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Republic of Kenya

Draft Sessional Paper No. 5 of 198

on the

Acceptance of the Report of the National Council for Science and Technology dated May 1980

entitled

Science and Technology for Development

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SESSIONAL PAPER ON
SCIENCE AND TECHNOLOGY FOR DEVELOPMENT

Introduction

1. Ever since independence, there has been a general feeling that science and technology policy must be an integral part of the economic and social policy, contributing in the formulation and realization of the national development objectives and aspirations. The Third Development Plan (1974-1978) states that it is the identification of scientific requirements, the use of technological advances, and the allocation and management of the concomitant financial and manpower resources in supporting and pointing the way to cultural, social and economic development that constitutes the national science policy. It is the Government's view, as expressed in the same document, that science and technology provide the knowledge with which to identify development opportunities and to increase growth rates by making capital and labour more productive. The use of science and technology is not a new feature in Kenya. It has been used for a long time in the development of various sectors of the economy, and has a history extending to over eighty years. The new approach is, however, a new feature in the sense that it seeks to provide coherence between previously unrelated or barely related activities.

Terms of reference

2. In 1977, Parliament enacted the Science and Technology Act and established the National Council for Science and Technology. The Council was established to provide a machinery for advising the Government on all matters relating to the scientific and technological activities and research necessary for the proper development of the Republic; for co-ordination of research and experimental development, and for matters incidental thereto and connected therewith. The Science and Technology Act requires the Council to determine priorities for scientific and technological activities in Kenya, and to advise the Government on a national science policy. Similarly, the Fourth Development Plan (1979-83) calls upon the Council to formulate and publish a national science and technology policy statement. In response to these requirements, the Council produced the report entitled *Science and Technology for Development* dated May, 1980.

Science Policy and Economic Planning

3. The national science policy should be based on the aspirations and provisions of the development plans. The present policy reiterates the programmes contained in the Fourth Development Plan (1979/83) and goes further in identifying the principal areas of national activity in which better planning and utilization of science and technology hold promise in enhancing national development. The central problems of the Republic, namely, creation of income earning opportunities, improvement of expenditure patterns, provisions of basic needs and institution building, all of which are designed to alleviate poverty, must be tackled in a comprehensive and correlated manner. The main objective of alleviating poverty necessitates a co-ordinated and complementary interface between science and technology policy on the one hand, and policies for encouraging savings habits, wealth creation and redistribution, on the other. There are many procedures where science and technology can contribute to the alleviation of poverty, especially by providing settings for increased production that will help in the provision of basic needs.

The Science Policy making Machinery

4. There are many agencies in the Government which are involved in the science policy making process at various levels. The major agencies involved are—

(i) the Office of the President which monitors the economic performance of the Republic and co-ordinates development policies for the various sectors of the economy;

(ii) the National Council for Science and Technology in the Office of the President, created in 1977 to advise the Government on all matters relating to scientific and technological activities and research necessary for the proper development of the Republic;

(iii) the Sectoral Scientific Advisory Research Committees, also established in 1977, for co-ordinating of research and experimental development;

(iv) technical departments in Government Ministries;

(v) research institutions and establishments;

(vi) statutory bodies and parastatal organizations;

(vii) the higher education sector;

(viii) professional bodies and organizations; and

(ix) the private sector.

5. The Government will encourage the flow of ideas from as many fronts as possible. The working relationship between the various science policy making agencies will be co-ordinated by the National Council for Science and Technologies which will in turn advise the Government.

MAIN AREAS OF ACTIVITIES

Demographic Trends and Future Prospects

6. In August, 1979, the total population of Kenya was estimated to be 15,322,000 as compared to 10,943,000 in 1969. The average growth rate in 1969 was given as 3.3 per cent per annum and had increased to just 4.0 per cent per annum by 1979. The Government considers the evaluation of demographic resources as a critical factor and an integral part of science and technology policy. Basically, there are four aspects of the population situation in which the Government will utilize science and technology. These are—

(i) an appraisal of the demographic trends and future prospects and implications of the changing structure of the population;

(ii) the spatial population pattern and population dynamics;

(iii) the emerging policies regarding the population of the country; and

(iv) the identification of problem areas and research needed to provide solution to the problem.

The knowledge so gained will be utilized in planning improved Agriculture, Industry, Services and other invisibles.

Research and Experimental Development

7. Research and experimental development are considered crucial in advancing and improving the relevance of our science and technology system. The concept denotes the seeking out of

new knowledge leading to practical, tangible innovations, such as new or improved materials, products, devices, processes, or methods. The research process in Kenya should lead to techno-economic feasibility and social acceptability of its innovations, construction of prototypes and pilot plants, and full scale production. This will ensure that the research is integrated in socio-economic development.

8. Currently, it is only in the field of Agriculture that a well developed research system exists. The impact of research in this sector is evident (hybrid maize, dairy production, wheat, barley etc). In other sectors research is either weak or conspicuously absent, a situation attributed in part to the past relegation of scientific research to the now defunct East African Community. The Government will therefore deliberately, but conscientiously, expand its research system to cover all sectors of the economy. The statutory research institutions created in 1979 will be encouraged to function. Research in the private sector is minimal and will be encouraged to grow. Measures to achieve this will include financial incentives, joint research projects with the public sector research institutions, and legislation.

9. There are too few research scientists in the country estimated at less than 500 and the turn over of researchers in the Government sector is too high, a situation attributed to lack of favourable terms and conditions of service to attract and retain qualified and experienced research scientists. For this reason the Government will encourage the expansion of post-graduate training facilities at the University of Nairobi and will also continue to grant scholarships for study at overseas universities in areas of scientific disciplines not available at the University of Nairobi. The Government will also encourage on the job training in research and industry. The terms and conditions of service for professionals will also be improved to attract and retain qualified research scientists in the public sector.

10. There is a large cadre of scientists at the University of Nairobi and other institutions of higher education whose research effort and contribution to national development is hampered by inadequate financial resources. The Government will therefore

seek additional resources for research at these institutions and will also establish linkages between these institutions and research establishments in Government departments and industry.

11. Budgetary provisions for research in the Fourth Development Plan has been raised from K£11 million in 1979/80 to K£15 million in 1982/83. The Government's aim is to attain a level of 1 per cent of GDP for research and experimental development.

Acquisition and Transfer of Technology

12. Effective transfer of technology is not taking place in the country because decisions relating to most aspects rest with multinational corporations. In addition, the types of technology acquired do not necessarily accord with the natural resource endownments of this country. The existing New Projects Committee is not an effective instrument in technological transformation, since it tends to concentrate more on the economic aspects rather than technological aspects of new projects. Tighter control of acquisition of technology will be exercised, mainly through the re-structuring of the New Projects Committee. The process involves providing the Committee with the necessary expertise and resources for identifying the various technological alternatives available the world over; examining and reviewing joint ventures and investments agreements; advising on repatriation of profits; and local participation in the industrialization process.

Development of Human Resources

13. In order to build a broad base for technological transformation, it is intended to create awareness among the population on those aspects of science and technology that affect their daily lives. This includes training of scientists and engineers, technologists and technicians, artisans and craftsmen, skilled labour and the public by way of familiarization with equipment and other scientific and technological innovations. The required ratio of the various cadres should be 1 scientist for 5 technicians and 30 craftsmen. The Industrial Training Levy, which has accumulated funds because of unwillingness of the private sector to sponsor candidates and because of legislative encumbrances, will be utilized for the training

of technicians and craftsmen, mainly through the Harambee Institutes of Technology. Development models should therefore include the development of relevant skills in, and the proper utilization of, human resources.

Agriculture

14. The effective use of appropriate types of technology is considered crucial for the success of rural agricultural development. Technological innovations in agriculture have proved to be the most powerful tools for increasing the output of the available resources with favourable input-output relations. The major programmes for the development of agriculture will focus on—

(i) development and spread of new technologies in the rural areas than has occured in the past;

(ii) enhanced use of biological innovations such as plant breeding and plant protection;

(iii) development of technologies for land use intensification;

(iv) problems limiting agricultural production in the arid and semi-arid areas;

(v) continued research in food, food processing, industrial and export crops;

(vi) multiplication of hybrid seeds so that they reach rural farmers, especially small scale farmers, at reasonable cost;

(vii) ensuring availability and safe use of agricultural chemicals and pesticides;

(viii) expansion of irrigation and drainage facilities;

(ix) development of agricultural machinery and other labour saving devices to increase output where labour is a constraint; and

(x) conservation of the productive potential of land such as soil and water.

Livestock Development

15. Meat and dairy products will be increasingly scarce in Kenya because of the rapidly increasing population and competition for land between livestock and crop production especially in the high potential areas. To ensure continued availability of livestock products, there is need to exploit the great potential that exists in the rangelands for beef cattle, sheep, goats and camels. This will require—

(i) continued improvement of communications system throughout the rangelands so that expertise in livestock and range management as well as health services can be provided throughout the year;

(ii) development of efficient marketing for livestock and their products;

(iii) further development of co-operative ranching schemes for more efficient use of available expertise credit and marketing;

(iv) research infrastructure to determine the types and extent of livestock and range management problems; the type and extent of livestock diseases; the best marketing strategies for various livestock species; and the best methods of educating farmers in the range areas.

16. In areas of good rainfall, problems facing the livestock industry are different and mainly concern inadequate delivery of existing services. For this area the Government will—

(i) continue to take over dip management in more districts in order to ensure that cattle dips are properly managed;

(ii) rigorously enforce quarantine regulations to curb the spread of diseases;

(iii) expand the AI service to cover more areas where the service is needed;

(iv) encourage more small scale farmers to keep improved dairy breeds and undertake animal breeding so that progenies reach farmers at reasonable cost; and

(v) formulate a policy regarding the slaughter of female livestock.

17. Research will be encouraged and strengthened in the areas of disease control and manufacture of essential drugs locally.

Forestry

18. The major objectives of forestry are conservation of present forestry resources, both plantation and indigenous forests, by application of scientific management supported by appropriate legislative regulations, attainment of maximum productivity of the forest potential, and to increase the area under forest cover. Policy elements in this sector are—

(i) continued expansion and research in plantation forests;

(ii) development of indigenous forest species;

(iii) development and conservation of mangroves at the Coast and the identification of alternative species for the region;

(iv) afforestation of semi-arid areas;

(v) agro-forestry development;

(vi) supply of wood-fuel for energy; and

(vii) efficient utilization of forest products.

Fisheries

19. The principal objective is to ensure proper exploitation of all available fisheries resources. By 1983, it is expected that about 80,000 persons will be employed in the fisheries industry. This calls for—

(i) introduction of fishing vessels and gears capable of exploiting both shallow and deep waters;

(ii) exploitation of the 200 miles exclusive economic zone;

(iii) improved infrastructure such as landing, storage and marketing facilities;

(iv) promotion of fish farming;

(v) creation of a body or agency to spearhead development of commercial fishing; and

(vi) enhancing of research capacity in fisheries.

Wildlife

20. The national goal regarding wildlife is to optimize returns from this resource taking into account returns from other forms of land use. The policy in this sector will include—

(i) maintenance of instruments of policy to police and enforce prohibitions;

(ii) strengthening of wildlife research based on the dynamics of the ecosystem as a whole rather than single species approach;

(iii) countrywide inventory of all aspects related to wildlife;

(iv) public education on the value of wildlife and the need to preserve it together with the environment on which it depends; and

(v) development of tourism with wildlife as a major base.

Industry

21. The industrial sector ranks second to agriculture in importance and is a major source of employment although this is more so in terms of quality rather than quantity. The Government's major policy thrust is the production of basic needs, goods and services at the lowest possible cost, expansion and diversification of production of goods required for domestic consumption and export, reduction of foreign exchange content of goods manufacture in Kenya through use of local materials, providing efficiency and production of quality goods, better utilization of labour, promotion of small and medium scale industries and Kenyanization of industry. To meet the above objectives, the country requires a capacity for—

(i) the development, acquisition, transfer and adaptation of technology;

(ii) assessment, unpackaging and regulation of technology transferred to Kenya;

(iii) industrial management;

(iv) engineering and industrial designs for the organization and modification of industrial processes and products;

(v) control of standards for manufactured goods, and equipment;

(vi) maintenance of plant, equipment and instrumentation;

(vii) manufacture of replacement and spare parts;

(viii) efficient utilization of the indigenous natural resources;

(ix) export of intermediate and manufactured goods;

(x) facilitating technological transformation; and

(xi) establishment of steel and capital goods (especially machine tools) industries as a basis for sound industrialization process.

22. Other policy elements in this sector include higher employment opportunities not only in specialized jobs but also in semi-skilled labour, dispersion of industries to rural areas, efficient utilization of the existing idle factory capacity, use of parastatal organizations and co-operative movements in the industrialization process, strengthening of industrial research and the integration of the informal sector in the national industrial development strategy.

Mining

23. The biggest mining venture in Kenya is the Magadi soda with an estimated capacity of 200 million tonnes of trona, the second biggest in the world. However, only 125,000 tonnes are mined annually. Other mining activities include industrial minerals and gemstones, but these have made little headway because of inadequate know-how and insufficient capital outlay. There is a limited supply of energy minerals in Kenya, and only a few base metals have been discovered.

24. The mineral deposits at Lake Magadi offer an ideal base for chemical industries. Unfortunately, the trona is mined under a venture which is entirely foreign owned, managed and operated. Consequently, there has not been an effective transfer of technology. A deliberate policy will be instituted to indigenize the venture. The required additional action in the mining sector includes—

(i) build up of technical capability comprising of mining engineers, mineral economists, geologists and financial analysts;

(ii) countrywide inventory of base metals, energy and industrial minerals;

(iii) acceleration of geological mapping using modern techniques such as aerial geophysical surveys, remote sensing imagery and regional geochemistry; and

(iv) research to remove impurities from minerals.

Health

25. Government development of public health has been phenomenal since independence. In spite of this, problems such as inadequate and uneven coverage of the population due to insufficient health delivery points, shortage of trained personnel, urban-rural imbalance in access to health facilities and shortage of essential supplies, still persist. To overcome these constraints it is necessary to institute or enhance—

(i) good planning for health services, including definition of priorities and involving related agencies in the planning process;

(ii) improved machinery for data gathering and analysis on mortality and morbidity;

(iii) development of methods of health delivery system which are cheap and effective especially in activities where several problems can be tackled simultaneously;

(iv) accelerated trained manpower;

(v) emphasis on preventive rather than curative medicine;

(vi) immunization to cover 85 per cent of the population as compared to the current level of 35 per cent;

(vii) measures for reduction of malnutrition;

(viii) access to pure water supplies;

(ix) ensuring the availability of drugs, chemicals and equipment at health institutions;

(x) increase in number of health delivery points and improvement in quality of service rendered;

(xi) encouragement and support of health institutions run by churches and municipalities; and

(xii) strengthening of bio-medical research.

Food and Nutrition

26. A comprehensive food and nutrition policy is therefore required. About 30 per cent of infants and small children exhibit mild forms of malnutrition while 5 per cent suffer from severe forms of marasmus and kwashiokor. Other sectors of the population affected by malnutrition are the pregnant and lactating mothers, the elderly and disabled, inhabitants of semi-arid and arid areas, the urban poor and unemployed, landless families, households with very little land, squatters, and farm households dependent on monocrops and cash crops.

27. Various Government Ministries are involved in aspects of nutrition, without a co-ordinating machinery to add up to a comprehensive programme. The Government will establish a National Nutritional Council to ensure that all elements of nutrition are taken into consideration. These elements include—

(i) a food policy to include production, storage, processing, marketing, and food exports and imports;

(ii) food demand including per capita income and its distribution, food prices, consumer preferences, nutrition education, supplementary feeding programmes and population policy; and

(iii) medical aspects of nutrition such as incidences of infectious and parasitic diseases, pregnancy spacing and lactation.

Water

28. Kenya has sufficient water resources to support increased human and livestock populations if properly harnessed. Harnessing of the water potential includes storage, conservation, distribution and management. It is the Government's intention to provide every household with clean water by the turn of the century. This is an ambitious programme given the constraints facing the nation in terms of cost of water works construction, distribution and management, and manpower.

29. In view of the dry nature of the large part of the country, there will be need to acquire cost effective technologies for inventory, development, utilization, conservation and management. In this connection the question of appropriate institutional arrangements will be considered at an early date.

Housing

30. The housing concept includes not only the provision of shelter but also the entire environment surrounding the home, such as accessibility to health, educational and other social activities as well as the actual potential employment opportunities. Housing is now considered a major investment and an important form of savings. In the urban areas, shortage of housing is the major problem, whereas in the rural areas, the point at issue is to upgrade quality. The major policy consideration in alleviating housing problems are—

(i) review of legislation and by-laws governing building specifications and occupancy standards which are at present too high and irrelevant to the realities of present day Kenya;

(ii) use of cheaper building materials such as timber and locally made bricks;

(iii) decentralization of industries in order to alleviate housing shortage in major urban centres;

(iv) extending mortgage periods so that more Kenyans can afford housing;

(v) encouraging more Kenyans to participate in the building industry; and

(vi) reduction of the imported content of building materials.

Education

31. The National Committee on Educational Objectives and Policies presented its report in December, 1976. Some of the recommendations are being gradually implemented by the Government. In future education will—

(i) be used as a tool for making people more productive in the modern, rural and informal sectors of the economy;

(ii) lay increasing emphasis on the teaching of science and mathematics;

(iii) be diversified, functional and of improved quality; and

(iv) take note of national manpower needs for skilled labour, artisans and craftsmen, technicians and technologists, and scientists and engineers.

Transport and Communications

32. An adequate level of transport and communications services is necessary for national development, and is catalytic and complementary to other sectors of the economy. The Government will formulate a comprehensive and integrated transport and communications policy for the country, clearly indicating the sectors best served by the road, rail, sea and air transport.

Road Transport

33. Road transport is by far the most important mode of transportation. Policy elements in this sector include—

(i) vigorous enforcement of statutory regulations governing vehicle gross weights, vehicle road worthiness, speed limits and driver competence;

(ii) provision of resources for the maintenance of roads;

(iii) increasing the national capacity for road construction and the encouragement of more Kenyan participation in construction and transport industries; and

(iv) increasing the locally produced content of local vehicles for use in assembly plants.

34. Meanwhile, the Rural Access Roads Technology Unit will be strengthened in order to—

(i) assist in the planning and implementation of rural access roads programmes;

(ii) conduct research aimed at rendering the execution of labour intensive road construction works more effective and commensurate with Kenyan conditions;

(iii) conduct research on suitable designs and local materials for construction and maintenance of roads and structures;

(iv) redesign curricula for all grades to show possibilities of using all strata of technology in road construction; and

(v) design tools and hardware which could be used economically for the construction and maintenance of rural access roads.

35. In order to alleviate transport problems in urban areas, an urban transport authority will be created to—

(i) undertake comprehensive studies of transport problems;

(ii) plan for and develop urban transport system; and

(iii) regulate and co-ordinate the various modes of transport in the urban areas.

Rail Transport

36. This mode of transport requires a comprehensive study with a view to—

(i) providing railway services in response to socio-economic development needs of the country, especially access rail lines to potential agricultural, mineral and industrial areas;

(ii) electrification of the railway as a long term objective;

(iii) renovation of old railway communications system;

(iv) optimal utilization of existing repair and maintenance facilities; and

(v) manufacture of wagons and spare parts in the country.

Sea Transport

37. The sector requires—

(i) development of comprehensive interlinkages of sea-rail, sea-road and sea-rail-road systems;

(ii) possibilities of establishing a second port;

(iii) improvement of facilities for servicing hydraulic machines;

(iv) improving cargo handling services;

(v) increasing the participation of Kenya nationals in the sea transport industry; and

(vi) establishment of a national shipping line.

Telecommunications

38. The main developmental needs for this sector include—

(i) installation of VHF/FM mode of transmission for VOK;

(ii) increasing teaching personnel at the University of Nairobi, the Polytechnics and departmental training institutions;

(iii) participation in international forums for policies and wave length allocations;

(iv) keeping abreast with new technology;

(v) establishment of a national capacity for research in, and manufacture of telecommunications equipment; and

(vi) broadcast programmes on education and information covering social, political and development strategies, policies and progress.

39. A National Telecommunications Council will be established. Its functions will be to—

(i) act as a specialist body for advising the Government on matters pertaining to telecommunications;

(ii) advise on the control and use of the national radio frequency spectrum and carry out the functions of frequency management body;

(iii) advise on the issue of licences for all services using radio frequency spectrum;

(iv) promote and foster the development of national telecommunications industry;

(v) study proposals and/or specifications submitted by individual national bodies with a view to harmonizing and assuring quality services;

(vi) recommend specific technology to be adopted in implementing national telecommunications services;

(vii) advise the Kenya Bureau of Standards on the changes and requirements of telecommunications and electronic activities; and

(viii) advise on personnel training and recruitment for various telecommunications service departments.

Energy

40. Kenya's dependence on oil for the energy needs of the modern sector (80 per cent of commercial energy consumption) has become an increasing burden on the national economy. The country spends over 25 per cent of all her foreign exchange earnings on imported oil. Events currently taking place in international oil markets will likely change this situation for the worse, and could tie up a major proportion of foreign exchange earnings. The rural sector is similarly heavily dependent on firewood and charcoal for its energy needs.

41. The major known indigenous commercial energy resources in Kenya are hydro and geothermal power. The Government's programme of exploiting these resources has met with significant success. The estimated total unutilized potential of the country is about 1200 MW. This potential will be fully exploited by the late nineties if consumption continues to increase at the rate of 8-9 per cent as in the past. Currently, renewable non-conventional sources of energy (solar, wind, biogas and nuclear energy) are not being utilized in the economy on a significant scale.

42. A realistic energy policy must recognize that neither oil in the modern, nor wood fuel in the rural sectors can be eliminated. Both commodities will remain the mainstay of the respective energy systems for some considerable time to come. Rather, Government economic and technological policies will strive to reduce as much as possible the proportion of these scarce commodities in the total energy picture, increase their efficiency, and adapt technologies which will gradually increase the role of alternative sources of energy. Government's objectives in this sector are—

(i) diversification of both the modern and the rural sectors energy systems with a view to lessening dependence on oil and wood fuel;

(ii) increasing the productivity (per unit use) of oil and fuel wood by—

(*a*) modifying the oil refining process by the introduction of new facilities which would increase the output of white oil by the refinery;

(*b*) conservation of oil in end uses;

(*c*) substitution of oil wherever possible;

(*d*) better planning of the transport system with a view to energy savings;

(*e*) development of more cost-efficient energy facilities;

(*f*) development of more efficient charcoal manufacturing processes (pyrolisis);

(iii) increasing exploration efforts for indigenous fossil and mineral fuel resources which may require a change in the public sector's role and also in the terms and conditions governing exploration;

(iv) undertaking a centrally run and planned nationwide reafforestation scheme, taking into consideration the conflicting demand for food and energy production;

(v) increasing the role played by electricity in the rural sector in order to relieve pressure on wood;

(vi) developing a capacity for research in non-conventional energy application;

(vii) initiation of pilot projects in the field of non-conventional energy, particularly in applications where the technology is nearly fully developed, and where commercial production of energy gadgets can be expected within a reasonable time; and

(viii) organizing the institutional infrastructure necessary for the planning and implementation of energy policies.

Scientific Information

43. The Government policy for scientific and technological information will have the following objectives—

(i) provide basic services such as primary communications and publication channels;

(ii) perform the basic identification and location of information sources;

(iii) provide basic services in the dissemination of information through various channels of communication; and

(iv) provide depository services for local and external documents and data which are important for national development programmes.

Commerce

44. Problems requiring attention in this sector include stabilization of price variations in basic foodstuffs between individual rural markets and between pre-harvest and post-harvest seasons, spatial imbalances in supply to different areas, information to producers on commodities which are in demand, development of weights and measures, protection of small-holders and consumers, modernization of price control structure, industrial protection, and the creation of small business development agency.

45. Efforts will be made to promote Nairobi and Mombasa as international commercial and trading centres.

Conclusion

46. The Government has noted the Report and is in agreement with the analysis of issues and problems calling for the utilization of science and technology in their resolution.

47. While the Government is in agreement with the proposed programmes of action contained in the Report, it has also noted that some of the programmes are ongoing and will only require optimization and co-ordination; some of the new programmes are short term and can be implemented within the current Fourth Development Plan; and that some are long term and will require considerable time to resolve. Each programme of action requires detailed programming including identification of necessary resources.

48. This sessional paper highlights the major issues contained in the report, and further reiterates the Government's commitment to the utilization of science and technology for the development of the Republic.

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