

# **TECHNOLOGY, RESOURCE ENDOWMENTS AND NATIONAL DEVELOPMENT**

**(9<sup>th</sup> Annual Guest Lecture of Stephen Oluwole Awokoya Foundation by I. A. Akinrele)**

## **PREAMBLE**

**I consider it a privilege to be asked to deliver this year's annual Lecture of the Stephen Oluwole Awokoya Foundation. Chief S. O. Awokoya was a man that I had respect and admiration for in his lifetime. He was a member of that team, the Awolowo cabinet of the former Western Region of Nigeria that blazed the trail of good self governance that is yet to be matched 40 years after its demise. Chief Awokoya demonstrated a vision, ability and tenacity in his professional career in Science Education which impacted glowingly on the capacity building of Nigeria's manpower, and left a legacy of how technology could be usefully applied to resource endowments for national development. I had the opportunity to interact with him in the early sixties as a part-time Lecturer in Chemistry at the Federal Emergency Science School at Onikan, Lagos when he was the foundation Principal. I formed the impression that he was indeed a motivator and a man dedicated to excellence. May his soul continue to rest in perfect peace.**

**In my letter of invitation, I was provided information about the aims and objectives of the Foundation as well as the list of past Lecturers and the themes of their speeches. All of these are quite revealing, noting that eminent persons have always been selected and that the subjects of their lectures were always relevant to contemporary issues in Nigeria. I would like to commend the members of the Board of Trustees of the Foundation for the refined and noble activities adopted to immortalize Chief S. O. Awokoya, and wish you continued success in the future.**

## **INTRODUCTION**

**It is in a sense of following the path of my predecessors and after a deep introspection that I have chosen to speak on "Technology, Resource Endowments and National Development". In 1956 the British colonial government recognized**

that it was inevitable that it would have to grant self-government to Nigeria and that it would ultimately lead to national independence. Altruistically, it took the logical step of inviting the International Bank for Reconstruction and Development (IBRD) the precursor of the World Bank to prepare a master plan for the economic development of Nigeria. In the report to the Nigerian government, the economic mission recommended that priority should be given to resource based industrialization. For this purpose, it advocated the establishment of institutional structures that would enable a sustainable programme of action to succeed.

Three Institutions were then proposed and subsequently established. They were the Central Bank of Nigeria charged with the mobilization of savings, management of fiscal payments and receipts and monetary policies. The Nigerian Industrial Development Bank (NIDB) which was funded to provide medium and long term finance at lower/viable interest rates for industrial projects that utilize local factor endowments notably local raw materials. The third institution was the Institute of Applied Technical Research now the Federal Institute of Industrial Research (FIIR). It was mandated to carry out investigations and researches into Nigerian raw material resources for use in local industries. More specifically, those materials that have the potential of being utilized as industrial inputs should be identified and characterized for suitability in processing, and to source the technology required, endogenously or externally. Technologies imported should be adapted for use under local conditions and tested for performance.

The economic policy objectives and strategies recommended by the IBRD were adopted and implemented in a consistent way during the next two decades. The results achieved were impressive in terms of economic performance and development indicators. Thereafter, new orientations to the policies were introduced emphasizing, 1 indigenization and federal character in the management of the economy and the supporting institutions. This marked the beginning of our development disconnect. There was an egocentric propensity to operate in fiefdom structures of power control, which impacted negatively on the political economy.

The statistics published of gross national income per capita GNI, human development index HDI and world ranking of Nigeria over this period (1977 – 2002) reflected such a dramatic decline in national development terms as to give concern.

Nigeria was reclassified from a middle income country to the group of the least developed countries (LDC), from food self-sufficiency to net food importing, from a country with a budget surplus to one with a budget deficit and unsustainable debt overhang. The consequences on the society were manifested in acute poverty, high unemployment, wide economic and social disparities and malnutrition and have been quite damaging for national esteem. The common refrain at public and private discussions is about our seeming paradox of wallowing in poverty in the midst of plenty. The situation has been further confounded by the recent trend to revert to some medieval practices. The introduction of penal codes that permit amputation of limbs for stealing, long periods of prison detention without trial of suspects of criminal offences, television shows of mammoth crowds seeking prosperity by financial breakthroughs, and dramatic cures of diseases and disabilities through ‘miracle technology’ are few examples of these.

The downturn in the economic and social conditions experienced in Nigeria during the last three decades has been attributed to many causes prominent amongst which are:

- a long period of dictatorial rule (military and central command type);
- lack of consistency in the implementation of fiscal and development policies;
- profane and massive looting of the treasury and the slashing of the funds offshore;
- wasteful and ostentatious projects of low priority for the country’s development;
- lack of transparency and corruption in commercial transactions.

The current Nigerian government (Obasanjo Administration) has shown equal concern about the retrogressing statistic, and is striving to arrest the trend in a bid to ameliorate the quality of life of the citizens. It has declared that it subscribes to

the basic philosophy that man should be at the centre of development, that priority must be given to poverty eradication and that development programmes should be designed and undertaken on a sustainable basis.

The government is no doubt facing a catalogue of problems, both from internal and external factors. The most aggravating in my judgement is the openly admitted fact that it is spending as much as 80% of its budgetary income on personnel and overheads. In that scenario, the scope for undertaking development projects must be very circumscribed indeed.

Although remedial action is being subjectively undertaken, there is nevertheless the need to go beyond this, and to engage in an objective analysis of our development strategy and path so far. The tools and methods of operation should be assessed against conventional and successful practices elsewhere to enable us determine what went wrong, and from which, a repetition can be avoided in our process of national rehabilitation.

## **TECHNOLOGY**

In a prosaic sense, technology may be defined as a way of doing things. Man is innately a technologist, inherently innovative. This characteristic is linked intimately with the constitution of his genes and is expressed in manual dexterity, stereoscopic vision and the ability to reason. The earliest products of technology were the bows and arrows, spears, hooks, nets, and intricately woven objects. 500 years ago, a new technology was born based upon investigations of the basic laws of nature. It was bolstered by modern science—a process designed to gain knowledge, characterized by the careful interplay of observation and theory. Thus science and technology have become mutually enforcing.

Science based technology is one of the prime motive forces of development. Its influence is pervasive and plays a decisive role in man's quest for more food, better education, health care, increased industrial output, more efficient and safer transportation and communication. As a composite factor for national development,

**technology is a complex system comprising of knowledge, skills, experience and organization required to produce, utilize and to control services and the tools or techniques. It is intrinsically a resource and can be also a creator of resources.**

### **SELECTION AND ACQUISITION**

**The choice of technology should be premised on the maximization of social welfare. In other words, the technology should be appropriate in the sense that it would be able to contribute most to the economic and social objectives of development. Three sets of factors should therefore be considered in determining whether a technology is appropriate, namely, development goals, resource endowments and condition of application.**

**Development goals should include growth of employment and output through more effective use of local resources, formation of skills, reduction in inequalities in income distribution, meeting of basic needs of the poor, improvement of the quality of life in general, and promotion of self reliance. Resource endowments would include the availability and costs of water and energy and natural resources. Some of these are more or less fixed whilst others can be influenced in the short or long-term. The conditions of application include a number of economic and non-economic factors, such as the level of infrastructure, climate and natural environment. The social structure of the population, traditions, cultural and educational background, as well as the location of the industry, the size and demand of the foreign and domestic markets, and the foreign exchange situation are also to be considered.**

**In a developing economy like Nigeria with a large agrarian community, the acquisition of technology should proceed through a dualistic system. The modern sector, urban enclave organically linked to the international market place, which would generally employ imported technologies that bring with them skill requirements, use of materials, organizational styles, and technical traditions. A traditional sector characterized by the use of simpler technologies that can be locally**

generated or adapted from foreign production processes. The latter sector would be largely producing for the domestic market, and thus should provide the framework for innovation through local research and development R&D effort. An important advantage deriving from the traditional sector is the organic linkage that will be fostered between the development of activities devoted to the generation of knowledge and the evolution of productive techniques. In other words, it would bring a marriage between science and production, a key factor in the creation of a national technology culture.

National policies should aim to strengthen the capacity to select and acquire technologies, recognizing that a judicious mix of technologies will be required for development objectives. There will be need to utilize “the largest and the smallest, the most complex and the simplest, the most expensive and the cheapest, the latest and the best, and the tried and the true”. All will be required at one time or another. However, preference should be for technologies that meet criteria such as: high employment potential, high productivity per unit of capital or other scarce resources, and high labour productivity. Domestic materials must be utilized, especially raw materials previously considered of little value, and have low running costs. They should also offer maximum opportunity for the development, as well as use of national skills and national management experience, dynamic opportunities for further improvement of the technologies and feedback effect on the national capacity to develop new technologies.

#### **ABSORPTION AND INNOVATION**

When a technology is to be transferred between a supplier and a user, it comes as a package comprising two components namely, the hardware and the software. In developing countries, there is a tendency not to give enough attention to the aspect of software transfer, hence many technologically based projects fail. Whereas machines are easily transferred physically from one location to the other, the software or know-how to operate and use them can only be transferred between human beings. Software can be likened to water that finds its level. In other words,

there must be an appropriate intellectual capacity and technological infrastructure in place to enable the software to be transferred and absorbed. It is only after a technology has been absorbed that opportunities are open during its utilization for innovation.

Edquist and Edquist have used their concept of social carriers to identify the problems associated with technology absorption. They suggest that effective absorption and diffusion is dependent upon the existence of a social entity or category- a 'social carrier'- which has an interest in applying that technology. A social carrier could be an individual farmer who changes his pattern of production as a result of the introduction of an improved plough. The carrier can also be an institution. It might be, for example, an enterprise or agricultural cooperative that can develop and promote the use of new machinery and agro-technologies. In the case of a large scale industrial technology in a developing country, the social carrier might be the government and its planning authorities, an international organization and a transnational corporation – alone or in various combinations. Human resource development is a particularly important aspect of technology absorption. Qualified engineers and scientists, middle level technicians and skilled labour provide the base for the transfer, adaptation and assimilation of technology. It is therefore of supreme importance that educational policy and manpower plans should be designed at the initial stages to take account of these and projected requirements.

Technology development calls for a directed programme that promotes research activity. Industrial establishments in developing countries do not generally have research and development units of their own and even these have a limited research and development record and with very little horizontal transfer. Whatever research takes place is, by and large, government funded through industrial research institutes or universities. This expenditure which is very low and usually less than 0.4% of the Gross National Product, is often spent on basic rather applied research,

involving programmes not necessarily drawn up as a result of clearly industry related priorities.

Manpower and financial constraints affect the process of technological innovation and development in a number of other and more detailed – ways. The commercialization of research findings for example, is dependent upon the existence of such services as product and process development, pilot plant, plant design and installation, process adjustment, advice on manufacturing operations, quality control, product and process improvement, etc. With a few exceptions, such skills and services are lacking in developing countries, and that is why the number of processes commercialized by industrial research institutes in developing countries has not been significant. In Nigeria for example, the two main institutions charged with commercializing industrial research results are the Raw Materials Research and Development Council RMDRC and the National Agency for Science and Engineering Infrastructure NASENI. These institutions do not have the composite disciplines enumerated above in their corporate profiles and so are bound to have limitations in their effectiveness.

#### **ROLE OF TRANSNATIONAL CORPORATIONS**

Transnational corporations act as “social carriers” of technology and have been responsible for about 80-90% of the technology transferred to the developing countries. This involves mainly ‘contractual transfers’ particularly in such science-intensive industrial sectors as chemicals, pharmaceuticals and electronic components. The use of transnational companies as a major source of technology has given rise to a catalogue of problems. Contradictions over basic values and social priorities have often led to the uncritical purchase of technologies and techniques, and in many cases proved detrimental to genuine development, even to the destruction of traditional technologies. Since the capacity to sell largely determines their capacity to increase their profits, the companies inevitably produce for those that can afford rather than those in need. Thus, they are essentially linked to and depend upon the affluent sectors of the society.

Transnational corporations have generally contributed little to the development of technological infrastructure in the developing countries. Rather, they have sought to minimize the value-added of their production. This is aggravated by the excessively high prices at which some technological know-how is supplied by so-called 'tie-in' clauses. Since proprietary and non-proprietary knowledge transferred by transnationals are in licensed or franchised forms from the parent company, there is little interest or initiative for R&D activities by subsidiaries and affiliates. New technologies, including improvements are developed in the parent company, which is close to the initial commercialization of the technology. Thus centralization of technology generation at the parent company helps to ensure control over proprietary technology, while the receiving country is further denied the patent.

An important aspect of negotiations with transnational corporations relates to the opening up of their technology package. Transnational companies tend to aggregate the investment function with the various technology elements, including project engineering, production technology, management and marketing. The unbundling of the technology package is important for determining the cost element of each part of the package, but of even greater significance is the possibility for domestic industry to participate in the supply of inputs and project engineering services. The extent of unpackaging is usually limited to certain sectors where the transnational company can ensure that the technology is used only by a subsidiary or affiliate under its control or is sold only in the form of a complete system, and not as separate components. In the case where foreign engineering contractors with the skills to combine various inputs are hired, the incentive to unpackage is usually weak or lacking. A great deal will depend on the technical expertise and contracting skills available in the host country. This underscores therefore, the need to place emphasis on the development of domestic capabilities in consultancy services.

## **RESOURCE ENDOWMENTS**

In the context of national economy, resource endowments provide a veritable link between technology and development. The resources may be of natural origin or

may be technology created. The natural resources are usually virgin and they only become of value by the application of technology. In other words, natural resources are not simply gifts of nature. They are also, and perhaps more importantly, defined by human judgement. It is man who decides whether or not a natural element – his country's soil, its vegetation, its fauna, its minerals, its climate – is workable or useable, and it is this decision which makes such an element a natural resource. This decision depends largely on the current state of scientific knowledge, which forms the basis of our technical know-how for transforming a given element in the natural environment into a source of energy, of agricultural or industrial product, or food. With the use of remote sensing technology, we are now able to identify and make an inventory of such resources – whether renewable like animal or vegetable resources or non-renewable like mineral resources.

Although it is often said that a nation's economic potentials are directly related to her natural resources, this axiom does not necessarily translate into reality. Africa is known to be the richest continent in terms of resource endowments. In addition to its reservoir of human resources, it has 97% of world reserves of chrome, 82% of world reserves of platinum, 64% of world reserves of manganese, 25% of world reserves of uranium and 13% of world reserves of copper without mentioning bauxite, nickel and lead. It is also reported to have 20% of world hydro-electrical potential, 20% of traded petroleum oil in the world (if we exclude the USA and the former USSR), 70% of world cocoa production, 50% of palm produce, to mention just a few. Yet Africa is the least developed and the poorest of all continents. Japan and Singapore, on the other hand, are not known to have natural resources of significance yet they belong to the advanced and rich country group.

The latter countries have used technology and human capital principally to drive their economies to wealth and prosperity. Other countries like India, China, Brazil, Mexico and Indonesia which are well endowed with natural resources but are hamstrung by large peasant populations, employ opportunities offered by

technology transfer adapted to local factor endowments to upgrade the quality of life of their citizens and to grow their economies.

Nigeria is also blessed with many and diverse natural resources. It has a tropical climate, vast area of arable land, extensive deposits of solid and liquid minerals, a substantial hydro- and geothermal energy potential. These have been systematically exploited for national development since independence using a combination of transnational corporations and international technical assistance.

The impact on the economy, however, has not matched those of other industrializing countries mentioned above. The difference can be traced to the inadequate technology infrastructure available in Nigeria, particularly with respect to the training and management of the workforce. Human resource development is rather skewed and the deployment of trained manpower is often times aberrantly implemented. Some of the distortions observed include the appointment of political kwangos to the Boards of technical institutions, technical professionals are engaged in non-technical jobs in the banks, and university professors appointed to administrative posts in the public service.

The invaluable experience and specialized training acquired by many older professional and skilled men and women have been peremptorily dumped to unproductive retirement. Young graduates of our tertiary and vocational institutions roam the streets in search of jobs. The situation calls for a reappraisal of our human resource development and utilization policy. If an objective and rational reward system were put in place, most of our professionals would opt for jobs best suited to their training. The economy would also profit from it, reducing our search for imported expertise and real need more selective.

The World Bank has recently issued a report on the relevance of the Nigerian University curriculum to national development. It commented thus: “while identifying higher education as fundamental in the construction of a knowledge economy and society, it listed Nigeria among developing nations in which the potential to fulfil this responsibility was thwarted by problems of quality, finance,

efficiency and governance. Advanced economies enjoyed the fruits of a self-promoting cycle in which the benefits of research helped to produce wealth and public support, needed to enable continued investments in research and development. Nigeria, among other developing countries, had neither articulated a development strategy linking knowledge to economic growth nor built up its capacity to do so. Though boasting of 20% of Africa's total population, Nigeria had only 15 scientists and engineers engaged in research and development per one million persons. Comparatively, Brazil has 168, China, 459, India, 158 and the United States, 4,103. This, it noted, left the country with no chance of participating in the emerging global knowledge economy”.

#### **NATIONAL DEVELOPMENT**

The goal of development in any sovereign nation is to achieve self-reliance, and to ensure for her citizens that the qualitative needs of life are met. This pre-supposes that the country's natural resources would be harnessed and appropriately transformed by the application of modern technology into valuable goods and services. National development results from two dynamics. One is internal dynamic, determined by the efforts of the country itself and the people, and the other is an external dynamic, which comes from the indispensable advantages drawn from international cooperation in terms of technical and financial support.

The internal dynamic is largely propelled by the activities of firms who actually produce the goods and services.

Companies which do not grow in size or sophistication are almost always eliminated from the market. World trade is now dominated by industrial products and services which are increasingly transacted in open market competition.

Therefore the focus of many countries that want to participate in the global trading system is to adopt development strategies that lead to value added manufacturing and industrial production.

The asymmetry in world production of goods and services between the industrialized and non-industrialized countries over the years was the basis for advocating a structural reform in 1970. Under the Lima declaration, the developing countries were to be allowed to increase their share of the trade in manufactures from 7% to 25% in a period of 25 years, that is from 1975 –2000. This was projected on the basis that they would be able to achieve an average growth rate of 10% annually in industrial production over the period.

The developed countries were therefore expected to deploy some of their industrial production to developing countries notably, the processing of raw materials and intermediate inputs. It was also believed that the redeployment of productive capacity and the building-up of technological capabilities in the developing countries, would require new mechanisms of international cooperation.

Most of the developed economies were thus persuaded to adopt policy measures conducive to foreign investment in developing countries. These included fiscal and financial measures, credit policies, investment information and promotion, subsidized pre-investment studies, investment insurance schemes, guarantee arrangements and investment protection agreements covering commercial and non-commercial risks. The concept of a new International Economic Order was now on stream, and expressed in new rounds of negotiations (Tokyo and Uruguay) under General Agreement on Tariff and Trade (GATT) and Generalized System of Preferences (GSP) rules.

It was in this framework that the Lome Convention between the European Economic Community EEC now the European Union EU and the African, Caribbean and the Pacific ACP states was signed in 1975. It provided for within the European Development Fund EDF, a significant volume of financial resources to support development strategies in the ACP countries. Trade, financial and technical cooperation and specific aid instruments were then established.

The Convention was hailed as a model of new relationship between the North and South of the economic divide, because it was contracted on a basis of equal

partnership, providing free access for the manufactured goods of ACP countries into EEC markets without reciprocity. It lasted for a period of 25 years, that is from 1975-2000, and about 40 billion euros was budgeted for its implementation. Industrial cooperation was the principal area that Nigeria was specially interested in, because of her economic potential to absorb technical assistance for industrial development, manufacturing, processing and technology transfer. The European community, in order to promote industrial development, undertook: “to assist in the establishment and expansion of all types of viable industry which have been identified by the ACP states as important in terms of their industrialization objectives and priorities”. In this context, the following areas were mentioned as meriting particular attention:

**1. manufacturing and processing of primary products;**

- a) industries processing on a national or regional basis, raw materials for export;**
- b) industries based on local needs and resources, focused on domestic and regional markets and mainly small and medium sized industries geared to the modernization of agriculture, the efficient processing of agricultural products and the manufacturing of agricultural inputs and tools;**

**2. engineering, metallurgical and chemical industries;**

- a) engineering enterprises for the production of tools and equipment tailored to maintaining the existing plant and equipment in the ACP states. These enterprises should as a matter of priority, support the manufacturing and processing sector, the major export sectors and small and medium-sized enterprises directed at satisfying basic needs.**
- b) metallurgical industries based on the mining products of ACP states, aimed at the secondary processing of mining products to supply ACP engineering and chemical industries;**
- c) chemical industries, particularly on a small and medium scale, aimed at the secondary processing of mineral products to supply the other branches of industry, and also the agricultural and health sectors;**

**3. industrial rehabilitation and capacity utilization: the restoration, upgrading, reorganization, restructuring, and maintenance of existing potentially viable industrial capacities. Special emphasis should be put in this respect on industries with a low import content that provide up-stream and down-stream linkages and have a favourable effect on employment. Rehabilitation activities should be targeted at the creation of conditions necessary to make enterprises being rehabilitated self-sustaining.**

**The European Community would also assist the ACP states to develop their technological base and indigenous capacity for scientific and technological development, and to facilitate the acquisition, transfer and adaptation of technology on terms that will seek to bring about the greatest possible benefits and minimize costs. Through the instruments of development finance cooperation, it was prepared, inter alia, to contribute to:**

- a) the establishment and strengthening of industry related scientific and technical infrastructures in the ACP states;**
- b) the drawing-up and implementation of research and development programmes;**
- c) the identification and creation of opportunities for collaboration among research institutes, institutions of higher learning and enterprises of ACP states, the EEC, Member states and other countries;**
- d) the establishment and promotion of activities aimed at the consolidation of appropriate indigenous technology and the acquisition of relevant foreign technology, in particular that of other developing countries;**
- e) the identification, evaluation and acquisition of industrial technology including the negotiation on favourable terms and conditions of foreign technology, patents and other industrial property, in particular through financing or through other suitable arrangements with firms and institutions within the EEC;**
- f) providing ACP states with advisory services for the preparation of regulations governing the transfer of technology and for the supply of available information, in particular on the terms and conditions of technology contracts, the types and sources of technology, and the experience of ACP states and other countries with the use of certain types of technology;**

- g) the promotion of technology cooperation between ACP states and between them and other developing countries, including support to research and development units in particular at regional level, in order to make the best use of any particularly appropriate scientific and technical facilities they may possess;**
- h) facilitating, wherever possible, access to and use of documentary and other data sources available in the European Community.**

**A Centre for Industrial Development CDI was established in Brussels charged with the operational implementation of these activities notably, by encouraging joint initiatives by economic operators of the EEC and ACP states. More specifically, it should undertake studies, promotional activities, assist in the setting up, strengthening and rehabilitation of industrial enterprises in the ACP countries, provide information and technical assistance on the opportunities for joint ventures and other forms of industrial cooperation between EU and ACP countries. I was appointed the foundation Deputy Director of the Centre (1977-1985), and subsequently became its first non-European Director.**

**The Organization of Africa Unity OAU working in the same vein for the new international economic order, adopted the Monrovia Declaration of 1979, the Lagos Plan of Action and the final Act of Lagos 1980. The objectives set included the alleviation of mass poverty and the improvement in the standard of living of the African people. It also opted for a strategy of collective self-reliance and self-sustained development with a target to achieve food self-sufficiency, provision of critical goods and services, the transformation of social and economic structures and the integration of African economies through cooperation at sub-regional, regional, and continental levels.**

**Industrialization was accorded a key role in the process, as a crucial instrument for the mobilization and exploitation of natural resource endowments, to raise Africa's share of world industrial production and to reduce her dependence on external factor inputs.**

The experience so far, has been disappointing and the results particularly woeful in Africa where her world share of manufacturing value added MVA is still about 1% instead of the projected 6%. The attainment of the high rates of MVA growth in African countries is contingent upon being able to mobilize substantially greater domestic investment and foreign capital flows, increased regional and interregional trade and production arrangements; and a considerable development of their technological capacity. Official Development Assistance ODA and transnational corporations are the twin elements by which these countries could raise their MVA but the requisites could not be met due to negative causes such as fratricidal wars, failure of regional and interregional cooperation and unattractive investment climate due to corruption and policy somersaults.

As one who had been involved in the operational management of international technical assistance funds for development projects, I have been sometimes baffled by the official attitude of some recipient countries. Their response can be described as bordering on ineptitude, indifference and a preference for self-seeking participation.

The projects that were often quickly followed up are what we call the 'easy options' notably, food aid, compensation funds for earning losses arising from natural disasters (STABEX), scholarships, overseas travel and training. The programmes and projects that impact on the economy on the other hand, such as those concerned with agriculture and rural development, re-forestation, anti-desertification, technology transfer and natural resource development (SYSMIN, Agricultural Commodities and Fisheries) made very slow progress. The impression given was that, because the interventions required identification, feasibility studies, appraisal and implementation by direct project funding, the donor requirements were too tedious, intellectually demanding and uninspiring.

Many African countries that are signatories of the Lome Convention and Cotonou Agreement with the European Union EU, are heavily burdened by debts from the London and Paris Clubs, yet they failed to utilize their allocations of the European Development Fund EDF for national development projects. The funds when applied

for social development and infrastructures are available as grants or loans bearing an interest at 1% for 40 years with a moratorium of 10 years. Other programmes and projects are financed by risk capital from the Fund or by loans from the European Investment Bank EIB. For example, over the period 2003-2007 as part of the Cotonou Agreement, the EIB will be able to grant EUR 3.9 billion for the financing of long-term investments in the ACP private sector. EUR 2.2 billion of this will come from European Development Fund EDF and will constitute the “Investment Facility”. The facility will be disbursed in the form of subsidized loans usually at about 9% interest per annum or as equity investments in small and medium sized enterprises SMEs through local or regional venture capital funds. In practice, not more than 30% of the EDF provision was utilized by the ACP states in a convention period. The balance is again carried forward to the next period. The countries who always made good use of their allocations (indicative programmes) are those who were willing to commit resources (human and intellectual capital) into the implementation process of their national projects.

Nigeria’s record of the implementation of the partnership agreement with European Union can be scored low from the fact that about 10% of her allocation of more than 800 million euros was utilized during the 25 year period of the Lome Convention. Yet she accounts for more than 20% of the population of the ACP states. Nigeria has always occupied the commanding height during periodic reviews and negotiations of the terms of the Convention. Improved terms and special concessions for trade, agriculture, mining, industry, finance and technical cooperation and vastly increased budgetary envelope were obtained from the European Union. However, the benefit gets lost at the implementation because of the inadequate infrastructure charged with the follow up in Nigeria. If such experience were to be repeated for the current, similar but less generous initiatives like NEPAD and AGOA, a great skepticism would be aroused.

## **CURRENT SCENARIO**

**International trade and economic relations between the developed and developing countries have experienced a remarkable change in policy measures and moral basis recently. The earlier tenets of more equitable distribution of wealth and division of labour among nations have been replaced by the more hard-faced and shrewd rules of the World Trade Organization WTO. The structural adjustment reforms required from the developed countries under the erstwhile International Economic Order have been supplanted by the structural adjustment policy SAP imposed on the developing countries whereby they are to open their markets for globalized competition of traded goods and services. International aid and technical assistance are also being subjected to political governance benchmarks largely determined by the developed countries. New stringent environmental conventions are being applied to developmental programmes and projects, sometimes elevating their costs beyond the benefit to poorer countries.**

**Huge financial investments are needed to implement the various programmes and activities for environmental protection and natural resource conservation. It was estimated in 1990 that the cost of ameliorating only six of the numerous environmental problems in Nigeria was at about US \$5 billion annually, which was the equivalent to the national budget.**

**Nigeria is reported in the World Development Report of 2002 to have fully embraced this new multilateral trading system and “built into its Rolling Plans trade and payment liberalization measures aimed at achieving SAP objectives”. The objective of the trade and payment liberalization measures is to encourage a more efficient and rational allocation of available resources through the interaction of market forces, while at the same time allowing local and foreign investors to jointly participate in the development of the economy. The fundamental idea is that in the new market economic climate underlying the SAP, it is essential that the true value of every resource and the long-term costs of exploiting it is known, budgeted, and paid for.**

The current resource base for the financing of development in Nigeria consists of wood, petroleum, coal, gas and water for energy. The principal mineral resources include fossil fuels (petroleum, natural gas, coal and lignite), metallic minerals (tin, columbite, iron, lead, zinc, gold), radioactive minerals (uranium, thorite, monazite, and zircon), and non-metallic minerals (limestone, marble, gravel, clay, shale, feldspar, etc.). The oil and gas sector has continued to be the backbone of the Nigerian economy, contributing over 90% of the nation's foreign exchange earnings and at least 80% of the GDP.

Agriculture still remains a key sector of the Nigerian economy. It provides employment for 60-70% of the population, it constitutes a substantial portion of the total non-oil export earnings and gainfully engages about 90% of the rural dwellers, of which women constitute the majority. The current growth rate of the agricultural sector is about 4.3%.

Although over 70% of the nation's population reside in the rural areas, development policies before now have tended to be urban-biased. Consequently, the rural areas have remained generally disadvantaged relative to the urban areas in term of resources allocation, economic opportunities and infrastructures.

Federal and state governments are beginning to accord priority to agriculture and integrated rural development. In pursuance of this, the Federal government is reported to have reached an agreement with the FAO in coming up with a Universal Trust Fund (UTF) for national food security programme. Other projects are the reactivation of the River Basin Development Authorities, the promotion of resource-based productive activities and grass root industrialization aimed at creating wealth and generating employment in the rural areas. The provision and enhancement of rural infrastructure namely, rural feeder roads, stock routes and jetties, rural water supply, sanitation and hygiene, rural transport and travel services, rural energy (electrification, biogas, solar and other alternative energy sources). Food storage is being provided for the storage and preservation of farm products. Also new seed/better varieties, yam and other tuber root mini-sets as well as germplasms collection are being provided to

enhance improved crop yields. Integrated Pest Management and other friendly agronomic practices, including tissue culturing of plant species and livestock transformation have also been embarked upon for increased sustainability in agriculture and rural development.”

“The Federal government has also embarked on many programmes and projects to use science as a vehicle for sustainable development. Some of these include:

- Establishment of many research institutes with specific mandates and objectives;
- Establishment of many agencies and parastatals with specific objectives and mandates such as the National Biotechnology Development Agency (NABDA); Scientific Equipment development Centre (SEDC);

Nigerian National Network of Seismic Stations (NNNSS); National Centre for Remote Sensing (NCRS);

Nigeria Natural Medicine Development Agency; and National Information Technology Development Agency (NITDA).

- Provision of research grants to Nigerian scientists;
- Ensuring the translation of science and technology results into actual goals and services: through adaptation and production; and
- Identification of areas of cooperation and establishing working relations between national research institutes and their counterparts in other countries.”

The desirability and necessity of these technological infrastructures cannot be questioned if they are well established, appropriately funded and staffed. However, what would be of greater interest is the impact they are making on the quality of life and living standard of Nigerians. Equally of concern should be the propensity to proliferate such institutions for State or Zonal political ego and ignoring the costs against the benefit. The Universities and other higher institutions of learning are glaring examples. The information that I have about our national research institutes is that many are poorly funded with regard to their R&D activities. I recall many years ago and during my tenure as the Director of the Federal Institute of Industrial Research, Oshodi, a capital development fund of N=30M naira equivalent to US\$ 30M dollars was allocated to the Institute for capacity building.

**It was to enable it grow to offer the technological services then hired from foreign institutions like Arthur D. Little, Batelle Memorial and Standford Research Institutes. That capital provision was taken away from the Institute after I left for Brussels in 1977, and shared to all Research Institutes without considering the purpose for which it was made. 36 years after, no national research institute of comparable technological capability and corporate profile exists to stem the search for foreign expertise in industrial development. The International Institute of Tropical Agriculture IITA is a case in point.**

**In a world dominated by globalization drive and survival of the fittest, Nigeria will need to divest itself of the negative effects of fragmentation and politicization of development infrastructures. Too much attention is given to the political exploitation of the resources of the country while the media act as accomplices to foster values that would normally be considered as aberrations. The practice of celebrating, awarding national honours or honorary degrees to public officers while still in office or to those in a position to administer favour is a case in point. In the European Union, for example, it was statutorily forbidden for a public officer to accept national or international honours while in office. Nigeria should consider a reward/honour system that is more aligned to objective criteria that place emphasis on time tested achievements over a period of our national history.**

## **CONCLUSION**

**I have in this discourse re-affirmed that technology when appropriately applied to resource endowments can considerably advance national development. This will only happen if acceptable management procedures are adopted. The financing of development should be based on planning, programming, performance budgeting system and implementation must be pursued with discipline and consistency of objective goals. Just as the industrial revolution brought about a change from muscle power to machines, so has today's electronic age rapidly transferred our mental processes into computers, micro-chips, networks, robotics etc. Nigeria with a literate workforce should compete to attract offshore transfer of micro-electronic manufacture as India and China have successfully done. This underscores the**

importance of mobilizing intellectual capital as a prime factor for national development.

Advocates of open market competition as the policy that promotes national development argue as follows: “Some countries have successfully harnessed market-oriented reforms to improve the welfare of all their people. But in other countries, markets have not given people as much incentive to engage in wider trade, the ability to use fully their skills and resources, and opportunities to increase their income. Effective institutions can make the difference in the success of market reforms. Without land-titling institutions that ensure property rights, poor people are unable to use valuable assets for investment and income growth. Without strong judicial institutions that enforce contracts, entrepreneurs find many business activities too risky. Without effective corporate governance institutions that check managers’ behavior, firms waste the resources of stakeholders. Weak institutions hurt the poor especially. For example, estimates show that corruption can cost the poor three times as much as it does the wealthy”.

If Nigeria will adopt these caveats in the development of her supporting institutions, then she may be truly getting out of the woods.

Allow me to close with the words of the World Bank President, Mr. James Wolfensohn in his introductory statement on the 2002 World Development Report. He states: “where countries are today, affects where they can go. A pragmatic approach to institution building is focusing on what can be done practically rather than on what should be done in an ideal world. Social and political factors affect the pace of change, and sweeping reforms are not always possible. It is important to work on the areas where opportunities present themselves; each step can take countries forward—if correctly designed. And smaller reforms can build constituencies for larger ones.”

I thank you for your audience.

## **BIBLIOGRAPHY**

- 1. Industrial Technology in Africa . UNIDO 18/222, 15 April, 1981. (Unpublished)**
- 2. Mexico’s Program for Science and Technology 1978-1982.**

**3. Technology and the Nigerian Society.**

**A series of Talks on the NBC, Lagos 1976 by I. A. Akinrele**

**4. Industrial Cooperation in the Framework of the Draft Treaty Establishing the African Economic Community. Prepared for UNIDO 1992, by I.A. Akinrele.**

**5. The Technological Self-Reliance of Developing Countries: Towards Operational Strategies. UNIDO/ICIS.133, 15 November 1979. (Unpublished)**

**6. Choice and Adaptation of Technology in Developing Countries. An Overview of Major Policy Issues. Published by OECD Development Centre, Paris 1974.**

**7. Lome IV Convention. The Courier March/April 1990.**

**8. ACP-EU Partnership Agreement signed in Cotonou, 23 June 2000 Courier Supplement, September, 2000.**

**9. Social Carriers of Science and Technology for Development. Discussion Paper 123.**

**Research Policy Programme, Lund University, Sweden, October 1979. by Charles Edqvist and Olis Edqvist.**

**10. EIB Investment Facility: Partnership Bulletin from CDE No.70 Jan/Feb 2004.**

**11. World Development Report 2002. Published by the World Bank.**

**12. National Agenda 21, CP 2002-Nigeria published by UNIDO**

**13. Higher Education. Article in the Punch Newspaper, Tuesday February 17, 2004 p.42.**