIBs is needed. These would be dedicated institutions on the ground in Africa focusing explicitly on building NSIs, understanding local capacities, and identifying opportunities to connect actors up across projects and programmes and sectors, linking up with and understanding technology users, and so on. (Note, this is likely closer to Professor Ambuj Sagar’s and his colleague’s original vision for what became the CICs, although their vision was for centres at a regional rather than national level – and it was exactly what was intended in the Sussex Energy Group’s proposal for the critical UN negotiations in Copenhagen in 2009). Each CRIB would feed in requests to

the CTCN via the NDE in their country. It would also link to, and learn from, CRIBs in other countries via the CTCN. It is a demand-driven model, with countries expressing their desire to establish a CRIB which would then be facilitated via support under the UNFCCC. This demand driven nature is critical. It provides African countries with the legitimate remit to influence the UNFCCC architecture in ways that facilitate development in directions that are self-defined and fluid, learning and evolving as they grow.

What is required under the UNFCCC, and what African negotiators must demand, is that long term funding be made available to establish and run CRIBs. Support could also be made available to help countries to design and initially establish them. They would also benefit from their direct link into the CTCN, providing for further, in-country demand driven support. Ideally, CRIBs wouldn’t be new institutions, but would be run through existing institutions with appropriate expertise (e.g. universities, research organisations or NGOs).

**New opportunity and approach**

There is an opportunity here for a new

framing of international climate technology policy around nurturing NSIs – an opportunity for an African driven and self-defined vision for making the UNFCCC work for them. Decades of empirical research support the idea that this policy framing would have significantly more impact than one built around hardware financing approaches.

We look forward to positive steps forward from the TEC in the months to come, to the creation of Innovation-System Builders, via the establishment of CRIBs in developing countries, and to a new turn in international policy efforts that works for all countries, not just the few who have benefited to date through mechanisms like the CDM. ■

*For the peer reviewed scientific basis to the proposal, please refer to our open access article in the journal Climate Policy [http://www.tandfonline.com/doi/full/10.1080/14693062.2015.1052958#.VZEksek\\_0c](http://www.tandfonline.com/doi/full/10.1080/14693062.2015.1052958#.VZEksek_0c).*



# USING DATA TO TACKLE CLIMATE CHANGE

By Dr James Kimondo  
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**Across Africa, accessing timely and accurate data in the land-sector is a challenge. Whether a decision maker wants to track changes in forest, a farmer wants to know what crop to plant, or a national climate change negotiator wants to understand a country's emissions, all too often they are confronted by data that is fragmented, incomplete or inaccessible.**

**F**or the last three years, government officials, academics and scientists in Kenya have been working with the Clinton Foundation to overcome this problem by building SLEEK (System for Land-based Emissions Estimation in Kenya). This programme is also supported by the Government of Australia.

The programme's first goal is to build a national GHG (greenhouse gas) Measurement, Reporting and Verification (MRV) system for the land-sector in Kenya. MRV systems are used by countries to track their GHG emissions and report changes to the United Nations Convention on Climate Change (UNFCCC). They play an important role in helping tackle climate change by providing vital information about a country's GHG emissions. Currently, Kenya does not have a system for estimating emissions in the land-sector. Without this, it is difficult to plan effective policies for reducing emissions. Furthermore, a robust MRV would enable Kenya to maximize the benefits from international programmes that seek to reduce emissions through reduced deforestation and implementation of green growth strategies. SLEEK will allow Kenya to track its GHG emissions and removals in the land-sector and to report this accurately to the UNFCCC.

The programme's second key output

is the development of applications and supporting data acquisition infrastructure to make this information available in ways that can help Kenya address other vital socio-economic issues, such as food security, agricultural productivity and land-management. Putting this data into the hands of Kenyans in formats they can use could have profound implications across the country, changing the way Kenya grows its food, manages its lands and protects its natural resources.

### How is SLEEK being built?

SLEEK is being delivered by teams of scientists and other experts from a range of institutions organized in Element Working Groups. This collaboration helps break down silos between agencies and helps scientists work together in new, innovative ways. The programme is supported by a broader governance structure, with administration located in a Programme Management Unit and high-level strategic oversight provided by a Programme Steering Committee.

The programme will bring together five key data sets:

- Soil data, providing essential information about soil nutrient and carbon levels;
- Forest data showing where forests were and are in Kenya, how much carbon is sequestered through growth, and information about the

optimal conditions for growth;

- Weather data, collected from weather stations across Kenya;
- Information about Kenya's key crops, including the conditions that change their growth patterns and how much carbon is stored by different crops; and
- Land cover maps of Kenya, showing how land-use has changed over the past thirty years.

To drive SLEEK, an integration tool called FLINT (Full Lands Integration Tool) has been developed by Government of Kenya and experts from the Clinton Foundation. This tool is able to analyze data sets to answer policy questions and guide the policy development process. It does this by identifying changes in Kenya's land-sector through remote sensing, and then using models to simulate the carbon fluxes as a result of this land-cover change. The tool has been built to be generic – which means that any other country will be able to adopt it, connect their own data and use it to meet their own policy goals.

### Challenges of building SLEEK

The road to building SLEEK has not been easy. It has taken time, effort and perseverance. A number of key lessons can be generalized from the programme, and can help inform similar projects that aim to build long-term data systems.

### **Data is fragmented**

Countries like Kenya have significant stores of data. However, often this data is fragmented and incomplete. Too many records are stored on paper, or have not been converted to a standard format that allows the data to be compared over time. This is often a result of the way various independent programmes collect data for their specific purposes. Even when intensive research is undertaken in certain sites, there are few ongoing, comparable monitoring systems developed. This means that data sets are frequently very lumpy, with inconsistent methods and irregular timescales.

### **The policy agenda is crowded and urgent**

Kenya, like most developing countries, confronts a wide range of vexing policy challenges, from the provision of high quality education to responsive health-care, inclusive communities and jobs. As a result, prioritizing policies to address climate change will always struggle in this environment, as the impacts will be felt over decades. Equally, building robust data-systems within governments requires long-term decision-making and a significant level of technical investment before benefits are realized.

### **Data systems are complex**

Building data-systems is always a complex undertaking, and the SLEEK experience so far is no different. These systems require innumerable decisions to be made across government departments and institutions and many hurdles to be overcome. SLEEK has benefited from drawing extensively on the experience of other countries. However the complexity remains a continuous challenge. This problem is not unique to MRV systems – all data systems need to make decisions across a range of institutions.

## **WHAT LESSONS TO CONSIDER IN BUILDING BIG DATA SYSTEMS LIKE MRV?**

### **Building strong foundations within a country**

The first step in building any system that will be sustainable within government is to build strong foundation and awareness within the country. SLEEK has been careful not to impose itself on top of pre-existing government structures. Instead, the development has respected and reinforced existing mandates. This has been supported by a careful, long-term engagement with experts across

the country – working at steady, accommodative pace that gave all stakeholders a chance to be involved.

### **Fill the gaps**

SLEEK has undertaken extensive efforts to identify the gaps that exist in datasets and to put in place programmes to fill these gaps. In many cases, data exists but is not in a usable format. For example, the programme has digitized over 1.7 million climate records at the Kenya Meteorological Service, which were previously stored in paper formats. This has greatly expanded Kenya's digital climate record, improving the service's capacity to analyze and understand Kenya's climate.

The programme has also strengthened the capacity of Kenyan scientists to develop and use models that are able to provide insight in crops, soils and forests in Kenya. The programme has developed interfaces that will make it easier for scientists to use a key soil model called the Rothamsted Carbon Model (Roth-C). Previously, scientists had to have detailed knowledge of the model's operation, however with the new interfaces they are able to access the model much more easily.

These user-friendly interfaces will continue to be developed for all key models used in SLEEK. The development of these interfaces has been supported by the provision of training by some of the most well respected research institutions in the world, which has brought global knowledge to Kenya. Finally, SLEEK has provided significant funding to develop new datasets. This is fundamental to filling the gaps in data, and to create a comprehensive system that can deliver the results needed by Kenya.

### **Improve the return on investment**

MRV systems are essential for tackling climate change. However, as discussed, they compete with a range of other pressing needs. To overcome this, data systems need to over-perform by delivering a high rate of return on investment for a wide range of beneficiaries. In SLEEK, this has meant ensuring that the scope of activities is broad enough to address challenges across government, well beyond simply providing emissions estimation results. Harnessing data to meet development challenges creates champions across government, and fosters the political will to keep a system running long after donor funding has ceased.

### **Make the data matter to people**

SLEEK has been explicitly designed to help address a range of socio-economic issues such as food security, agricultural productivity and land-management. This will primarily be done through the development of programmes and applications. Kenya has already recognized that there are a wide range of applications that could be developed using SLEEK data. The Clinton Foundation has worked with the Government of Kenya to scope an initial set of applications which would have a significant benefit for Kenya.

For example, by bringing together climate data, crop information and maps of Kenya's soils there is the capacity to help provide information about the best crop to grow in a particular area. This information can be disseminated through SMS, information programmes or table applications. The data collected by SLEEK can also help overcome challenges in programmes that haven't succeeded for a lack of reliable data. For example weather index-based crop insurance has been difficult in Kenya due to a lack of access to weather data. SLEEK will help provide access to this information through certified weather maps that are timely, accurate and accessible. SLEEK can also help connect local databases with national infrastructure. For example, a proposed forest tracker will help Kenya's forest managers track deforestation and identify areas for reforestation. Communities will also be able to use this tool to help plan their own reforestation projects, and will be able to estimate the income they could generate by selling carbon reductions to others who want to offset their impact on the environment.

These three applications are an indication of the possibilities that can result from the SLEEK data collection process. Continuing to identify and capitalize on these datasets will be a key opportunity for all Ministries within the Government of Kenya.

### **Making data systems sustainable**

SLEEK was born out of a need to track emissions in Kenya. However, making the system sustainable required the reach of the programme to extend beyond these initial aims. The lesson is that data-systems in Africa can't be restricted to narrow goals – instead, they have to address a range of national development priorities. This lesson applies beyond MRV, and can help inform programmes across the developing world. ■

# E-GOVERNMENT AND ENVIRONMENTAL IMPACT ASSESSMENT IN KENYA

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**In October 2012, Kenya’s National Environment Management Authority (NEMA) launched a digital portal. NEMA’s e-EIA system has the potential to yet again reinforce Kenya’s status as one of Africa’s most technologically adventurous countries.**

**T**he cornerstone of e-governance has always been utilization of information and communications Technology (ICT) in the delivery of equitable and efficient public services as required by citizens and organizations. The ‘e’ in e-government refers to the enabling technology and is not the primary focus – that remains on ‘government’. The goal is to eradicate poverty and disease, improve literacy, protect the environment, enhance transparency and accountability, empower citizens and accelerate economic development. Without radical commitment by governments to leverage the opportunities presented by enabling

technology, the digital age is unlikely to provide lasting solutions to fundamental social and economic challenges. African countries are still largely natural resource based economies. Many are highly susceptible to the negative effects of environmental degradation. A review of EIA systems conducted by the United Nations Economic Commission for Africa (UNECA) in collaboration with Capacity Linkages for Environmental Assessment in Africa (CLEAA) (UNECA, 2005) revealed that while African countries have made significant efforts to implement EIA legislation, the institutionalization of EIA has been slower in Africa than else-

where in the world. Limited capacity to manage, utilize and disseminate information effectively is one of the major challenges. Others include corruption, poor quality EIA reports, inadequate EIA review and Environmental Management Planning (EMP).

Innovative and effective use of ICTs, in the form of e-environmental governance has the potential to address some of these challenges. According to the UN E-Government Survey of 2014, for the first time, all the 193 UN Member States have achieved online presence. 130 countries have made efforts to provide environmental information online,



23 of which are in Africa. Tunisia, Mauritius, Egypt, Morocco and Seychelles lead the middle income economy countries while Ethiopia, Kenya and Rwanda are at the forefront in the low income economy category. A diverse array of digital channels including national websites, Wide Area Network (WAN), mobile applications, e-participation features (social media, crowdsourcing and Short Message Service – SMS) and dedicated Open Government Data portals are now actively in use for the provision of services and environmental information by environmental agencies in Africa.

#### Kenya's e-EIA system

The Kenyan e-EIA system was de-

veloped by the ICT department after an assessment of the requirements and consultation between environmental experts and ICT professionals at NEMA. It is an integrated Government-to-Citizens / Government-to-Business / Government-to-Government (G2C/G2B/G2G) model.

The e-EIA system has enabled the automation of the following services:

- **Registration of EIA experts:**
- application for registration as an environmental impact assessment/audit expert
- application for license to practice as an environmental impact assessment/audit expert

in relation to the rest of the region and the world. The report is available for download on the NEMA website. Other online publications and resources are also available such as the NEMA Magazine, EIA regulations, policies and procedures, EIA experts register with contact details and samples of approved EIA study reports for reference purposes.

The user interface of the NEMA e-EIA system is web based and accessible to the public. The back-end application has an inbuilt workflow management system (WfMS), making it possible for all applications and submissions to be tracked online. Links to related government agencies (Ministry of Environment and Natural Resources, Kenya Meteorological Department, Department of Resource Surveys and Remote Sensing (DRSRS) and the Mines & Geological Department can also be accessed on the web platform. For payment purposes, information on the specific bank account to be used is provided on the site.

To date, NEMA has not undertaken a comprehensive benefits evaluation exercise so the degree to which the e-EIA system has influenced EIA performance, service quality, operational efficiencies and public participation remains to be established. However, at a glance, it would appear that operations at the agency are now modern, traceable and relatively more efficient. Productivity and accountability of the staff has increased. With more transparent procedures, it is hoped that instances of corruption and unnecessary delays will reduce. For project proponents and EIA experts, perhaps the biggest gains have been realized through the remote submissions and applications system. ■

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Without radical commitment by governments to leverage the opportunities presented by enabling technology, the digital age is unlikely to provide lasting solutions to fundamental social and economic challenges.

veloped by the National Environmental Management Authority (NEMA) in 2012. It was predicated on the assumption that the integration of ICTs in the management and implementation of the Environmental Impact Assessment (EIA) process has the potential to transform environmental regulation and protection. The e-EIA system aims to:

- improve the quality and efficiency of service delivery
- simplify operational procedures
- enable access to NEMA services throughout the country
- promote productivity through tracking and monitoring of progress
- minimize administrative and operational costs
- enhance public participation and consultation
- reduce avenues for corruption through transparency and accountability

The e-EIA system was developed in-

#### Environmental Impact Assessment review:

- submission of environment impact assessment project report
- submission of environment impact assessment study report
- application for variation of environmental impact assessment license
- notification of surrender of environmental impact assessment license

#### Compliance and Enforcement (waste management, noise, biodiversity, water quality and ozone depleting substances):

- Environmental Licensing
- Environmental Auditing
- Environmental Inspection
- Environmental Incident Management and Disaster Prevention through a 24hr dedicated hotline
- Environmental reporting: NEMA publishes the annual State of the Environment (SoE) report which provides updates on various environmental issues affecting Kenya

# ADAPTATION AND DEVELOPMENT POLICY IN AFRICA

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Africa's vulnerability to climate change coupled with the region's socio-economic dependence on climate sensitive sectors underpinned by healthy ecosystems means the adaptation imperative for the continent is no longer debatable.

**T**he IPCC 4th assessment report (IPCC AR4) documents that Africa is among the most vulnerable regions to climate change, with wide ranging impacts impinging on its key economic sectors recorded in the IPCC's 5th assessment report (IPCC AR5), the 1st Africa Adaptation gap report (AAGR1), and more recently, the 2nd Africa adaptation gap report (AAGR2) released early 2015 among other notable publications. Among sectors at risk include health-care, water resources, infrastructure, energy, tourism, ecosystems and agriculture, which employs up to 60% of labour in Africa, yet is 98% rain fed, hence vulnerable to climate change. In addition, climate impacts of flooding and sea level rise on rapidly urbanizing African cities is also noted by the IPCC

AR5 as a major developmental concern.

## WHAT IS AT STAKE FOR SECTORS DRIVING AFRICA'S ECONOMIES?

### Agriculture and fisheries

In agriculture, climate change is linked to potential declines in yields of major staples in Africa. The World Bank reports that in SSA, by the 2030s, droughts and heat will leave 40% of the land now growing maize unable to support the crop, while rising temperatures could cause major loss of savanna grasslands, thereby threatening pastoral livelihoods. The implication is that by 2050, depending on the sub-region, the proportion of the population undernourished is projected to increase by 25 – 90% compared to the present.

The AAGR1 reports that climate change effects on crop yields for key staples in the continent point to mean yield changes (reductions) by the 2050s of -17% for wheat, -5% for maize, -15% for sorghum, and -10% for millet. On precipitation, northern and southern Africa regions are projected to experience particularly strong declines, with a projected decrease in annual precipitation of 5 – 20%. This while 95% of food in SSA is grown under rain fed agriculture.

The AAGR2 mirrors findings of the IPCC AR5, noting serious implications of yield reductions for key staples in the continent leading up to 2050. For instance under a 20C warming scenario, West Africa will experience 7% reduction in maize yields, the Sahel will expe-

rience 13% and 11% reductions respectively for maize and millet, Central Africa will experience 13% reduction in maize yields, and southern Africa 11% reduction. For a 30C world, the Sahel is projected to suffer 40% reduction in millet yields, a major staple in this region.

In fisheries, climate change is projected to result in substantial reduction in marine fish production and decline in fish protein supply in West Africa by the 2050s. Fisheries are a vital source of food/nutrition security and livelihoods in this region. Economic loss to this region as a result of reduced catches by 2050 under a 2°C warming scenario is projected at 21% of annual total landed value baseline to 2000 (from USD 732 million in 2010/11 to USD 577 million, using constant 2000 dollars) and a 50% decline in fisheries-related jobs. Côte d'Ivoire, Ghana, and Togo are projected to suffer the greatest impacts on their landed values with up to 40% declines.

### Energy sector

In the energy sector, climate change has been identified as a significant driver of water shortages in hydro-power systems, with impacts recorded in high potential areas like Southern Africa, Kenya, Tanzania (rainfall variability contributing to 64% decline in water levels in Mtera dam which supplies 50% of hydropower in Tanzania) and the DRC. The AAGR1, AAGR2 as well as the IPCC AR5 document that energy generation in Africa will be impacted negatively by climate change induced rainfall variability as well as temperature increases. Most energy production methods used in Africa require significant amounts of water, either directly, such as hydro-generation or indirectly, as coolants in thermal plants and for other operations. Some countries, including Zambia, Namibia and Mozambique, rely almost exclusively on hydroelectric sources for their electricity production, whereas the rest of the continent relies primarily on thermo-electrical sources such as coal, oil or gas. Both these methods require significant amounts of water. As water levels in rivers continue to decline and incidences of heat extremes continue to sour due to climate change, hydroelectric dams and the cooling systems of thermoelectric power plants may experience production disruptions, resulting in disruptions in energy supply and constricting economic growth in the continent.

These impacts would be catastrophic considering the continent's current energy poverty situation, where only 219 million out of 915 million people have access to electricity and the total number without access is rising. The fact that two-thirds of the region's

population lacks access to electricity is undermining efforts to achieve more rapid social and economic development in the continent. In addition, about 65% lack access to clean energy for cooking. On the business front, some 10 million medium-sized enterprises lack access to electricity. In addition, frequent power shortages cost African economies 1 – 4% in lost GDP annually. In Kenya for instance, at least 50 power outages occur annually.

### Human health

In healthcare, changes in temperature and precipitation patterns as well as extreme events such as droughts, floods, storm surges, and heat waves are projected to undermine human health in Africa through increased

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In fisheries, climate change is projected to result in substantial reduction in marine fish production and decline in fish protein supply in West Africa by the 2050s.

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incidences of physical injury, infectious diseases through shifts in disease vectors as well as undernourishment. The AAGR1 projects that the rate of undernourishment in the Sub-Saharan African population would increase by 25-90% with a warming of 1.2-1.9°C by 2050 relative to a 2010 baseline. Current trajectory points to a 40C warming scenario, signaling potentially dire consequences. The gradual shift in temperature and rainfall may also have a significant effect on the geographic range of many diseases. For instance, malaria is expected to disappear from some areas and spread into others that were previously inhospitable to malaria vectors and pathogens. The IPCC AR5 observes that climate change is expected to affect the geographic range and incidence of malaria, with contractions and expansions, and increasing and decreasing incidence. The AAGR2 reports with significant confidence that highland areas, especially in East Africa, could experience increased malaria epidemics due to climate change. In addition, climate change is linked to changes in leishmaniasis epidemics in sub-Saharan Africa, with spatial spread to peri-urban areas and to adjacent geographic regions, possibly due to changing rainfall patterns. In addition, studies have linked the changing climate to increased incidences of Ebola through a complex interaction of human, environmental and climatic factors.

## Water sector

In the water sector, which also supports biodiversity in general as well as the agriculture and energy sectors, climate change is expected to cause many African countries that are already facing water shortages to experience increased water stress in the coming decades, with reductions in both surface and ground water resources. For a warming of 2 – 40C, much of Sub-Saharan Africa is projected to experience 60-80% reduction of surface runoff by 2100, relative to a baseline of 1961 – 1990. For ground sources in the period the period 2041-79, at a 20C warming scenario, ground-water recharge rates are projected to decrease by 30-70 in North Africa and south-western Africa compared to a 1961-90 baseline.

Impacts in the water sector are also projected to impinge on agriculture, with projected declines in water available for agriculture attributed to climate impacts on the water sector. It is projected that for a warming scenario of 3.50C above pre-industrial levels, in the period 2070 – 2099, the total blue and green water (BWGW) available for agriculture in Africa will decline by more than 10% relative to the 1971 – 2000 period.

## Tourism, coastal cities and infrastructure

Currently, over 25% of Africa's population lives within 100 km of the coast and over 50% lives in low elevation coastal zones in urban areas, accounting for 11.5% of the total urban population of the continent. Going forward, urban population in Africa is projected to triple by 2050, increasing by 0.8billion. Some cities are projected to swell by up to 85% of their current size by 2030. The impact of climate change on urban Africa will incrementally have implications on an increasingly significant proportion of the continents population.

Sea level rise and flooding in cities is projected to result in significant socio-economic loss for African countries, through displacement of populations in coastal cities, damage to infrastructure

and disruption of economic activities such as tourism. Average sea level rise is projected higher along Africa's coast line than the global average. By 2100 for an over 40C warming scenario, while average global rise is projected at approx. 70cm, sea level rise in Africa is projected to reach 80cm. The impacts of this rise without adaptation efforts are grim. The AAGR2 records that sea level rise will put over 10million at risk of flooding in large coastal cities, of Mozambique, Tanzania, Cameroon, Senegal, Egypt, Morocco among others by 2050, not to mention the ensuing



damage to infrastructure and disruption in food supply to urban areas, exposing populations to elevated food prices.

In eastern Africa, the IPCC AR5 projects the impact of coastal flooding due to sea level rise in Kenya by 2030 to affect 10,000 - 86,000 people, with associated economic costs ranging between USD 7 - 58million. In the coastal city of Mombasa, by 2030 the population and assets at risk of 1 in 100-year return period extreme water levels is estimated to be between 170,700 - 266,300 inhabitants, while economic assets, including infrastructure at risk is between USD 0.68 – 1.06billion. For neighboring Tanzania, in its capital Dar-es-Salaam,

the population and economic assets at risk of 1 in 100-year return period extreme water levels by 2030 range between 30,300 - 110,000 inhabitants and economic costs range between USD 35.6 – 404.1million.

Additional risks are recorded for the key tourism sector, through climate impacts on ecosystems and biodiversity where shift in ecosystem ranges and loss of biodiversity is projected to result in loss in touristic attractions and consequently, a decline in the number of visitors. In addition, extreme temperatures are projected could render summertime and even off-peak seasons less pleasant thus deterring would be tourist. The AAGR1 records that revenue generated from tourism will be directly affected by damage to infrastructure due to sea level rise and flooding and changes in the length and quality of climate-dependent tourism seasons.

The Nile Delta of Egypt, which is particularly vulnerable to inundation and saltwater intrusion associated with sea level rise, provides a classic example of the potential impact of sea-level rise on tourism. Rising sea levels is projected likely to damage recreational tourism and beach facilities, in addition to inundating coastal freshwater lagoons and salinating groundwater resources. In Alexandria, a key tourist city, submersion of tourist sites is projected to increase

from the current level of 28% to 62% with a sea-level rise of 1m, and valuable cultural sites could be placed at risk by storm surges.

## Population growth exacerbating climate risks

Africa's rapidly growing population also presents an additional challenge. Currently, SSA's population stands at approximately 856 million. It is estimated that by 2050, it will more than double to approximately 1.7 billion and represent roughly half of the additional global population. In terms of age, SSA has the youngest population in the world. Young people aged 15 – 25 represent more than 60% of the continents total

population. Poverty among these youths is rife. More than 70% of the youths live on less than USD 2 per day, and youth unemployment is high with 60% youth unemployment in Africa. Going forward, it is approximated that 350 million young people under the age of 25 years will be entering the labor market by 2035.

This portends more mouths to feed, more jobs to create and an imperative for inclusive sustainable economic growth. In addition, the millions of unemployed youth constitute an impending threat to stability in the continent, a possibility acknowledged by the African Union. The continent's climate sensitive sectors must deliver opportunities to empower these youth.

The growing population, while it can be leveraged as a demographic dividend if appropriately harnessed by creating jobs, also means increased pressure and demand on ecosystem services underpinning food, water, energy, biodiversity, and other socio-economic inputs and the need to sustainably manage them for future generations. Considering the threat of climate change on these inputs and the need to create jobs, adaptation and climate resilient development policy making is more than a matter of good common sense for the continent. It is an urgent imperative to guarantee socio-economic growth well into posterity.

**Adaptation policy imperative**

As recorded above, climate change is projected to significantly impact Africa's economic growth negatively. Consequently, the need for climate change adaptation being a central component of sectoral developmental policy planning and implementation is urgent to safeguard Africa's future development.

**Cost of adaptation**

While the need to invest in climate adaptation cannot be overemphasized, the costs are astronomical. The AAGR2 observes that under the current trajectory, mitigation efforts are not in tandem for a below 20C warming scenario by 2050. Rather, the current track could lead to

an above 40C average global temperature rise by 2100. The implication is that Africa's adaptation costs could hit USD 100billion annually by 2050. Cumulatively, the AAGR2 reports that Africa's adaptation costs for the "below 20C" and "over 40C" warming scenarios are projected to exceed USD 1trillion by the 2060s. It further adds that even with effective adaptation, the cost of residual damage is expected to be double the adaptation costs in period 2030-2050.

**Investing in ecosystems – potential panacea for climate adaptation**

In fisheries, climate change is projected to result in substantial reduction in marine fish production and decline in fish protein supply in West Africa by the 2050s.

**Adaptation and job creation**

While the need to adapt to climate change is a developmental imperative for the continent, the prohibitive costs are alarming. Furthermore, in light of diminishing official development assistance (ODA) (as share of total external financing, declined from 38% in 2000 to 27% in 2014) to the continent, the need for sustainable financing strategies for the continent is urgent. One way Africa can ensure sustainable financing for adaptation is by looking at adaptation as a business, not only as a developmental issue per se. Africa needs to invest in economic opportunities that climate adaptation presents, and ensure creation of incomes and jobs in the process.

Investing in ecosystems and ecosystem based adaptation (EbA) will be key for Africa because ecosystem services such as water, hydrologic regulation, soil fertility, biodiversity, climate change adaptation etc. underpin Africa's economic sectors like energy, tourism, agriculture to name but a few, that are vital at achieving inclusive growth. Africa can go a long way in ensuring environmentally sustainable and socially inclusive economic growth – creating jobs and income opportunities thus eradicating poverty, ensuring food security for its citizens, ensuring climate resilience using environmental resources, all while simultaneously ensuring the environment is conserved - by using affordable and accessible ecosystem based means. This by making sure African ecosystems continue to provide these services well into the future by putting in place development policies and strategies, that protect them and sustainably utilize them to achieve sustainable industrial development. Such policies should target all economic sectors, and especially the climate sensitive sectors demonstrated as underpinning economic growth in the continent.

The agriculture sector deserves special mention. It currently employs up to 60% of labor in the continent, including women producing up to 80% of the food. This sector occupies a unique position to enhance inclusive growth, job creation and alleviate hunger and poverty in the continent, if its full potential is unleashed holistically.

This can be done by embracing an agriculture paradigm, that seeks to optimize agricultural productivity along the entire value chain, - from on-farm productivity by applying ecological agriculture / ecosystem based approaches that not only increase yields but also enhance ecosystem productivity and



climate resilience of communities to beyond farm-gate value addition strategies where agribusiness is unleashed through embracing technology to reduce post-harvest losses (PHLs) (PHLs accounted for USD 48 billion worth of food lost in the continent in 2010) through storage, improve market access for farmers using mobile and other online innovations, implement food processing, etc. and in the process create many jobs and increase incomes along this value chain.

Actualizing this holistic paradigm will be the overriding theme of the upcoming 2nd food security conference to be hosted by UNEP in collaboration with ACTS and other partners in July 30-31, 2015.

African agriculture and agribusiness is estimated, could be worth USD 1 trillion by 2030. An agribusiness private sector working alongside government could link farmers with consumers and create many jobs. Further, Foreign Direct Investment (FDI) in African agriculture is projected to grow from less than USD 10 billion in 2010 to more than USD 45 billion in 2020. In addition, growth in this sector can reduce poverty twice as fast as growth in other sectors. Africa should capitalize on this.

Opportunities inherent in ecological agriculture approaches and agribusiness value chains have been demonstrated in a number of countries, both by enterprises and individual entrepreneurs. In taking these opportunities, incomes are generated and poverty reduced.

In Zambia, farmers increased crop yields by 60% by switching from monoculture practices to intercropping and other sustainable methods. Through agroforestry, smallholder farmers also produce more diverse crops, which means they can potentially serve a wider market and earn more incomes.

By incorporating marketing services as a value addition strategy in their enterprise, the improved crop yields and diversity can be leveraged to service a larger market and enhance incomes to these farmers.

In Uganda, SESACO Foods Company is leveraging on value addition along the food supply chain. By this, the company employs 80, 55 being women, and generates monthly revenues averaging USD 39,000. In the same country, AGROWAYS (U) LTD., offers cleaning, drying, grading, and storage services to small holder farmers at affordable prices. Through this value addition, farmers are reducing post-harvest loss.

Cameroon's Mewanko Farm has set up an online marketplace for farmers to sell fresh produce in a scheme it hopes will increase the income of 13 million people. Altogether, a number of mobile innovations that link farmers to potential markets already exist, and include MLOUMA in Senegal, ESOKO in Ghana, and POULTRY GUIDE in Uganda among others. In Nigeria, a fruit processing enterprise, REELFRUT, managed to expand to 20 retail outlets within three months of establishment. The enterprise processes and packages health snacks made from freshly dried fruits – mangoes and pineapples.

Across West Africa, integrated soil fertility management (ISFM) across over 200,000 ha has resulted in yield increases of 33-58% over four years, improving food security and accompanying revenue increases of 179% for maize and 50% for cassava and cowpea. Specifically, ISFM using micro-dosing has been applied by about 500,000 small holders in Mali, Burkina Faso and Niger, with associated increases in millet and sorghum yields of 44 – 120% along with 50 – 130% increases in family in-

comes.

Applying storage as a value addition strategy, the hematic bag has demonstrated its effectiveness in West and Central Africa by registering cumulative savings for the region of about USD 500 million annually. Individual entrepreneurs and the youth are also creating jobs by leveraging ecosystem services. In Ethiopia, a young farmer is applying irrigation, and in the process, produces fruits and vegetables on 25ha, and cereals on another 12ha, and employs 50 young persons. In Lesotho, a young entrepreneur is leveraging livestock production to generate income, create employment, offer training services and expand into additional businesses in other sectors

In addition to agriculture, the importance of ecosystem services to African countries is manifest in a number of other sectors. In Rwanda, by investing in ecosystem productivity, the country has seen an improvement in its tourism sector and energy generation with increased incomes and jobs created. On tourism, Rwanda, by sustainably managing its ecosystems, is leveraging its unique position as the home of the mountain gorilla, a major tourist attraction to reap huge economic benefits. The country's booming tourism industry, which now accounts for the biggest share of national GDP, is driven primarily by the country's iconic gorilla. After a decline in tourism in the 1990s, gorilla visitation has since increased from less than 1200 tourists in 2000 to a record of 7417 visitors in 2004. With visitors paying USD 375 each to see the gorillas, these tourists have generated over USD 3 million in revenue every year since 2005. This has also contributed to the creation of many new jobs associated with the management and maintenance of the National Park and its related touristic activities.

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In fisheries, climate change is projected to result in substantial reduction in marine fish production and decline in fish protein supply in West Africa by the 2050s.

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In the energy sector, wetland restoration in rural Rwanda has also improved livelihoods and created alternative forms of employment. Ecosystem restoration efforts estimated at USD 149,670 have resulted in increased water levels which also led to the construction of a 2.1 MW hydro power station and jobs for rural residents with multiplier effects for other socio-economic activities. Rwanda is showing that countries stand to gain exponential economic benefits if ecosystems are kept healthy and productive

In Togo the rehabilitation of two dams having a combined storage capacity of 94,000 m<sup>3</sup> of water, has made it possible to rehabilitate 30 hectares of land. If the water is used to grow vegetables (Example Tomatoes), it is possible to harvest at least two crops in one year. With potential yields of 30 tons per hectare for each harvest, a farmer working a holding of one hectare can harvest 60 tons of tomatoes per year, which nets USD 30,000 at the price of USD 0.5 per kg of tomatoes.

In Seychelles 40 m<sup>3</sup> of water was harvested from roof catchments of schools and stored in plastic tanks. In one school there was a saving on water bills of USD 250 per month. This means that in one year the school would save USD 3,000. If all the 10 schools covered by the project saved similar amounts in water bills, the intervention will save the schools from paying USD 30,000 in one year which is a big economic impact.

In Tanzania a project to develop a manual of best practices on sustainable utilization of woodlot forest products generated huge benefits at the grass roots, community level. Farmers in Makete district where the project was undertaken earn between TAS 20,000 and 5,000,000 depending on the size of woodlot. By following and imple-

ment the guidelines, farmers were able to achieve and sustain tree densities of at least 1,000 trees in one hectare. Considering each mature tree can give a net profit of TAS 27,840, it implies that in one hectare the farmer is able to get net profit of TAS 27,840,000.

At the global level, investing in biodiversity and ecosystems services can yield an estimated return worth over USD 21-72 trillion every year - comparable to the World Gross National Income of USD 58 trillion in 2008. Africa should not be left out of this billion, or better trillion dollar industry.

Policy options – putting adaptation at the center of development policy and practice  
From the foregoing, it is demonstrable that:

- Africa needs to climate proof its development for posterity by ensuring climate adaptation becomes part and parcel of sectoral developmental policy making;
  - Africa needs to ensure its development policies ensure investment into conserving and sustainably managing its ecosystems, whose services constitute a resource base that underpins its key economic sectors;
  - And related to the above, considering the cost implications of climate adaptation, Africa should consider policies geared toward defining adaptation as a business to guarantee the sustainability of efforts. The aim in the continents adaptation measures should be to ensure unlocking of income generation, savings and job creation opportunities in the various climate sensitive sectors.

The continent needs to ensure its development policies are contextualized to climate change. This calls for policy interventions that will ensure a structured vertical up scaling of climate change

adaptation strategies into the decision making level in individual countries and their implementation. These policy options should address current bottlenecks to achieving vertical scale and implementation of climate adaptation in the continent.

### **Adaptation Implementation in Africa– Driving Policy Changes and Going beyond Talk**

#### **(a) Financing and cost – benefit evaluation**

Clearly estimate total cost and benefit of implementing EbA and other adaptation strategies at sectoral level and establish sources of funds to ensure activities to be captured in policy are accompanied by requisite national budgetary allocation. For a start, countries can set aside a share of the first rising diaspora remittances to specifically fund adaptation initiatives. Diaspora remittances are forming a significant proportion of domestic financing in Africa. Projections to 2016 suggest that remittances could rise to over USD 41 billion, up from USD 32 billion or around 2% of continental GDP in 2013. In addition, economic growth, fiscal reforms and improved domestic tax collection and management is resulting in improved revenues for countries. For instance, tax revenues in Africa reached USD 527.3billion in 2012. Additional reforms such as scraping unnecessary tax expenditures, e.g oil subsidies and unnecessary incentives could recoup more funds. Case in point, fuel subsidies in Nigeria, Cameroon and Ghana cost these economies USD 7.5billion, USD 600million and USD 276million respectively in 2011, accounting for 30%, 12%, and 3% of budgets in these three countries respectively. Considering that 65% of subsidies in Africa benefit the richest 40% of households hence achieve minimal social justice, phasing

them out would result in additional revenues that could be dedicated to finance climate adaptation.

**(b) Researching environment and development interactions**

There is a need to demonstrate that climate adaptation matters are tied to development to give them the necessary impetus in decision making cycles. Research Institutions, relevant line ministries and other stakeholders should intensify efforts to clarify the inter-linkages between ecosystems and socio-economic development to ensure policy is backed by scientific research. Research should be undertaken with the explicit objective of influencing policy decisions and providing recommendations on the best way forward on implementation.

**(c) Leverage data and knowledge management to bridge the Science – policy – action gap**

There is a need for environmental lead agencies and think-tanks to improve environmental information systems as a basis for sound decision making. The IPCC AR5 records that making climate change information more reliable and accessible is one of the most pressing and cross-cutting adaptation needs in the continent.

Currently, the gap between science and policy explains the lack of climate proof policy making in the continent. Policy-makers need demonstrable evidence so they can build support for climate change being part of sectoral and developmental policy at the national level. Creating accessible information dissemination tools, that dispense timely, accurate, reliable and user friendly scientific climate information demonstrating the imperative of having adaptation as part and parcel of sectoral developmental policy will go a long way in bridging this gap.

Think-tanks, the private sector, research and educational institutions, NGOs, intergovernmental organizations at national, regional and international levels should work in partnership with African governments to create physical databases at regional and national levels and enhance networking, collaboration and information sharing between states. Once these are set, information management will have to cover both generation of accurate and actionable content, as well as its dissemination to all levels of application, from public policy to the private sector, NGOs, CBOs, general public in grass roots, where unre-

stricted information sharing should be embraced and accessible media used. Apart from online media implied earlier, print media tools, including policy briefs, working papers, project reports and periodic newsletters could also be used to disseminate information.

**(d) Enhancing education and training**

Countries should ensure that essential human resources exist, or be developed, to undertake the integration of adaptation strategies, including EbA into socio-economic development at various stages of the decision-making and implementation process. Educationalizing EbA at the institutions of higher learning across the continent is vital. Universities and colleges should consider internal policies that ensure curricula of academic disciplines that are climate reliant, e.g. water resources, agriculture, energy etc. are reviewed to include specific courses on climate adaptation strategies, including EbA and how to contextualize them to the respective developmental sectors.

At policy level, systematic training of policy makers - government personnel, planners and managers should be done on a regular basis, to ensure they are abreast with the latest in climate change and EbA strategies, so they can then include it in their sectoral policies.

**(e) Promoting public awareness**

Non-governmental actors, such as CBOs, CSOs, NGOs, the donor community, national human rights institutions, the media and the international community, should promote awareness in the public at large, as well as in specialized circles, of the importance of considering adaptation and socio-economic development in an integrated manner, and should establish mechanisms for facilitating a direct exchange of information and views with the public. An informed public will then demand from their leaders at the policy level, that climate adaptation strategies, including EbA be part and parcel of development policy at both national and sub-national.

**(f) Strengthen national institutional capacity and inter sectorial corporation and coordination**

Considering that impacts of climate change on ecosystem services are cross sectorial, and responding to them will

require multi-sectorial approaches, governments, in cooperation, where appropriate, with international organizations, should strengthen cross sectoral planning and decision making capacity for all climate dependent sectors to ensure integration of adaptation strategies, including EbA and appropriate coordination mechanisms during implementation. Attention should be given to breaking silos and moving away from sectoral approaches where they prove counterproductive, and progress towards full cross-sectoral coordination and cooperation.

**(g) Invest in youth education**

Government, the donor community and academic institutions should also put in place appropriate policy meas-



ures that will incentivize youth investment in climate change adaptation and EbA related courses at undergraduate level. This can be through appropriate policy to govern scholarships offered to ensure adequate scholarships are availed for such courses. This can be extended to post graduate level. It will be vital in creating a critical mass of informed potential policy makers, who can then effect a generational paradigm change on policy toward adaptation and EbA once they assume these positions in the future.

**(h) Invest in women in agriculture**

Besides agriculture being the biggest employer in Africa, absorbing up to



60% of labor, women are a significant constituency in Africa's agriculture, which is a climate dependent sector. They produce up to 80% of the food consumed in the continent. Yet they are disadvantaged in accessing key inputs and factors of production such as land, capital, credit, extension services, at times due to cultural practices. In integrating adaptation and EbA into policy in climate dependent sectors such as agriculture and making it the norm, there is need to ensure women, who produce most of the food are appropriately facilitated. Affirmative action policies to ensure their access to training, credit and assets/land ownership will be vital to enhance their productivity, and hence productivity of the sector as a whole. It is also important to recognize

At policy level, systematic training of policy makers - government personnel, planners and managers should be done on a regular basis, to ensure they are abreast with the latest in climate change and EbA strategies, so they can then include it in their sectoral policies.

in these policies that women smallholder farmers are involved in agricultural production as well as care work which include activities such as fetching water, firewood, child care among others which takes a significant proportion of their time. Policies should therefore be integrated, addressing both care work as well as agricultural production.

#### (i) Technology transfer policy

Technology is a vital ingredient in means of implementing climate adaptation strategies, including EbA. The donor community, NGOs, and CSOs have traditionally played a capacity building role to complement action by government, research and educational institutions and even private sector. This role

should be harnessed to facilitate transfer of requisite knowledge and technologies needed for action in various climate dependent sectors by government, private sector, educational and research institutions. To actualize this, an appropriate policy, that would incentivize transfer of new equipment, material, technical skills etc. such as zero rating equipment import for climate adaptation, will be pivotal.

#### (j) Unleash Africa's off-grid renewables potential to enhance energy access and 'adaptation as a business'

Energy is a vital input to socio-economic development. The current low grid electricity coverage in the continent can be an opportunity to incentivize off-grid energy solutions leveraging renewables and creating business opportunities for "solar-preneurs". While off-grid fossil fuel based solutions such as house hold kerosene lighting cost households USD 4-15 per month, renewables would cost significantly less at USD 2 per month to run solar lighting systems. Here in lies a business opportunity that 'solar-preneurs' are cashing in. As an example, in rural Kenya, a 'solar-preneur' is creating incomes by selling a variety of solar based products. A solar lamp costs USD 10, while a solar kit including panel, battery, wires and light bulbs costs around USD 150. Additional examples exist across Africa. In Tanzania, solar charging kiosks are earning monthly profits of USD 75-150. In addition to individual entrepreneurs, larger enterprises are also leveraging this potential, with annual earnings of up to USD 20million.

This demonstrates that resilience building efforts at the grass roots can realize income opportunities for communities and medium sized enterprises. Considering that analysts at the International Energy Association (IEA) believe the sun could be the world's largest source of power by 2050, Africa should be on track to cash in on this eminent future by putting in place favorable policies to incentivize renewables based private enterprise. These should include tax based incentives such as zero-rating tax on all necessary imported renewable energy technologies, including relevant equipment, tools, spares etc., as well as non-tax incentives such as appropriate policies to standardize technology and practice in the sector, appropriate policy to govern partnerships such as public-

private partnerships that may be pivotal in achieving scale, policies creating special economic zones among others.

#### Way Forward

Climate Change adaptation is an urgent imperative that needs to be made a central pillar of development policy making in Africa. The continent's development is tied to highly climate sensitive sectors including energy, agriculture, tourism among others and these sectors are underpinned by healthy ecosystems.

With a growing and increasingly youthful population signifying increasing pressure on the continent to deliver its development promise, adaptation is an urgent imperative and should be put in the vision of Africa's development to ensure that:

- The growing and increasingly youthful population is empowered through job creation in the productive sectors to facilitate realization of a demographic dividend.
- The continents ecosystems continue providing services that underpin sectoral development to safeguard development well into posterity.

Regardless of the great adaptation need for the continent, the associated prohibitive cost needs to be addressed. In light of declining international financing, the need for a sustainable approach to domestic financing, to fund initiatives is an area that needs to be given attention. Considering that policy is the biggest influencer and driver of change, policy measures to ensure climate adaptation can be vertically up-scaled to become part and parcel of development policy. Building on the proposed policy options presented herewith can address inadequacies in the group areas of financing, knowledge management, education, technology transfer, among others. It is only when climate change adaptation strategies are part of development strategies in key economic sectors in the continent that achieving sustainable development canons can be practical for the collective benefit of the African people. ■

*\*Dr. Richard Munang is the United Nations Environment Programme (UNEP) Africa Regional Climate Change Coordinator. He tweets as @mtingem. Mr. Robert Mgendi is the Ecosystem-based Adaptation Programme Officer with the UNEP's Regional Office for Africa Climate Change Programme. The views expressed here are those of the authors and do not necessarily represent those of the institution with which they are affiliated*

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# THE PRIVATE SECTOR AND SCIENCE IN AFRICA

By Dr Álvaro Sobrinho,  
Angolan businessman and philanthropist,  
and Chairman of the Planet Earth Institute

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**Though recent headlines have called into question the ‘Africa rising’ narrative, the continent’s budding reputation as an emerging economic powerhouse remains strong.**

It has more than half the world’s fastest growing economies, including Angola, Tanzania, Uganda, Rwanda and Nigeria. The latter, Africa’s largest economy, is projected to expand by 4.9 per cent in 2015.

However, despite Africa’s recent economic growth, there is a significant and telling disconnect between business communities and scientists on the continent. Technical knowledge is not keeping pace with economic growth, and businesses in Africa regularly complain about the lack of technically skilled local candidates. In fact, the most recent PwC Annual Global CEO survey found that 90 percent of

CEOs in Africa are highly concerned about the low availability of key competencies on the continent.

This problem extends to academia. According to a 2014 World Bank report, scientific output has nearly doubled in sub-Saharan Africa in the last decade, with the region increasing its share of global research output from 0.44 per cent in 2003 to 0.72 per cent in 2012. The report goes on to suggest that the quality of this research has also improved. However, at less than 1 per cent – and given the rapid growth of many African economies and the many significant development chal-

lenges they face - much more needs to be done to increase science, technology, engineering and mathematics (STEM) research capacity on the continent.

Furthermore, while scientific research output has increased, there has not been the same increase in registered innovation. Sadly, no African country featured in the top 20 countries for patent applications in 2013, according to the World Intellectual Property Organization (WIPO). Though progress has been made, in many African countries protection of intellectual property (IP) is still underdeveloped. Weak enforcement

of IP rights in national court systems, as well as a lack of education as to how to register ideas, means the majority of the continent's would-be entrepreneurs and innovators are reluctant or unable to protect their ideas.

The problem is not a lack of potential or ambition, but a lack of appropriate competencies. Employers surveyed across 36 African countries as part of the African Economic Outlook Report, repeatedly stated that the mismatch in technical and industrially relevant skills was more concerning than an overall lack of skills. Of course, such skills mismatches highlight the poor quality of education across much of sub-Saharan Africa, but also crucially, the absence of linkages between the education systems of the continent and its employers.

Consider the agriculture sector, undoubtedly one of Africa's most important industries. Currently, the sector contributes 13% of the continent's GDP, yet only 2% of African students study agriculture at the university. Most worryingly, Africa contains 60% of the world's uncultivated land suitable for crops, but appears to lack the scientific expertise to leverage this resource.

Why is this? In recent decades, major international donors and policy makers have prioritized primary and secondary education. This has detracted from investment in tertiary education in some African countries. Providing higher education in technical fields can be far more expensive than the social sciences, forcing increasingly impoverished public education institutions to cut training in these areas. At the same time, businesses have focused on short-term gains, considering investment in technical and scientific skills as too time consuming, and opting for the 'easy' but unsustainable approach of parachuting in the necessary expertise, often from Europe and North America, and at great expense. All of this has created a higher education system that is out of sync with local industry needs, and mostly geared towards producing public sector managers. As Harvard's Prof. Calestous Juma has said, "today's African universities are factories that churn out civil servants".

As the leading source of job creation, the private sector can and should take a leading role, helping African countries create high quality STEM graduates and researchers. They should partner with local universities to improve the quality and relevance of STEM cur-

ricula. What's more, private companies can use their financial resources to help universities provide physical resources to deliver this training. This would allow companies to reduce the risk of investing in workforce training, as well as help universities to market themselves as destinations for ambitious students.

Businesses should also provide young scientists with financial assistance so that they can pursue postgraduate and post-doctoral training in African universities, by increasing industry focused scholarships and placements. Major global players including IBM are doing so with its IBM-Research in Kenya, which has established a new resident scientist programme for schools in Kenya and other African countries. The applicants are leading scientists and researchers from pre and post-doctoral backgrounds, as well as from academia, government, or industry, and work with IBM researchers in the physical lab environment. Such initiatives allow private companies to build a pipeline of skilled local talent and give young Africans the tools they need to create solutions to the continent's most pressing development challenges.

Innovative collaborations such as this require open communication between local education institutions, tasked with preparing students adequately for the workplace, and the private sector, looking to secure employees with skills that can help their businesses grow. Currently, there is lack of communication and mechanisms for dialogue between these groups - something that the Planet Earth Institute is determined to change. With the help of our partners, we are advocating for a strong business-led academic agenda in Africa, focusing on how the private sector can best drive scientific and technological development, working directly with governments responsible for creating the right policy environment, and academia and civil society to support sustainable and inclusive growth across the continent.

I have long sought a new approach for business in Africa and have recently embarked on an exciting programme of work with the World Bank. Personally, I will be leading a new group of ten 'African Business Champions for Science', made up of influential figures from industry with a passion for science, technology and innovation on the continent, and who will become a loud voice for the change we want to see. The group was formally outlined in a Call to Action at the 'Partnership for Skills in Applied Sciences, Engineering and

Technology (PASET)' Regional Forum in 2014, in Dakar, Senegal. The World Bank is facilitating the PASET initiative, which seeks to help meet Africa's skills needs in Applied Sciences, Engineering and Technology (ASET) for the socio-economic transformation of Africa. Myself and the other Champions will work alongside African governments, the PASET Steering Committee (comprising three African Ministers from the Education sector – Ethiopia, Rwanda and Senegal and the World Bank); and a high-level Consultative Advisory Group (comprising of scientists and academics).

The Africa Business Champions met at the 25th African Union Summit of Heads of State and Government in South Africa in June 2015. During this important gathering, we outlined our plans for a number of projects, including support for a new Regional Scholarship Fund for PhDs, with an ambitious goal of producing 10,000 African PhDs in the next ten years. We want these PhDs to be working with local businesses from the start, with work placements and sponsored research, to ensure the work undertaken by students is useful to local economies and industries. Scientists need to know and understand business, and young entrepreneurs must know the value of science. Projects like this can help create not just a new generation of scientists, but a new generation of scientific leaders, able to turn ideas, inventions, patents and research into jobs, security and prosperity.

We know this can work. I would encourage Africa to seek inspiration from the most innovative international models. As Prof. Juma points out, consider the example of South Korea's Phang University of Science and Technology (POSTECH). POSTECH was actually the brain child of Prof. Hogil Kim, the founding president of the university and Tae-Joon Park, chair of the Pohang Iron and Steel Company (POSCO). While POSCO's initial goal was to train world-class engineers for its own operations, POSTECH now has a major role in educational reform in Korea and is recognized as a leader in science and engineering education in Asia.

Given that 11 million young Africans expected to enter the job market each year for the next decade, businesses can have all the scientists, engineers and technicians they need on their doorstep. But only if they properly collaborate with and invest in the institutions that train them. ■

# PROMOTING BASIC SCIENCES IN AFRICA

**Prof. George O Amolo, Nicholas W Makau and Joseph Z Mapelu**  
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**B**asic science is the driving force behind engineering and technology the world over. The two latter disciplines are often referred to as applied sciences. The prevalence of strategic national laboratories and institutes has catalyzed manufacturing industries and economic development in advanced economies. These laboratories/institutes have established a scientific culture that over generations has churned out a large number of expertise in basic sciences. Close collaboration between scientific institutes and industry has led to job creation and the formation of spin-off companies.

Many African countries have visionary plans that seek to harness application of science and technology for economic development. Notably, many of these countries are looking for ways to effectively engage their growing youthful population in productive activities. Sectors such as agriculture that have traditionally performed well in the past are not creating enough jobs nowadays to accommodate the growing population.

Harnessing science and technology for development will require that Africa invests in training a new generation in basic and applied sciences. The Scientific Mentorship Programme at University of Eldoret (previously, Chepkoilel University College of Moi University) seeks to do just that. The programme was started 8 years ago and is now managed by the Computational Materials Science Group ([www.uoeld.ac.ke/cmsg/](http://www.uoeld.ac.ke/cmsg/)). The goal of the programme is to identify brilliant, self-driven undergraduate students in basic sciences and encourage them to proceed to graduate school in Kenya or elsewhere.

The identification process begins by scouting for potential mentees from the 2nd year of undergraduate study and monitoring their academic progress through the final year. By the end of the 4th and final year, the most likely candidates are shortlisted. The formal selection process is based on academic performance, motivation and gender balancing.



*Mentees, from left to right: Valid Mwatati, Justin Omeri, Peris Ngeywo, Benson Kamau and John Ogot in front of the Administration Block, University of Eldoret.*



*The coordinator (extreme left) of the programme with mentees for 2014 on their first day*

The programme has a second dimension which seeks to attract back home, students who go to study overseas. The programme aims to attract 2 or 3 students who have attained their PhDs abroad, and engaging them in the mentorship of the next generation of graduates. Dr Korir Kiptiemoi (second from left) being welcomed back home to join the programme after his PhD in Torino, Italy.

## Success stories

The programme had humble beginnings. In the beginning, the students were supported by the initiators themselves. However, since 2009, the University of Eldoret has received support from the National Commission for Science, Technology and Innovation (NACOSTI) in Kenya and the Emerging Nations Science Foundation (ENSF, Trieste, Italy). Students who have gone through this programme are now spread across the world. After 8 years, the programme has gone through a full cycle and now has two pioneer mentorship students who recently attained their PhDs. Some of those who have proceeded to PhD are Dr Emily Aradi and Dr Cecil Ouma who recently graduated from the University of the Witwatersrand and University of Pretoria, respectively.



*Dr Emily Aradi and Dr Cecil Ouma during their PhD graduation ceremonies*

## Conclusion

It takes about a decade to train a student from the BSc to PhD in basic science. The initiative by the Scientific Mentorship Programme supplements efforts of Kenya and other African nations to harness science and technology for development. However, many African countries have not yet taken the necessary bold steps to train manpower that will sustain the scientific and technological base of their visions for development. The Mentorship Programme is one model for accelerating Africa's capacity building in basic and applied sciences. ■

# KENYAN INNOVATORS DEVELOP THE FIRST LOCAL ANTIMALWARE SOFTWARE



**B**unifu Technologies is an industry innovation leader in Kenya. It has developed more than 30 products since it was founded in 2011. Among these is Bunifu Sniper Anti-Malware, reportedly the first Antivirus software developed in Kenya. The Bunifu Sniper Anti-Malware was introduced in the Kenyan market on 16th May 2014.

Bunifu Technologies is run by a small group of young Kenyans:

- Wilberforce seguton – Team Leader
- Kimutai Kipngetch – Lead Soft-

ware Engineer

- Elisha kiptukyo – Business Development Manager
- Emmanuel Yatich – Graphics Design
- Winston Komen – Virus Database Administrator
- Komen Solomon –Social Media Manager
- Keith Korir – System Analyst & Malware Researcher
- Isaac Kiplagat – Software Quality Assurance Manager
- Amos Chepcheng – Software Developer

Dr. Cosmas Ochieng, the Executive Director of ACTS interviewed Mr. Keith Korir, Bunifu Technologies' System Analyst and Malware Researcher.

## CO: Why Bunifu Sniper?

KK: Bunifu sniper is one among many products that our company has developed. Our products derive their names from their 'functions'. A sniper is a highly trained marksman, with specialized training in high-precision, surveillance and target acquisition. These are key traits of our antivirus product, hence

the name Bunifu Sniper Antivirus.

**CO: How long did it take you to develop this product?**

KK: It has taken us more than 2 years. The team started working on Bunifu Sniper in February 2012, but this was preceded by the development of various modules and utilities including:

- Bunifu antipiracy module
- Swochei duplicate file Scanner
- Bunifu C# File search DLL (Library)
- Tiondo wireless framework

**CO: Has the product been independently tested by a third party?**

KK: Prior to its launch, Bunifu Sniper antivirus underwent months of testing and trials internally (i.e. within the company) and externally. A computer science class of 80 students in one of the public universities took part in the testing and debugging process. Several institutions and customers have also used the product and provided product reviews. Most of the reviews are from technology enthusiasts, Magazines (e.g. CIO Magazine, Tech Moran and The Kenya Engineer) and software distributing vendors such as CNet and softonic. The product has also been profiled in the media, including The East African Standard and Kiss TV in Kenya.

**CO: How much did it cost to produce Bunifu Sniper?**

KK: The time and effort of 9 people working on the same thing for two and a half years. Factor in office space and running expenses. So yes, we faced a number of changes: (a) Lack of funding for the research and (b) Lack of a fully equipped virus testing lab/ unit. Working in Baringo rather than Nairobi had its challenges. For one, internet connection in Baringo isn't great.

**CO: What are the key features and strengths of Bunifu Sniper?**

KK: It comes with a number of unique features:

- Shared Protection – Ability to scan shared LAN files and folders
- Recovery tool– it repairs and restores corrupted files and documents
- Immunity tool - for pen drive and system drive vaccination.
- Directory Navigation Guard or

DNG

- Anti-piracy Licensing module for piracy protection.
- Automated removable media scan.
- File & Folder Lock & unlock (Utility Add-on)
- Registry Scan
- Heuristic Engine
- Proactive real time surveillance
- Clip board paste protection
- Zipped file scan capability
- Zipped file extraction protection
- Fast scan engine
- Virus activity logs & Graphical Reporting

**CO: System requirements?**

KK: At a minimum:

- Speed of 1 Ghz
  - 1GB of RAM (2GB Recommended)
  - 1 GB of free memory in Drive
  - A CD/ DVD Drive is required (For Hardcopy installs)
  - Internet Connection (For Activation)
- CO: How much does it retail for, and where can one buy it?

KK: The product is available from our website [www.bunifusniper.com](http://www.bunifusniper.com) or [www.bunifu.co.ke](http://www.bunifu.co.ke). It is also available in hardcopy from authorized dealers and distributors. The product comes in two variants:

- A single user for 1 PC (retailing at Kshs 1000)
- 3 Users for 3 PCs (retailing at Kshs 1800)

**CO: Your target customers?**

KK: Our target customers are PC owners, companies and governments. So far, we have had over 2500 downloads from our e-commerce portal. We have also registered downloads through software distributing vendors such as CNet and softonic. Most of our hardcopy sales have been local, but we have an aggressive expansion strategy for the East African market and beyond.

**CO: What do you need to expand or grow?**

KK: We have a ready product and a dedicated team backing it. What we need to fast track growth is capital. We are currently looking for an investment partner who will help us grow from a mid-sized company to a global player servicing the entire African continent

and beyond.

**CO: How would you characterize the future of the software industry in Kenya?**

KK: The future of the industry is bright. There are so many talented people in the industry here in Kenya. The problem is lack of capital. There are so many start-ups in the industry but they come and go very quickly due to lack of financing. The government could do more to create enabling conditions. I also wish we had more angel investors or venture capitalists over here. Local innovations and solutions need to be celebrated and promoted.

**CO: What other products do you offer?**

KK:

- Sikizi DRE system: This is Africa's first Direct Recording Electronic system. It provides for instant voting and tallying of polls through several electronic platforms, namely; SMS, Android and Desktop.
- Droid PC: This is Africa's first remote desktop utility. It allows seamless connectivity between your computer and telephone no matter the location.
- RoboCrawl: This is a forensics tool helping web developers and administrators to assess the presence or absence of vulnerabilities in web & server applications.
- Penetration testing: Assessing vulnerabilities in an organization's IT infrastructure. Our pen test team would simulate real attack scenarios while leaving traces in vulnerable areas.
- Red team Assessment: A type of assessment aimed at simulating the types of attacks carried out by malicious users and criminals when targeting an organization's physical infrastructure.
- Cloud security assessment: helps organizations to find suitable cloud service providers and packages that suit their requirements and ensure security of the services



Website: [www.bunifu.co.ke](http://www.bunifu.co.ke)



# RETHINKING AFRICAN HEALTHCARE SYSTEMS

**Prof Gideon B.A Okello\***

(MD, FRCP, MRCP, MBBS, D.T.M.S&H, CBIOL, MIBIOL (LONDON), FAAS, FTWAS)

Professor of Medicine & Senior Consultant Physician

Former Director of Medical Services, Kenya

Former Dean Faculty of Medicine University of Nairobi.

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**Historically, healthcare planning and management in sub-Sahara Africa has been informed and driven by the burden of communicable diseases. Non-communicable diseases have been viewed as a problem for rich countries.**

**C**ontrary to this conventional opinion, Africa increasingly faces a 'double' disease burden of communicable and non-communicable diseases (NCDs).

According to the World Health Organization (WHO) data on Global Burden of Diseases, two thirds of deaths from communicable diseases occur in Sub-Sahara Africa. These include: tuberculosis, Hiv/Aids, diarrheal diseases, measles, malaria and lower respiratory infections, perinatal conditions and nutritional deficiencies. Twenty percent of these deaths occur among children under five years of age while thirty percent of all deaths occur among ages 15-59. Approximately 1 in every 20 adults in SSA lives with HIV. There were 34 million people living with HIV globally in 2011, with 69 percent of these in SSA. Malaria killed 600,000 thousand people in 2010, a majority of them being Afri-

can children.

The WHO data also shows that Africa is undergoing an epidemiological transition from communicable to NCD disease burden. NCDs are not passed from person to person. The four main types of NCDs are cancers, diabetes, cardiovascular diseases (e.g. heart attacks and stroke) and chronic respiratory diseases (e.g. chronic obstructed pulmonary disease and asthma). The WHO projects that 28 million people in Africa will die from a chronic disease over the next 10 years. The WHO also projects the rate of increase of deaths from chronic diseases to surpass that from infectious diseases, maternal and perinatal conditions and nutritional deficiencies more than four-fold over the same period. Changing demographics, globalization of unhealthy lifestyles and behavioural habits, rapid and informal urbanization, physical inactivity, harmful con-

sumption of alcohol and tobacco are some of the contributing factors to the rise in NCDs in Africa.

African health care systems are ill-equipped to deal with the NCDs. Few African countries have invested in the healthcare infrastructure and expertise necessary for the control and management of NCDs. Secondly, the healthcare costs for NCDs such as cardiovascular diseases, cancers and diabetes are often beyond the reach of many people in Africa given the general levels of poverty in the continent. The NCDs can and often drive people into poverty.

African health care systems are barely equipped to handle communicable diseases. The inability of health care systems in West Africa to effectively cope with the recent outbreak of the Ebola virus disease exposed weaknesses of these systems. Considering that the con-



continent is facing a growing double burden of communicable and non-communicable diseases, a rethink of Africa's health-care priority setting, planning and systems management is needed.

The growing burden of both communicable diseases and NCDs hinders the pursuit of poverty reduction and sustainable development, including the attainment of both the UN Millennium Development Goals and the proposed post-2015 Sustainable Development Goals. Both communicable and non-communicable diseases must thus be viewed as 'development issues'.

Africa needs to reassess its current and future health priorities and to re-design its health systems, plans and investments accordingly. The continent will need to take two sets of interrelated actions: (a) find ways to harness well proven cost effective strategies that have worked well elsewhere especially but not exclusively in the North, and (b) re-orient its healthcare systems towards control and management of NCDs alongside communicable diseases.

Africa has not made the most of existing medical interventions, technologies and innovations. Existing interventions could prevent up to 63 percent of all infections in Africa. Examples of available cost-effective interventions include ORT (Oral Rehydration Therapy) to reduce deaths from diarrhea in children, prenatal care and skilled birth attendance, universal immunization against childhood illnesses, DOTS strategy for controlling Tuberculosis and free availability of ARVS (Anti-retroviral) drugs for HIV/Aids, given the extreme poverty of many of those affected by HIV/Aids. Improved surveillance and tracking of infections to points of origin would lead to significant improvements in controlling the spread of Sexually Transmitted Infections (STIs).

Vaccine Preventable Diseases which include Diphtheria, TB, Tetanus, Pertussis, Polio, Measles, Rubella, Hepatitis B, Yellow Fever, Meningococcal disease and Japanese encephalitis can all be eradicated by ensuring that all children have access to the vaccines. The percentage of children not vaccinated is as high as 20-60% in some African countries. In many African countries the vaccines are fully donor funded! Imagine what would happen if donor funds suddenly 'dried up'!

Malaria remains one of the main causes of death in Sub-Sahara Africa. It causes

9 percent of all deaths and kills more than one million children in Sub-Sahara Africa. All or most countries outside Africa have successfully controlled the disease through a combination of preventive measures and treatment strategies. Africa is hindered by weak and poor public health systems and infrastructure.

DOTS is the cornerstone of TB control as it entails diagnosis with positive sputum sample, short-course treatment, regular drug supplies and systematic monitoring to evaluate outcomes for every patient. More than 99 percent of all global maternal deaths occur in developing countries, principally in Africa. Health spending would have to be more than tripled to provide the basic maternal and child health care package along with special intervention related to Neonatal survival.

In a nutshell, Africa can significantly reduce its disease burden by effectively harnessing available interventions or cost effective measures that have worked elsewhere. This however requires competent health care systems – staffed with skilled experts, adequately funded, transparently and accountably managed, and making the most of communication and information technologies (including health management information systems). Many of these measures would also work for the control of non-communicable diseases including: cardiovascular diseases, diabetes, various cancers and injuries. Ischaemic heart disease, heart failure and strokes are common and the associated risk factors such as obesity, high blood pressure, physical inactivity and salt intake and smoking are also on the increase. Some of the cancers common in Africa include those of cervix, liver and stomach and are associated with the preventable risk factors namely chronic infection with human papilloma virus, Hepatitis B and Helicobacter Pylori, respectively. Besides harnessing available technologies, interventions and practices to combat the rise of both communicable and non-communicable diseases, the continent needs to invest in health research, technology and innovation; disease surveillance and tracking systems, improved health management information systems; human and physical capital; and efficient and effective organization and management of health care systems.

That is, the pillars of a good health care system in Africa would consist of the following:

- Information, Surveillance and Research
- Management of Health Services
- Human Resources
- Financing

#### Information and Surveillance

Health information is usually obtained from seven major sources:

- Vital events: - births, deaths etc.
- Health services statistics
- Clinical information on patients
- Services provided to the patients
- Diagnoses of diseases
- Public Health Surveillance for diseases trends and out breaks
- Census data
- Periodic household surveys
- Resource tracking of human resources
- Research for generation of new knowledge about diseases

#### Management of Health Services:

In the management of health care, particular attention must be paid to the quantity, quality and equity of services provided.

#### Human Resources:

This is investment in the people providing health care, such as doctors, nurses, public health experts, etc. It is key to good health care provision. It should be managed well to ensure improved skills, to prevent, diagnose and treat illnesses.

#### Financing:

It is important to mobilize sufficient funds and to use the funds well. These are not easy but are critical to good health care. In Africa there is the problem of inadequate funding of health care such as provision of vaccines. Donors have no obligation to help Africa. Finally I must emphasize that these four pillars necessary for a functional good health care system are very weak in Africa especially Sub-Sahara region. There is clearly a need for more funding in Africa. Some disease epidemics such as Ebola, Yellow Fever, and Marburg Fever are found almost exclusively in Africa. There is a need for collaboration in efforts to eradicate these diseases. To combat the dual disease burden, African countries need a comprehensive approach to healthcare. This extends beyond the narrow confines of the health sector to include education, agriculture, finance and economic planning and even foreign affairs. ■

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# AFRICAN UNION

## WHY THE AFRICAN UNION SHOULD BE DISBANDED

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One enduring project of Pan-Africanists is an All-Africa union as the solution to Africa's underdevelopment. They view the lack of such a union as one of the major causes of the continent's underdevelopment predicament. From Nkrumah to the Organization of African Unity (OAU) and the African Union (AU), their disagreements have been about the means and ways of achieving this goal. In their view, the development of Sub-Saharan Africa (SSA) is inseparable from that of North Africa. I argue that this is not and should not be the case, because SSA socioeconomic outcomes and their causes diverge organically from those of North Africa. The AU should be dismantled. SSA should politically reconstitute itself, without North Africa, into a self-sustaining, organically integrated Unifederation better suited to address its twin problems of underdevelopment and over-politicization of the state.

## Introduction

The 'Arab Spring' of 2011 was instructive. Although many of the regimes (Yemen, Bahrain, Syria, and Egypt) used force against their populations, only Libya provoked NATO's bombardment in support of the armed internal opposition against the Gaddafi regime. (Only later, due to a different set of geopolitical reasons, was Syria subjected to international military pressure). The internal opposition and NATO bombardment in Libya provoked three noteworthy reactions. First, there was spontaneous and relatively uncoordinated support for the Gaddafi regime by the masses in some SSA countries. Second, the AU extended tepid support to the Gaddafi regime and timidly proposed a cease-fire between the regime and its foes. Third, the AU-proposed cease-fire was rejected off hand by the Libyan armed opposition, whose members are supposed to be part of AU.

Both the AU's tepid support and the opposition's rejection of the cease-fire contrasted with Gaddafi's vocal support for AU and his bigger financial contribution to the organization in the 2000s. Gaddafi's leadership was instrumental in the birth of AU. The first major move toward the union was the Sirte Declaration in Libya in 1999. After the Constitutive Act of the African Union was adopted in Lome (Togo) in 2000, it was in Sirte again that the establishment of the Union was proclaimed in 2001 before the official birth of the Union in South Africa in 2002. Libya's financial contribution to AU and SSA countries under Gaddafi was quite impressive. In addition to its 15 percent share of the AU budget (of about \$257 million in 2011), Gaddafi's Libya paid the membership fees for some very poor countries that could not afford it. This raised Libya's contribution to the AU annual budget to about one-third of the total. By some estimates, Gaddafi's Libya provided about \$97 billion to SSA in investments and aid.

The overall reactions to Gaddafi's demise in October 2011, however, revealed that, despite Gaddafi's impact on the pauperized masses in some SSA countries because of his financial largesse, his investments in AU have not paid off. It is almost a sure bet that after Gaddafi, there will be no strong support left for AU in North Africa, let alone in Libya. The lack of payoff for Gaddafi's support for AU is both a symptom of

and a metaphor for the organization's lack of usefulness in African Affairs.

### The 'Exceptionalism' Of SSA and the Limitations of the African Union

With a few exceptions, Africa obtained its independence in the 1960s - later than South America and Asia. Naturally, South America and Asia founded regional organizations before Africa did. This was the case with the Arab League in 1945 and the Organization of American States (OAS) in 1948. Another regional grouping in Asia, the Association of Southeast Asian Nations (ASEAN), was created in 1967, four years after Africa's continental organization, OAU, was founded in 1963. All these regional organizations rested on functional integration that promoted solidarity, economic cooperation, peace and security, and the protection of the sovereignty of the member states.

Africa's type of grouping differs from the three others in two major respects: membership and objectives. Africa's grouping was and remains continental, encompassing the whole African continent as opposed to subregional groupings in Asia. And unlike OAS, it is entirely made of developing countries. It has more member states (fifty-four countries) than any other regional grouping in the world. Although Africa's functional integration and cooperation resembles that of South America and Asia, its specific objectives differ from theirs. Explicitly, Pan Africanists have sought to solve the severe socioeconomic and political underdevelopment of Africa. To grasp this difference, one needs to bear in mind that Africa's flirtation with continental grouping has had four phases. All four lead back to Kwame Nkrumah, the first president of Ghana, who passionately called for the total unification of the African continent.

Nkrumah was so painfully aware of the deep political and socioeconomic underdevelopment and deprivation of Africa that he looked to the US, the Soviet and West European models of political organization for answers. He shunned the models of grouping offered by Africa's fellow Third world regions of South America and Asia. High premium was put on solving the severe state of underdevelopment of Africa. Nkrumah's project faced stiff opposition from his African peers and their foreign backers. To bridge the gap between Nkrumah and the opposition, the OAU was cre-

ated. The OAU constituted the second phase in Africa's quest for continental grouping. It was a 'compromise recognition' of Nkrumah's rationale and prime reason for the unification project: the severe socioeconomic and political underdevelopment of Africa and the need to solve it. The third phase in the process was the commitment to the idea of functional economic cooperation among African countries. Subregional economic organizations were its pillars. No fewer than 200 subregional economic organizations have been created in Africa since independence.

The OAU and its auxiliary subregional economic organizations had some success in the decolonization of the continent. Overall, however, they failed as an institutional framework for Africa's development. Several well-known reasons account for the inadequate performance of the OAU and the subregional economic institutions. They need not be rehearsed here but will be referred to below. Worth repeating is the fact that the OAU and its subregional offshoots consecrated the principles of national sovereignty, sanctity of colonial borders, and non-interference in other states' internal affairs. Although they were not the core reason for its failure (as I will argue), these principles undermined at its core the political and economic policy goal around which revolved the Pan African project. Deprived of any effective means of policy implementation, including financial contributions by member states, the OAU could not pursue any consistent and effective policies that would meet its enunciated goals.

Against this backdrop of failure and of the deterioration of the African socioeconomic situation, the AU was launched in 2002 to replace the OAU. The AU constituted, thus, the fourth phase in the African quest for continental grouping. It was in effect Nkrumah's revenge against his peers. Indeed, the socioeconomic standing of Africa had so deteriorated in the years after Nkrumah passed away, from the 1970s onward, that there was now the incontrovertible recognition of the implacable socioeconomic and political situation that Nkrumah wrestled with in his days. Most commentaries lauded the advent of the AU because of its potential, as a political union, to finally help Africa emerge as a force that can solve its problem of severe underdevelopment. The AU's Constitutive Act itself stressed the need to accelerate the socioeconomic development of Africa via a common vision

of a united and strong Africa. This required strengthened and empowered common institutions.

Thus, through its four phases of continental grouping, Africa distinguishes itself from South America and Asia. Unlike these two, it is the only developing region that has consistently and explicitly in the post-1945 period called for a continental political union to deal with its predicament. It has done so not only through an intellectual articulation of the problem as in Nkrumah's and many other writings, but also through its artists and populace. More is expected of Africa's grouping efforts because there is a recognition, however vague and intuitive in most cases, of the exceptional socioeconomic ills of Africa. Unfortunately for Pan Africanists, the AU is the wrong answer.

Like any big organization or institution, the AU was bound to experience 'growing pains.' Since its launching in 2002, the AU has not had a smooth sailing. It has faced budget shortfalls and it has not been able to put in place some of its agreed-upon institutional organs. Many of the existing ones have not functioned well. In 2004, an audit revealed a case of gross mismanagement and embezzlement of seven million dollars earmarked for a 'Conference of African and Diasporan Intellectuals' that was supposed to provide the intellectual impetus and cover for the AU. The relation between the president of AU Commission and the 54 African heads of state has been fraught with conflicts and misunderstandings. A clear manifestation of this was the row and split between the former president of the Commission, Alpha Oumar Konare, and the heads of state on the issue of democracy in Togo, Central African Republic and Mauritania. Konare held steadfastly to the principles of democracy, human rights, and the respect of the rule of law and constitutions to the chagrin and annoyance of many heads of state. They either maintained the undemocratic status quo or opposed him on the basis of the 'African reality.' The New Partnership for African Development (NEPAD), designed to serve as the connecting bridge between AU and Western and industrialized democ-

racies that promised economic and political assistance to AU, has not lived up to the expectations. Personality clashes among the main African protagonists of NEPAD, divergent agendas, and the inability of Western countries to keep their promises have brought NEPAD to a screeching halt.

The 2012 marathon election (four rounds) of the new president of AU Commission once more revealed the split between 'Francophone' and 'Anglophone' countries as each camp sup-

ported its own candidate. In the end, the Anglophones won; the South African Nkosazana Dlamini-Zuma, the former wife of President Zuma, was elected. More importantly, perhaps, the two tactical and policy positions held by two major views of AU have negatively impacted it. Although all heads of state signatories to the Constitutive Act of AU profess their commitment to an-all Africa political union, they hold two different views about how to implement this policy. On the one hand are the advocates of the fast track approach (e.g., Senegal under Abdoulaye Wade). They argue for the immediate institutional

implementation of the political union since, in their view, the failure of the OAU and the advent of the AU necessitate such an approach. On the other hand, there are those (e.g., South Africa) who prefer a step-by-step approach similar to the one followed by the European Union. They warn against a rush to political union and hold to national sovereignty.

Yet these 'growing pains' are not the reasons why I argue that the AU is the wrong answer and should be disman-



ned. Many of these difficulties are to be expected. In any case, they are secondary reasons that are subordinated to deeper problems. To better grasp these deeper problems or reasons, it is worth saying first what they are not. First, as just stated, I do not call for the dissolution of AU because of the growing pains experienced by AU. Second, one oft-mentioned reason for skepticism about building an all-Africa union is the sheer geographical and demographic size of Africa. Skeptics argue that the AU cannot administratively manage the whole continent of Africa that lacks infrastructure and efficient

bureaucracy. However, this reason lacks strength; it is not why the AU should be dismantled. India and China have larger populations than the whole continent of Africa. Yet both have been able to administer their territories with some efficiency. Moreover, the idea of a continental union was born to precisely address the issue of lack of infrastructure in Africa. Lack of infrastructure cannot, therefore, be a deterrent to continental union.

Third, discontinuation of the AU should not be because of the five issues generally invoked about the failure of the OAU and its auxiliary subregional economic organizations: (1) the low level of trade exchange among African countries; (2) a plethora of subregional organizations that supersede each other; (3) unpaid dues by member states; (4) political instability and conflicts, and (5) attachment to national sovereignty at the expense of the regional or continental organizations, which results in the failure to apply policy agreements. We know that these five issues implicitly justified OAU's replacement by the AU. By replacing the OAU, the AU is supposed to solve or to have solved these issues. In reality, however, the AU cannot and has not been able to solve the five issues. The inability of the AU to solve them stems from the fact that these issues are symptoms of deeper problems. Only by explaining and solving these deep-rooted problems can we help cure the symptoms. The five symptoms are, therefore, not the reason why I propose the dissolution of AU.

Fourth, the reason for dissolving AU is not because North Africa is made of 'Arabs' and SSA of 'Blacks,' and the masses of North Africa feel more attached to the Arab world than to 'Africa.' The expected diminishing support for the AU in North Africa after Gaddafi is not the reason either. To be sure, there is a 'racial' and cultural split between North Africa and SSA. Denying it is disingenuous. President Nasser of Egypt, a strong Pan Africanist, held misguided views about SSA that he regarded as the 'Dark Continent' to be civilized and dominated by Egypt. His Pan Arabism trumped his Pan Africanism. Gaddafi, a visceral proponent of African unification via the AU at the

time of his death, espoused in the early days of his rule an aggressive policy of land grabbing and regime destabilization toward SSA countries in the name of Arab nationalism. In reaction to this, Mobutu, the former dictator of Congo-Kinshasa, attempted to take the leadership of 'Negro Africa' away from Arabs in an attempt to counter the Arab penetration of SSA.

In fact, Gaddafi's wholesale embrace of a union with SSA came as a reaction to his many failures to create political unions with Arab leaders in North Africa and the Middle East, including with Syria. At an Egyptian exhibit in the American city of Houston, the Egyptian representative once proclaimed to the chagrin and consternation of African Americans that the mummies represented Egyptian culture and history and not 'African culture.' He sought to distance ancient Egyptian civilization from SSA. In an attempt to differentiate itself from SSA, Morocco once sought membership in European Union only to be told that it was not a European country. By the way, Morocco ended its membership in OAU/AU long ago over Western Sahara. Among the North African populace, the split from SSA is perhaps best illustrated by the Libyans who chanted 'We are native Arabs, not Africans' when Gaddafi announced to them in 2000 the creation of the AU. As a Libyan respondent, who does not think of himself as 'African,' put it in a survey by BBC News on January 23, 2004, '98% of Libyans are against any African Union.' Africans, he opined, have brought suffering to Libyans by spreading HIV and AIDS. These sentiments are shared by many Egyptians and other North Africans, who do not want to be associated with SSA, preferring to proclaim their 'Arabness'. Nevertheless, this racial and cultural split is not a reason why I argue that manage the AU does not meet the requirement as an institutional response to North Africa and SSA. After all, one finds just as many anecdotes about North Africans proclaiming their African proclivities and connections to SSA. One is reminded of Algeria's former president Ouari Boumedienne's retort to the Arabs: 'If you force me to choose between the Arab world and Africa, I choose Africa.' And despite his misgivings, Nasser was closer to Nkrumah's

views than were many Nkrumah's own SSA peers.

None of the above four reasons explains why the AU should be dismantled because they are all secondary reasons. They are symptoms of and subordinated to more systemic and organic causes on which SSA and North Africa diverge. The AU should be dismantled because it is an institutional mismatch between SSA and North Africa created by diverging organic causes. The notion of 'organic causes' will be defined in the next section. In order to do so, however, some comparative discussion about SSA socioeconomic outcomes is first in order.

Recently there has been much euphoria about 'Africa, the next Asia,' 'Africa's robust growth,' and the 'decrease of Africa's poverty level.' The claim is that SSA socioeconomic differences with North Africa and other regions are being erased. The euphoria emanates from 'Afro-optimists' and Sinophiles who extol the merits of China's investments in Africa as the path to SSA development. Their optimism flows from Africa's share of foreign direct investments and the sectoral growth achieved in some SSA countries in recent years (IMF projected about 5.5 percent of growth rate in 2012). In 2011, for example, foreign direct investment to Africa grew by 27 percent. Most of the growth has been spurred by the export of raw materials and minerals, such as oil, copper, cobalt, and agricultural cash crops. From 2002 to 2007, the share of raw materials in GDP for Africa was 24 percent, by far the leading sector. Exports of raw materials have stimulated growth in other sectors, including government spending. No surprise that by 2014, China, the most important beneficiary and consumer of raw materials, had invested more than \$100 billion in Africa. A side effect of this has been China's involvement in infrastructure building in SSA countries.

True as all this may be, the Afro-optimists would be well advised to temper their euphoria. Africa has experienced this type of commodity boom in the past (notably in the late 1960s-early 1970s) only to go bust when conditions changed. Moreover, the reliance on



commodities and its attendant infrastructure is not historically a novelty for Africa either. One needs not be an apologist of colonialism to recognize that European colonial rule did generate tremendous growth in many of the colonies. Belgian Congo, South Africa, Rhodesia, Kenya, and Egypt are examples. In these countries, much of the growth was spurred by commodity exports, minerals and cash crops. And expectedly, the level of infrastructure in these countries, especially around the areas that produced the raw materials, was higher than elsewhere. Yet colonial economic growth and its attendant infrastructure did not prevent SSA from becoming the 'poorest region' of the world. The issue here is not colonial exploitation or Chinese exploitation. Rather, Afro-optimists fail to properly account for the reasons why SSA is 'the poorest region' and lags behind its fellow 'Third World' peers. They crave for 'some good news from Africa' and are eager to toot the horn for just about any shred of positive economic activity. Afro-optimism and Afro-pessimism should give way to 'Afro-realism.'

The reality is that, although SSA still shares many socioeconomic traits with North Africa, Asia, and South America, it stands alone at the bottom of the comparative scale. Its socioeconomic indicators lag behind those of North Africa and all other developing regions, even when the current Arab Spring-generated crisis is taken into account. SSA oft-repeated cases of 'success' are very small countries (e.g., Botswana or Mauritius) with no major impact on the overall development of SSA. South Africa is so beset by Apartheid-era-induced internal poverty that its economic attraction to the struggling populations of other SSA countries is fraught with dangers of xenophobia and violence against these migrant populations. The data in table 1 tell the story of Afro-realism.

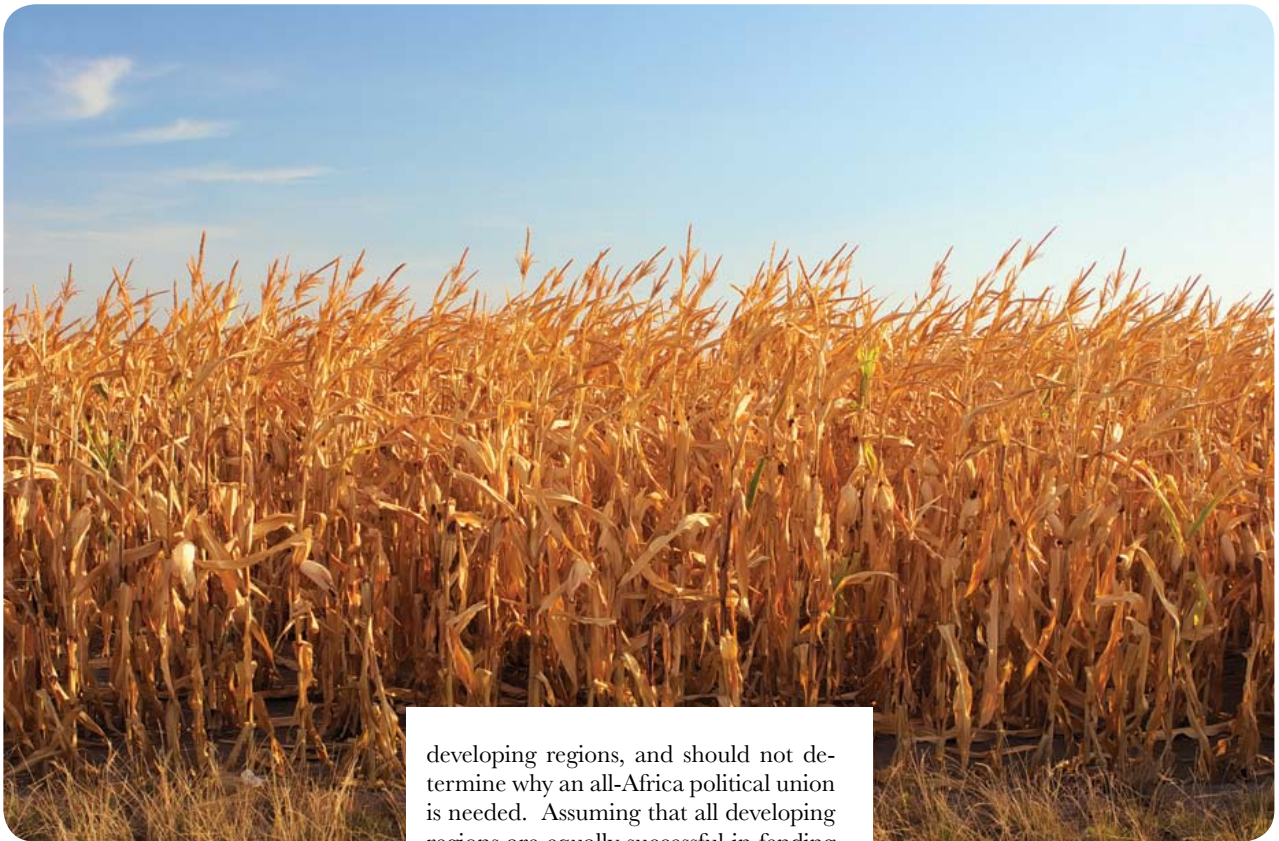
YEAR		SSA*	MNA*	SA/EA*	SAM*
1960-2003	GDP(in 2000 US \$)	511	2140	283	3168
	Life Exp	47	64	56	66
	Inf Mort	105	78	74	35*
	Poverty % Change**	+20	---	-21/-43	-1
1988-2003	GDP Change**	-20	+197	+103	+206
	Life Exp Change**	-2 Yrs	+3 Yrs	+4 Yrs/+1 Yrs	+2 Yrs
2003-2009	GDP Index (1980=100)	98	125	201/259	112
	Life Exp	50	69.5	64/71	73
	Inf Mort	94.5	34	62/24	22.5
	Pol Strife Index (AV)	42.5	35	39/40	33
	Peace Index	96	78	75	83
2010	GDP in \$ (AV)	2270	3565***	7530****	7556
2011	GDP in \$ (AV)	2442	4279***	13611****	8084
2010	HDI Rank (AV)	141	87***	86****	79
2011	HDI Rank (AV)	155	99***	98****	84

SSA=Sub-Saharan Africa; MNA=Middle East & North Africa; SA=South Asia; EA=East Asia; SAM=South America.

\*\* Change from previous year.

\*\*\* North Africa by itself.

\*\*\*\* Asia as a whole



developing regions, and should not determine why an all-Africa political union is needed. Assuming that all developing regions are equally successful in fending off imperialism via their regional groupings, there still remains the gap between SSA and the three other developing regions. The issue for Africa is not how continental strength will deter and fend off Western powers, but rather why SSA lags behind North Africa and its peer developing regions and how to solve this lag. Creating a union between SSA and North Africa on the basis of the colonial shared experience does not answer this question, and is not the solution.

The data clearly show that SSA has lagged behind North Africa and all other developing regions in all the indicators since 1960—except Asia’s early GDP. Pan Africanists either are unaware of the reality conveyed by these data or simply ignore it. As a result, they rely on three erroneous premises. First, they invoke the geographical contiguity between North Africa and SSA to advocate a common union for the two subregions. Certainly, the importance of territorial contiguity is not to be discounted in regional groupings. However, North Africa’s contiguity to SSA is not enough of a reason for a continental union with SSA. Mali, Senegal, or Niger may be geographically closer to Algeria, Morocco, and Tunisia than they are to Kenya, Malawi, or Congo-Kinshasa; but their GDP per capita (average \$714) are closer to those of the latter three SSA countries than they are to the three North African countries (average \$4246). Contiguity does not seem to close the gap.

Second, Pan Africanists rely on the ‘Africa as a great power’ assumption, according to which, to be heard in the world and to fend off Western or other forms of colonial domination, the whole continent of Africa must be united to create continental strength. In truth, fending off imperialist encroachment is not exclusively African. It is the goal of all

Third, because political and economic unions (e.g., USA, EU) have been successful in other regions of the world, Pan Africanists assume that a similar union will solve the African predicament. A glaring aspect of this imitation today is the pairing of EU and AU. Not only is ‘African Union’ an imitation of ‘European Union’ in naming, the Constitutive Act and Charter of AU are modeled after EU. So are AU institutional organs. Lost in this imitation is the question of whether the problem to be addressed and solved by the continental institution in Africa is the same as that addressed by EU. More importantly, is the problem to be solved the same in North Africa and SSA?

**Geology, Politics and the SSA-North Africa Divide**

To assess the validity of the institutional solution proposed by Pan Africanists in the face of SSA lagging socioeconomic

development, one needs to delve into the relationship between socioeconomic outcomes, institutions, and politics. The AU is an institution. Institutions involve some well-defined organizational patterns, regular rules and procedures governing the behaviour of groups or collectivities. Although they suppose some routinization and stability, institutions are made. They do not just occur out of the blue. They are an outcome of a ‘situation’ that requires or necessitates their existence. There are many ‘situations’ that can necessitate the existence of an institution. In most cases, however, POLITICS and its consequences are the main triggers. Politics is a society-rooted competition over property, resources, goods, services, values, and—as a crucial corollary—political power. Because of the competition involved, politics generates differential or unequal socioeconomic outcomes. Moreover, it triggers the building of institutions designed to structure the competition, to deal with its effects, and, more importantly, to solve or respond to the problems that the collectivities involved in the competition face.

Herein lies the relationship between politics and institutions. Politics makes institutions, including the state. By contrast, institutions can only shape and mold politics in return without being ubiquitous self-made agents or the pro-

genitor of politics as institutionalists would have it. Therefore, with respect to tackling socioeconomic problems, institutions that work best are those that meet one major criterion. They must be tailored to reflect the prevailing brand of politics in society and to respond directly to its socioeconomic consequences. As an All-Africa institution, the AU does not meet this requirement with regard to SSA and North Africa. The reason is the vast difference in socioeconomic outcomes between SSA and North Africa that politics imposes

given that politics determines institutions and the state itself, the difference in politics also explains why political institutions and the state in Western countries differ from those in non-Western/Developing countries. This is so even when these institutions are formally and in appearance similar to those of Western countries. Even routine and regular elections do not eliminate these differences as events have shown over and over again.

political behavior that reflects the absence of compromise in politics. Because irresolvable issues are not off the table, basic compromise is hard to reach. As a result, politics does not lead to institutional/procedural and policy compromise. Hence, the general tendency toward institutional instability and 'deviations' from the Western norm. Space prevents a full elaboration of these points here. But liberal compromise does not suggest that 'political crises' do not occur in the West.



SSA shares over politicization with North Africa, Asia, and South America, but to different degrees and with variations. Variations in their politics and its socioeconomic effects are due to variations in physical, historical, and anthropological backgrounds of their respective societies. What are the backgrounds or factors that have shaped SSA variations in politics? Methodologically and logically, SSA lagging socioeconomic indicators suggest that they are not caused by a factor SSA shares with the other developing regions. It cannot be the Cold War, imperialism, colonialism, the world capitalist system, neocolonialism, deterioration of the terms of trade, dependency on foreign aid, inadequacy of aid, price control/protectionism, or the generic 'bad governance,' all factors that all developing regions have in common. These shared factors cannot explain why (only) SSA has diverged from other developing regions. It stands to reason that exceptional factors or backgrounds explain why SSA has diverged in its politics and, hence, in socioeconomic terms from its peers. 'Exceptional' means that these factors either exist in all developing regions, including North Africa, but display a very unique feature in SSA, or exist only in SSA and not at all in the other regions. Compared to North Africa (and Asia and South America), SSA has exceptional physical, historical, and anthropological backgrounds that shaped its society in a peculiar way, with severe implications for its brand of politics. There are four such exceptional factors: (1) geocology, (2) ethnic dispersal and profusion, (3) slavery, and (4) low precolonial socioeconomic outputs. Only a skeletal outline is provided here.

and why it imposes these differential outcomes. Therefore, in order to propose an institutional format that solves the SSA predicament, we need to pay attention to politics and its differential socioeconomic effects in North Africa and SSA.

What, then, caused SSA politics and its consequences to diverge from North Africa's? The definition of politics provided above suggests that politics is inseparable from the type of society in which political competition takes place. Resources, goods, and values, which are the objects of the competition, are society-based. Politics is ultimately tributary to and structured by the physical, ecological, anthropological, and historical backgrounds of society. This specification helps explain why politics in non-Western or developing countries differs from politics in Western countries. And

Regardless of their level of economic development or regime type (democratic or authoritarian), developing countries share a common property, over politicization. The latter defies liberal compromise in the political competition of non-Western countries. It distinguishes their political outcomes from those of Western countries. Their state, in contradistinction to the liberal democratic state in Western countries, is an over politicized state. Liberal compromise (and not just any type of compromise) means that a basic compromise about the values, beliefs, and goals of the political community has been reached, taking off the table irresolvable issues. As a result, political competition leads to institutional/procedural and policy compromise and relative stability.

Over politicization is the opposite of liberal compromise. It is a pattern of

### Geocology

The geocology of SSA demarcates itself exceptionally from that of the other regions in a negative way. Partly because of its northern boundary imposed by the Sahara desert and its consequent almost total confinement within the tropics, SSA maintains a physical/



geographical unity among its subregions. As a result, the overall tropical climate, soil, vegetation and ecosystems of SSA are more closely shared by its subregions and countries (except the Cape in South Africa) than is the case in Asia and South America. Compared to the two regions, SSA is the most tropical. It has the fewest benefits associated with temperate climate, monsoon, and with high lands. It has the most rainforest negatives, the most savanna negatives, the most desert impact, the fewest fertile river banks/valleys, the highest soil limitations for production, the fewest navigable rivers, and the most landlocked countries (except Central Asia).

SSA holds the first rank in all tropical infectious diseases (river blindness, bilharzia, sleeping sickness, Guinea worm, yellow fever, yaw disease, malaria, HIV, Ebola). In short, Asia and South America hold a geoecological advantage over SSA.

The overall climatic impact on North Africa differs sharply from the impact on SSA for two reasons. First, the effects of the desert are mitigated in North Africa by massive mountain ranges. They soften the noxious effects of the desert and shield North Africa's populations from its taxing impact. SSA lacks comparable number of mountain ranges and these ben-

efits. Although East Africa has higher mountains (e.g., Kilimanjaro in Tanzania and Mount Kenya towering respectively 19,340 feet and 17,058 feet), their effects are mostly confined to specific areas in Kenya, Tanzania and, to an extent, Uganda. This is a small area of SSA. East African Mountains have no positive impact on the Sahel countries. In North Africa, the effects of mountains are also distributed over a relatively small area; but they are felt by almost all North African countries. Due to its high elevations, North Africa, unlike SSA, is not home to the disease-causing tsetse fly that attacks cattle and livestock and is the main vector of sleeping sickness in humans. Although malaria has occurred in North Africa, this has been of the least fatal variety. North Africa does not have the SSA specific type of malaria-causing mosquitoes that carry and transmit the very lethal pathogen *Plasmodium falciparum*.

The second reason has to do with the real im-

part of the desert on the populations and their livelihood. It turns out that such an impact is far more negligible in North Africa than in SSA. Vast areas of the North African countries affected by the desert are empty. As a result, the majority of North African populations live in the cities in the northern end of the countries, along the Mediterranean coast. Or they are concentrated in the most fertile areas of the countries, such as the Nile Valley in Egypt and the Tell region, a hilly region, in Algeria. This means that, despite the desert, the majority of the North African population lives in the Mediterranean climate, a transitional climate between dry tropical and temperate climate. It differs from the SSA predominant climate cluster, and makes North Africa's climate resemble that of Chile in South America and California in the US. Due to the Mediterranean climate, North Africa is much more productive than the Sahel and other SSA desert-affected countries. Unlike SSA, with its record-breaking landlocked territories, all North African countries have direct access to the sea, which has economic and commercial implications.

SSA exceptional geoecology is, thus, overwhelmingly negative and more taxing on people than in North Africa and other regions. Arguments that take geoecology seriously are easily and often inaccurately dubbed 'deterministic.' No sin of determinism has been committed here. Although there is some direct cause-to-effect relation between SSA geoecology and its socioeconomic outcomes, I do not draw such a direct causal relation. Instead, SSA exceptional geoecology helps us define three intermediate exceptional factors (variables) that it generated. The three intermediate factors more directly cause variations in SSA politics. As already mentioned, they are (a) ethnic profusion and the attendant ethnic horizontal relations, (b) slavery, and (c) low precolonial socioeconomic outputs.

### **Ethnic Dispersal and Profusion**

SSA does not have the monopoly on 'tribes.' North Africa and other developing areas have 'tribes' as well. Yet ethnicities in SSA and North Africa do not shape politics the same way because of their differential historical and anthropological fates. What explains this difference is not colonialism as often claimed with much exaggeration, but the exceptional nature of SSA geoecology. Historians agree that the ethnic distribution of Africa was more or less set between the 7th and 11th centuries, although it continued up to the 19th century. The ethnic distribution involved higher levels of dispersals and migrations of peoples than in most other regions because of the geoecological constraints they faced. In most cases, poor soil conditions, diseases, drought and famine set the limits to the population density. Quarrels ensued, and the result was new migrations and ethnic splits. The most famous migration in SSA is the Bantu migration. In West Africa, in addition to Bantu

It stands to reason that exceptional factors or backgrounds explain why SSA has diverged in its politics and, hence, in socioeconomic terms from its peers.

migration, “changes resulted from many small, essentially kin-based groups searching for more advantageous places to live. Soil, fertility, water supply, and distribution of disease, particularly sleeping sickness and river blindness, undoubtedly influenced settlement patterns as much then as they did later. The preferred locations developed as population centers, where many of the languages within the Atlantic, Mande, Gur, Kwa, Benue-Congo, and Adamawa-Ubangi branches of Niger-Congo originated.”

In Central, East and Southern Africa, the very slow movement of the Bantu from East

the dispersal of Luo and Luo-associated groups, such as the Acholi, Lango, and Alur. The famous Shaka-Zulu-driven social and political revolution that engulfed the Nguni people from the late 18th century to the mid-19th century and that reordered the ethnic composition and structure of the whole Southern Africa up to Tanzania in East Africa had its origin in the ecological imbalance, drought, and dwindling land resources for herding. Wars broke out and made new ethnic groups or amalgamated others.

By contrast, the ethnic dispersal in North Africa was circumscribed and much more limited by two very powerful factors. First, the continental dispersal of populations that followed the Sahara desiccation had reduced the territorial space over which North Africans could settle. The population concentration in cities along the Mediterranean and Atlantic coasts and in the fertile valley did not allow for a vast ethnic dispersal of people. Second, because the Phoenician, Roman, Arab, Ottoman, Portuguese colonization and

from time to time without succeeding in controlling power. This ethnic verticality differs fundamentally from SSA ethnic horizontality (I return to this concept below).

Thus, geocology caused a higher dispersal, profusion, and number of ethnicities in SSA than in North Africa and the two other developing regions. There are about 4600 ethnic groups in SSA. North Africa (minus Western Sahara and Mauritania), by contrast, counts about 96 groups, most of which are Berber. In other words, SSA has about 48 times the number of ethnicities of North Africa. It displays an ‘anomaly’ when compared to other regions. Indeed, SSA has had historically the lowest average population density of the three comparative regions (18/sq.km vs 25/sq.km in North Africa, 31/sq.km in South America, and 70/sq.km in Asia); yet it has the highest number of ethnicities. By comparison with North Africa, Asia and South America, SSA ethnicity/population ratio is higher. There are far more ethnic groups per population cluster in SSA than it is the case in North Africa and the two other regions. This ethnic dispersal and profusion was exacerbated by slavery, thus further distancing SSA from North Africa.

### Slavery

SSA did not hold a monopoly on slavery either. Slavery has existed in almost all continents. Yet, by any standard, slavery in SSA was exceptional because of its three exceptional features. First, slavery in SSA was the largest intercontinental forced migration in modern history. It differed from all the others by its highest rate of mortality and social dislocation. Second, its impact was not confined to SSA but extended to all the continents, except Oceania. In all of them, there were sellers and buyers of SSA slaves. Third, its effects have persisted and endured in

SSA did not hold a monopoly on slavery either. Slavery has existed in almost all continents. Yet, by any standard, slavery in SSA was exceptional because of its three exceptional features.

Africa to Southern Africa (6 km/year) and the limited fertility of soils explain the dispersal of populations in small settlements along the way. Northeast arid ecology dictated the Cushitic Somali migrations from southwest Ethiopia and northern Kenya. Pastoralism and splits in ‘clans’ were outcomes. Geocology also provoked the Oromo migrations from the south of the Rift Valley in search of new grazing lands for cattle. The result was two types of ethnic dispersal: those who remained in the south and assimilated Oromo groups dispersed throughout Ethiopia and Kenya. Geocology-rooted migrations and conflicts among Western Nilotic Nuer, Dinka, and Luo explain

invasions occurred centuries and even thousands years ago, they had created a settlement pattern in North Africa that deterred the type of ethnic profusion that occurred in SSA. Given the type of colonial rule and its longer time span, these different groups came to co-exist in a form of settlement colonies, in which the invaders reordered the indigenous Berber social life politically and religiously/culturally. The integrated social order that emerged out of this reordering became vertical, dominated hierarchically by the invaders, notably the Arabs. The ‘Arab tribe’ imposed its hegemony over all other indigenous Berber groups—which explains Berber revolts and resistance

all the continents up to the 21st century as attested to by refugees (e.g., Somalia 'Bantu people' in the US), political debates, and the intractable socioeconomic low status of and discriminatory practices against the descendants of SSA slaves in all the continents. What, then, explains the exceptional nature of slavery in SSA?

The answer is SSA exceptional geocology. Consider the five major reasons imputed to SSA itself by historians to explain slavery: (1) lack of private property, (2) the active participation of SSA precolonial rulers in the slave trades, (3) better epidemiological resistance to diseases by SSA slaves, (4) the Ham Curse, and (5) SSA precolonial states' weakness and inability to fend off slavers. All five resulted from SSA harsh geocology. For space reasons, I make only barely skeletal points. In SSA, slaves were used by some individuals/rulers and by lineages. Why this reliance on slaves? Because of SSA formidable geocology, a special premium was put on land. This forced the dispersed ethnic groups to opt for communal land ownership. Indigenous slavery compensated, thus, for the lack of private property in land by serving as a source of private wealth for some individuals/rulers; it also served as a source of extra labor power for lineage members to alleviate the burden of the lineage and its members within such a forbidding environment. This situation imparted to SSA indigenous slavery its distinct character. Because some individuals and lineage members depended so strongly on this geocology-induced wide and deep indigenous slavery system, SSA rulers easily participated in slave trades when goaded by Arabs and Europeans. As for the other three causes, suffice it to mention that the epidemiological advantage of African slaves and the Ham Curse, which is linked to the black skin color, are direct by-products of SSA geocology that imparted to people of SSA their phenotype and differential resistance to the parasites and disease load. Unfortunately for the people of SSA, these saviour attributes made them vulnerable to slavery and biblical distortions. Geocology also explained why 'strong states' emerged in South and Southeast Asia to fend off slavers but not in SSA. Asian states emerged in a fertile environment of intermediate tropical zone as opposed to

the equatorial wet zone. In SSA, ever-wet and most tropical environment and the attendant ethnic dispersal could allow mostly only fragmentary and small states unable to fend off the encroaching slavers. Thus, geocology imparted to SSA slavery its exceptional nature (I do not discount Arab and European responsibility). This explains why its effects also differ from those of slavery in other parts of the world.

Slavery's major impact on SSA was not, as often maintained, the demographic loss or the fostering of autocratic rule. Although these did occur, their impact is exaggerated. Instead, slavery had three particularly severe internal consequences for SSA: (1) it reinforced the

slaves. This behaviour has deep roots in slavery and is tied up to the tale of the white revenants. The wealth obtained from the slave trade by Arab and European slave traders so impressed the Africans that they explained it through the social death of the slaves: When slaves were taken to the Americas and the Arab world, they died. And as spirits, they reappeared as White revenants with massive wealth. This tale or myth derived from the reality of slavery of centuries ago has become 'part of the culture.' The wealth and magic of the 'white man' are held in higher esteem, and one can accede to it only through sorcery-sanctioned death of a human being. Consider here the ritual killings of Albinos in Tanzania, Uganda, Ken-



higher ethnic dispersal and profusion caused by SSA geocology in all the subregions of SSA; (2) it worsened the fragility of traditional economic organizations and the low outputs; and (3) it devalued SSA and its people.

Slavery devalued SSA and its people in two major ways. The first way is the devaluation by outsiders, that is, people from all the other regions of the world. The reasons for this are twofold. The slave ideology contained in itself the venom of the devaluation of the people in SSA. In addition, the presence of SSA slaves in Europe, the Americas, North Africa, the Middle East and Asia had established the 'objective basis' for the denigration of SSA, their land and culture of origin. The second slavery-derived type of devaluation is self-devaluation by the people of SSA them-

elves, Burundi and Congo for wealth making. Their 'white-like' body parts are representative of 'white wealth.' Slavery did not create sorcery, but it fortified it. The death of slaves and of the sorcerer's victim, which turns them into 'white' and wealth, is the symbolic devaluation of the Africans by Africans themselves in the face of the 'white man's' wealth and prestige. Because myths become routine, they acquire structural strength by becoming 'reality.' Both the intelligentsia and the populace in SSA recognize the daily empirical manifestations of this situation. A Ghanaian returnee best summed it up: 'Nothing pleases a Ghanaian worker more than to have a white boss. The more abusive the boss, the better and the more endearing the staff are to them.' He contrasted this attitude to the aversion of the same Ghanaian workers and populace to value

their fellow Ghanaian bosses. Slavery-derived devaluation of SSA by both outsiders and the people of SSA themselves creates a complex of superiority for the outsiders and of inferiority for the people of SSA.

### **Precolonial Fragile Economic Organizations and Low Outputs**

Harsh geoeology had a negative impact on SSA ability to build viable economic organizations. It is no mystery why food production did not take place as early as was the case in Asia and the Nile Valley in Egypt. The paucity of domesticable native plant species, the much smaller area suitable for indigenous production, and the often stingy climatic zones deterred such an occurrence. The very features that made SSA geoeology exceptionally negative required a survival and subsistence type of economic activities at the expense of vibrant forms of production. Ethnic dispersal exacerbated and codified this fragile and subsistence economy. Geoeology and ethnic dispersal determined both the relations of production that came to rest on communal ownership of the land and the attendant technology that remained rudimentary.



For its part, slavery reinforced the fragile traditional economy through generalized insecurity that prevailed from roughly the 16th to the 19th centuries. It also stunted the SSA productive forces, and strengthened ethnic dispersal. The dispersal had implications for state formation and centralization that impacted negatively the long-term economic development. To be sure, precolonial economies were not uniform throughout SSA. Trade-led economies of West Africa, for instance, fared better than elsewhere. Nevertheless, compared to North Africa, Asia, and South America, SSA, as a whole, had depressed socioeconomic outputs by the time of European colonialism. Colonial rule's economic transformations did not alter this gap. By 1960, economic outputs (in GDP) were, on the average, \$16,467 for North Africa and \$3, 761 for SSA.

### **Organic Nature of Politics and its Modifiers in SSA**

Thus, geoeology generated three intermediate exceptional factors: ethnic

dispersal and profusion, slavery, and low precolonial socioeconomic outputs. The three have a direct impact on SSA politics. They modify politics by means of three exceptional direct manifestations. First, ethnic dispersal and profusion manifest themselves directly in the form of ethnic horizontal relations. Ethnic horizontal relations are exclusive to SSA and are not observed in North Africa (Asia and South America). They differ from ethnic vertical relations in North Africa, Asia, and South America. Ethnic vertical relations are pyramidal, unequal, and dominated by one 'ethnic' group politically, economically, and socially (e.g., Arabs in North Africa and the Middle East, Europeans or Mestizos in South America, Han Chinese in China, Kinhs in Vietnam, Indo-Aryans in India). Unlike in North Africa, Asia, and South America, in SSA European

or pre-European colonization never succeeded in reordering ethnic vertical relations, except temporarily in Southern Africa and Sudan. As a contrasting result, ethnic horizontal relations characterize SSA. Ethnic horizontal relations rest on assumed and built-in equality among ethnic groups. The expectation is that no single group dominates the others by controlling political power exclusively; power is potentially accessible to all ethnic groups. This assumed equality begets demands by each ethnic group—however small—to be given (or to take) equal chance to control political power. This may take the form of violent overthrow or rigged or fair election, even though the outcome does not necessarily reflect this equality. Second, the direct manifestation of low socioeconomic outputs is a more extreme form of socioeconomic deprivation and competition in SSA than obtains in North Africa (and Asia and South America). The comparative data in Table 1 above partly reflect this extreme deprivation. It deeply and differentially shapes the SSA brand of politics. Third, slavery's

double devaluation of SSA and its people manifests itself directly in the form of a higher level of insecurity and inferiority complex of the SSA political leadership than is the case in North Africa (and Asia and South America). It adds, unlike in North Africa (Asia and South America), an extra layer on top of the colonial devaluation that SSA shares with all colonized non-European peoples. It has deep modifying implications for SSA politics.

Thus, ethnic dispersal and profusion, low precolonial socioeconomic outputs, and slavery modify and impact politics in SSA through their three direct manifestations: ethnic horizontal relations, more extreme form of socioeconomic deprivation and competition, and higher level of insecurity for the political leadership. They explain why the socioeconomic consequences of politics in SSA differ from those of North Africa (and Asia and South America). The three intermediate factors and their three manifestations form an organic and systemic whole in four specific ways.

First, they all relate to and bear the imprint of SSA exceptional geoeology. Second,

the three determine and reinforce each other: Ethnic dispersal and fragile precolonial economies prevented the emergence of 'strong' states to fend off slavery; slavery, in turn, exacerbated ethnic dispersal and the fragility of precolonial economies; ethnic dispersal codified and put its imprint on traditional economies (e.g., collective land ownership and subsistence), which, in turn, reinforce ethnic dispersal by provoking the overuse and degradation of the land and soils and, hence, the migrations of the populations to new settlements. Third, the three factors are found in all SSA subregions. Although the three and the underlying geoeology may display variations in individual countries, they impact directly or indirectly all SSA countries alike. Fourth, their three attendant manifestations (i.e., ethnic horizontal relations, the more extreme form of socioeconomic deprivation and competition, and acute form of inferiority complex) are found and directly affect politics in roughly the same way in all SSA countries. Because of these four traits, the three fac-

tors and their manifestations constitute the organic causes of SSA politics. As such, the organic causes of SSA politics are to their variations in individual SSA countries what the trunk of a tree is to the branches. Attempts to save one or several dying branches of an infected tree remain ineffective unless one treats the infected trunk of the tree.

The organic causes of politics have organic consequences as well for SSA. They make politics in SSA as a whole exceptional when compared to politics in North Africa and the other developing regions. This process is more complex than can be analyzed here given space constraints. Suffice it to say that because of these organic causes, politics, which is by definition conflict-ridden, acquires in SSA a more Hobbesian character than in the other developing regions. Liberal political compromise, generally difficult to reach in developing regions, is made even more so in SSA. Because politics makes and shapes the state, exceptional politics in SSA makes its state exceptional as well. Herein lies the difference between the SSA variant of the over politicized state and that of North Africa (and of Asia and South America). This explains why in SSA the institutions of the state have been more predatory and viciously appropriated by some groups or individuals—often and almost always tied up to ethnic claims and interests; why extreme forms of political buffoonery verging on sadism have occurred there (e.g., Idi Amin, Bokasa, Doe, Abacha); why SSA has brewed more civil wars than any other developing region in the recent postcolonial period; why it has a higher political strife index and lower peace index than the other developing regions; why in the ‘consolidated democracy era,’ SSA has witnessed the larger number of military coups and coup attempts (e.g., Mauritania, Guinea, Guinea Bissau, Madagascar, Niger, Mali, Central African Republic, and coup attempts in Benin, Malawi, South Sudan, Congo-Kinshasa, and Lesotho); and why there are more so-called ‘failed states’ in SSA than in the other developing regions. [As a historically specific, concurrent, and multistate ‘revolution,’ the ‘Arab Spring’ and its ramifications in the Middle East and North Africa are not considered here in the comparison.]

By definition, the state is the institution-

al format through which public policies are taken to tackle the problems of socioeconomic development. In SSA, this viciously Hobbesian character of politics and its variant of the over politicized state prevent the state from acting as the catalyst for development. The cumulative impact of this exceptional politics on the state explains the gap in socioeconomic outcomes between SSA and North Africa (and other developing regions) in table 1. What, then, is the solution?

### **Unifederation as the Organic Institutional Solution**

The socioeconomic consequences of politics in SSA are, thus, different from those of North Africa. Their causes are organically embedded in the SSA fabric, and systemically affect all SSA subregions and countries, albeit with

Solutions to individual SSA countries may temporarily impact local variations and alleviate some aspects of the predicament. But they will not solve the problem for organic SSA.

local variations. Therefore, the design of the institutional format apt to solve SSA socioeconomic predicament needs to reflect and respond to these organic differential causes and consequences of politics. In light of this, the natural impulse to let each SSA country fend for itself and solve its own development problems loses its rationale. This includes the impulse to rely on ‘ethnicity’ as the basis for political reorganization in each country. Ethiopia, the first SSA country to clearly subscribe to the strategy of reorganizing the polity on the basis of ‘ethnicity,’ has not moved away from the collective fate of other SSA countries. Solutions to individual SSA countries may temporarily impact local variations and alleviate some aspects of the predicament. But they will not solve the problem for organic SSA. Like the treated branches of an infected tree that cannot survive unless the trunk of the tree is treated, the temporarily relieved countries will not extricate themselves from the SSA organic socioeconomic predicament unless the organic causes

of politics they share with other SSA countries are dealt with. For the manifestations and causes of the SSA predicament resemble the Greek mythological hydra, the gigantic monster with nine heads, all of which were anchored by a central immortal head. As one head was cut off, two grew in its place. Only by burning out the roots and severing the immortal central head from the body did Heracles destroy the monster.

Whatever country-based solution is proposed to SSA socioeconomic ills will not be able to sever the immortal central head of the hydra. It will not treat the infected trunk of the tree. For example, the socioeconomic situation of Congo-Kinshasa was relatively better than that of Rwanda before the 1990s. So was that of Cote d’Ivoire compared to its neighbors. Today both the Congo and Cote d’Ivoire (the Congo more so) are ‘basket cases’ because failure to solve Rwanda’s and Cote d’Ivoire’s neighbors’ problems has re-infected the Congo and Cote d’Ivoire via ethnic political strife. South Africa may have a stronger economy, but failure to solve the socioeconomic plight of its neighbors haunts it via deadly xenophobia against its ‘fellow Africans.’ Kenya may be the ‘economic power house’ of East Africa, but the Somalia’s imbroglio has come to haunt Kenya via terrorist attacks.

The need to respond to the organic socioeconomic outcomes in SSA and their causes requires that the response be organic as well.

On the other hand, the common pitfall of the Pan Africanists is to be oblivious of the specifically organic nature of the SSA predicament and its differences from North Africa’s situation. As a result, they rely wrongly on an all-Africa continental solution. The concept of organic SSA militates against all-Africa institutional solutions that emulate those proposed in other (developed or developing) regions. It prevents us from likening poorer Eastern Europe’s entry into EU to the AU situation between SSA and North Africa. Unlike Western Europe, North Africa’s economic situation, although better than SSA’s, is structurally incapable to bear the burden of SSA. But more importantly, because North Africa does not share the organic causes of SSA politics, AU, the institution designed to solve the effects of this politics, cannot succeed in doing

so. Therefore, the difference between organic SSA and North Africa requires the administrative and political separation of SSA from North Africa. It cries out for the repudiation of the African Union and for the urgent need to organically tackle the predicament for SSA as a separate whole.

The institutional separation of SSA from North Africa helps to tackle the organic causes of SSA socioeconomic lag. This can be accomplished only through a successor institution to AU that best responds to the organic causes and consequences of SSA exceptionally Hobbesian politics. The state, is such successor institution for two reasons. First, the state is the institution through which public policies are devised to tackle the problems of socioeconomic development. Second, because the state in SSA is the direct institutional consequence of the exceptionally Hobbesian brand of politics. Through

allow the state to structure and mold politics positively in return for SSA as a whole. Such a revolutionary transformation of the state, which makes it the center of decisions for the whole SSA, requires that the national state lose its sovereignty.

Neither the OAU nor the AU offers any theoretical, comparative, and organic basis to repudiate national sovereignty. Under the new state arrangement, by contrast, national sovereignty is rendered, on theoretical and comparative grounds, indefensible by the organic causes of SSA politics. In contrast to the European Union model copied by AU and the generally loose and functional integrative model that guides most regional integrations, SSA should rely on a tight integrative model that reflects its organic exceptionalism. A tight integrative model assumes unique sovereignty of the integrative state as opposed to multiple sovereign-



it are generated extremely negative socioeconomic outcomes. To make the SSA socioeconomic situation positive, the direct institutional response to this brand of politics and its attendant type of state is a different type of state.

Indeed, although the state and its institutions are made and determined by politics, the state and its institutions mold politics in return. Yet we now know that the SSA situation rests on a paradox. On the one hand, the causes of exceptional politics and its negative impact on the state and on socioeconomic outcomes are organic and applicable to the whole region of SSA; on the other hand, the states themselves are 'national' and 'sovereign.' The challenge is to make the state as regionally organic as the causes of exceptional politics. This would

ties of the constitutive states. It rests on rearranging the SSA political space by dismantling the highly 'negative' national states to allow their transformation into a SSA organic state.

Let me resort to a neologism to refer to this new institutional format as a Unifederation. By Unifederation I mean a reconfigured and unified political and territorial body. Its local and subregional entities make no claim to complete sovereignty as in AU and as in other regional groupings in the world. They do not claim complete but progressively delegated sovereignty as in EU. Nor is their claim about 'residual sovereignty,' which is the source of interpretative frictions between the federal government and the states in the US. Rather, local and subregional entities are decentralized under the

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Indeed, although the state and its institutions are made and determined by politics, the state and its institutions mold politics in return.”

complete and unified sovereignty of a newly constituted SSA multi-territorial state. In most regional groupings, institutional decisions are either not binding or loosely and selectively binding. The new institutions attached to the SSA organic state, by contrast, impose sovereign and constraining obligations to all members. It also means that territorial borders separating the previously sovereign countries lose their meaning as a new geo-spatial space is created. Although Unifederation has much in common with federalism, it is historically unique. It maintains the decentralization and practical autonomy of its constitutive entities while deriving its unique sovereignty from the organic nature of the causes of the SSA predicament. The Unifederation reflects SSA exceptionalism.

#### **Payoffs and Feasibility of the Unifederation**

As the center of decisions for the whole SSA, targeting roughly the same problems in all SSA subregions, the Unifederation becomes the means through which a unified and purposeful policy can tackle, beyond national variations, the organic factors that modify politics negatively in SSA. There are four specific payoffs. First, the unifederal organic state provides the political framework and means to tackle SSA socioeconomic lag. Because the low socioeconomic outputs are for a major part due to SSA harsh geocology, it is almost impossible for individual countries to solve the problem. The unifederal organic state remedies this situation by being the center of decisions for the whole SSA. It provides resources and coordination in the transformation of the traditional economies. It allows different subregions of SSA to compensate for their specific geocological disadvantages by benefiting from the geocological advantages of the other subregions. Because of its rearranged socioeconomic space, the unifederal state reduces ethnic dispersal and horizontal relations; it, thus, transforms the traditional forms of economic organizations. Only within such a rearranged space can the much-talked about and much-needed land reform, improvement in rural agricultural production, and the upgrading of human resources and skills can succeed in SSA. A successful integrated industrialization is possible only with these improvements.

Most studies on globalization cite SSA as the region the least integrated into the current global economy. Because

it is a better institutional solution, the Unifederation accommodates globalization better than does AU or individual countries. It uses its unique sovereignty to dictate the direction and goal of SSA integrated involvement in the world markets as opposed to being dictated serially by global actors. Moreover, the Unifederation allows a more vibrant and open economic and political system, a bigger and organically integrated geographical space, and a larger and more skilled population. These conditions favor globalization's information technology, foreign investments, international travel, trade, financial markets and the movement of capital in SSA.

As a second payoff, the Unifederation sets up conditions for democratization through territorial reorganization. By rearranging the geopolitical and economic space at the SSA level, the unifederal organic state frees the competing groups from their dependence on the national negative and instrumentalist state. The freeing leads to broader and multiterritorial political coalitions within the unifederal larger space. Previously competing ethnic groups at the national state level, who are easily mobilized by the potentially equal access to political power offered by ethnic horizontal relations, have now to contend, at the unifederal level, with many other groups of similar strength or coalitions of many groups from all the subregions of SSA. The Unifederation deprives 'tribalist' protagonists of the individual country-based territorial, economic, and political conditions that make their equal search for political power attractive and destructive. Ethnic horizontality-built-in equality is very sensitive to any semblance of 'domination' by any ethnic group within the confines of the national state; unifederal broader political coalitions allay these fears. In short, the Unifederation dilutes the conditions that invigorate the equal ethnic claims to political power at the national level. It renders them inoffensive. This creates a perfect or semi-perfect equilibrium of political forces. The result is a search for compromise, which begets democracy. Democratic politics is the surest breeder of inclusively vibrant socioeconomic institutions.

Third, because it rearranges the SSA space, democratizes it, and stands as the center of sovereign decisions, the Unifederation helps eliminate the conditions that breed strife, civil wars,

militarism, and undemocratic behaviors. It fosters peace. Hence disappears the need for costly military assistance or interventions by the US and other SSA ‘partners.’ By transforming the socioeconomic fortunes of SSA, the Unifederation improves the standard of living of the populace, enhances security, and deters the conditions that have emboldened Islamists and Al Qaeda in SSA. Moreover, the consequent socioeconomic outcomes of the Unifederation reduce the need for US and other foreign powers’ development assistance (as was the case with US assistance to Europe, Japan, and to South Korea). The Unifederation helps, thus, reach the goal of Pan Africanists—de-

of the acute insecurity and inferiority complex felt by the political leadership. Likewise, it deters the superiority complex of the outsiders. Indeed, Unifederal broader political coalitions and the attendant equilibrium of political forces deprive the political leadership of its three main allies in enacting inferiority complex-driven policies: They constrain the leader’s freedom of arbitrary actions; take away the usually exorbitant power and influence that superiority complex-imbued expatriates have over the insecure and inferiority complex-stricken political leaders; and render insignificant the leader’s ethnic support and complicity in allowing this influence to prevail.



AU-driven ‘unification of Africa’ is a pipe dream. Not so much because it is difficult to implement as because it will not solve SSA lagging socioeconomic outcomes. Similarly, reliance on individual SSA countries’ ability to make themselves ‘the next Asia’ and the excessive faith of Sinophiles in China’s ability to develop SSA are illusions. China or India will not eliminate the organic causes of SSA socioeconomic lag. Unless people in SSA have resigned to their fate and have accepted at the outset that they will always occupy the last rank compared to all other developing regions, only SSA itself can do so. And the Unifederation is the way. Unifederation is not a pipe dream because it squarely addresses SSA lagging outcomes and their organic causes. It has the chances of

terrifying foreign encroachments—without resorting to the ill-conceived continental union with North Africa.

fundamentally altering SSA status as the ‘poorest region’ of the world.

Fourth, the Unifederation addresses the issue of SSA inferiority/superiority complex. SSA extreme form of economic deprivation exacerbates the slavery-derived devaluation of the African self; the expected socioeconomic payoffs of the unifederal organic state have the added benefit of curing the people of SSA of their complex of inferiority vis-à-vis the economically better-endowed outsiders. Beyond this, the Unifederation deters and eliminates the policy consequences

There remains, of course, the question of how to actually implement the project. Proposing today that AU be dismantled would seem to be pure folly in the face of the efforts deployed by Pan Africanists for the last 50 years. Actually, it is not a folly. AU has performed one major positive deed that facilitates its own demise in favor of the Unifederation. And this is the establishment of constitutional norms in its Constitutive Act that are consistent with the two most powerful movements of the post-1991 period:



globalization and democratization. Indeed, under the aegis of AU, all SSA countries have been sensitized to today's international democratic norms. Sensitization to the democratic norms serves, thus, as the necessary transitional period before the implementation of the Unifederation. It has provided the masses in SSA with enough incentives and means to redirect their efforts democratically toward implementing the Unifederation.

Relying on the democratic gains of the last 20 years, the implementation should feature two concomitant strategies. First, at the national level, where the popular masses fight for democracy. Each SSA country organizing elections or other non-electoral actions should feature political parties and mass organizations that explain to the general populations why SSA lags socioeconomically behind its previously equal fellow 'Third World' regions; why the solutions proposed since independence by their national states and leaders have not worked; why China or India are not good substitutes for SSA own creative energy; and why AU, the organization aimed at solving the problem at the continental level, is ineffective when compared to the SSA-based Unifederation. Second, at the AU elite level, where the AU edifice was built. The frustrated elite and 'intellectuals,' who have worked within the AU bureaucracy only to decry its ineffectiveness, should join the masses in the fight for the dismantling of AU and its transformation into a SSA Unifederation. Their expert advice and clear understanding of the causes of their frustration and of the unavoidable failure of AU should strengthen the democratic process of liquidating AU in favor of the Unifederation. We, thus, have both a bottom-up and a top-down strategy of implementing the Unifederation project.

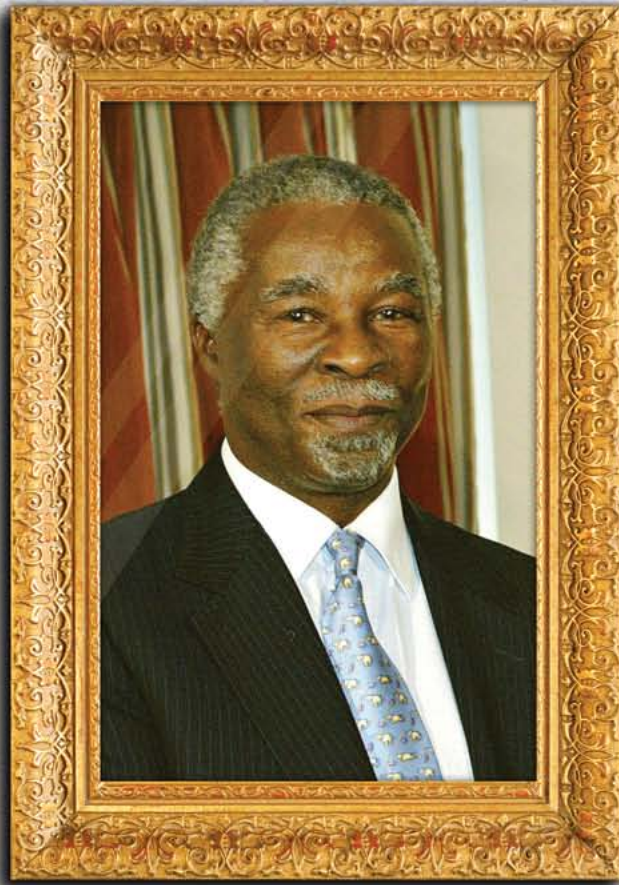
The implementation process benefits greatly from globalization's lower communication costs and breakdown of trade and cultural barriers among countries. By challenging the national state sovereignty, globalization facilitates the process of territorial and sovereignty rearrangement dear to the Unifederation.

Globalization allows people in SSA to challenge the 'tyranny of place' associated with the current SSA state. As one of the legacies of the Westphalia Treaty of 1648, state sovereignty is not as sacrosanct as believed. USSR, Czechoslovakia, and East and West Germany are examples of altered sovereignty in two opposite directions. South Sudan and Eritrea in SSA itself are other examples.

As high as the hurdles faced by the implementation of the Unifederation seem, they are by far more salutary for SSA than the 'growing pains' of AU, which will never eliminate the gap between SSA and the other developing regions. SSA faces two choices. The first is the status quo and its attendant perpetual lowest ranking for SSA. And the second is

Indeed, Unifederal broader political coalitions and the attendant equilibrium of political forces deprive the political leadership of its three main allies in enacting inferiority complex-driven policies:

the implementation of a salutary intellectual alternative for a positive transformation. The difference between these two options can be measured. Ask the best statisticians in the world to gather all the available data. Let them calculate the human, economic, financial, political and psychological costs of maintaining the status quo represented by AU and SSA today. Then look at the cost of implementing the alternative in the form of a Unifederation. There is no doubt that the cost of the status quo for SSA is exponentially higher than the cost of implementing the salutary alternative. ■



# THE UNSUNG HEROISM OF THABO MBEKI

Dr Cosmas Milton Obote Ochieng  
Executive Director, ACTS

*“In our world in which the generation of new knowledge and its application to change the human condition is the engine which moves human society further away from barbarism, do we not have need to recall Africa’s hundreds of thousands of intellectuals back from their places of emigration in Western Europe and North America, to rejoin those who remain still within our shores! I dream of the day when these, the African mathematicians and computer specialists in Washington and New York, the African physicists, engineers, doctors, business managers and economists, will return from London and Manchester and Paris and Brussels to add to the African pool of brain power, to enquire into and find solutions to Africa’s problems and challenges, to open the African door to the world of knowledge, to elevate Africa’s place within the universe of research the information of new knowledge, education and information”.*

**Thabo Mbeki, 1998**

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It was Day 2 of the International Conference on the Emergence of Africa held in Abidjan, Cote D'Ivoire (March 19th, 2015). All the pomp and ceremony of the first day was gone: the multi-coloured African flags; the red carpet; the traditional dancers; the uniformed security; the press corps.

**N**either President Alassane Ouattara of Cote D'Ivoire nor President Macky Sall of Senegal, two of the Chief Guests on Day 1 were in attendance. The UNDP Administrator, Helen Clark, a former Prime Minister of New Zealand, and another Chief Guest from Day 1, had also left.

The Hotel Sofitel Conference Centre, the posh venue of this international conference had a decidedly anticlimactic feel to it. Sure, the Prime Minister of Cote D'Ivoire was still around, as were several high ranking current and former ministers for finance and economic planning, heads of central banks and distinguished academics from the African continent and beyond. The charismatic former Prime Minister of Burkina Faso, Tertius Zongo, would be moderating the day's first Plenary Session. Nevertheless, after the refreshingly wonky High Level Panel Discussion on Day 1, during which Allasane Ouattara (on total factor productivity), Thabo Mbeki (on illicit financial flows in Africa), and Helen Clark (on inclusive growth and human development) had stolen the show, Day 2 felt a bit low key. This was clearly a day for technocrats: a keynote address by a representative of the World Bank, followed by a panel discussion led by leading scholars on the development experiences of South Korea, India, Mauritius and Brazil.

The camera panned across the room and beamed a picture of a familiar looking face, seated nonchalantly deep in the audience. It was Thabo Mbeki, the former President of South Africa, looking much younger than his 72 years. This is one of the striking things about Thabo Mbeki. He appears not to have aged much since 1994 when much of the world got to know him for the first time as he took the oath of office as Deputy President of a democratic, non-racist and non-sexist South Africa. The second most striking thing about Thabo Mbeki is his unsung heroism, especially in his native South Africa. This,

despite a solid record of monumental accomplishments. For the first 14 years of post-apartheid South Africa, he had been at the centre of South Africa's political and economic transformation – arguably the chief architect of post-apartheid South Africa's economic and social contract. For the final 10 years of apartheid rule, he had led the negotiations on the dismantling of apartheid. He had spent 28 years in exile, lost a son and a brother in the struggle, survived an assassination plot, and watched his father spend 24 years in detention.

In a political movement blessed with extraordinary talent, he rose to become the trusted aide of two of the ANC's most revered leaders (Oliver Tambo and Nelson Mandela) and proceeded to beat a formidable cast of political rivals to become Deputy President, en-route to becoming post-apartheid South Africa's second democratically elected leader.

While his place in history is certainly assured, his achievements are seldom celebrated. This architect of South Africa's transition to democratic rule; this author of much of post-apartheid South Africa's economic, political and social policies; this successor and 'comrade' to Nelson Mandela, Oliver Tambo and Govan Mbeki; this 21st century leader of African rebirth; this originator of NEPAD (New Partnership for Africa's Development), was here in Abidjan, less than 7 years after leaving office, and is hardly noticed by those who study and practice development in Africa.

The camera hadn't spent more than a few seconds on him. It wasn't even clear that many of the delegates had recognised his presence. He was seated alone, no fawning fans crowding him to ask for autographs or 'selfies'. He also appeared very much at ease and not an inch out of place in this meeting of low level technocrats. This is the third most striking thing about Thabo Mbeki. His 'bookish' reputation is well deserved. He is an ideas man, an avid reader who

genuinely enjoys rigorous intellectual exchange. Here he was, a 72 year old pensioner, formerly the most powerful man in Africa, happy to take 'lessons' on the development experiences of South Korea, India, Brazil and Mauritius while the people currently in charge of Africa's destiny were nowhere to be seen.

The fourth most striking thing about Thabo Mbeki is his unsung Pan Africanism. Nowhere is this more apparent than in his contribution to the 'New African Renaissance'. Yes, he was talking about this and getting pummeled mercilessly for it by the South African press long before the emergence of the 'Africa rising' narrative. While he cannot claim all the credit for the 'Africa rising' narrative, it is hard to deny his role in the continent's economic and political governance over the last two decades. His leadership on (a) good governance on the continent (b) African ownership of, and solutions to Africa's problems, (c) redefinition of African foreign policy (towards Afro-centric and non-confrontational diplomacy - a rejection of 'victimhood' and Afro-pessimism in favour of an Afro-centric, proactive, non-confrontational African engagement in international affairs), and (d) the 'African Renaissance Coalition' (Olusegun Obasanjo of Nigeria, Abdoulaye Wade of Senegal, Pedro Pires of Cape Verde, Joachim Chissano of Mozambique, Meles Zenawi of Ethiopia and Paul Kagame of Rwanda) combined to create conditions favourable to the emergence of 'Africa rising' narrative.

I have lived in South Africa and I am aware that Thabo Mbeki remains a controversial figure in that country. Many South Africans consider him 'bookish' and 'detached' or more concerned with 'Pan-African' rather than 'South African' problems. Notably, his focus on African Renaissance seemed to have rubbed many of his compatriots the wrong way. In the complex history of race relations in South Africa, his work on the 'African Renaissance'



has been misconstrued in some quarters as not being inclusive of South Africa's 'non-black races'. This perception is misguided but it hasn't been helped by the affirmative action policy with which Mbeki is also closely associated: Black Economic Empowerment (BEE). Criticism that benefits of the BEE were narrowly targeted at black South Africans instead of all 'races' that had suffered marginalization under apartheid led to the revision of the programme in 2007 to something called Broad Based BEE. Broad Based BEE continues to suffer from much of the original criticism levelled against the original BEE.

There are as many legitimate critiques of the BEE as there are of Pan Africanism. Why South Africans should single out Mbeki for particularly harsh judgement over the 'sins' of BEE and African Renaissance, is the puzzle. After all, both African Renaissance and BEE were championed by the sainted Nelson Mandela and no one has ever accused him – post-apartheid - of being insufficiently invested in South African problems or of being insufficiently inclusive in his 'African Renaissance'. While it is true that Thabo Mbeki has given stirring speeches on African Renaissance and dedicated much of his life, before, during and after his presidency to this cause, it is also true however that nobody has made a grander, more heartfelt and policy focused speech on South Africa's role in the 'new African Renaissance' than the much beloved 'Madiba': "Where South Africa appears on the agenda again, let it be because we want to discuss what its contribution shall be to the making of the new African Renaissance. Let it be because we want to discuss what materials it will supply for the rebuilding of the African

city of Carthage. Africa cries out for a new birth, Carthage awaits the restoration of its glory. . . . Tribute is due to the great thinkers of our continent who have been and are trying to move all of us to understand the intimate inter-connection between the great issues of our day of peace, stability, democracy, human rights, cooperation and development. . . . We know as a matter of fact that we have it in ourselves as Africans to change all of this. We must, in action, assert our will to do so. We must, in action, say that there is no obstacle big enough to stop us from bringing about a new African Renaissance." Nelson Mandela

For some reason, Thabo Mbeki tends to be judged more harshly than others. This is true of three of the most enduring criticisms levelled against him: his response to the HIV/Aids epidemic, his 'quiet diplomacy' on Zimbabwe, and his obsession with 'African Renaissance'. Let's examine each in turn.

#### **Mbeki and HIV/Aids: A damning and deserved criticism**

The strongest criticism against Thabo Mbeki rests on his 'enabling' of what can fairly be described as state-led 'HIV/Aids denialism' in South Africa during his time as president. The government of Thabo Mbeki's approach to HIV/Aids can be characterized as follows:

- Official questioning of the global scientific consensus on the causes of HIV/Aids;
- Official reluctance to embrace early implementation of anti-retroviral drugs therapy;
- Government inaction, interference, pseudoscientific wars, and outright antagonism towards the country's

leading scientists, professional medical societies and HIV/Aids organizations.

Mbeki personally questioned the scientific link between HIV and Aids. He expressed doubt that HIV caused Aids and suggested that Aids was caused by socio-economic factors (i.e. poverty) and lifestyle choices. His ministers questioned the efficacy and effectiveness of early anti-retroviral drugs (especially AZT and nevirapine) while indulging in pseudoscientific arguments. At the 16th Global Aids Conference in Toronto, Canada, the South African Department of Health formally exhibited garlic, lemons and beetroot, alongside anti-retroviral drugs.

So let's be clear. On HIV/Aids, Thabo Mbeki failed South Africa and Africa. He should have recognised the magnitude of the scourge and provided timely and clear leadership in combating it. In fact, the ANC recognised the severe implications of the HIV/Aids epidemic as early as 1990. That was four years before the party ascended to power. At the Fourth International Conference on Health in Southern Africa, held in Maputo, Mozambique, then Head of the ANC's armed wing and General Secretary of the South African Communist Party (SACP), Chris Hani, asserted: "We cannot afford to allow the Aids epidemic to ruin the realization of our dreams"

Thabo Mbeki's government should have done more to combat the disease. South Africa had the knowledge and wherewithal to do so. For a firm believer in African solutions to African problems, Mbeki failed his own African leadership test. A leading advocate of harnessing



science, technology and innovation for accelerated development in Africa, his flirtation with HIV/Aids denialism and his indulgence of HIV/Aids deniers is indefensible.

Having said that, one might be tempted to think that Mbeki is an anomaly as far as global leadership on HIV/Aids is concerned. Unfortunately, the history of HIV/Aids is characterized by 'denialism', silence and failure of political leadership. The list of leaders who failed in this respect is long and diverse. Arguably, the Reagan Administration takes the cake.

The first cases of HIV/Aids in the US were reported in 1981. President Reagan did not make a formal statement on the disease – despite intense pressure from US medical and public health agencies - until May 31st 1987. By this time, the disease had spread to 113 countries, killed more than 20,000 in the US alone and infected another 36,000. That same year, the US imposed a travel ban on those with HIV/Aids from entering the United States, a policy that would remain in force until late 2009, when it was lifted by the Obama Administration. The effect of the travel ban was to stigmatize the disease and to constrain US leadership in this fight. Dozens of other countries would follow the US lead in imposing such travel bans. Some of these remain in effect.

The process for lifting the ban was actually initiated in 2008 by a true hero in the fight against HIV/Aids: George W. Bush. His PEPFAR (President's Emergency Plan for AIDS Relief) initiative has saved many lives and fundamentally transformed African and global ap-

proach to HIV/Aids. Reagan and Mbeki are not alone in their failure to lead on HIV/Aids. Many African leaders in the 1980s and 1990s were slow to recognise the gravity of the epidemic. Some engaged in their own pseudo-scientific analysis. For example, the idea that the disease was limited to gays, was a particularly widespread misconception in the continent in the 1980s and early 1990s.

Curiously, the failures of many of these leaders have either been forgotten or forgiven. Reagan was twice elected president of the United States and remains popular to this day. (Mbeki was twice elected too, although he is not exactly the most popular person in South Africa today). Today, 24.7 million people live with HIV in sub Saharan Africa – more than 70 percent of all people living with HIV worldwide. Not a single African leader has ever lost his job because of inaction or inadequate response to HIV/Aids. None is even particularly remembered for their slow or ineffective response to the epidemic. Yet, criticism of Mbeki's response to HIV/Aids remains withering and unyielding.

As I have said, it is well deserved. My concern here relates only to why this is true of Mbeki and not the others. Perhaps Mbeki engaged in his pseudo-scientific analysis much later than most (i.e. when the weight of scientific evidence on the causes of HIV/Aids was already considerable). Perhaps a lot was expected of South Africa, a country with a long and proud history of scientific excellence, especially in medicine. (It should be noted that the apartheid regime also failed South Africa here, wasting valuable time engaging in its own brand of HIV/Aids conspiracy

theorising and pseudoscience). Perhaps a lot was expected of Thabo Mbeki personally. He is a smart man, after all. Some tin pot dictator in some banana republic could get away with some crazy, pseudo-scientific ideas. Perhaps the 'bookish' Mbeki deserved a full blown intellectual pushback. He could do real damage, given his political legitimacy, moral authority and intellectual credentials. Tinpot dictators of banana republics are never taken seriously. They can cause real harm but only by coercion rather than persuasion, and there are limits to what coercion can achieve. Persuasion, as Mbeki very well knows, can be achieve unbelievable things. Perhaps. The point is, Mbeki appears to be subject to a double standard here.

### **Mbeki and Zimbabwe**

Mbeki is also subject to a double standard when it comes to the question of Zimbabwe. It is a complex matter but the gist of the criticism is relatively straightforward. On account of 'electoral fraud and human rights violations', the European Union and the US imposed targeted but restrictive sanctions on Zimbabwe following the 2002 presidential election. The idea was that the sanctions would force a change in the behaviour of the government of Zimbabwe towards improved democratic and economic governance. When this didn't appear to be happening, an argument arose that given the degree of 'integration' between Zimbabwean and South African economies, the only effective sanctions would be those imposed by South Africa. True to his Afrocentric, proactive, non-confrontational African diplomacy, Mbeki opted for 'quite diplomacy' instead: seeking a peaceful resolution to the crisis by talking directly to the government of Zim-

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**This struggle that we face now is more complicated. It is even difficult to see who is an enemy. I think because we are dealing with this complex situation, that’s when we need to raise the level of leadership. Surely we can’t lower the level of leadership.**”

babwe. That ‘quiet diplomacy’ in Zimbabwe (and other African countries) has been roundly criticised.

Arguably, Mbeki bears some level of responsibility for the trajectory of events that took place in Zimbabwe between 2002 and 2008. He was the OAU/AU Chairman at the time of the controversial 2002 presidential elections in Zimbabwe. Many of his critics consider his approach to the 2002 election as the embodiment of the failure of the ‘Quiet Diplomacy Approach’. Their Exhibit A? The Khampepe Report.

On the 14th of November 2014, following a ruling of the Constitutional Court, the South African government was forced to release the Khampepe Report on the 2002 Elections in Zimbabwe. (<http://cdn.mg.co.za/content/documents/2014/11/14/reportonthee2002presidentialelectionsofzimbabwe.pdf>). The Khampepe Report is a report of a Judicial Observer Mission (JOM) appointed by President Mbeki on 12th February 2002 and sent to monitor the 2002 presidential elections in Zimbabwe, held in March of the same year. It was written by South Africa’s Constitutional Court judges Dikgang Moseneke and Sisi Khampepe.

The terms of reference of the JOM were to observe and to report to the President of South Africa, on whether in the period before, during and shortly after the elections, the Constitution, electoral laws and any other laws of Zimbabwe relevant to the elections could ensure credible and substantially free and fair elections. The JOM’s chief conclusion was as follows:

“It was principally the pre-polling, legal and other environment, which informed our assessment of the conduct

of the elections. We recognise that opposition parties fully participated in the electoral process to the end. We acknowledge that on polling days, no significant irregularities, save in Harare and Chitungwiza occurred. The counting of votes was completed regularly and timeously. Notably, the polling occurred peacefully... However, having regard to all the circumstances, and in particular the cumulative substantial departures from international standards of free and fair elections found in Zimbabwe during the pre-election period, these elections, in our view, cannot be considered to be free and fair”.

Critics of Mbeki’s ‘quiet’ diplomacy, including Freedom House, opine that had the report been made public at the time, it would have had far reaching consequences on South Africa Zimbabwe relations, with potentially democratic and human rights gains for Zimbabwe.

Perhaps. Criticisms of Mbeki’s quiet diplomacy miss several important things. The first and most important is the central role that ‘quiet diplomacy’ has played in Mbeki’s life and his many successes with this approach in South Africa and elsewhere. ‘Quiet diplomacy’ is to Mbeki what ‘Realpolitik’ was to Otto Von Bismarck. Mbeki used ‘quiet diplomacy’ or secret channels to negotiate the end of apartheid. He used quiet diplomacy to rally the support of international and domestic businesses against the apartheid regime long before many people believed that the system could fall. He had used quiet diplomacy to rally international public opinion against the apartheid regime. Finally, after he became president, Mbeki successfully used quiet diplomacy to encourage good governance and democratization on the African continent. Notably, he helped transform the old, backward

looking Organization of African Unity (OAU) into a new, relatively vibrant African Union (AU), with a potentially even more dynamic intellectual arm: New Partnership for Africa’s Development (NEPAD).

Reaching out to parties he might disagree with in order to extract something for the ‘greater good’ is an art Thabo Mbeki has perfected. Nobody has ever questioned his anti-apartheid credentials, yet he opened and successfully concluded secret negotiations with that regime. To view Mbeki’s quiet diplomacy as tacit approval of some of the actions of African leaders would be a fundamental misreading of the politics and philosophy of the man. Thabo Mbeki has no time for mediocre leadership in Africa. When it comes to political leadership in Africa, he is probably the most frustrated man out there. Here he is in 1998, enraged by political mediocrity on the continent:

“Africa has no need for the criminals who would acquire political power by slaughtering the innocents as do the butchers of the people of Richmond in KwaZulu-Natal. Nor has she need for such as those who, because they did not accept that power is legitimate only because it serves the interests of the people, laid Somalia to waste and deprived its people of a country which gave its citizens a sense of being as well as the being to build themselves into a people. Neither has Africa need for the petty gangsters who would be our governors by theft of elective positions, as a result of holding fraudulent elections, or by purchasing positions of authority through bribery and corruption... The call for Africa’s renewal, for an African Renaissance is a call to rebellion. We must rebel against the tyrants and the dictators, those who seek to corrupt our societies and steal the wealth

that belongs to the people. We must rebel against the ordinary criminals who murder, rape and rob...". Thabo Mbeki SABC, Gallagher Estate, 13 August 1998

Less than two years ago (December of 2013) Thabo Mbeki used the occasion of the memorial for Nelson Mandela (at Midrand's Calvary Methodist Church) not to praise the man he reveres but to call for 'quality' leadership in Africa. "This struggle that we face now is more complicated. It is even difficult to see who is an enemy. I think because we are dealing with this complex situation, that's when we need to raise the level of leadership. Surely we can't lower the level of leadership."

Those who are quick to criticise Mbeki's quiet diplomacy in Zimbabwe and elsewhere in Africa might want to reflect on his historical successes with this strategy and his personal commitment to 'African renaissance'. Of course, simply because his quiet diplomacy succeeded elsewhere does not mean it is the right one for each and every circumstance. I am only saying that an appreciation of his overall record with this strategy might help explain his preference for it in Zimbabwe and elsewhere in Africa.

The criticism of Mbeki's quiet diplomacy with reference to Zimbabwe also overlooks two critical points. One, alternative approaches (e.g. sanctions) were already being applied – to arguably no effect. Those who championed these 'failed' approaches are not subject to the same level of criticism directed at Thabo Mbeki.

Finally, why Mbeki gets a disproportionate share of the blame for the crisis in Zimbabwe is also a puzzle. Yes, he bears some blame. South Africa is one of Zimbabwe's most important neighbours. And yes, he led a number of diplomatic efforts to resolve the crisis there including the 2008 Power Sharing Agreement. To the extent that all these are important and/or problematic, he has his share of responsibility. But what about political leaders in Zimbabwe? Other neighbours of Zimbabwe? SADC? The African Union? The Commonwealth? The UK? The European Union?

Thabo Mbeki is also held to a different standard with respect to his work on 'African Renaissance'. While it might come as a surprise to modern day South Africans (partly because of the banning of the ANC for much of

the 20th century and the skewed nature of the apartheid education system), the idea of an African 'regeneration', 'revival' or 'renaissance' has been a bedrock ideology of the ANC (African National Congress) since its formation. Successive leaders and leading thinkers of the ANC have been fierce promoters of this idea. This idea has evoked some of the most stirring speeches or writings from the leadership of the ANC. ANC co-founder and former President, Pixley Ka Isaka Seme gave one of the earliest, most powerful speeches on the subject as an undergraduate student at Columbia University in 1906. His speech on the 'Regeneration of Africa' won him the George William Curtis Medal, Columbia University's highest oratorical award.

As can be seen from this passage from the 'Regeneration of Africa', Mbeki's speeches and writing on the subject mirror Pixley Ka Isaka Seme's: "The African people, although not a strictly homogeneous race, possess a common fundamental sentiment which is everywhere manifest, crystallizing itself into one common controlling idea. Conflicts and strife are rapidly disappearing before the fusing force of this enlightened perception of the true intertribal relation, which relation should subsist among a people with a common destiny. Agencies of a social, economic and religious advance tell of a new spirit which, acting as a leavening ferment, shall raise the anxious and aspiring mass to the level of their ancient glory".

The idea of the African renaissance is also to be found in the writings and speeches of many of the ANC's leading lights including: Richard Victor Selope Thema, Zachariah Keodirelang Matthews, Ashby Peter Mda, Solomon T. Plaatje, John L. Dube and Nelson Mandela. Unlike many of these people, Mbeki did get an opportunity – as President of South Africa - to do more than speech making. As aforementioned, he helped foster the creation of both the African Union and NEPAD in addition to shepherding numerous efforts to promote good governance on the continent. Perhaps this is why he gets much of the criticism. That would be understandable but still problematic.

While his commitment to Africa's renewal is directed at the overall well-being of the continent, it has been beneficial to South Africa. It helped ease South Africa back into the community of African nations. Today, South Afri-

can businesses and products litter the continent. A South African, a former South African minister for foreign and home affairs, Dr Nkosazana Dlamini-Zuma, is the current chairperson of the African Union Commission. These are no mean accomplishments. Africa has a complex relationship with 'big powers'. It took enormous skill to integrate South Africa smoothly into the rest of the continent. The fact that South Africa continues to enjoy considerable prestige and popularity across the continent (despite the recent xenophobic attacks) is a testament not only to the power of its moral triumph over apartheid, but also to the diplomatic skills and vision of its post-apartheid leadership, most notably, Nelson Mandela and Thabo Mbeki.

South Africans may owe a lot to Mbeki's 'quiet diplomacy' and 'African renaissance' than they realise. Yes, whether South Africa should have used its moral authority more aggressively to foster good governance across the continent remains a legitimate question. On the question of HIV/Aids, Thabo Mbeki clearly failed the continent. His domestic policy record, which we have not reviewed here, may also have its problems. However, after all is said and done, it seems to me that his work before, during and after his presidency, has a number of transformative elements that should not only assure his place in African history but might be worth highlighting as the continent begins to grapple with many of the questions that Mbeki has grappled with for decades.

Thabo Mbeki is a leader of 21st century Pan Africanism. He is a different kind of Pan African leader: Afro-centric, democratic, pro-active, pragmatic and non-confrontational. He doesn't play the African 'victimhood' or 'pessimism' card. This alone constitutes real progress in the movement's journey. A shared colonial experience has been the chief unifying force of the Pan African movement for decades. Mbeki is trying to move the movement towards the creation of a new galvanizing force: the creation of a newly 'emergent' Africa: characterized by economic, social and political development as well as scientific and technological progress. There is one thing that Thabo Mbeki shares with 20th century Pan Africanists such as Kwame Nkrumah of Ghana or Haile Sellassie of Ethiopia: not being particularly adored at home. ■



**\*EVAH WANJIRU**

*Evah Wanjiru is a 3rd year Law student at Moi University, Kenya. She is a poet, an environmental activist and a champion of social justice. Get more of her poems and articles on her blog [www.evahshirow.wapblog.com](http://www.evahshirow.wapblog.com)*

**WHEN HUNGER TURNED INTO MADNESS**

*By Evah Wanjiru*

.....

When the scorching sun became unforgiving  
And the parasitic worms in our intestines  
Began to complain  
When bile began to burn our duodenum  
And the fats in our bodies began to disintegrate  
Our bones clasped so tightly on our scaly skins  
When we became ten pounds too thin  
And our eyes turned grey with horror  
Hunger turned into madness

When our fertile lands turned into a barren hell  
A vast desert where no one could hear us yell  
When we danced to the rhythmless tunes  
Of hot air slapping across our dry faces  
And we sang to the everlasting songs of tolerance  
When our hipbones protruded  
And our ribs became razor sharp  
Hunger turned into madness

When our steps grew slower and our hearts heavier  
And our dreams were filled with charging lions  
When the secretary birds and the vultures  
Began circling high above us with  
Timeless ancient patience  
We held on so tightly on to life  
But the ravens could no longer tolerate  
Hunger turned into madness

When the cries of the vultures grew loud and impatient  
And hunger became too much to bear  
We lost consciousness  
We drifted in the cities where they sat shamelessly  
Eating and drinking deeply into satisfaction  
Stuffed their stomachs until there was no room for more  
And when they heard the vultures had caved in on us  
They rushed with their cameras to capture  
As the vultures savagely tore our flesh  
And ate us alive  
We died when hunger turned into madness





# ACTS IN THE WORLD!

## ACTS attends the 15th Delhi Sustainable Development Summit, New Delhi, February 5-7, 2015.

ACTS' Executive Director Dr Cosmas M.O. Ochieng attended the 15th Delhi Sustainable Development Summit, in New Delhi, India. The Summit, convened by TERI (The Energy and Resources Institute), an ACTS Partner, and the Indian Ministry of Environment, Forest and Climate Change, focused on 'Sustainable Development Goals and Dealing with Climate Change'. It was attended by among others: Mary Robinson, Former President of Ireland and UN Secretary General's Special Envoy for Climate Change, Laurent Fabius, Minister of Foreign Affairs and International Development France, Felipe Calderon Hinojosa, Former President Mexico and Chairman, Global Commission and Climate, Kevin Rudd, Former Prime Minister of Australia and President, Asia Society Policy Institute, Maumoon Abdul Gayoom, Former President Maldives and President, Progressive Party of Maldives, Nobel Laureate, Jose Ramos Horta, Former President East Timor and Chair, High Level Independent Panel on Peace Operations, United Nations, Nobel Laureate, Prof Yuan Tseh Lee, President Emeritus and Distinguished Research Fellow, Academia Sinica, Nobel Laureate, Kailash Satyarthi, Founder, Bachpan Bachao Andolan and Chairperson, Global March Against Child Labour, Arnold Schwarzenegger, Former Governor California, Founding Chair, Regions of Climate Action, Ruud Lubbers, Former Prime Minister, The Netherlands, Lord John Prescott, Former Deputy Prime Minister, UK and Laurence Tubiana, Special Representative of the French Minister of Foreign Affairs for the 2015 Paris Climate Conference (COP 21).



Arnold Schwarzenegger delivers Special Address at the 15th DSDS



Laurent Fabius addressing delegates at the Summit.



Leadership Panel 1: From MDGs to SDGs and Addressing Climate Change.  
15th Delhi Sustainable Development Summit

### **ACTS Wins a BID Century International Quality ERA Award!**

The African Centre for Technology Studies (ACTS) won a BID Century International Quality ERA Award (Gold Category) for its ‘innovation’ in relation to its work on harnessing applications of science, technology and innovation for sustainable development in Africa. The Award was presented to ACTS’ Executive Director, Dr Cosmas M. O. Ochieng at a ceremony in Geneva, on March 22, 2015.



ACTS won the Century International Quality ERA Award in the Gold category in Geneva in the presence of leaders and representatives from 53 countries at the Century International Quality ERA Convention. From left to right: Prof Dr Alfonso C. Casal, Scientific Director of BID, Jose E. Prieto, President and CEO of BID, Cosmas Milton Obote Ochieng, Executive Director, ACTS, Craig Miller, President of the QC100 and Norman Ingle, President of the Quality Mix.

**ACTS Convenes the 2nd Kenya Climate Science, Technology and Policy Round Table, Nairobi, Kenya**

ACTS convened the second Kenya Climate Science, Technology and Policy Roundtable at the Hilton Hotel in Nairobi on April 26th, 2015. The Roundtable is part of a series of national, multi-stakeholder based dialogues that ACTS is convening to explore how Kenya can harness climate science, technology and policy to build a sustainable, green and climate resilient economy. The Roundtables are generously supported by INASP (International Network for the Advancement of Scientific Publications) through their Vakayiko Grant programme.



Dr Saleemul Huq, Senior Fellow, IIED and Director, International Centre for Climate Change and Development speaks at the Roundtable. Looking on is Dr Richard Munang of UNEP.



Dr Alice Kaudia, Environment Secretary, Ministry of Environment, Water and Natural Resources (MEWNR) Kenya, addresses participants at the Roundtable



Wangare Kirumba of NEMA answers a question at the roundtable. Next to her is Mourine Cheruiyot of ACTS.



Prof Shem Wandiga, University of Nairobi/Egerton University speaks at the Roundtable.

### **ACTS Co-Convenes the Cartagena Data Festival in Cartagena, Colombia**

ACTS, together with its Partners (ODI, CEPEI, UNDP, UNFPA, UNICEF, WWF, Paris 21, Civicus, DATA Pop Alliance, Africa Gathering, Global Pulse, Data2X0, SocialTIC, GNDR, Colombia Ministry of Foreign Affairs, among others ) co-convened a 'data revolution festival' in Cartagena, Colombia in April 2015.

The conference sought to:

- Drive the changes that are needed to advance a data revolution by bringing together the people and organisations whose innovations, resources, expertise and influence can make them happen
- Develop concrete solutions and practical tools to produce long term and sustainable progress through a data revolution
- Build the ideas, innovations and partnerships needed to monitor the sustainable development goals. A report launched at the conference can be found here: [www.developmentprogress.org/datarevolution](http://www.developmentprogress.org/datarevolution)



Dr Bitange Ndemo, University of Nairobi, speaks at the Cartagena Data Festival, Cartagena, Colombia.

### **ACTS co-hosts the 9th Conference on Community Based Adaptation in Kenya**

ACTS, together with the Ministry of Environment, Water and Natural Resources (Kenya), IIED (UK) and the Bangladesh Centre for Advanced Studies (BCAS), co-convened the 9th Conference on Community Based Adaptation at the Safari Park Hotel, Nairobi in late April 2015. The Cabinet Secretary, Ministry of Environment, Water and Natural Resources, Kenya, Prof Judi Wakhungu delivered the Keynote Address. The meeting was also addressed by: Ibrahim Thiaw, UNEP Deputy Executive Director and Assistant Secretary General of the United Nations, Jean-Pascal van Ypersele, Vice Chairman, IPCC, Irish Ambassador to Kenya, Vincent O'Neill and Saleemul Huq, Senior fellow, IIED, and Director, ICCCAD. You can watch Dr Saleemul Huq read the outcome of the Conference or the Nairobi Declaration here: <https://www.youtube.com/watch?v=3v2Hs5B7DQM&app=desktop>



Some delegates at the CBA9 Conference, Safari Park Hotel, Nairobi, Kenya



A section of ACTS staff in a planning meeting for the CBA9 Conference, April 2015.

### **ACTS attends the first 3GF-Africa Regional Conference in Nairobi, Kenya**

ACTS' Executive Director attended the first 3GF (Global Green Growth Forum) Africa Regional Conference held at UNEP Headquarters in Nairobi, 13th May, 2015. The conference brought together more than 150 leaders and decision-makers from governments, cities, private sector, international organisations, universities and civil society to explore how to advance inclusive, green growth in Africa. Sustainable consumption, sustainable energy, sustainable water management, financial innovations and growing urbanisation were some of the key issues discussed. The meeting was attended by among others: William Ruto, Deputy President, Kenya, Judi Wakhungu, Cabinet Secretary, Environment, Water and Natural Resources, Kenya, Adan Mohamed, Cabinet Secretary, Industrialization, Kenya, David Bahati, Minister of State for Finance, Planning and Economic Development, Uganda, Achim Steiner, Executive Director, UNEP, Geert Aagaard Andersen, Danish Ambassador to Kenya, Vimal Shah, Chairman, Kenya Private Sector Alliance / Bidco Oil Refineries, Samuel M. Nyantahe, Chairman, Confederation of Tanzania Industries (CTI), Joshua Oigara, Group CEO, KCB (Kenya Commercial Bank).



Kenya's Deputy President, William Ruto, is introduced to Dr Alice Kaudia, Ministry of Environment, Water and Natural Resources, Kenya, on his arrival at the UNEP Headquarters for the 3GF Conference. Introducing them is Prof Judi Wakhungu (Centre), Cabinet Secretary, Ministry of Environment, Water and Natural Resources, Kenya.

### **ACTS Joins NACOSTI at the 4th Kenya Science, Technology and Innovation Week!**

The National Council for Science, Technology and Innovation (NACOSTI) in Kenya convened the 4th National Science, Technology and Innovation Week (May 11- 15th). ACTS, together with NACOSTI convened a Public Lecture on PhD Training for Science, Technology and Innovation in Africa. The Lecture was given by Prof Mike Stewart, Professor in Neuroscience Department of Life, Health & Chemical Science, The Open University, UK.



Dr Cosmas M.O. Ochieng, ACTS (left), Prof Mike Stewart, Open University (Centre) and Dr Moses Ruggutt, NACOSTI, during the Public Lecture on Doctoral Training in Science, Technology and Innovation at the 4th National Science, Technology and Innovation Week, at the University of Nairobi



Charles Tonui of ACTS at the Ivory Burning Site, Nairobi National Park.

### **ACTS joins Kenya in raising awareness against wildlife poaching**

On the World Wildlife Day (March 3) which also coincides with the Africa Environment Day and the Wangari Maathai Day, President Uhuru Kenyatta of Kenya set ablaze more than 15 tonnes of elephant ivory tusks at a ceremony at the Nairobi National Park. The ceremony was hosted by the Kenya Wildlife Service (KWS). It was meant to send a clear signal of Kenya's commitment to wildlife conservation. ACTS attended the ceremony.



Charles Tonui with Dr Paula Kahumbu, CEO of Worldlife Direct and Campaign Leader, 'Hands off Our Elephants' Campaign.

### **ACTS and Partners Launch the Africa Sustainability Hub!**

ACTS together with the African Technology Policy Studies Network (ATPS), the Stockholm Environment Institute's Africa Centre (SEI Africa) and the ESRC STEPS (Social, Technical and Environmental Pathways to Sustainability) Centre - partnership between the Science Policy Research Unit, Sussex University, and the Institute for Development Studies, launched a new Africa Sustainability Research Hub in Nairobi, on June 10th, 2015. The Africa Sustainability Research Hub will make a "huge contribution" to promoting low carbon economic development in Kenya and Africa, according to Hon. Henry Rotich, Cabinet Secretary of the National Treasury, Kenya. The speech was delivered on behalf of Hon. Rotich by Prof. Judi Wakhungu, Cabinet Secretary, Ministry of Environment, Water and Natural Resources, during the formal launch of the Hub at a workshop on Low Carbon Development in Africa at Crown Plaza Hotel Nairobi, Kenya. The launch was also attended by the High Commissioner of Malawi to Kenya, Dr. Perks Ligoya, Ethiopia's Ambassador to Kenya, Dina Mufti, Dr. Julius Kipngetich, Chief Operating Officer, Equity Bank, Dr. Ari Hurtala, Climate and Development Knowledge Network, Dr. Virinder Sharma, DFID East Africa, Dr. Ahmed Hamdy, African Union, Dr. Mohammed Kyari, African Union, Dr. Heinz Kopetz, World Bioenergy Association, Mr. Julius Korir, Industrialisation Secretary, Kenya,

Hon. Evans Ondieki, Nairobi County Government, Dr. Dozie Ezigbalike of the UNECA and Dr. Evans Kituyi of the IDRC, among others.

The participatory workshop defined the agenda with which the hub will now engage. They articulated a clear mandate for the Africa Sustainability Hub to initially pursue three key activities:

1. A pan-African programme of comparative research addressing a range of existing knowledge gaps on low carbon energy access. In particular, demand was expressed for research that looks beyond the usual focus on engineering and finance to encompass socio-cultural considerations, the self-defined needs of poor people and the politics of low carbon energy transitions.
2. Training for finance ministries on accessing international climate finance.
3. Training for African negotiators on strategies for engaging with the UN climate negotiations in Paris in December 2015.

Participants to the workshop lamented the lack of any pan-African platform through which research users can articulate priority research needs – a role that the workshop had fulfilled for those present and one that they would like to see sustained. As well as conducting



world class research, the Africa Sustainability Hub will also work to fulfill this role. The Africa Sustainability Hub forms one of six regional hubs that make up the Pathways to Sustainability Global Consortium. It is hosted at the African Centre for Technology Studies (ACTS) in partnership with the African Technology Policy Studies Network (ATPS), the Stockholm Environment Institute's Africa Centre (SEI Africa) and the ESRC STEPS (Social, Technical and Environmental Pathways to Sustainability) Centre (STEPS is a partnership between Sussex University and the Institute for Development Studies, IDS).



Hon. Prof. Judi Wakhungu, Cabinet Secretary, Ministry of Environment, Water and Natural Resources, Kenya, delivers a Keynote Address on behalf of Hon. Henry Rotich, Cabinet Secretary, National Treasury, at the Launch of the Africa Sustainability Hub in Nairobi.



H.E. Dr. Perks Likoya, High Commissioner of Malawi to Kenya speaks. Looking on is H.E. Dina Mufti, Ethiopian ambassador to Kenya



Prof Ian Scoones, Institute of Development Studies, University of Sussex, and Director STEPS Centre/ Co-convenor Future Agricultures Consortium at the Launch of the Africa Sustainability Hub



Peter Odhengo, National Treasury Kenya, addressing delegates at the Launch of the Africa Sustainability Hub

**ACTS participates in a Special Session at 2015 Water World Congress**



The International Water Resources Association held the XVth World Water Congress from the 25th to 29th May 2015 at the Edinburgh International Conference Centre (EICC), Edinburgh, Scotland. Dr Joel Houdet, Senior Research Fellow and Head of ACTS South Africa Office ACTS was involved in the Special Session: Ten Years since the Millennium Ecosystem Assessments: A global perspective on water ecosystems services. Key speakers included Prof Bob Ferrier, Dr Julia Martin-Ortega, Prof Iain Gordon, Dr Kirsty Blackstock, all from The James Hutton Institute; Dr Rebecca Badger, Scottish Environmental Protection Agency, Dr Mark Mulligan, King's College London, Dr Stephen Turner, Lincoln University and Dr Samantha Capon, Griffith University.

3rd Kenya Climate Roundtable at the Intercontinental, Nairobi



**Suresh Patel,**  
Kenya Private Sector Alliance



**Dr. George Ruthathi of ACTS**  
follows proceedings.



Participants in a discussion during one of the sessions.



**Dr. Wilbur Ottichilo** in a discussion with delegates.



# HUMAN RESOURCES

By Susan Murunga, Human Resources Manager, ACTS

**Two New Members Join the ACTS Governing Council**  
**In its meeting in January 2015, the ACTS Governing Council admitted two new members to the Council: Prof Norman Clark and Dr Simon Bransfield-Garth.**



## **Prof. Norman Clark**

Norman Clark is Emeritus Professor at the Open University UK and a research fellow at the INNOGEN Institute (Edinburgh University). Previously he was Vice Chancellor of Kabarak University, Kenya, and before that Professor of Environmental Studies and Director of the Graduate School of Environmental Studies at the University of Strathclyde where he is also now an Emeritus Professor.

He is a development economist specialising in science, technology and innovation policy issues with particular relevance to Third World problems, a field in which he has published extensively. He has lived and worked in many countries including Kenya, Nigeria and India. Previously he held academic posts at the Universities of Glasgow and Sussex. While at Sussex he acted as the Founding Director of Graduate Studies at the Science Policy Research Unit (SPRU) where he worked for some 15 years and now holds the post of Honorary Professor. He has also acted as Founding Director of the Technology Planning and Development Unit, University of Ife, Nigeria; Visiting Professor, Institute for Advanced Studies, University of Sao Paulo, Brazil; and Director of the Capacity Development Programme at the African Centre for Technology Studies (ACTS). He was a member of the Millennium Development Goals (MDG) Task Force Team 10 on Science, Technology and Innovation and has acted as an adviser to the NEPAD secretariat in Pretoria, to ILRI in Nairobi and to the World Bank.



## **Dr Simon Bransfield-Garth**

Dr Simon Bransfield-Garth is the Chief Executive Officer, Azuri Technologies and a World Economic Forum Technology Pioneer, delivering pay-as-you-go solar power on a commercial basis to rural communities in sub-Saharan Africa. He holds a BA and Ph.D in Engineering from St John's College, Cambridge UK. He is a former Fellow of Cambridge University and a former Industrial Fellow of the Royal Society. He has over 25 years' experience in building rapid growth, technology-based businesses in sectors including semiconductors, automotive equipment and mobile phones. His career includes 7 years at Symbian, the phone OS maker, where he was a member of the Leadership Team and VP Global Marketing.

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## ACTS Welcomes Two New Research Fellows



### **Dr Aschalew Demeke Tigabu, Postdoctoral Fellow**

Dr Aschalew Tigabu joined ACTS in January 2015 as a Postdoctoral Fellow, Climate Resilience Economy Programme. He is also a Researcher with the Africalics (African Network for the Economics of Learning, Innovation, and Competence Building Systems) project. Dr Tigabu holds a PhD in Economics from the VU University Amsterdam. His research interests are in energy, innovation and climate policy.



### **Mr Simon Wanda, Junior Research Fellow, Information Economy**

Simon Wanda joined ACTS in January 2015 as a Junior Research Fellow, Information Economy Programme. He holds an MSc in African Studies from the University of Oxford, UK.

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### **Visiting Research Student**

Lukhona Mnguni joined ACTS as a Visiting Research Student in May 2015. He is currently an MSc student in African and International Development at the University of Edinburgh. At ACTS, Lukhona is attached to the Responsible Natural Resource Economy Programme.

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### **Research Interns**

Nereah Adhiambo, Carol Njoroge Alicia Olago joined ACTS as research interns in March 2015. Alicia is currently studying for a Masters in Environmental Security and Governance Climate Change Specialization at the University of Peace in Costa Rica. Carole is studying for a Master's degree in Project Management at the University of Nairobi, Kenya. Nereah is a Part Time Project Assistant at the Centre for Advanced Studies in Environmental Law and Policy (CASELAP), University of Nairobi. At ACTS, they are all attached to the Climate Resilience Economy Programme.

# SUBMIT AN ARTICLE TO THE AFRICAN TECHNOPOLITAN!

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The African Technopolitan is open to policy and research insights, analysis, commentary, opinions and other forms of relevant submission by scholars, policymakers, technocrats, bureaucrats and members of the public.

The African Technopolitan welcomes contributions that offer constructive, provocative and original ideas, analysis and commentary on how applications of science, technology and innovation can be harnessed to address Africa's fundamental development challenges: enhancing agricultural productivity and food security; sustainable energy access for all; universal clean water access; sustainable biodiversity conservation and use; climate change adaptation and mitigation; industrial development; infrastructure and human resource development.

We invite submissions of not more than 3000 words from across academic disciplines and policy spheres. We are particularly interested in submissions that are multi or interdisciplinary, based on empirical work, advance original or alternative theories; and challenge conventional schools of thought on contemporary issues in science, technology and innovation policy research and practice in Africa.

**Please send your submissions to:**

[Executive.director@acts-net.org](mailto:Executive.director@acts-net.org)

We look forward to publishing your article in the next Issue of the African Technopolitan!



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