



BRICS/Africa Partnership for Development

Driving Inclusive Growth and Transformational Change



United Nations
Economic Commission for Africa



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Economic Commission for Africa
P.O. Box 3001
Addis Ababa, Ethiopia

Tel: +251 11 544-9900
Fax: +251 11 551-4416

E-mail: ecainfo@uneca.org
Web: www.uneca.org

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FOREWORD

The development of a green economy that serves as a basis for social and economic progress is rooted in the belief that social and transformation are key drivers in preserving the earth's finite resources. Climate change and variability concomitantly present new threats and new opportunities that will test the resilience of African societies and economies.

The African journey towards structural transformation will be accompanied by a number of challenges, not least the imperative to achieve green industrialization and to leapfrog towards cleaner technologies. The continent must overcome both energy and water insecurities, and orient its development pathway on a trajectory that recognizes the imperative for green growth.

The United Nations Conference on Sustainable Development confirmed green economy as one of the indispensable tools for maintaining, enhancing and rebuilding natural capital viewed as a critical economic asset to generate new economic activities, thus representing a real opportunity for social change. For far too long, the acquisition of wealth and well-being has been achieved at a cost to the environment. It is ironic that Africa – one of the regions least responsible for anthropogenic climate change, accounting for a mere 2.4 per cent of global emissions – suffers more from its impacts than anywhere else in the world, while remaining gridlocked on the periphery of development.

The paper entitled, BRICS/Africa Partnership for Development: Driving Inclusive Growth and Transformational Change, outlines the practical necessity of identifying and examining policy options for pursuing a transformational agenda that is aimed at reconciling economic growth with ecological limits and social equity. It includes an examination of the transformational changes that have occurred in Brazil, Russia, India, China and South Africa (BRICS), and

the role the BRICS countries can play in supporting Africa towards achieving a similar type of green transformation.

The paper also showcases lessons and experiences from BRICS in integrating sustainable development and climate change into their policies and practices, and how each country capitalizes on emerging opportunities within its prevailing national reality.

Natural resources are the backbone of the continent's recent economic growth. In 2011, raw and semi-processed goods accounted for about 80 per cent of African exports, compared with 60 per cent in Brazil, 40 per cent in India and 14 per cent in China. Agricultural commodities, timber, metals and minerals, and hydrocarbons have accounted for approximately 35 per cent of growth in Africa since 2000. They also provide the basis for the livelihoods of a population that is largely dependent on fertile soil, forest, fishery and other resources from nature for their survival.

However, the continent is still plagued by severe poverty, of which energy poverty is a major drawback. Indeed, if current trends continue, almost 600 million people in rural areas will still lack access to electricity in 2030, and an even larger number will lack access to clean cooking facilities.

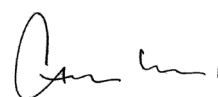
Africa is at a crossroads between fragile economic growth and a determination to race towards industrialization. The continent's structural transformation towards more value-added activities and modern jobs is crosscut by a dominant primary extraction sector and this presents major challenges.

Many of the ingredients needed for structural transformation will also be useful for fighting climate change and charting a course that is aligned with the continent's aspiration for inclusive green growth.

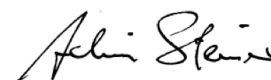
Coming late to industrialization provides Africa the opportunity to do it differently. It is not solely about placing the spotlight on export-oriented substitution models. The new industrial hubs must be closer to commodity extraction centres and place a high premium on leapfrogging technological potential, and with African market growth in mind, industrialization should ensure strong forward and backward linkages and be based on an understanding of the sophisticated global value chains. The emergence of the BRICS as major global players has raised new hopes for a win-win partnership that will foster the development of Africa, harness its abundant natural resources, seize opportunities that come with its growing consumer power, and translate its current demographic bulge into real economic dividends.

The time is now. The African people are waiting with bated breath to use all their resources to trigger lasting and impactful changes in every sphere of continent's development orientation. Indeed, Africa can become a solution-provider for climate change

and other mega trends. It is high time that the continent uses its abundant resources to change the tide and reverse the proverbial resource "curse" into plentiful opportunities that will serve as a lubricant for lasting structural transformation.



Dr. Carlos Lopes
Executive Secretary
Economic Commission for Africa



Achim Steiner
UNEP Executive Director and
Under Secretary-General of the United Nations

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The Driving Inclusive Growth and Transformational Change- BRICS/Africa Partnership for Development research paper was initially conceived by the Executive Secretary of the Economic Commission for Africa (ECA) as an opportunity to reinforce the imperative for industrialization in Africa, and to identify where partnerships can be brokered and cases in which Africa will need to align its own development trajectory based on the continent's priorities, needs and experience.

The paper is informed by consultations with feedback received from various consultants and professionals. The work and research was undertaken as a joint group effort through contributions made by the African Climate Policy Center (ACPC) and the African Minerals Development Centre (AMDC), the United Nations Environment Programme Regional Office for Africa (UNEP-ROA), with support from the Publications and Documentation Section of ECA and the African Center of Statistics (ACS). The rich and wide-ranging feedback received from the individual inputs was instrumental in structuring the objectives and action areas of this paper and ensuring its overall coherence.

We would like to express our my appreciation to the UNEP Deputy Executive Director, Mr. Ibrahim Tchiaw, for his leadership in mobilizing the team and moving the process forward. The paper was prepared by a team of experts from institutions within the United Nations and the Africa region. We would like to extend our thanks and gratitude to the following who generously contributed to the writing and research support that shaped the paper, from ECA: Bruk Tekie; Fatima Denton; Tessa Adamson; Johnson Nkem; and Frank Rutabingwa, from ACPS: Munyaradzi Change; Samba Harouna; Desta Mebratu; Fulai Sheng; and Ding-Yong Tan, from AMDC: Jeremy Webb and the team from UNEP-ROA. We also

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ABBREVIATIONS

ACS	African Centre for Statistics
BRICS	Brazil, Russia, India, China and South Africa
CAADP	Comprehensive Africa Development Programme
GDP	gross domestic product
EAOPS	East African Organic Products Standards
ECA	Economic Commission for Africa
FDI	foreign direct investment
IEA	International Energy Agency
IFOAM	International Federation of Organic Agriculture Movement
IPCC	Intergovernmental Panel on Climate Change
NEPAD	New Partnerships for Africa's Development
NREGA	National Rural Employment Guarantee Act
NGO	non-governmental organization
OECD	Organization for Economic Cooperation and Development
PASS	Program for Africa's Seed Systems
PGS	Participatory Guarantee System
PV	photovoltaics
SHP	small hydropower
SWH	solar water heating
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNEP	United Nations Environment Programme
UNU-IHDP	United Nations University International Human Dimensions Programme on Global Environment Programme

EXECUTIVE SUMMARY

African countries are faced with the option of turning their economic growth and development into one that takes into account environmental sustainability and is resilient to climate change. Over the past decade, they have made remarkable progress in their efforts towards achieving economic and social development, including with regards to realizing some of the Millennium Development Goals. Currently, Africa is the region with the fastest growing economy in the world. Seven of the ten countries with the highest projected annual growth rate between 2013 and 2015 are in Africa **(1)**. The continent, however, still faces major challenges, such as access to energy and safe drinking water, food insecurity and land degradation. In sub-Saharan Africa for instance, access to electricity is the lowest of all the regions, at 30 per cent, while access to safe drinking water is at 64 per cent and sanitation is at 31 per cent. Also, of note, 65 per cent of the agricultural land in the region is degraded, primarily due to water and soil erosion **(5)**. Furthermore, a majority of the livelihood systems in most African countries are largely dependent on natural resources, such as land, water and forest resources, that are highly vulnerable to climate variability and climate change impacts. Thus, the adverse effects of climate variability and climate change on these critical resources will take a toll on the livelihoods of the rapidly growing population in Africa.

For African countries to maintain their current economic growth trajectory, a transformational change in which revenue generation, investments and development technologies critical for creating a resilient, low carbon, green and inclusive economy for the African population are in alignment. The current rapid rate of exploitation of non-renewable resources (fossil fuels, metallic and non-metallic minerals) could have undesirable consequences on future growth and sustainability. Thus, it is critical to switch from using non-renewable fossil fuel-based energy sources to

renewable sources that take into consideration the environment or the effects of climate change and allows for healthy ecosystems that constitute the foundation of the national economies and livelihoods of millions of people across Africa.

INTRODUCTION

DEVELOPMENT CONTEXT AND CHALLENGES

The present paper outlines the practical necessity of identifying and examining policy options for pursuing a transformational agenda that is aimed at reconciling economic growth with ecological limits and social equity. It includes an examination of the transformational changes that have occurred in Brazil, Russia, India, China and South Africa (BRICS), and the role BRICS can play in supporting Africa towards achieving a similar type of green transformation. The paper also aims to showcase some of the lessons and experiences from BRICS in integrating sustainable development and climate change in their policies and practices, and how each country capitalizes on emerging opportunities within its prevailing national reality.

There is a growing body of evidence that climate-related impacts are already adversely affecting the development efforts of countries across Africa. Thus, African countries that are striving to limit the impacts of climate change on their economic growth and development must assess and evaluate their natural capital, geographical confines, and human and social capitals in designing their economic development agenda. This will enable them to identify viable and sustainable development options that steer economic growth away from inefficient and inappropriate technologies and business models that fail to adequately consider environmental consequences or social costs. The purpose of this is to guide countries on how to optimize the opportunities for sustainable and inclusive economic growth. Climate change

will affect production systems, water resources, infrastructure and delivery systems and consequently, the quality of life of Africans. Freshwater supply systems, irrigation systems, aqueducts and canals will easily be major casualties of extreme climate events, such as floods. Health-related implications, such as heat stress, respiratory and water-borne infectious diseases, could become severe and lethal and consequently, on a cumulative basis seriously affect the continent's public health systems.

The continent's low carbon emission level, about 3.6 % of the global total, coupled with its rich endowment of natural resources offer a unique opportunity for it adopt and pursue a development pathway that favours technologies that depend on cleaner, efficient and renewable sources of energy for more advanced water, transport, energy supplies, and sustainable land-use solutions for its economic development model.

BRICS AND DEVELOPMENT

In building resilience to global crises, BRICS countries have adopted a pathway that envisions achieving sustainable economic growth and shared prosperity of their citizens based on a diverse economy, technological modernization and innovative development. This requires continuous investment in energy efficiency, alternative energy, information, telecommunications and new medical technologies, and the development of drugs. Great emphasis is placed on the significance of processing the rich mineral resources, as well as on enhancing growth in agricultural production.

BRICS currently play an increasingly prominent role in world trade, investment, finance and governance. Globally, they represent more than 40 per cent of the population, 25 per cent of the gross domestic product (GDP) and 50 per cent of the economic growth. BRICS can have a

significant impact on the industrialization of the African continent **(2)**. These countries offer Africa new opportunities and alternative pathways for aligning economic growth in adopting similar comprehensive innovation and approaches for the transformation towards a green economy and achieving low carbon development.

At the Fifth BRICS Summit, which was held in Durban, South Africa, on 26 and 27 March 2013, leaders and representatives of the BRICS concluded with a series of agreements, two of which focus on financing for a green economy and infrastructure in Africa, the BRICS Multilateral Infrastructure Co-Financing Agreement for Africa and the BRICS Multilateral Cooperation and Co-Financing Agreement for Sustainable Development. The first agreement aims to pave the way for the establishment of co-financing arrangements for infrastructure projects across the African continent. The second agreement seeks to explore the establishment of bilateral agreements aimed at establishing cooperation and co-financing arrangements, specifically around sustainable development and green economy elements **(9)**. These two agreements are indications that the BRICS intend to support similar sustainable economic growth and inclusive prosperity for the transformation and development of Africa.

Similar to BRICS, Africa strives to play an increasingly prominent role in global affairs, trade and development. In a recent report by the Economic Commission for Africa (ECA), the Executive Secretary Dr. Carlos Lopes stated that *"the size of the BRICS economies, their economic potential and their demand for stronger political voice on international platforms make them particularly relevant to Africa's development."***(2)**. As such, there are potential synergies between the BRICS and African interests.

To ensure that lessons learned from, and cooperation with, the BRICS countries leads to balanced and sustainable development, it is important to deal with some key issues. For example, sustaining the current economic growth of Africa requires a deliberate effort to align growth with structural transformation. Structural transformation must be tuned towards high economic growth, jobs and wealth creation that do not undermine environmental sustainability. This must be anchored on innovations that take into account the following imperatives:

Resource efficiency – The natural resource capital of Africa can serve as a key asset in overturning poverty and steering the continent towards a broader based development agenda. This new outlook requires the management of wealth and resources for the greater benefit of people, ecosystems and services. In this regard, African institutions must take on the challenge of identifying commensurate policies that lead to good investments and job creation opportunities, as well as the sustainable consumption of its vast natural resources.

Adopting low carbon development strategy – A low carbon development pathway allows for resource efficiency while taking advantage of cleaner technologies that support growth. There are number of options for promoting the use of renewable sources of energy in the continent, while limiting investment in high carbon and dirty technologies.

Investment as a key tool — Investment has the potential to generate income and jobs, while shaping the future of the economies where investment is taking place. Investment in a green economy would have greater impact in sectors in which growth is likely to be more sustainable and visible. The transition to a green economy involves shifting investments into

forward-looking infrastructure, clean technologies, natural capital and human development. Hence, Africa needs to focus on priority sectors that will drive the economy towards sustained growth and an accelerated transformation pathway.

Building strong institutional frameworks — Establishing functional institutions and enabling policies that spur economic growth and lead Africa into a green economy are key prerequisites. Government plays an important role in enabling the green economy transition, especially with regard to prioritizing strategic sectors and industries. These are critical elements for leapfrogging in a way that converts environmental constraints into socioeconomic opportunities.

Inclusiveness — A green economy generates a greater transformational impact on society, especially if it is based on an inclusive benefit-sharing scheme. Green growth could serve as a tool for poverty eradication, as it results in the following: the creation of new types of jobs; the establishment of safety nets to help those affected by the transformation; and a range of opportunities for investments in education and training for workers to take advantage of the green economy.

KEY CHANNELS OF ENGAGEMENT IDENTIFIED WITH BRICS:

1. Trade

- a. Merchandise trade in Africa with BRICS doubled between 2007 and 2012.
- b. Most of the exports out of Africa are primary commodities.
- c. Manufactured goods (73.8 per cent) and food products (14.6 per cent) were two of the largest categories of imported products by Africa from BRICS in 2011.

2. Foreign direct investment

- a. The BRICS share of FDI inward stocks and FDI inflows to Africa in 2011 was 14 per cent and 25 per cent, respectively. Combined total investment from China and India was \$30 billion.
- b. In 2012, FDI flows to Africa totalled \$50 billion, only 3.7 per cent of the global share, the lowest among all regions.
- c. More than 30 per cent of Chinese direct investment has been aimed at the extractive industries.

3. Development assistance aid

- a. In 2010, Russia spent \$98.2 million on agricultural training and technology in African countries, and in the following year, it provided an estimated 8,000 African students with educational opportunities at Russian universities (See annex III for the complete list).
- b. South African aid is granted through annual disbursements to the African Renaissance and Inter Cooperation Fund, which have amounted from \$45 million to \$75 million in recent years.
- c. China had pledged \$10 million to assist in wildlife preservation and to promote joint research in protecting biological diversity.

The tables below show the top five recipient African countries of development aid from BRICS countries, excluding South Africa.

TABLE 1. DEVELOPMENT AID

Development aid		
Donor	Recipient	Amount (US\$ millions)
Brazil	Guinea-Bissau	3.5
	Algeria	3.5
	Senegal	2.8
	Sao Tome and Principe	2.0
	Angola	2.0
Russia	Democratic Republic of the Congo	2.9
	Kenya	2.9
	Somalia	2.0
	Guinea	1.0
	Mali	0.7
India	Mali	100.0
	Democratic Republic of the Congo	70.0
	Gabon	67.0
	Central African Republic.	60.0
	Zambia	50.0
China	Nigeria	1727.0
	Egypt	731.0
	Ghana	246.0
	Ethiopia	182.0
	Kenya	98.0

Source: Agência Brasileira de Cooperação, exchange rate: World Bank, AidData (<http://china.aiddata.org/downloads>), Ministry of External Affairs, Government of India, OECD

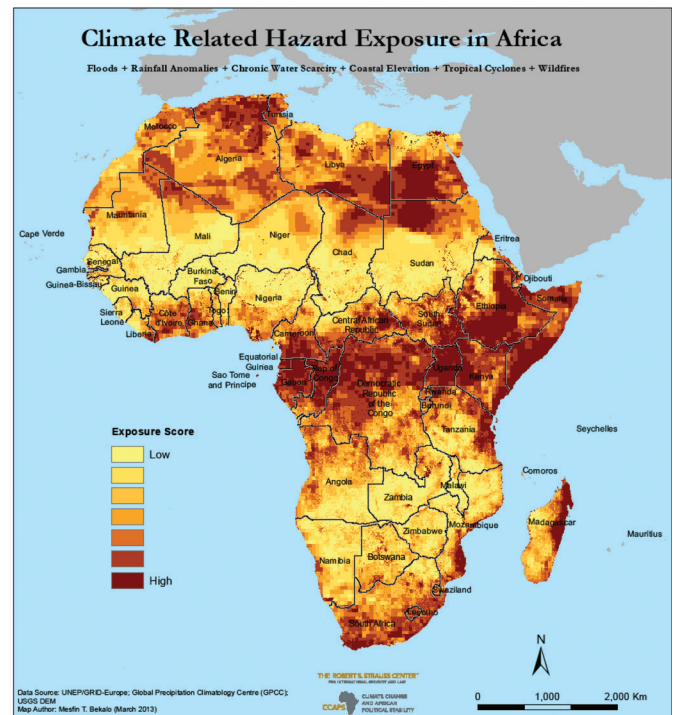
Faced with energy insecurity, depleting natural resources and pollution challenges, African countries must put in place appropriate strategies for designing future development, using suitable technologies for sustainable development. Green technology does not only offer Africa a chance to “leapfrog” from carbon-intensive development characterized by wasteful and unsustainable technologies and systems used by developed countries, but it provides the continent the opportunity to directly transition to cleaner and renewable energy sources needed to achieve sustainable development.

AREAS OF STRATEGIC ENGAGEMENT

ENVIRONMENT: CLIMATE CHANGE ACTIONS

Climate change is increasingly perceived as a major problem without apparent approaches to manage the scope of the risks it poses (20). The Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) further reaffirmed that Africa is the most vulnerable region in the world to climate change impacts and has limited capacity to respond to the scale and magnitude of the impacts. With more than 95 per cent of smallholding farmers relying on rain-fed agriculture, the level of vulnerability and system insecurity is extremely high. Due to the high contribution of agriculture to the national economies, the continent's growth trajectory is strongly influenced by climate change, which requires that strategies aimed at achieving sustained economic growth take into consideration climate change risks and opportunities. Figure 2 shows the effects of differential exposures to climate change hazards following variability in precipitation patterns and the frequency of extreme weather events, such as floods, storms and droughts, that affect the livelihoods and economies of countries across the continent. The impact of these climate shocks on livelihoods is exacerbated by low levels of development and widespread poverty, factors that underlie the vulnerability of local communities to the impacts of climate variability and change. For instance, more than 70 per cent of all natural disasters in the United Republic of Tanzania are linked to extreme droughts and floods due to climatic variability. Adopting resilient approaches could enhance the performance of food systems and their key functions in contributing to food security, social welfare and ecosystem security. Responding effectively to these challenges needs to be aligned with national and regional development strategies.

FIGURE 2. CLIMATE CHANGE-RELATED EXPOSURE IN AFRICA



(Floods + Rainfall Anomalies + Chronic Water Scarcity + Coastal Elevation + Tropical Cyclones + Wildfires) (28)

BOOSTING THE POTENTIAL OF AGRICULTURE IN AFRICA

Food security is a function of effective food systems. Unfortunately, food systems in Africa, in spite of the enormous potential for agribusiness and large-scale irrigation, are increasingly vulnerable to changing climate patterns, which have direct impacts on agricultural production. The changes in production due to climate impacts have a knock-on effect on the supply chain, that ultimately leads to increased food prices for the consumers.

Despite all of these challenges, agriculture still remains the backbone in transforming and stabilizing economic growth in Africa and lifting underperforming sectors. The continent's agricultural sector is yet to be capitalized as an engine for

propelling economic growth and transformation. Currently, about 260 million people in Africa lack food security. The continent spends \$40 billion - \$50 billion yearly on imported agricultural products, and has the lowest level of average agricultural productivity in the world, at 1.5 tons per hectare (21). The loss of soil nutrients is valued at 4 billion per annum and cereal imports have increased over the past 50 years from 5 million tonnes to more than 50 million tonnes a year (11/13). Since 1980, more than 80 per cent of agricultural productivity emanates from the expansion of cropping areas, rather than from increased productivity on lands currently cultivated.

In order to achieve resilience and sustainable agricultural productivity, Africa must do the following: (a) resort to using cultivation techniques that reduce soil erosion; (b) develop market-oriented production systems, effective public policies and better management systems for water and soil resources; (c) provide agricultural financing; (d) use improved technology; (e) invest in infrastructure to increase access and distribution; and (f) scale up agribusiness to diversify sources of rural income. A recent report by United Nations Environment Programme (UNEP) and the Ministry of Environment of South Africa found that investment in sustainable ecological practices could increase yields by as much as 23.9 per cent by 2030, while reducing further CO₂ emissions in South Africa (25). For example, pastoral production systems are considered to have high environmental footprints. Investment in sustainable pastoral practices, such as, mobility corridors and mobile services, can result in 2 to 10 times higher productivity as pastoralists would have the ability to move their herds rather than being restricted year-around to keeping them at one site where the rain variability might be unpredictable. The implementation of such practices would also result in lower greenhouse gas emissions per kg of meat produced, and enhanced resilience to climate variability (12).

It is evident that the transformation of Africa would be contingent on a stable agricultural base and restructuring of agricultural production systems. China and India, despite having three to six times less arable land than in Africa, have illustrated how surpluses from increased agricultural productivity can stimulate industrial growth. Given that Africa has a rapidly growing population, which is set to reach two billion by 2050 and is endowed with about 60 per cent of the world's unused arable land while 75 per cent of the African people rely on agriculture for their livelihoods, the agriculture sector is key for the continent to achieve sustainable development.

China has pledged \$10 billion to support the Comprehensive Africa Development Programme (CAADP), a programme of the New Partnerships for Africa's Development (NEPAD), in its effort to develop public-private-partnerships in agriculture. Other BRICS countries could further support the African agricultural sector in creating an enabling environment for enhancing partnerships that would allow the region to increase agricultural production in ways that do not increase infrastructural and transports costs beyond the reach of smallholder farmers', the main drivers of African production systems.

A number of African countries have already started to put in place concrete strategic measures that place the green economy at the centre of their national development strategy. An increasing number of African countries are taking the lead initiative for utilizing these opportunities by developing national green economy and green growth strategies. Notable examples include Green Growth and Climate Resilient: National Strategy on Climate Change and Low Carbon Development of Rwanda, Climate-Resilient and Green Economy Strategy of Ethiopia, the Green Economy Roadmap of Mozambique and the New Growth Path of South Africa. In addition, green economy strategies set by Kenya and Ghana are already being carried

out with support from UNEP and other development partners.

Agriculture – The utilization rate of artificial fertilizers in Uganda is less than 2 per cent (or 1kg/ha) of the already very low continent-wide average of 9kg/ha in sub-Saharan Africa, and is among the world’s lowest rates. The limited artificial fertilizer use has been harnessed as a real opportunity to pursue organic forms of agricultural production, which is a policy direction strongly embraced by Uganda. According to the International Federation of Organic Agriculture Movement (IFOAM), the global market for organic foods and drinks, which increased by 10-20 per cent annually between 2000 and 2007, is estimated to be about \$50 billion. This subsector provides a unique export opportunity for many developing countries, owing to the fact that 97 per cent of the revenues are generated in Organization for Economic Cooperation and Development (OCED) countries, while 80 per cent of the producers are in developing countries of Africa, Asia and Latin America. Notably, in Africa, Uganda is a significant producer of organic products, which have become an important source of export earnings and revenue for farmers. Certified organic exports increased from \$3.7 million in 2003- 2004, to \$6.2 million in 2004- 2005, before jumping to \$22.8 million in 2007- 2008. Organic agriculture certification is spreading in Africa, with, for example, **Kenya and Tanzania** are developing organic agriculture standards similar to those in Uganda.

RENEWABLE ENERGY FOR THE TRANSFORMATION OF AFRICA

In the next 20 years, demand for energy in Africa will increase in line with its population and economic growth. Currently, the one billion people living in the continent account for only 4 per cent of the total global energy consumption, but represent 15 per cent of the world’s population. By 2035, energy consumption in the continent is projected

to increase by 93 per cent from the current level (6). The International Energy Agency, in its World Energy Outlook Report 2013, states that about 600 million Africans do not have access to electricity, and in rural sub-Saharan Africa, the electrification rate is only 19 per cent(7). Energy is an indispensable element of development and a key driver of economic growth since it facilitates the establishment of construction and manufacturing industries that are energy intensive. The strong relationship between economic growth and energy consumption is well established. For example, in 2010, the United States of America energy consumption was more than six times that of Africa (United States consumed 98 quadrillion British thermal Units (Btu), African consumption was only 16.32 Btu).

Africa has a large comparative advantage over other global regions due to its endowment of vast but untapped diverse energy resources, such as hydro, solar, wind, geothermal, and bio-energy. Regarding hydropower, for example, Africa has the potential to generate 1852TWh/year, an amount that could satisfy the needs of the continent, especially through power pooling arrangements and cross-border power trade, but thus far, it has only been able to develop less than 9 per cent of its exploitable hydropower energy potential(8). Africa receives, on average, uniform bright sunlight in more than 325 days per year and thus has the potential to generate 2000 kwh/er sq. meters per year. It also has wind and wave power potentials along the West Coastline of Africa, exceeding 3,750kwh, and significant geothermal potentials in the Eastern Rift Valley region stretching to about 3,700 miles in length. The geothermal potential in Kenya alone is estimated at 10,000mW, although this would come with greenhouse gas emissions. Table 2 below contains a list of the potential renewable energy sources in Africa. Rural electrification with renewable energy presents another great opportunity for the continent since

the rural inhabitants, who account for more than 70 per cent of the population, are the most affected by lack access to energy. The availability of renewable energy sources would reduce dependence on increasingly expensive fossil fuels and facilitate the development of the sector at the local level through the promotion of small-scale renewable technology such as micro-wind turbines and micro- or mini-hydro power plants that are suitable and affordable for providing a modern and decentralized energy system. For instance, in 2011, more than 80 per cent of electricity generated across the continent was from fossil fuels, yet electricity only accounted for a fraction of African energy use, with fuelwood serving as the

primary source of energy consumption. On the other hand Brazil, the eighth largest total energy consumer in the world, generated 80 per cent of its electricity needs using hydropower.

Thus, in spite of this large potential, the lack of access to reliable and sustainable energy services is costing the continent a 2 to 4 per cent loss in GDP, and is depriving the population from clean cooking facilities, electricity to power their homes and adversely affecting efforts to achieve sustainable development (10).

TABLE 2, RENEWABLE ENERGY RESOURCES OF AFRICA

Energy type	Potentials	Regional distribution	Comments	Reference
Renewable				
Hydropower (11% of the world's total potential)	1,834 TWh/yr	Central Africa: 57% Eastern Africa: 32% Other Africa: 11%	93% of African potential remains unexploited Democratic Republic of the Congo holds about 42% of the hydropower potential in Africa	WEC, 2010
Biomass	Woody biomass: 70 billion tones	All regions	Currently, most of the biomass is used for cooking as traditional biomass. Biofuel production is being explored in countries, such as Ghana, Mozambique, and Zambia.	Parikka, 2004
Solar	Solar insolation: 1800 – 2850 kWh/ m ² .a	Most of Africa North Africa, potential average solar radiation 6.1 kWh/m ² /day Eastern Africa potential average solar radiation 5 kWh/m ² /day Southern Africa potential average radiation varies 5-6 kWh/m ² /day West Africa potential average varies from 3-4 kWh/m ² /day	Tunisia potential of solar radiation: 1,700-2,200 kWh / m ² per year PV technical potential: 33 TWh/a in Gambia 8,700 TWh/a in Sudan. Concentrating solar power potential: 7 TWh/a in Eritrea 40,500 TWh/a in Libya.	WEC, 2010 NREL, 2008
Wind	Wind speeds: Southern Africa (6 – 7 m/s) Northern Africa (5 – 8.5 m/s)	Most attractive sites in the Northern and Southern coasts.	Egypt, Morocco and Tunisia account for about 96% of the 1,014 MW installed capacity in the region. By 2020, add about 8,500 MW to African energy production.	DRFN, 2010 Business Insights, 2010 WWEA, 2011
Geothermal	9,000 MW	Eastern Africa	172 MW installed in Africa as at 2008. About 95% of this installation is in Kenya.	Karekezi & Kithyoma, 2003 WEC, 2010

Source: ACPC: WP10 - Integrating Renewable energy and climate change policies 2011 (ECA/PBL, 2011)

The development of energy infrastructure and a reduction in barriers to clean and renewable development through innovative public policies should be priorities in Africa. Expanding energy production options would enable the continent to increase energy security, reduce fossil fuel dependency and lower fossil fuel foreign exchange payments as well as provide beneficial outcomes from cleaner technologies, such as solar photovoltaic and mini-grids or off-grid installations, that are cost effective.

If current energy demands are not met, then the industrialization aspirations of Africa will become a pipe dream.

Renewable energy investments:

- **Ethiopia** - The Ashegoda Wind Farm officially went online in October, 2013. This 120 MW wind farm is the largest wind farm in Africa. It is expected to produce about 400 million kWh a year.
- Geothermal in **Kenya** - Kenya is the first country in Africa to generate electricity from geothermal sources. The exploitation of abundant geothermal resources, considered a strong option for the country with an estimated potential of 7,000 to 10,000 MW, is being fast-tracked.
- The Lake Turkana Wind Power Project is targeted to provide 300MW of reliable, low cost wind power to the **Kenya** national grid, equivalent to approximately 20 per cent of the currently installed electricity generating capacity. The project, which costs 70 billion Kenya Shilling (\$800 million), making it the largest single private investment in Kenya, is of strategic importance to Kenya. The wind farm site, covering 40,000 acres (162km²), is in Loyangalani District,

Marsabit West County, in north-eastern Kenya, approximately 50km north of South Horr Township. The wind farm will be fully operational at 300 MW by 2016.

- Some types of renewable energy projects are perceived as expensive and could engender environmental concerns. For example, the proposed Atoka Gorge Project involved the construction of a dam wall and subsequently a hydropower plant on the Zambezi River close to Victoria Falls. The station is expected to generate electricity to be shared between **Zimbabwe and Zambia**. The project is expected to increase power supply for the countries and the region at large. It stands to be the third large hydropower development on the Zambezi River, after the Kariba Dam and the Cahora Bassa Dam, and the tenth large reservoir on the Zambezi system. The existing dams have already had damaging effects, including degradation of coastal mangroves and reduction in freshwater and prawn fisheries, floodplain agriculture, floodplain water supply and wildlife carrying capacity and biophysical impacts, such as the down-cutting channels in the delta and reduction of the water table level. An additional dam would worsen these impacts. As a result, comprehensive long-term environmental impact assessments of the proposed projects must be undertaken.

TECHNOLOGY, INNOVATION AND EMPLOYMENT OPPORTUNITIES FOR SUSTAINABLE AND INCLUSIVE GROWTH

Science, new technologies and innovation are central to all efforts regarding the greening of the African economies. Adopting new green technologies will not only result in higher productivity and improved development outcomes, but they provide the continent with the opportunity to leapfrog from dirty and inefficient technologies and products, thus

skipping the most polluting and less sustainable production and consumption patterns. Recently, in the outcome statement of the Africa Regional Consultative Meeting on the Sustainable Development Goals, which was held in Addis Ababa from 21 October to 5 November 2013, member States emphasized that technology development and transfer were key means of implementation and an integral part of the United Nations Conference on Sustainable Development outcomes and made suggestions to that end. However, very little is known about the set of technologies that African countries can employ to achieve their green economy objectives. New technologies have been acknowledged, but little is known about their effectiveness.

Technology has been a powerful force in the development of human civilization and a critical factor in meeting societal needs. However, technological development does not happen in a vacuum; it is shaped by social processes and relations, economic conditions and institutional arrangements, and, in turn, the social and economic context is shaped by the technologies that are produced and used. In this regard, technological learning is critical for technological change, which is a process that calls for the development of capabilities to use, adapt and improve technologies. Technical capability does not only entail understanding the theory behind technical solutions, but also how well technology is internalized into everyday living. For example, in developed or emerging economies, it is not necessary to be engaged in “technological” work in order to think technologically. Technology is part of the social world. In contrast, people in Africa, by and large, tend to be passive users of technology, often locked into a subsistence level of use. For example, inefficient open fire cooking stoves are still used widely across Africa despite the fact that their use is associated with the increased hardship of fuelwood collection and use, and the cause of respiratory diseases. The current death rate per annum in Africa stands at 400,000 due

to indoor pollution caused by the burning of biomass for cooking; most of the victims are women and children (8). In this regard, there is a need to transform the relationship between society and technology in which ordinary citizens participate as practitioners and innovators to shift the technological imagination to a higher level. This requires radical policies and investment in a range of consciousness-building initiatives, and critical education with a view to use education as a vehicle for genuine social change. . An example of this is an activity of the Program for Africa’s Seed Systems (PASS), which is part of the AGRA-alliance. To ensure that research on African crops continues over the long term and a steady pipeline of new seed varieties is maintained, PASS supports the education of African Crop scientist. By the end of 2013, a total 135 Master of Science degrees and 56 PhD students had graduated through fellowships funded by this programme (43).

Employment is another major channel for economic growth to reduce poverty. For most African countries, unemployment remained quite high over the last 10 years. Currently, the continent has a youth population of almost 200 million (ages 15–24), which is expected to double by 2045(2). As FDI from BRICS increases in the continent, key sectors, such as extractive industries, agriculture or services, will need to become sources of sustainable employment for local communities and contribute to growth. In the next 40 years, investment in green agriculture could potentially create 47 million additional jobs globally.

More needs to be done to encourage the BRICS countries to use the region as a production hub. For example, major Indian car manufacturers, such as Tata Motors, Mahindra and Maruti Suzuki, are increasingly looking towards Africa to expand their businesses, extending beyond such vibrant markets as China and the Republic of Korea. India was the twelfth largest automobile exporter to Africa in 2003. Nine years later, it was sixth largest automobile exporter to the

continent, topping France and the United Kingdom of Great Britain and Northern Ireland. The 2008 crisis had forced many Asian countries, including India, to look for other markets beyond the United States and Europe (22). A sluggish internal market marred by inflation in Asian countries and high borrowing rates have also forced countries, such as India, to covet Africa as the next “big automobile” market. Tata Motors is assembling trucks close to Pretoria, South Africa and will establish similar companies with local enterprises in Kenya. These are all signs of the growing importance that the African market represents. Tata Motors has deliberately adopted a slower pace of expansion in Africa compared to their Chinese rivals, but this is calibrated on a longer term vision that will accrue more profits with potential entry points in Côte d’Ivoire, Tunisia and the United Republic of Tanzania.

- **Transport** — The Government of **Kenya** is constructing a mass rapid transport system in the Nairobi metropolitan area. The first phase of the Nairobi Commuter Rail Network was launched in November 2012. The provision of an efficient and reliable public transport will encourage more commuters to use low-carbon sustainable transport. Similar investments are being undertaken in **Ethiopia**.
- On **financing** — **South Africa** established a national green fund in 2012/2013. The fund provides a unique opportunity for government, financiers and the private sector to be directly involved in supporting innovative green economy initiatives. An initial allocation of 800 million South African rand (\$75 million) from the Government of South Africa disbursed through the Development Bank of Southern Africa. Various entrepreneurs in high-impact green projects have benefited from this fund.

PARTNERSHIP AND DEVELOPMENT

BRICS INVESTMENT IN AFRICA

Currently, BRICS countries trade more with Africa than they do among themselves, with trade expected to reach more than \$500 billion by 2015. Investment from China alone reached \$2.3 billion in 2013. The rapidly growing relationships between BRICS and the continent seem to be only expanding into new areas. For example, demand for the Chinese currency (yuan) on the continent has been increasing over the years. In 2012 only 0.5 per cent of trade deals were settled in yuan; this figure could reach nearly 40 per cent by 2015. Recently, the Government of Kenya announced its desire to host a clearinghouse for the yuan, and in Mauritius, the State Bank together with the Bank of China had to import 5 million yuan (5m RMB (\$806,000) to meet the increasing demand for the Chinese currency on the island (17). While some argue that the motive behind BRICS involvement on the African continent is for the abundant natural resources, large numbers of investment projects undertaken by BRICS can be seen in many countries across Africa and in various sectors (See table 3 and annex IV). In the coming years, these investment and trade activities will present significant opportunities for the large and untapped agricultural sector of Africa, as well for investments and transfer of technology and knowledge that target the growing middle class, which is expected to reach one billion by 2060 (27). So how can African countries approach these opportunities using the local population while empowering them to build a more sustainable and inclusive future?

TABLE 3. EXAMPLES OF MAJOR INVESTMENT BY BRICS IN AFRICA

BRICS	African Country	Sector	Investment
Brazil	Angola	Energy	A joint venture between the Angolan state oil company, Sonangal, and Brazilian construction company, Odebrecht, for a \$220 million project for sugar and ethanol production.
Brazil	Africa	Natural Resources/ mining	Vale, the world's second largest company in metals and mining, has invested about \$2.5 billion in Africa, mostly in mining projects. The company is planning to scale up investment in Africa to \$15 billion-20 billion over the period 2010-2015.
Russia	Africa	Agriculture	Invested in 2010 \$98.2 million for agricultural training and technology
Russia	Côte d'Ivoire Ghana	Energy	Lukoil invested \$900 million in oil exploration
India	Africa	Manufacturing	Tata Motors, the largest automotive company in India is manufacturing in 11 African countries.
India	Sudan South Sudan	Energy	ONGC Videsh, Indian oil and gas company, owns a 25% stake in the main production facilities in both Sudan and South Sudan, In 2008, the Government of India invested \$200 million for the construction of an oil pipeline from Khartoum to the Red Sea.
India	Sub-Saharan / North Africa	Telecommunication	In 2010 BhartiAirtel of India paid \$10.2 billion for networks owned by Zain, and have continued to expand in Uganda and the Democratic Republic of the Congo..
China	Africa	Agriculture	The Government of China pledged \$10 billion in public-private-partnerships in agriculture to help attain the NEPAD-CAADP objectives
China	Ethiopia	Telecommunication	Ethio Telecom, Chinese telecommunications firm ZTE and Huawei Technologies secured an agreement on a \$1.6 billion deal to roll out 4G in the capital Addis Ababa and 3G across the country.
China	Ethiopia	Infrastructure	Disbursed \$4.81 billion of loans to fund a new railway project
China	Democratic Republic of the Congo	Infrastructure	The Government of China pledged \$3 billion for infrastructure building in exchange for mining seven million tons of copper and almost half a million tons of cobalt from the country over the next quarter century with State mining agency.
China	Kenya	Infrastructure	\$25.5 billion for the construction of a maritime port in Lamu.
China	Kenya	Energy Infrastructure Wildlife protection	The Government of China signed a \$5 billion deal to fund a new energy project, a railway, and assist in wildlife protection
China	Nigeria	Infrastructure	The Governments of China and Nigeria signed an agreement to extend a \$1.1 billion low-interest loan (less than 3%) between the two countries for the construction of four airports and a railway for the capital

BRICS	African Country	Sector	Investment
China	Uganda	Infrastructure (transportation)	The Government of China committed \$350 million to build an expressway way between Entebbe International Airport and the capital, Kampala.
China	Uganda	Energy	Sinohydro corporation is building the 600MW Karuma Hydropower Dam
China	Zimbabwe	Energy	The Governments of China and Zimbabwe are financing the expansion of the Kariba Dam with a US\$319 million loan
China	Zimbabwe	Energy Agriculture	The Governments of China and Zimbabwe are putting forward \$1.2 billion to help finance the National Matabeleland Zambezi Water Project
South Africa	Nigeria	Telecommunication	A South African mobile phone operator, has 45.6 million subscribers in Nigeria
South Africa	Nigeria	Manufacturing	In 2012, Tiger Brands made its third acquisition in the Nigerian market, buying a 63.5%- stake in Dangote Flour Mills.

Source: Various Sources (2, 17, 18, 19)

BRICS IN GREEN INVESTMENTS: OPPORTUNITIES AND LESSONS FOR AFRICA

The BRICS countries have some of the leading firms in the core green economy sectors that are emerging across the world. In 2012, China added 23.1 GW of clean energy-generating capacity, while investing \$65.1 billion in clean and renewable energy. Three of the top five hydropower producers in 2012 were from China. The country is the largest producer of hydropower in the world with a 23% share, followed by Brazil, with an 11% share, and Russia with a 4.5% share (14). Green job opportunities have increased in recent years in BRICS countries. In 2010, Brazil recorded 2.9 million green jobs (6.6 per cent of formal employment) in sectors with activities that were aimed at reducing environmental harm. China, through its forestry programme has created more than one million jobs (15). In the energy sector, Brazil aims to create 52,000 jobs related to solar thermal systems by 2018. South Africa plans to provide 50,000 green jobs by 2020. China will make available

430,000 jobs by 2030 in renewable energy and almost 900,000 jobs related to solar PVs by 2020(15). Between 1990 and 2008, with technological changes as major components of industrial energy efficiency, China reduced its industrial energy intensity by nearly two thirds, India by nearly a half, followed by Russia and South Africa at around 30 per cent (16).

Here are few working examples of green investments by the BRICS countries:

• Brazil

Brazil has been very successful in building its renewable energy capacity. In particular, hydropower constitutes a large share of its energy supply. Some 85.4 per cent of the country's electricity supply was produced by renewable sources in 2010, with hydropower alone accounting for 78.8 per cent of the country's electricity production (29). Hydropower capacity is projected to increase from 89 GW in 2011 to more than 130 GW in 2035. This could serve as an example for African countries, especially for Cameroon, Ethiopia and the Democratic Republic of

the Congo due to their vast hydropower potential, which, based on estimates, could exceed 1800 TW. (30)

The Brazil example, however, shows that there are problems associated with the construction of large hydropower plants. The construction of such plants can have significant adverse effects on the local environment, as dams need to be built in areas that could be flooded, which could be detrimental to biodiversity. In the Amazon for example, dam construction has led to a massive release of methane gas, a greenhouse gas that is more potent to climate system than CO₂. In addition to harming the environment, the construction of dams could have negative impacts on the local population by forcing displacements, affecting fish stocks and impeding the river as a means of transport.

Brazil is trying to avoid these negative impacts by using “run of river” designs for the construction of dams. These designs cut the need to resort to flooding vast areas, which results in displacements and deforestation. Even though there are still protests against the construction of massive hydropower plants, such as the Belo Monte hydroelectric plant, which will be the third biggest plant in the world, progress has been made in trying to limit the socioeconomic fallouts by granting compensation payments to affected local communities and building fish-ladders and boat hoists, as well as constructing homes and schools for displaced people. (29) Nevertheless, studies have found that three fourths of all large-scale dams suffer from extensive cost overruns during construction (31).

Another important positive example from Brazil has been the dramatic reduction in deforestation over the last two decades. In the 1990s, an area of the Brazilian rainforest the size of Belgium, was deforested every year; the deforestation rate fell by 70 per cent in the past decade, from a ten-year average of 19,500 km² (7,500 square miles) per year in 2005 to 5,800 km²

in 2013 (33). According to the Economist, if forest clearing had continued at the rate in 2005, an extra 3.2 billion tonnes of carbon dioxide would have been added into the atmosphere, which is equal to a year’s emissions from the European Union (32).

This was the result of a three-stage process consisting of bans, better governance in frontier areas and consumer pressure on companies. During the first stage of the process, from the mid-1990s to 2004, government efforts were centred on banning and placing restrictions on forest clearing. These actions, however encountered resistance with compliance because they were too restrictive. Notably, this was actually the period of the worst deforestation. During the second stage, between 2005 and 2009, the government tried to boost its ability to police the Amazon. It made halting deforestation a priority, which resulted in better cooperation between different parts of the government, especially the police and public prosecutors. The area in which farming was banned was increased from a sixth to nearly half of the forest. Most significantly, government action was backed by other factors, such as a reduction in export earnings from soybeans due to a rise in the Brazilian currency, the real, a sharp improvement in cattle breeding, which meant farmers could raise more animals on fewer hectares and a consumer boycott of soya organized by non-governmental organizations (NGOs).

According to the Economist, the third stage, from 2009 onwards, was a test of whether restrictive regulations could survive as demand for soybeans rebounded. The government shifted its focus from farms to counties. Farmers in the 36 counties with the worst deforestation records were banned from getting cheap credit until those rates fell. A proper land registry system was set up by the government requiring that landowners report their properties’ boundaries to environmental regulators. (32) There was also a cattle boycott modelled after the soya

boycott. For the first time, there were rewards as well as punishments: an amnesty for illegal clearances before 2008 and money from a special \$1 billion Amazon Fund financed by foreign aid.

• **Russia**

Russia has significant potential for green investment in ecosystem services, which includes forests, wetlands and other natural ecosystems (33). While the country is one of the world's largest energy producers, its natural capital can also play a dual role for the planet. On the one hand, its natural resources constitute a storehouse for the development of the global economy by providing raw materials. On the other hand, the major part of such reserves is in areas undisturbed by human activity and their large-scale economic development could have a negative impact on the global ecological balance.

About 65 per cent of the land in Russia is in a pristine environment, which includes 22 per cent of the world's natural forest resources. This forest tract plays a crucial role in carbon sequestration, regulation of the continental water cycle in Eurasia and conservation of biodiversity. Therefore, careful management of the country's valuable ecosystems would make Russia a major provider of ecosystems services and energy. The Russian Ministry of Natural Resources and the Environment and the Federal State Statistical Service have thus, commissioned studies on the possibilities for valuing natural capital (34).

One particular aspect of natural capital that Russia is seeking to take advantage of is agriculture. Organic agriculture is a rapidly growing industry worldwide, and Russia, with its fertile soils and suitable environmental conditions, has the potential to take advantage of this. At present, lawmakers are considering legislation to boost this sector, such as through the certification of producers and state support for farmers.

On the other hand, Russia has not taken advantage of its large renewable energy potential due to the relative cheapness of domestic fossil fuel production (35). The economic capacity of renewable energy sources is up to about a third of all extractable fossil fuels: renewable energy sources could comprise at least 25 per cent of the Russian energy mix if their economic capacity were to be tapped. This would free up additional volumes of oil and gas for exports and domestic refining.

• **India**

The National Rural Employment Guarantee Act 2005 (NREGA) is a guaranteed wage employment programme that enhances the livelihood security of marginalized households in the rural areas of India. Implemented by the Ministry of Rural Development, NREGA directly touches the lives of the poor, promotes inclusive growth and contributes to the restoration and maintenance of ecological infrastructure (36). Under NREGA, at least 100 days of guaranteed wage employment in a financial year is provided to every household whose adult members volunteer to do unskilled manual work paid for by the central government.

In its first two-and-a-half years of operation, from 2006 to 2008, NREGA generated more than 3.5 billion days of work, reaching, on average, 30 million families per year. The programme has been implemented in all of the 615 rural districts of the country, with women representing roughly half the employed workforce. Emphasis is placed on labour-intensive work, prohibiting the use of contractors and machinery.

In addition to supplementing wage employment, the secondary objective of NREGA is to strengthen rural natural resource management. This is achieved by financing rural works that deal with causes of drought, deforestation and soil erosion, thus restoring the natural capital base on which rural livelihoods depend.

The rapid urbanization of India has resulted in severe pollution, especially in important rivers, such as the Ganges, which is now one of the most polluted rivers in the country (37). Not only is the Ganges among the most religiously significant rivers in India, it also provides water to about 40 per cent of the population in 11 states. The pollution stems from untreated human and industrial waste that is poured into it from the many cities along its route, a problem made worse during pilgrimage season, as well as from dams, which have slowed the river's flow. The Ganga Action Plan was launched in 1986 by the Government of India with the aim to clean up the river. Thus far, it has not alleviated the problem despite heavy expenditure. In fact, the river is more polluted now than when the plan was launched due to the rapid urban growth along the river.

India was the site of one of the world's worst industrial disasters. In 1984, as a result of a gas leak at the Union Carbide pesticide plant in Bhopal, Madhya Pradesh, more than 500,000 people were exposed to toxic gas and other chemicals, leading to the immediate deaths of several thousand and the probable deaths of thousands more in the weeks following the disaster through related ailments. The gas leak also resulted in tens of thousands of disabilities and injuries. Chemicals abandoned at the plant continue to leak and pollute the groundwater. While the cause of the accident — whether the firm was guilty of negligence or was the victim of sabotage by an employee — remains disputed, one lesson learned is that tighter regulation and, more importantly, the enforcement of such regulation is needed.

• China

The Tannin Eco-city, a flagship collaboration between the Governments of Singapore and China, is a project to design and build an environmentally friendly and resource-efficient city from scratch (38). It is meant to be a model for sustainable development, underpinned by the principles of being practicable (technologies adopted must be affordable and commercially viable),

replicable (the principles and models should be applicable to other cities in China and other countries) and scalable (the principles and models should be adapted for another project or development on a different scale).

The Government of China set two criteria for the location of the Eco-city site: it should be developed on non-arable land, and in an area where there are water shortages. The selected site is 40 km from Tannin city centre and 150 km from Beijing city centre, in a relatively water-scarce region. It is located within the Tannin Bonsai New Area — one of the fastest growing regions in China. Prior to the development of the Eco-city, the site comprised mainly saltpans, barren land and polluted water bodies, including a 2.6 sq. km-large wastewater pond. When fully completed in around 2020, it will have a population of 350,000 and comprise a total land area of 30 sq. km.

Rapid industrialization has helped transform China into an economic powerhouse. However, there is an important lesson to be learned from the Chinese development, example: the environmental impact of rapid industrialization must be dealt simultaneously with the development of the economy. On one hand, the first step on the way to industrialization entailed making the country's agricultural sector more productive and thereby freeing up members of the labour force to work in the industrial sector (39) (in Africa, 65 per cent of the labour force is still employed in the agricultural sector, which only produces 32 per cent of GDP (40)). On the other hand the people of China have suffered heavily in the last decades from air and water pollution, as well as from soil degradation stemming from unfettered industrialization (41). It is thus essential to ensure that the environmental damage from industrialization is managed from the beginning of the development process by providing incentives and enforcing regulations so that only environmentally friendly technologies are used.

• South Africa

In November 2011, South Africa unveiled the Green Economy Accord from which a partnership between the government, business community, trade unions and civil society was launched. The Accord is one in a series agreed under the country's New Growth Path. A key element of the accord was for the green economy to create 300,000 jobs as a contribution to the objective of the New Growth Path to create five million jobs by 2020, and to double the country's generation of clean energy.

The Accord is a positive example of fostering a partnership between the constituents whose support would be needed for a green economy transition. It also highlighted the State's key role in green industrial development by providing an enabling policy environment, institutional mechanisms and financial support.

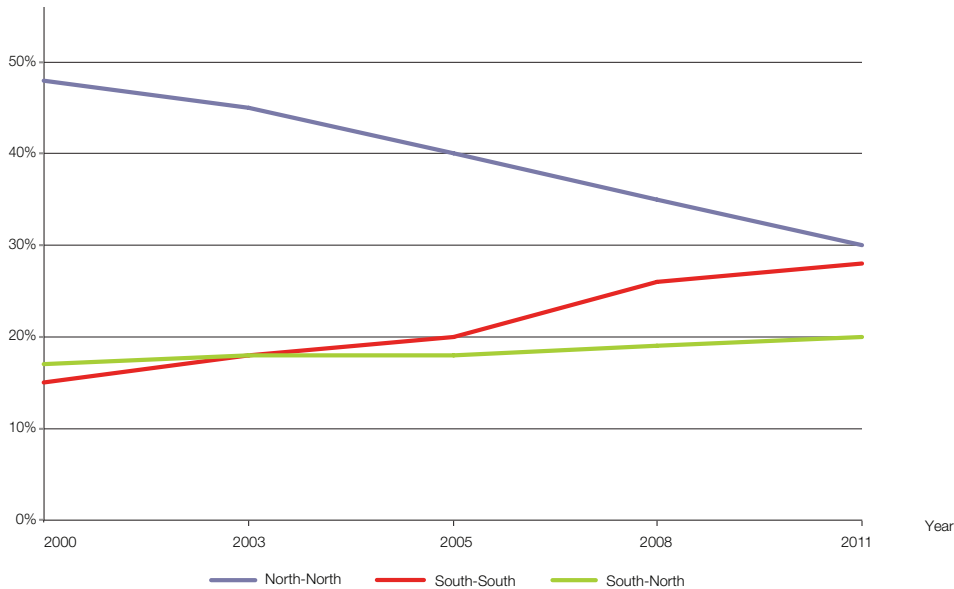
The Government of South Africa has also announced plans to implement a carbon tax despite the country's dependency on fossil fuel production. It is hoped that this would help to spur a more energy efficient economy and the development of more environmentally friendly fuel alternatives. Originally scheduled to take effect in 2015, the imposition of the tax has been delayed to 2016, reportedly due to pressure from business lobby.

It is important that South Africa develops local skills and an infrastructure base that can effectively implement and support the adoption, diffusion and effective use of green technologies, as these technologies require a minimum threshold of skills that are not fully available yet (42). Also, experts have pointed out that the country needs to aggressively support human skills development in the area of green technologies, given the low student uptake in science courses, which has proven to be a major obstacle in developing a highly skilled workforce (42).

SOUTH – SOUTH: AFRICA RISING

According to the 2013 Human Development Report, which was published by the United Nations Development Programme (UNDP 2013), "The rise of the South is radically reshaping the world of the 21st century, with developing nations driving economic growth, lifting hundreds of millions of people from poverty, and propelling billions more into a new global middle class". The report further says that "Environmental inaction, especially regarding climate change, has the potential to halt or even reverse human development progress in the world's poorest countries and communities" (23). Over the last decade, trade between South–South has almost doubled, while North–North trade has been declining (see figure 1). BRICS countries have become African countries largest trading partners, with, as noted earlier, trade expected to exceed \$500 billion by 2015. Trade between China and sub-Saharan Africa, for example, has risen from \$1 billion in 1992 to \$140 billion in 2012. Natural resources (excluding fuels) accounted for 13.1 per cent of African exports to BRICS in 2011, however, they are being exploited unsustainably with the results generated from trading them having a very limited impact on the continent's social and economic development imperatives. It should be noted that fuels were the largest export commodity from Africa to BRICS, at 74.4 per cent in 2011 and that more than 30 per cent of Chinese direct investment in Africa are in the extractive industries(2)(see annex 2). In addition to being endowed with abundant natural resources, which could potentially generate opportunities for inclusive and sustainable industrial strategy, and linkages across sectors, many African countries have a young population that could conceivably meet the global trade demands as the productive workforce of developed countries diminishes due to a rapidly aging population.

FIGURE 1. SHARE OF WORLD MERCHANDISE TRADE FROM 2000 TO 2011



Source: Human Development Report 2013 (23)

Africa should strive to establish partnerships with the BRICS to unleash potential opportunities to develop green technologies as they are quickly becoming the dominant force for innovation for sustainable development.

TRADE LINKAGES

1. South-South trade offers African countries a way to benefit from their commonalities with other developing countries.

- African countries have similar needs with regard to technologies and their adaptation to local conditions. As a result, there are South-South trade opportunities for equipment and services. South-South trade offers new opportunities for African countries to participate in global value chains, and to export to developing countries in other regions. Proximity and common conditions in countries in the same region provide opportunities for trade, including in environmental goods. A regional market

could help in achieving the economies of scale developing countries need in the context of existing regional integration schemes.

2. Green technologies for renewable energy

- Strong growth is expected in renewable energy installations in Africa. China is the largest exporter of photovoltaic cells to other developing countries, including in Africa. India is another significant photovoltaic exporter (although at much smaller scale than that of China and Taiwan Province of China) Notably, China exported \$400 million worth of photovoltaic cells to a number of African countries over the period 2009-2012.

3. Remanufacturing industry in Africa

- Remanufacturing enables producers to recover a substantial portion of the material and components originally used in the manufacturing process, thereby reducing the

costs of making a new product. This process also has environmental benefits: greenhouse emissions are lower and less waste is generated as compared to manufacturing a new product. In addition, the overall cost associated with remanufacturing could be up to 40 per cent lower. Remanufacturing can be applied to any product that can be disassembled and cleaned and contains components that can be replaced or repaired to preserve the original functionality. Thus, this process is an attractive option for new business ventures in developing countries as it delivers environmental benefits, results in lower consumer prices and boosts the export sector aimed at other developing country markets. It is becoming a major part of the industrial strategy of many countries. There is already active intraregional trade in remanufactured products in Africa.

4. Organic agriculture opportunities for regional cooperation and trade.

- Organic agricultural production is a dynamic sector with exports from developing countries being directly targeted to developed-country markets. Challenges exist with the development of organic markets in Africa, including, among them, lack of government support, inadequate economies of scale (small farm size), subsidized agricultural imports from many OECD countries, lack of resources, skills and training which require time and monetary investments, high certification costs, proliferation of standards in export markets and non-adaptation of foreign standards to local agro-ecological conditions.
- A responsive private sector and a multi-stakeholder approach involving partnerships among farmers, farmers groups, NGOs, organic movement organizations, governments and certifying bodies are beginning to yield results in

some countries, such as in Uganda. Progress has been made in the implementation of regional organic standards. For example in East Africa, the East African Organic Products Standards (EAOPS) was established to help smallholders have their products recognized as organic in local markets through a certification method called the Participatory Guarantee System (PGS) (44). Some governments have started including organic agriculture in incentive programmes for non-traditional exports.

- Policies aimed at developing domestic markets in Africa could spur South-South trade in organic agricultural products on a regional basis. Regional cooperation could also help to generate commercially viable volumes of supply for export. Regional standards and mutual recognition initiatives, as well as labelling initiatives can benefit from South-South trade.

5. Energy efficient standards for appliances

- Solar water heating (SWH) is one of the simplest and least expensive ways to harness renewable energy. Some African countries are implementing trade policy measures to support the development of SWH markets and domestic manufacturing. South Africa has an ambitious target to install one million SWH systems by March 2015. Authorities are considering setting a low carbon climate resilient condition for participation in the procurement process for supplying locally produced SWH systems benefiting from government subsidies.
- **Development of small hydropower.** The advantages of small hydropower (SHP) technologies are their simplicity, long-term reliability, high performance and easy maintenance. Small hydropower plants are the cheapest technology for rural electrification over

the lifetime of the system.

- Africa accounts for only 0.5 per cent of installed SHP capacity, but in sub-Saharan Africa, there is large untapped potential for this technology. Imported SHP systems from South-South trade would help African countries tap that potential over the coming years.

CONCLUSION

The goal of transformational change is coming at a time when many African countries are making major investments in energy, agriculture, water, and infrastructure to support their economic and social development goals. In support of the needs of a burgeoning population and the changing consumption patterns of a growing middle class, African countries must adopt innovative ways to achieve sustainable and inclusive growth that take into consideration environmental and social issues. Renewable energy sources in Africa have the potential to significantly expand access to and increase the affordability of decentralized energy systems in rural areas.

Green investment and inclusive growth in Africa requires better use of natural resources guided by a combination of policies and regulations that take into consideration environmental and social concerns in development. A number of BRICS countries are transforming their development using innovations and mainstreaming sustainability into their core business practices. Africa can emulate these lessons through cooperation in human capacity development, financing, fair trade, infrastructure development and the transfer of cleaner technologies.

Studies have shown that when GDP growth is adjusted to account for the contribution of natural resources and ecosystems, in most cases growth actually becomes lower and in some cases even

negative. For example, according to the Inclusive Wealth Report 2012, the economies of China, Brazil and South Africa grew by 422 per cent, 31 per cent and 24 per cent, respectively, between 1990 and 2008. However, when assessed using the Inclusive Wealth Index (IWI), the Chinese and Brazilian economies only grew by 45 per cent and 18 per cent, respectively, while the economy of South Africa actually decreased by 1 per cent. During that period, natural resources per-capita declined by 33 per cent in South Africa, 25 per cent in Brazil, and 17 per cent in China (26). The cautionary message in this is that even though natural resource exploitation may generate economic benefits in the short term, resource depletion could decrease the potential for economic growth and development in the long term. Thus, for Africa to continue its current growth trajectory and achieve long-term development and poverty alleviation, it must avoid making the same mistakes of developed countries. This can be achieved by following a green pathway for the developmental and structural transformation of Africa.

ANNEX I

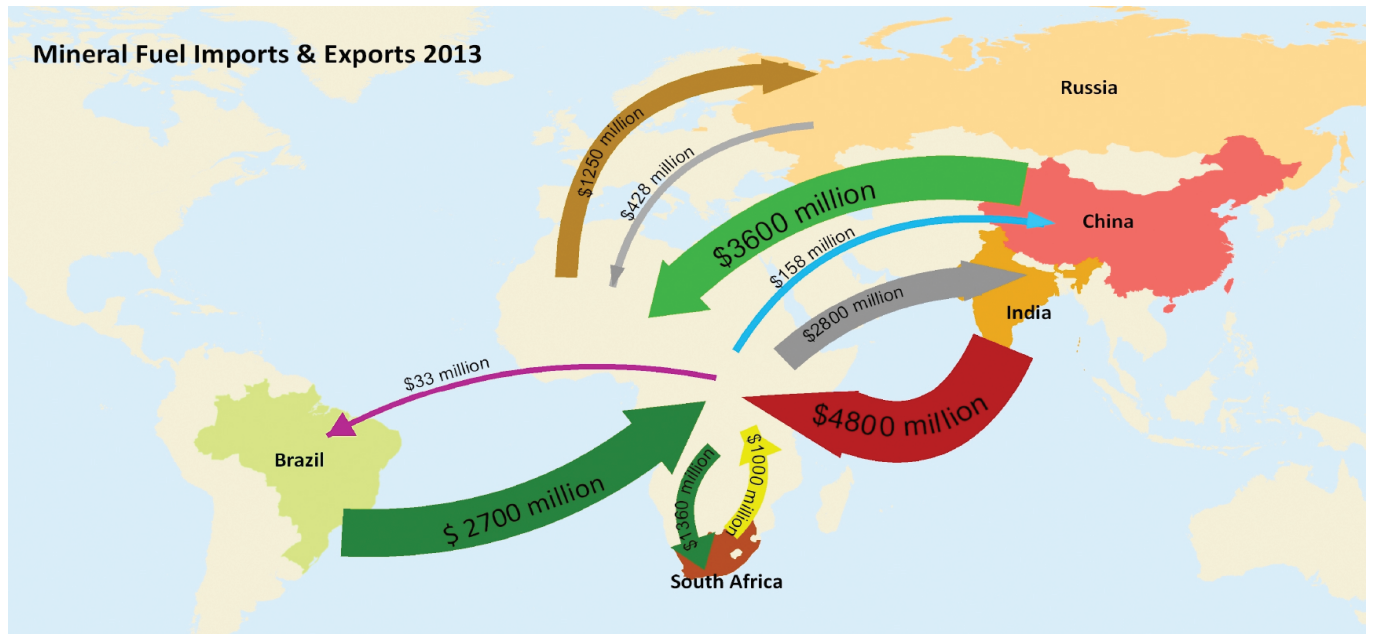
TABLE 1: ENERGY (RENEWABLE AND NON-RENEWABLE) RESOURCES OF AFRICA

Energy Type	Reserves	Regional distribution	Comments	Reference
Renewable				
Hydropower <i>(11% of the world's total potential)</i>	1,834 TWh/yr	Central Africa: 57% Eastern Africa: 32% Other Africa: 11%	93% of the potential remains unexploited Democratic Republic of the Congo holds about 42% of the hydropower potential in Africa	WEC, 2010
Biomass	Woody biomass: 70 billion tones	All regions	Currently, most of the biomass is used for cooking as traditional biomass. Biofuel production is being explored in countries, such as Ghana, Mozambique, and Zambia.	Parikka, 2004
Solar	Solar insolation: 1800 – 2850 kWh/m ² .a	Most of Africa North Africa, potential average solar radiation 6.1 kWh/m ² /day Eastern Africa potential average solar radiation 5 kWh/m ² /day Southern Africa potential average radiation varies 5-6 kWh/m ² /day West Africa potential average varies from 3-4 kWh/m ² /day	Tunisia potential of solar radiation 1,700-2,200 kWh / m ² per year PV technical potential: 33 TWh/a in Gambia 8,700 TWh/a in Sudan. Concentrating solar power potential: 7 TWh/a in Eritrea 40,500 TWh/a in Libya.	WEC, 2010 NREL, 2008
Wind	Wind speeds: Southern Africa (6 – 7 m/s) Northern Africa (5 – 8.5 m/s)	Most attractive sites in the Northern and Southern coasts.	Egypt, Morocco and Tunisia account for about 96% of the 1,014 MW installed capacity in the region. By 2020, add about 8,500 MW to African energy production.	DRFN, 2010 Business Insights, 2010 WWEA, 2011
Geothermal	9,000 MW	Eastern Africa	172 MW installed in Africa as of 2008. About 95% of the installation is in Kenya.	Karekezi and Kithyoma, 2003 WEC, 2010

Energy Type	Reserves	Regional distribution	Comments	Reference
Non-renewable				
Crude oil <i>(9.5% of the world's total potential)</i>	132.1 billion barrels	Northern Africa: 53.2% Western Africa: 28.2% Central Africa: 16.9% Other Africa: 1.7%	Libya accounts for more than 70% of the reserves in Northern Africa. Nigeria accounts for almost all of the crude oil reserves in Western Africa.	BP, 2011
Natural gas <i>(8% of the world's total potential)</i>	14.7 trillion M3	Northern Africa: 55.8% Western Africa: 36.1% Other Africa: 8.2%	Algeria (55%), Egypt (27%) and Libya (18%) account for most of the natural gas reserves in Northern Africa. Nigeria holds almost all of the reserves in Western Africa.	BP, 2011
Coal <i>(4% of the world's total potential)</i>	31,696 billion tones	Southern Africa: 95.2% Eastern Africa: 1.6% Other Africa: 3.2%	About 95% of the coal reserves are in South Africa	BP, 2011
Nuclear	Reasonably assured resources: 663,400 tonnes Inferred resources: 286,300 tonnes	Northern Africa: 2.9% Western Africa: 36.7% Central Africa: 2.7% Eastern Africa: 4.2% Southern Africa: 53.5%	Niger accounts for all the Uranium resources in Western Africa. South Africa and Namibia account for all the Uranium resources in Southern Africa.	WEC, 2010

Source: ACPC: WP10 - Integrating Renewable energy and climate change policies 2011 (ECA/PBL, 2011)

ANNEX II



Source: African Centre for Statistics (ACS)/ Economic Commission for Africa (ECA) 2013

ANNEX III

Student Mobility Between Africa and the BRICS (X 1,000 students)



Source: United Nations Educational, Scientific and Cultural Organization (UNESCO) 2012

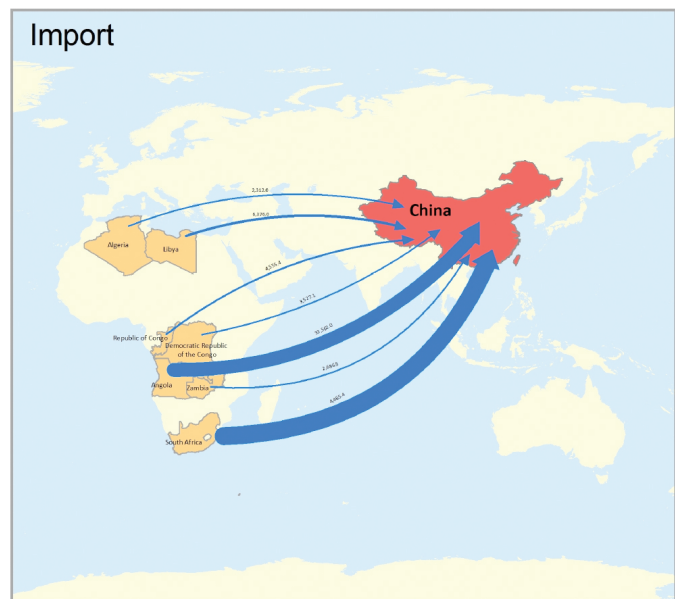
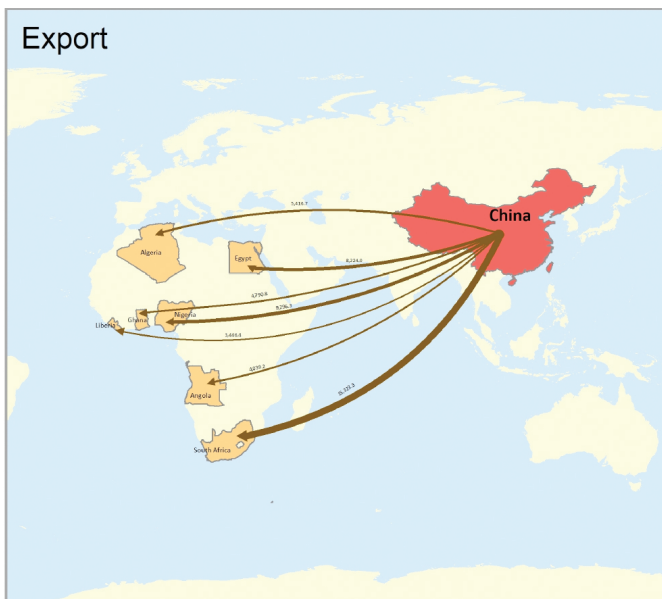
ANNEX IV

BRAZIL – TRADE 2012



Source: African Centre for Statistics/ Economic Commission for Africa (ECA)

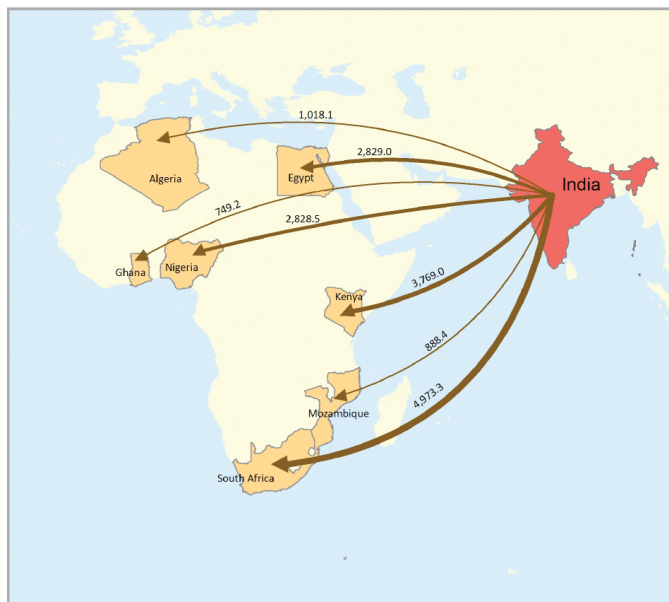
CHINA-TRADE 2012



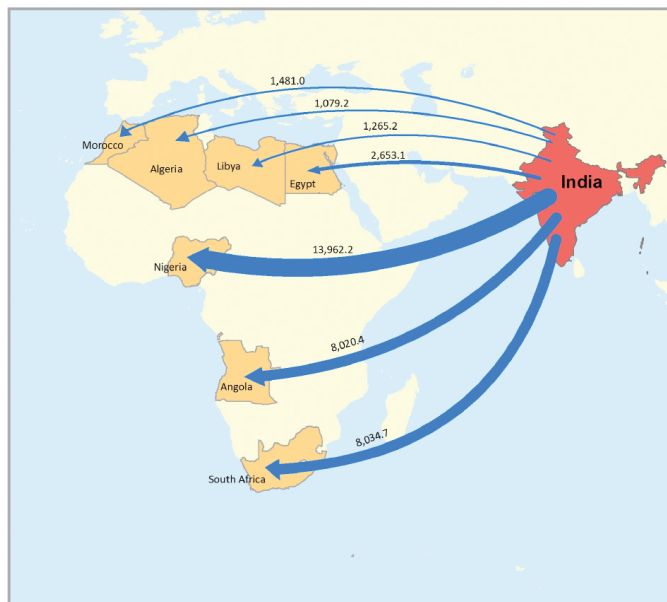
Source: African Centre for Statistics/ Economic Commission for Africa (ECA)

INDIA- TRADE 2012

Export



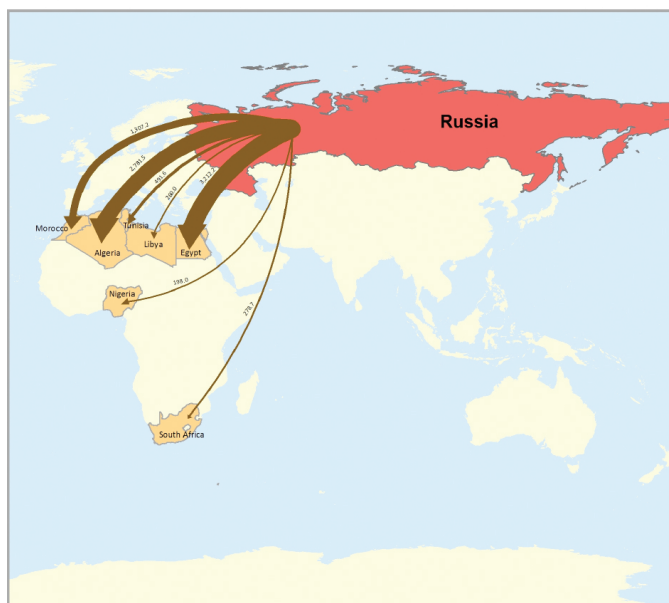
Import



Source: African Centre for Statistics/ Economic Commission for Africa (UNECA)

RUSSIA- TRADE 2012

Export



Import



Source: African Centre for Statistics/ Economic Commission for Africa (ECA)

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Can Africa, with its strong economic growth, identify opportunities for partnerships with BRICS (Brazil, Russia, India, China and South Africa) to transform its economies and trigger structural transformation?

Is the African continent ready to model economic growth on an environmental stewardship that can support the transition to cleaner energy sources, industrialization and green growth?

And through partnerships with BRICS, can Africa leverage growth and embrace socially inclusive development?

This paper points to key challenges that Africa faces in transitioning to green economies and blunting the impacts of climate change. It identifies and emphasizes the imperatives for green industrialization. It highlights key lessons, innovative approaches and green technologies employed by BRICS in redesigning economic growth. However, it cautions against a trend of growth that is oblivious to environmental degradation and over-usage of ecological goods and services leading to natural resource scarcities. The paper recognizes the need for increased partnership between Africa and BRICS, that will maximize the continent's opportunities towards green industrialization, but recognizes that African governments should not pursue a blueprint at any cost, but rather leave a development trail that is contoured on African realities and cognizant of its opportunities and limitations in turning its back against poverty and marching boldly towards structural transformation.