'African Renewal, African Renaissance': New Perspectives on Africa's Past and Africa's Present.
The African Studies Association of Australia and the Pacific (AFSAAP)
Annual Conference 26-28 November 2004, University of Western Australia

How Africa can benefit from knowledge*
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INTRODUCTION

There is a correlation between knowledge, development and power. It is the states which control the fountains of knowledge that often exercise preponderant influence in world affairs.[1] Africa's poverty and lack of global influence appear to stem from its weak technological and knowledge base. As Ali Mazrui has pointed out: 'The entire international system of stratification has come to be based not on "who owns what" but on "who knows what"'.[2] Similarly, Calestous Juma has argued: 'Much of the reference to Africa in international forums has focused on the continent's natural wealth. However, natural resource endowment is not a sufficient basis for economic growth; it must be accompanied by investments in science and technology'.[3] Investment in science and technology implies establishing the foundation for knowledge production. For purposes of this article, the term knowledge means formal and informal education, scientific know-how and useful ideas. It may be acquired through books, journals, the internet, educational institutions, research centres, internships, workshops and conferences. Knowledge is a double-edged sword that can be used for destruction or construction.

Africa's opportunities to benefit from global knowledge flows lie partly with the global community and partly with Africa itself. Africa is rich in natural resources, but to turn them into consumable wealth, it would require a capacity to engage in appropriate knowledge-intensive processes. These can be obtained through education, social learning and the strategic partnerships that African states and universities can establish with institutions abroad. Through strategic partnerships, Africa might build its pool of expertise in a range of disciplines, such as law, medicine, policy studies, and science and technology. As knowledge is double-edged, this paper argues that Africa should seek knowledge that can facilitate sustainable development, environmental management, democratic governance and peace building. This type of knowledge holds the key to Africa's future. It is African countries that should come up with initiatives on how they can tap into appropriate sources of knowledge. However, the global community should consider it to be in its own interest to provide training facilities and financial resources with which African states can pursue such initiatives.

To explore systematically how Africa might benefit from global knowledge, this paper examines several variables: the global structure of knowledge; strategic leadership; the African political and legal climate; and capacity building. Its first hypothesis is that Africa remains on the scientific, technological, economic, political and military margins of the world largely because it is a net consumer, rather than a producer, of useable knowledge. The second hypothesis is that African countries and universities require strategic leadership in order to benefit adequately from the rapid increase in global knowledge flows. The third hypothesis is that African countries could have a larger share in the benefits of global knowledge if they established a political and legal atmosphere that permitted innovations in science and technology, flexible working conditions, and respect for fundamental freedoms. The fourth hypothesis is that African countries would find it easier to build knowledge economies if they engaged seriously in capacity building, which includes the revamping of universities and research centres.

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This paper is guided by one ethical concern, namely that under the present circumstances, knowledge creation in Africa needs to be geared towards alleviating poverty and raising the standards of living for the majority of the people. Knowledge processes must target at least four important goals: human welfare, participatory democracy, peace building, and socio-economic justice.

THE STRUCTURE OF KNOWLEDGE

One of the starting points for a discussion of the role of knowledge in Africa is the global structure of knowledge, which is a major determinant of Africa's share of knowledge. The Western world dominates the global structure of knowledge through various means, including journals and books that promote Western-generated knowledge. The refereeing process in journals is a policing exercise that ensures that only knowledge framed in ways that reflect Western standards is accepted for publication. Domination is also achieved through citations, which are considered a measure of the impact of publications. Whereas African scholars cite sources from all parts of the world, Westerners mainly cite fellow Westerners even on African issues where credible African sources exist. Even textbooks written by Africans for Africans rely heavily on Western-generated epistemological and methodological perspectives. A good example is *Power, Wealth and Global Order: An International Relations Textbook for Africa*.[4] This book makes no effort to explore the perceptions of us/them, self/other and outside/inside in African traditions. Its bibliography includes one book by Kwame Nkrumah, but it lists no publication by other African thinkers who played important roles in shaping Africa's relations with the rest of the world, such as Julius Nyerere, Frantz Fanon and Leopold Senghor. Another disappointing feature regarding knowledge production in Africa is that few African journals, outside South Africa, are published regularly. For example, my first refereed article was accepted by an African journal in 1976, but it was not published until 1982. This is one of the reasons that Africa remains a net consumer, rather than a producer, of knowledge.

As a net consumer, Africa suffers several disadvantages. First, Africa applies knowledge that was shaped by non-African contexts that might have little or no relevance for African conditions. Knowledge production is a social and political process that reflects the historical, cultural and institutional milieu of its producers. Knowledge is constructed for a social, scientific or political purpose and for a community of scholars or policy makers. In interpreting data, researchers are often influenced by their cultural, ideological or racial values. In disseminating the findings of research, scholars emphasise some facts and ignore others, depending on their audience and preferences. What Robert Cox said about theory equally applies to knowledge. In Cox's words: 'Theory is always *for* someone and *for* some purpose. All theories have a perspective. Perspectives derive from a position in time and space, specifically social and political time and space'.[5]

Moreover, when researchers convey their findings, they do so in language, which cannot be value-neutral. In sub-Saharan Africa, this linguistic factor assumes an extra dimension because the language of transmission of ideas is often a borrowed one: English, French and Portuguese. As knowledge construction is a social and political process, it has to be recognised that while scholars may engage in serious research and may treat all evidence consistently, they cannot provide value-free knowledge.[6] Revelations about the tobacco industry have shown that sometimes scientific knowledge is interpreted to suit the interests of the funding body. It is this value-laden knowledge that Africans consume.

Second, all knowledge is contestable and, in some cases, transient, and Africa is disadvantaged because it plays no role in the adjudication of knowledge claims. The transient character of knowledge suggests that while society may accept today's scientific findings, it should not lose sight of the possibility that these findings may be challenged tomorrow. A good example of a recent successful contestation of established knowledge was the challenge to the claim by medical science that peptic ulcer was caused by excessive

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acidity in the stomach. For many years, antacids were prescribed, and are still prescribed in many African countries, but in the 1980s a study in Western Australia found that the cause of stomach ulcer was not acidity, but a bacteria called *helicobacter pylori*. Excessive acidity was the symptom, not the cause. The study established that '100% of patients with duodenal ulcer and 80% of those with gastric ulcer' had *helicobacter pylori*.[7] This was a big threat to the pharmaceutical companies which manufactured antacids, and they initially challenged this finding, using other gastroenterologists and histopathologists to try to discredit the two medical researchers – B. J. Marshall and J. R. Warren - who had discovered *helicobacter pylori*. However, it is now generally accepted that *helicobacter pylori* 'is the cause of most gastric and duodenal ulcers, with elimination of the organism leading to healing of the ulcers and a significant reduction in the incidence of recurrence'.[8]

The attempt to disregard the clinical significance of *helicobacter pylori*, even after logical answers to most questions had been published, is not an isolated case. As Neil Harrison argues, the contestation of knowledge in science often follows a pattern.[9] Generally, a problem would be identified. Scientists would be asked by policy makers to present their best research findings on it. However, if the findings were seen not to be politically expedient, the policy makers would disregard the science. In such a case, if the scientists persisted in calling attention to their data, they would be labelled dissenters and their reputations attacked. To participate effectively in the contestation of knowledge, scientists need excellent facilities for research and experimentation. Unfortunately, no African country can afford such facilities. This became apparent a few years ago when South African researchers, with the support of President Thabo Mbeki, sought to question the understanding that it is HIV alone that causes AIDS.[10] The South African researchers did not possess the evidence and tools with which to challenge the existing paradigm. Their failure does not mean that their hypothesis is wrong. The implication of knowledge contestations is that Africa, as a net consumer, receives only that knowledge, which the knowledge brokers in the developed world consider to be socially and politically palatable.

Third, Africa's marginal socio-economic position vis-à-vis other parts of the world is, in large part, due to the fact that it is a net consumer of knowledge and technology. More than 150 years ago, Karl Marx argued that it was the economic base that determined the prevalent ideas and institutions. If this was the case during his time, it is no longer so. The global structure of knowledge and ideas plays a very important role in determining the structure of political and economic power and influence. Societies that are rich in natural resources, but poor in knowledge and modern technology, like many African states, may not succeed as well as those which have both knowledge and resources. Indeed, the states that are rich in knowledge and modern technology are likely to have greater global influence, even if they are poor in natural resources. This is one of the reasons why a natural-resource poor country like Japan is richer and globally more influential than a natural-resource rich country like Congo, which is poor in knowledge.

While Africa is marginalised in the global structure of knowledge, it can still build a knowledge economy using at least four sources of knowledge. The first consists of indigenous knowledge producers, and if Africa were to succeed, it would need to work closely with this group. There are indigenous sources of knowledge on medicine and environmental management that could be exploited. Zimbabwe's successful Communal Areas Management Programme for Indigenous Resources, in which people living in communal lands have been given legal rights and technical support to manage their natural resources sustainably, is a product of indigenous thinking. Under this scheme, communities that have a proper management plan approved by the Department of National Parks and Wildlife Management, are permitted to harvest wildlife and use the profits for rural development while at the same time contributing to conservation.[11] The second source consists of home-based African researchers, some of whom have done commendable research on many issues, including biodiversity[12], democracy[13], development[14] and

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security.[15] Global efforts aimed at assisting African countries to build their intellectual capital need to explore ways of establishing strategic partnerships with home-based African researchers. The third source consists of expatriate knowledge brokers, who provide a 'band-aid' type of support to knowledge creation. African states that want to succeed in developing viable strategies for the creation of knowledge through their universities and research centres should make use of expatriates as some of them might help Africans establish strategic partnerships with foreign institutions. The fourth group of knowledge creators in Africa consists of African scholars in the diaspora. Some members of this group have explored ways of networking with their counterparts in Africa to try to inject new life into African universities and research centres. For example, in 2001, a group of African scholars working in Australia, the UK and the US launched the African Millennium Initiative for Science and Technology (AMIST) through the UN University Institute for Natural Resources in Africa (UNU/INRA). The aim of AMIST is to bridge the knowledge gap between home-based African academics, and their counterparts in other parts of the world.[16]

The current global structure of knowledge disadvantages Africa and demands that the way forward is for it to create knowledge that is appropriate for its conditions and goals. The most effective way for Africans to convert their natural resources into national wealth is to focus on widening and deepening their knowledge base. Given the present level of economic, scientific and technological capacities in Africa, education needs to be geared towards the achievement of human welfare, participatory democracy, poverty alleviation, sustainable development, peace and security. Realising these policy goals calls for strategic leadership.

THE ROLE OF LEADERSHIP

Leadership is a key variable in the production and application of knowledge. It is generally acknowledged that leadership entails a vision, inspiration, goals and strategies. The term leadership conjures up the image of an exemplary figure; of someone who can help others set goals and achieve them. It also implies the capacity to control, shape or direct an entity, an activity or a process. This capacity requires creative and imaginative thinking, innovation and entrepreneurship. In the area of knowledge production, leadership includes, but is not restricted to, the ability to manage groups of researchers, strategies to raise funds for research projects, and plans to disseminate research findings. Hence, research leadership may be defined as the ability, willingness and a commitment to mobilise and utilise the best resources, operational skills and techniques available to attain a given goal or find a solution to a problem. Good leadership, whether research-oriented or not, should be concerned with generational change, and this implies the need to identify and, where necessary, train the potential successors.

In Africa at present, it is possible to differentiate new leadership from old-fashioned leadership. Ali Mazrui has identified at least four 'traditions' in the old-fashioned leadership in Africa: the elder tradition, like that of Jomo Kenyatta, 1963-1978; the warrior tradition, like that of Idi Amin, 1971-1979; the sage tradition, like that of Julius Nyerere, 1961-1985; and the monarchical tendency.[17] In addition, Mazrui has identified seven 'styles' of leadership that include: intimidatory; patriarchal; reconciliatory; bureaucratic; and mobilisational. According to this typology, some leaders have combined several styles, such as Kwame Nkrumah (1957-1966) who combined intimidatory and mobilisational. Others moved from one style of leadership to another, as Milton Obote of Uganda (1962-1971; 1980-1985) changed from reconciliatory to mobilisational. The monarchical tendency, charisma and the personality cult among some African leaders may have been attractive during the struggle for liberation from colonial rule, but in subsequent years, they

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hindered the development of democratic rule and strong public institutions. This, in turn, impacted negatively on the processes of knowledge creation.

Some of the above leadership traditions and styles would now be regarded as subversive of global values, norms and rules.[18] Even during the Cold War, these traditions and styles had mixed results. For example, Idi Amin's warrior tradition and intimidatory style drove intellectuals out of Uganda, impoverished the country, and destroyed institutions of learning, including the previously famous Makerere University.[19] He also led his country into war with Tanzania before he was ousted by Tanzanian troops. Indeed, Amin's eight-year rule is one reason why Uganda fell behind its neighbours in knowledge creation. Julius Nyerere's political experiment, on the other hand, attracted the world's leading leftist intellectuals to Tanzania, but as a result of the West's hostility to his policies, Tanzania's development stagnated.[20] If Africa were to create a knowledge economy compatible with its current needs, it would have to recast the old-fashioned leadership traditions and styles. It would also need to avoid choosing heads of state like Amin, Charles Taylor of Liberia and Mobutu Sese Seko of Congo, who led their countries to ruin through their misguided goals, policies and strategies.

When the Kenyan electors overwhelmingly rejected the 39-year old-fashioned rule of KANU in December 2002, the newly-elected President, Mwai Kibaki, pledged to establish a more accountable, responsible and transparent government. However, three months later, on 25 March 2003, President Kibaki did what his predecessor Daniel arap Moi had done many times. He replaced the Vice-Chancellor of Jomo Kenyatta University of Agriculture and Technology, Professor Ratemo Michieka, a soil scientist, with Professor Nick Wanjohi, a political scientist, without prior notice.[21] Professor Michieka was only half-way through his term, and his removal was announced just one day before the graduation ceremony that he had organised. His successor, Wanjohi, had been involved in Kibaki's presidential campaign and had himself failed to win a parliamentary seat. This development demonstrates at least three issues about the relationship between leadership and knowledge creation in Kenya, and some parts of Africa. First, to be considered for a vice-chancellorship one needs to be close to the political leadership, as was Professor Wanjohi. Second, the idea that the chief executive officer of the university might have some work-in-progress is not taken seriously. This is why Professor Michieka, who was mid-way through his term, was removed without notice. Third, the university community has no say in the choice of its leaders, who, in turn, have no obligation to promise any particular achievement during their tenure. The way President Kibaki handled the change of leadership at Jomo Kenyatta University of Agriculture and Technology raised serious questions about how political leadership impacts on the processes of knowledge production. He demonstrated the type of leadership that Africa needs to avoid if it is to take knowledge creation more seriously.

African states need strategic leadership to engineer the creation of appropriate knowledge. First, strategic leadership is needed to provide proper conditions for formal training and learning. This is imperative given the conditions in which African universities and research centres find themselves. Second, African states need strategic leadership to help their universities and research centres establish productive partnerships with industry and other institutions abroad. However, these partnerships should be managed in such a way that industry and foreign institutions do not set or control the agenda in African universities and research centres. Third, Africa needs strategic leadership to create conditions and structures that can facilitate the absorption of scientific innovation and its utilisation for the conversion of natural resources into national wealth. However, these goals can only be pursued in conditions of peace and security. Indeed, strategic leadership is vital for peace and security, without which knowledge creation is impossible.

Leadership is diversified and dispersed in society. For example, there are heads of government, universities and other centres of learning, who are bound to play key roles in

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shaping the appropriate conditions for knowledge creation. It is these leaders that should establish conditions for the creation of knowledge that is suited to Africa. In addition, leaders of the business sector, civil society, trade unions, the farming community, and other professions, should also perform important tasks by providing room for the absorption and application of the knowledge generated. Therefore, the term leadership applies to political as well as non-political actors.

While status or high offices, such as those of prime minister and president of a country provide a platform for exercising leadership, not all those who occupy these offices demonstrate appropriate leadership. It is possible to have a president of a country who has no strategic vision. It is also possible to have a vice-chancellor or president of a university who is not capable of providing future directions for his/her university.[22] University heads who are appointed on the basis of ethnicity, ideology or political affiliation alone may not be equipped to provide the direction that knowledge production demands in the globalising world. Thus, while it is generally expected that those who occupy high office should provide leadership, it is not always correct to associate leadership with status and rank. Even those who do not hold formal positions of power can provide leadership. For example, Nelson Mandela provided leadership while still in prison, and at a time when he did not occupy a formal position in the African National Council.

Many African states and tertiary institutions cry out for strategic leadership, that is, leadership with a clear vision and the capacity to mobilise human, financial, scientific and social resources to produce knowledge that can be used to achieve human welfare, participatory democracy and social-economic justice. The entire African continent needs leadership that can help states, governments, universities, think tanks and civil societies to generate ideas and work out the most appropriate ways of utilising the abundant national resources. It could be argued that Africa needs leaders who recognise that the pursuit of democratic governance, sustainable development, peace and security requires sound ideas and policies based on rigorous research.[23] Africa's marginalised place in the global structure of knowledge calls for leaders who acknowledge that democracy is unlikely to succeed without peace and sustainable development, and without democracy, scientific innovation may falter. There is a connection between knowledge, democracy, peace and development.

Above all, strategic leaders would recognise that universities, research centres, industry and civil society are capable of generating sound ideas for policy-making. Their tasks would be to establish conditions under which these groups can provide ideas for governance. Such leadership is not in evidence in much of Africa, but there is nothing to preclude its emerging in the future. After all, contrary to the old-fashioned perception that leaders are born rather than made, leaders can be made. Society makes leaders, and the task of policy makers is to provide conditions that are conducive to the social construction of strategic leaders.

Therefore, it is imperative that African policy makers give top priority to the training, development and nurturing of strategic leaders at all levels of society. They need to identity young people who have the potential to be effective leaders and give them opportunities to train and develop further their leadership skills. The global community should also play a role in training African leaders and in providing opportunities for such leaders to be exposed to best practices. Such training and exposure should take into account the needs for poverty alleviation, participatory democracy and peace. It is through such measures that African states can establish conditions for the creation of an appropriate knowledge base.

POLITICAL AND LEGAL CLIMATE

Just as leadership is a key variable in the production and application of knowledge, a country's intellectual capital is only as good and strong as the national political and legal

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climate permits. It is the political and legal structures of African states that have, in part, determined the poor shape of these countries' knowledge bases. Calestous Juma's call for greater 'investments in science and technology'[24] cannot be achieved easily by African states unless they restructure their political and legal systems. Just as foreign direct investments require supportive political and legal structures, investments in knowledge creation need an accommodating political-legal climate.

There are several obstacles to the efficient production of knowledge in Africa. The first is the low remuneration for researchers and university lecturers in many African states. South Africa is the exception, but even there the lecturers' salaries have been falling behind those of other professions. The second obstacle is the lack of flexibility in employment conditions. There are no incentives for hardworking researchers and lecturers, and no funds to hire the best researchers. The third is the constraints under which scholars carry out research. In developed countries, researchers simply need funds to conduct research. Ethics committees in their universities may insist on following ethical rules, but they do not hold them back. However, in many African countries, researchers need research clearance certificates, and obtaining one can take many months in some countries. The fourth obstacle is the unwillingness of the political elite to recognise that competent researchers can provide useful input into the policy process.

If African states were to make use of the knowledge produced in their own countries and elsewhere, the policy establishment would need to take a number of steps to reconfigure their political and legal structures. The first step is to make the conditions for research more flexible and attractive by redesigning political and legal mechanisms that are accommodating to innovations in the arts, science and technology and other fields. The global community can play an important role of encouraging African states to take these initiatives by funding some of them. It is through such measures that Africa can benefit from a highly skilled and mobile workforce and develop appropriate knowledge economies.

The type of political and legal structures required for African states to share in the benefits of the global knowledge economy may vary from one country to another, and from one continental region to another. Even within the same country, they will evolve in response to changing times. In the present global environment, appropriate institutions should be able to tackle the need for flexibility in the workforce, accommodate innovations in science and technology, and reform taxation rules, especially those relating to the importation of equipment associated with knowledge creation. The redesigned political and legal mechanisms also need to address effectively human rights, gender relations, environmental issues, and participatory democracy, among other things. It is such conditions that will encourage investments in knowledge creation.

The second step is to provide a mechanism for integrating science and technology adequately into development plans. Many African states are interested in the benefits of science and technology, but some of them lack the basic policy infrastructures to integrate science and technology sufficiently into development objectives. This may be blamed partly on the lack of strategic leadership, partly on the lack of skilled personnel, and partly on the nature of the political-legal structures. African policy makers can address this issue by designing political-legal structures that allow for the absorption and integration of new technologies into development.

In relation to the new technologies, critics have raised legitimate questions about genetic engineering, which, in its present form, is relatively new and it may be fraught with danger and other uncertainties. In particular, there is no consensus on the effects of genetically modified crops on the environment. It was for this reason that the UN Secretary General, Kofi Annan, stated in his Millennium Report that he intended to establish 'a high-level global public policy network to address [the ethical and social problems] and related controversies concerning the risks and opportunities associated with the increased use of

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biotechnology and bioengineering'.[25] Kofi Annan's statement implies at least three things. First, advances in biotechnology are crucial for the development and transformation of developing countries. Second, innovations in biotechnology may bring with them serious social and ethical challenges. Third, it is possible to address these challenges and controversies within a global public policy network.

This issue needs be addressed by the scientific community, including biotechnologists, ethicists and environmental specialists, but, without a proper political-legal climate, this is not possible. It is through new political and legal structures and processes that African states can meaningfully develop appropriate knowledge economies. As most African states do not have the human and financial resources to adequately pursue these measures on their own, the global community can play an important role by funding initiatives geared towards the greater integration of science and technology into development plans.

The third step is to design political and legal frameworks that take account of both global forces and indigenous contributions. African countries are part of international society, so their political and legal structures are partly derived from the rules, institutions, values and norms that bind other countries. For example, establishing political and legal frameworks in Africa must take into account the revolution in biotechnology and biomedical research, global knowledge flows, and agricultural innovations. This may help African countries to take advantage of the latest technology to improve their crops, farm in semi-arid areas, and exploit their biodiversity resources. It also may facilitate the development of strategic partnerships between African universities and research centres, and their counterparts abroad. Therefore, it is imperative that African policy makers recast their political and legal frameworks for the development of knowledge that reflects the changes in global norms while at the same time serving the local needs.

However, foreign institutions cannot be transplanted root, stem and branch into African societies without taking account of African practices. The structural adjustment programmes (SAPs), which the IMF and the World Bank promoted from the 1980s, did not take into account the positive aspects of the existing practices. As a result, SAPs were partly responsible for eroding the accumulated technological capacity in several sectors. The new structures need to reflect as much as possible the progressive values, norms and standards in Africa. The indigenous African people have knowledge about medicine, environmental management and agriculture, which may be of use in the new millennium. In this case, African universities can play important roles in setting the breadth and depth of indigenous values that are to be incorporated in the knowledge banks. Knowledge production demands that African policy makers promote, and experiment with, policies that incorporate social learning. Social learning encourages borrowing from other countries, but it also requires a greater understanding of the evolving social, cultural, economic, and scientific contexts within which African universities and research centres operate.

Thus, the top priority of African policy makers should be to redesign the political and legal structures that facilitate the development of knowledge bases. They need to establish new mechanisms that embody incentives and flexibility in workplace relations, provide room for the input of indigenous knowledge, and reflect the changing global norms and best practices. They should create structures and policies that are geared towards the absorption of appropriate technologies for the conversion of natural resources into national wealth. Finally, policy makers need to recognise that universities and research centres have the capacity to play useful roles in policy making by identifying problems and suggesting solutions to them.

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CAPACITY BUILDING

The term capacity building is often used to refer to a wide range of activities related to learning and the acquisition and use of knowledge. For example, the United Nations Environment Programme has defined capacity building as 'the strengthening and/or development of human resources and institutional capacities. It involves the transfer of know-how, the development of appropriate facilities, and training in sciences related to safety in biotechnology and in the use of risk-assessment and risk-management'.[26] In other cases, capacity building has been used to describe the training of highly skilled professionals such as lawyers, accountants, computer programmers, nurses, doctors, and science and technology specialists.

As a process of acquiring and applying knowledge, capacity building legitimises imitation. This means that through capacity building, individuals are encouraged to adopt the skills, techniques and methods of those whom they perceive as 'successful' and apply them to address problems in their own situations or countries. The term capacity building is used in this paper in a limited sense to refer to the building of human resources and societal institutions that are necessary to perform specific tasks, namely the creation of knowledge using indigenous and global sources. It is employed to describe the creation of conditions and organisational structures through which African societies can achieve human welfare, participatory democracy, peace and socio-economic justice.

Capacity building is crucial for development, the application of appropriate science and technology, and the conversion of natural resources into national wealth. Unfortunately, across the continent at this stage of Africa's development, there are still very few appropriate organisational structures and outfits for capacity building. For this reason, developing institutional capacity remains a high priority for Africa.

Successful states like Japan, Malaysia, Singapore, South Korea and Taiwan care more about capacity building than do African countries. The main problem with this example is that these states built their intellectual capital under authoritarian or semi-authoritarian regimes, which African states have to avoid. However, there are aspects of Japan, Malaysia, Singapore, South Korea and Taiwan's development that African states may need to emulate, namely adequate investment in capacity building. If African states do not do so, they are unlikely to succeed in creating the infrastructure that will get them out of the poverty cycle. There is plenty evidence that some African universities and other training institutes have been mismanaged, starved of research funds and neglected to the extent that they offer few answers to Africa's needs for capacity building. For example, at the 10th general conference of the Association of African Universities in Nairobi in February 2001, it was pointed out that most African universities were 'reeling under mismanagement, political interference and a shortage of funds'.[27]

If universities cannot provide the capacity needed, what alternatives do African states have? Donor countries insist that think tanks or research centres should play a role, but critics have raised doubts about the neoliberal-based epistemological and methodological straightjackets of these organisations. There are several reputable research centres in Africa, such as the African Centre for the Constructive Resolution of Disputes (ACCORD), the African Centre for Technology Studies (ACTS), the African Economic Research Consortium (AERC), the Council for the Development of Social Sciences in Africa (CODESRA), the Kenya Institute of Public Policy Research and Analysis, and the UN University Institute for Natural Resources in Africa (UNU/INRA). The ambitions, competencies and effectiveness of these, and similar, organisations vary enormously. They also face different political and legal constraints, depending on where they are based. Some of these research centres carry out rigorous policy analysis and have influenced state policies. However, unless some of them move out of their neoliberal straightjackets, they

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are unlikely to support consistently policies that are predominantly geared towards human welfare, participatory democracy and socio-economic justice.

Given space limitation, this paper will discuss only three of these organisations, AERC, ACTS and UNU/INRA, which have done commendable research in the science and technology policy area. The African Economic Research Consortium (AERC) serves as the regional partner network for the worldwide-wide Global Development Network.[28] It networks with other research centres and universities in West, East, and southern Africa, cutting across linguistic barriers. The AERC trains researchers and provides grants for research on several issues, including poverty, labour markets and income distribution.[29] It disseminates its research through working papers, special papers and seminars. Much of its research is conceived within the neoliberal economic philosophy.

The African Centre for Technology Studies (ACTS) has made a visible contribution to capacity building. Its books on different areas of science and technology, including biotechnology, have been of great use to policy makers and academics alike. Moreover, in collaboration with the World Resources Institute, ACTS has established a regional training course for African policy makers on the Convention on Biodiversity. The course covers several areas, including the formulation of national access and benefit sharing legislation. This is an important aspect of capacity building, but it cannot be a substitute for formal training.

It has been argued that the UN University Institute for Natural Resources in Africa (UNU/INRA) could provide the required institutional leadership 'to build African capacity in the application of science and technology, particularly in the management of Africa's biological resources and biopolicy'.[30] The UNU/INRA has the clout to assume such a leadership role. Indeed, the UNU/INRA has established an innovative networking system that serves a useful capacity building function. The UNU/INRA College of Research Associates (CRA) provides research, education and training opportunities for African scholars in different areas of science and technology. CRA members are drawn from various universities in Africa, and while participating in the UNU/INRA programmes, they still remain in their home institutions. Members are usually encouraged to prepare research proposals, which are peer-reviewed. Successful projects become part of the scheduled activities of UNU/INRA after adoption by the Advisory Board of the UNU/INRA. However, the UNU/INRA's efforts at capacity building would still leave a void because it, like its parent University in Tokyo, does not have the mandate to offer degrees.

In the long-term, African states will have to look for alternative ways of capacity building. The richer African states, like South Africa, might train their own personnel in most disciplines, with minimal outside assistance. The poorer states face more daunting tasks. They might find it necessary to give their universities strategic leaders, but unless these universities are restructured and funded appropriately, they cannot provide the needed training. There are at least two ways of addressing this problem. One is that the poorer African states might join forces to build their human capacities. The second is that the global community will find it to be in its interest to help these countries build their capacity for the generation of knowledge.

It has been rightly suggested that part of the personnel African states need in order to build their capacities should train in economic theories 'that seek to place issues such as innovation, human development and knowledge at the centre of the growth process'.[31] In addition, those charged with capacity building in African states would also need to consider imparting knowledge that draws the connections between democratic governance, resource use, sustainable development, environmental management, peace building, and international cooperation. The choice of disciplines to emphasise should change as societies evolve and as the global values and demands change. In general terms, education or training that links environmental management, sustainable development, peace and

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security would be ideal, although what constitutes each of these issues is subject to reinterpretation at different times.

The fact that there are no formal degree programmes in African universities that offer courses that link these mega-policy issues is a matter of regret. Some of the required skills can be acquired through training seminars, workshops, issue networks and strategic partnerships involving personnel from various departments and ministries. Through such *ad hoc* arrangements, African scholars and policy makers may be sufficiently exposed to theories and policy prescriptions that seek to integrate democratic governance, resource use, environmental management, sustainable development, peace building, and international cooperation. However, this is only the second best option. The first option is to restructure African universities and research centres and equip them to handle such programmes.

One of the priorities for African policy makers is to ensure that high quality research moves out of university campuses into the government ministries. This can be achieved through revamping the universities and other centres of higher education with a view to training personnel that is able to facilitate effectively the creation of knowledge economies. Policy makers should also explore opportunities of establishing regional institutes to help develop the capacity they need to enhance their knowledge bases. Such institutes are likely to receive funding from the donor community, provided they are competently managed. In addition, African policy makers and educational leaders need to broaden and deepen research partnerships with industry, as well as with developed and other developing countries. Through such partnerships, they may acquire part of the knowledge and funding they need to help their societies establish strong knowledge bases. It is these measures that will pave the highway for the creation of competitive knowledge economies in Africa.[32]

CONCLUSION

Compared to other parts of the world, Africa remains marginalised scientifically, economically, politically and militarily due its weak technological and knowledge base. This situation presents four major challenges to African policy makers.

The first challenge is that African policy makers should define the type of knowledge they need. Knowledge has been used for different purposes, including creating profits for corporations at the expense of workers and waging war on other societies. African policy makers have to identify the knowledge they need to attain human welfare, participatory democracy, peace and socio-economic justice.

The second challenge is to facilitate the emergence, nurturing or training of strategic leaders. Whether it is political, business, or educational leaders, or leaders in science and technology, it is people with strategic vision who will find the way out of Africa's marginalised position. The global community will need to play a role by providing training and exposing such leaders to the best practices.

The third challenge for African policy makers is to help build the political and legal climate through which they can address their problems in a globalising environment. It is through an accommodating political-legal climate that the African people can use new technologies, as well as indigenous knowledge, to exploit natural resources for the generation of wealth. Without transforming their political and legal machinery, African states will have very limited chances of creating appropriate knowledge and subsequently addressing some of the main causes of poverty.

The final challenge is to revamp the universities and other centres of learning, establish regional research centres, and broaden and deepen strategic partnerships with successful countries. African states have to take capacity building more seriously, as part of their efforts to create appropriate knowledge bases. It is these measures that will pave the way for Africa's meaningful participation in global knowledge flows.

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ENDNOTES

[1] Paul Kennedy subscribes to this view in his book *The Rise and Fall of the Great Powers* (New York: Random House, 1987).

[2] A. A. Mazrui, 'Technological Underdevelopment in the South: The Continuing Cold War' in P. Wapner and L. E. J. Ruiz (eds), *Principled World Politics: The Challenge of Normative International Relations* (Lanham, MD: Rowman and Littlefield, 2000), p. 275.

[3] Calestous Juma, *Science, Technology and Economic Growth: Africa's Biopolicy Agenda in the 21st Century*, UNU/INRA Annual Lectures on Natural Resources Conservation and Management in Africa (Tokyo and Accra: UNU/INRA, 2000), p. 49.

[4] Philip Nel and Patrick J. McGowan (eds.), *Power, Wealth and Global Order: An International Relations Textbook for Africa*, (Cape Town: University of Cape Town Press, 1999).

[5] Robert Cox, 'Social Forces, States and World Orders: Beyond International Relations Theory', in Robert O. Keohane (ed.), *Neorealism and Its Critics* (New York, Columbia University Press, 1986), p. 207.

[6] See, for example, K. T. Liftin, *Ozone Discourse: Science and Politics in Global Environmental Cooperation* (New York: Columbia University Press, 1994).

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[8] P. R. Murray, K. S. Rosenthal, G. S. Kobayashi and M. A. Pfaller, *Medical Microbiology*, 3rd edn. (St. Louis, Mosby,1998), p. 256.

[9] Neil E. Harrison, *Constructing Sustainable Development* (New York: State University of New York Press, 2000).

[10] See Adele Sulcas, 'Mbeki's AIDS call alarms scientists', *The Sunday Independent* (Johannesburg), 18 march 2000.

[11] CAMPFIRE fact sheets, http:www.campfire-zimbabwe.org/facts_06.html, accessed on 4 February 2001.

[12] See R. L. A. Mahunnah and Keto E. Mshigeni, 'Tanzania's policy on biodiversity prospecting and drug discovery programs', *Journal of Ethnopharmacology*, 51(1-3), April 1996; and John Mugabe and Norman Clark (eds.), *Managing Biodiversity: National Systems of Conservation and Innovation in Africa* (Nairobi: African Centre for Technology Studies, 1998).

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[13] See John Makumbe, 'Is there a civil society in Africa?', *International Affairs*, 74(2), 1998, pp. 305-317; and Roddy Fox, 'Bleak Future for Multi-Party Elections in Kenya', *Journal of Modern African Studies*, 34(4), 1996, pp. 597-607.

[14] F. Ahwireng-Obeng and P. Mcgowan, 'Partner or Hegemon? South Africa in Africa', *Journal of Contemporary African Studies*, 16(1), pp. 5-38 and 16(2), pp. 165-196, 1998.

[15] See Peter Vale, *Security and Politics in South Africa: The Regional Dimension* (Boulder, CO: Lynne Rienner, 2003); and Heidi Hudson, 'Mainstreaming Gender in Peacekeeping Operations: Can Africa Learn From International Experience?', *African Security Review*, 9(4), 2000.

[16] See, for instance, A. Uzo Mokwunye (ed.), *Bridging the Knowledge Gap: Revitalizing Africa's Universities* (Accra: UNU Institute for Natural Resources in Africa, 2002), p. 71.

[17] Ali A. Mazrui, 'Political Leadership in Africa: Seven Styles and Four Traditions', in Hans d'Orville (ed.), *Leadership for Africa: In Honour of Olusegun Obasanjo on the Occasion of His 60th Birthday* (New York: African Leadership Forum, 1995).

[18] While it is plausible to argue that 'global' values are mainly derived from the West, many of them have increasingly been accepted by non-Western societies, including African countries.

[19] See Ali A. Mazrui, *Soldiers and Kinsmen in Uganda* (Beverly Hills: Sage, 1975).

[20] See, for example, Julius K. Nyerere, *Man and Development* (Dar es Salaam: Oxford University Press, 1974); and Goran Hyden, *Beyond Ujamaa in Tanzania: Underdevelopment and an Uncaptured Peasantry* (London: Heinemann, 1980).

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[22] See, for instance, Samuel Makinda, 'Why selected vice-chancellors are outdated', *Sunday Nation* (Nairobi), 11 February 1996.

[23] For detailed and varied perspectives on some of these issues, see Diane Stone (ed.), *Banking on Knowledge: The Genesis of the Global Development Network* (London: Routledge, 2000).

[24] Juma, *Science, Technology and Economic Growth*, p. 49.

[25] See *We the Peoples: The Role of the United Nations in the 21st Century*, www.un.org/millennium/sg/report/. Accessed on 1 December 2003.

[26] See I. Virgin, R. J. Frederick and S. Ramachandran, 'Biosafety Training Programmes and Their Importance in Capacity Building and Technology Assessment', in S. Shantharam and J. F. Montgomery (eds.), *Biotechnology, Biosafety*

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and Biodiversity: Scientific and Ethical Issues for Sustainable Development (Enfield, NH: Science Publishers, 1999), p. 6.

[27] Kariuki Waihenya and Samuel Siringi, *Nation*, 11 Feb 2001.

[28] See Erik Johnson and Diane Stone, 'The genesis of the GDN' in Diane, *Banking on Knowledge*, pp. 3-23.

[29] See www.aercafrica.org/about.asp. Accessed on 28 November 2003.

[30] Juma, *Science, Technology and Economic Growth*, p. 55.

[31] Juma, *Science, Technology and Economic Growth*, p. 54

[32] See Samuel M. Makinda, *From Natural Resources to National Wealth: Ethical, National Interest and Policy Issues for Africa in the New Millennium*, UNU/INRA Annual Lectures on Natural Resources Conservation and Management in Africa, (Accra and Tokyo: UNU/INRA, 2001).

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