Centre for International
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Fixing Climate Governance Series | Paper No. 5 – June 2017

From Technology Transfer to Technology Absorption

Addressing Climate Technology Gaps in Africa

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A prolific and highly regarded scholar, he has published more than 40 peer-reviewed articles, books and reports on climate finance, energy infrastructure and extractive resource governance. His most recent publication is *The Human Rights-Based Approach to Carbon Finance* (Cambridge University Press, 2016).

Damilola was formerly deputy director, environmental law, of the International Law Research Program at CIGI. He also previously worked as an international energy lawyer at Norton Rose Fulbright Canada LLP, Calgary, where he served on the firm's global committee on extractive resource investments in Africa. He has lectured on energy and environmental law in more than 20 countries, including Australia, Canada, China, Denmark, France, Great Britain, India, Jordan, Kenya, Nigeria, Qatar, Spain and the United States.

Damilola holds a doctoral degree in energy and environmental law from the University of Oxford, UK, a master of laws degree from Harvard University, US, and another master's degree in natural resources, energy and environmental law from the University of Calgary, Canada.

Damilola has been admitted to the bar in Alberta and Ontario, Canada, and in Nigeria. He serves on the executive committees and boards of the American Society of International Law (co-chair), Washington, DC; the International Law Association, London, UK; and the Environmental Law Centre, Alberta, Canada. He is vice president of the International Law Association (Nigerian Branch), editor-in-chief of the *Journal of Sustainable Development Law and Policy*, associate editor of the *Carbon and Climate Law Review* and associate fellow of the Centre for International Sustainable Development Law, Montreal.

About the Fixing Climate Governance Project

Project Leaders: John Odell, CIGI Senior Fellow and David Runnalls, CIGI Distinguished Fellow

Climate scientists agree that human activity has been changing our planet's climate over the long term. Without serious policy changes, scientists expect devastating consequences in many regions: inundation of coastal cities; greater risks to food production and, hence, malnutrition; unprecedented heat waves; greater risk of high-intensity cyclones; many climate refugees; and irreversible loss of biodiversity. Some international relations scholars expect increased risk of violent conflicts over scarce resources due to state breakdown.

Environmentalists have been campaigning for effective policy changes for more than two decades. The world's governments have been negotiating since 1995 as parties to the United Nations Framework Convention on Climate Change (UNFCCC). Their 2015 Paris Agreement represents a historic new platform for international cooperation. It is the first UN climate agreement obliging all member states to make concrete contributions to address the problem. Yet important details of this new regime remain to be negotiated. The members' pledges still must be implemented. And it is widely agreed that, if implemented, their 2015 pledges alone will not be sufficient to meet the need identified by science or to achieve their own agreed goal of stopping global warming well below 2°C.

The Fixing Climate Governance project is designed to contribute fresh ideas to the global debate. High-level workshops have developed a set of policy briefs and short papers written by experts from multiple countries and disciplines. Publications began in 2015. Some offer original concrete recommendations for making the UNFCCC more effective. Some propose diverse other ways to improve climate governance. The ideas in two 2015 publications were implemented in Paris. New publications, taking stock of recent conditions and research and looking forward on multiple levels, appear as they are completed.

Executive Summary

Despite many years of technology transfer to Africa under various mechanisms and programs of the United Nations Framework Convention on Climate Change (UNFCCC), Africa remains the continent with the lowest level of technology required for climate change mitigation and adaptation. Several studies on how to fix Africa's climate technology needs, including policy prescriptions by African leaders, tend to focus primarily on the need for more technology transfer to the African continent. In contrast, this paper emphasizes how African countries can do much more to address current technology gaps by removing local, institutional, regulatory and bureaucratic barriers to the smooth assimilation and deployment of climate technologies. Rather than focus on technology transfer alone, African countries must focus on four main tasks:

- promoting local awareness and more transparent stakeholder engagement on the nature and importance of climate technologies, such that local communities can better understand and support new climate technologies and projects;
- reviewing current technology transfer laws and institutions to ensure strategic alignment with technology transfer and absorption goals;
- promoting the development of small and medium-scale cleantech start-ups that can develop and deploy clean technology; and
- working together regionally, and with other key players, including Canada, China, the European Union, India, Japan, the United States and the Group of Twenty, to establish long-term plans for technology absorption, training and capacity development.

Introduction

For many African countries, climate change is not just an academic issue. Climate change poses complex and multi-faceted threats to the survival, livelihood and health of the African continent, more so than to, arguably, any other region in the world. Apart from the many mainland African states with unique geographical vulnerabilities, which contribute to their low adaptive capacity, the African continent is home to surrounding low-lying island countries, such as Cape Verde, the Comoros, Equatorial Guinea, Madagascar and Mauritius. These countries have dual vulnerability to climate change — both as arid countries in the Sahel region and as impoverished small island states. Even without climate change, Sahelian African states are already subjected to tough arid conditions and severe water shortage, which typically make farming and agriculture difficult and sometimes near-impossible. Climate change would only escalate these pre-existing social, economic and environmental conditions, and could intensify the cycle of food shortage, desertification, water scarcity, depleting fish stocks and the spread of diseases in Africa. Despite the grim reality of climate change, Africa remains one of the world's most vulnerable and least prepared regions facing it (African Development Bank 2011; UNFCCC 2007).

Some African countries — for example, Malawi, Rwanda, Tanzania and Uganda — have already made progress in promoting the use of locally made fuel-efficient cookstoves, as a way of reducing the deforestation and greenhouse gas emission effects of burning wood for cooking.[1] As well, the African Development Bank, alongside regional and national governments across the continent, has increased efforts aimed at promoting climate-resilient infrastructure development (African Development Bank 2012). However, despite these efforts, the development and deployment of better technology remains very critical for Africa to achieve significant gains in its response to the challenges of climate change. For example, as a continent with seven major river systems and high sunshine and wind intensity, as well as several other renewable energy resources, technologies relating to solar, hydroelectric, geothermal, ocean, biomass, biofuel, and wind energies and power are of primary importance for Africa, to leverage its comparative advantage and strengths in reducing vulnerabilities to the adverse impacts of climate change.

However, one of the key factors that continues to thwart the capabilities of African countries to effectively combat climate change is the lack of needed mitigation and adaptation technologies for response to climate change threats. Although the extents of technological gaps vary from one African

1 See http://unfccc.int/secretariat/momentum_for_change/items/8284txt.php.

country to the other, low-carbon and climate-resilient technologies that are required for climate change mitigation and adaptation are simply not available in most African states. Consequently, technology transfer — that is, "the process of deliberate and systematic acquisition/provision/sharing/licensing of equipment and machinery, technology, skills, knowledge, intellectual property rights…for the application of a process or for the rendering of services"[2] — has been, and continues to be, the primary means — and perhaps the only realistic means — by which the African continent can accelerate its response to climate change.

This reality was recognized recently by the 2016 Marrakech Action Proclamation for Our Climate and Sustainable Development,[3] which calls for an increase in access to and the volume and flow of finance for climate technology from developed to developing countries. Article 10 of the Paris Agreement on Climate Change also encourages developed countries to provide technology development and transfer support to developing countries, in order to improve resilience to climate change and reduce greenhouse gas emissions.[4] These global commitments to increase the flow of clean technologies to developing countries are not new, and have been enshrined in the international climate change regime as far back as 1992, when the UNFCCC was adopted. Article 4 (5) of the UNFCCC provides that developed countries "shall promote, facilitate and finance, as appropriate, the transfer of, or access to, environmentally sound technologies and know-how" needed by the developing country parties to meet the targets of emission reductions.[5]

However, despite several proclamations and declarations on the need to promote the transfer and deployment of climate technologies to African countries, Africa remains the continent with the lowest level of technology deployment on earth. Several studies on Africa's climate technology needs, including policy prescriptions by African leaders, tend to focus primarily on the need for more technology transfer to the African continent as a primary way of boosting Africa's technological capacity to combat climate change.[6] For example, the Technology Mechanism, a mechanism established at the sixteenth session of the Conference of the Parties to the UNFCCC in Cancun (COP 16) to enhance climate technology development and transfer to developing countries, has focused attention mainly on technology transfer as the key to bridging the technology gap in developing countries. This one-track approach has failed to fully analyze and address the complicity of African countries in exacerbating current technological gaps.

The basic premise of this paper, therefore, is that the problematization of the lack of climate technology in Africa must move beyond current prevailing policy discourses on the need for increased technology transfer to Africa. The key barrier to climate technology diffusion across Africa is arguably not the lack of technology inflow to Africa; rather, it is the perennial inability of African states to absorb and assimilate transferred technology.

Technology assimilation and absorption encompass the ability of the technology-importing country to adopt, deploy and learn from the acquired technology so that it can develop its own domestic capabilities (UNECA 2010). For example, over the last two decades, climate technologies have been transferred at varying scales to several African countries in one form or the other. According to a United Nations' study, inflow of technology to Africa through foreign direct investments soared by over 800 percent between 2000 and 2008 (ibid.). This percentage has further increased since the progressive adoption and implementation of Clean Development Mechanism (CDM) projects across Africa (Kreibich et al. 2016). Despite evidence of rapid growth in the rate of Africa's technology acquisition, lack of technology remains one of the key threats to climate change action in Africa. Due to cultural, political and legal barriers in several African countries, the full-scale adoption, diffusion and assimilation of climate technologies and innovation have remained complex endeavours across the continent.

This paper discusses how African countries can do much more to address the continent's current technology gaps by removing local, institutional, regulatory and bureaucratic barriers to the smooth assimilation and deployment of climate technologies.

2 See United Nations Economic Commission for Africa [UNECA] (2014, para 3).

3 See https://unfccc.int/files/meetings/marrakech_nov_2016/application/pdf/marrakech_action_proclamation.pdf.

4 See https://unfccc.int/files/meetings/paris_nov_2015/application/pdf/paris_agreement_english_.pdf, p. 9.

5 See https://unfccc.int/resource/docs/convkp/conveng.pdf, p. 9.

6 See, for example, Agola (2016).

Barriers to Technology Assimilation in Africa

Africa must find the political will to address local, institutional, regulatory and bureaucratic barriers, across the technology transfer chain, that often stand in the way of the effective assimilation and deployment of climate technologies in the continent. The problem starts from the point of reception, during which several cultural barriers make it difficult for technologies to fit into the African context, followed by legal questions on intellectual rights, and then concerns on technical capacity to effectively deploy and assimilate the technologies. Each of these barriers is briefly examined in the following sections.

Cultural and Traditional Barriers

One key domestic concern facing technology absorption across Africa is the perennial local and cultural resistance to transferred technology. Many imported technologies have either been rejected by local communities for cultural or religious reasons, or for political reasons. For example, despite the huge technology transfer prospects of the Kwale CDM project in Nigeria — a project designed to capture and recover associated gas that would otherwise be flared at the Kwale Oil-Gas Processing Plant — this project was heavily resisted by local communities. Local groups in Nigeria raised concerns ranging from the cultural implications of the project for traditional lands and forests, to lack of adequate information on the long-term benefits of the gas recovery technology, to failure of the Nigerian government and project proponents to adequately consult with local communities or demonstrate the clean benefits of the project to stakeholders. Concerns about the impacts of foreign technology on local culture, traditional lands and forests are often exacerbated by the failure of national authorities to provide adequate information to local communities on the nature and importance of climate technologies and projects. Many of these concerns are results of decades of imbalanced power relationships and mistrust between governments and indigenous communities,[7] and must be comprehensively addressed if African countries are to effectively leverage and absorb transferred technology.

Weak Legal Protection for Imported Technologies

Another key barrier to technology absorption and assimilation in Africa is the weak legal protection for intellectual property rights (IPRs) in many African countries. This long-standing concern has exacerbated the difficulty in retaining and assimilating climate technologies in Africa. Generally, innovators want to be sure that their innovations will not be abused, or deployed without adequate permission or protection under national regimes of the country to which the technology is transferred. Lack of an adequate and efficient IPR system to protect innovation has seen several technology innovators depart Africa for countries with more robust IPR protection laws (United Nations Environment Programme 2013; Abdel-Latif 2014). Although many African countries are parties to the Trade-Related Aspects of Intellectual Property Rights (TRIPS) agreement, which emphasizes the importance of domestic IPR protection regimes for inventions, legal and policy frameworks have not been effectively implemented across the African continent to strengthen IPR protection (Foray 2009).

Concerns over inadequate protection of IPR in Africa manifest in two broad ways. One is the wide exclusion of certain technologies from patentability. Patent laws in many African states still maintain and apply rigid and exclusionary definitions of patents and inventions, which exclude certain technologies from patentability.[8] The Nigerian Patents and Design Act, for example, grants several arbitrary powers to Nigerian authorities to exclude some innovations from patentability. It also fails to clarify whether climate change technologies and inventions can be patented (Mgbeoji 2014, 234). Concerns about

7 For detailed discussions of these, see Olawuyi (2016a, 1–15; 2016b).

8 Article 7 of the TRIPS agreement provides that the objective of the protection and enforcement of intellectual property should be to "contribute to the promotion of technological innovation and to the transfer and dissemination of technology, to the mutual advantage of producers and users of technological knowledge and in a manner conducive to social and economic welfare...." (www.wto.org/english/docs_e/legal_e/27-trips.pdf).

legal barriers to biofuel patenting have also been raised in Egypt, Mozambique and Tanzania.[9]

A second paradox in IPR protection laws in surveyed African countries is the application of expanded compulsory licence provisions that allow the use of a patented product or process without authorization or compensation to the patent rights holder. Article 31 of the TRIPS agreement, for example, provides some safeguards against the use of a patented product or process without authorization or compensation to the patent rights holder, including the requirements that the proposed user should have made good-faith efforts to obtain authorization from the patent holder, that the use will be for domestic supply only, that the patent holder shall be granted adequate remuneration and that there be an established review process for considering the application for compulsory licences. In many of the surveyed African regimes, however, several of the procedural safeguards under TRIPS are not replicated.[10] In Nigeria, for example, not only does its Patents and Design Act not codify these safeguards, it in fact provides that once a compulsory licence has been granted, the licensee is insulated from making any payment to the patentee in the form of royalty or any other manner described. Similarly, the Nigerian law authorizes federal and state authorities to utilize or obtain a patented product for the service of the government agency in Nigeria for public interests. This excessive power to leverage innovations for "public interest" again raises concerns as to the adequacy of legal protection available, in practical terms, to IPRs in African regimes. In a continent in dire need of climate technologies, overzealous legal provisions and policies that narrow or weaken IPR protection must be addressed and removed. The level of protection accorded to IPR must not only be strengthened, but appropriate institutions and regulatory structures must also be revitalized or put in place to instill confidence in inventors that transferred technology will be protected from arbitrary confiscation or abuse.

Lack of Capacity

Another key barrier is the lack of capacity to adequately deploy and maintain transferred technologies. As the African Development Bank rightly noted, poor technological capability remains one of the major constraints to Africa's efforts to achieve sustainable development (African Development Bank 2014). In Ethiopia, for example, the absence of a critical mass of university-educated people who are skilled in hands-on technology and available for work has been cited as a key reason why imported technologies have not been put to effective and consistent use. This challenge continues to hinder the progressive adoption of climate technologies in Ghana, Kenya, Nigeria and South Africa. As the African Development Bank notes, apart from the fact that newer climate technologies are not readily available for practical skill acquisition, Africa's stock of graduates remains skewed toward the humanities and social sciences, while the share of students enrolling in science, technology, engineering and mathematics averages less than 25 percent (ibid.).

To effectively absorb and assimilate climate technologies, there is a need for a large pool of graduates, officers and staffs trained and skilled in utilizing the newer and cleaner technology options. Importation or availability of new technologies to Africa is simply not enough. Without the required human capacity, such facilities may rot away without use or be suboptimally deployed. Governments must, as a matter of priority, identify the training needs of regulators, environment ministries, climate change institutions and private-sector agencies, and then provide adequate and updated knowledge for them in essential areas.

Weak Investment Environment for Cleantech Entrepreneurship

For Africa to move beyond its dependence on technology transfer, it must create the right economic, social and environmental conditions for entrepreneurial activity and start-ups to deploy, commercialize and develop climate technology. Several African countries currently lag in this area. For example, in a recent survey released by the World Wide Fund for Nature, South Africa, the only African country in the global survey, is ranked as having a weak potential to produce entrepreneurial cleantech start-up companies to commercialize cleantech innovations over the next 10 years (Parad et al. 2014). Failure to create the

9 Fernando dos Santos and Simão Pelembe (2014, 248) state that despite the clear articulation of biofuel policies in Mozambique's National Policy and Strategy on Biofuels of 2009, patenting and IPR protection are not adequately addressed in Mozambique's biofuel strategy.

10 See, for example, sections 55 and 56 of South Africa's *Patents Act* No. 57 of 1978.

right environment for cleantech entrepreneurial activity not only weakens the abilities of African countries to continually attract sustained inflow of clean technology, but it also hinders the rise of cleantech companies that can spearhead the large-scale deployment of climate technologies. Cleantech innovators generally want to transfer technologies to, or settle in, countries where they can readily market their technologies at an early stage of development. African countries must actively promote cleantech innovation nationally and provide the right incentives and opportunities for cleantech entrepreneurs to assemble and maintain imported technologies, or to spearhead homegrown technological solutions. For example, the Province of Ontario, Canada, has maintained its reputation as having the fastest-growing cleantech sector in Canada, and one of the largest in North America, by actively providing capital for cleantech firms under its Clean Tech Venture Capital Fund — a $55 million fund designed to help cleantech firms get the capital they need to grow their business. Some countries — for example, China, India and Malaysia — have also committed significant resources to supporting clean technology, and have over the years been rewarded with a geometric rise of start-up cleantech companies and increased technology inflow, for example, a 60 percent rise in cleantech investment in China in 2016 (Middlehurst 2017).

Bridging Africa's Technology Gaps through Domestic Action

Africa's capabilities to effectively contribute to the Paris Agreement's global agenda of reducing the threats of climate change hinge on how fast and how well the continent can absorb and leverage the technological competencies needed to sustain climate mitigation and adaptation. The ratification of the Paris Agreement by many African countries, coupled with the adoption of domestic climate change laws and progressive efforts across the continent to facilitate the transfer of low-carbon and climate-resilient technologies, demonstrates a real and determined effort to address technological gaps that hinder climate action across the continent.

To build on this momentum and bridge existing governance gaps with respect to climate technology, African countries should take advantage of the drop in the price of oil since 2014 — greater than 70 percent[11] — to promote the development of small and medium-scale cleantech start-ups that can effectively develop and deploy clean technology. By providing adequate policy backing for cleantech investments, and by adopting tax incentives, feed-in tariffs and other fiscal and regulatory measures that could make technology inflow and deployment more attractive to private-sector entrepreneurs and investors, Africa's quest to bridge current climate technology gaps could move from being mere aspirations to reality.[12]

11 See Organization of Petroleum Exporting Countries (OPEC) (2015); Moshinsky (2015).

12 Article 66.2 of the TRIPS agreement, signed at Marrakesh on April 15, 1994, recognizes the importance of incentives in promoting technology transfer. It requires developed country World Trade Organization members to "provide incentives to enterprises and institutions in their territories for the purpose of promoting and encouraging technology transfer to least-developed country Members" (www.wto.org/english/docs_e/legal_e/27-trips.pdf).

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