

## Skills for Science Systems in Africa: The Case of ‘Brain Drain’

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### **Abstract**

This chapter discusses key circumstances surrounding skills and opportunities for researchers in science, technology, and innovation (STI), as well as highly trained STI policymakers and research managers, in Africa. So-called ‘brain drain’ – the phenomenon of massive skilled labour migration from developing countries to developed and industrialized countries – applies continuous pressure on local human resource capacities for development in African countries. Various vital sectors in developing societies are affected by massive outflows of highly skilled labour, hence affecting institutional capacities and knowledge wealth of these societies’ science systems. African countries cannot afford to lack strategies that aim to mitigate the negative impacts of ‘brain drain’ and optimize any positive aspects and opportunities related to it. This chapter presents a comprehensive review of the challenges and opportunities resting on the role of highly skilled African migrants in African science and STI systems. It reviews how science systems are affected by human capital flight and demonstrates the main approaches that respond to it in Africa and beyond. A few policy recommendations are shared at the conclusion of the study.

## Introduction

While concerted efforts are continuing to increase human capacities in Africa for industrial, technological and scientific progress, massive skilled labour migration from the continent to other parts of the world – mostly developed industrialized countries – is a major phenomenon that seems to work in the opposite direction to such efforts. It is estimated that about 20,000 highly qualified African researchers have been leaving the continent every year since 1990. There are currently more African PhD holders outside the continent than inside it; a statement that cannot be said about any other continent of the world. Up to one-third of African scientists and research professionals (excluding other professionals) are said to be lost to what is called ‘brain drain’ – the phenomenon of massive skilled labour migration from developing countries to developed and industrialized countries. Exodus of productive labour from Africa to developed countries is a notably distressing example of the disruptive effect of large-scale migration (Elnur, 2002). It depletes the continent of its talented minds and hinders the building and progress of science systems in general with their various actors in Africa. While such a phenomenon is not unique to Africa, it has a disproportionate effect as compared to other regions. For example, the skilled human capital outflow from Asia is larger in size than from Africa, but not in severity or impact (looking at the entire continent). Emerging and industrialized Asian economies are stronger in human capital than African economies overall. The higher population size and density in Asia account for the larger size of ‘brain drain’ there but Africa is more affected by the phenomenon than any other continent or region. The overall number of researchers in the region is generally low compared with those of other developing countries.<sup>1</sup>

This chapter discusses key circumstances surrounding skills and opportunities for researchers in science, technology, and innovation (STI), as well as highly trained STI policymakers and research managers in Africa. Various vital sectors in developing societies are affected by massive outflows of highly skilled labour, hence affecting institutional capacities and knowledge wealth of these societies’ science systems. Numbers, trends, and observations overall show that the phenomenon must be of serious concern to both developing and developed countries, with overlapping and conflicting interests. This chapter presents a comprehensive review of the challenges and opportunities resting on the role of highly skilled African migrants in African science/STI

systems. It reviews how science systems are affected by ‘brain drain’, with its scope and consequences, and argues for a re-understanding of the role of skilled African migrants. It demonstrates the main approaches, learnt from global and local experiences that respond to skilled labour migration issues with a few cases from around the world, Africa included, presented. Discussion follows, to draw lessons for Africa. To conclude the study, some policy recommendations on responding to African ‘brain drain’ are shared.

### **How African science systems are affected by highly skilled labour outflow**

By science systems we refer to the entire network formed by institutions, actors, policies, information, and communication channels that together determine the pathways and content of scientific enterprise in any given society. By scientific enterprise we refer to activities that use and produce scientific knowledge (i.e. knowledge based on methodological inquiry and evidence) in various sectors, for example, industry, education, healthcare, infrastructure, communication, and environmental management. For science systems in Africa, addressing ‘brain drain’ deserves to be on the list of priorities, because it has many strong interactions with those priorities. Various vital sectors in developing economies are affected by the mass migration of highly qualified human resources, hence affecting science systems.

The effects of this migration on science systems in Africa have been briefly addressed by previous authors (see for example, Beaudry, Mouton and Prozesky, 2018; Nunn 2005; Aubert, 2005), but often as a side note – not saying it is a trivial issue but also not dedicating particular attention to it or addressing possible mitigations. In contrast, policymakers, and researchers in emerging and newly industrialized economies in Asia have been vocal and active in dealing with ‘brain drain’ in their countries and regions (as we shall see later in this chapter). Thorough discussions in Africa are due.

Researchers and policymakers of scientific enterprise play critical roles in any science system (besides those who play roles in the system but not in research or policymaking, such as engineers and technologists in industry, physicians and nurses in health facilities, medium-level public servants, etc.). Between researchers and policymakers also exist research managers – those with the skills and mandate to make sure that research activities are well-organized and research funding well managed to produce the best possible quality and most relevant research

outputs and outcomes. These are also highly educated, skilled workers that are important for any country's development, and their area of work can be affected by brain drain.

Science granting councils (SGCs) in several African countries, for example, face challenges of high employee turnover; especially in positions of higher qualifications and influence on institutional strategies and performance (Sheikheldin, 2019). Under the Science Granting Councils Initiative (SGCI), the first author became engaged with SGCs from 15 African countries, as well as with coordinating technical agencies (CTAs). Within a few years, many of these organizations witnessed significant employee turnover in senior positions. In many cases, these employees move to work in other places in the same country, or with international agencies operating in their country or region. Some of them also leave the country, either for employment in other parts of the world or to pursue further academic studies. In general, there is a trend among Africans who leave their countries for high tertiary education – they tend to not return (at least not right after they finish their studies) (Zweig, 2006). And while many return as well, however, some migrate back owing to uncondusive environments. The general picture is that there are not enough people capable in research management to go around in a country, so we find many agencies and organizations competing for them, resulting in high employee turnover. On the other hand, high employee turnover in any organization erodes institutional memory, reduces long-term career investment in these organizations, and overall, affects performance in undesirable ways.

Migration in general, in the modern world, often results in some positive correlations, such as increasing the quantity and quality of highly skilled workers in various sectors of human knowledge and economic activity, and financial remittances from migrants back to their countries of origin in ways that contribute to local economies. However, despite positive correlations, many studies agree that the observed and forecasted negative impacts outweigh positive ones, for many developing societies; especially with current trends unchallenged since the 1990s. With ample evidence, 'brain drain' is understood to apply continuous pressure on local human resource capacities for development in African countries, including economic and knowledge capacities. For example, in plain figures, it has been estimated that the full cost of educating a medical doctor in sub-Saharan Africa from primary school to university is about US\$66,000, while the corresponding cost of educating a nurse is US\$43,000. If this investment is lost to the home country, the opportunity

cost could be at least US\$364,000 and US\$238,000, respectively, for each emigrated professional (Kirigia et al., 2006). These amounts exceed the remittances that these professionals could send home during their working life (UNCTAD, 2012).

Numbers, trends, and observations overall show that the outflow of human capital from less developed countries must be of serious concern to both developing and developed countries, with both overlapping and conflicting interests. It is also not going away any time soon; not without serious intervention. In fact, it is increasing in severity. A 2016 report by the IMF says that “migrants [from sub-Saharan Africa] in OECD countries could increase from about 7 million in 2013 to about 34 million by 2050,” confirming that “the migration of young and educated workers takes a large toll on a region whose human capital is already scarce” (IMF, 2016, pp. 197–98). The OECD highlights that “in parts of sub-Saharan Africa and Central America, sometimes more than half of all university graduates migrate to OECD countries, with potentially serious consequences for critical sectors such as education, health and engineering” (OECD, 2015). Even more alarming is that young African scientists and researchers residing in the continent overwhelmingly express that they considered migration as an option. For example, in a study conducted by Beaudry et al. (2018b) in which early career African researchers from around the continent were surveyed, a large proportion (80 per cent) of respondents “indicated that they have considered leaving the African country where they were working or residing at the time of the survey: 20 per cent said that they have ‘often’ considered doing so, whilst a further 51 per cent indicated that they ‘sometimes’ think of leaving their home country. For the remaining minority (29 per cent), this has never been a consideration” (p. 115).

### **Towards a reconceptualization of the highly skilled African migrants: beyond brain drain**

For many decades, Africans continued to move in massive numbers both within and beyond the continent. The unifying experience of African peoples dispersed by the trans-Atlantic slave trade marked the colonial era. “The African diaspora, together with the Jewish diaspora – the epistemological source of the term diaspora – enjoys pride of place in the pantheon of diaspora studies” (Zezeza, 2005, p.36). In most related literature, the communities and individuals who were engaged in these early waves of migration are commonly known as the African Diaspora; and their roles in the creation of new cultures, institutions,

and ideas outside Africa are well documented. The more recent waves of the “*new diaspora*” or “*the second boat*” are by and large products of a failure of the modernization project in the post-colonial countries and an increasingly globalized world (Elnur, 2002, p. 37).

The trans-Atlantic slave trade targeted mainly young and able-bodied Africans who were forcibly transferred to the *new world* to produce physical labour, disrupting their lives and the historical process. On the contrary, and in comparison with previous epochs, “contemporary African labour migration tends to cream off some of the most skilled and educated parts of the labour force, impoverishing the domestic economy” (Elnur, 2002, p. 38). The effects of recent trends of labour migration flow from Africa, especially to the West, on the sending countries are tackled both in scholarly and policy literature under the term ‘Africa’s brain drain’. However, the concept of ‘brain drain’ is arguably inadequate in describing the phenomenon and can be misleading sometimes because it overwhelmingly connotes migration to a merely drastic phenomenon and suggests that it is irreversible. In this chapter, we use other terms, interchangeably with ‘brain drain’, to reflect our use of the term in context while still being critical of it.

The etymology of the term ‘brain drain’ emerged in the 1950s and was first used by the British Royal Society to describe a situation in the 1950s, where scientists, doctors, engineers and other skilled individuals were migrating from Europe to the United States and Canada in search of employment. While the term could be quite useful in drawing attention to the adverse impacts of the outflow of skills and talents, it is time to critically question ‘brain drain’ as a concept and propose that it might be often misleading during our attempts to envision ways in which this flow can be reversed and made to contribute optimally to the progress and prosperity of the migrants’ countries of origins. Against this, the valorization of skilled labour as merely ‘brain drain’ is problematic on a number of accounts including:

- First, it can be perceived to regard the sending country as a geographical, passively static locale, hence deprives this locale from being recognized as a dynamically engaged site in the migration process. Therefore, instead of recognizing migration as a process and skilled migrants as carriers of social capital, brain drain as a notion renders these talents collectively to a permanent loss of resources to the sending countries while also disregarding the role and conditions of the receiving ones, and the agency of the migrant in shaping and being shaped by their diasporic lives<sup>2</sup> (Radwan and Sakr, 2018).

- Second, it tends to point to the movement of skilled migrants as a traditionally major problem for economic development for poorer countries (Docquier, Lohest and Marfouk, 2007). While this argument is partly true, it will be invalid without acknowledging the socioeconomic and political conditions in the countries of origin which represented a prevailing driving force for outmigration and what Elnur describes as a “failed developmental model” (2002, p. 39).
- Third, overall it diminishes human capital loss from the poor countries solely to migrants who fall in the category of tertiary education and above, with little attention paid to younger-age migrants and second generation in the diaspora, many of whom managed to return or contribute to the country of their parents. In studying the effect of ‘brain drain’ on science systems, which typically focuses on highly skilled migrants, the point may be less concerning, but is worth noting. The uncalculated value of human capital loss is accompanied by an omission of the cost incurred as a result of what is called “brain waste” in the host countries, where qualified migrants find employment only in occupations that do not match their qualification; and
- Fourth, it often appears to underestimate the sought-after ambition or knowledge and expertise acquired by migrants abroad which in some cases might not have been possible without migration to a developed/industrialized country. This somewhat explains why special talents and skilled migrants are overwhelmingly present in the prosperous countries of the global north. In a recent study, Radwan and Sakr (2018, p. 518) contend that the “measures taken to prevent the outflow of scholars might have negative consequences on local development and technological advancements,” and that “the mobility of scholars significantly narrows the economic and industrial gap between developed and developing countries.”

Many scholars were aware of the dilemma surrounding the terminology of ‘brain drain’ and its usage, and proposed alternative terms such as brain circulation, brain gain, brain reverse, etc. For example, Adesote and Osunkoya (2018) noted that ‘brain drain’, otherwise known as human capital flight, has been described as a contentious subject, which has been challenged in recent years, and today some scholars, rather than using the term ‘brain drain’ prefer more politically neutral terms such as ‘brain exchange.’

However, the term ‘brain drain’ still has currency, since even if we talk about ‘brain circulation’ or ‘brain exchange,’ we cannot escape the reality that this ‘circulation’ and ‘exchange’ is still disproportionately costing Africa, and other developing regions of the world, in ways that outweigh the noted benefits, as confirmed by prevalent studies and statistics.

Nevertheless, whatever the terminology may be, the challenges remain. To initiate and strengthen venues of exchange and circulation, enhance the role of the African social capital abroad and allow the transfer of knowledge and technology towards the building of science systems in Africa, it is essential to understand the magnitude of the problem and examine the migration journey including both the pre- and post-departure sites in both the sending and receiving countries respectively.

### **The scope and consequences of the highly skilled African migrants**

The outflow of highly skilled labour is a multifaceted phenomenon, befitting of the age of globalized communication, business, and mobility. Therefore, it has many connections with other phenomena, in various ways. For example, Adesote and Osunkoya (2018) argue that four major factors account for the patterns in modern-day African migration: (i) globalization and integration of the world economy; (ii) economic and political development failures in Africa; (iii) immigration and refugee policies in Europe and the United States; and (iv) colonial background.

In a recent volume, containing a comprehensive study about trends of scientific research in Africa, and particularly the size and productivity of African scientists, a chapter by Mouton (2018) stated that:

“Arguably, the biggest cause of the decline of African science during the 1980s and 1990s was the devastating effects of the erosion of human capital through the brain drain. Studies sponsored by the Research and Development Forum for Science-Led Development in Africa (RANDFORUM) reveal that up to 30 per cent of African scientists – that is, excluding other professionals – were lost due to the brain drain. According to the Economic Commission for Africa (UNECA) and the International Organization for Migration (IOM), an estimated number of 27,000 skilled Africans left the continent for industrialized countries between 1960 and 1975. Since 1990, at least 20,000 qualified people have left Africa every year. This means Africa has 20,000 fewer people [every year] who can deliver public services and articulate calls for greater democracy and development” (Nunn, 2005, p. 7).



**Figure 6.1: Scope and Consequences of the African Highly Skilled Migration**

Research and Education	Health	Engineering
<ul style="list-style-type: none"> <li>• African PhD holders outside Africa outnumber those inside it.</li> <li>• Shortage of teachers and instructors</li> <li>• African researchers are pressured with time in ways that have clear impact on their research productivity.</li> <li>• 80% African researchers indicated that they have considered leaving Africa</li> <li>• Since 1990, at least 20,000 qualified researchers left Africa every year.</li> </ul>	<ul style="list-style-type: none"> <li>• Disparity in the ratio of health professionals:</li> <li>• In Nigeria, 2008, the ratio was 1 to 41,000.</li> <li>• In Liberia, one pharmacist for 85,000 people.</li> <li>• In 2008, Ethiopia had 900 practicing doctors in a country of ~90 millions.</li> <li>• 3,000 Ethiopian doctors work overseas, more Ethiopian-trained doctors practice in Chicago than in Ethiopia</li> </ul>	<ul style="list-style-type: none"> <li>• Significant shortage of engineering skills all over the continent (engineers, technologists, and technicians).</li> <li>• For example, in 2013, it was reported that “in Namibia, Zimbabwe and Tanzania, there is [on average] one qualified engineer for a population of 6,000 people -- compared to one engineer per 200 people in China.”</li> </ul>

Source: adapted from: Beaudry, et al. 2018; UNCTAD 2012 and UNESCO 2010

While not considered as the only reason for the acute shortages of human capital in critical sectors such as healthcare, education and engineering, in most African countries this outflow of skills occupies a special place among those reasons (see Figure 6.1). Africa is battling with the challenge of having significant shortages of engineering skills (UNESCO, 2010), which are felt continentally while amplified in some countries. In December 2013, UNESCO’s Director General, Irina Bokova, relayed that “in Namibia, Zimbabwe and Tanzania, there is one qualified engineer for a population of 6,000 people – compared to one engineer per 200 people in China.” The situation in the healthcare sector is not any better (Kinfu et al., 2009). The flight of different categories of skilled health professionals such as consultants, doctors, pharmacists, nurses and social service personnel, led to direct and negative effects on the delivery, effectiveness and quality of services available to the

public in both public and private health institutions in home countries. Another major effect of the loss was the disparity in the ratio of health professionals to patients. For example, Sudan lost 90 per cent of its medical doctors to the outside world, while in some parts of Nigeria, the ratio of healthcare professionals to patients in 2008 was as high as 1 to 41,00 (Elnur, 2002). In Liberia, one pharmacist was said to be servicing about 85,000 people. These numbers contrast severely with the minimum health standards recommended by the World Health Organization (WHO) for developing countries, which emphasise that “to ensure basic healthcare services requires 20 physicians per 100,000 people (that is 1 physician to 5,000)”. In the African continent, the general ratio of physicians to patients was 1 to 8,000. By comparison, the US has 255 doctors per 100,000 people (WHO, 2014).

Another vivid example of brain drain in the healthcare sector is the case of Ethiopia. It is estimated that more Ethiopian-trained doctors practise in Chicago than in Ethiopia, and while Ethiopia had only 900 doctors in 2008, about 3,000 Ethiopian doctors worked overseas (Shinn, 2008). It has been argued that one of the main reasons why Africa has found it difficult to effectively fight the scourge of HIV/AIDS in the continent was the serious shortage of African health professionals (Adesote and Osunkoya, 2018).

Regarding the education sector, shortages of teachers and instructors are also pronounced (UNESCO, 2016). In African universities, overall, class sizes became bigger owing to the unavailability of resources to have more classes with more manageable sizes for lecturers, partly because the availability of qualified lecturers is a bottleneck (Beaudry et al., 2018a). Additionally, and consequently, African scientists in these universities are pressured with time in ways that have clear impact on their research productivity (Beaudry et al., 2018a). We cannot read these conditions and trends without seeing and acknowledging how the massive outflow of productive labour from the continent has a strong hand in all of it. However, Mouton and Blanckenberg (2018) also found that there has been a recent rise in research-based knowledge production coming from Africa, partly due to some changes in the way African scientists work and collaborate with scientists based outside the continent.

And while the situation on quantity is problematic enough, quality is not spared, with possible connections. For example, many foreign companies and organizations that are technology and science based, operating in African countries, continuously cited problems of competency in explaining why they do not hire more local engineering

**Box 6.1: Ethiopia's academic diaspora: a case study**

There is a dearth of people with doctorate-level degrees in Ethiopia, and this is especially true where they are most needed – in higher education. Among the 15,192 teachers and researchers working in the country's 25 universities, only 979 (6.4 per cent) hold a doctoral degree. Moreover, PhD holders are very unevenly distributed, since half of them work at the University of Addis Ababa. The bulk of the country's university teachers and researchers have a master's degree (43.4 per cent) or a bachelor's degree (42.6 per cent). The number of PhD-holding teachers and researchers active in the country's universities is much lower than the members of the Ethiopian diaspora just in the United States and Canada who have that level of education: 1,600, according to conservative estimates. A study on the Ethiopian academic diaspora that was prepared in 2012 for an UNCTAD report identified 200 Ethiopian professors working in foreign universities, of whom 148 were active in the United States. Among these, 72 were full professors. In Ethiopia, by contrast, only 65 persons at the time held an equivalent position. In other words, there are more Ethiopian full professors working in the United States than in Ethiopia itself, despite the strong need of Ethiopian universities for highly skilled scholars and teachers.

*Source: UNCTAD, 2012*

graduates; a problem that can be connected to the pressure on African academic staff to teach and train more students while their numbers – the academic staff – may not be sufficient in colleges and universities. When many such foreign companies and agencies do not absorb enough local engineers and technicians, that eventually impacts technology transfer negatively. A study on local technological capabilities and foreign direct investment in Tanzania, by the Science, Technology and Innovation Policy Research Organization, in 2011, found that in manufacturing, agriculture and mining, weak linkages between local and foreign investments partly arose from concerns among foreign firms about capacities of local labour and firms, which in turn resulted in very limited transfer of technological know-how to local talents.

Another impact of 'brain drain' that is not often addressed is the substantial decrease of purchasing power in local economies. Highly educated workers in modern societies often fill a large slot of the middle-income bracket of the local population, who often account for a larger

share of consumption of goods and services in local economies. When a local economy has less middle-income workers, the purchasing power within that economy is generally negatively affected. In the same vein:

“Endogenous growth theory...typically predicts that high skilled emigration reduces economic growth rates. Indeed, research finds that the average level of human capital in a society has positive effects on productivity and growth. One study of 111 countries from 1960 to 1990 found that a one-year increase in the average education of a nation’s workforce increases the output per worker by between 5 and 15 per cent. Conversely, low average levels of education can slow economic growth, damage the earnings of low-skilled workers, and increase poverty” (Lowell and Findlay, 2001, p. 6).

Nonetheless, the picture is not complete without having an idea of what happens to those highly skilled Africans who migrate to other parts of the world. By far, most of them end up in OECD countries, primarily North America and Europe. In Canada, the USA and Europe, immigrants represented 31 per cent, 21 per cent, and 14 per cent, respectively, of the increase of highly educated labour force. Such labour force comes from all over the world and not just Africa, but we can take a closer look at African migrants. For instance, in the USA, a study by the Census Bureau, between the years 2008 and 2012, found that “compared with the overall foreign-born population, the foreign-born from Africa had higher levels of educational attainment” (Gambino, et al. 2014, p. 9), meaning that, if considered as one group, African immigrants – first generation immigrants – are shown to be the most formally educated of all immigrants in the USA. The situation may not be the same in Canada and Europe, but given that the majority of highly educated African migrants go to North America, with the USA receiving more of them than Canada (for reasons that seem to be generally related to differences in the sizes of the job market and population between the two North American countries), the statistics from the USA carry a strong impression.<sup>3</sup> There are, however, studies that speak specifically to African migration of the highly skilled in some European countries (e.g. Nunn, 2005) and their results seem to echo the situation in the USA.<sup>4</sup> Overall, various studies have established that immigrants contribute significantly to technological progress and innovation in the OECD, whether in industrial R&D or scholarly and academic R&D, especially in Science, Technology, Engineering and Mathematics (STEM) (Hunt, 2010; Ruiz, 2014) or overall improvements in products and services provided by innovative companies (Hewlett, Marshall and Sherbin,

2013). In direct economic contribution, immigrants overall contribute to public budgets of OECD countries, in the form of taxes (income, property and business taxes) annually more than they receive from states in the form of social services (Greenstone and Looney, 2010; Liebig and Mo, 2013; Chiswick, 2011).

The former president of the USA, Barack Obama, once said, “We can never say it often or loudly enough: immigrants and refugees revitalize and renew America”.<sup>5</sup> If African immigrants can generally have this overall positive impact in their newly-adopted countries, and if the impact on the other side (in Africa) is almost opposite to that, we can begin to see why African ‘brain drain’ is a significant, longstanding challenge.

However, it would indeed be unrealistic and untrue to say that skilled labour migration, in the modern world, has no positive aspects, or that things would be better if it did not exist at all. The movement of educated minds and exceptional talents across borders, since the last century, has contributed to realizing breakthroughs, enhancements and transformations in theories and applications in science, technology, communication, ideas, trade, social systems and knowledge paradigms, and even before that, all over the globe. In recent trends, many skilled migrants from developing countries to OECD countries gain advanced knowledge and techniques in research and technological specialties. In several cases, such gains were shown to find a way to contribute to science systems back in their first home countries, in various ways. For example, a significant number of skilled migrants tend to stay connected with their first homes and become actively involved in relevant research, teaching and consultancies in their scientific and technical fields in their first homes.

Additionally, skilled migrants who begin to earn higher incomes in their newly-adopted countries tend to contribute to the economies of their first homes by sending remittances, and sometimes investing there (Lowell and de la Garza, 2000; World Bank, 2011); even some second generation immigrants with high skills and high earnings seem to do the same actions as their parents. In some cases, immigrants return to their first homes, bringing back with them added knowledge and skills (Lowell and Findlay, 2001; OECD, 2014). Africa has its share of these cases (Haque and Khan, 1997; Haque and Kim, 1995). Nonetheless, it is noted that no studies so far could say that the economic benefits from migrant remittances to their first home outweigh, or even balance out, significant losses caused by massive outflows of skilled labour.

Additionally, several studies have shown that some of the highly skilled migrants do not send remittances, especially if they remained for prolonged periods outside their first homes, while those who return to their first homes often return as retirees, no longer active in their skilled professions.

What could be said, to understand the big picture, is that skilled labour migration is not necessarily always a problem or a negative thing in itself; but it becomes a serious problem when it becomes ‘brain drain’, that is when it becomes massive, continuous and disproportionately disadvantaging to one side – the fragile countries; that is when it becomes unsustainable. Currently, in the case of Africa, it is unsustainable.

### **How the world responds to ‘brain drain’**

Although the challenge is as big as it appears by now, lessons from around the world show that there are approaches that can work in mitigating the loss of a country’s highly qualified citizens. For instance:

“The migration of skills can be slowed through the return of expatriates to their country of origin, as demonstrated by the examples of Israel... China, and more recently India and Mexico, whose diaspora communities have been mobilized to transfer, teach, and upgrade the vital technical and managerial skills needed in their countries” (Aubert, 2005, p.27).

Countries around the world have been addressing this phenomenon with various strategies; particularly in Asia’s emerging and newly industrialized economies, but also other countries such as Mexico.

Policies of addressing mass exodus of knowledge and skills have been summarized by what is called ‘the six Rs’ as a list of main approaches all starting with R: Return, Restriction, Recruitment, Reparation, Resourcing, and Retention (see Fig 6.2):

“The choice of “Rs” is simply expository; there is no agreed-upon terminology for the policies used to respond to the brain drain. Thus, return, restriction, and recruitment are policies directly affecting the movement of people (e.g., migration policies). Reparation refers to schemes to create monetary compensation to source countries for brain drain. The resourcing option includes a variety of approaches that might be grouped under what are variously known as diaspora options, e.g., ways to benefit from expatriates. Retention includes policies that focus on improving domestic opportunities in the educational sector, as well as those that target domestic economic growth and lessen the incentive to emigrate” (Lowel, 2001, p. 3).

Depending on the country, a mix of the above approaches have been used or explored. 'Return' is perhaps the most direct and rewarding approach, but also perhaps the most challenging. A mix of incentives, opportunities, and perhaps consequences, may make return a viable option for a good number of skilled migrants (including those who received foreign education). For example, economic growth in China, along with political stability, improved housing and the opportunities opened with growth, made tens of thousands of Chinese migrants consider returning (Démurger and Xu, 2011), but also government policies made it encouraging for foreign-educated managers, academics and scholars to take the return option seriously.<sup>6</sup> The size of the phenomenon of returnees, and the preferential treatment many of them receive ('recruitment'), became worthy of its own name in China since the last decade: sea turtles. But while economic growth made sea turtles return to China, their return itself propagates that growth by increasing the pool of skilled human capabilities and middle-income consumers in the country. Policies of 'recruitment' have also been tried, with relative success, in India and Thailand (Kale, Wield and Chataway, 2008; NSTDA, 2015). As Kale et al. (2008) put it: "Over the years, [regions of India and China] typically have been treated as low-cost production sites for multinational companies, but the 'reverse brain drain' of engineers or scientists educated and trained in the US or Europe can accelerate technological upgrading of these regional economies" (p. 417).

The 'restriction' approach exists in many developing countries, where there are some policies and regulations that make travel abroad for work not easily accessible to all skilled workers. Although the restriction approach can keep some people from migrating (or going abroad for work for some years), its sustainability is questionable as globalization takes hold all over the world. However, when used in calculated, flexible doses, and combined with other policies of incentives, restriction may be prudent. Restriction policies, if necessary, must be carefully introduced, because if not taken voluntarily they might create a tension between the country's "public good" and citizens' human rights in freedom of travel and movement, as per – for example – the 1948 Universal Declaration of Human Rights.

'Reparation' was, and continues to be, an approach that still invites strong opinions and sentiments, although it has not been broadly implemented. It is the idea that loss of human capital deserves compensation for countries that bear the consequences of that loss, paid either by the recipient countries or by the migrants themselves (in the

form of ‘brain drain taxes’). Lowell (2001) reports that the idea was quite popular in the 1970s, despite never being realized. Could it still hold ground today, now that many studies have cumulated evidence for the benefits of receiving countries from brain drain and the losses borne by ‘sending countries’?

‘Resourcing’ and ‘retention’ policies are perhaps the least controversial in the era of globalization, in both theory and practice. India, Mexico, Thailand, Bangladesh, China, and South Africa are some of the countries that use policies of resourcing and retention (Bangladesh Employers’ Federation, 2015; Zweig, 2006; Aubert, 2005; Lowell, 2001; NSTDA, 2015). For example, leading collaborative research and co-publishing have been a noticeable trend between home-based and migrant Chinese scholars (Wang, et al., 2013). This can be compared to the level of collaboration among African scholars, inside and outside Africa, which is limited and disparate (Mouton, Prozesky, and Lutomia, 2018).

### Figure 6.2: How the World Responds to ‘Brain Drain’: The Six Rs

<b><u>Return</u> of migrants to their source country</b>
Permanent return focus of most policies
<b><u>Recruitment</u> of international migrants</b>
Improved regulatory and other incentives
<b><u>Restriction</u> of international mobility</b>
Restrictive exit/travel policies
<b><u>Reparation</u> for loss of human capital</b>
Compensation for skilled migrants’ opportunity cost in the country of origin, through tax paid wither by host states or migrants themselves
<b><u>Resourcing</u> expatriates</b>
Establish links and networks with the diaspora in order to facilitate STI transfer and remittances
<b><u>Retention</u> of local skills</b>
Creating national robust institutions to encourage skills to stay and retain work ties with those who have left

Source: Adapted from Lindsay, Lowell B., 2001, P.4

These experiences and others, broadly reviewed, bring perspective into the African situation: massive outflows of highly skilled Africans are problematic but relative mitigation is possible, if we learn from such experiences and adapt to our contexts.



## Case studies from Africa: current approaches

Rwanda has been successful in adopting internationally accepted best practices for ICT, and in so doing, becoming a hub for technology innovation in sub-Saharan Africa (Chand, 2018). One of the key findings of the World Investment Report was that countries that ranked high in nepotism and corruption in the labour market were also ranked high in 'brain drain'. By improving its anti-corruption apparatus, coupled with investment in the ICT field, Rwanda reaped the fruit of reducing push factors for 'brain drain' by attracting talents from other parts of Africa (UNCTAD, 2012).

This points to the importance of African countries investing in the fields of science and technology if they want to reverse their 'brain drain'. Rwanda is now a leader in sub-Saharan Africa in attracting talent from other countries, followed by Seychelles, Morocco, and Ivory Coast (Chand, 2018). A large part of Rwanda's success could be attributed to its working with different internal stakeholders to design its Technical and Vocational Education and Training (TVET) programme to help meet the demands of the labour market. The programme was launched in 2008 and has resulted in more workers with technical skills who can be employed by industries. This went hand in hand with its "One laptop per child" policy in educating children in schools. Additionally, Rwanda has benefited from a relatively open visa policy in attracting international and African talents (UNCTAD, 2012).

Ethiopia, on the other hand, has extended to its diaspora members the same benefits and rights as domestic investors through the issuance of yellow cards and introduced investment incentives for diaspora members. These practices can be studied and adapted by different African countries as they design their own programmes to connect with their knowledge diaspora in the US (UNCTAD, 2012).

Nigeria, as well, has well-developed diaspora professional associations in the US and returnee diaspora organizations (UNCTAD, 2012). In 2017, Malawi launched a national diaspora engagement policy which "seeks to establish a mutually beneficial relationship between Malawi and her diaspora, with the underlying goal of mainstreaming and empowering Malawians abroad to effectively make significant and effective contribution to the development of the country" (Republic of Malawi, 2017). On February 18th, 2019, Malawi's first diaspora portal was launched – a platform that aims to provide an interactive platform for continuous engagement with highly skilled Malawians abroad and connect them with stakeholders at home.

At the continental level, one example of short-term diaspora engagement projects is the Carnegie African Diaspora Fellowship Program (CADFP), a scholarly fellowship programme for educational projects at African higher education institutions. It is offered by the Institute of International Education (IIE) in collaboration with the United States International University-Africa (USIU-Africa) and funded by a grant from Carnegie Corporation of New York (CCNY). In the pilot of the programme (2013–2015), the CADFP supported 110 short-term fellowships for African-born academics (UNCTAD, 2012). An ongoing initiative is for instance, a collaboration between the African Academies Diaspora Fellows Program (AADFP) in Senegal and the Inter-Academy Partnership Carnegie Project (IAP-NASAC project Academies). The Academy started to create a diaspora database to establish a strong cooperation link between the Senegalese scientific diaspora and their home country. It also helps to develop a national strategy for Senegalese skills residing abroad, to enable them to contribute to Senegal's economic, social, and cultural development efforts in training, research, expertise, consultancy and specific initiatives that enhance research results.

The African Union has a Citizens & Diaspora Directorate (CIDO), “the department responsible for leading the AU's engagement with non-state actors through Diaspora & Civil Society Engagement.”<sup>7</sup> According to CIDO, it works to engage the African diaspora and civil society to work closely with the AU's Economic, Social and Cultural Council. It could perhaps be utilized more to coordinate approaches such as the aforementioned ones. On the other hand, in September 2018, Ghana declared 2019 as the ‘Year of Return’, commemorating the 400th anniversary of the arrival of enslaved Africans in the Americas. The call was made to people of African descent to return to their home continent.<sup>8</sup> While too early to assess, and while meant to be inclusive, it could be another window of attracting highly skilled professionals, entrepreneurs and others who could contribute to Ghana's STI system; and could lead other African countries to observe and learn from Ghana.

Another example of such an approach would be the services provided by the African Partners Medical Group, a group of African doctors and nurses in North America and Europe who sponsor annual educational workshops around Africa. These workshops through teaching, seminars, and hands-on experiences, help local physicians, nurses, and other supporting staff with opportunities to acquire new skills in a small group setting.

## Discussion

Two things can be learnt from literature and reality: that the African massive outflow of skilled labour overall works against the development agenda of the continent, including the agenda of advancing STI, and that measures can be taken to address it. As shown from records, highly skilled labour migration is not likely to resolve itself (rather, it is more likely to exacerbate) but the experiences of other countries show that it is possible to steer trends towards more favourable outcomes, that is, from ‘brain drain’ to ‘brain circulation’. Although conditions in African countries in general tell a different story from South Asia, China or Mexico, lessons could still be learnt from their experiences and modified to look towards Africa. State policies play a sure role in the picture (De Haas and Rodríguez, 2010).

The ‘Six Rs’ approaches provide a variety of possibilities and policy mixes. Resourcing and recruitment, for example, can work together through various policies to make Africans abroad more engaged and interested in African science systems, whether they remain physically in their newly-adopted countries and find opportunities of being involved in work in Africa while not necessarily ‘moving back’ completely, or they decide to return (partially or fully). Research projects, on topics of scientific and technological frontiers or relevance, can draw talents and skills from a larger pool than those already residing in Africa, and can intentionally make research and R&D collaborations between ‘diaspora’ and ‘homeland’ Africans more frequent and significant than they are now. Retention policies, on the other hand, could purpose to value the African talents that are already residing in the continent, by ensuring an enabling and conducive environment for researchers, technologists and innovators to build their careers. Absorbing local talents, in productive and fulfilling career paths, is a priority.

Windows of ‘return’ are not far-fetched either. African migrants always express nostalgic sentiments of home and some of them do return; this reverse mobility presents “a major advantage of mobility for home institutions, in the case of returning researchers, is gained through the resultant brain gain” (Beaudry et al., 2018b, p.114). As put by a young African scientist: “Actually it’s not leaving for good but leaving only for opportunity and then coming back because this is my homeland, it’s where my family is ... [The reason I am going is] to expand the scope of my work and also to be able to practise what I have, if I had the opportunity” (Beaudry et al., 2018b, p.114).

Despite massive outflows, there have been noticeable inflows recently of returning Africans to the continent – skilled workers and entrepreneurs who took recent economic growth records in African countries as windows of opportunity (see for example, Sinatti, 2018; Black and Castaldo, 2009). Overall, the number of expatriate workers and migrants in Africa has been steadily increasing since the beginning of the millennium. According to the International Migration Report of 2017, by the United Nations, 25 million documented international migrants were residing in Africa in 2017, accounting for about 2 per cent of the total population in the continent. Between 2000 and 2017, migration to Africa increased by an average of 3 per cent per annum. This evokes lines of thinking that, if this number is increasing, to meet increasing demands from growing local economies in African countries, it should be intuitive that many of those incoming expatriates could be and should be returning skilled Africans. As we saw earlier (in the previous section), that is what happened in China, India, Thailand, Mexico and other countries.

While ‘restriction’ measures already exist in many African countries, they alone do not seem to work properly. Rather, they are seen as problematic in the era of globalization and mobility of labour, goods and finance. On the other hand, some countries already have some ‘reparation’ policies in place, although they are not called that. In countries like Sudan, for instance, Sudanese expatriates have been contributing more to the state budget, through different payments for public services and taxes, than their local counterparts. Eritrea has a similar system. Such measures are not necessarily problematic or unpopular by themselves but can be viewed as ineffective when managed poorly, for example, when expatriates still receive little-to-no recognition for their contribution and when the general public service and taxation systems fail to meet basic standards of good governance.

We would also do good to touch on whether levels of respect for human rights can be influential in determining trends of ‘brain drain’ besides economic development and political stability; sometimes comparably. Admittedly, most of the literature on migration and brain drain has focused on the subject from a development perspective; particularly economic opportunities and general conditions that count as political stability. Yet, addressing human rights’ deficits as one of the elements affecting migration in general, and highly skilled labour migration in particular, is a legitimate angle of inquiry. As explained in a paper by the Office of UN’s High Commissioner for Human Rights, “where poverty

and lack of opportunity is a major cause of migration, human rights can contribute to remedying these factors such as gender discrimination and lack of equal access to education, health and housing” (p. 5). For a long time, research on the area did not quite pick-up on the connection between socioeconomic opportunities and human rights, but such oversight is difficult to excuse under some influential discourses on development, such as the ‘development as freedom’ discourse, pioneered globally in the last two decades (Sen, 1999).

## **Conclusions and recommendations**

A well-educated and skilled labour force is a key resource that every country in the world seeks to have enough of. The global phenomenon of human mobility across borders and seas, for visiting, working and learning, is overall an impressive feature of modernity, allowing humanity, its creativity and productivity, and the fruits of such creativity and productivity, to be more global and less territorial. For science systems, and for STI and R&D, this feature does wonders when different minds from around the world have access to each other’s wealth of knowledge and skills. The big picture of that phenomenon however still has negative aspects to deal with. The phenomenon of massive outflows of highly skilled labour from developing to developed and industrialized countries, often referred to as ‘brain drain’, is one of these aspects. For Africa, it is a significant problem.

As African scientists, engineers, managers and innovators leave the continent at a rate higher than what the continent can relatively balance through local opportunities of higher education, career and research support, African science systems are left continuously disadvantaged by brain drain. The disadvantage also affects the economy and overall development agenda. To build more sustainable and productive science systems and STI environments, brain drain needs to be addressed at national and regional levels. It would be advisable to do this through evidence-informed policies that rely on accurate description of the phenomenon, accurate relevant data, and a reliable study of possible remedies. There is need to increase studies on African ‘brain drain’, but with what we already have as data and case studies of practices from around the world, we can build informed opinions and suggest initial policy directions.

African national and regional institutions that deal with STI and science systems should take highly skilled labour migration seriously. For example, events that address the problem as a main issue, instead

of a side topic, should be organized, for example, national and regional fora and conferences, focused meetings of governments, industries and academia (triple helix), and related initiatives. Previous experiences on international and national levels in other parts of the world exist, and conventions, conferences, and policy roundtables, as well as policy papers, are common practices that precede policy agenda setting and formulation.

National policies that are directly related to 'brain drain' should explore the 'six Rs' approaches, to come up with suitable policy mixes and use various policy instruments (including regulations, incentives, targeted programmes, and soft instruments such as information dissemination and awareness campaigns). There is also a need to facilitate and encourage collaboration between scientists, engineers, and administrators of the African diaspora and those in the home continent, on various projects and programmes. This approach has a record of making a difference, as witnessed in the Chinese and Indian experiences. In addition to all the above, strengthening and promoting research and R&D establishments in Africa is a must, by all means possible and sustainable. Researchers and developers are more inclined to stay and build careers at home when a conducive research environment that allows them career growth exists, while in return they enrich the entire science system.

There are also other regulatory aspects that may not be directly related to 'brain drain' but they influence national environments and how they fare in comparison with other countries. For example, dual-citizens are nowadays, generally, an advantage to their first homes (countries of origin/birth), in the era of globalized knowledge and business; thus policies that reduce the ability of migrants who attain new citizenships to contribute to technological and economic progress in their first homes should be reconsidered. Currently there are African countries that keep national policies and criteria, from decades ago (when they perhaps made more sense than nowadays), that are unfriendly to multiple citizenships. Such policies are increasingly disappearing from the rest of the world, for the reasons mentioned above.

Overall, there is a problem that needs to be acknowledged, and there are possible remedies or solutions to investigate. African countries, individually and collectively, cannot afford to lack a strategy of mitigating the challenges of 'brain drain' and optimizing any relatively positive aspects and opportunities related to it.

## Notes

<sup>1</sup> Although, on the other hand, some trends are encouraging in some respects, such as that ‘the proportion of female to male researchers [in the Southern African region] is better than in many countries outside the [southern Africa].’ (taken from the first regional report on investments in R&D for STI, by Southern African Development Community (SADC); not made public yet).

<sup>2</sup> Contrary to this, in many cases, emigration cannot be considered as a permanent decision, and skilled migration is characterized by its temporary nature. Moreover, empirical evidence has identified a correlation between migration flows to the host country and knowledge flows to the source country (Radwan and Sakr 2018).

<sup>3</sup> There are other strong impacts of migrants on industrialized countries, that may not be directly related to highly educated labour force but still related to semi-skilled labour force that is crucial for industrialized economies. For instance, in addition to the above, “immigrants represented about a quarter of entries into the most strongly declining occupations in Europe (24%) and the United States (28%). In Europe, these occupations include craft and related trades workers as well as machine operators and assemblers; in the United States, they concern mostly jobs in production, installation, maintenance, and repair. In all these areas, immigrants are filling labour needs by taking up jobs regarded by domestic workers as unattractive or lacking career prospects.” (OECD, 2014, p. 2)

<sup>4</sup> Mary Kent. ‘More US Scientists and Engineers are Foreign-born.’ January 11, 2011: <https://www.prb.org/usforeignbornstem/>

<sup>5</sup> Barack Obama, from a speech on December 15<sup>th</sup>, 2015 at the National Archives Museum, where immigrants from over 25 countries were sworn in as U.S. citizens.

<sup>6</sup> ILO. “International Migrants Day (18 December 2006). Reversing the brain drain in China: the return of the ‘sea turtles’”. Article, 11 December 2006: [https://www.ilo.org/global/about-the-ilo/newsroom/news/WCMS\\_080665/lang--en/index.htm](https://www.ilo.org/global/about-the-ilo/newsroom/news/WCMS_080665/lang--en/index.htm)

<sup>7</sup> African Union. The Citizens & Diaspora Directorate (CIDO). Viewed on March 27, 2020 on: <https://au.int/en/directorates/citizens-diaspora-directorate-cido>. Further information could not be found about the activities and projects of CIDO to date.

<sup>8</sup> Benjamin Tetteh. “2019: Year of return for African Diaspora”. *Africa Renewal*, December 2018–March 2019: <https://www.un.org/aficarenewal/magazine/december-2018-march-2019/2019-year-return-african-diaspora>

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