



SECTION SIX

**NATIONAL POLICY
ON
SCIENCE AND TECHNOLOGY**

FOREWORD

The National Science and Technology Policy was formulated by the Federal Ministry of Science and Technology in 1986 in the realisation of the fact that overall national development could only be sustained through the effective application of scientific and technological skills for the production of goods and services. The policy was to be a guideline designed to create harmony in the quest for knowledge about the environment through research and development and the use of that knowledge to ensure a better quality of life for our people.

However, while the reasons for which the Policy was formulated were still valid more than ten years after its publication, there is a recognition of the need to review it to take care of recent developments in the areas of science and technology and refocus its implementation to take care of these developments.

In order to come out with an up-to-date policy, the Federal Ministry of Science and Technology established a Committee of Experts and assigned to it the responsibility of carrying out a review of the extant policy. In carrying out the assignment, the Committee proceeded by circulating the extant policy document to institutions, agencies as well as individuals that were considered relevant to the evolution and eventual implementation of the National Science and Technology Policy. The Committee thereafter collated and appraised the comments and memoranda received, and together with the contents of the extant policy arrived at a reviewed National Science and Technology Policy.

In the reviewed document, science is given a prominence by creating a chapter on Science Policy in order to ensure that adequate attention is given to the development of its major domains. The highlight of the Policy Document also includes statements of National policy objectives on a sector by sector basis, including the following sectors which were not in the extant policy:

- (i) Information Technology
- (ii) Minerals and Mining
- (iii) Water Resources
- (iv) Transportation
- (v) Population and Demography
- (vi) Land
- (vii) Housing
- (viii) Urban and Regional Development
- (ix) Communications

(x) Space Science and Technology

A new chapter on organisation and structure of the Science and Technology System was added for effective coordination and management of the science and technology system. In addition, International Collaboration in Science and Technology was treated under a separate chapter.

The strategies for systematic application of science and technology for the achievement of the policy objectives, as well as for effective funding of research and development activities were also adequately crafted.

It is hoped that this Policy will provide the necessary framework within which contributions to the national advancement will be achieved through science and technology.

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Chapter One

INTRODUCTION

1.1 Basic Philosophy

Nigeria is committed to creating an independent, integrated and self-sustaining economy. The National Policy on Science and technology must therefore be geared towards achieving this goal. In formulating the Policy, statements have been made which express the intentions, objectives, strategies, and the resources to be employed in organising and utilising Science and Technology for the overall national development.

A policy should always be defined for some stated time-interval, at the end of which it should be reviewed and the priorities revised in the light of what has been achieved in terms of implementation up to the review date. The national policy contained in this document is defined within a time frame of 25 years and it should be reviewed every 5 years.

1.2 General Objectives

The National Policy on Science and Technology is anchored on the basic philosophy outlined above and the general guidelines which are expressed as follows:

- (a) Science and Technology shall form the basis for national development as a tool for influencing Nigerians thinking and working processes
- (b) The policies for Science and Technology shall take due cognizance of the economic situation and the cultural milieu in the country.
- (c) Provision shall be made for adequate development of scientific and technological manpower so as to ensure the development of the national capability in Science and Technology, and provide the basis for efficient utilisation of Nigeria's abundant natural resources.
- (d) The socio-political system within the country shall reflect the prime position of science and technology with regard to national development.

1.3 Structural Framework for National Policy on Science and Technology

It is important in a policy statement on Science and Technology to recognise the

differences between Science and Technology in their functional roles in relation to development.

Science is objective knowledge about the nature, properties and behaviour of the physical world. Developing science strictly means extending our stock of such knowledge through observation, experimentation and reasoning, which is called Research. Science creates understanding which in itself is neutral, but that understanding may be used by man to invent or create.

Technology is knowledge plus skill necessary to develop principles, procedures and processes that can be used to modify, manipulate, and otherwise produce changes in specific features, and in the behaviour of the physical world to serve human or social needs. It is technology that we apply to development.

Because of the explanations given above concerning Science and Technology, the National Policy on Science and Technology covers amongst others, the principles, methods and measures taken to stimulate, create, organize, and use scientific and technological potentials for the purpose of achieving economic, social, and cultural development.

In view of the foregoing consideration, the Nigerian National Policy on Science and Technology is hereby designed as consisting of:

- (i) National Policy on Science,
- (ii) National Policy on Technology.

Chapter Two

NATIONAL POLICY ON SCIENCE

2.1 Policy Statement

The country shall create and maintain national capability in the major domains of science, so as to be able to understand, contribute to and benefit from international advancement at the frontiers of scientific knowledge.

2.2 Objectives

- (a) To develop manpower for science, that is Senior scientists, junior scientists, and technicians.
- (b) To create specialised national institutions which are adequately equipped for study and research in natural sciences
- (c) To create networks and various mechanisms for cooperation and interchange of ideas and information, between research workers within the country.
- (d) To establish facilities and programmes for participating in international exchange of scientific ideas and information.

2.3 Strategies

- (a) Training of manpower in prioritised domains of science
- (b) Undertaking and funding of research in identified branches of science
- (c) Funding science education and training at all levels.
- (d) Providing facilities for participation in national and international workshops, conferences, seminars, and other fora for exchanging scientific ideas and information.
- (e) Providing job opportunities for scientists with adequate remunerations that will retain them in their professions.
- (f) Creating national research centres and laboratories, which shall set scientific standards, carry out specialised research on energy and materials and develop new techniques for scientific experimentation.
- (g) Establishing a national astronomical observatory.
- (h) Providing publication facilities in all scientific fields.
- (i) Strengthening the teaching of all domains of science in universities and other tertiary institutions.

Chapter Three

NATIONAL POLICY ON SCIENCE AND TECHNOLOGY: SECTORAL UTILIZATION

3.1 Preamble

The technology policy is more extensive than science policy, and it deals with the acquisition and utilisation of technology in various sectors of the economy. The sectors covered in this document are as follows:

3.2 Agriculture

3.2.1 Policy Statement

The nation shall utilise science and technology for intensive agriculture for the purpose of achieving food security, and providing adequate raw materials for sustainable industrialization.

3.2.2 Objectives

- (a) To increase food production to the level of self-sufficiency and for export; and also to ensure its availability throughout the year.
- (b) To increase the production of agro-based raw materials for local industries and export
- (c) To promote adequacy of agro-based industries that process raw materials

3.2.3 Strategies

- (a) Increasing crop production through the development of:
 - (i) more efficient farming methods,
 - (ii) high yielding crop varieties,
 - (iii) appropriate farm inputs.
 - (iv) suitable irrigation methods,
 - (v) appropriate farm implements and
 - (vi) sustainable use of land resources.
- (b) Diversification of food sources by:
 - (i) introducing new sources of food,

- (ii) adopting new dietary habits, and
 - (iii) developing new uses of existing food items.
- (c) Ensuring availability and adequacy of food throughout the year through:
- (i) the systematic upgrading of traditional technologies to improve their capacity and efficiency for food storage and processing and
 - (ii.) utilization and adaptation of imported technology for food storage and processing.
- (d) Increasing production and productivity of livestock through the development of:
- (i) improved and adapted breeds for increased quantity and quality of meat, milk and carcass,
 - (ii) vaccines and drugs for controlling animal diseases, and
 - (iii) livestock feeds from local raw materials.
- (c) Increasing fish production by:
- (i) initiating programmes for the accurate determination of the breeding and migration patterns of offish, and the productivity potential in the continental shelf region as well as the Exclusive Economic Zone (EEZ) of the nation,
 - (ii) developing improved and suitable infrastructure including fishing boats and gears, and
 - (iii) developing improved fish-farming methods with respect to fingerling multiplication, suitable fish feeds and low-cost pond construction.
- (f) Ensuring availability of livestock and fish products through the development of improved preservation, processing, storage and packaging practices.
- (g) Promoting and supporting research and application technologies such as biotechnology, that hold potential for agricultural productivity and improving the market and nutritional quality of agricultural product.
- (h) Promoting the use of agricultural mechanisation for agricultural production.

- (i) Enacting and enforcing bio-safety regulations for genetically manipulated organisms and materials.
- (j) Increasing the potential of the nation's forest products for a variety of industrial and domestic uses through the development of:
 - (i) capabilities for agro-forestry research and extension,
 - (ii) improved woody forest species,
 - (iii) purposeful afforestation programmes in all ecological regions,
 - (iv) effective enforcement mechanisms for forest conservation, and
 - (v) effective regulations against bush-fires
- (k) Increasing wildlife population for maintaining ecological balance, human consumption, game and recreation.
- (l) Improving the technology for processing, preserving, storing and utilizing forest products.
- (m) Encouraging the wider use of agricultural and forest products as inputs in other industries.
- (n) Developing efficient agricultural extension services.
- (o) Developing local capacity for the production of agro-chemicals.

3.3 Health

3.2.1 Policy Statement

The nation's health-care delivery system shall be enhanced through effective research and development activities in science and technology.

3.3.2 Objectives

- (a) To improve the health of the people.
- (b) To attain self-reliance in the nation's need for drugs and medication
- (c) To integrate traditional medicine into the national health-care delivery system
- (d) To combat drug abuse among the populace especially the young

3.3.3 Strategies

- (a) Ensuring support for health-care delivery system for all by engaging in purposeful medical research and development, including:
 - (i) maintaining a well-organised disease-reporting system by collecting epidemiological data for national health-care planning,

- (ii) developing appropriate and effective health-educational programmes aimed at improving health-care delivery system and environmental sanitation.
 - (iii) developing, improving, adapting and producing vaccines, drugs and diagnostic reagents locally
 - (iv) establishing and maintaining culture banks and National Reference Centres for pathogenic viruses, bacteria and parasites and
 - (v) developing new techniques/strategies for the control of communicable and non-communicable diseases, especially malaria, HIV/AIDS, schistosomiasis, measles, trypanosomiasis, poliomyelitis, hepatitis, onchocerciasis, sickle cell, anaemia, diabetes, and hypertension.
- (b) Developing local capability for adaptation and production of medical equipment and devices
 - (c) Increasing productivity in the local drug industry by developing medicines and other biological products through a combination of genetic engineering, microbial fermentation and biochemical engineering.
 - (d) Improving and integrating traditional medicine into the national health care delivery system.
 - (e) Identifying and collating data on local medicinal herbs and plants.
 - (f) Improving the efficacy of local medicinal herbs and plants
 - (g) Extracting active ingredients from, and standardizing the dosage of, local medicinal herbs and plants.
 - (h) Promoting public health research

3.4 Industry and Commerce

3.4.1 Policy Statement

The nation's research and development activities shall be directed towards technological development for the production and marketing of industrial goods and services.

3.4.2 Objectives

- (a) To expand the industrial base of the economy

- (b) To ensure optimal utilization of the nation's material resources through research and development.
- (c) To develop local capacity for analysis, design and machinery and equipment for rapid industrial growth.
- (d) To ensure adequate supply of engineering materials and their application through research and development.

3.4.3 Strategies

- (a) Ensuring that, as far as possible, the strategic capital-goods industry is controlled by Nigerians.
- (b) Encouraging the establishment of industries that have multiplier effects on the economy.
- (c) Promoting indigenous specialized scientific and engineering consultancy services to solve technical problems at national level.
- (d) Developing and adapting technologies that are appropriate for small-and medium-scale enterprises in urban and rural areas.
- (e) Initiating and intensifying programmes.
 - (i) in technology development in both public and private industrial, educational and service establishments, and
 - (ii) that will guarantee the development of local capabilities through the incorporation of imported "unpackaged" technologies into appropriate areas of industry.
- (f) Establishing technology transfer offices in universities, polytechnics and research institutes.
- (g) Promoting technology forecasting and assessment to facilitate informed choice in the acquisition of imported technologies.
- (h) Establishing and maintaining demonstration units on selected viable technologies in critical areas of concern until the technologies are widely adopted.
- (i) Determining the type of foreign investments in industries to ensure technology acquisition within a specified time frame.
- (j) Establishing a comprehensive inventory of local technologies and initiating improvement of these through the incorporation of high level technology to enhance efficiency.
- (k) Encouraging technology-based public and private enterprises to

- establish and maintain functional research and development units within the country.
- (l) Encouraging the public and private sectors to ensure that their research and development activities are relevant to national development
 - (m) Strengthening:
 - (i) the existing "standard" organisations in terms of technical and legislative facilities as well as trained manpower, to establish, monitor, control and maintain strict standards on materials, machinery and products in the country, and
 - (ii) the legal manpower resource-base for science and technology to improve its skills in terms of inspectorate functions and the drafting of licensing and technology contract agreements.
 - (n)
 - (i) incentives to manufacturing and service industries that have set up local research and development facilities,
 - (ii) tax and other financial incentives to organisations that commission small-scale industrial research for the purpose of manufacture, and
 - (iii) financial incentives to entrepreneurs by allowing them to retain part of their profits for their own use in the accomplishment of new technologies and new products.
 - (o) Encouraging industries to provide bonuses as material incentives to workers who develop or introduce new products and processes.
 - (p) Initiating and promoting:
 - (i) rapid and widespread development of foundries and associated refractory materials, and
 - (ii) the development in materials science and engineering for sustained local production of machinery relevant to national needs, e.g standard-gauge railway project, armaments, steel mills, ship-building, heavy engineering, alloyed metals, special steel, precision equipment, petro-chemicals, and spare parts thereof.
 - (q) initiating the design, production and related copy-technology activities in the area of machinery and tools for capability building.
 - (r) Ensuring regular preventive maintenance of all items of equipment, structures, and infrastructures in a co-ordinated manner.

- (s) Providing fiscal incentives to firms engaged in heavy engineering.
- (t) initiating and encouraging:
 - (i) Science and Technology activities that promote the use of local materials as substitutes in existing industrial processes, and
 - (ii) programmes for the improvement of locally available materials, such as coal and iron ore for iron and steel production, crude petroleum and natural gas as petrochemical feedstock, and agricultural produce as feedstock for food processing, and health industries.
- (u) Promoting and adapting processes for converting local raw materials to suitable forms as substitutes for industrial raw materials for local use and export.
- (v) Developing new and alternative materials, (metallic, organic and inorganic), to provide a good foundation for the development of new technologies
- (w) Promoting and supporting linkages between research institutes, industries and investors, especially on the issue of commercialisation of research findings.
- (x) Promoting, facilitating and ensuring safe disposal of hazardous industrial and other wastes.
- (y) Encouraging and supporting research and development activities in the areas of textiles, leather and leather products, wood and wood products, and paper and paper products
- (z) Encouraging the active participation of women in industrial science and technology activities.

3.5 Energy

3.5.1 Policy Statement

The nation's energy resources shall be optimally developed and harnessed.

3.5.2 Objectives

- (a) To ensure self-reliance in the harnessing and exploitation of energy resources.
- (b) To ensure an optimal exploitation of all energy resources with due regard being paid to environmental protection.

- (c) To ensure efficient and cost-effective energy utilization programme.
- (d) To guarantee adequate supply of energy for national development.

3.5.3 Strategies

- (a) Compiling and maintaining an up-to-date inventory of the nation's energy resources, needs and utilisation.
- (b) Rehabilitation and maintaining the existing power stations to achieve a high level of performance.
- (c) Improving the efficiency of energy conversion of fuelwood while pursuing an aggressive afforestation programme.
- (d) Encouraging the extensive use of renewable sources of energy such as solar, wind, geothermal, tidal and biogas.
- (e) Evolving simple, affordable and reliable energy systems to aid rapid development, especially of rural communities.
- (f) Promoting research and development efforts aimed at popularising and disseminating energy technologies for urban and rural areas.
- (g) Initiating and promoting local design and manufacturing of appropriate machinery for the exploitation, conversion and utilization of energy resources.
- (h) Mobilizing available local expertise to establish an optimal energy flux for the country.
- (i) Promoting safe and reliable generation, transmission and distribution of energy for local needs and export.
- (j) Initiating and promoting research and development in conventional and non-conventional energy resources such as biogas, hydro, solar and nuclear energy.
- (k) Promoting optimal energy utilization practice in all sectors of the economy.
- (l) Promoting energy conservation practices in all sectors of the economy.
- (m) Involving the private sector:
 - (i) in the generation, transmission, distribution and sale of electricity, and
 - (ii) investment in other energy technologies.
- (n) Increasing the use of natural gas for electricity generation and domestic uses.

- (o) Ensuring that in the implementation of all energy policies and programmes due regard is paid to safety and environmental protection.

3.6 Information Technology

3.6.1 Policy Statement

Information technology shall be advanced through research to ensure the adequate development and exploitation of information resources.

3.6.2 Objectives

- (a) To ensure that information technology resources are readily available for national development.
- (b) To guarantee that the country benefits maximally from and contributes optimally to, the continuously enlarging pool of the world's knowledge and information
- (c) To ensure efficient diffusion of information nationwide.

3.6.3 Strategies

- (a) Establishing programmes to facilitate the diffusion of information technology nationwide through
 - (i) promoting computer literacy as basic skill and computerization of records in the public and private sectors.
 - (ii) promoting the application of information technology in small-and medium-scale enterprises.
 - (iii) A national project on information technology education covering all levels of the educational system, and
 - (iv) The introduction of informatics as a discipline in faculties of engineering of universities and polytechnics.
- (b) Developing and exploiting hardware and software skills in information technology, with special emphasis on contemporary front-line technologies, such as computers, microelectronics, communications, artificial intelligence, robotics and cyber-space
- (c) Establishing programmes and appropriate institutions for the enhancement of national capability building in information technology through:
 - (i) research and development activities, the development of local

- capacity for manufacturing spare parts and rural/urban digital telephone exchanges, and
- (ii) the development of local capacity for manufacturing spare parts and rural/urban digital telephone exchanges, and
- (iii) the development and application of tested technologies such as radio, radar, and satellite communications with a view to upgrading and expanding the nation's telecommunications infrastructure.
- (d) Facilitating the establishment of all export-oriented local information technology industry.
- (e) Promoting full internet connectivity nationwide and encouraging its utilization at all levels.

3.7 Environment

3.7.1 Policy Statement

The science and technology activities of the nation shall be conducted in a manner to ensure sound environmental management.

3.7.2 Objectives

- (a) To protect the environment from harmful effects of human and other activities
- (b) To facilitate the preservation of the environment.

3.7.3 Strategies

- (a) Evolving clear guidelines for the development and use of natural resources.
- (b) Articulating appropriate environmental regulation that will not inhibit social development.
- (c) Incorporating environmental considerations in the planning, review and implementation of all development projects. These include:
 - (i) analysing the environmental impact of the development projects
 - (ii) instituting mitigative measures at the planning stages of these projects.
 - (iii) carrying out surveillance programme in the construction, commissioning, operation, and decommissioning stages of

- projects to ensure environmental control and protection, and
- (iv) conducting environmental and socio-economic monitoring programmes to confirm assessment predictions, and determine if design, and operating changes are required to clean-up the environment, and forestall further pollution during the life of the project.
 - (d) Assigning responsibilities and providing clear guidelines for rehabilitation of the environment after project decommissioning.
 - (e) Providing appropriate regulations to ensure good agricultural industrial, and mining practices and transportation systems that prevent pollution, decertification and land degradation.
 - (f) Carrying out periodic nationwide environmental audit and highlighting changes in the ecosystems.
 - (g) Establishing capabilities for effective prediction, monitoring and mitigation of the effects of natural phenomena such as erosion, earthquake and land-slide.
 - (h) Strengthening research and development to ensure proper waste management and the use of environmentally-friendly materials for shelter.

3.8 Defence and Security

3.8.1 Policy Statement

The nation's defence and security system shall be developed and sustained through effective applications of science and technology.

3.8.2 Objectives

- (a) To infuse science and technology activities into the operations of the armed forces and the other security services.
- (b) To ensure self-reliance in our defence and security needs and capabilities.
- (c) To promote military science and technology as strategic inputs into national development.

3.8.3 Strategies

- (a) Ensuring that all training institutions for the armed forces and security

- personnel emphasize science and technology in their programmes.
- (b) Establishing an Armament Technology Division in the existing armed forces institutions.
 - (c) Establishing a space science and technology unit in existing armed forces' institutions.
 - (d) Strengthening the Research and Development Division of the Ministry of Defence, and to provide attachment facilities for existing armed forces' institutions including Defence Industries.
 - (e) Encouraging the use of advanced technologies in military hardware and Operations
 - (f) Encouraging local production of military hardware.

3.9 Minerals and Mining

3.9.1 Policy Statement

The country shall explore and exploit all its mineral resources for economic development.

3.9.2 Objectives

- (a) To carry out comprehensive survey of liquid and solid mineral deposits in the country.
- (b) To process the mineral resources of the country for domestic and industrial uses, and stimulate export.

3.9.3 Strategies

- (a) Supporting research and development activities in identifying minerals of potential use.
- (b) Developing adequate technological capacity to undertake mineral exploration, mining and product processing.
- (c) Promoting and integrating self-sustaining industrialization process which takes into account development, exploitation, processing and utilization of mineral resources.
- (d) Promoting research and development activities in petroleum mining and solid minerals.
- (e) Supporting research on the socio-economic impact of mining operations.

- (f) Encouraging the development of small-scale mining industries.
- (g) Incorporating land reclamation activities in licensing agreements with mining companies
- (h) Ensuring pollution control in the mines' environments.
- (i) Encouraging the development of a coordinated rock-quarrying and rock polishing industry.

3.10 Water Resources

3.10.1 Policy Statement

The country shall promote science and technology activities that would facilitate efficient planning, management, conservation and utilization of surface (rain, river, ponds and lakes) and ground water resources.

3.10.2 Objectives

- (a) To support research and development activities that would facilitate acquisition of information on the status (quantity, quality and time trend) of water resources.
- (b) To support research and development activities on appropriate technology for efficient management and utilization of water resources.
- (c) To promote science and technology activities for the conservation of ground-water aquifers and surface water quality.
- (d) To promote science and technology activities for understanding specific impact of water resource development on the environment.

3.10.3 Strategies

- (a) Supporting and developing a comprehensive monitoring system for the whole country to provide accurate and adequate data for efficient surface-water management and utilization.
- (b) Supporting and developing a comprehensive programme for establishing the parameters of the various aquifer systems.
- (c) Supporting research and development activities for the purpose of enhancing the yield and quality of ground and surface water.
- (d) Promoting research and development into rain water harvesting for delivery of wholesome water for the various uses (domestic, industrial, agriculture, etc).

- (e) Promoting science and technology activities for the purpose of conservation of surface water quality and management of the aquifers.
- (f) Facilitating research and development activities aimed at prevention of pollution of surface and ground water.
- (g) Promoting site- and project-specific science and technology activities for assessment of impact of water resource development on the environment.

3.11 Transportation

3.11.1 Policy Statement

The nation's transportation system shall be developed and sustained through science and technology activities to meet the needs of the economy for an efficient, fast, safe, coordinated, and multi-modal transportation system with the minimum expenditure of resources

3.11.2 Objectives

- (a) To support research and development activities in the design, construction and maintenance of the transportation infrastructure.
- (b) To promote science and technology activities for the improvement of the nation's transportation system in terms of equipment, vehicles and spare parts.

3.11.3 Strategies

- (a) Supporting research and development activities on the use of local materials for the design, construction and maintenance of the transportation infrastructure.
- (b) Modernizing the Nigerian Railways to use the standard-gauge to replace the present narrow-gauge system.
- (c) Promoting the use of electric-traction transportation system, e.g. Trams and electric trains.
- (d) Constructing East-West and other lines for the Nigerian Railways.
- (e) Supporting science and technology activities in the road construction industry.
- (f) Construction of roads and improving the existing road network.
- (g) Modernizing the Nigerian sea, river, and air-ports to international standards.

- (h) Supporting research and development activities in the ship-building industry.
- (i) Encouraging research and development activities relating to the aviation industry.
- (j) Supporting research and development activities in the manufacture of essential equipment, vehicles and spare parts.
- (k) Improving technical and managerial skills for the selection, use and repair of modern transportation system.
- (l) Improving the information system for the various modes of transportation.

3.12 Population and Demography

3.12.1 Policy Statement

The nation shall promote science and technology activities that will improve the quality of life of the population and facilitate demographic research.

3.12.2 Objectives

- (a) To channel science and technology activities towards reducing the level of poverty of the population.
- (b) To support research studies on population, and promote S&T activities for effective national planning.

3.12.3 Strategies

- (a) Supporting periodic census-information gathering by giving assistance to the development of Geographical Information System (G.I.S) using remote sensing, which would help with delineation of Enumeration Areas.
- (b) Developing appropriate computer software for population research.
- (c) Developing appropriate technologies that will alleviate and reduce poverty.
- (d) Promoting appropriate technologies for the development of rural areas in order to stem rural-urban migration.
- (e) Promoting geographical redistribution of population.
- (f) Promoting scientific and technological methods helpful to good family planning.

3.13 Land

3.13.1 Policy Statement

The country shall promote and support science and technology activities that will facilitate conservation, sustained utilisation, and management of land resources for national development.

3.13.2 Objectives

- (a) To promote research on the development and utilisation of land resources in the country.
- (b) To institute science and technology measures to promote conservation of land resources.
- (c) To introduce measures to minimize man-made land degradation and adverse effects of natural disasters.

3.13.3 Strategies

- (a) Planning the use of land through:
 - (i) zoning ordinances and restrictive covenants, and
 - (ii) acreage control and land-use succession
- (b) Carrying out of land capability survey to identify poor and marginal lands for forestry and good land for cropping.
- (c) Monitoring the implementation of Land Use Act (LUA) especially the size of land to be allocated to various or users.
- (d) Carrying out cadastral survey to document pattern of land ownership.
- (e) Determining the type of management of Fadama land all over the country.
- (f) Creating grazing reserves, cattle routes and grazing corridors to minimize conflicts between nomadic herdsmen and crop farmers.
- (g) Utilizing remote sensing to document population dynamics and land use.
- (h) Surveying of potentially irrigable land and impoundable water.
- (i) Encouraging the development of appropriate agroforestry technologies and their adoption by small-holder farmers.
- (j) Enforcing compliance with the existing forestry policies to ensure replanting and conservation of the nations forest, flora and fauna.
- (k) Developing special natural landscapes for tourism and recreational purposes.

3.14 Housing

3.14.1 Policy Statement

The country shall develop necessary science and technology capacity to facilitate housing development in both the urban and rural areas.

3.14.2 Objectives

- (a) To support through science and technology the development of appropriate local building materials for the supply of qualitative housing.
- (b) To provide through science and technology the necessary incentives to facilitate productivity of labour force needed for housing development.
- (c) To provide low-cost housing technologies for the populace.
- (d) To ensure that both the public and private sectors participate effectively in the supply of housing

3.14.3 Strategies

- (a) Making an inventory of housing stock nationwide
- (b) Upgrading low-quality houses in both the urban and rural areas in order to improve the quality of the environment.
- (c) Identifying local raw materials suitable for manufacture of building materials.
- (d) Supporting research and development activities for promoting the use of locally-produced building materials as a means of reducing cost.
- (e) Supporting the production of standard housing design to reduce or eliminate design costs, especially for the low-income earners.
- (f) Encouraging the establishment of small-scale enterprises for the production of building materials and components.
- (g) Establishing appropriate guidelines for the production and standardization of building materials and components.
- (h) Developing work-study techniques for application in the housing industry.
- (i) Establishing National Output Standard (target output standards) for construction labour.
- (j) Establishing appropriate incentives (Financial and non-financial) for motivating the productivity of construction labour.

- (k) Developing prototype housing from standard design
- (l) Promoting and encouraging self-building housing cooperatives
- (m) Utilizing direct labour approach for the production of housing units and related infrastructures.
- (n) Encouraging pre- fabrication of building elements and components.
- (o) Strengthening the local capability in science and technology research in the construction industry.
- (p) Encouraging the private sector to participate fully in providing housing units for all income groups through tax incentives and other fiscal measures.
- (q) Government at all levels to provide appropriate infrastructures (road, electricity, water, etc)

3.15 Urban and Regional Development

3.15.1 Policy Statement

The country shall facilitate easy access to land and promote balanced urban and regional development.

3.15.2 Objectives

- (a) To promote through research and development the preparation of appropriate maps to facilitate effective and efficient development efforts.
- (b) To promote through research and development balanced urban and regional development to achieve stable and qualitative environment.
- (c) To provide and ensure unimpeded access to infrastructurally developed land.
- (d) To ensure that all tiers of government and the private sector participate effectively in the orderly development of the environment.

3.15.3 Strategies

- (a) Producing adequate cadastral and topographical maps to facilitate land use planning and administration.
- (b) Producing and updating regional development plans and urban and regional master plans.
- (c) Supporting science and technology activities for appropriate location of

- (d) industrial, commercial, social and economic projects.
- (e) Integrating effectively physical, social and economic activities in order to promote their orderly growth.
- (f) Redeveloping or upgrading of existing residential areas.
- (g) Providing residential layouts for all income groups.
- (h) Providing environmental impact assessments of urban and regional development projects for the approval of appropriate public agencies.
- (i) Providing infrastructural services to facilitate house ownership and orderly urban and regional development.
- (j) Improving road and drainage as part of settlement upgrading.
- (k) Supporting science and technology activities in the production of equipment, pipes, fittings, etc. to promote access to potable water.
- (l) Supporting science and technology activities for balanced sewage and environmental sanitation in relation to population dynamics.
- (m) Establishing land information system and encouraging land registration.
- (n) Encouraging research in urban and regional development
- (o) Restructuring relevant public institutions involved in land-use planning and management to allow private sector participation.

3.16 Communications

3.16.1 Public Statement

Science and Technology shall be applied to enhance the performance of the communication industries to stimulate economic activities and access to universal service.

3.16.2 Objectives

- (a) To design, construct and maintain appropriate communication systems, through research and development
- (b) To ensure that Nigeria is part of the Global Information System with adequate communication and information facilities.
- (c) To utilize the powerful tool offered by communications as a vehicle of development in all sectors of the economy for improving the quality of life in urban and rural area.
- (d) To support research and development in satellite communications, optical fibre and the emerging communication technologies in order to

"leap frog" into the modern communication era.

- (e) To support research and development in radio and television broadcasting (especially digital) to provide internationally acceptable standard of service to both urban and rural areas.
- (f) To utilise radio and television for educational purpose especially in rural areas.

3.16.3 Strategies

- (a) Encouraging research and development efforts in the design and fabrication of communication facilities.
- (b) Encouraging and promoting research and development activities in electronics for the communication system.
- (c) Encouraging and supporting research and development activities for the production and application of simple communication systems to facilitate modern communication services throughout the country.
- (d) Strengthening the appropriate government regulatory agency to fully incorporate information technology as part of its mandate.
- (e) Further liberalisation of the communication sector for effective and quality services.
- (f) Strengthening the capability in Nigeria for the development of the Nigerian Satellite Communication System.
- (g) Establishing a Research and Development Centre on Communication and Information Technology for the actualization of these objectives in all their ramifications.
- (h) Promoting science and technology activities in digital, radio and television broadcasting.

3.17 Space Science and Technology

3.17.1 Policy Statement

Indigenous capabilities shall be developed for space science and technology.

3.17.2 Objectives

- (a) To produce indigenous Space Scientists, Engineers and Technicians
- (b) To develop a national capability for the application of remote sensing and its related technologies in Nigeria.

- (c) To promote the effective use of space geodesy, science and techniques.
- (d) To encourage indigenous research, development, production and application of satellite communication technology.
- (e) To pursue a comprehensive satellite meteorology programme that will meet the needs of the country in weather forecasting.

3.17.3 Strategies

- (a) Strengthening the National Centre for Space Science and Technology
- (b) Promoting education of, and research and development in Space Science and Technology.
- (c) Designing, launching and monitoring of Nigerian satellites solely or in cooperation with other countries.
- (d) Establishing a National Remote Sensing Centre.
- (e) Undertaking pure and applied research in remote sensing and related technologies.
- (f) Acquiring, storing, publicising and providing regular information on remote sensing
- (g) Setting up a Space Geodesy and Geodynamics Centre
- (h) Encouraging research and development in Geodesy and Geodynamics
- (i) Conducting research and development in satellite technology
- (j) Collaborating with regional and international organisation in the development of satellite technology
- (k) Conducting research and development in meteorological satellite receivers.
- (l) Establishing national, regional and international cooperation in satellite meteorological development and application.
- (m) Encouraging Nigerian industries to participate in Space Science and technology programmes.

Chapter Four

NATIONAL POLICY ON SCIENCE AND TECHNOLOGY CAPACITY BUILDING

4.1 Preamble

The task of developing national capability for technology covers the following issues:

- (a) The training of manpower, comprising engineers, technologists, technicians and skilled craftsmen.
- (b) The development and maintenance of institutional capability in
 - (i) technology research and development
 - (ii) product design and development, and
 - (iii) design and development of machinery, plant and capital equipment.
- (c) Acquisition of technology for production of goods and services through:
 - (i) licensing, purchase and transfer of proprietary technology
 - (ii) learning and utilization of open technology, and
 - (iii) endogenous research and development

4.2 Education

4.2.1 Policy Statement

The educational system shall emphasize science and technology at all levels.

4.2.2 Objectives

To inculcate science and technology in the thinking and working processes of the society in order to create a science and technology culture.

4.2.3 Strategies

- (a) Making it possible for the average child to have early contact with the concepts of and materials related to science and technology even before attaining primary school age.
- (b) Ensuring a sound science foundation during the primary and secondary stages of the educational system through:

- (i) entrenchment of science teaching in the school curriculum,
 - (ii) promotion of computer literacy
 - (iii) provision of adequate teaching aids, laboratories and workshops,
 - (iv) provision of well-trained and well motivated science teachers and
 - (v) introducing gainful practical activities such as model-making, handicrafts, gardening, wood-working and metal-working.
- (c) Enforcing strictly an absolute minimum of 60:40 ratio of science-based courses to other courses in students yearly enrolment into the nation's universities.
- (d) Orienting science and technology curricula of polytechnics and colleges of technology to be less theoretical and more practical.
- (e) Enforcing strictly admission into polytechnics and colleges of technology to reflect a strong science and technology bias aiming at not less than 80% status.
- (f) Developing special science and technology postgraduate programmes in universities, polytechnics and research institutes, with the aim of creating an inroad into the area of high technology.
- (g) Initiating and supporting continuing education programmes aimed at specific training for top level scientists, science teachers, engineers, technologists and technicians.
- (h) Initiating and encouraging programmes for the training of scientific and technical personnel on a scale adequate to fulfill the country's needs in education, agriculture, medicine, engineering, industry, defence, etc.
- (i) Working towards establishing at least one Trade Centre/Vocational School in each local government area of the country to provide both theoretical and practical training in craftsmanship.
- (j) Ensuring that adult education includes learning how things work in addition to learning how to read and write.
- (k) Encouraging Nigerian scientists, engineers, technologists and technicians working outside the country to return home and contribute to the development of science and technology in the nation.
- (l) Encouraging and promoting the writing of mathematics, science and technical text-books at all levels.
- (m) Promoting and encouraging the publication of learned journals in

- science and technology.
- (n) Encouraging individual initiative for the acquisition and dissemination of knowledge and for the generation of new knowledge in science and technology.
 - (o) Ensuring appropriate and adequate industrial attachment programmes for all science-based courses at the tertiary level.
 - (p) Creating avenues for science and technology management training at the tertiary educational levels.
 - (q) Evolving programmes for the recognition, encouragement and development of scientific and technological talents at all levels.
 - (r) Honouring with special awards, deserving scientists, engineers, technologists and technicians involved in science and technology activities, in recognition of their contributions.
 - (s) Supporting institutional arrangement for science and technology management with the objective of stimulating and facilitating:
 - (i) the overall management of Science and Technology systems, and
 - (ii) interdisciplinary scientific knowledge and multi-disciplinary technology packages in national development systems.

4.3 Popularisation of Science and Technology

4.3.1 Policy Statement

General information on science and technology and its potential for development shall be disseminated to the general public.

4.3.2 Objectives

To ensure that members of the public are fully informed about the opportunities offered by science and technology to improve their general well-being and content of their daily lives.

4.3.3 Strategies

- (a) Utilizing the electronic and print media to give prominence to science and technology (including space science and technology).
- (b) Establishing national museums for science and technology and children's science parks

- (c) Promoting science journalism.
- (d) Sponsoring science and technology fairs at which new innovative technologies are exhibited.
- (e) Operating well-stocked and up-to-date science and technology libraries in terms of books, journals, films and other audio-visual materials.
- (f) Promoting and encouraging the publication of popular science and technology texts.

4.4 Motivation

4.4.1 Policy Statement

Due recognition and support shall be given to science and technology and persons engaged in science and technology endeavours shall be motivated through special incentives and remunerations.

4.4.2 Objective

To attract and retain a substantial percentage of the society in the mainstream of science and technology activities in the country.

4.4.3 Strategies

- (a) Ensuring that all cadres of science and technology personnel employed in science and technology undertakings are better remunerated than their counterparts in other professions.
- (b) Encouraging all levels of government in the country to develop programmes for inducing a large proportion of secondary school students to pursue science and technology courses and training in tertiary institutions through the award of grants, bursaries and allowances.
- (c) Organising prize-winning competitions in science and technology at all levels of the educational system.
- (d) Fashioning career structure and prospects for scientists, engineers, technologists and technicians to enable deserving individuals among them to attain the highest positions in the public or private sector.
- (e) Increasing postgraduate scholarships in science and technology courses.
- (f) Establishing a reward system for inventors and innovators in science and technology.
- (g) Recognising science and technology professional societies and

associations, and promoting their activities through the award of annual grants.

- (h) Utilizing the professional skills of learned societies in science and technology for consultancy services.
- (i) Encouraging the apex bodies in science and technology to provide leadership in the promotion of science and technology in the country.

Chapter Five

SCIENCE AND TECHNOLOGY FINANCING

5.1 Preamble

For science and technology to make meaningful and effective contribution to social and economic development of the country, substantial investment must be devoted to science and technology and its management. Hence, this chapter is devoted to addressing the issue.

5.2 Policy Statement

Science and technology activities shall be financed through a funding system involving all tiers of government and the private sector.

5.3 Objective

To provide adequate funds on a predictable and assured basis for S&T activities in general, and research and development in particular.

5.4 Strategies

- (a) Strengthening Venture Capital Investment Schemes to provide risk capital to industries for the development of science and technology, particularly high-capital risk projects.
- (b) Funding of science and technology development programmes by the Federal Government up to a level of 5 per cent of its annual budget, while state and local governments should contribute up to 1 per cent and 0.5 per cent of their annual budgets respectively.
- (c) Fostering in-house and local contractual research and development activities in public and private enterprises by making such investments tax deductible.
- (d) Establishing a National Science and Technology Fund (NSTF).
- (e) Requiring every industrial outfit as deemed appropriate to:
 - (i) establish and equip an in-house research and development unit,
 - (ii) make contributions to the National Science and Technology Fund, and

- (iii) give grants and endowments to individuals and institutions for research and development activities
- (f) Promoting philanthropic contributions to the NSTF by individuals and groups of people for specified research and development projects.
- (g) Encouraging the participation of research organizations in programmes of compensated transfer of technology.
- (h) Encouraging commercial and merchant banks to set fixed percentage of their loan fund at preferential rate of interest for financing capital-good industries.
- (i) Providing loan guarantees and entering into financial sharing arrangements in key areas of engineering industry to catalyse growth.

INTERNATIONAL COLLABORATION IN SCIENCE AND TECHNOLOGY

6.1 Policy Statement

The nation shall be actively involved in bilateral and multilateral exchange and cooperation in science and technology.

6.2 Objectives

- (i) To improve bilateral and multilateral co-operation in science and technology.
- (ii) To enhance competitiveness in industrial production.
- (iii) To enhance the nation's contribution to global science and technology development

6.3 Strategies

- (a) Facilitating the acquisition and advancement of new and emerging technologies through international science and technology exchanges and co-operation.
- (b) Undertaking collaborative research and development activities with international agencies.
- (c) Participating in international science and technology information networks.
- (d) Organising and participating in international conferences, workshops, seminars, study and lecture tours.
- (e) Promoting exchange programmes for staff and students in tertiary institutions to carry out advanced research abroad.
- (f) Stimulating collaboration with science and technology agencies of other countries
- (g) Procuring external funds by participating in bilateral and international schemes for science and technology co-operation.

ORGANISATION AND STRUCTURE OF THE SCIENCE AND TECHNOLOGY SYSTEM

7.1 Policy Statement

There shall be an active and effective organisation and structure for the science and technology system in the country.

7.2 Objective

To establish an effective organisation and structure for the coordination, management, promotion and application of science and technology for development.

7.3 Strategies

- (a) Strengthening the Federal Ministry of Science and Technology as the coordinating institution for all science and technology activities in the country.
- (b) Strengthening the National Council for Science and Technology to perform effectively its role as a policy-making body for science and technology in the country.
- (c) Ensuring that all relevant science and technology research institutions in the country are under the supervision of the Federal Ministry of Science and Technology.
- (d) Encouraging collaboration among all science and technology institutions in the country.
- (e) Encouraging all science and technology institutions in the country to carry out programmes and activities that are in consonance with the National Policy on Science and Technology.
- (f) Ensuring periodic reviewing and restructuring of the national science and technology system.
- (g) Establishing effective science and technology organs at state and local governments levels.