Science and Technology for Socio-Economic Development
A Policy for Jamaica

National Commission on Science and Technology (NCST)
Office of the Prime Minister
October 13, 2005
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Message

[A message is expected from the Chairman of the NCST and Prime Minister of Jamaica]

Preface

Jamaica, like all underdeveloped countries, has not made sufficient use of the vast reservoir of knowledge that is made available by science and technology for socio-economic development.

There are a number of cultural, economic and political reasons for this shortcoming, most of which have been identified by both local and international work over many decades. This policy and the associated implementation plans are designed to harness this information and set the foundation for correcting this national insufficiency.

The policy’s elaboration, and subsequent successful implementation, demand the full support and engagement of all segments of the population. Accordingly, to ensure that this policy has the full understanding and approval of the widest cross-section of the Jamaican people, urban and rural consultations, lasting over a year, were undertaken. There was an intensive interchange between all involved, with digital, voice and paper contributions, with over ten drafts being prepared and circulated. It can therefore truly be said that this policy document was the result of the open expressions, felt needs and forlorn aspirations of the Jamaican people.

Many thanks are therefore due to all those who participated in these consultations, who provided comments and criticisms and those who actively helped in the drafting, rewriting and vetting of the final editions of the document. These individuals are too numerous to list here, but the appended list of consultations provides a gist of the many firms, community organizations, private and public sector individuals, who took part in the exercise to construct this historic document.

A.K. Ventura
September 2005
1. **INTRODUCTION**
Science, technology and their varied products, services and insights are influential in all walks of life and in all corners of the world. These factors are major forces directing our thoughts, actions and the course of civilization. As a matter of fact, a country’s ability to cope with its many challenges and satisfy the demands of its citizens depends to a large extent on the development and application of science and its technologies.

With very few exceptions, all nations that are considered developed are masters of the generation and use of science and technology (S&T), while the underdeveloped ones are weak in the deployment of these instruments. Essentially, scientific and technological capabilities are the major defining elements separating developed from developing countries and is also the force extending the gap between the rich and poor.

A crucial step in closing these development fissures is the willingness of developing countries to craft policies, strategies and plans to use S&T innovatively to tackle socio-economic problems and protect their environments.

2. **SITUATIONAL ANALYSIS**
   (i) **Historical Perspective**
Jamaica has had a long history of scientific awareness and application, and was among the earliest developing countries to craft a scientific law to guide the use of S&T for the exploitation of domestic natural resources. This was not surprising considering the fact that the island was among the first in the American hemisphere to gain electricity, build a railway, establish botanical gardens, as well as, innovatively use research results to boost sugar cane production.

Jamaica’s first S&T Policy was promulgated in 1960 when there were few research and development bodies outside those in agriculture and mineral exploration. This policy was very comprehensive and very prescient for its time. Nevertheless, the rise of other S&T entities besides the Scientific Research Council (SRC), the body created by the first S&T law, along with other local and global progressions, have overtaken its
relevance and usefulness. Because the law did not anticipate these rapid changes, it eventually proved somewhat over-ambitious as it did not anticipate that the SRC would be unable to discharge the assigned array of duties, which included research and development (R&D), information collection and dissemination, coordination, popularisation and research support. The important national function of coordination really never took place and became a vexed issue. The SRC in many quarters was regarded as a competitor and not a friendly facilitator and arbitrator in the domestic S&T arena.

The second S&T Policy of 1990 ensured national S&T coordination and management, by creating the National Commission on Science and Technology (NCST). The efforts of the Commission subsequently demonstrated the long overdue central importance and necessity of national S&T advice, integration and management functions. However, it operated within the ambit of the old SRC law, without formal legal status and adequate personnel and funding.

(ii) Third Policy
This third policy seeks to correct these impediments and speaks to the following:

- strengthening the role of innovation and the proper funding of S&T activities to stimulate diversification of agriculture, revival of manufacturing and expansion of services,
- greater private sector participation in S&T development and application,
- reduction of poverty and unemployment, especially among the young,
- creation of greater abilities and capacities to compete in global trade, through fair competition, and heightened respect for the environment,
- protection of the island’s delicately balanced ecology and biodiversity,
- developing and maintaining scientific skills critical for implementing the policy

This policy is considered a platform for assertive execution, and consequently, will be accompanied by a national S&T strategy, and will form the umbrella under which specific policies and implementation plans for the major sectors will be
developed. These include energy, water, agriculture and agro-industry, S&T education, biotechnology and information and communication technology policies and plans.

(iii) Island Peculiarities
Small countries, like Jamaica, will have to contend with a comparatively limited number of professionals and material resources, yet will have to face most, if not all, of the challenges of larger, better endowed jurisdictions. This forces the Jamaican population to be very innovative in using the resources available by gaining maximum efficiencies, while remaining flexible and adaptable to rapid changes.

This means that the island’s S&T management has to become adept at using the few skilled and trained individuals in a very considered and focused manner, to achieve beneficial results. Decisions on what to tackle locally and what to acquire from the outside, and how to marry the two, are ineluctable and searing questions. Monitoring, evaluation and learning become essential in these endeavours.

Jamaica realises that it has to use existing technology and engineering knowledge to start tackling chronic production problems, while meticulously building a stronger R&D base to seek answers and anticipate problems. Jamaica, therefore, has to strengthen its knowledge surveillance capabilities and partnership creating systems, to cope with the limitations of small size and quantum of natural resources.

Furthermore, although Jamaica has a strong University system and science pedigree, it has been difficult to translate domestic scientific results into technologies, products and services, because of insufficient capital goods, funding, implementation machinery, engineering and entrepreneurship capacities. The island’s private sector is not only small, but also largely conservative in it’s approach to development, and shies away from taking risks in technological investments while taking comfort in Government
paper, securities and retail trading. Many of its members shun innovation and technological upgrading.

Additionally, Jamaica also finds it difficult to compete in mass markets and now has to trade in niche products and knowledge circumscribed operations. The island’s coastline is difficult to police without modern surveillance and detection technologies to prevent the entry of contraband, illicit drugs and weapons. Crime has become a major concern.

The island essentially has all the main infrastructural S&T components, except for risk and venture capital funds for technology-led projects and pilot plant facilities. Improvement in the assessment capabilities of banks to estimate risks in the knowledge economy is needed. Ways to encourage University and other tertiary graduates to commercialise knowledge, and create novel products and services, are also vital elements in a successful domestic economy.

Science Policy has two separate missions, both of which must be addressed in Jamaica. The first is to improve science, technology and engineering, and the second is, to ensure that S&T are used as tools to serve the dictates of society. While the endeavour to enhance local S&T capabilities and capacities must be guided by the immediate needs of communities, it must be broad enough to accommodate unanticipated demands and the pursuit of basic sciences, which may not have any immediate, or obvious use, besides the creation of knowledge.

(iv) Government’s Role
Because Jamaica has a small, and overall, a relatively weak private sector, Government is presently forced to shoulder most of the burdens of establishing and maintaining a functional S&T system. Currently, almost all advance training in science and most of the island’s R&D take place within Government institutions.

The over forty public sector S&T institutions and statutory bodies cover most of the major components to permit an impactful S&T infrastructure, among these are
standards, and specialised R&D institutions in agriculture, bauxite and minerals and energy. However, scaled-up and pilot plant facilities, including capital goods fabrication and engineering, and risk and venture capital, are almost non-existent. Proper transfer and adaptation of technologies are presently insubstantial and there is undue, inordinate and costly reliance on foreign expertise and knowledge. Also, local professional bodies demonstrate little influence on the progress of S&T for development. Furthermore, since building S&T competence is a long-term proposition, it requires a broad consensus across all areas of government to ensure commitment to its growth and development.

Recently, to try and remedy these shortcomings, the National Commission on Science and Technology (NCST) installed a fledgling risk capital fund and a special incentive scheme for R&D and the promotion of advanced training in innovation, to stimulate closer partnership between the Government and the private sector for S&T development and application. However these are yet to make a noticeable impression.

**To advance coordination in the very competitive S&T sector, the NCST will be strengthened to enable it to coordinate, integrate and support national activities. The Jamaican Government must also take steps to make the circumstances attractive for engendering a closer working relationship between the public and private sectors and between academia and production.**

**(v) Tackling Poverty**

Jamaica has the reduction of poverty high on its S&T agenda and has been working to improve small-scale agriculture, micro business and employment in the inner cities for over a decade. Poverty reduction is seen as crucial to the attainment of social harmony, reduced crime, increased production and productivity and food security and safety on the island. Linking urban and rural areas needs with the activities of S&T institutions, as well as, the informal with the formal sector, and man with nature with these operations, have been successful strategies used elsewhere to improve the contributions of the poor to their own advancement and the overall development of their
communities and their nations. E-governance to reduce the space and improve the understanding and confidence between the government and the governed will be moved from plans to actions.

There is a strong belief that S&T will increase the gap between the rich and the poor if these tools are not specifically used to target the needs of the under-privileged to improve their productive base, democracy and overall quality of life.

(vi) Response to Global S&T Movements

Networks
Since Jamaica has to depend on outside developments for most of its S&T knowledge, the island is highly sensitive to the trends and counter currents of S&T progress. The future of the island will depend on its ability to anticipate, react and benefit from international S&T movements. Its intelligence and surveillance ability, will determine how quickly it can detect and respond to challenges and seize opportunities, which arise within current fast-paced global scientific and technological developments. Jamaican institutions and communication networks abroad, have to be significantly improved and re-oriented, and additionally, associated training of personnel undertaken on a continuing basis, to meet the challenges of becoming part of the knowledge revolution.

Partnerships
Attraction of appropriate foreign direct investments, participation in overseas conferences, trade shows and global discussions, promotion of S&T licensing agreements and use of intellectual property information, will therefore be pursued. Institutions and instruments to collect, digest and disseminate information and knowledge, will be strengthened, and better use made of foreign meetings, journal subscriptions and conferences. Subscriptions to international bodies, and investments in conferences, as well as publications, will be reviewed to get the best from these national endeavours.
More skills and knowledge have to be acquired to build linkages and partnerships with relevant institutions and workers abroad, especially those in the Diaspora. Institutions and competence, will consequently be built, or augmented where possible, to improve technology search, acquisition, modification and transfer. This is especially important when tackling pervasive poverty on a small island such as Jamaica, where physical, biological and psychological deprivations are widespread and oppressive. Science and technology insights to avoid confrontation and social dislocation are immediate necessities. Accordingly, e-governance, e-government and ways to deepen democracy, are becoming urgent imperatives. Jamaica will follow and share experiences in these domains.

Jamaica will use its creativity and talent, housed both on the island and abroad, to make the best use of evolving global information as it builds domestic competence.

(viii) Linkages With Other Policies And Programmes
The emphasis of this S&T policy is guided by the priorities laid out in the National Industrial Policy which include the following strategic clusters:
- Information technology and telecommunication
- Agriculture and agro-processing
- Tourism and entertainment
- Apparel

3. VISION STATEMENT
The vision of this policy is to use science and technology to augment the 2015 vision as expressed in the statement: “A prosperous and dynamic Jamaica, which upholds the fulfilment of human rights, dignity for all persons and builds continual progress based on shared values and principles of partnership. Minds are transformed and extraordinary results are produced in this, the most caring and secure country in the Americas, where individuals fulfil their potential, are in control of their destiny, take responsibility for their lives and work always for the larger good.”
The vision that will guide this policy imperative therefore, is that which embodies the social transformation of the country, and which speaks to making the island “a friendlier, more respectful and prosperous country”. Additionally, Ministers of Government have in their public statements explicitly singled out agro-industrial development and the creation of a digitally capable and aware society, as avenues to extend services, production and trade.

4. POLICY OBJECTIVES

(i) Context

The systematic development and application of S&T today not only account for economic growth and transformation, but also are responsible for the rapidly emerging gaps between the rich and the poor, within and among nations. Little advantage is left to be realised from cheap labour and raw natural resources, instead innovative deployment of the island’s innate intellectual capacity and worldwide knowledge, especially S&T information, must be employed to move up the value chain, to save and create jobs and tackle other growing social demands.

Countries which invest up to 3% of their GNP in S&T are those with competitive economies. Furthermore, those nations, which have elected to reduce these investments, also see a reduction in their production and productivity. For maximum beneficial returns, it has been observed that these S&T investments must be placed in supporting environments. Critical to this approach are the following:

- Skilled and educated workforces
- Universally connected information and knowledge generation systems
- Physical and funding infrastructures
- Accommodating public and private sectors
- Strategic and legal frameworks
Just as S&T investments can propel socio-economic development, so too lack of attention to these investments can place economies at great risk of slipping behind in trade and international relationships, and in programmes of social upliftment and the ability to satisfy the needs of their populations. In addition, what is quite clear is that neglect of S&T for development exposes more citizens to conditions of poverty, as jobs are lost, export falls and balance of trade deteriorates. When this happens, inevitably the environment suffers, as individuals do whatever is required to survive, including abusing their surroundings and engaging in ecologically unfriendly actions.

A well-considered and widely accepted S&T policy is the cornerstone of a strongly supported and capable S&T infrastructure. It provides the surety and confidence to pursue targeted scientific and technological endeavours and identifies where support can be anticipated to face inevitable challenges. It also provides the means and ways to follow and evaluate progress. Businesses in this environment are more prone to work with S&T specialists to introduce new methods, expand commercial scope and upgrade equipment in their operations.

With meaningful policies in place, tracking international S&T developments to conceptualise new opportunities and anticipate and assess hindrances, becomes normal attributes of an S&T community. Against this background, there is a greater will to operationalize and commercialise local research findings and those adopted from abroad. In this connection, the development of appropriate technologies and engineering skills, management methods and institutions, to deliver R&D results and innovative ideas to industries and enterprises, to improve competitiveness and local relevance, are principal components of this S&T Policy.

Accordingly, mechanisms to take S&T to rural and deprived urban communities, to reduce poverty and enable linkages with the formal business sector, will receive special attention.
The Jamaican private sector still contributes only minimally to the national development and application of S&T, and this has made it difficult for this sector to adjust to the fact that the world’s trade has shifted from resource-based to technological-based products. There is still the strong tendency to persist with primary commodities and low technology-type manufacturing, both of which do not allow for aggressively pursuing market share, especially in a small country, with limited resources.

Based on these facts, the challenge for Jamaica is to create a policy environment and relevant institutions that are supportive of technological development, application and diffusion, especially in the private sector.

The creation and growth of the NCST was a response to this challenge. The Commission has become important in ensuring that such policies and institutional changes take place by affording better management and organization of the island’s S&T resources, as well as, match and catalyse capabilities to meet the growing demands of the island. The Commission and its complementary National Foundation for Science and Technology, must be strengthened and provided with the legal backing to expeditiously conduct their national responsibilities.

(ii) Main National S&T Objectives

Socio-economic development in a fast moving technological world will require not only new scientific ideas, technological advancements, and timely innovations to fuel production, productivity and social harmony, but also the following:

- New management and organizational techniques
- New linkages between enterprises and knowledge centres
- Closer relationships between the private and public sectors’ industry and science,
- More efficient information flows throughout civil society and the state apparatus.
- Additionally, for islands like Jamaica, factors which influence trade and capital movements, in particular, market intelligence, metrology and standards, and
technological trends, must be carefully considered to allow competition in the global arena.

Generally, S&T policies will gain maximum benefit from an interplay of these factors, together with balances between incentives, capabilities, attitudes, instructions and investments. These relationships and considerations are becoming increasingly necessary in light of the pressures to liberalize economies, the advent of many market failures, especially in poor countries, and the reduction in technical and financial assistance.

5. KEY STRATEGIC AREAS

Accordingly the following national goals for S&T are crucial to set the country on a path of peace and prosperity:

(i) Collection and use of vital national S&T information

In a knowledge-led world, information is the most important currency. The market does not allow for proper flows of timely information, and therefore, government must establish institutions, set policies and implement plans in order to ensure that the vital statistics of the country are collected, analysed and distributed, to inform business development and social adjustments. Also, the island has to tap into regional and global networks to follow technological trends, scientific developments and business and trade signals that may have significant impact on local enterprises and cultural norms.

The following initiatives are the minimum requirements to fulfil such purposes:

a) Gather accurate information on what S&T skills, institutions, organizations and projects, exist.

b) Match this knowledge with the present industrial, manufacturing, service and social demands, and thereby identify and fill vital gaps.
c) Establish performance criteria and standards to monitor and evaluate domestic S&T and engineering activities to help their progress and ensure optimum use of resources.

d) Establish a review mechanism to permit national budgeting by performance, especially S&T activities within Ministries and main statutory bodies.

e) Share tacit knowledge peculiar to the Jamaican situation, especially for the production of goods, services and recreation.

(ii) Intelligence Capabilities

Intellectual capital is the development bedrock of nations and this is fed by the development and analysis of domestic information and pursuit of knowledge from the global arena. Consequently, the importance of effective intelligence management to promote business expansion and vitality, has never been greater. Policy and planning will require high quality social intelligence, from a variety of quarters, if resources are to be allocated optimally and development aims achieved in a timely fashion. An information network that spans the globe is therefore of significance to the local prospects for socio-economic development. This is especially so for small states like Jamaica. The following objectives are therefore paramount:

a) Develop social intelligence networks, engaging missions, embassies and other Jamaican bodies abroad.

b) Train diplomats, politicians and other government officials as well as trade union bosses and national leaders in S&T currency and their impacts.

c) Develop systems for local S&T intelligence to maximise collection, analysis, dissemination and feedback.

(iii) More Profitable Uses of Natural Resources

Jamaica is blessed with a wide variety of natural resources that in the past have fuelled a prosperous primary commodity trade. Today, all evidence has indicated that the markets for primary commodities are saturated with new comers and with surpluses from improved productivity occasioned by technological progress. Prices of these tradables have fallen dramatically and continue to fall. Jamaica cannot effectively
mass-produce because of its size and therefore cannot benefit from scale, accordingly, the island has to go for high technology markets, boutique items and value-added products. The logical objective would then be to find innovative ways to harness our natural resources and gain from the high quality resident in many of them. This can be achieved as follows:

a) Develop a national S&T programme to enhance the contributions of natural resources to the economy and particularly job creation by:

- Placing agriculture and agro-industry, forestry and livestock on a firmer technological commercial foundation
- Conducting biodiversity and gene pool audits
- Improving mining and mineral exploration and exploitation
- Exploring the value of marine resources
- Supporting systems of Innovation to optimally utilize domestic resources and make use of traditional and indigenous knowledge
- Establishing a systematic bio-prospecting programme to maximally and strategically create a balance between conservation of natural resources and socio-economic development
- Creating specific R&D and S&T facilities to support small farmers

(iv) Improved Biotechnological Competence
A major plank of Jamaican’s Industrial Policy is the expeditious use of the island’s biological resources. Building additional biotechnological competence is a major goal in this endeavour. The Government, in collaboration with outside funding, has created a Biotechnology Centre at the University of the West Indies, and has worked with the Organization of American States (OAS) and United Nations Commission on Science and Technology for Development (UNCSTD) to improve and disseminate competencies for agriculture and agro- businesses. Much is still left to be done to make expeditious use of the many new methods that have been developed in a variety of fields relevant to Jamaica, including ways to master the following:

a) Increased agricultural productivity, and improve food safety and security
b) **Rehabilitate soils**

c) **Advance medical, public health, traditional and animal husbandry applications**

d) **Improve forensic methods**

f) **Expand environmental remediation and preservation**

g) **Gain abilities to conduct surveillance and testing to ensure biosafety**

h) **Create biofuels and other industrial chemicals**

i) **Replace agricultural chemicals with biofertilizers and biopesticides**

(j) **Monitor and adapt developments in genomics and bioinformatics**

(v) **Deepen and Expand Information and Communication Technology Competence**

Informatics and telecommunications are currently at the centre of the accelerated rate of globalization and increased production and trade. These technologies were the results of scientific discoveries, which led to a range of practical developments including electricity, radio waves, the laser, the transistor, the World Wide Web and the web browser. Their influences have been profound in almost all walks of life and already have provided economic benefits in states with high levels of diffusion, use and improvement of these technologies, while countries that are lagging in this field, are also being left behind in knowledge sharing and application. To make these technologies work for socio-economic development, several factors are required including, liberalization and open competition, expanded infrastructures, balanced regulations, innovation in management and organization and the use of these technologies in an increased number of firms and institutions to improve production and marketing. Accordingly, widespread competence in this field is necessary to ensure the ability to gain, share and use information constructively throughout the society. Areas where this competence is needed in Jamaica include:

a) **Enhancing information and communication technology policy and skills in:**

- Software development
- Design and hardware assembly
- Cultural Products
- Services for the main drivers of the economy e.g. tourism and banking
• Small and medium businesses
• Networking
• The utilization of bio-informatics to enhance the merger of the pure sciences and applied technologies

b) Gaining the most up-to-date education and skills to foster innovative application of these technologies.
c) The provision of universal access to affordable telecommunication, Internet and computer facilities.

(vi) Environmental Preservation
Socio-economic development will not be sustainable if protection of the environment is not factored into the change equation. This is especially true of a small tropical island with a fragile ecology and mounting population, as well as, transportation and industrialization pressures. To be able to strike a delicate balance between economic development and protection of the environment, the best local information is required, and this will depend on astutely directed R&D and the creative use of the ensuing results, leading to the attainment of international standards. The science of biodiversity, biosafety and bioremediation accordingly will become vital.

Policy initiatives to ensure the minimum requirements for protecting our environment and our citizens must include:

a) Improving R&D to reduce ecological pressures, as well as, address the exigencies of natural and man-made hazards, including droughts and floods
b) Setting up biosafety regulations and measures
c) Improving building codes
d) Providing information to effect a balance between construction and agriculture
e) Zoning to ensure that flatter, more suitable lands are reserved for agriculture.
f) Finding ways to successfully implement environmental preservation strategies
g) Introducing cheaper, more efficient and less polluting fuels in the island’s energy mix
(vii) **Building a Competitive Manufacturing Sector**

Manufacturing is the backbone of human civilization and permits countries to satisfy both domestic and trade needs. Value-added manufacturing in Jamaica has remained inconsequential for many decades, and with open competition, this sector has come under severe duress.

The technological content of local manufacturing has been low and it is proving difficult to remain competitive with unskilled cheap labour and by the simple processing of natural resources. Technological change, new organizational and management methods, flexible responses, greater networking and integrated production systems across firms, have been slow in coming. There is an unhealthy reliance on existing, instead of new capacity.

The island’s export oriented strategy must therefore be reinforced by policies to boost learning, acquire new skills, and improve access to information and extension services to retool and deploy the most advanced technologies to gain and maintain competitive positions.

Consequently the following objectives will be pursued:

a) *Promote the transfer of more efficient technologies with continual upgrading, through licensing and foreign direct and domestic investments.*

b) *Move to compete in regional and international markets*

c) *Develop skills, technical knowledge and organizational techniques, to make new technologies work properly*

d) *Create technical and supply clusters*

e) *Integrate the production systems of the formal with the poor and informal sectors*

f) *Improve capital goods, equipment and retooling in the sector.*

g) *Increase International Standards Organization (ISO) 9000 certification to boost confidence in exports.*

h) *Apply more creative use of patents to gain added information and new ideas.*

i) *Provide incentives for the development of a sustainable and thriving sector*
j) Develop a Center for technology transfer in which the private sector will play a significant role.

k) Help create science and technology parks and promote wider participation in them

A review of the SRC, as the main multifaceted R&D institution, will be done to ensure that its results have direct impact on the productive sector, especially the manufacturing and service sectors. The objective is to have the organization focus on R&D and transfer of technology to more effectively influence production.

(viii) Advanced Education

Cultural distortions have led to overt indiscipline, coarseness and a tendency to violence and selfish behaviour, in many sections of the Jamaican society. To permanently remedy this situation warrants, in the medium to long term, dedicated emphasis on early childhood and remedial education, with a strong emphasis on values, attitudes and logical and critical thought and action, to stem the further slide in antisocial behaviour. At the same time, the forces of competition and expectation dictate a more immediate acquisition of advanced technical education and the better use of existing global knowledge, to provide jobs and maintain and improve livelihoods. Without a cadre of highly educated and technically trained individuals, the island will not be able to generate enough resources to correct its many social ills. This must be coupled with a more scientifically literate public to make better use of advancing technology.

Many of the newly industrialized nations have transformed their economies and societies by investing heavily in literacy and education, especially advanced education and technical skills. Additionally, today, political and business leaders are being offered S&T education to allow more informed national decisions to be taken by creating more awareness of the overwhelming power that knowledge commands in society.

Accepting that improvement in skills and national technological activities are closely related, and are subject to constant change, and that ordinary basic education and
technical training, even with “in-firm” apprenticeships, are not enough to cope in the modern world, new realities dictate:

a) **High-level and specialized training**
b) **Interaction between education and industry to identify changing needs.**
c) **Increased tertiary and engineering enrolments**
d) **Training abroad to gain experience-based learning from using and mastering new technologies**
e) **Improved cognitive skills and scientific reasoning throughout the society**
f) **Develop programmes to engender an S&T awareness culture, including the social sciences and their application, as compulsory components of all advanced education programmes**
g) **Specialized teachers with attractive remunerations be placed in particular schools to enable students to be properly taught S&T.**
h) **More attention be given science education at the community teachers’ colleges.**
i) **Increased computer literacy**

(ix) **Social Applications**
Jamaica has been very active in exploring the use of S&T to tackle poverty and accelerate general social upliftment. At first, the precocity of the idea was met with cool responses, but today these approaches have been endorsed by the world’s political leaders and defined by the pursuit of the Millennium Development Goals. These are targeted objectives to reduce poverty substantially by 2015. Jamaica will continue to work and expand its thinking and share its experience with those who are committed to achieving these targets in the time frame established.

Nevertheless, Jamaica also recognises that although S&T are vital tools for social upliftment and poverty eradication, these are often not the major limiting factors. Social nuances and cultural rigidities are key ingredients preventing the best use of scientific, technological and engineering information. Accordingly, the island will ensure that the social and behavioural sciences play a pivotal role in the use of knowledge to acquire a better quality of life for the Jamaican people.
Therefore, the following social applications will be pursued:

a) *The development of S&T initiatives in conjunction with the less fortunate who will directly benefit by their empowerment.*

b) *The selection, adaptation and application of the most appropriate technologies and knowledge to ensure social upliftment and the reduction and eventual eradication of poverty.*

c) *The innovative use of the most up-to-date methods to widen and enhance the variety of cultural norms on the island, including those in entertainment, music, films, fashion and other creative arts.*

d) *Methods to make science attractive to the young and their families by revisiting how we presently teach it in schools and improving laboratory facilities for practical demonstrations.*

e) *The promotion of interactions between the social and the natural, physical and engineering sciences, to solve chronic social problems.*

f) *The development of ways to gauge success in all these areas.*

(x) **Building S&T Awareness**

This objective is fundamental to gain the full support of civic society for adequate investments and purposeful use of S&T results. The ordinary man must accept the power, limitations and usefulness of S&T, if these factors are to take their rightful place in the affairs of the nation. Popularisation of S&T must be geared towards public ownership of, and support for, these factors. Recently, there has been a lull in the embrace of the scientific disciplines among the young with a preference for management and business academic subjects, as better avenues for career opportunities. However, it is now clear that these tendencies will be insufficient to solve the production and trade problems, which the nation faces. Clearly, there is an urgent need for more people to appreciate the opportunities, confidence and motivation which science brings to society.

Therefore, this policy will seek to build S&T awareness, through the following initiatives:
a) Increase the understanding of the scientific method and principles by demonstrating the power of scientific thinking in development, across all segments of the population, including – politicians, scientists, workers, managers, students and homemakers.

b) Educate the population of the high content of S&T knowledge in goods and services and the need to be scientifically aware to deploy them effectively.

c) Conduct S&T polls on a regular basis to monitor progress of domestic scientific temper.

d) Promote scientific practice and science as careers.

e) Persuade society of the importance of investing in R&D to define and solve social problems.

f) Monitor the progress of the NCST to allow for civic society to have a greater say in its operations and membership.

xi) Technologies for Coping with Hazards

Jamaica is in a hazard-prone zone and subject to frequent hurricanes, flooding and earthquakes. Jamaica must therefore pay critical attention to modern technologies such as material and nano-technologies, to improve the selections of sites, the suitability of material and cost of construction.

More affordable and safer housing for much of the population is an urgent requirement. The island must therefore do the following:

a) Conduct a survey of the various construction material and technologies that are available for building in tropical zones.

b) Create an awareness among R&D institutions of the opportunities for work in this area

c) Foster a greater engagement of professional societies in these endeavours

6. RESPONSIBILITIES AND OBLIGATIONS OF STAKEHOLDERS

(i) Government Responsibilities
In a country like Jamaica, with relatively small firms and a comparatively weak private sector, Government interventions to correct market failures in the provision and implementation of S&T and engineering, are indispensable. However, for maximum effect this must be done with a degree of objectivity, impartiality and independence of narrow institutional and private sector interests. Government will therefore support and strengthen the National Commission on Science and Technology (NCST) to create the institutional competence and confidence to discharge its functions.

Government policies, especially science, technology and engineering policies, play a vital role in the supply, demand and application of knowledge. Government is the only entity capable of effectively supplying basic and advanced education and S&T infrastructural services, and coherent intensive negotiation approaches to protect and advance trade, biodiversity, technological transfers, intellectual property and the island’s S&T establishments. Accordingly, the prudence and perspicacity of S&T advice provided Government becomes crucially important, and dictates a S&T Adviser’s Office which is properly funded and staffed.

The clarity of national social and economic objectives will greatly facilitate the pursuit and acquisition of relevant S&T information and design skills, along with efficacious implementation and monitoring capabilities. This requires direct involvement of leaders at the highest political levels, close collaboration with private businesses, well-supported and dedicated civil service, and the ability to reward or penalise performance, as Jamaica opens its markets to the outside world.

Protection of infant and struggling industries becomes necessary in the present global climate. However, this must be accompanied with the resolve to acquire new skills, technologies and information, as well as, the apportioning of preferential investment capital, to quickly make these firms internationally competitive.

To undertake these tasks, Government will therefore do the following:

a) *Develop flexible policies to boost learning, acquire new skills and access unfolding*
knowledge.

a) Improve substantially the allocation of funds to S&T and R&D activities by reforming the present budgetary process with better reporting and more accountability.
b) Develop long-term international partnerships to make-up for the island’s small size and limited resources.
c) Participate in international activities to gain and share knowledge and resources.
d) Reform teaching to include the importance and the basic elements of S&T for socio-economic development, at all levels of the educational system, including teacher and informal training.
e) Maintain a national roster of skills and competencies to identify and rectify gaps.
f) Build capacities for exportable S&T services.
g) Encourage and support the creation of an innovation and knowledge accommodating society.
h) Secure top-level S&T advice.
i) Develop a system to engender an environment specifically designed to encourage, support and nurture the development of the creative skills of young scientists and entrepreneurs.
j) Develop a regular system of monitoring and evaluation of the effectiveness of S&T and R&D contributions and promote the concept of accountability for the improvement and execution of these tasks.
k) Offer high-level S&T training for national decision-makers in the public and private sectors.
l) Promulgate associated S&T policies for water, energy, education, agriculture, information and communication, biodiversity, and others, as they become necessary.

(ii) Private Sector

Although it is the norm that the State has the main task of building and maintaining an impactful S&T system, it is the private sector, at all levels of the economy, which will be called upon to use this system constructively.
The private sector therefore has an obligation to support, and where possible, conduct R&D and pursue the monitoring and transfer of more advanced technologies and management methods, to make locally produced products and services more efficient and competitive. The more established firms must move away from a static approach to local R&D and S&T, and instead, must take a lead role in policy, planning and implementation. This is especially important in ensuring innovative linkages with concerns in the small, micro and informal sectors, which will augur well for the impactful expansion of the economy and the production of jobs.

An important component of the private sector, which impinges directly on S&T development and use, are the banks. As such, banks must become more creative in supporting innovation systems in the main and emerging economic sectors, by ensuring that their staff is equipped with the necessary risk assessment capabilities, and become comfortable with seeking advice on the nuances of the unfolding S&T landscape and their importance to the local weal.

A close working relationship between educational and training systems with the practical and productive environment of the private sector, to improve domestic working skills and productivity, must be regarded as an indispensable strategy to raise the creativity and skill base of the society.

(iii) Civil Society
The rapid pace of technological developments and the profound ethical and moral questions surfacing because of the march of science, dictate that ordinary citizens must take an active role in how these developments are handled in society. This can only be meaningfully realised if persons see it as an obligation to become more scientifically literate. This will redound to the benefit of more insightful political and private sector leaders as it will deepen democracy on the island.

(iv) Non Governmental Organizations
The NGOs operating in Jamaica must accept that their work and responsibilities will become more meaningful if they keep abreast of S&T developments both locally and abroad. This is especially true of those working in the area of protection of the environment and reduction of poverty.

(v) **The Scientific and Technological Community**

A concerted effort to strengthen the existing S&T infrastructure on the island is necessary because of the erosion of both the numbers and quality of scientific and technological professionals, over the last two decades, in preference for more lucrative occupations. This trend can only be reversed if the existing members of the scientific and technological community make assertive efforts to attract the young to the S&T enterprise. This must be done in a careful and scientific manner, and not through the ephemeral public relations approaches that recently have become popular. The scientific and technological community has an obligation to confidently demonstrate that S&T are indispensable to local progress, and this may be done by recalling the current and historic contributions of local professionals to both local and global developments.

When contributions of S&T to society is made known in a careful and balanced way, it has the power of validity, and hence the character of relevancy, longevity and sustainability.

As a pertinent corollary to this endeavour, the scientific community must also devise ways to ensure that the best scientific advice is routinely taken into account when national decisions are being taken.

7. **IMPLEMENTATION MECHANISMS**

(i) **Key Issues**

Jamaica is famous for ideas but has a tradition of weak translation and implementation. This was evident in the two science policies promulgated since the renaissance of the application of S&T for socio-economic development in the 1960s. The first policy was largely weak in implementation because of its over-ambitiousness and because few
resources were allocated to its implementation, as well as, the fact that there was no one body with the responsibility to oversee and promote its execution.

The creation of the NCST was the most visible attempt undertaken to give effect to the island’s S&T ambitions. This body has done much, with limited resources, and have realised certain aspects of the second policy, such as biotechnological capability building, coordination of R&D, filling of S&T gaps and promotion of liberalisation in the telecommunication sector, and the development of indicators of success and accountability.

The NCST will therefore be supported to select, promote and facilitate the accomplishment of cross-institutional and inter-disciplinary work of major national importance, to demonstrate the effectiveness of S&T for local socio-economic development.

In doing this, the NCST will seek to give all stakeholders a voice in project selection and execution, and the Commission will also work closely with communities to find ways to identify innovative approaches to solve local problems and thereby enhance production, productivity and the creation of jobs.

Also by giving communities a voice in these types of S&T activities, the stage will be set to enhance governance and democracy. Such actions will gain for S&T a wider and firmer popular base.

To bolster the present limited resources of the NCST, the National S&T Foundation will be provided with the operational capacity to build a trust fund, and attract resources for the efficient functioning of the NCST.

(ii) Strategic Initiatives
Among strategies that will be employed to promote policy implementation and direction are the following:

(a) Funding
Jamaica’s allocations to R&D and S&T fall far below the international average for successful countries (2-3% vs. 0.03% of Gross Domestic Product (GDP) for Jamaica). Increased funding for R&D must be a national priority. Therefore, the following actions will be taken:

- Rationalization of the various incomes, taxes, services and revenues earned by S&T institutions, to form one major S&T fund for development.
- HEART, as it currently exists, functions to retrain students who have performed poorly in the educational system, however, its purpose would be more wisely served through more emphasis on the necessity for prevention of remedial measures, by apportioning their national receipts to S&T for development.
- A percentage of funds from the National Lottery (CHASE Fund) will be allocated to S&T. Additionally, those S&T institutions that can earn substantial revenues, should be made to increase the pool of resources allotted to those which do not.

In addition, a percentage of the education tax will be used specifically for S&T education.

There is a need to ensure that a sizeable portion of the total budget allocated to R&D institutions be geared towards actual R&D, as opposed to the current scenario where substantial portions of budgetary expenditures are allocated to salaries and administrative activities.

The original vision of the National Foundation for Science and Technology as the major fundraising agent for the activities of NCST, will be realised. The foundation will be constituted to provide substantial financial resources for the operations of the NCST.
A major use of the anticipated funds, must be the promotion of competitive bidding for R&D activities, technological investments, and support of technology-led commercial projects. The Foundation will systematically seek to encourage the private sector, particularly the financial institutions, to commit funds for the advancement of S&T on the island.

Other funding mechanisms include:

- Seeking substantial increase in financial resources from expatriate Jamaicans, the multilateral system, and global benevolent institutions, as well as, more thoughtful allocation from local sources such as a portion of the CHASE fund for S&T.
- Strategic use of these additional funds to realise innovative projects and strengthen institutional learning and sharing.
- Establishing a fund and incentives to move away from largely low-level processing of natural resources and manufacturing of simple goods, for mainly domestic markets, by improving existing capacity and capabilities.
- Building national innovation systems according to the needs of specific firms and sectors by use of:
  - Incentives
  - Regulations
  - Risk financing
  - Introducing new technologically inspired ideas to help expand industrial and business opportunities, and attract foreign investment.
- Establishing discrete funding mechanisms to support competitive projects in:
  a) *Basic sciences*
  b) *Applied R&D*
  c) *High risk S&T-led commercial projects*
  d) *The innovative transfer of conventional technology to micro, small and medium size enterprises*
  e) *Technologies aimed directly at poverty eradication.*
Exploring possibilities of recompense from the First World, through payments for their employment of categories of highly trained local S&T professionals, in their efforts to replace their aging workforce.

(b) Management and Coordination

- Provide additional support for NCST, including the following:
  a) The NCST will be accepted and supported as an independent national body, which represents all local stakeholders.
  b) The NCST will be given resources and legal authority to allow influence on policy execution, coordination and collaboration, based on the acquisition of reliable data and experiences.

- The S&T Adviser’s office will be empowered to link the Prime Minister with the scientific community, help the Prime Minister to set priorities based on S&T inputs and have regular meetings with the Heads of S&T institutions, and set budgets for S&T. It will also be improved with a think tank capability, to include S&T foresighting, comprehensive reviews of S&T on development and social advancement, as well as gauge civic society’s feelings about ethical S&T issues.

- Improve the management, monitoring and accountability of investments in S&T, to ensure the timely execution of S&T institutional and sector policies and plans (to be developed separately by each sector).

- Improve S&T competence in each Ministry by installing S&T focal points, which will act as part of a national network for the acquisition and use of knowledge, and thereby integrate national efforts for socio-economic development.

- Include S&T experts in trade and security negotiations

- Arrange for more scientists to work directly on poverty questions, such as its total cost to society.

- Encourage the private sector to be a part of the planning process for S&T by being integrally involved.
Use of national S&T teams drawn from ministries, institutions, academies and universities, to tackle selected, important national problems within time frames, with responsibilities and adequate resources.

Develop a plan to improve modern technological skills on the island based on an up-to-date roster of local capabilities, such as those in the areas of biotechnology, information technology, nano-technology, foresighting and S&T management.

Promote the involvement of civil society in the support and proper implementation of the S&T policy.

(c) Technological Acquisitions and Monitoring

- Make better use of knowledge existing in the international patent system
- Review policies and plans at yearly intervals and make adjustments.
- Attention focussed on research directed at understanding technological development and investments, in order to facilitate more efficient use of technologies.
- Redefine excellence to meet the new realities of Jamaica and establish Centres of excellence in selected fields.
- Accelerate the move towards accreditation of laboratories, especially in the area of food safety and medical services.
- Encouragement of expatriate Jamaicans to set up enterprises in Jamaica.
- Decrease reliance on fossil fuels by monitoring progress in this field.
- Provided time for S&T representations before Parliament.

(d) Incentives and Standards

- Set up national incentives and rewards systems for institutional and individual excellence
- Use scientific publications, in refereed local and foreign journals, as an integral part of career advancement requirements for those employed in S&T jobs.
- Use of R&D to advance domestic standards and metrology.
(e) S&T Information

- Government will negotiate the purchase in bulk to lower the cost of scientific journals for specialised institutions and the S&T community in general.
- Improve electronic networking in the island’s S&T infrastructure
- Engage the local media to improve national S&T literacy and understanding of unfolding S&T issues, particularly by using incentives such as offering a prize for the best science reporter.

(iii) Implementation Plan

(a) Allocation of Duties
Within six month of the promulgation of this policy, the NCST will identify and obtain consent from institutions, groups or individuals, to take responsibility for the implementation of the strategic initiatives. Plans for the execution of clutches of initiatives or individual ones, will be prepared with clear responsibilities, resources, time lines and monitoring schedules. These will be posted on the Commission’s website which will be upgraded and hyper linked to all major institutions and foreign collaborators.

Additionally, the NCST will refine its responsibilities and operations through a strategic plan which will also be placed on the website.

The effectiveness of the implementation of the S&T Policy will be comprehensively evaluated at least once every two years.

8. REVIEW OF POLICY
Within the context of the dynamic and rapidly advancing scientific and technological developments and the changing local environment, the implications of this policy will be subject to regular monitoring, and review by the Commission on Science and Technology at least every three years, especially to facilitate the inclusion of the
impacts of emerging cutting-edge products of global S&T research for domestic purposes, especially the application of S&T to the eradication of poverty.

9. CONCLUSION
The long-standing stagnation of the Jamaican economy is largely due to the reliance on old visions of socio-economic development and anachronistic production systems, management practices and a reluctance to use evolving knowledge in many corners of the society. There is need for a clear recognition of the fact that our primary product-based economy has lost its lustre because technology and the number of players entering the market have superseded it. Primary product prices have fallen some 80% over the last century and will continue to fall making small inefficient producers unable to cope. Also, it must be recognised that tourism by itself is not sufficient to provide the type of economy required in the future. As a consequence, there has to be change to a more competitive economy based on S&T capabilities and capacities, as well as, modern administration and management.

The message is clear, Jamaica must compete by moving to value-added products for niche markets, produce new manufactured products and provide more science-based services. These will require judicious use of both local capability and global information to find innovative solutions to old and new problems.

This policy therefore is intended to provide the basis for developing the island into a knowledge-based economy to serve the needs and ambitions of the Jamaican people.
APPENDIX 1
METHODOLOGY

The dialogue process for the elaboration of this policy commenced with the engagement of the members of the approximately 44 organizations of the Jamaican S&T public sector infrastructure and was based on the socio-economic directions contained in the 1996 National Industrial Policy as well as the two previous S&T policy statements promulgated in 1960 and 1990 and the Science and Technology and Innovation Policy of Jamaica, 1997. A series of urban and rural consultations lasting for well over a year were subsequently arranged, allowing for intensive interchange of a wide cross-section of urban and rural stakeholders, with over ten drafts being circulated for comments.
APPENDIX 2
Consultation List

Government Ministries

Office of the Prime Minister
Ministry of Commerce Science and Technology (with Energy)
Ministry of Agriculture

S&T, R&D Organizations and Agencies

University of the West Indies
Faculty of Pure and Applied Science
Faculty of Medical Science
Biotechnology Centre
Centre for Environment and Development
Centre for Marine Science
International Centre for Environmental and Nuclear Science
Tropical Medicine Research Institute
University of Technology
College of Agriculture Science and Education
Northern Caribbean University
Agricultural Development Corporation
Citrus Growers Association
Cocoa Industry Board
Coconut Industry Board
Coffee Industry Board
Food Storage and Prevention of Infestation Division (MCST)
Forensic Laboratories (Ministry of Security and Justice)
Geology and Mines Division (Ministry of Agriculture)
Government Chemist Laboratory
Institute of Jamaica
Bureau of Standards Jamaica (MCST)
Fisheries Division (Ministry of Agriculture)
Consultation List Cont’d…

Bodles Research Station (Ministry of Agriculture)
Veterinary Services Division (Ministry of Agriculture)
Rural Physical Planning Division (Ministry of Agriculture)
Environmental Control Division (Ministry of Health)
Vector Control Unit (Ministry of Health)
National Irrigation Authority
National Public Health Laboratories
National Water Commission
Natural Resources Conservation Authority
National Commission on Science and Technology
Pesticide Control Authority, Ministry of Health
Water Resources Authority
Scientific Research Council, (MCST)
Sugar Industry Research Institute
Jamaica Bauxite Institute
Banana Board
Natural Products Institute
Caribbean Agricultural Research and Development Institute
Earthquake Unit (UWI)
Petroleum Corporation of Jamaica
Caribbean Food and Nutrition Institute
Pesticide Control Authority (Ministry of Health)

Private Sector Organizations and Companies
Mandeville Weekly
Citrus Growers Association
Jamaica Manufacturers Association
Jamaica Exporters Association
St. Elizabeth and Manchester Growers Association Ltd.
Manchester Chamber of Commerce
Ginger Growers Association
Consultation List Cont’d…

St. Elizabeth Chamber of Commerce
Perishables Jamaica Ltd.
Jamaica Trading and Manufacturing Company Ltd.
Small Businesses Association of Jamaica
Advanced Technology Systems Ltd.
Jamaica Broilers Group
Conrad Douglas and Associates
Fisher Price and Associates
Call Associates Ltd.

NGOs
Secondary Schools
Principals and Teachers Groups
Farmers
Leadership of Community Organizations
Civil Society
APPENDIX 3
ACKNOWLEDGEMENTS

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