

# THE KEYS TO AFRICA'S SUSTAINABLE DEVELOPMENT: SCIENCE, TECHNOLOGY, AND INVESTMENT

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## Introduction

In August and September 2002 the world's leaders meet in Johannesburg, South Africa at the World Summit on Sustainable Development (WSSD) to review progress in the implementation of Agenda 21 – a program on sustainable development adopted 10 years ago at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro, Brazil. They will also renew their countries' commitment to the program and may adopt decisions to promote its faster implementation.

There are a number of reasons why the WSSD is important for Africa. First, the continent closes the first decade after the UNCED with many economic, environmental, and socio-political challenges. The region is still searching for *the* way out of *its* crisis – the “African crisis”. Africa still aspires to join the rest of the world in enlarging and sharing global economic prosperity. The region's leaders will use the WSSD to restate their countries' sustainable development goals and challenges, with emphasis on issues of poverty reduction. They will seek international support to fight poverty and related problems of environmental degradation.

Second, the WSSD is held at a time when there is a renewed search for the continent's sustainable development. The New Partnership for Africa's Development (NEPAD) is the vehicle for that renewed search. It is a framework with political arrangements that are focused on turning African economies onto growth and development trajectories. Led by Algeria, Nigeria, Senegal, and South Africa, African countries will use the WSSD to articulate NEPAD's goals and to secure international support for the initiative.

Third, in the background of the WSSD is the continuing intense international debate on impacts of globalization and new technologies on developing economies, particularly those of Africa. Globalization<sup>1</sup> and such new technologies as biotechnology and informational and communications technologies (ICTs) are changing the content of national and global economies. Global trade and investment have grown rapidly in the past decade. They have been driven by several interrelated factors: trade and investment liberalization at national, regional, and international levels, privatization, deregulation, and rapid technological

changes in information and communications technologies. For Africa, concern is about its further marginalization from the rest of the world and its growing inability to harness new technologies to integrate itself into the world economic system. Of further concern is the region's limited capacity to harness and apply the new technologies for human development.<sup>2</sup>

NEPAD explicitly recognizes the urgency of instituting measures – policies and institution – that will reduce technological gaps between Africa and the rest of the world. It states: “The poverty and backwardness of Africa stand in stark contrast to the prosperity of the developed world. The continued marginalization of Africa from the globalization process and the social exclusion of the vast majority of its peoples constitute a serious threat to global stability.”<sup>3</sup> African leaders are “convinced that an historic opportunity presents itself to end the scourge of underdevelopment that afflicts Africa. The resources, including capital, technology and human skills, that are required to launch a global war on poverty and underdevelopment exist in abundance, and are within our reach. What is required to mobilize these resources and to use them properly is bold and imaginative leadership that is genuinely committed to a sustained human development effort and poverty eradication, as well as a new global partnership based on shared responsibility and mutual interest.”<sup>4</sup>

At WSSD African countries have an opportunity to rekindle international interest in and support to programs aimed at strengthening the region's scientific and technological capabilities. They may wish to put emphasis on ways of enlarging international support to the implementation of science and technology recommendations of Agenda 21.

This paper focuses on the role of science and technology in meeting sustainable development goals articulated in Agenda 21 and NEPAD. It argues that current national and regional institutional arrangements in Africa are not suited to the challenges posed by globalization and associated rapid scientific and technological developments. Making the transition to sustainable development will require new forms of institutions, particularly agencies that are dedicated to science and technological innovation. Such agencies should be erected on a new sustainability paradigm.

Therefore, the WSSD will need to pay more attention to the nature of institutions for promoting Africa's scientific and technological development. International support to the creation of regional centres of excellence in science and new technologies can be stimulated by the WSSD and subsequent activities of the NEPAD.

The first section of the paper is an overview of Africa's sustainable development challenges and the various responses to the problems of poverty, environmental degradation, and declining health status.

The second section focuses on the role of science and technology in human development and the opportunities that new technology offer for Africa's sustainable development. It also discusses the role of foreign direct investment in sustainable development. The final section discusses new forms of international support to NEPAD's science and technology

agenda. It focuses on support to the implementation of science and technology recommendations of Agenda 21 and emphasizes those issues that Africa's leaders should articulate at the WSSD.

## **Africa's sustainable development challenges**

Africa enters the second decade of implementation of Agenda 21 with poor economic performance, increasing food insecurity, human health problems, environmental degradation, and intense political and ethnic conflicts. The region's economies have performed dismally in the past decade and poverty is a marked feature of more than three-quarters of Africa's human population. In 1970, sub-Saharan Africa's annual growth of real per capita Gross Domestic Product (GDP) was estimated at 3.2 per cent, while South Asia's was 1.2 per cent. By 1989 the trend had been reversed with Africa registering 2.2 per cent and South Asia averaging 3.2 per cent. In 1998 more than 301 million Africans were living on less than US\$1 per day compared to 217 million in 1987.<sup>5</sup>

Africa has now the largest share of people living on less than \$1 per day. In contrast, poverty declined most rapidly in South and East Asia during the 1990s. In Viet Nam, for example, the incidence of poverty dropped from 58 per cent in 1993 to 37 per cent in 1998. This was mainly a result of economic growth from agricultural diversification. Agriculture – the mainstay of African economies – has witnessed slow growth and in some countries rapid deterioration. The region's capital stock per hectare of land is less than one-quarter of that in Latin America and one-sixth of that in Asia.<sup>6</sup>

Recent estimates show that less than 35 per cent of Africa's population has access to basic health or medical care facilities. Malaria and the Acquired Immune Deficiency Syndrome (AIDS) are now major destroyers of human life on the continent. World Health Organization (WHO) estimates show that at least 0.4 million adults and 1.6 million infants died of AIDS or related HIV in Africa.<sup>7</sup> Malaria is responsible for at least 75 per cent of rural deaths in tropical Africa. Poor health and associated subsequent child and adult mortality are among the main sources of the poor and declining economic performance of many of Africa's states. They are rapidly eroding the region's chances of seeing economic recovery and growth.

Closely associated with its relatively poor economic performance is the destruction of Africa's natural environment, particularly its natural resources. Despite growth in public environmental awareness in the region, many countries continue to experience high rates of deforestation, loss of biological diversity, soil erosion, and degradation of water bodies. Recent assessments have vividly shown that Africa is losing its natural resources at relatively rapid rates compared to many other regions of the world.<sup>8</sup>

Economic decline and environmental degradation (particularly the associated natural resources scarcity and increasing competition for these resources) contribute to conflicts within and between African states. At least 14 out of the 53 African countries have gone

through major strife – civil and military wars. These countries have, as a consequence, not been able to achieve the necessary levels of economic growth. Conflicts have been a source of economic and political instability.

Africa's telecommunications infrastructure is the least developed in the world. Africa has less than 2 per cent of the world's telephone mainlines. By 1999 it had about 10 million telephones.<sup>9</sup> "Africa has less international bandwidth than Sao Paul, Brazil."<sup>10</sup> Of the 400 million Internet users in the world in the year 2000, less than 500,000 were in Africa. Many of the region's economies are yet to be linked to global e-commerce.

On the whole, 10 years after adopting Agenda 21 Africa still sustains a deep crisis: increasing poverty, worsening environmental problems, dismal industrial productivity, growing food insecurity, and deteriorating public health. These problems have led to a variety of policy responses, ranging from structural adjustment to the ongoing efforts at formulating poverty reduction strategies. Emphasis is largely focused on getting macroeconomic conditions right.

While sound macroeconomic management is crucial for achieving economic growth, it is the ability of African countries to generate and manage technological change that ultimately determines its success in fighting poverty and enlarging economic competitiveness in the world market. Growth is the most powerful weapon in the fight against poverty. But accelerating and achieving it will require policies that deliberately promote endogenous scientific and technological development. This is the point that many of those responsible for development policy and planning for African countries often fail to grasp or sometimes lack the necessary analytical tools to engage with.

## **Science, technology, and investment for human development**

### ***Science and technology for sustainable development***

Sustainable development, which is "the ability of present generations to meet their obligations without compromising the ability of future generations to meet their own needs", involves the generation and application of knowledge for efficient management of ecological and human resources for the long-term improvement of the social and economic welfare of the populations.<sup>11</sup> Technology and the associated scientific information and knowledge form a major source for economic growth, social change, and ecological governance.

The development and application of science and technology have extended the scope and scale of global, national, and local economic activities. They have brought immense changes both in human life and on the ecological base. For centuries science and technology have been applied to improve and manage the health, social, nutrition, and economic spheres of the population. For this reason the development and application of science and technology remain major issues of public policy discourse.

The concept of sustainable development articulates the fact that technology may have environmentally harmful effects. This fact has provided impetus for the concerns demanding the development and utilization of environmentally sound technologies. There is global concern for the establishment of regulatory (legal, institutional, and policy) measures to control the generation and use of technologies that have negative ecological and socio-economic effects. For example, most countries of the European Union (EU) have adopted regulations that ban the application of certain biotechnological processes used in the manipulation of life forms. At the international level, concerns on managing technology to avoid ecological and socio-economic catastrophes are reflected in Agenda 21. Specific chapters articulating concerns of regulating the development and use of technology are: Chapter 16 on environmentally sound management of biotechnology and Chapter 34 on transfer of environmentally sound technology, cooperation, and capacity-building.

The principles of sustainable development also encompass issues of equity in the allocation of the benefits of technological development. In African countries, the results of technological development in the form of improved health facilities, increased nutrition, enhanced agricultural production, and improvements in the quality of food, easy and fast transportation, telephones, radios, etc., are accessible to only a small percentage of the people.

The proper application of technology should enhance national economic growth, improve the socio-economic welfare of the people, increase national competitiveness, and improve efficiency in the use of natural resources. It should increase the range and volume of a country's exports by making it possible for the country to respond quickly and more effectively to changing patterns of global trade and opportunities created by technological advances. It should also make it possible to effectively address social and environmental problems, particularly those of the poor and disadvantaged.

It should also be noted that the impact of technological change on a country's socio-economic structure is determined by the broad policies of the country toward income distribution, employment, health, basic needs, and by specific technological interventions on particular problems and opportunities affecting the majority of poor people. Indeed, the challenge to African countries lies in establishing suitable policies and institutions that promote the harnessing of appropriate technologies and applying these to the solution of local problems. An extension of that challenge is to also develop indigenous technological capabilities and absorb and assimilate imported technologies. This extends to reforming existing economic and political institutions and policies that allocate the benefits of development to a small portion of society. It is mainly through well-informed policy and institutional reforms that the imperatives of sustainable development will be addressed through proper application of technology.

The challenge for African countries is two-fold. One, they should establish a better understanding of the new and emerging technologies and their implications for sustainable development. Two, these countries should ensure that international regimes explicitly pro-

mote environmentally sound technology transfer. They should also integrate technology considerations into development cooperation and trade negotiations with the industrialized countries.

### *The dual revolutions: Challenges for Africa in the 21<sup>st</sup> century*

The 21<sup>st</sup> century is an epoch of dual revolutions: radical advances in biotechnology and information and communications technologies (ICTs). It is a period when the relevance and quality of global, regional, and national governance regimes are being tested as the development and application of new technologies – products and processes – profoundly expand socio-economic and political choices for households in the developed and some developing countries. For example, advances in ICTs have radically changed global commerce and associated patterns of financial flows. They have “reduced the cost and increased the speed of communications across the globe, abolishing pre-existing barriers of time and space, and in consequence affecting all areas of social and economic life. ... [and this] has made possible the integration of national systems of production and finance, and is reflected in incredible growth in the scale of cross-border flows of goods, services and capital.”<sup>12</sup> Electronic commerce is irreversibly altering existing trade policies, rules, and practices as well as the concept of money. Many complex jurisdictional challenges in tax management, information security, crime control, and protection of intellectual property rights are emerging.

Developments in modern biotechnology provide potential to produce new, improved, safer, and less expensive products and processes. Pharmaceuticals and diagnostics for humans and animals, seeds, entire plants, animals, fertilizers, food additives, industrial enzymes, and oil-eating and other pollution degrading microbes are just a few of the goods that can be developed using the technology. In agriculture, at least 70 genetically modified (transgenic) varieties of crops were registered for commercial cultivation worldwide in 1999. These include new varieties of cotton, potato, tobacco, tomato, and clove. More than 15,000 field trials have been undertaken globally. More than 100 plant species have undergone genetic modifications and are growing in laboratories, greenhouses, or in the field, providing farmers with new agronomic traits, particularly herbicide tolerance and pest resistance.

Genomics, a fast growing area of modern biology, is making it possible for scientists and companies to identify genes that are linked to particular diseases. They are able to develop genetic tests that can facilitate prevention of certain illnesses. This science has also advanced drug development in very profound ways. Combined with advances in imaging technology and sensors, medical practitioners will be able to use genomic approaches to diagnose many neoplastic diseases and offer early treatment. The completion of the mapping of the malaria parasite genome and the genomes of bacteria and many other parasitic organisms will pave the way for the development of vaccines and other control measures for many of the tropical diseases in the developing world.

Some developing countries are already reaping the benefits of biotechnology. For example, Cuba has deployed biotechnology to develop two vaccines: meningitis B vaccine and hepatitis B vaccine. The meningitis B vaccine is effective and exported to many coun-

tries. Despite the embargo, the US has made an exception and has agreed to import this vaccine. Cuba generates more than US\$100 million annually from the sale of vaccines. More than 97 per cent of Cuba's children and adult population have been vaccinated and acquired immunity against meningitis.

While advances in biotechnology offer significant and growing opportunities to reduce human suffering and enlarge the range of socio-economic choices, they also pose potential risks. Some of these genetically modified organisms could undermine ecological stability, reduce biological diversity and cause harm to human health. The introduction of genetically modified foods with new proteins may cause allergies to some populations. The risks should be considered and their cost weighed against potential benefits, and specific risk management regimes introduced.

For Africa, the dual revolutions are not yet making a difference. Food insecurity, poor and deteriorating public health, environmental degradation, and socio-political unrest continue to be major preoccupations.

There is a common lesson that Africa can draw from the economic history of some of the Asian countries. A key factor in the successful economic and industrial development of these countries is that they have formulated and are implementing deliberate policies to harness and apply science and new technologies. These countries have acquired new forms of technological dynamism that have enabled them to improve their methods of economic production. For example, "the reduction in undernutrition in South Asia from around 40 per cent in the 1970s to 23 per cent in 1997 – and the end of chronic famine – was made possible by technological breakthroughs in plant breeding, fertilizers and pesticides in the 1960s that doubled world cereal yields in just 40 years. That is an astonishingly short period relevant to the 1,000 years it took for English wheat yields to quadruple from 0.5 to 2.0 tonnes per hectare."<sup>13</sup>

The role of science and technology in development is becoming more manifest with the growth of the knowledge economy. Industrial change and productivity are increasingly being driven by science and technological change. Yet, in many African countries there are *weak links between science and industrial activities (Author's emphasis)*. "Local industries generally purchase technology and related know-how from abroad rather than connect to local scientific thrusts. Toward the lower end of the development spectrum there is an almost total disjuncture between science and industry."<sup>14</sup>

The distribution of benefits of the dual revolutions and the closing of technological gaps between Africa and the rest of the world are some of the key policy and political issues of governance today. Without the engagement of Africa's political leadership and the formulation, as well as implementation, of strategic science and technology policies and programs, the dual revolutions will continue to ignore and marginalize Africa and its people. At the regional level, there is a growing recognition by African politicians and policy-makers that collective (Africa-wide) action is required to "extricate ...the continent from the malaise of underdevelopment and exclusion in a globalizing world."<sup>15</sup> Translating this recognition into

action requires a well thought-out agenda and associated programs. It will require African governments to pay more attention to the main sources of economic change and globalization: science and technological innovation.

NEPAD is a new opportunity to embark on the formulation and implementation of action-oriented regional programs for scientific and technological development. It creates the necessary space for the mobilization of African politicians, policy-makers, the public, and scientists to collectively establish common R&D activities for common problems. NEPAD recognizes that its programmatic agenda must be “based on national and regional priorities and development plans that must be prepared through participatory processes involving the people.”<sup>16</sup> It identifies a number of priority areas and sets some goals. For example, information and communication technologies are identified as important for integrating African economies into the global system. The NEPAD document sets the objective of doubling “teledensity to two lines per 100 people by 2005, with an adequate level of access for households”. It also recommends that investment in ICTs should be focused on developing local content software based on Africa’s cultural systems. The NEPAD calls for the establishment of science and technology actions to:

- a) promote cross-border cooperation and connectivity by utilizing knowledge currently available in existing centres of excellence in the continent
- b) develop and adapt information collection and analysis capacity to support productive activities as well as for exports outside Africa
- c) generate a critical mass of technology expertise in targeted areas that offer high growth potential, especially in biotechnology and geo-science.<sup>17</sup>

Through NEPAD, Africa aspires “to increase her contribution to science, culture and technology”.<sup>18</sup>

### ***Foreign direct investment (FDI) and sustainable development***

Economic growth in sub-Saharan African (SSA) countries, which are predominately primary commodity exporters, is strongly influenced by movements in commodity prices on international markets and the content and levels of foreign direct investment. Sub-Saharan Africa’s total imports declined from US\$83.5 billion in 1998 to US\$77.2 billion in 1999. This was largely due to the Asian financial crisis. The crisis exerted pressure on the region’s terms of trade, as world prices fell for most of Africa’s commodities. There was lower demand in Asia for Africa’s exports – crude oil, gold, and copper. The terms of trade of the countries worsened during the 1990s.

The region’s share of global trade has declined considerably while the volume of global trade has tripled. SSA’s trade has grown less than 10 per cent in the past two decades or so. SSA accounts for less than 1 per cent of US merchandise exports, and less than 2 per cent of US merchandise imports. It accounts for only 3.5 per cent of total global

exports and 3.7 per cent of total imports for the EU. However, the US is still Africa's largest single market, purchasing 19 per cent of the region's exports in 1999.

Africa's vulnerability to changes in global commodity prices has had effects on its growth and demonstrated the need for economic reforms that promote economic diversification and industrialization. GDP growth in SSA declined from 3.1 per cent in 1998 to 2.2 per cent in 1999. The region's growth rate has lagged behind that of developing countries as a group.

To change Africa's economic performance and promote sustainable development, domestic resources must be complemented or reinforced by external support. Official Development Assistance (ODA) constitutes a large component of external efforts and resources, but it is declining. While measures are needed to reverse this trend, it is also important that ODA be complemented by other sources of external capital, particularly foreign direct investment (FDI).

FDI is particularly attractive to African countries for at least two main reasons. First, it has the potential to address the problems of low levels of investment and foreign exchange shortages. FDI inflows bring to the host country foreign exchange, supplement domestic savings, and raise the level of investment. Import substituting investment can help reduce a country's import bill, while FDI in export industries will increase its foreign exchange earnings. Second, FDI could be a source of new technologies, including know-how and know-why. It can stimulate the establishment of local industries to supply inputs to the newly established plants, and could transfer technologies, including skills, to domestic enterprises. FDI can also be a source of environmental norms, values, and standards for host African countries. These are key to economic growth and sustainable development. The inflow of FDI through mergers and acquisitions can bring new forms and values of corporate governance, including better methods of organizing institutions and making decisions.

"[FDI has other] potentially desirable features that affect the quality of growth and assist with poverty reduction. First, it helps reduce adverse shocks to the poor resulting from financial instability.... FDI helps improve corporate governance. In particular, it is not easily subject to asset stripping that may render property rights distribution more unequal. Third, contrary to popular criticism FDI can help improve environmental and labour standards, because foreign investors tend to be concerned about reputation in markets, where high standards are seen as desirable. Finally, FDI generates taxes that support the development of a safety net for the poor. Many foreign investors also invest substantially in community development in areas where they operate and thus in the safety net for the particular area. Very importantly FDI can help improve the management of the social safety net, particularly service delivery to the poor, for example, water supply."<sup>19</sup>

On the other hand, in the absence of strong regulatory measures to protect the environment, FDI and investment liberalization can lead to environmental degradation and undermine

social development. They can generate pressures on the environment such as increased pollution and over-exploitation of natural resources.

The need for capital inflows in general and foreign direct investment in particular is nowhere more pressing than in sub-Saharan Africa where poverty, technological backwardness, environmental degradation, and political conflicts continue to erode domestic resources. The region has experienced deterioration of its national economies and rising levels of poverty.

Given that financial flows are inadequate and volatile and the region is subject to frequent terms-of-trade and natural shocks, it should not come as a surprise that growth continues to be too erratic and slow to permit an increase in both living standards and domestic savings. Breaking this vicious circle requires, *inter alia*, a sustained injection of external financing in amounts large enough to give a big push to the region to accelerate and maintain growth at levels higher than in the past ...<sup>20</sup>

However, sub-Saharan Africa accounts for the largest share of ODA. During the period 1990-95, the region received at least 26 per cent of total official development finance provided to all developing countries. Almost 90 per cent of this was made on either highly concessional or grant terms. In contrast, the share of long-term private capital inflows, particularly FDI, is lower than that of all other developing regions except South Asia. In 1999 FDI inflows to Angola, Lesotho, Liberia, and the Sudan exceeded bilateral ODA flows.<sup>21</sup>

In the mid-1980s private FDI flows to sub-Saharan Africa rose but began to decline in the early 1990s before recovering modestly during the mid-to late 1990s. Until the early to mid-1990s the region received a small share of FDI, relative to other developing regions of the world. Its share of global FDI flows increased considerably between 1995 and 1999. During the period 1995-98, the share of FDI inflows to the region reached 4 per cent of total flows to developing countries. As a share of GDP, FDI tripled during the late 1990s. Sub-Saharan Africa experienced an increase in FDI in 2001. According to UNCTAD, FDI flows in Africa increased from US\$9 billion in 2000 to US\$11 billion in 2001, while overall FDI flows to developing countries were estimated to have dropped from US\$240 billion in 2000 to US\$225 billion in 2001.

However, most countries in the region have not been able to attract FDI. It has been concentrated in a few oil and mineral rich countries. Over the period 1985-91, FDI to mineral and oil rich countries accounted for at least 75 per cent of total FDI flows to the region. In 1999 about 60 per cent of FDI in the region was allocated to oil and natural resources.<sup>22</sup> Between 1995 and 1999 at least 40 per cent of average FDI inflows to sub-Saharan Africa went to Angola, Nigeria, the Republic of Congo, and Equatorial Guinea, which are all oil-exporting countries.

There is no evidence that current FDI flows into the region are contributing to sustainable development. Efforts to promote FDI in Africa have not been based on and/or guided

by explicit sustainable development considerations. FDI has not necessarily targeted poverty reduction and environmental sustainability goals. The overall social, economic, and environmental impacts of private capital flows in general and FDI in particular are not easy to assess because of paucity of data. However, many studies of FDI in Africa conclude that it has had limited and in some cases negative effects. In some African countries, FDI may be undermining prospects of achieving sustainable development. In Uganda, for example, there has been debate about environmental impacts of FDI in the hydro-electric sector.

In 2001 the US-based AES corporation, the world's largest independent power producer, received approval to construct a US\$530 million dam near Bujagali Falls on the Nile. It has acquired a US\$70 million partial-risk guarantee from the International Development Association (IDA), US\$85 million financing from the International Finance Corporation (IFC), and US\$125 million from the US government investment agency OPIC, commercial loans, the African Development Bank, and its own sources.

A project information document prepared by the World Bank and the IFC states that the proposed investment by AES would "promote increased growth through the provision of adequate, reliable and affordable power in line with Uganda's comparative advantage. ...would help catalyze private investment to develop the country's significant hydroelectric potential, and potentially increase export of electricity to neighbouring countries".<sup>23</sup>

An impact assessment sponsored by AES in 1999 concluded that 820 people would be displaced. The AES did not anticipate any significant negative impacts on the people and the environment. But according to Pottinger the project "will permanently submerge highly productive agricultural land as well as islands supporting valuable natural habitats. The changes to the river could permanently harm fisheries. The area around Bujagali Falls supports a substantial number of subsistence and commercial fishermen, who depend on the resource for both food and income."<sup>24</sup> He asserts: "The project has been characterized by political pressure, both from the Ugandan president and the US government, both of which favour the project. While Parliament was still in the process of evaluating the project last year (in 1999) having rejected it several times, the US government added to the already intense political pressure coming from the President of Uganda. Local newspaper accounts reveal that both the US Ambassador in Uganda and the US Secretary of Commerce contacted the Ugandan president on the project, and stated that US-Uganda relations could suffer if the dam were not approved quickly. Shortly thereafter, Parliament approved the project."<sup>25</sup>

The impact of FDI largely depends on the nature and effectiveness of national investment policies and rules and associated agencies. It is really the investment regulatory measures and structures that a host country establishes that often determines or influences FDI focus on social, economic, and environmental benefits for the country and its citizens. Maximizing the benefits of FDI requires a regime of policies, rules, and agencies that set minimum social, economic, and environmental standards to be met by investors. Such a regime should give emphasis to the role that FDI could play to facilitate technological development of recipient/host countries.

## The road from Johannesburg

### *Regional obligations and responses*

African countries are playing a major role in international negotiations on sustainable development. They have been active in such negotiations as those on trade (at Doha), the biosafety protocol, and the convention on biological diversity. In these negotiations they have often focused their attention on three issues: technology transfer, capacity-building, and finances. Their efforts may have led to the integration of these issues into international conventions. However, they have not followed up on the translation of the convention's provisions with specific regional and national programs for implementation. Little has been achieved in terms of technology transfer, capacity-building, and new financial flows.

The Johannesburg summit offers them a new opportunity to initiate processes and programs for ensuring the implementation of Agenda 21 and related conventions on biological diversity, climate change, and desertification. They will need to do the following to make the transition from negotiations to implementation:

- Reflect on the science, technology, and investment provisions of Agenda 21 and related conventions. This should be the basis for building new and enlarging existing political and civil society constituencies for the global and regional sustainable development agendas. In particular, they should integrate sustainable development considerations into NEPAD programs and processes.
- African countries have established several regional and sub-regional cooperation arrangements. Many of these have been formed to achieve political rather than sustainable development goals. They have not focused on science and technology, particularly technological cooperation programs and networks. Through NEPAD, Africa should now develop a long-term science and technology strategy and action plan. It then needs to create institutional mechanisms for implementing the agenda.
- There is a large and growing pool of African scientists living and working in the industrialized world. While many Asian (e.g., India) countries have developed and adopted strategies to mobilize and utilize their diasporas, African countries lack such measures. The region can no longer afford to ignore this capital. Indeed, it should tap the enormous scientific and technical talents of Africans abroad and use them for its own scientific and technological development. NEPAD should develop and implement a strategy and action plan to mobilize and efficiently utilize African expertise in the diaspora.
- International cooperation and diplomacy are now powerful carriers of scientific and technological information. Yet African governments have not integrated science and technology considerations into their foreign policies. The extent to which Africa will benefit from global scientific and technological advances depends on whether and how its governments will articulate the region's specific science and technology needs as well as aspirations to the international community and particularly to the industrial-

ized countries. The WSSD is an opportunity for Africa to bring its scientific and technological development needs and agenda to the international community. Instead of continuously focusing on issues of additional financial resources, it now needs to articulate science, technology, and investment as important variables or elements of sustainable development.

### ***International support***

Despite many international negotiations and the UNCED where the international community committed itself to supporting Africa's sustainable development through technology transfer and increased investment, little has been achieved. At WSSD, African countries should remind the international community and particularly the developed countries of their obligations and commitments. They may wish to seek international support for building scientific and technological capability for sustainable development. Such support may be in the form of resources to improve the quality of scientific research institutions, establish centres of excellence in new science and technologies, and engage effectively in research and development on new technologies with emphasis on Africa's environmental, human health, and food production problems.

### **Conclusions**

This paper has outlined Africa's sustainable development challenges and problems. It has provided a general overview of the roles of science and technology in addressing the challenges and problems. The paper has noted that African countries need to articulate issues and agendas of science, technology, and related investment at the WSSD in Johannesburg. They need to solicit or seek international support for those activities and processes that will improve and enlarge the region's scientific and technological base for human development.



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## References

- Adam, R. 2001. *Choosing Good Science in a Developing Country*. Presentation at the 1st Roundtable on Africa, Science and Technology in the Age of Globalization, Nairobi, August 7, 2001.
- Klein, M., C. Aaron, and B. Hadjimichael. 2001. *Foreign Direct Investment and Poverty Reduction*. Paper Presented at OECD Conference on New Horizons and Policy Challenges for Foreign Direct Investment in the 21st Century, Mexico City, November 26-27.
- Organization of African Unity (OAU). 2001. *The New Partnership for Africa's Development* (Abuja: OAU).
- Pottinger, L. 2000. *A Case Study in Corporate Welfare* (Berkeley, CA: International Rivers Network).
- United Nations Conference on Trade and Development (UNCTAD). 1999. *Foreign Direct Investment in Africa: Performance and Potential*. United Nations Publication, UNCTAD/ITE/IIT/Misc.15., Geneva.
- UNCTAD, 2000. *Capital Flows and Growth in Africa*, Geneva.
- UNCTAD, 2001. *FDI in Least Developed Countries at a Glance*, Geneva and New York.
- UNDP. 2001. *Human Development Report 2001 – Making New Technologies Work for Human Development* (New York: UNDP).
- UNEP. 1999. *Global Environment Outlook (GEO-2)* (Nairobi: United Nations Environment Programme).
- World Bank. 2000. *Can Africa Claim the 21st Century?* Washington, DC.
- World Commission on Environment and Development. 1987. *Our Common Future* (Oxford and New York: Oxford University Press).
- World Health Organization (WHO). 2000. *World Health Report 2000*, Geneva.

## Notes

- 1 We define globalization as the opening up and integration of national economies. The process is largely driven by rapid flow and exchange of new knowledge and information.
- 2 See UNDP, 2001. *Human Development Report 2001 – Making New Technologies Work for Human Development*. United Nations Development Programme, New York.
- 3 *New Partnership for Africa's Development (NEPAD)*, p. 2.
- 4 *Ibid.*, p. 2.
- 5 <http://www.worldbank.org/poverty/data/trends/regional.htm#afr>
- 6 World Bank, *Can Africa Claim the 21st Century* (Washington, DC: World Bank, 2000), p. 172.
- 7 WHO, *World Health Report 2000* (Geneva: World Health Organization, 2000).
- 8 See for example UNEP, *Global Environment Outlook (GEO-2)* (Nairobi: United Nations Environment Programme, 1999).
- 9 World Bank, *Can Africa Claim the 21st Century?* p. 134.
- 10 UNDP, *Human Development Report 2001* (New York: United Nations Development Programme, 2001), p. 3.
- 11 World Commission on Environment and Development, *Our Common Future*. (Oxford: Oxford University Press, 1987), p. 8.
- 12 Organization of African Unity (OAU), *The New Partnership for Africa's Development* (Abuja: OAU, 2001), p. 10.
- 13 UNDP, *Human Development Report 2001*, p. 2.
- 14 R. Adam, *Choosing Good Science in a Developing Country*. Presentation at the 1st Roundtable on Africa, Science and Technology in the Age of Globalization, Nairobi August 7, 2001.
- 15 OAU, *The New Partnership for Africa's Development*, p. 5.
- 16 *Ibid.*, p. 13.
- 17 NEPAD.
- 18 *Ibid.*
- 19 M. Klein, C. Aaron, and B. Hadjimichael, *Foreign Direct Investment and Poverty Reduction. Paper presented at OECD Conference on New Horizons and Policy Challenges for Foreign Direct Investment in the 21st Century, Mexico City, November 26-27, 2001*, p. 2.
- 20 UNCTAD, *Capital Flows and Growth in Africa* (Geneva: United Nations Conference on Trade and Development, 2000).
- 21 UNCTAD, *FDI in Least Developed Countries at a Glance* (Geneva and New York: United Nations Conference on Trade and Development, 2001).
- 22 UNCTAD, *Foreign Direct Investment in Africa: Performance and Potential*. UN Publication UNCTAD/ITE/IIT Misc.15 (Geneva: UNCTAD, 1999).
- 23 See [www.worldbank.org/pics/pid/ug63834.txt](http://www.worldbank.org/pics/pid/ug63834.txt)
- 24 L. Pottinger, *A Case Study in Corporate Welfare* (Berkeley, CA: International Rivers Network, 2000). p. 3.
- 25 *Ibid.*, p. 5.