

Scientific Mobility and the African Diaspora

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SECTION A

INTRODUCTION

A.1 BRAIN DRAIN AFFECTS BOTH DEVELOPED AND DEVELOPING COUNTRIES

Although every human society is characterised by both internal and external mobility and migration has become part of modern economic and social transformation, the magnitude and direction of these flows has gained momentum in the recent past. Moreover, while general population movements may have characterised the early migration processes, those of the last five decades have been systematically dominated by skilled people, whether in South-North, North-North, North-South, and South-South Movements. Even in situations where political conflict or instability triggered such population movements, it has become clear that more often than not it is the highly-skilled people who leave their country of origin in search of better opportunities elsewhere. This phenomenon of the movement of the skilled-human resources from one country to another in search of better socio-economic opportunities in a peaceful political environment is herein described as brain drain.

In an increasingly globalising knowledge economy where human resources matter most, brain drain – also tagged the “flight of human capital” – now centred more on the scientific, engineering and technological workforce. The Europeans have had their share of brain drain of the highly skilled to North America, especially the United States of America (USA), which indeed prompted the British Royal Society to coin the term “brain drain” in the 1960s. For example, it has been estimated that about 400,000 European science and technology graduates now live in the USA and that thousands more depart every year. Meanwhile a survey released in November 2003 by the European Commission found that only 13% of European science professionals ploughing their trade abroad had intended to return home in the future (*Time*, 19 January 2004:32).

However, today the increasing outflow of highly-skilled people from the developing to the developed countries comprises another area of concern. This latter movement of

the highly-skilled people has received much global attention in the recent past due to the growing inequality in the production and utilization of scientific and technological knowledge and innovation processes. The rising inequalities in the capacity in scientific fields (such as health and medical sciences) and important sectors (such as higher education) have given cause for alarm. This is particularly so because scientific and human resource developments in these fields and sectors are of crucial importance towards addressing the challenges that developing nations face (as embodied in the United Nations (UN) Millennium Development Goals).

Moreover, although the mobility of skilled personnel between developing countries is still under-researched and available empirical data rather sketchy, there appears to be an emerging phenomenon of an '**internal brain drain**' (Oni, 2000). For instance, there is some anecdotal evidence of skills migration from other Sub-Saharan (and in particular Anglophone) countries to South Africa. A further phenomenon in South Africa and other developing countries - again the evidence is only anecdotal at this stage - is that of an **intra-country brain drain** from academia to government and industry. Both of these developments are fuelled by the stagnant salaries in many higher education systems in Africa and, arguably, present a more serious, if not permanent, brain drain than the loss of the academic workforce to overseas higher education institutions. The reason for saying this is because it is highly unlikely that those who have gone to industry and government will return to academia.

A.2 A BRIEF OVERVIEW OF THE SCALE OF THE BRAIN DRAIN IN DEVELOPING COUNTRIES

Although studies on the size and extent of the brain drain are bedevilled by the absence of reliable and systematic data on international migration - something that is made more difficult by the fact that countries use different methods for recording migrants (Carrington & Detragiache, 1999) - the following figures are provided in order to give a flavour of the scale of the outflow of highly skilled personnel (HSP) from developing countries.

- The Commission for Africa (2005) estimates that around 70% of Ghanaian medical officers trained in the 1990s have left the country. Further, it has been estimated that there are more African scientists and engineers working in the USA than in the whole of Africa (Nunn, 2005).
- The Zimbabwe National Association of Social Workers estimates that 1,500 of the country's 3000 trained social workers emigrated to the UK during a period of 10 years (Mutume, 2003).
- Teferra (2000) mentioned that of the 20 members of the physics faculty at Addis Ababa University who left the country (mostly for the US) to undertake their PhD studies, none has returned.
- Among the immigrant populations living in the US, those from Sub-Saharan Africa are among the groups with the highest proportion of higher education qualifications (Carrington & Detragiache, 1999).
- The United Nations Development Programme (UNDP) estimates that up to 100 000 professionals leave India each year to take up jobs in the US (Mashelkar, 2005).
- The US is the leading beneficiary – the world's “largest skills magnet” (Lowell, 2003) – of the international mobility of highly skilled personnel, with 40% of its foreign-born adult population having tertiary education. It also has 32% of all foreign students studying within the OECD countries, and these students are becoming a major source for the recruitment of high-skilled labour by US firms (Cervantes, 2002).
- Data from the US shows that, on average, only 50% of overseas graduate students return to their country of origin on completion of their studies, and that the rate of return has been declining despite the increasing volume of immigration to the US (Lowell, 2004). However, some countries have higher rates of return than others. For example, 79% and 88% of the 1990/91 cohort

of doctoral graduates in the US who came from India and China, respectively, were still working in the US in 1995. In contrast, in the case of Korean and Japanese doctoral candidates who also graduated in 1990/91, only 11% and 15%, respectively, were still working in the US in 1995 (Cervantes, 2002).

In conclusion, from this brief overview it is clear that the migration of highly skilled scientific personnel affects developing countries and has particularly devastating consequences for the development prospects of countries especially in Africa.

SECTION B
SKILLS AND MIGRATION IN INDUSTRIALISED AND NEWLY
INDUSTRIALISING ECONOMIES¹

B.1 INTRODUCTION

In the current knowledge-based economy where knowledge is the most important factor in the production, distribution and utilization of goods and services and in ensuring national competitiveness in the global market, developing and increasing the appropriate human resource base in science, technology and engineering is the main policy challenge facing most countries. However, the shortage of skills in S&T is emerging as one of the crucial factors that may hinder the development of knowledge-based societies. The developed countries in this study are currently using their educational and immigration policies to attract more people, especially from the developing countries to cover the shortfall in their human resources. Thus, the internationalisation of the higher education system implies that foreign students are now a very good source of labour to the recipient nations. In this regard, developing countries seem to be the main losers where the rate of return of students trained abroad is low, for example, India. However, there are also prospects for reverse brain gain, although this is low when compared with the levels of brain drain in Korea, India and Malaysia.

B.2 COUNTRIES WITH INDUSTRIALISED ECONOMIES

B.2.1 Canada

The brain drain of highly skilled people is not a major problem in Canada. However, there are concerns about the movement of such skilled people to the United States, especially in the information and communications sector. The lack of employment opportunities for new graduates, partly because of the demand for three to five years' work experience by Canadian employers, is seen as a problem.

¹ This section benefited greatly from a draft report by CENIS on the National Innovation Systems of selected countries, April 2003.

It is also worth noting that Canada itself is a good recipient of migrant workers from other countries around the world. The number of these migrant workers, both as temporary and permanent residents, has been increasing over the years. Currently over 90,000 foreign workers enter Canada every year as temporary workers to help address the shortage of skills in some sectors of the economy.² In fact, a study in 1999 indicates that new immigrants were responsible for over 30% of employment growth among computer engineers, systems analysts and computer programmers during the period 1991-1996.³ The Expert Panel on Skills serves to constantly remind the government that Canada is competing with countries such as the USA, Australia, European Union member states and Israel for skilled immigrants and should therefore formulate the appropriate policies to attract and retain them.

Indeed, in its February 2003 Budget Statement, the Government of Canada announced that it would invest \$41 million over the next two years to assist new Canadians to integrate quickly into the economy. Such assistance would cover areas including second language skills, faster recognition of foreign credentials, or pilot projects to attract skilled immigrants to smaller communities across Canada.⁴ This initiative falls in line with the government's belief that getting highly qualified immigrants coming into the country as permanent residents or temporary foreign workers is one the three sources of addressing the skills challenge.⁵

Besides attracting highly qualified immigrants as permanent residents and temporary foreign workers, there is a drive to intensify the recruitment of top international students into the country as they may choose to become permanent residents upon graduation. Meanwhile, the new *Immigration and Refugee Protection Act* and its regulations now makes it possible for qualified foreign workers to apply for permanent residents status without having to leave the country.⁶ As argued in a recent study in 1999, "immigrants are expected to account for all net labour force

²<http://www.cic.gc.ca/english/work/index.html> 09/07/2002 (The President of the South African Medical Research Council complained about the migration of medical doctors to Canada from South Africa in 2000.)

³ Stepping Up: Skills and Opportunities in the Knowledge Economy, Report of the Expert Panel on Skills, 2000, p. 45.

⁴ "The Budget Speech 2003", 18 February 2003. <http://www.fin.gc.ca/budget03/speech/speeche.htm>

⁵ *Achieving Excellence*, p56.

⁶ *Achieving Excellence*, pp.57&58.

growth by 2011 and for all net population growth by 2031”⁷. There have been encouraging signs because recent immigrants to Canada, on average, obtained higher levels of education than the Canadian-born population. In 2000 for example, 58% of the working-age immigrants had a post-secondary qualification at entering, as compared with 43% of the existing Canadian population.⁸ Meanwhile under the Canadian Research Chairs programme, the government announced in November 2002 that 43 out of 123 scientists were recruited from abroad. Together, expatriate and foreign-born appointees accounted for 35%. This represents a higher percentage than the previous six rounds, where only 85 out of 623 scientists appointed were from outside Canada. This attests to Canada high drive in search of highly qualified researchers from overseas.⁹

To further consolidate the process of attracting and retaining skilled immigrant, the Canadian Government has announced additional measures to facilitate immigration and integration processes in its 2006 Budget Statement. These measures include:

- Effective immediately, reduction of the Right of Permanent Residence Fee by 50% from Can\$975 to Can\$490;
- Increasing immigration settlement funding by Can\$307 million; and
- Taking action to establish the Canadian Agency for Assessment and Recognition of Foreign Credentials.

B.2.2 United Kingdom

Even though there are no critical shortages of technical skills in the UK, shortages of skills are occurring in the fields of engineering, mathematics and the physical sciences. As part of the drive to encourage more overseas scientists and engineers to come to the UK, Prime Minister Tony Blair took an initiative in 1999 to increase the number of overseas students studying in the UK. Efforts are now being made to permit overseas students with skills and knowledge in science and engineering to pursue their career objectives in the UK, if they get the opportunity to do so after obtaining their degrees. The government is also changing immigration and work-

⁷ *Knowledge Matters*, p49.

⁸ *Knowledge Matters*, p51.

⁹ “New Research Chairs Mean Brain Gain for Universities” *Science* Vol 298, 6 December 2002, p1879.

permit rules so that students who qualify for a work permit can secure one without leaving the UK. Furthermore, the government is also removing the requirements for separate permits for supplementary work to enable foreign academics to work more easily in the private sector, for instance, as consultants or entrepreneurs. The UK also hopes to facilitate the movement of people, following the creation of the European Research Area.¹⁰

In the Pre-Budget 2002, the government reconfirmed the importance of overseas skills to fill the shortages of positions facing UK employers. On 28 January 2002, the UK Government launched a new Highly Skilled Migrant Scheme to further support employers' efforts to recruit highly skilled people. The scheme will enable highly skilled individuals to come to the UK without a specific job offer. Applicants need only to demonstrate their eligibility for the scheme through educational qualifications, work experience, achievements in their field or past income.¹¹ As a result, the work permit and immigration system has been reviewed. Work permits are now issued for up to five years rather than four as before, and the processing times have dropped to the extent that more than 95 per cent of applications are processed within 24 hours.¹²

The UK immigration procedures have also been revised to make it easier for overseas students to obtain permission to work in the UK on completion of their studies.¹³ For instance, in the Pre-Budget Report for 2005, the Government announced measures to help the Higher Education sector benefit from the opportunities of globalisation (or internationalisation of Higher Education). This is to ensure that the UK retains its reputation as one of the most attractive places for students to study abroad. In fact, the international market for overseas students in the UK is worth over £3 billion to the economy each year (HM-Treasury, 2006:67). In March 2006, the UK Home Office announced new proposals for redesigning the migration system, which according to the Government will provide a more efficient, transparent and objective application process for those willing to come to the UK to work or study. According to the

¹⁰ Excellence and Opportunity, p. 25.

¹¹ HM Treasury Pre-Budget Report 2002.

http://www.hm-treasury.gov.uk/Budget/bu_bud02/budget_report/bud_bud02_repchap3.c

¹² HM Treasury Pre-Budget Report 2002.

http://www.hm-treasury.gov.uk/Budget/bu_bud02/budget_report/bud_bud02_repchap3.c

¹³ HM Treasury Pre-Budget Report 2002.

http://www.hm-treasury.gov.uk/Budget/bu_bud02/budget_report/bud_bud02_repchap3.c

proposals, students who obtain degrees from UK universities will get extra points within the new system, thus making it easier to work in the UK on a long-term basis. The UK Government has stated that it will build on this progress so as to:

- Implement early, from 1 May 2006, the announcement made in the 2005 Pre-Budget Report to allow all international students on completion of a post-graduate degree, or an undergraduate degree in a shortage sector, or work in the UK for up to 12 months, benefiting up to 50, 000 students;
- Establish three new University Partnerships Schemes to enhance long-term sustainable links between UK universities and centres of excellence in India, Russia and South Africa through academic exchanges, scholarships and research collaboration in science and technology; and
- Lead more high-level education trade missions to help universities and businesses open new markets and expand existing ones (HM-Treasury, 2006:67).

While pursuing these policies, the UK Government and its agencies are at the same time concerned about the emigration of some of their best researchers and postgraduate students, especially to the USA. Determined to stem the brain drain in institutions the government, together with the Wolfson Foundation, is funding a Research Merit Award scheme worth £20 million, over several years, administered by the Royal Society. This scheme gives institutions extra funds to top up the salaries of researchers whom they wish to retain or recruit from industry or abroad.¹⁴

B.2.3 Australia

Data from the Australian Department of Immigration and Multicultural Affairs indicate that, although there have been occasional shortages of skills in some specialists' areas in the national economy there has not been a major brain drain. Instead, migration into Australia has been a source of skills from engineers, scientists, academics and computer professionals. Analysis of the data shows that during the 1980s net gain from migration was 55 000, of which 27 000 were engineers and 16 000 computer scientists. This net gain is said to be equivalent to the output of

¹⁴ OECD 2002. "United Kingdom" Science, Technology and Industry Outlook. P16.

graduate scientists and engineers from about five or six universities over the same period. In 1991, the bulk of the scientists and engineers came from the former Soviet Union.¹⁵

Reaping the benefits from migration, the Minister for Immigration and Multicultural Affairs announced that the 2001-02 Migration (non-Humanitarian) Programme was targeting 85 000 places in the national economy, including 37 900 places in the Family Stream and 45 500 places in the Skill Stream. The Skill Stream will consist of at least 54% of the total. In 2001, the Prime Minister also announced changes to the immigration policy to allow highly qualified overseas students to apply to migrate without leaving Australia. There is also a Skill Stream contingency reserve expanded to 8 000 places to accommodate any increased demand from successful foreign students obtaining an Australian qualification in a skill of national shortage, such as information and communication technologies.¹⁶ Meanwhile, the 2002-03 migration programme target ranges between 100 000 and 110 000, an increase of 12 000 over the outcome for the 2001-02 programme. The target for the Skill Stream is 60 000 and represents a 4% increase to 58% of the total programme and is set to be the largest migration programme in the past decade. The government is aiming at an average of 100 000 overseas migrants per year.¹⁷ (The 2001-02 programme achieved a target 93 080 migrants, of which 53 520 were highly skilled people) and it is two and half times larger than the skill stream in a decade.¹⁸

B.2.4 Finland

Closely related to our discussion of the human resource problems above is how the brain drain and brain gain will influence the future strength of Finnish national innovation. During 2000 a total of 16 830 immigrants entered Finland, while 14 291 emigrants left the country. Net immigration was, therefore, 2 539 people. Data from Statistics Finland indicate that between 1991 and 2000 the immigration inflow of

¹⁵ <http://www.dest.gov.au>

¹⁶ "Migration programme continues to deliver economic benefits"
http://www.minister.immi.gov.au/media_releases/media01/r01045.htm

¹⁷ "Transcript: Migration Benefiting Australia"
http://www.minister.immi.gov.au/media/transcripts/transcripts02/migration_conf.htm

¹⁸ "Migration programme highly skilled and largest in a decade"
http://www.minister.immi.gov.au/media_relaese/media02/r02068.htm

foreigners was 90 513, while those foreigners moving abroad from Finland numbered 19 580 people. In the same period Finnish citizens moving abroad from Finland was estimated at around 74 029. However, no official measures have been introduced to encourage the use of foreign labour as a way of alleviating the recruitment problems. Nevertheless, at the beginning of 2000 the Ministry of Labour reformed work permit application procedures at employment offices to serve labour market needs in more flexible, faster and more predictable ways. The reform has, however, been described as not having any effect on the basic structures that involve the use of foreign labour.¹⁹ There have also been attempts to encourage an estimated 1.3 million Finnish emigrants and their descendants living outside Finland to return. There are Ministry of Labour officials present at the Finnish embassies in St Petersburg and Stockholm to offer information and advisory services for returnees (Sweden, in particular, having been a very good recipient of Finnish emigrants in the past).

B.2.5 USA

Increasingly, the migration of skilled science and engineering (S&E) workers across national frontiers is seen as a major determinant of the quality and flexibility of the labour force in the most developed and industrialized countries. In fact, the United States (US) has since the 1960s been a major receiver of migrant and skilled labour from other parts of the world. Recent survey results indicate that the US receives an estimated 54.3% of the brain drain migration from developing countries to advanced countries. Carrington and Detragiache (1999) note that the US received 1.5 million immigrants from Asia, almost all of them having at least a high school education and the majority having a higher education qualification. Of the 300,000 immigrants from India and Korea, 75% and 53% respectively have tertiary qualifications. A large number (730 000) of the Filipino immigrants also have tertiary qualification, as well as half of the 400 000 Chinese immigrants.²⁰

Even though there are few African immigrants in their study, an amazing 75% of these are college educated, with the largest numbers from Egypt, South Africa and

¹⁹ Finland: OECD Sopemi Trends in International Migration, pp. 6-11.

²⁰ William J Carrington and Enrica Detragiache 1999. "How Extensive Is the Brain Drain? *Finance & Development (a quarterly magazine of the IMF)* June 1999, 36(2), p48.

Ghana. More than 60% of the migrants from these three countries have tertiary qualifications. As there are almost no African immigrants without at least a high school education, the African immigrants are considered the most highly educated with 95,000 of the 128,000 African migrants having secondary or tertiary education. An amazing 60% of all Gambian, Jamaican, Guyana, and Trinidad with tertiary qualifications immigrate to the USA. While in most other countries the percentages are much lower, a college educated person is much more likely to immigrate to the USA than those with no formal education. Even a few major countries, like Iran, Korea and Taiwan have 15% of all college graduates emigrate to the US each year. From Jamaica, 33% of all high school graduates and 77% of all college graduates immigrate to developed countries. Germany, France, Canada and Australia follow the USA as major importers of skills; together they account for 93% of the flow of migrants into the OECD countries.²¹

Much of the brain drain is an international, planned phenomenon. While the migration of highly educated individuals from China accounts for only 3% of their college graduates, the percentages from the top universities in those countries are much higher. Overall, 12% of all scientists and engineers in the USA are foreign-born, including 23% of those with doctorate degrees and 40% in the fields of engineering and computers. The *Science and Engineering Indicators 2002* report shows that in April 1999, 27% of doctorate-holders in S&E in the United States were born elsewhere. With regard to their fields of work, the lowest percentage of foreign-born doctorate-holders was in psychology (7.6%), and the highest percentage was in civil engineering (51.5%). Almost one-fifth (19.9%) of all those with master's degree in S&E were born outside the US. Even at the bachelor-degree level, 9.9% of those with S&E degrees were foreign-born; the largest percentages of these degrees were in chemistry (14.9%), computer sciences (15.2%), and engineering (14.6%).²²

Furthermore, in terms of immigrants with S&E higher degrees, 8% came from India, 7% from China, 4% from the Philippines and 4% from Germany (mainly from the former East Germany). On a regional basis, the highest percentage – 57% - came from Asia (including the Western Asia sections of the Middle East), 24% from Europe,

²¹ How Extensive Is the Brain Drain? p49.

²² Science and Engineering Indicators, p3-29

13% from Central and South America, 6% from Canada and Ocean, and lastly, 4% came from Africa.²³ The most recent data for 1999 from the Immigration and Naturalization Service (INS), the number of permanent visas issued to immigrants in S&E shows a small decrease for each S&E occupation. However, the total number of immigrants employed in S&E is somewhat higher than that before 1992- a year in which various legislative and administrative changes took effect.

The overall picture based on recent data suggests that there are 3.1 million foreign-born S&E degree holders in the USA, 300000 of them have doctorates. Although no country is said to dominate as supply source, 14% of them came from India and 9% from China. In terms of foreign born S&E doctorate degree holders China accounted for 21% and India 14% (NSB, 2006:3-34). Meanwhile the US H-1B visa programme, provides visas for up to 6 years for individuals to work in occupations that require at least a bachelor's degree.

²³ Science and Engineering Indicators, p3-29&30.

B.3 COUNTRIES WITH NEWLY INDUSTRIALISING ECONOMIES

B.3.1 India

Since the 1960s brain drain of scientific and technical skills is a major problem facing most countries, especially the developing countries of which India is a part. This phenomenon has been exacerbated by the policies of developed countries ‘targeting’ professionals from developing countries. For example, in October 2000 the United States approved legislation allowing 195 000 additional work visas to be issued for skilled professionals. Of the 81 000 visas approved between October 1999 and February 2000, 40% were for individuals from India; more than half were for computer-related occupations and a sixth for science and engineering.²⁴ Meanwhile, the cost of providing university education to these professionals has been estimated at \$2 billion per annum, representing a great loss of resources from the national coffers.²⁵

However, a secondary effect has emerged: a new kind of business or brain drain/gain. The success of the Indian diaspora in the Silicon Valley IT sector in United States, for instance, is influencing the way the world views India. As reported in the 2001 UNDP’s *Human Development Report*, “Indian nationality for a software programmer sends a signal of quality, just as a ‘made in Japan’ label signals first class consumer electronics”.²⁶ In addition, the worldwide network of Indian professional has been investing in the development of skills at home (India). The network has worked to raise the endowments and improve the finances of some of India’s institutions of higher education. The network is also making efforts to establish five global institutes of science and technology. Furthermore, the strong link between Silicon Valley and Bangalore is built on the Indian Diaspora in trans-national networks as they invest and facilitate contacts for market access, especially within the IT sector.²⁷ Thus, the initial brain drain is turning out to be a positive brain gain.

²⁴ Human Development Report: Making new technologies work for human development, p38.

²⁵ Human Development Report- 2001, p91.

²⁶ Human Development Report -2001, p91.

²⁷ Human Development Report- 2001, p91.

B.3.2 Republic of Korea

As a developing country, the brain drain of skilled labour, especially those with post-graduate masters or a doctoral degree, is a major problem confronting Korea. In our discussion of the United States in this review study, we pointed out that of the 300,000 immigrants each from India and Korea, 75% and 53% have attained tertiary qualifications respectively.²⁸ Another survey for 1999 indicates that of the 738 Koreans who received doctoral degrees in science and engineering in the United States only 37% of them returned home.²⁹

However, with its major economic growth and development, Korea has been making concerted efforts to train more of the S&T workforce at home, to reduce outflow of skills. For instance, in the last five years Korean students earned more doctoral degrees at home than in the United States.³⁰ At the same time, the Korean Government is offering competitive salaries and good incentive packages to Koreans abroad with higher education qualifications to entice them to return home, unlike other developing countries with poor economic growth and development. This effect of this approach has been enhanced by the fact that R&D centres of foreign businesses in Korea are employing returning scientists and engineers, for example, Motorola Korea Software Research Centre and the South Korea International Business Machines (IBM) Tivoli Software Development Centre.³¹

Recently, the Korea Government also introduced a “green card” system aimed at encouraging the employment of foreign scientists in permanent research positions. The government issues the green card to qualified foreign scientists, and it entitles them to long-term multiple visas.³²

²⁸ William J Carrington and Enrica Detragiache 1999. “How Extensive Is the Brain Drain? *Finance & Development (a quarterly magazine of the IMF)* June 1999, 36(2), p48.

²⁹ National Science Board 2002. *Science and Engineering Indicators- 2002*. Arlington, VA: National Science Foundation, (Text table 2-12,p2-36).

³⁰ Science and Engineering Indicators- 2002,p2-41.

³¹ See Science and Engineering Indicators- 2002.

³² See OECD STI Outlook- 2002.

B.3.3 Malaysia

With less than 15% of its labour force having a tertiary education qualification in 1999 (54% of the labour force has secondary qualification),³³ the need to train and develop the human capital base in the era of increasing global mobility of labour and the attendant brain drain is a recognized policy challenge facing the Malaysian Government. The transition to a knowledge-based economy demands a more skilled labour force, especially in the ICT sector, and recruiters from countries of North America and Europe are already scouting Asian universities for such talent.³⁴

To stem the brain drain of skilled workers the government has made efforts to recruit foreign talent, given the comparative advantage it has in Asia. Between 1995 and 1998, the government introduced the *Returning Scientists Programme*, managed by the Ministry of Science. This programme attracted 93 overseas and Malaysian scientists on short-term contracts to local institutions. But their high wages posed a financial strain and contributed to wage inequalities vis-à-vis local scientists.

In spite of the high cost involved, the *Returning Scientists Programme* was revived in early 2001, and the recent national Budget provided incentives to encourage Malaysian experts abroad “who have the required expertise” to return and serve the country. Such incentive packages include:

- Income tax exemption for income remitted within two years from the date of arrival.
- Import duty and sales tax exemption for two cars registered in the country of origin for at least six months.
- The husbands/wives and children of Malaysian citizens will now be given PR status within six months of the date of arrival. This provision is very important because in the past husbands who were non-citizens were not entitled to PR status, while non-citizen wives could only apply for PR after five years residence in Malaysia.

³³ Knowledge Economy Master Plan, p42.

³⁴ Knowledge Economy Master Plan, p48.

The second term of the *Returning Scientists Programme* has been in place since 1 January 2001 and as at May 2001 the authorities had approved 73 applications. In all, the programme covers six fields of expertise and skills including: Information Technology, Science and Technology, Industry, Finance and Accounting, Arts, and Medicine and Health.³⁵ (There were approximately 700 thousand foreign workers working in Malaysia.) With Malaysia emerging as a health tourist centre, the medicine and health sector is also receiving government assistance. During 2001, a total number of 75 thousand health tourists visited and received medical treatment in Malaysia and this generated 28 million ringgit in foreign exchange earnings.³⁶

B.3.4 Brazil

In the post World War II era, as mentioned earlier, brain drain has been a major challenge facing developing countries in their effort to build human resource capacity. The lack of educational infrastructure in the early decades meant that governments of the developing world had to send students abroad for training and this also became the channel for brain drain, as most graduates did not return after obtaining their degrees. Governments of the developing countries, as ‘victims’ of this process, also seized this opportunity to establish the appropriate infrastructure in selected fields of science and technology and Brazil became a hub for the training of specific skills in Latin America. For example, since its creation in the 1960s, the Institute of Pure and Applied Mathematics (IMPA) has played an important part in training not only Brazilians, but also students from other Latin American countries with the help of the Latin American School of Mathematics (ELAM).³⁷ Currently, Brazil also trains most of its masters and doctoral students at home and a larger percentage of those trained abroad return home. For instance, in 1999, of the 156 Brazilians who received their doctorate degrees in the United States, 69% of them returned home. In comparison to the 888 Indians who also obtained their doctorates in the same year, only 10% of them returned to India.³⁸

³⁵ Knowledge Economy Master Plan, p49

³⁶ The 2003 Budget Speech, p41.

³⁷ World Science Report, p62.

³⁸ Science and Engineering Indicators, p2-36.

In summary, Section A has been devoted to present a global picture (albeit partial) of the dynamics of brain drain and how the competition for skilled-human resources for sustainable production and competitiveness will continue to influence the trends of migration whether permanent or temporary. Whatever the current situation in Africa may be, constant interactions with relevant stakeholders both within and without the continent may help alleviate some of the impact of migration of its skilled scientific and technological workforce since the current pull-factors are strong as the push-factors as far as skilled-migration is concerned.

An interesting aspect of the current flow of skill migrants is that international migration policies are becoming very competitive among some developed countries and newly industrialising countries as well. For instance improved economic growth and development especially in developing countries of Asia, with attendant increases in investments on R&D and good prospects for employment, will reduce the current level of the skills flow to the USA in the future. China, Korea and Taiwan are now training a large number of their postgraduate masters and doctoral students at home and give incentives to those trained abroad to return home. The United Kingdom, Australia and Canada among others have formulated policies to attract more skilled labour.

SECTION C

THE MIGRATION SITUATION IN AFRICA

C.1 BACKGROUND

Of the 150 million migrants in the world, more than 50 million are estimated to be Africans. However, a recent report submitted to the United Nations suggests that there are 191 million international migrants in 2005, with those living in Africa accounting for only 9%. In terms of skilled migrants, the report notes that there were about 20 million migrants with tertiary education and aged 25 or over living in OECD countries in 2000, which is up from 12 million in 1990 (UN, 2006). It is the outward movements of the skilled migrants from African countries that we attempt to look at in this section. Indeed, the extent of human capital outflow from Africa has been described as staggering given that the level of training and research infrastructure and resources available in most African countries is not comparable to the developed and newly industrialising countries.

Studies sponsored by the Research and Development Forum for Science-Led Development in Africa (RANDFORUM) reveal that up to 30% of African scientists – i.e. excluding other professionals – are lost due to the brain drain (see Adeboye, 1998). Given the gravity of the situation, therefore, the brain drain of scientists and other professionals from Africa was the subject of a discussion at a “Regional Conference on Brain Drain and Capacity Building in Africa” organised by the United Nations Economic Commission for Africa (UNECA-ECA) in the Ethiopian Capital, Addis Ababa, in February 2000 (ECA, 2000). According to the ECA and the International Organisation for Migration (IOM), an estimated number of 27,000 skilled Africans left the continent for industrialised countries between 1960 and 1975. During the period from 1975 - 1984, the figures increased to 40,000. Since 1990, at least 20,000 qualified people have left Africa every year (*Education Today*, 2006:4). Accordingly, Alex Nunn of Leeds Metropolitan University notes that this situation leaves Africa with 20 000 fewer people who could have delivered public services and articulated calls for greater democracy and development (cited in *Education Today*, 2006:4).

C.1.1 Critical sectors

While migration affects all professions and sectors of socio-economic importance, the brain drain in the health and higher education sectors in most developing countries is now receiving much critical worldwide attention. For instance, it has been estimated that about 60% of doctors trained in Ghana during the 1980s have left the country, with 200 of them leaving 2002 alone.³⁹ Also, a study of the 1995, 1996 and 1997 graduate cohorts from the College of Medicine of the University of Nigeria totalling 468 of which 416 graduates were located shows that 40% of the medical graduates were presently living abroad (including 50% of the female graduates).⁴⁰ In 2003, the United Kingdom alone approved work permits for 5880 health and medical personnel from South Africa, 2825 from Zimbabwe, 1510 from Nigeria, and 850 from Ghana even though these countries have been included among those proscribed for the UK National Health Service (NHS) recruitment.⁴¹

However, some scholars and analysts are now emphasising the importance of the brain gain in Africa, but there is still a long way to go before Africa can reverse its brain drain into positive brain gain. The irony is that with the current outsourcing of certain industrial activities and therefore jobs in some developed countries to developing countries, it is countries with high-level scientific manpower such as India and China that stand to benefit most. Few African countries can take advantage of the situation, because of limited fields of knowledge and limited capacity for rapid expansion as a result of the poor educational and research infrastructure in both the public and private sectors.

³⁹ Sagoe K as cited in Eastwood, JB, RE Conroy, S Naicker, PA West, RC Tutt and J Plange-Rhule 2005. "Loss of health professionals from sub-Saharan Africa: the pivotal role of the UK", the *Lancet* 365: pp. 1893-900.

⁴⁰ Chikwe Ihekweazu, Ike Anya and Enyinnaya Anosike 2005. "Nigerian medical graduates: where are they now? The *Lancet* (May 28): pp1847-8.

⁴¹ JB Eastwood *et al* 2005, p1893.

C.1.2 Economic cost of migration

The costs of migration of professionals from African countries have been estimated. The United Nations Commission for Trade and Development study reported in 1996 estimated that each migrating African professional represented a loss of US\$184000 to Africa. The overall estimate is that Africa spends about US\$4 billion on expatriates' salaries and other emoluments every year. In 2000, Bundred and Levitt reported that there were about 600 South African doctors registered to practice in New Zealand alone. The cost to the South African taxpayer was estimated at US\$37 million.⁴² However, these figures today are underestimates because the original studies had been done 5-10 years ago.

Even though there are arguments that the migration of skilled professionals benefits the sending countries by way of remittances these benefits do not favourably compare with those of the destination countries. For example, in the UK, one of the major recipient of medical professionals from Africa, it has been estimated that "each qualifying doctor costs £200 000-£250 000 and 5-6 years to train. So every migrating doctor arriving in the UK is in effect importing this sum - or in economic terms, appropriating human capital at zero cost - for the use of the UK's health services. Furthermore, the effect is immediate rather than in 5 years' time"⁴³. Such inequality has prompted a recent editorial comment in *The Lancet* that states, "Every rich country can afford and should aim to train as many health-care workers as it needs. To poach and rely on highly skilled foreign workers from poor countries in the public sector is akin to the crime of theft."⁴⁴

C.1.3 Human resource training infrastructure in recruiting countries

Western countries including Britain, Canada and the USA are becoming increasingly reliant on foreign students and oversea-born and trained doctors to meet their medical workforce needs. In a recent interview Leslyanne Hawthorne, assistant dean and director of international unit at Melbourne University's faculty of medicine in

⁴² Bundred Peter E and Cheryl Levitt 2000. "Medical migration: who are the real losers? *The Lancet* 356 (July 15), pp245-246.

⁴³ JB Eastwood *et al* 2005, p1895.

⁴⁴ Editorial "Migration of health workers: an unmanaged crisis", *The Lancet*, 365 (28 May 2005), p.1825.

Australia, indicated that overseas-born and foreign fee-paying students now comprised a significant number and growing proportion of those studying medicine and nursing with about 1300 of them in 2005. Hawthorne indicated that in 1991, 40% of Australia's medical workforce had been born overseas and by 2001 this number had risen to 46%. Realising this shortfall the Australia government established new medical universities along its east coast regions. However, it believed it could take ten years before the new schools begin to produce enough graduates to meet the shortfall.⁴⁵

C.2 SELECTED AFRICAN EXAMPLES

C.2.1 Ghana

The migration of skilled labour has long been a source of concern for most developing countries, but Africa in particular because it is regarded as a major impediment to national and regional development. For instance, although remittances to Ghana from non resident Ghanaians over the years have increased tremendously reaching \$4.25bn (with \$1.2billion from Ghanaians in the Diaspora) there are serious concerns about the impact on Ghana's human resources capacity development and sustainable development efforts. A recent World Bank report on census and population, titled 'International Migration, Remittances and Brain Drain', indicated that 47 percent of Ghana's college-educated citizens live abroad. In fact it has been estimated that about 90% of all Ghanaian graduates have attempted at one point or the other to travel overseas. Although remittances are growing, in the words of Kwesi Andam, "nations are built with brains, not with absentee dollar remittance" (quoted by *Adomako, Appiah Kusi 2006 Ghanaweb Feature, 29 August 2006*).

Also a new United Nations report on International Migration the presented before the 61st UN General Assembly in August 2006 points out that "Between 33 and 55 per cent of the highly-educated people of Angola, Burundi, Kenya, Mauritius, Mozambique, Sierra Leone, Uganda and the United Republic of Tanzania live in the countries of the Organisation for Economic Co-operation and Development (OECD).

⁴⁵ Geoff Maslen 2005. "Migrant GPs plug deficit", *The Times Higher Education Supplement* 16 September 2005, p12.

The report notes that about 50% per cent of the 'highly-educated' Ghanaians have migrated – mainly to more developed countries such as the United States, Britain and others within the OECD. Although brain drain cuts across sectors of the Ghanaian economy the health sector has received much attention in recent times. For example, Samuel Owusu-Agyei, Ghana's Deputy Minister of Health, expressed regret that out of the over 73 members of the Class of 1986 medical graduates, only 23 were currently working in Ghana with the rest working abroad. Table 1 shows the brain drain of medical and health personnel from Ghana in recent years with about 448 doctors leaving the country between 1999 and 2004.

Furthermore, an important aspect of scientific mobility in Ghana is internal, with more researchers at the public research institutes opting to join the higher education sector due to worsening conditions of service and poorer remuneration in the research institutes (Ayensu, 2005). For instance, the CSIR researchers went on strike in late 2004 upon failure to reach an agreement with government over salary and wage negotiations for better conditions of service.

Table 1: Brain Drain Health Personnel in Ghana, 1999-2005

Category of personnel	1999	2000	2001	2002	2003	2004*	Total
Doctors	72	52	62	105	117	40	448
Pharmacist	49	24	58	84	95	30	340
Allied Health workers	9	16	14	12	10	8	69
Nurses/Midwives	215	207	235	246	252	82	1,237

* Provisional

Source: ISSER 2006, p181 based on MOH

C.2.2 Botswana

A 1987 review of the of the state of conditions of experimental research in the agricultural, engineering, life and physical sciences in Botswana, suggested that outward brain drain was not a major problem in the country. The report noted that

Botswana professionals who studied abroad also readily returned home. However, the assessment was that there was internal brain drain at that time from research institutes by Botswana professionals to join other parastatals and the private sector mainly due to general unsatisfactory terms of service in research and teaching but there was a net gain in migration with most research institutes staffed by expatriates in key positions (see Tebicke, 1987). The key question here is how different is the current situation in Botswana regarding scientific mobility two decades later?

Available figures from Botswana indicate that over 90% of doctors, 61% of pharmacists, and 64% of radiography cadre in the health sector facilities are expatriates. As a result the country is making great efforts to expand local training capacity and to increase the number of health students to address the problem (Gaolathe, 2005). At the University of Botswana, which is one of the key research performing units in the country, 77% of the professorial rank is international staff, while only 23% of the citizens are at the same level. The senior lecturer level international staff represents 64% of this category, while 36% are Botswana nationals (University of Botswana, 2006:7).

In view of the net gains from migration inflow of the highly-skilled, the government has realised the importance of the inflow of skilled labour into the country. In order to speed up the processing of work and residence permit, the government has established a second Regional Immigrants Selection Board in Gaborone. Since the Board started its work in May 2005, the turn around time for processing of work and resident permits has been reduced from about 12 months to 2 months. However, this turn around time for processing permits is still longer than that of some of the industrialised and newly industrialising countries mentioned earlier in Section B.3 of this report.

C.2.4 Mauritius

The Island state of Mauritius has in the past been a recipient skilled migrant workers for its manufacturing sector, with India, China and Bangladesh as major source countries. However, the Government of Mauritius is embarking on a new 10-year economic

reform programme to address the question of new and young skilled labour entrants into the job market as well as addressing the issue of mismatch of skills in the economy. One of the strategies here is the Government's intention to encourage foreign professionals with specific skills to help in the development of Mauritius, investors, self-employed professionals and retired persons issued with an "Occupation Permit" which enables them to work and live in Mauritius for a period up to 3 years. After the 3-year period, they are eligible for a permanent residence permit.

- Despite the gains of inward migration, there are concerns of emigration of skilled workers increasing, especially in the health sector where nurses and doctors are leaving for other countries. The Mauritian Diaspora is estimated to be between 120,000 and 200000.
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SECTION D

INTERVENTIONS TO ADDRESS BRAIN DRAIN

D.1 AN OVERVIEW OF INTERVENTIONS AND INITIATIVES

D.1.1 African Union (AU) policy measures

Since 2000 the issue of migration and brain drain has received renewed attention at continental level dialogue and discussions, especially the management of migration and how Africa can best take advantage of its Diaspora and retain valuable skills to promote socio-economic transformation. During the 1st Ordinary Session of the AU Executive Council held in July 2002 in Durban, South Africa called for the involvement of the African Diaspora in the programmes of the Union. In July 2003 the AU Summit in Maputo decision amended the Constitutive Act to provide for the participation of the African Diaspora in the building of the AU; while at the AU Summit of Heads of State and Government in Khartoum, Sudan from 23-24 January 2006, the Summit expressed its concern over the magnitude and impact of migration on development and over the growing number of migrants in Africa and beyond, and the brain drain syndrome, particularly towards the developed countries; and requested for the preparation of a common African position on Migration and Development;

More importantly, the Executive Council Decision (EX.CL/Dec.264 on Migration and Development (VIII)) adopted during the January 2006 Khartoum Summit mandated the Commission of the African Union to convene an Experts' Meeting on Migration and Development in Algiers. The meeting took place as scheduled from April 3-5, 2006. At the end of the meeting the delegates adopted a Draft African Common Position on Migration and Development which covers a number of areas including Migration and Development, Human Resources and the Brain Drain, Remittances, Trade, Migration and Peace, Security and Stability, Migration and Human Rights, Gender, Regional Initiatives and Access to Social Services but to mention a few.

The Draft African Common Position on Migration and Development also contains a set of recommendations at National, Continental and International level which are aimed at addressing migration and development issues. The delegates also adopted a

Report of the Experts Meeting, which among other things, mandated the African Troika to address the issue of migration and development with the European Troika during their meeting in Vienna, Austria on May 8, 2006. The African Common Position on Migration and Development has since been endorsed by the Executive Council through the Executive Council Decision (EX.CL/Dec.305 (IX)) adopted at the Banjul Summit in July 2006. Some of the key issues raised in this draft migration policy regarding the management challenges on migration and more specifically on brain drain are highlighted below.

On brain drain:

- Promoting policies and reforms to reduce brain drain;
- Supporting programmes which foster the mobility and temporary return of members of the diasporas with the necessary skills in their countries of origin, in order to contribute to capacity building;
- Encouraging common innovative instruments to enable countries of origin to benefit fully from skilled African workers based in host countries.
- Strengthening educational systems and adapting them to the needs of each African country; improving the working conditions of researchers (and other teachers) and encouraging the use of local consultants for different development projects;
- Exploring options to mitigate the effects of large scale departures of highly skilled African professionals in critical sectors.

On migration management challenges:

- Finding concrete solutions to the problems posed by irregular migratory flows by regulating the influxes of migrants from Africa within the context of genuine partnership that ensures the eradication of poverty, unemployment and diseases thereby achieving comprehensive and sustainable development;
- Pursuing a holistic approach ensuring a balanced response and concerted action with respect to all migratory routes;
- Providing assistance to African countries for the management of both South-South and South-North migratory movements;

- Developing regional initiatives appropriate to different migration routes both within Africa and from Africa to Europe, fostering close links between the respective regional organisations and deepening action as appropriate, as initiated for example by the Rabat conference;
- Addressing possibilities of generating policy coherence at international, regional and national levels, e.g. through promoting better integration of the impact of migration into development policies in respect of developing countries, and developmental aspects into migration strategies. Non-state actors at all levels should also be consulted;
- Meeting the concerns and interests of countries of origin, transit and destination alike, as well as the migrants themselves;
- Addressing unregulated migrant flows, which are currently taking serious dimensions that can undermine stability and security and must be adequately addressed through a comprehensive approach;
- Creating an enabling environment in the countries of origin through good governance and the respect of rule of law, elimination of corruption, promotion and protection of human rights.

D.1.2 New Partnership for Africa's Development (NEPAD) initiatives

At the inter-governmental level, there are a number of interventions that have been undertaken under the auspices of the 'Platforms' programme of the New Partnership for Africa's Development's (NEPAD) African Ministerial Council on Science and Technology, which has identified five 'flagship' programmes in areas such as biotechnology, water & energy, materials science, mathematical sciences, and ICT and space technology⁴⁶. Some of the objectives of the overall programme, which will be implemented between 2006 and 2010, are to:

- bring together researchers, through networks of research groups and institutions;
- improve the infrastructure and facilities for R&D in research-performing organisations and promote the sharing of such facilities;
- create institutional and policy arrangements that enable African countries to mobilize and share their scarce resources to conduct science and generate

⁴⁶ <http://www.nepadst.org/platforms/index.shtml>

technological innovations;

Two of the programmes under this scheme are the African Institute of Space Science, which is aimed at providing a network for astronomers and space scientists from various universities and space exploration agencies on the continent. Another programme that has been endorsed by NEPAD is the Bioscience Facility for Eastern and Central Africa. The objective of this initiative is to bring together researchers working in the bioscience field in the two regions under one umbrella structure that will be hosted by the International Livestock Research Institute, which is base in Nairobi, Kenya (Mugabe, 2005).

These initiatives that we have just highlighted are in line with the spirit of one of the recommendations that came out of the ECA conference on the brain drain, where it was stated that, because the repatriation of skilled émigrés was no longer a viable option for the majority of African countries, steps have to be taken to develop the available capacity by mobilising and linking dispersed expertise and resources through the establishment of regional or continental centres of excellence that would undertake collaborative research and training programmes with northern and other southern counterparts.

The introduction of government policies and independent strategies and initiatives geared towards halting the outflow of highly skilled personnel is not restricted to developing countries, however. As Cervantes & Guellec (2002) point out, the UK government increased the salaries of post-docs and the funding made available for the recruitment and hiring of university professors in order for them not to seek better opportunities elsewhere, in this case in the US and Australia.

D.1.3 Hewlett Packard (HP) and UNESCO Joint Initiative

On 20 November 2006 Hewlett Packard (HP) and UN Educational, Scientific and Cultural Organisation (UNESCO) launched a new project "Piloting Solutions for Reversing Brain Drain into Brain Gain for Africa", which aims to help to reduce brain drain in Africa by providing grid computing technology to universities in Algeria, Ghana, Nigeria, Senegal and Zimbabwe. The project aims to re-establish links

between researchers, who have stayed in their native countries and those that have left, connecting scientists to international colleagues, research networks and funding opportunities. Faculties and students at beneficiary universities would also be able to work on major collaborative research projects with other institutions around the world (UNESCO, 2006).

Under this project, preference would be given to university departments with important information technology components. HP would provide equipment – including servers and grid-enabling technologies – and local human resources to the universities, as well as training and support, until the projects become self-sustainable. It would also donate PCs and monitors and fund research visits abroad and meetings between beneficiary universities. UNESCO would be in charge of overall coordination and monitoring of activities; as well as administrative management; evaluation and promotion of results. After its first two-year implementation phase, the project may be extended to cover other countries (UNESCO, 2006).

D.1.4 Homecoming initiatives in Africa

There are now increasing attempts at reversing the brain drain from Africa. We mention two. The first Ghana Homecoming Summit was held in July 2001 to explore among others the investment potentials of Non-Resident Ghanaians both in terms of financial investments and technical skills. In recognition of the great potential of Non-Resident Ghanaians contributing to economic and social development, the 2005 Ghana Club 100 Awards was held under the theme: "Leveraging Skills and Resources of Non-Resident Ghanaians for National Development".

The first symposium on the Mauritian Diaspora was held and brought together over 1000 representatives from the Diaspora in July 2006. The University of Mauritius is in the process of developing a databank for those professionals to whom it can appeal to lecture to young students. Also the Government approached the IOM to provide assistance in reaching migration agreements with countries including South Africa, Australia, United Kingdom, Canada as well as countries in the Middle East.

D.1.5 Examples of initiatives in South Africa and Nigeria

Several initiatives have evolved in South Africa aimed at dealing with the issue of brain drain. One initiative is the Homecoming Revolution, a non-profit organisation encouraging and assisting South Africans around the world to return home. The activities of Homecoming Revolution are sponsored by the First National Bank and involve work with other strategic partners to make the journey home as easy as possible. In January 2003 the Homecoming Revolution was launched across the internet to 27 000 South Africans worldwide, in partnership with THOS (The House of Synergy) and SAW (South Africans Worldwide). “What started as a small little ad campaign has snowballed beyond our wildest dreams...the response has been phenomenal. We have an average of 10000 visitors a month and it’s increasing.” (Angel Jones – Founder).

The first Nigerian Diaspora Day/ 2nd Science and Technology Day took place in Abuja from 25-27 July 2006. According to the press release, the Nigerian Diaspora Day (25 July) is part of the government’s efforts to mobilise and encourage the participation of Nigerians in the Diaspora in the country’s development process. The day has been set aside to recognise Nigerians in the Diaspora as stakeholders in the Nigerian Project, acknowledge their contributions to national development and celebrate their individual as well as collective successes. For example, it has been estimated that in the last three years over 30 medical missions have been undertaken to Nigeria, particularly from America by the Nigerian professionals.

D.2 A CLASSIFICATION OF INTERVENTIONS AND INITIATIVES TO ADDRESS THE BRAIN DRAIN

A useful way of reviewing some of the government and civil society responses – at the level of both policy and programmatic interventions – is to discuss them under the heading of the “Six R’s”, a classification that has been developed by Lowell (2001; 2003) to distinguish between the various policy responses and interventions that governments have devised to address the brain drain. Although Lowell’s classification is focused primarily on categorising the different types of policy interventions, our

discussion will incorporate into these categorisation examples of initiatives that emanate from civil society, especially within universities and other publicly funded research performing organisations. Lowell's "Six R's" are: Reparation, Restrictions, Recruitment, Return, Retention, and Resourcing/ Diasporal Policies.

D.2.1 Reparation

The idea of levying a tax on companies in rich countries who recruit and employ highly skilled immigrants from developing countries came into prominence in the early 1970's after being proposed by the Indian economist Jagdish Bhagwati. The proposal for the tax was premised on the idea that the advanced economies, as the main beneficiaries of the international migration of skilled personnel, ought to compensate the developing countries for their loss of skilled labour (Parthasarathi, 2006). According to Lowell (2003) the idea has never gained currency with any of the Western governments that are the beneficiaries of skilled migration.

D.2.2 Restrictions

Restrictive immigration and emigration policies have been implemented in many countries. Although the aging population and frozen or declining birth rates have led many countries in Western countries to ease their entry requirements for skilled workers, restrictive immigration policies remain the norm for less skilled labour migrants, and are very much at the centre of many electoral manifestos in much of Europe today. Restrictions on emigration were, of course, the norm in the Eastern bloc during the Cold War years, as well as in other repressive regimes like South Africa under the apartheid government. Even under the democratic government in South Africa, there has been continuing debate as to whether the Department of Home Affairs is doing enough to open-up or ease its immigration policies in order to attract skilled professionals; and universities and the private sector have been the most critical, arguing that the many bureaucratic impediments to immigration have cost them dearly in terms of their ability to recruit highly skilled foreign professionals, scientists and researchers.

D.2.3 Recruitment

Recruitment policies and strategies are, of course, the main instruments through which governments realise their immigration policies. Again, this has become a major debate in South Africa, with the active recruitment of health professionals, social workers and teachers by some foreign governments having given rise to some heated debate and controversy. Crush (2002: 148) has quoted the South African Minister of Health as stating in Parliament that the government would:

continue to object vigorously whenever developed countries plunder the meagre skills resources of developing countries in organised raids. Countries that systematically under-produce skilled workers because it is cheaper to poach them from poorer countries are guilty of exploitation.

Such strong feelings about the (real or perceived) actions on the part of the advanced economies with regard to their recruitment policies and its effects on developing countries has not been confined to South Africa, as the president of the African Union, Alpha Oumar Konare, recently lambasted the developed countries' "selective immigration" policies for luring scientists and other skilled workers away from developing countries. He is quoted as having stated that the industrialised nations have taken a "one-sided decision to loot" African countries of their best skilled people⁴⁷.

D.2.4 Return

This is the one area where there have been a number of initiatives both at the national and global levels. The programmes can either be for permanent or temporal return. At the international level, the International Organization for Migration (IOM) has sought to alleviate, if not reverse, the brain drain problem through its Return and Reintegration of Qualified African Nationals (RQAN) programme. The programme, which was established in 1983, has been used by ten African countries which include Angola, Ethiopia, Ghana, Kenya, Uganda, Zambia and Zimbabwe. Between 1983 and

⁴⁷ "Head of African Union attacks 'brain trade'", *SciDev.Net*, 5 April 2006:.

1995, the programme has facilitated the return of 2 565 professionals to their country of origin, or to where their skills were needed most (ECA, 2000). It is not clear to what extent these returns were permanent or not, as there has not been any systematic studies or evaluation undertaken of this programme.

The Ghanaian Ministry of Health has initiated a Project to encourage Ghanaian health professionals residing in the Netherlands and the European Union countries to come home and work during their leave. The Project, "Migration for Development in Africa", carried out by International Organisation for Migration (IOM), would enable them to transfer their knowledge, skills and other resources through short assignments when they are on holidays.

Dr Gladys Ashitey, a Ghanaian Deputy Minister of Health, said the project formed part of efforts to mitigate the effects of the brain drain affecting health care delivery. She said the Project, which would last for two-and-a-half years and subject to renewal, would facilitate the temporary and longer-term return of about 30 Ghanaians in the Diaspora; facilitate training of about 20 health professionals from Ghana in The Netherlands and help to build networks and cooperation between health organizations in Ghana and those in The Netherlands.

There have been similar initiatives elsewhere; for example, the Uruguay government established the National Commission for Repatriation, whose remit was to facilitate the return of migrants generally, and also had a specific focus on scientists and academics (Nunn, 2005). Khadria (2002) also mentions two programmes that were introduced in India to encourage the permanent or temporal return of its highly skilled personnel that had settled abroad. The first programme is the TOKTEN-INRIST (Transfer of Knowledge and Technology through Expatriate Nationals-Interface for Non-Resident Indian Scientists and Technologists) initiative which was initiated by the country's Council for Scientific and Industrial Research (CSIR) in collaboration with the United Nations Development Programme (UNDP). The programme's objective was to provide placements for returning/visiting Non-Resident Indian nationals (NRIs) with private sector firms and R&D units. However this scheme largely failed because of frustrations with the bureaucratic functioning of the CSIR (Khadria, 2002).

The second programme was an initiative of the University Grants Commission (UGC) and its objective was to attract expatriate Indians with offers for posts in Indian universities from a lecturer up to a professor position, with substantial research grants over and above the salaries that were to be paid to them. Although this scheme started off well, it ran into problems when the Research Scientists were treated as 'second-class' citizens by the permanent faculty of the university they were attached to, apparently because they were employed on 5-year contractual appointments. Later the UGC ran into budgetary problems and the scheme was withdrawn in the mid-1990s.

One of the major limitations of the return option as far as many African countries are concerned is that, on the one hand, many of the push factors that precipitated the brain drain in the first place (especially the political and economic situation, but also the low salaries, lack of infrastructure, etc.), and on the other hand, the equally strong pull factors in the receiving countries (better pay and working conditions, security and stability, access to resources and facilities, etc.), still prevail. Although the empirical evidence is hard to come by, there is an assumption in the literature on the African Diaspora networks (Teferra, 2004; Tettey, 2003) that most of these knowledge communities are constituted by a large number of academics and scientists who left because of repressive (political) conditions, or as a result of a lack of viable academic or economic opportunities at home – what has been referred to earlier as ‘brain waste’. This may suggest that some of the conditions and interventions that have made it possible for countries such as Taiwan and Korea to attain partial success with regard to the ‘return’ option may not yet prevail in many African countries.

Other factors – which are beyond the control of African governments – that militate against the return option are the declining birth rates and the aging populations in the North, which will increase the demand for skilled labour in these countries. As Mutume (2003) has put it: "in a globalizing world, where the dominant economic paradigm promotes the free movement of capital, it will become increasingly difficult to restrict the free movement of skilled labour." Indeed, one of the key points that was made at a conference on brain drain, which was organised under the auspices of the Economic Commission for Africa, was that the emphasis on promoting the return of Africans in the diasporas is not realistic; instead, more attention should be paid on

retaining the experts who are in Africa by providing a conducive environment for conducting research⁴⁸. Some of the initiatives in this regard are the subject of our discussion in the section that follows.

At a conceptual level, some authors (Cao, 1996; Meyer & Brown, 1999) have argued that the return option as a policy lever for governments has failed since it is premised on shaky theoretical foundations, the primary of which is the human capital framework, which assumes that governments can manipulate the mobility of labour.

An observation by Lowell (2004) is that the chances of the return option being successful are increased when there are transnational professional networks in existence, since these play a crucial role in facilitating return. South Korea and Taiwan seem to be one of the few success stories regarding return migration, where the government has played a pivotal role in both countries' initiatives. Parthasarathi (2006) attributes these two countries' success to the already well-resourced and advanced R&D environment that the respective governments were able to provide in order to lure back their scientists; in other words, the 'absorptive capacity' of the home country is a *sine qua non* to a successful reverse migration. China, on the other hand, has been less successful in its endeavours to promote the return of its skilled expatriates, despite a strategy of carrots and sticks from its government. Further than these few cases, the effectiveness or otherwise of government efforts in facilitating the return of HSP has not been widely studied.

D.2.5 Retention

A scientist is like a painter. Michelangelo became a great artist because he had been given a wall to paint. My wall was given by the United States⁴⁹

Lowell (2003) argues that retention policies and strategies that target the critical sectors of a country's economy stand a better chance of containing emigration, at least in the short term. These policies and strategies generally seek to address the push factors that give rise to the brain drain. Measures that have been introduced include

⁴⁸ Conference on Brain Drain and Capacity Building in Africa, 22 February, 2000, Addis Ababa.

⁴⁹ Ricardo Giacconi, Nobel Laureate in Physics from Italy (quoted in Mashelkar, 2005)

the improvement in the salaries of academics, scientists, technologists and professionals whose skills are in short supply, and increasing investment in research and education infrastructure. Other initiatives that are specific to higher education are regional and continental initiatives that have been established to promote collaborative programmes in capacity development, either through joint academic and research programmes, or the establishment of centres of excellence. Some of the more notable initiatives in Africa are the following:

The African Economic Research Consortium⁵⁰ (AERC), which was established in 1988, is a public not-for-profit organization that is devoted to the advancement of economic policy research and training. The AERC works *via* a network of close to 30 universities as well as 15 research centres and institutes from 19 countries in sub-Saharan Africa. Its primary mission is to strengthen local capacity for conducting independent and rigorous inquiry into the problems facing the management of economies in sub-Saharan Africa. Specifically, the AERC's objectives are to:

- Enhance the capacity of locally based researchers to conduct policy-relevant economic inquiry,
- Promote the retention of such capacity, and
- Encourage its application in the policy context

The second initiative is ICIPE⁵¹ (The International Centre of Insect Physiology and Ecology, now changed to the African Insect Science for Food and Health), which constitutes another experience of regional cooperation for research training in insect physiology. In this case, one centre focuses on developing capacity in a particular discipline (Insect Science), and students from the whole continent are invited to apply for competitive scholarships to enrol in masters or doctoral programmes. ARPIS (The African Regional Postgraduate Programme in Insect Science), a programme associated to ICIPE, was inaugurated in 1983 and is a training programme implemented in partnership with 31 African universities, national and international institutions and academies of science, the donor community, and an ARPPIS alumni network within national institutions. According to the organisation's website (<http://arppis.icipe.org/background.html>), "With very few exceptions, ICIPE's

⁵⁰ www.aercafrica.org/home/index.asp

⁵¹ www.icipe.org/index.shtml

graduates have remained to work in Africa... despite the continent's loss of human resource capability through 'brain drain'.

Another initiative worth mentioning is the University Science, Humanities, and Engineering Partnerships in Africa (USHEPiA) programme, which was launched by the University of Cape Town (<http://web.uct.ac.za/misc/iapo/ushepia/bg.htm>) and is a successful capacity-building partnership among eight south and east African universities. Through this programme, staff members of the partner universities are able to apply for fellowships to do PhD studies in a 'split-site' format, where they carry out their research in their home country.

D.2.6 And what about remittances?

Although also starting with an “R”, remittances are not one of Lowell’s six “Rs”. This is because, unlike the other “R’s”, remittances are not an outcome of a deliberate policy intervention on the part of governments, either by the recipient or sending country, but are a voluntary initiative from the migrants themselves. The importance of remittances to the brain drain equation cannot be overlooked however, since they are a crucial part of the role migration plays in economic development. The total value of official remittance flows to developing countries has been estimated at over \$2billion (Hussain, cited in Seguin, 2006). However, although remittances remain a large source of income for many developing countries, there is growing evidence that the amounts sent by highly skilled migrants are not only small, but are actually declining (Khadria, 2002; Parthasarathi, 2006). Although we have not come across any studies that have been undertaken to explore this phenomenon, one possible explanation is that many of the lowly skilled migrants tend to leave the rest of their family behind (or are not allowed to bring their families with them), while the highly skilled emigrants leave with their families.

D.3 RESOURCING/ DIASPORAL POLICIES

The potential role of scientific diasporas or expatriate knowledge networks in the economic development of their home countries has come into prominence in the

recent literature on the brain drain and international migration (Lowell & Gerova, 2004; Meyer, 2003; Mutume, 2003; Seguin, *et al*, 2006; Song, 2003; Teferra, 2004; Tettey, 2003). This literature seeks to explore new ways of responding to the problem of the brain drain, since there is a recognition that most of the policy precepts that were geared towards addressing this problem – most of which we have discussed above - have largely failed.

Meyer and Brown (1999) have developed a typology of five expatriate knowledge networks, which they have classified in terms of their objectives, their membership, and their organisation and administration. This typology has emerged from their analysis of the data which they gathered through searches of internet databases, a review of the literature and the use of personal contacts. The type of networks that Meyer and Brown (1999) have identified (most of which are organised on a country or nationality basis), are the following:

1. Student/Scholarly networks: these offer assistance to students studying abroad and encourage the sharing of information and dialogue between scholars. Student networks are an important source of the Diaspora networks as most of the scientific émigrés from the subcontinent and South East Asia are students-turned-migrants, that is, people who left their countries to study in the US or in Europe and found jobs there after completing their studies. And in the case of China – which has more expatriate scientists and engineers than any other country – 90% of the approximately 2000 Chinese scientists and engineers who earn a PhD in the US each year express an intention of staying after graduation (Song, 2003).
2. Local associations of skilled expatriates are groups of highly skilled professionals who meet on a professional and social level. Their aim is to promote the professional interests of their members as well as to socialise on a more personal level.
3. The Transfer of Knowledge Through Expatriate Nationals (TOKTEN) programme is a United Nations Development Programme (UNDP) initiative that identifies highly skilled expatriates and assists them to return to their home country for short visits. These visits usually last between three weeks

and three months, during which the expatriates engage in various developmental projects or undertake teaching assignments at local universities.

4. Developing intellectual/scientific diaspora networks: Although the aim of these networks is to make use of the highly skilled expatriate pool of their countries in order to contribute to the development of their home country, Meyer & Brown (1999) have distinguished them from the type below because these networks do not meet all the criteria that they have highlighted as a key requirement for classification as a fully-fledged intellectual/scientific diaspora network.
5. Intellectual/scientific diaspora networks: In order for an expatriate network to be classified as an intellectual/scientific diaspora, it has to meet the following criteria (Meyer & Brown,1999):
 - a) its members must be mostly nationals of a particular country living and working or studying abroad;
 - b) members must be highly skilled, active in a number of professional fields, and, more specifically, conducting scientific research;
 - c) the network must have as its main purpose the economic and social development of the country of origin of its members;
 - d) there must be a degree of connection or linkage between network members and their counterparts in their country of origin.

Although it is clear that there is considerable overlap between Meyer and Brown's categories of Diaspora networks, our discussion will focus on the last group, namely the intellectual/scientific diaspora networks. In a formulation that incorporates many of the criteria of Meyer and Brown's classification, Barre *et al* (2003) have defined a scientific diaspora as a "self-organized community of expatriate scientists and engineers working to develop their home country or region, mainly in science, technology, and education". Many of the Diaspora policies and initiatives typically seek to harness the potential of the Diaspora networks in contributing to the development of their home countries through forging linkages via student exchanges, collaborative research projects, short-term appointments and teaching engagements, to mention but a few of their objectives.

Lucas (cited in Lowell, 2004) argues that the density, frequency and quality of inter-personal relationships within a Diaspora network largely determines the extent to which the network is able to contribute to the transfer of knowledge to, and the development of business opportunities within, the home country. Further, the role of government is important in helping Diaspora networks go beyond their philanthropic and social function to also include economic and social development.

There is a dire lack of research on the African scientific Diaspora networks. In one of the few empirical studies on a specific intellectual diaspora, which at the time of the study was not yet organised into a network, Kaplan (1997) has identified some important characteristics of the highly skilled South African expatriates living abroad. Some of the distinguishing features of the South African intellectual/scientific diaspora are that it is:

- highly concentrated geographically, and is located mainly in six countries, namely Australia, New Zealand, the US, the UK, Canada and Israel;
- large, estimated to be well in excess of 50 000 in 1997
- highly skilled (for example, almost 28% of the University of Cape Town's contactable doctoral graduates are living abroad – and this is twice the average of all the university's graduates who are resident abroad)
- overwhelmingly white and liberal (loosely used) in political orientation (especially those that left the country prior to the first democratic elections in 1994)

The South African Network of Skills Abroad (SANSA) was established to link highly skilled South African professionals living abroad with their South African counterparts. Although starting off as an independent initiative, it has now been adopted by the government as a key vehicle for linking up with the South African scientific Diaspora network and is now being managed by the National Research Foundation (NRF). Although it was seen as one of the few functioning and potentially successful Diaspora networks from the African continent, a recent survey that was

conducted by the NRF as part of its plans to revamp the SANSA website (Séguin *et al*, 2006)⁵², seems to raise some doubts about this optimism.

This survey reports that out of a total of 2440 e-mail contacts present in the SANSA database, 32.5% of the questionnaires sent to members were undelivered and 13.1% bounced back. Of the 1323 questionnaires that were delivered, 428 responses were received. One of the questions of this survey was on the frequency of use of the website by its members: out of 426 responses (response rate varied by question), 38.5% and 39.5% said they infrequently or never used the website, respectively (Ravenhill, cited in Séguin, *et al*, 2006). Finally, in line with past criticism of not corresponding to the needs of the diaspora, a large number of survey respondents said that they did not feel they received value from SANSA. However, the report highlighted that the respondents wished to cooperate with SANSA and to optimise the engagement of the diaspora group.

The conclusion that Séguin *et al* (2006) draw from the results of this survey is that it is indicative of how a seemingly good Diaspora initiative which has the support of the government may still not be useful to its end-users or effective in its capacity building efforts. Although it is not yet clear how effective SANSA has been as a vehicle for mobilising the South African intellectual and scientific diaspora, Teffera (2004) has highlighted the following as being some of the factors that can affect the effectiveness of Diaspora networks:

1. The nature and extent of the intellectual capital of the network
2. The level of organisation of the network
3. The home country government's commitment to "genuinely engage" its intellectual diaspora
4. The perceptions and attitudes of home communities towards its intellectual exiles
5. The existence of a policy framework, resources, infrastructure, etc. to involve networks in national development efforts
6. The technical and logistical issues involved in engaging the Diaspora network

⁵² Although Séguin *et al* (2006) cite the author of this NRF commissioned survey/report (Ravenhill, 2005), we have not been able to find it anywhere, including from the NRF website itself.

7. The "compatibility" of the home and Diaspora environments to supporting partnership and interaction

Another South African initiative that seeks to tap the skills of the scientific diaspora is the South African Research Chairs Initiative (SARCHI)⁵³, which is funded by the Department of Science and Technology and managed by the National Research Foundation. The main objective of the programme is to increase the number of world class researchers at South African universities; the ultimate goal is to have established 210 Research Chairs at various higher education institutions by 2010. An interesting aspect of this initiative is that one of its stated objectives is to help universities "retain and attract back" qualified scientists, both in terms of those who are living abroad, and those who left academia for industry or government. To this end, a recent communiqué from the NRF states that the 55 Research Chairs that are on offer in the first round of the initiative in 2006 will be filled according to a ratio of 3:2 between international and local candidates (NRF, 2006). In other words, this means that approximately 33 Research Chairs will be filled by researchers from outside South Africa, be they expatriates or non-South Africans.

Obviously, the jury is still out as to whether this initiative will succeed in attracting back some of the highly skilled South African scientists that emigrated. A potential drawback in this regard is the requirement within the guidelines of the initiative that stipulates that the successful candidate must reside full time in SA for the duration of the Research Chair award. Considering that the award is for a maximum duration of 15 years and that there is no allocation or allowance in the budget for commuting, it may be difficult to attract scientists who would prefer a temporal arrangement.

Having done an internet survey of the 41 Diaspora networks that were identified by Meyer and Brown (1999), Lowell (2004) argues that these networks have not proven to be stable over time. Her survey shows that only 5 new networks have been formed since Meyer and Brown's study was conducted in 1999, and that only 44% of the websites of the networks they surveyed were updated regularly. On the basis of the survey's findings, Lowell's (2004) concluding observation is that the ability of

⁵³ www.nrf.ac.za/sarchi/index

Diaspora networks to contribute to development depends on the institutional capacity (in particular technical and financial resources) of the network itself as well as in the home country. Seguin *et al* (2006) also note that very few studies have been undertaken to examine the impact, viability and sustainability of the scientific Diaspora networks.

The growing importance of migration and development and especially the role of Diaspora communities/expatriate networks in contributing towards the development of their home countries had led to the establishment of research institutes/organisations working in the field of migration in the Diaspora with a focus on the African situation. Some of these organisations include: African Federation of Women Entrepreneurs (AFWE), The Foundation for Democracy in Africa, and African Foundation for Development (AFFORD).

SECTION E

SOME CONCEPTUAL ISSUES AND FUTURE RESEARCH

E.1 CONCEPTUAL ISSUES

The analytic literature on the brain drain, whose main point of reference is the experience of developing countries, is generally in agreement about the deleterious effects of the brain drain phenomenon on these countries' economies, in particular its effect in undermining sustainable development and economic growth. Much of the conceptual literature reiterates the same theme: namely that the concept of 'brain drain' does no longer capture the recent dynamics of the international migration of skilled labour, and that there is a "paradigm shift" (Meyer, 2003) from 'brain drain' to 'brain circulation' (Cao, 1996; Meyer & Brown, 1999; Song, 2003).

The conceptual lineage of the brain circulation approach can be traced to elements of the sociology of science, in particular the (Mertonian) notion that scientific nomadism is an inherent feature of the development and advancement of science (Meyer *et al*, 2001). Much of the literature on brain circulation focuses on the dynamics and the potential of the Diaspora knowledge networks in contributing to development in their home countries (Meyer & Brown, 1999; Meyer, 2003; Song, 2003; Teferra, 2004; Tettey, 2003). Meyer and Brown (1999) offer the most comprehensive analysis of the nature of the Diaspora knowledge networks, identifying 41 expatriate knowledge networks that have been established in some 30 countries since the early 1980s.

The brain drain paradigm, according to these authors, is premised on human capital theory, which treats labour or human capital as a fixed asset that is manipulable. As a consequence, the policies that have been devised to address it assume that governments can intervene to reverse the brain drain itself, if not its effects, by determining or shaping their national labour markets. In contrast, the starting point of the brain circulation framework is that the international mobility of human capital is governed by (global) market considerations, over which individual governments have no control (Cao, 1996). Further, the international mobility of highly skilled personnel (HSP) is seen as a contributor to, and also a consequence of, globalisation and, as

such, should be seen as one of the indicators of the interdependence and convergence of the world economy. As one of the earliest proponents of this thesis, Cao (1996) has argued that what is usually regarded as 'brain drain' should rather be seen as an ongoing and global phenomenon that is neither permanent nor irreversible.

Therefore, instead of devising policies and strategies that seek block or hinder the mobility of HSP, Cao's advice to developing countries is that they ought to manage it by creating a favourable domestic (political and economic) climate that will make it possible not only for their skilled émigrés to return, but for these countries to attract other (developed) countries' HSP as well – hence his notion of a brain 'exchange'. It is within the context of this strategic shift in thinking that the potential of diasporal knowledge networks in addressing the deleterious effects of brain drain should be considered.

The problem, however, is that not only does this advice sound very much like that which used to be dispensed by the IMF to struggling economies in the South *via* its Structural Adjustment Programmes: if only the developing countries could embrace the free market principle of liberalising their economies by lowering or breaking down their tariff barriers and introducing flexible labour markets, all will be fine. And, as we know, this remedy didn't work for the developing countries. As Meyer *et al* (2001) have noted, the international mobility of HSP is not simply a consequence of a neutral and/or market co-ordinated operation of the global supply and demand of labour. These knowledge flows are also, and perhaps pre-eminently, influenced by the highly selective nature of the immigration policies of most OECD countries.

What is usually cited as evidence of this paradigm shift are the experiences of countries such as Australia, New Zealand, Canada and some countries in Western Europe (including the UK) who have lost skilled workers (mostly scientists and engineers) to the United States and have, in turn, been able to replenish this loss through their ability to recruit and attract skilled workers from other countries, especially developing countries. This then means that the notion of a 'circulation', or the multi-directional mobility of skilled personnel, is largely to be found only within the developed countries, especially within the OECD, rather than between the North and the South. Further, the claim that the mobility is no longer unilateral (from poor to

rich countries) but is now multi-directional and global is also not borne by the evidence, since most of the émigrés in the diaspora not only do not return to their home country, but they seldom move to third or fourth countries (Meyer *et al*, 2001). Thirdly, although the existence of transnational professional networks is seen as crucial in facilitating return, there is no evidence that these diasporal networks – which are usually cited as evidence of this ‘paradigm shift’ – have had any effect on the brain circulation itself.

So with the exception of the OECD countries mentioned above, there is very little evidence of a reverse flow of skilled personnel – and thus a circulation – taking place from developed to developing countries; in other words, most of the brain circulation is highly asymmetric (Parthasarathi, 2006). Although there is certainly some counter-movement in the form of short-term visits back to their home country by many émigrés’, these periodic visits do not by any means constitute an indication of a sustainable and long-term trend. Indeed, many developing countries, especially those in Africa and Latin America, continue to experience a unidirectional and permanent outflow of their skilled personnel to the industrialized North (Kapur, 2005; Lowell, 2004; Parthasarathi, 2006).

Finally, another area of convergence in the literature is that most of the policy initiatives that governments have implemented to reverse the brain-drain have largely failed (Cao, 1996; Lowell, 2004; Meyer & Brown, 1999; Song, 2003). The only non-OECD countries that are seen to have partially reversed the unidirectional outflow of skilled workers, and thus contributed to brain circulation are South Korea (an OECD member country since 1996), Taiwan, and to a lesser extent, China and India. There is some evidence, although not conclusive, that some of this ‘return’ was fuelled by the rapid economic development that these countries experienced (in the 1980s in case of Korea and Taiwan, and more recently in India and China), which saw them making considerable investments in R&D infrastructure in their bid to ‘catch-up’ with the developed world, and which provided the returnees with access to facilities and resources that would have been equivalent to what they were used to in Europe and the US.

Song (2003) however argues that even in such cases the phenomenon of brain

circulation can be short-lived, as seen from the experience of Korea and Taiwan, which have gone through what he refers to as the “typical” 3-phase brain migration cycle: the first phase commences with the loss of skilled intellectual capital *via* students who, on completion of their studies, do not return and thus become migrants; the second phase is linked to the return of expatriate scientists, engineers and other professional workers, lured by favourable prospects that have come about as a result of rapid economic growth in their home countries; the final or third phase is linked to the second wave of outflows of highly-skilled labour that usually follows an economic downturn in the home country. Song (2003) suggests that the interventions these governments have made – by making considerable investments in R&D infrastructure and also providing financial incentives – are in themselves not sufficient to lure back the expatriates. For Song (2003), it is the personal and non-material factors – which governments largely ignore – such as family considerations, cultural identity and feelings of obligation that were the major motivating factors in the decision of émigrés to return in cases of South Korea and Taiwan.

Since the emergence of these networks is a fairly recent phenomenon, there is not much research that has been undertaken to assess their effectiveness in promoting brain circulation. Further, although the contribution of diasporic networks to (sustainable) development in home countries is strongly hinted at within the literature, there is not much empirical evidence available to support what can only be regarded as conjectural assertions at this stage.

E.2 CONCLUDING REMARKS AND ISSUES FOR FURTHER RESEARCH

One of the recurring themes on the literature on the brain drain, and more specifically on the diasporal networks, is that we still know very little about the nature and extent of these phenomena, in particular as these relate to the African continent. The review has also attempted to highlight the specific issues that pertain to a sector of the highly skilled personnel, namely academic-scientists and researchers. One may well ask: what is so special about this particular group with regard to the brain drain and diasporal networks? One response is that, if, as Meyer *et al* (2001) have pointed out,

the occupations related to research and knowledge production have the highest proportion among the highly skilled immigrant population in the US, then it follows that the higher education sector is the biggest contributor to – or, to put a negative spin, it is the primary victim of - the brain drain. And because of their role in the production, dissemination, and application (including technology transfer, exploitation of intellectual property, etc.) of new knowledge, universities are central to the production – and more importantly – the reproduction, of a highly skilled workforce.

Unfortunately, universities in Africa are still plagued by a number of factors that continue to undermine their contribution to development, and many of which also contribute in fuelling the brain drain. Some of the problems are the following:

- An aging academic workforce
- Low academic salaries, which lead to many young researchers not considering higher education as an attractive career option
- Aging, if not obsolete, equipment
- Poor journal holdings and lack of access to online database sources
- Lack of linkages to international expertise networks

Further, the persistence of these problems and challenges make it difficult for many higher education institutions in Africa to play a role as ‘magnets’ for attracting expatriate scientists and researchers. Although the question that Meyer and Brown (1999) pose is still very valid and pertinent: “Why would a scientist resort to [working with] an expatriate when he could apparently call on any fellow scientist in any part of the world, whatever his/her national origin might be?”; an equally valid and even more pressing question is: “Why would expatriate scientists want to go back to working under conditions that are not conducive to the pursuit of scientific research when they can happily stay where they are?”

Notwithstanding the problems facing higher education in Africa, universities remain the key, if not primary, organisations through which research is undertaken in most developing countries. It is therefore important that they play a central role in providing a platform for engaging the scientific diasporal networks. However, this is

not a role that universities can assume without the active support of their governments, who have the resources are crucial in sustaining these linkages.

Since one of the key issues or concerns regarding these networks is their sustainability, it is surprising that there is not much discussion within the literature with regard to how these diaspora knowledge networks can – or should – be institutionalised, and what the benefits or disadvantages of such institutionalisation would be. One is thinking of the absence in the literature of the role that (international) bilateral partnerships between universities could be used as a vehicle for fostering linkages between diasporal networks and their home countries, rather than leaving this to individual volition and effort.

Other issues that have been triggered by the examination of the literature but require further research and investigation are the following:

- Are 'Southern' countries whose universities have established linkages through knowledge-producing networks with their counterparts in the North less likely to experience brain drain (and instead more brain circulation) than those countries without such networks, other things – such as political and economic stability – being equal?
- To what extent are the new modes of knowledge production fuelling the brain drain or the outflow of highly-skilled knowledge workers from developing countries?
- To what extent do bilateral agreements and partnerships between countries provide an opportunity for diasporal networks to get involved in long-term initiatives, especially if these are driven by institutionalised and well-funded projects in which universities from the participating countries participate?
- If South Africa can be regarded as a semi-peripheral country – in that, in terms of the world systems approach, it is a regional power that is attracting skilled personnel from other African countries on the one hand, whilst also experiencing its own skills-flight to other Northern countries – what strategies should it be looking at in promoting brain circulation?

Finally, another gap in the literature is absence of discussion about the various initiatives that have sprung up from the (African) continent itself, and primarily driven by higher education institutions themselves – some of which we have briefly discussed - which seek to develop and consolidate expertise in Africa through continental collaborations. Although these initiatives have started as capacity building interventions, they have the potential of addressing/arresting the flight of highly-skilled workers (in other words promoting brain retention) by creating networks of expertise (and making it possible for people to have access to resources that they would not ordinarily have) across the continent. These continental networks could then form the ‘magnet’ through which linkages with diasporal networks can be profitably forged.

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