THE NATIONAL SCIENCE, TECHNOLOGY AND INNOVATION POLICY

CATALYSING NATIONAL DEVELOPMENT

Ministry of Science, Energy and Technology

THE NATIONAL SCIENCE, TECHNOLOGY AND INNOVATION POLICY

CATALYSING NATIONAL DEVELOPMENT

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MINISTER'S MESSAGE

Science, Technology and Innovation (ST&I) are necessary tools to empower Jamaicans to aspire to achieve their fullest potential; a secure, cohesive and just society; a prosperous economy and a healthy natural environment. Jamaica must join the developed world in leveraging ST&I as important tools in advancing national development, increasing global competitiveness, improving the quality of lives for its citizenry and paving the way for excellence as we explore this dynamic world around us.

A responsive and coherent policy is paramount as we strive towards a digital and knowledge-based economy. The Policy will define our future expectations and course of actions to centralise ST&I in our national, regional and international development.

It is with great pleasure, that I present Jamaica's National Science, Technology and Innovation Policy: Catalysing National Development. It is the first long-term policy that envisages '*a dynamic Science, Technology and Innovation culture, unleashing the creative potential of our people, catalysing economic development and sustainable prosperity, contributing to social transformation, empowering Jamaicans to excel in an evolving world and contribute to the global frontiers of science.*'

The Government of Jamaica will adhere to this strategic framework to advance Jamaica's economic, social and environmental aspirations as it aligns and supports all outcomes of the National Development Plan, Vision 2030 Jamaica.

The Policy seeks to harness the excellence among our scientists, engineers, educators and students to contribute to improving profitability in local and global industry and enhance government efforts in providing a better quality of life for all Jamaicans. It also seeks to entrench a culture of entrepreneurship and innovation in our society and economy. Increased focus on national and international cooperation, research infrastructure and funding, Science, Technology, Engineering and Mathematics (STEM) education, science popularization and governance of the ST&I landscape are the key pillars of the Policy.

This is a bold attempt to fully weave knowledge and its applications into the rubric of Jamaican culture and society. It is through cooperation among all players in the ST&I sector and successful implementation of this Policy that Jamaica will become '*the place of choice to live, work, raise families and do business.*'

Honourable Daryl W. Vaz, M.P.
Minister of Science, Energy and Technology

LIST OF ACRONYMS

AR&D	Academic and Research and Development Institutions
BSJ	Bureau of Standard Jamaica
CAP	Community Access Points
CARICOM	Caribbean Community
CCST	Caribbean Council for Science and Technology
CDB	Caribbean Development Bank
DBJ	Development Bank of Jamaica
eGOV	eGOV Jamaica Limited
GoJ	Government of Jamaica
GDP	Gross Domestic Product
GERD	Gross Expenditure on Research and Development
GII	Global Innovation Index
ICENS	International Centre for Environmental and Nuclear Sciences
ICT	Information and Communications Technology
ICVIS	Integrated Crime and Violence Information System
IDB	Inter-American Development Bank
IP	Intellectual Property
IPR	Intellectual Property Rights
JAMPRO	Jamaica Promotions Corporation
JMEA	Jamaica Manufacturers and Exporters Association
JSI	Jamaica System of Innovation
MDAs	Ministries, Departments and Agencies
MOEY	Ministry of Education and Youth
MOFPS	Ministry of Finance and the Public Service
MOJ	Ministry of Justice
MNS	Ministry of National Security
MSET	Ministry of Science, Energy and Technology
NCST	National Commission on Science and Technology
NCSTI	National Commission on Science Technology and Innovation
NDP	National Development Plan
NFDST	National Foundation for Development of Science and Technology
NGOs	Non-Governmental Organization
NRF	National Research Fund
OECD	Organisation for Economic Co-operation and Development
OPM	Office of the Prime Minister
PIOJ	Planning Institute of Jamaica
PPP	Purchasing Power Parity
PPPs	Public-Private Partnership
PSOJ	Private Sector Organisation of Jamaica
R&D	Research and Development

RICYT	Ibero-American and Inter-American Network of Science and Technology Indicators
S&T	Science and Technology
SDG	Sustainable Development Goals
SIDS	Small Island Developing States
SIPP	Security Interest in Personal Property
SME	Small and Medium Enterprises
SRC	Scientific Research Council
ST&I	Science, Technology and Innovation
STATIN	Statistical Institute of Jamaica
STEM	Science, Technology, Engineering and Mathematics
SWOT	Strengths, Weaknesses, Opportunities and Threats
TIS	Tablets in School
TVET	Technical Vocational Education and Training
UN	United Nations
USF	Universal Service Fund
UTECH	University of Technology Jamaica
UWI	University of the West Indies

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EXECUTIVE SUMMARY

Presented in this document is the National Science, Technology and Innovation (ST&I) Policy: Catalysing National Development. This Policy sets a framework of action for Jamaica to achieve by 2029:

> ***A dynamic ST&I culture, unleashing the creative potential of our people, catalysing economic development and sustainable prosperity, contributing to social transformation, empowering Jamaicans to excel in an evolving world and contribute to the global frontiers of science.***

The Policy is an update to the National Science and Technology Policy (1990). A new Policy was prioritized by Jamaica's National Development Plan Vision 2030 to achieve Outcome 11: A Technology-Enabled Society. This outcome aims to deepen the application of science, technology and innovation (ST&I) to benefit all aspects of national development.

The Policy was developed through nationwide consultations with public, private, academic, non-profit and civil society representatives. It represents the collective agreement that Jamaica will achieve its Vision for 2030 and beyond by aspiring to have:

1. **A Dynamic and Responsive National System of Innovation:** Jamaica has a well-established system of innovation which yields competitive world-class S&T achievements that will advance national development.

2. **A Culture of Innovation:** Jamaicans in all private, public and productive spheres value the role of science, technology and innovation in expanding the base of wealth creation and improving the overall quality of life for all.

3. **A Development Agenda Advanced by ST&I:** Jamaica achieves its development agenda by integrating science, technology and innovation to enhance its economic, social and environmental goals.

4. **An Excellent Research and Development Capability:** Jamaica has an excellent world-class and distinctive research and development (R&D) capability and a reputation for innovation.

5. **An Enabling ST&I Policy Environment:** Jamaica has a dynamic policy, legislative and institutional framework that capitalizes on ST&I for all aspects of national development.

Strategic Framework

These five (5) goals will be achieved through a mix of short to medium-term actions, as well as, long-term strategic priorities for the government, private sector, industry and civil society. The Policy will address the creation, adaptation and use of scientific knowledge, technology and innovation, and will also govern the development of institutions, legislation, policies, programmes and human resources.

The framework underpinning this Policy outlines goals, objectives and strategies. They are comprehensive, flexible and adaptable to meet new challenges and opportunities as they arise. The Policy framework is designed to:

- promote a sense of commitment in public and private sector institutions and individuals toward research and innovation as bases for human capital development, economic growth and job creation, international competitiveness and the management and protection of the environment;
- ensure that the government promotes ST&I in public and private spheres;
- anticipate and embrace new and emerging technologies and innovation (including disruptive technologies) and assess their potential impacts – positive or negative – on national development;
- place strategic focus on local knowledge creation, technologies and innovation, specifically those which advance our traditional and unique sectors, commodities and services, making them more internationally competitive;
- underscore the importance of incremental and adaptive innovation, placing strategic focus on identifying, acquiring and adapting these innovations;
- create strategic alliances and linkages within the Diaspora, recognising it as an untapped resource for ST&I development;
- enhance the country's knowledge, human, technology and institutional capital forms;
- facilitate access to capital for industry to use science and technology to foster innovation;
- strengthen the country's technology-related infrastructure and support further the development of the Intellectual Property Strategy; and
- ensure that the country uses science and technology to fast track the implementation of Vision 2030 Jamaica to advance sustainable development.

Policy Implementation

The successful implementation of the ST&I Policy will be governed by a National Implementation Plan (NIP) to be developed through comprehensive stakeholder consultations. Ministries,

Departments and Agencies (MDAs) will align their work plans with the NIP; academic institutions and private sector entities will also be encouraged to do the same.

The Ministry with responsibility for the science and technology portfolios will steer, monitor and evaluate the implementation of the ST&I Policy for Jamaica. The National Commission on Science and Technology (proposed National Commission on Science, Technology and Innovation (NCSTI)) will be responsible for coordinating the various implementation activities across sectors. The NCSTI will provide quarterly reports to the Ministry on implementation activities.

INTRODUCTION

Science and Technology (S&T) has always been pivotal to the advancement of human civilization. The advent of tools and fire during the Stone Age, Mayan astronomy and engineering in the Classic Period, the birth of philosophy during the Renaissance, Columbus' fleet and maps during the Age of Discovery, and the Fourth Industrial Revolution in the 21st Century are but a few examples of how the creation and application of scientific and technological knowledge has revolutionised man's development and place in the world; where the application of this knowledge has birthed numerous innovations. As such, for this Policy, ST&I may be defined as a cohesive system where the real-world application of scientific and technological knowledge produces new or improved goods, processes or services[1].

Today, countries all over the world use ST&I as a means of advancing economic and social development and environmental sustainability[2]. Notably, Governments and institutions that have been able to use S&T as drivers of innovation are better able to maintain competiveness in the global space, leading to an increase in wealth and prosperity[3]. It has long been understood that the capacity to innovate or the existence of robust innovation ecosystems as a factor in driving a country's competitiveness[4].

As a cross cutting enabler, ST&I play a fundamental role in the creation of wealth, economic growth and development and in the improvement of the quality of life of all citizens. ST&I are essential to the development and management of various sectors including agriculture, agro-processing, energy, waste, biodiversity, education, adaptation to climate change, the management of hazards and crime prevention and control. In addition, it helps to generate employment, enables the design and commercialisation of new products and services; reduces poverty, improves education, health, nutrition and trade; and builds new capacities that are essential in the 21st century.

In a similar manner, the application of ST&I is one of the ways by which Jamaica can be transformed to developed country status by 2030. As such, Jamaica's National Development Plan - Vision 2030, through Goal 3 ('Jamaica's Economy is Prosperous'), and the corresponding National Outcome 11('A Technology Enabled Society'), aims to deepen the application of science and technology to benefit all aspects of national development and unleash the full creative potential of our people. The Plan dictates that science and technology should be used to foster innovation in Jamaica's knowledge, human, institutional and cultural capital across all sectors. Furthermore, ST&I must be used to add greater value to lower and more traditional forms of capital. This broad-based approach will enhance

[1] Baregheh, A., Rowley, J. and Sambrook, S. (2009). "Towards a multidisciplinary definition of innovation". *Management Decision.* 47 (8): 1323-1339

[2] Organization for Economic Co-operation and Development 2000. Science, technology and innovation in the new economy. OECD Observer Policy Brief.

[3] Al, Umut, and Zehra Taşkın. "Relationship between economic development and intellectual production." *COLLNET Journal of Scientometrics and Information Management* 9.1 (2015): 25-35.

[4] Schwab, K. "The Global Competitiveness Report 2019." (2019). World Economic Forum.

Jamaica's resilience and lay the foundation for long-term transition to a knowledge-based society, as well as, a digital and innovation-based economy.

RATIONALE

Recognising the shifts in the global political economy, and the unrelenting pace of the technology revolution and other developmental challenges affecting countries worldwide, Jamaica as a small island developing state (SIDS) must build its capabilities to achieve sustainable development.

In this regard, it is vital that Jamaica embraces and becomes more engaged in using ST&I to derive greater economic, social and environmental benefits for the country. As such, ST&I in Jamaica will enable us to:

- Make demonstrable progress in addressing health and nutrition problems, avoid and mitigate the impacts of natural disasters, embark on a path of sustainable poverty reduction, safeguard fragile eco-systems, and improve the quality of life for the rural and urban poor;
- Transform the economy from one that is based on subsistence agriculture, enclave extractive industries, and simple, low skilled manufacturing into one that is based on the production of more knowledge-intensive, higher value - added goods and services;
- In managing the risks, explore the opportunities that may arise through innovation to raise productivity, wealth, and standards of living by developing new, competitive economic activities to serve local, regional, and global markets; and
- Develop appropriate R&D capacity to support technology-based economic growth and to address social, economic and ecological problems specific to the country.

THE POLICY

As we work towards national prosperity, Jamaica must achieve policy coherence to fully integrate ST&I as a strategic tool. The Policy will:

- catalyse national development by ensuring that the developmental goals under Jamaica's Vision 2030 are enabled and supported by the application of knowledge across productive sectors and in the delivery of public goods and services;
- improve competitiveness of the country's industries to support faster growth, create jobs and improve health, education, security and governance;
- develop new unique and indigenous products and services, while adding value to the lower forms of capital stocks; and
- augment the human capacity of the Jamaican citizenry in relation to the exploitation of science, technology and innovation.

This Policy will help to mainstream ST&I across all sectors and services at the national level by facilitating the design, coordination and implementation of the multi-sectoral process that will promote ST&I as central to the transformation and development of Jamaica.

Historical Profile of S&T in Jamaica

Jamaica has a long history of leveraging science and technology to exploit natural resources, drive economic growth and improve the quality of life. In the 18th and 19th century, Jamaica was the first in the Western Hemisphere to establish a botanical garden, generate electricity and construct a railway outside of North America and Europe [5]. Additionally, Jamaica used research results to boost sugar cane production.

Jamaica's early approach to systematic development of S&T is reflected in the 1960 Scientific Research Council Act of Parliament which created the Scientific Research Council (SRC). In the 1970s, Jamaica made major strides economically by increasing its investments in agricultural research and development (R&D) and infrastructure. Scientific applications in animal husbandry, fisheries and plant epigenetics yielded high returns in the agriculture sector and formed the basis for much of the scientific developments in those fields across the world. For example, scientist Thomas P. Lecky pioneered extensive research in the agricultural sector resulting in the first breed of indigenous Jamaican cattle. Through genetic manipulation of the cattle (bull) species, he was able to produce a more resilient hardy species that could live in our climate and provide more meat and milk for consumers.

At the turn of the 20th Century, Jamaica's primary products for economic viability were being threatened by the newer technology driven methods of production, as well as the subsequent use of new materials. Furthermore, robotics and computer-assisted manufacturing technology undermined the traditional advantages of cheap labour. Therefore, an appropriate S&T Policy response to address these challenges was deemed necessary.

Role of S&T in National Development

The Science and Technology Policy (1990) was aimed at increasing the role of science and technology in achieving economic and social development in Jamaica. The policy's objectives were to *inter alia*, establish linkages within the S&T sub-system, develop productive sectors, increase the nation's competitiveness in trade, and develop education and training programmes. This policy led to the establishment of a national coordinating entity for S&T, the National Commission on Science and Technology (NCST) and its funding arm, the National Foundation for Development of Science and Technology (NFDST).

Notably, in 1996, the National Industrial Policy, which recognized S&T as a strategy to enhance growth and international competitiveness, was developed. In essence, this policy promoted the integration and coordination of various institutions that would help to grow the country's Gross Domestic Product (GDP).

The policy anticipated Jamaica's per capita GDP to grow at an annual average rate of 5.8% between 1994 and 2010. However, according to the World Bank's data, Jamaica's per capita GDP grew at an annualized rate of

[5] National Commission on Science and Technology (2005). Science and technology for Socio-Economic Development: A Policy for Jamaica.

approximately 1.73% between 1994 and 2014. The disparity between the anticipated goal and the current reality continues to be as a result of limited resources, inadequate funding and lack of coordination between stakeholders. Furthermore, the absence of empirical data makes it difficult to link the contribution of S&T to economic growth in Jamaica. Undoubtedly, the anticipated benefits of both policies did not result in the expected economic growth.

Recognizing these challenges and acknowledging the rapid changes in the global political economy, there are calls for Jamaica to enhance its economic resilience, improve its global competitiveness, and to foster and promote innovation. In response, the government along with its stakeholders within the S&T sector, identified that the role of innovation is a critical aspect for driving Jamaica's global competitiveness and to address its developmental challenges.

Innovation Models

In 2007, the Caribbean Council for Science and Technology (CCST) presented to the Caribbean Community (CARICOM) a Regional Policy Framework for Science, Technology and Innovation (ST&I). This framework was an attempt to specifically guide the region's policy and decision-makers on building ST&I capacity to meet the pressing new demands of the knowledge-driven era.[6] As Jamaica responded to the call to capitalize on innovation, its implementation and application to society became a key point of reference.

Innovation is rooted in the complex interaction between the highest forms of any nation's capital; the human, the knowledge and cultural assets[7]. It is through this interaction, that true successes can be found in the innovative process. Furthermore, innovations may arise whether or not there is a formal Innovation System (Ecosystem) to encourage them established.

There are two basic models for innovations systems: The Triple Helix Model of Innovation; and the Quadruple Helix Model of Innovation.

The Triple Helix Model of Innovation[8] has three components: Government, Universities and Industry. In this model, innovations result from government funding of research carried out in universities (and government institutions) that are then adopted by industries to produce commercial goods that generate jobs and tax revenues, grow the economy and, in so doing, allow the government to fund more research. This model originated in developed countries and its dependency on government funding for research is limiting in developing contexts, where there is a pattern of limited government funding available and allocated for research.

A more appropriate model for the developing country context is the Quadruple Helix Model[9]. This model complements the top-down, government-financed approach of the Triple Helix Model with bottom-up approaches; the innovations come directly

[6] Science, Technology & Innovation for Sustainable Development- Caribbean Regional Policy Framework for Action. March 2007, CARICOM

[7] Vision 2030 Jamaica, National Development Plan (2009)

[8] Etzkowitz, H., & Leydesdorff, L. (1995) The Triple Helix---University-Industry-Government Relations: A laboratory for Knowledge-based Economic Development. *EASST Review* 14(1):14-19.

[9] Carayannis, E.G. & Campbell, D.F.J. (2009) 'Mode 3' and 'Quadruple Helix': toward a 21st century fractal innovation ecosystem. International Journal of Technology Management. 46(3/4):201.

from entrepreneurs in the private sector and civil society, with support from non-government sustainable-financing mechanisms (e.g., Pay-It-Forward agreements with innovators who find success).

Historically, 63% of applicants for Jamaica's biennial Innovation Awards are entrepreneurs from outside the government and university systems, suggesting that a National Innovation System—based on the Quadruple Helix Model that encourages entrepreneur-led innovation in addition to honouring the conventional university-developed innovations—is the way forward for Jamaica.

Current Profile of ST&I in Jamaica

Jamaica has made strides in developing and implementing S&T related initiatives, which have led to noteworthy innovations across various sectors. Notwithstanding these achievements, the ST&I sector continues to grapple with various challenges, which impact the country's ability to fully utilize its indigenous resources to foster sustainable development. The challenges are further discussed below:

I. Governance and Coordination

The coordinating body responsible for fostering and advancing the national policy for science and technology is the NCST. The current size and structure of the entity remains constrained in its ability to effectively coordinate activities and programmes across the ST&I landscape and to effectively achieve its mandate due to limited funding. This is further compounded by the fact that other Ministries, Departments and Agencies (MDAs) have 'independent' ST&I-related agendas, mandates, functions and associated infrastructure. As a result, there is duplication of efforts to a significant degree.

The NFDST was established to fund the activities and programmes of the NCST[10]. To date, no major advancements have been forthcoming as a result of this initiative which may be due to the fact that it too has not been able to operate effectively according to its mandate.

II. ST&I Landscape Under-resourced

Despite acknowledging the critical role of ST&I in national development, the GoJ has made little to no sustainable efforts towards bolstering the sector's resources and initiatives.

The following key areas, once addressed would help to foster growth and development:

a) Funding and Investments in ST&I

The Government outlined that 2020 would be the year there was an inclusion of a "modest allocation" for research and development in Jamaica's National Budget in an effort to improve the fundamental role R&D has for economic and social development[11].

The persistently low levels of support to Jamaica's ST&I landscape impacts negatively on the (i) imperative of building, maintaining and equipping proper R&D laboratories; (ii) accountability of

[10] This fund is overseen by a Board which is comprised of representatives from the private sector, academia and government.

[11] R&D Included in GDP Analysis by 2020 – Clarke, The Gleaner Online, June 13, 2019, http://jamaica-gleaner.com/article/lead-stories/20190207/rd-included-gdp-analysis-2020-clarke

responsible parties with respect to stipulated R&D outcomes; and (iii) aggressive acquisition and infusion into the economy of new ideas, practices and knowledge derived from the competitive and dynamic global ST&I ecosystem.

Admittedly, the GoJ has taken steps to recognize Intellectual Property (IP) as a form of collateral through the Security Interest in Personal Property (SIPP) Act (2013), however, financial institutions are still reluctant to fund R&D projects for entrepreneurs and innovators as they are unable to establish a direct link between ST&I initiatives and projected revenue. As such, efforts toward gaining access to financing remain difficult. The Jamaica Intellectual Property Office (JIPO) has taken steps to address this difficulty and is implementing a project with funding from the Inter-American Development Bank (IDB) and the Caribbean Development Bank (CDB) to address the issue.

b) Education & Training Development

Presently, science is taught at all levels in schools, however its application at the primary level is rudimentary. This process stagnates students' ability to develop critical thinking skills through the process of inquiry utilised for problem solving and decision making.

Although technology is incorporated in the primary and secondary school curriculum and as a teaching tool, its application, access and reach remain limited. This may be as a result of limited government funding and resources, and the rapid changes in technology which challenges the education sector to keep abreast with these advancements.

Furthermore, the education sector places emphasis on traditional occupations such as lawyers, doctors, et al., and as a result, children lack nurturing in S&T careers, while on the other hand, adults who have been exposed to S&T are unable to get jobs in the sector or have opted to pursue more viable careers[12] in other areas.

In addition, literacy throughout the adult population (specifically the elderly) and those with special needs remains an issue of concern across society. Any lasting benefits or impact from introducing and exploiting ST&I will require addressing the steep learning curve that may exist. Consequently, there is a general need for literacy and human capacity development across the board.

Recognising these challenges, it is critical for the new ST&I Policy to develop and implement strategies geared towards improving scientific literacy at an earlier age to give young and older students the skills and knowledge they need to succeed in school, work and beyond.

c) Human Resources and Employment Opportunities

To date, Jamaica has made strides in establishing science-related organisations to streamline R&D functions and science-based initiatives. Still, these entities remain under-resourced as it relates to human resources (staff complement) and capacity building. It should be noted that although there are established departments and

[12] Technology, education and society, The Jamaica Observer, September 13, 2020, http://www.jamaicaobserver.com/news/technology-education-and-society_203015?profile=1096

agencies within the government sector, there still exists a need for the inclusion of science advice/ input across all MDAs. This will ensure that, through R&D, better policy cohesion and direction will be made to alleviate all sector-related problems.

Employment data collected from 10 selected ST&I and R&D institutions, indicated that in 2018 there were 794 persons (388 females) involved in research activities[13].

Table 1: Number of Researchers by gender employed to selected ST&I and R&D entities.

Entity Type	Number of Researchers		Total
	Male	Female	
GOJ Agencies	24	53	77
Specialized Institutions	22	10	32
Higher Education Institutions	360	325	685
Total	**406**	**388**	**794**

The challenges are further exacerbated by the fact that graduates in S&T vastly outnumber the available employment opportunities across public and private sectors. In the instances where some of these graduates decide to pursue entrepreneurial endeavours, they too are faced with the challenges of accessing funding from financial institutions to support the development, testing, production and marketing of their innovative products and services.

III. Measuring the Benefits of ST&I

One major issue related to the system of ST&I in Jamaica is that there is no established mechanism to measure expenditure on research and development in order to track its contribution to the country's development [14] . This is an important indicator for identifying the potential benefits of investment. The implementation of a standardised tracking mechanism will allow for an assessment of the impact of current initiatives in the ST&I arena, and will serve as the basis for promoting spending by the public and private sectors.

In an attempt to address this challenge, the GoJ adopted a methodology based on the internationally recognized Organisation for Economic Co-operation and Development's (OECD) Frascati Manual (2015) which provides statisticians and ST&I policy makers with guidelines for collecting and reporting data on R&D. A pilot study was launched in 2017 to commence assessment of the R&D landscape; however, some institutions have not been forthcoming with the data required to measure spend on research and development.

IV. Infrastructure (Government Laboratory System)

In 1985, an audit commissioned by the SRC of the public laboratories in the Hope Gardens Complex revealed severe shortcomings in human resources, equipment maintenance, budgets and overall performance. The findings of this review are not different from the last review conducted

[13] Economic and Social Survey Jamaica, 2018

[14] R&D Included in GDP Analysis by 2020 – Clarke, The Gleaner Online, June 13, 2019, http://jamaica-gleaner.com/article/lead-stories/20190207/rd-included-gdp-analysis-2020-clarke

in 2015, by the former Ministry of Science, Technology, Energy and Mining. Several facilities which participated in the review, were found to be operating in silos, under-resourced and not able to reliably deliver their services at acceptable levels of quality and quantity.

The review noted, that portfolio oversight for these laboratories was spread across five different Ministries and as a result there was little time or inclination for scientific collaboration and coordination.

Across the ST&I landscape, there exists limited infrastructure to conduct R&D activities, and where they do exist, the equipment is either outdated or in need of continuous repair. This challenge limits scientists' and innovators' potential for scientific and technological advancements/breakthroughs.

Furthermore, these laboratories and centres are concentrated in the Kingston Metropolitan Area, making them less accessible to innovators in other parts of the island.

While there have been a few noteworthy discoveries or economically enabling R&D breakthroughs, notwithstanding these challenges, greater coordination, improved infrastructure and expanded access is required.

V. Monitoring and Evaluation

Monitoring and evaluation of the progress and impact of the ST&I development efforts and utilization of S&T products are critical to the success of ST&I Policy.

ST&I outputs are measured by R&D activities including expenditure and human resources across a variety of institutional sectors and units. In addition, other ST&I outputs are measured using instruments such as publication rates, patents and export volumes, and earnings from high technology products.

Jamaica and other CARICOM countries have only now begun to embrace the necessity to examine ST&I performance at the detailed level required for informed decision-making.

As such, there are no robust systems in place to collect data of ST&I indicators and provide targets and benchmarks.

Noteworthy Successes in ST&I

Several initiatives have been launched over the years that have benefitted entrepreneurs, scientists, research practitioners and investors. Of notable mention is the Development Bank of Jamaica, which provides grants of up to J$4 million towards business innovation to assist locally registered start-ups with the commercialization of their products and services.

Other initiatives have played major roles in providing benefits on a public and private level. Although it has proven difficult to quantify these benefits, their impact on the country's economy is evident:

- SRC facilitates the production of sorrel all year round. Beverage manufacturer Red Stripe (part of the Heineken Company) has capitalized on this initiative through the production of its sorrel beers.
- Wigton Windfarm is the largest wind facility in the English-speaking Caribbean, and contributes to Jamaica's energy mix. This is in alignment with the

Vision 2030's indicator of the use of alternative forms of energy, to reduce the dependence on fossil fuels.

- The International Centre for Environmental and Nuclear Sciences (ICENS), currently assesses contamination of agricultural produce by heavy metals and toxins (mercury, lead, cadmium).
- Nutraceutical Industry – Jamaica's indigenous plants are known for their medicinal benefits. Plants such as ginger, turmeric, cannabis, etc., are currently being tested and utilized in the cosmetic, agriculture and health industries for their medicinal properties.
- Universal Service Fund (USF) Connect JA - Connect JA aims to establish free Wi-Fi in strategic locations across the country, in areas including, but are not limited to, parks, town centres and even high traffic stretches of roadway.
- Community Access Points (CAP) – the USF has established over 300 CAP sites in an effort to bring ICT (internet) to underserved areas in Jamaica at minimal or no cost for business, bill payment, educational purposes, communication, etc.[15].
- Tablets in School (TIS) Programme - this programme promotes the use tablets as the major support strategy in the teaching and learning process.

Conclusion

Jamaica's ST&I system is not delivering outputs in quantities and at rates that are most needed to transform the Jamaican economy as envisaged in the Industrial Policy (1996), the S&T Policy (1990) and the various Acts of Parliament establishing public ST&I institutions since independence. Despite its vast potential and successes, Jamaica's R&D system is at best, under-performing, poorly managed, under-resourced and in need of effective and coherent coordination, repositioning and transformation that will link it to the national economy.

[15] Gunn, T. (2019, February 18). USF to Establish More Community Access Points. *Jamaica Information Service.* https://jis.gov.jm/features/usf-to-establish-more-community-access-points/

SWOT ANALYSIS

The strengths, weaknesses, opportunities and threats (SWOT) analysis of ST&I in Jamaica was developed to assess and streamline the policy goals within the Jamaican context. The results from the 2017/2018 analysis are as follows:

TABLE 2: Strengths, Weaknesses, Opportunities and Threats in Jamaica's Innovation Ecosystem

S STRENGTHS	W WEAKNESSES	O OPPORTUNITIES	T THREATS
GOAL 1: A Dynamic and Responsive National System of Innovation: Jamaica has a well-established system of innovation which yields competitive world class science and technology achievements that will advance national development.			
a) Track record of significant international contributions to science and innovation. b) Dedicated institutions with mandate for ST&I development, utilisation and coordination (e.g. NCST, SRC, ICENS & portfolio Ministry)[16].	a) Absence of a National Innovation System, resulting in no formal mechanism/ platform for the integration of indigenous knowledge and the rapid transfer of technology. b) Fragmented Sector with many ST&I actors and inadequate coordination. c) Limited or no knowledge transfer and or succession planning.	a) Develop a strategic Action Plan for the Jamaica System of Innovation (JSI).	a) With no innovative system in place, Jamaica will not be able to optimize its human and natural resources. b) Limited capacity and awareness to generate, protect and enforce IP rights.

[16] The Government of Jamaica Assignment of Subjects and Departments, Agencies and Other Public Bodies. 13 September, 2020. Retrieved from: https://cabinet.gov.jm/wp-content/uploads/2020/09/GOJ-Assignment-of-Subjects-Departments-Agencies-13-September-2020.pdf

S STRENGTHS	W WEAKNESSES	O OPPORTUNITIES	T THREATS
GOAL 2: A Culture of Innovation: Jamaicans in all private, public and productive spheres value the role of science, technology and innovation in expanding the base of wealth creation and improving the overall quality of life for all.			
a) A creative society. b) High level of endemism and natural capital-strong country brand "Brand Jamaica".	a) Barriers for accessing financing to implement research and engage in new and emerging ventures. b) Low priority placed on calculating returns on investment in publicly funded research institutions. c) Slow pace of technology adoption and lack of innovation in the main goods and services-producing sectors and industries resulting in, *inter-alia,* low productivity levels, inefficient resource use, limited value-added production, and poor environmental performance. d) Low levels of public awareness and knowledge regarding Intellectual Property Rights. e) Lack of prioritization of a culture of innovation in the public sector	a) Leverage natural assets and traditional knowledge as a basis for the formation of a bio-economy. b) Ability to commercialise domestic IP assets to generate income, promote clean tech entrepreneurship, and improve quality of life. c) Availability of free and low-cost online training in innovation and innovative tools. d) Improve gender and age disparities by encouraging inclusivity.	a) High levels of business informality impinges on the development of competitive ST&I–driven industries. b) Lack of clear policy and sanctions to prevent the erosion of "Brand Jamaica".

S STRENGTHS	W WEAKNESSES	O OPPORTUNITIES	T THREATS
GOAL 3: A Development Agenda Advanced by ST&I: Jamaica achieves its development agenda by integrating science, technology and innovation to enhance its economic, social and environmental goals.			
a) ST&I entrenched in Vision 2030 Jamaica; specifically, Outcome 11: Technology Enabled Society.	a) No national research agenda linked to national development priorities. b) Low levels of investment in ST&I nationally; low return on investments (ROIs). c) No formal data collection system for ST&I indicators. d) Limited advocacy for ST&I as a driver for development. e) Absence of an established secure connected infrastructure for the GoJ.	a) Develop mechanisms and tools to ensure that ST&I are mainstreamed into all developmental planning processes and governance structures. b) Strengthen and promote efforts in R&D work focusing on engaging ST&I to explore solutions to local problems. c) Integrate S&T to ensure efficient and impactful delivery of public goods such as education, health care, energy access, waste disposal and security. d) Facilitate direct opportunity for trained ST&I students to access employment in the private sector.	a) Country still at the factor-driven stage of economic development (i.e., driven by unskilled labour and natural resources), therefore unable to attract direct investment. b) Changes in political administrations may possibly influence the prioritisation of strategies and programmes. c) Global, rapid changes in technology and countries' transition to innovation-driven economies create an increasingly complex and competitive market environment for Jamaica and other SIDS.
GOAL 4: An Excellent Research and Development Capability: Jamaica has an excellent world-class and distinctive R&D capability and a reputation for innovation.			
a) A small cadre of highly qualified ST&I professionals locally and in the Diaspora.	a) Poor ST&I infrastructure and limited resources to propel national development.	a) Improve gender and age disparities by encouraging inclusivity. b) Review incentive schemes to facilitate	a) Country still at the factor-driven stage of economic development (that is driven by unskilled labour

S STRENGTHS	W WEAKNESSES	O OPPORTUNITIES	T THREATS
	b) No established National Research and Development Fund to support ST&I. d) Small developing economy with low levels of economic growth and high debt to GDP ratio[17]. e) Misalignment between strategic plans at the ministerial level and the country's development goals/priorities; poor communication/ understanding of the priorities and their links.	public sector bodies benefitting from commercialisation of their R&D findings. c) Construct science/knowledge parks, centres of excellence and science museums and knowledge/technology transfer units. d) Provide dedicated funding for competitively selected research, aligned to the country's development goals.	and natural resources), therefore unable to attract direct investment.
GOAL 5: An Enabling ST&I Policy Environment: Jamaica has a dynamic policy, legislative and institutional framework that capitalizes on ST&I for all aspects of national development.			
a) Dedicated institutions with mandate for ST&I development, utilization and coordination (e.g. NCST, SRC, ICENS & portfolio Ministry) b) A newly approved (September, 2018) Science Division within the portfolio Ministry. c) The implementation of the new ICT Authority.	a) Outdated/inflexible policy and regulatory framework does not engender adaptability to changing economic, social and environmental conditions. b) No established mechanisms for the evaluation of development impact of new technologies. c) Utilizing procurement in a restrictive way.	a) A new and updated policy will facilitate a responsive policy and regulatory environment which promotes multi-sectoral integration for sustainable national development. b) Use labour market information to design and adapt curricula at all educational levels.	a) Outdated, limited or absent legislation/ regulations, and this limits innovation. b) Shifts in global economic policy and power. c) Rapid changes in technology and global standards related to ST&I.

[17] The World Bank in Jamaica: Overview. https://www.worldbank.org/en/country/jamaica/overview

Global Trends and Emerging Issues in the ST&I Landscape

Creation, distribution and exploitation of knowledge lead to competitive advantage, wealth creation and high quality of life [18]. Intellectual capital and its interaction with physical and human capital are at the centre of the modern economy. With rapid developments in information and communication technology (ICT), knowledge capital flows are now international. The internationalisation of innovation has led to many revolutions in new and emerging fields of S&T. National, regional and global policies must embrace these swells in knowledge to address profound challenges such as climate change, infectious diseases, energy and food security. Public policy must also leverage knowledge to increase productivity and create new economies based on S&T such as ICT, mining, nanoscience and space exploration.

MEGATRENDS

Slow but significant changes in the social, economic, political, environmental and technological landscape have immense potential to create an uncertain, unpredictable and highly disruptive future. Megatrends such as demographic and social changes, rapid urbanisation, shifts in global economic power, scarcity of natural resources, energy security, climate change, technological breakthroughs, and globalisation have the potential to create a profound and lasting impact on human activity. Therefore, these changes are likely to create new markets and labour demands. As such, the development of ST&I policies and strategies as a response to changing environments and solutions will have to be suited to mitigate loss and improve resource use efficiency.

DISRUPTIVE TECHNOLOGIES

The Fourth Industrial Revolution is characterized by a fusion of technologies within the physical, digital, and biological spheres. Marked by emerging technology breakthroughs, the fourth wave of the industrial revolution will see the heavy implementation of several emerging technologies creating new or disruptive markets.

As such, the rapid development of technologies across the globe requires that national policies forecast not only beneficial innovations but disruptive ones as well. Robotics, drone technology, the internet of things, big data, bioengineering, artificial intelligence and space exploration are examples of exponential technologies that will transform or disrupt people's lives. In response, many countries have developed foresighting polices that predict and analyse potentially disruptive R&D, and applications recognizing that some of these technologies create new or disrupt markets and value networks. Foresighting exercises or predictions will also open the dialogue on determining what strategic investments in transformative technologies are

[18] Organization for Economic Co-operation and Development 2000. Science, technology and innovation in the new economy. OECD Observer Policy Brief.

most likely to yield the highest returns, particularly within the industrial sectors.

TECHNOLOGICAL GAP

Globally, $1.948 trillion Purchasing Power Parity (PPP) was projected to be spent on R&D in 2016.[19] This accounted for 1.96% of the world's GDP. The United States spends approximately 2.8% of its GDP on R&D – the largest percentage in the western hemisphere. The Caribbean accounts for approximately 0.1% of the total global R&D expenditure (Figure 1)[20]. Notably, Trinidad and Tobago leads the region at 0.09%. Furthermore, since 2015 most members of the Caribbean Common Market (CARICOM) have continued to experience low economic growth rates[21].

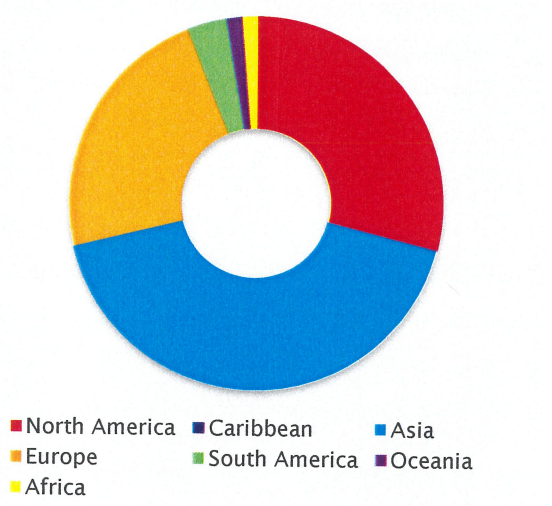

FIGURE 1 Total Share of Global R&D Expenditure on R&D ($1.948 Trillion Purchasing Power Parity).

Although there have been increasing investments in innovation, countries of the Global South that are on the lower end of the technological or innovation scale, are likely to fall behind in economic growth and development as the gaps continue to widen.

Therefore, developing countries must implement policies and strategies to facilitate greater investments in R&D and ST&I activities as they strive towards reduced insecurity and dependence, social resilience, wealth creation and a competitive advantage in a globalised world.

PUBLIC VS. PRIVATE RESEARCH AND DEVELOPMENT

R&D investments in many developed and emerging economies have been weakening in recent times. Policy makers have to strategically distribute capital in the areas where there is the greatest potential for high returns. Policy trends demonstrate greater focus on financing business innovation and entrepreneurship specifically among Small and Medium Enterprises (SMEs) and start-ups. In addition, greater policy attention has been given to supporting technology transfer, specifically internationalization of innovation, thereby giving SME's access to global knowledge networks and commercialisation beyond national shores and into the international market place.

A growing share of public investment in R&D has been allocated to the business sectors in an effort to increase business capacity to innovate. The rationalisation of public sector research has improved ties between public and private research to encourage inter-disciplinary research. Industry is playing a bigger role in resourcing public research, through public-private partnerships, in an effort to share risk, resources and orientation.

[19] IRI (2016). 2016 Global R&D Funding Forecast. Industrial Research Institute

[20] UNESCO (2015). UNESCO State of Science Report: Toward 2030. UNESCO Publishing, Paris

[21] UNESCO (2021). UNESCO Science Report: The Race Against Time for Smarter Development. S. Schneegans, T. Straza and J. Lewis (eds). UNESCO Publishing: Paris.

The Policy recognises that ST&I underpin the growth of all sectors and reaffirms its application across all areas of society. To advance the ST&I vision, a mapping exercise will be conducted as a key step in gathering information to verify the priority areas. The Policy will seek to give priority to key areas by implementing strategies, coordinating collaborative engagement across various sectors and entities, to facilitate the integration and alignment of ST&I within the broad development agenda.

The following priority areas will be addressed in the short to medium term:

1. **Agriculture** - To promote the implementation of the best science and technology input, research-based initiatives in solving complex challenges and to secure support for the adoption and adaption of modern cutting edge technologies including but not limited to biotechnology and agricultural science techniques, in soil, crop and animal cultivation, harvesting, training, production, pest control, processing of agricultural products, responses to climate change, promoting value-chain and food system innovation, and drought mitigation and adaptation efforts towards enhancing the country's food security and self-reliance.

2. **Health Management** – to support existing strategies promoting innovative responses to challenges within the sector, reducing the prevalence and prevention of Non-Communicable Diseases in the Jamaican population, addressing the disparities in the healthcare sector, foster key stakeholders partnerships to assist the development of mechanisms that promote knowledge sharing, technical advice and support in national emergency and non-emergency situations, strengthen the establishment of the national nutraceutical industry to support public health and safety, and promote the use of natural resources for social and economic benefits.

3. **Environmental Resource and Conservation** – Environmental sustainability seeks to enhance human well-being through the management of natural resources, i.e. soil, water, minerals, etc. In contributing to the national outcome for the sustainable management and use of environmental and natural resources the Policy will give priority focus to programmes and initiatives that promote improved professional practices, environmental, awareness and evidence-based solutions towards managing natural resources and most sustainable use alongside the handling and management of waste generated. The policy will lend support to the adoption of best practices and mechanisms

towards waste management and disposal, inclusive of hazardous waste.

4. **Education and Training** – This policy will contribute to Jamaica's vision of developing an education and training system that produces well-rounded, qualified, creative and productive individuals with relevant science, technology, engineering, and mathematics (STEM) skills, competences and fluency from early childhood to the tertiary level. The framework will support the efforts of relevant authorities in the design and implementation of holistic approaches to STEM education, diverse programmes, promoting authentic hands-on experiences and real-life situations that ignites a passion for STEM.

5. **Crime, Justice and Public Safety** –It is important for the criminal justice system to take advantage of state-of-the-art technologies, surveillance systems, social and scientific research in changing the course of crime (including cybersecurity) in Jamaica and restoring public safety. The framework will take advantage of research strategies, science and technology advice on best practices, innovative approaches, the use of new or emerging technologies and the development of effective infrastructure and training for the prevention and fight against crime in all its forms.

6. **Funding** - Mapping the ST&I system will enable the identification of gaps across the priority sectors and allows for challenges to the successful implementation of scientific and technical solutions and inputs to be addressed. This will facilitate a thorough review of the current institutional arrangements, regulatory guidelines, policies and financial resources available, necessary for developing financing strategies. For instance, establishing a grant fund in tertiary institutions allows potential innovators, scientists and entrepreneurs, at the tertiary level and equivalent institutions, to vie for funds through a competitive process.

7. **Tourism –** With the environment and human resources as the backbone of the industry, maintenance and conservation is crucial to development. Fostering innovation and applying science and technology will improve: (a) the country's use of natural and indigenous resources resulting in increased value-added products and services, (b) improve tourist safety and security and contribute to the overall sustainability of the sector. As such, focus will be placed on eco-efficiency, environmental protection, leveraging of creativity in communities, science-based tourism, etc.

8. **Disaster and Risk Management** – to establish the systematic management of administrative decisions, operational skills and abilities to implement policies, strategies and coping capacities of the society to engender the flexibility of the national machinery to plan, anticipate, and respond to disasters, and potential risks through the use of mitigating techniques such as foresighting, national security protocols.

Strategies

These priority areas will be addressed through the following strategies:

I. Develop mechanisms and tools to ensure that ST&I are mainstreamed into all developmental planning processes and governance structures.
II. Integrate S&T to ensure efficient and impactful delivery of public goods such as education, health care, waste disposal and security.
III. Repair, refurbish, re-equip and rationalise existing laboratory facilities ensuring efficient, effective, collaborative and coordinated use across sectors.
IV. Develop national standards/codes of operation for all national/training infrastructure to ensure facilities are safe and conducive for learning and innovation.
V. Encourage private sector involvement in the development of ST&I infrastructure through Public-Private-Partnerships (PPPs).
VI. Develop policy for STEM education, to include curriculum development and delivery, and teacher capacity.
VII. Integrate innovation and new science development as key strategic features of every industry (e.g. Tourism, Health, etc.), in an effort to promote growth and sustainable wealth, as well as to mitigate any emerging issues.

LEGISLATIVE FRAMEWORK

Due to the cross-cutting nature of ST&I, the Policy is governed by several pieces of legislation, as outlined in Table 3 below:

TABLE 3 Legislation governing Science, Technology and Innovation in Jamaica

ACT	OPERATIONAL DATE
Copyright Act	1993
National Commission on Science and Technology Act	2007
Patents and Designs Act	2020
Protection of Geographical Indications Act	2018
Scientific Research Council Act	1960
Standards Act	2002
Trade Marks Act	2001

Other legislation related to the Policy are listed in **Appendix 3**.

LINKAGES WITH OTHER POLICIES

Vision 2030 Jamaica: National Development Plan

The National Development Plan (NDP) identifies ST&I as a cross-cutting enabler of development. The proposed role of ST&I is articulated in National Outcome 11: A Technology-Enabled Society and two (2) national strategies:

1. Integrate science and technology into all areas of development.
2. Establish a dynamic and responsive National Innovation System.

From the NDP, a ST&I Sector Plan was developed with the following goals and objectives:

1. A Scientific culture entrenched into all aspects of national life.
   - 1.1. Jamaica is a major generator and user of ST&I knowledge.
   - 1.2. National capability for the development of indigenous ST&I knowledge, intellectual property and business, elevated and strengthened.
   - 1.3. Popularise a ST&I culture as a viable agent of social and economic transformation.

2. Excellent and distinctive R&D capability and a reputation for innovation
   - 2.1. Dynamic, responsive National Innovation System exists.

2.2. A world-class dynamic enabling environment for persistent R&D and innovation in line with national development goals developed.

2.3. The national productive capacity and competitiveness, through efficient application of innovation improved.

2.4. Regional centre of excellence in ST&I.

2.5. Foster creativity.

3. A Knowledge-Based Society

3.1. Networks developed and facilitated for knowledge exchange both locally and internationally.

4. Jamaica repositions itself to take advantage of ST&I in all aspects of development

4.1. Existing knowledge, both local and international, for socio-economic advancement adopted and adapted, Public-Private Partnerships and commercialization of technologies.

Regional and International ST&I Linkages

This Policy and Jamaica's Vision 2030, are consistent with the CARICOM Strategic Plan (2015-2019), which highlights ST&I as a cross-cutting enabler to be infused and mainstreamed in every aspect of planning and implementation to drive the region's development process. The CARICOM Strategic Plan also calls for a policy and legislative framework under which R&D agendas will be set, resources allocated and functional intra-regional cooperation undertaken.

The Policy is also consistent with the strategies for achieving the Global Goals for Sustainable Development Agenda 2030 (SDGs), in which ST&I was placed in a cross-cutting role with governments being called upon to invest in ST&I: (i) infrastructure; (ii) education; (iii) entrepreneurship activities; (iv) small and medium-sized business; (v) effective advisory capacity for governments and the private sector (especially by Academies of Science); (vi) governance mechanisms; and (vii) transformation in universities to establish new links to industry and government businesses and services so as to enable knowledge creators to effectively support innovation.

The United Nations (UN) member-states made a commitment to launch a Technology Facilitation Mechanism (Article 70), which is a multi-stakeholder collaboration among member states, civil society, the private sector, the scientific community, UN entities (represented by a UN inter-agency Task Force), and others. These regional and international initiatives will be important links to Jamaica's innovation system.

OTHER POLICIES

Considering the cross cutting nature of science, technology and innovation, the effect of the ST&I Policy will be evident throughout Jamaica's National Policy Programme.

Table 4 Linkages of the ST&I Policy with existing National Policies

MINISTRY	POLICY
AGRICULTURE AND FISHERIES	National Plant Health Policy
	National Seed Policy
CULTURE, GENDER, ENTERTAINMENT AND SPORT	The National Culture Policy (being revised and renamed to the National Policy on Culture and Creative Economy)
	National Sports Policy
	National Policy on Gender Equity
ECONOMIC GROWTH AND JOB CREATION	Jamaica Water Sector Policy
	National Biodiversity Strategy and Action Plan on Biological Diversity in Jamaica
	Policy for Jamaica's System of Protected Areas
	National Forestry Policy
	National Land Policy
	National Population Policy
	Encouragement of Export Industries
	Special Economic Zones Policy
	Construction Policy
	Forestry Policy
	Orchid Policy
	Climate Change Policy
	The Culture and Creative Industries Policy
	National Policy and Strategy on Environmental Management Systems
	National Policy and Strategy for the Environmentally Sound Management of Hazardous Wastes
	Emissions Policy (draft)
EDUCATION AND YOUTH	Education: The Way Upward
	National Policy for HIV/ AIDS Management in Schools
	Competence – Based Transition Policy
	The Task Force Report on Education Reform
	The National Youth Policy
	National Policy on Children
	Data Collection and Information Sharing Policy (draft)
FINANCE AND THE PUBLIC SERVCE	Government of Jamaica Public Sector Procurement Policy

	National Population Policy
FOREIGN AFFAIRS & FOREIGN TRADE	Ocean and Coastal Zone Management Policy
	National Foreign Trade Policy and Action Plan
	National Diaspora Policy (draft)
HEALTH & WELLNESS	National Health Policy
	National Healthy Lifestyle Policy
	Drugs for the Elderly
	National HIV/AIDS Policy
	Mental Health Reform
INDUSTRY, INVESTMENT & COMMERCE,	National Quality Policy
	National Investment Policy (draft)
	Food Safety and Implementation Plan
	National Food and Nutrition Security Policy and Action Plan
	MSME & Entrepreneurship Policy
	Intellectual Property Strategy (draft)
LABOUR AND SOCIAL SECURITY	National Policy for Persons with Disabilities
	National Policy for Productivity Improvement
	National Policy for Senior Citizens (draft)
LOCAL GOVERNMENT AND RURAL DEVELOPMENT	Integrated Solid Waste Management Policy
NATIONAL SECURITY	National Security Policy
JUSTICE	Jamaica Justice System Reform Policy Agenda Framework
SCIENCE, ENERGY AND TECHNOLOGY	Information and Communications Technology Policy
	Information and Communications Technology Authority Act, 2019
	National Energy Policy
	National Science and Technology Policy (1990) (currently being revised and renamed to the Science, Technology and Innovation Policy)
TRANSPORT AND MINING	National Transport Policy
	National Road Safety Policy
	National Minerals Policy (draft)
TOURISM	National Community Tourism Policy and Strategy
OFFICE OF THE CABINET	Public Sector Modernization Vision and Strategy Paper
	Strategic Environmental Assessment Policy

DEFINING THE POLICY FRAMEWORK

VISION

A dynamic ST&I culture, unleashing the creative potential of our people, catalysing economic development and sustainable prosperity, contributing to social transformation, empowering Jamaicans to excel in an evolving world.

GUIDING PRINCIPLES

The principles guiding the implementation of this Policy are:

(i) **TRANSPARENCY**: The sector will have a transparent system of setting targets, accountability, measuring and benchmarking its achievement against international norms and standards.

(ii) **SHARED APPRECIATION & EFFICIENCY**: There is shared appreciation of the role of ST&I in transforming the nature of societies world-wide from factor-driven, through efficiency to innovation economies. This will need to be accompanied by a realization of the possibility of Jamaica 'leap-frogging' from the current factor-driven economy to innovation through relentless implementation of this Policy.

(iii) **PARTNERSHIP**: While the ST&I players are diverse in their missions, strategic plans, nature of business, affiliations, size, resources and challenges, it is believed that they will find a common thread linking their shared struggle to succeed through the benefits of Jamaica's robust system of innovation.

(iv) **EQUITY**: The Policy will promote fair and just management of all persons including women, the elderly, youth, children and persons with disabilities, institutions and sectors served or impacted by ST&I ensuring access and inclusion.

(v) **PARTICIPATORY**: The approaches herein are based on collaborative and collective decision making processes and reflect the broad range of interests, industries, perspectives and values of those directly and indirectly affected by the Policy; with consideration for rural and other traditionally underserved groups/communities.

(vi) **SOCIAL COHESION**: ST&I will be embedded in the way of life and culture of the Jamaican people. It should be used to promote well-being, meet the social needs and sustain the development of the society.

(vii) **SUSTAINABILITY**: The strategic planning and implementation process must yield self-reliant and sustainable economic, social and environmental sectors.

(viii) **EVIDENCE-BASED**: The development and implementation of the policy and its evaluation must be based on research findings, robust data, analytics and expert input.

GOAL 1: A Dynamic and Responsive National System of Innovation: Jamaica has a well-established system of innovation which yields competitive world-class science and technology achievements that will advance national development.

Jamaica will have a robust integrative approach to generate, store, transfer and apply knowledge and technologies that will promote growth and competitiveness. Jamaica's innovation system must continuously enhance service delivery; production processes; be responsive and adaptable to change (e.g. climate change); contribute to governance, economic, social and environmental development. There will be continuous interaction among knowledge creators (universities, government, research organizations, creative firms, etc.) and knowledge users (industry, policy makers, markets, personal end consumers). These partnerships will ultimately result in enhanced quality research, spurring synergies and complementarities towards influencing more actors in the ST&I arena.

KEY ISSUES ADDRESSED

- Limited facilities and fora to encourage broad-based or multi-sectoral dialogue and synergies.
- Disconnect between public and academic research agenda (knowledge creation) and industry and policy demands (knowledge use).
- Absence of responsive innovation policies and legislation.
- Absence of baseline data to measure innovation outputs against R&D inputs.
- Limited activity or access to technology transfer and innovation financing/investment schemes.

KEY PLAYERS

- Ministry of Science, Energy and Technology
- National Commission on Science and Technology
- Planning Institute of Jamaica
- Ministry of Education and Youth
- eGov Jamaica Limited/ ICT Authority
- Jamaica Intellectual Property Office
- Research Enterprises (Universities, Public and Private R&D institutions)
- Local Authorities

- Bureau of Standards Jamaica
- Academic and R&D Institutions

OBJECTIVE

1.1. To establish a system of innovation for Jamaica.

STRATEGIES

1.1.1. Map Jamaica's ST&I system to identify the key economic, socio-political, institutional and organizational components and their relationships.

1.1.2. Develop a strategic action plan for the Jamaica System of Innovation (JSI).

1.1.3. Develop methods for measuring, assessing impact and benchmarking of JSI against the Global Innovation Index (GII).

1.1.4. Conduct a Risk Management assessment for the ST&I Policy within the national and global landscape, to ensure measures related to fore-sighting, national security protocols, etc. may be employed.

OBJECTIVE

1.2. To promote collaboration among all the key components of the national innovation system.

STRATEGIES

1.2.1. Develop a governance framework for the innovation ecosystem, built on the results of the mapping exercise, to establish the relationships and interactions among entities.

1.2.2. Develop a national institutional and regulatory framework to promote commercialisation and legislative use of local R&D results, technologies and innovation that can gain market access nationally and internationally.

1.2.3. Prioritise and incentivise multi-sectoral, joint industry and interdisciplinary networking activities, programmes and facilities.

1.2.4. Promote regional and international research and technological cooperation in areas of interest to Jamaica with special focus on South-South Cooperation.

1.2.5. Create robust knowledge transfer and technology diffusion facilities, systems, regulatory framework and funding instruments to encourage the transfer of research and technologies from local universities and public research organizations to strengthen and develop business innovation.

1.2.6. Promote stronger partnerships and collaboration with local authorities and agencies working within (rural, underserved) communities [e.g. Community Development Committees, Social Development Commission, non-governmental organisation (NGOs)] in an effort to facilitate linkages with community members /"regular man".

1.2.7. Develop the national regulatory framework for sharing intellectual property across players ensuring that key players receive fair and equitable benefits from research and innovation outputs.

1.2.8. Facilitate personnel mobility to ensure that tacit knowledge flows throughout the innovation system.

1.2.9. Improve ICT networks and associated facilities particularly those linked to economic activities.

1.2.10. Promote electronic networking for knowledge transfer, information sharing and collaboration.

1.2.11. MSET/NCST to play a coordinating role in promoting the adoption of the Quadruple Helix Model of innovation with the inclusion of innovations from the general public, recognizing the value of innovation as a tool for national development.

GOAL 2: A Culture of Innovation: Jamaicans in all private, public and productive spheres value the role of science, technology and innovation in expanding the base of wealth creation and improving the overall quality of life for all.

Under this goal, all Jamaicans at the personal, public, private and political levels will understand the role of science and technology in our pursuits for prosperity. This enhanced awareness will shift behaviours and attitudes toward inquiry, discovery, risk and new knowledge to foster a culture of creativity, entrepreneurship and innovation and increased interest in S&T careers. Entrenching a scientific culture across all sectors will require capacity building, research, outreach and advocacy. These strategies will advance economic growth through the widespread creation and deployment of ST&I capacity.

KEY ISSUES ADDRESSED

- Limited appreciation for the role or importance of research and innovation at all levels of society.
- Low or inadequate investments in ST&I on projects, programmes and initiatives.
- Barriers for accessing finance to implement research and engage in new and emerging ventures.
- Society is largely a consumer of technologies from other countries.
- Low entrepreneurship and innovation.
- Popularization of ST&I.

KEY PLAYERS

- Ministry of Science, Energy and Technology
- Ministry of Culture, Gender, Entertainment and Sport
- Ministry of Education and Youth
- Ministry of Finance and the Public Service
- Ministry of Economic Growth and Job Creation
- Ministry of Industry, Investment and Commerce.
- Ministry of Agriculture and Fisheries
- Ministry of Foreign Affairs and Foreign Trade
- Ministry of Labour and Social Security
- Ministry of Culture, Gender, Entertainment and Sport
- Planning Institute of Jamaica
- National Commission on Science and Technology
- Scientific Research Council

- Private Sector Umbrella Organizations (e.g. Jamaica Manufacturers and Exporters Association, Private Sector Organization of Jamaica)
- Media/ Media Houses
- Academic and Research and Development Institutions
- Universities
- Small Businesses
- Jamaica Information Service
- Bureau of Standards Jamaica
- Jamaica Intellectual Property Office
- Local Authorities
- The Diaspora
- Institute of Jamaica

OBJECTIVE

2.1 To raise awareness of the benefits of ST&I to national development in order to fully engage and empower people, communities and sectors in public and private spheres.

STRATEGIES

2.1.1 Promote the awareness and understanding of ST&I (including traditional knowledge systems) and its relevance in its broadest sense, through the development and implementation of an ST&I popularisation/communication strategy.

2.1.2 Establish, formalise and/or strengthen networks that popularise ST&I via different forms of capital especially human, cultural, knowledge and institutional.

2.1.3 Develop the national capacity and expertise in S&T communication.

OBJECTIVE

2.2 To increase knowledge, technology outputs and innovative potential within industry to expand production, enhance productivity and service quality, firm profitability, international competitiveness, and sustainability.

STRATEGIES

2.2.1 Develop programmes geared towards augmenting the human capacity of the Jamaican citizenry in relation to the exploitation of science, technology and

innovation, in an effort to set the foundation for a technology-enabled society.

2.2.2 Promote R&D and innovation in industry by developing financing mechanisms to facilitate R&D activities. Major instruments should include loans, grants, subsidies, business angels, venture capital, crowd funding and tax incentives.

2.2.3 Publicly recognize achievements in innovative application of ST&I industry.

2.2.4 Promote business incubation and formation of ST&I-based start-ups and SME's.

2.2.5 Increase local share of earnings from ST&I-demanding consultancies from 30% to 60% by 2029.

2.2.6 Develop and implement professional programmes and incentives geared at enhancing capacity, mobility and preferential selection of R&D personnel in the private sector.

2.2.7 Strengthen and establish academia-industry partnerships to mainstream trained graduates into technical areas within the public and private sectors.

2.2.8 Promote innovators and scientists' awareness of the importance of protecting their IP Rights.

2.2.9 Promote linkages with the Diaspora in an effort to facilitate/strengthen participation in knowledge-sharing, investment and financing of research and development in ST&I locally and overseas.

2.2.10 Develop a network database where knowledge spanning the Diaspora can be created, stored and accessed through membership.

2.2.11 Promote access to innovation within the disabled community through: mentoring, twinning/pairing schemes, competition, sponsorship, industry/ government institutions aid, and inclusive strategies (including online workshops).

OBJECTIVE

2.3 To improve the local quality infrastructure in support of Jamaica's innovation system, technology transfer and enhancing Jamaica's competitiveness.

STRATEGIES

2.3.1 Promote opportunities for building cooperation and capacity among public, private, civil and academic stakeholders for the development of innovation, the ability to absorb foreign technologies and access to services for testing and standardization of local innovation at affordable or non-prohibitive costs.

2.3.2 Facilitate the creation of bottom up development of the national innovation system through a promotion of quality-driven innovation processes across priority sectors.

2.3.3 Promote research focused on system dynamics and leverage points to support the local innovation system and determine the best mechanisms for promoting innovation and the integration of support provided by the existing quality infrastructure.

GOAL 3: A Development Agenda Advanced by ST&I: Jamaica achieves its development agenda by integrating science, technology and innovation to enhance its economic, social and environmental goals.

To advance the ST&I vision, the strategies to be implemented under this goal, will facilitate the integration and alignment of ST&I within the broad development agenda, by ensuring that it is integrated into public policy, culture, education and other developmental arenas. Science and technology will be used to solve Jamaica's biggest developmental challenges such as environmental degradation, safety and security, and natural disaster risk. New knowledge and technologies will fully exploit opportunities, especially in areas of comparative and competitive advantage such as music, energy, sport, tourism and the bio-economy. Jamaica will also be able to forecast disruptive and transformative technologies and orient policy to minimize risk to Jamaica's development agenda.

KEY ISSUES ADDRESSED

- Chasm between national development and ST&I.
- Factor driven economy, largely dependent on the lower form of capital.
- Inefficient integration of ST&I in sector-based policy and planning framework.
- Safety, security, mitigating natural or manmade disaster risks.

KEY PLAYERS

- Ministry of Science, Energy and Technology
- Ministry of Finance and the Public Service
- Ministry of Economic Growth and Job Creation
- Ministry of National Security
- Ministry of Culture, Gender, Entertainment and Sport
- Ministry of Tourism
- Ministry of Education and Youth
- Ministry of Health and Wellness
- Ministry of Local Government and Community Development
- Ministry of Industry, Investment and Commerce
- Ministry of Agriculture and Fisheries
- National Commission on Science and Technology
- The Institute of Forensic Science and Legal Medicine
- Planning Institute of Jamaica
- Bureau of Standards
- Office of the Cabinet

- Local Authorities
- Academic and Research and Development Institutions

OBJECTIVE

3.1 To optimise the use of ST&I in key economic, social and environmental priority areas.

STRATEGIES

3.1.1. Develop mechanisms and tools to ensure that science, technology and innovation are mainstreamed into all developmental planning processes and governance structures, including emergency preparedness and disaster management response.

3.1.2. Forecast new and emerging technologies, paying particular attention to those which promote 'leap-frogging' into the innovation economy.

3.1.3. Promote capacity development in the Office of the Prime Minister through the inclusion of science intelligence from a network of science advisors, to provide guidance for decision making.

3.1.4. Strengthen and promote efforts in research and development work focusing on engaging ST&I to explore solutions to local problems.

3.1.5. Promote and incentivise the application of science and transformative technologies that develop innovative uses and add value to national resources and capital.

3.1.6. Integrate ST&I to ensure efficient and impactful delivery of public goods such as education, health care, energy access, waste disposal and security.

3.1.7. Establish subcommittees as required to examine, report and address the policy recommendations for sectoral priorities.

OBJECTIVE

3.2 To position the national science, technology and innovation system to respond future crises, through emergency preparedness, and disaster management and response.

STRATEGIES

3.2.1 Develop a database of resources and expertise, through capacity building.

3.2.2 Integrate the database information as a foundation for creating the necessary response teams, actions, etc.

3.2.3 Develop capacity for foresighting technology (tools) to aid in decision making; to manage safety and security and mitigate natural or manmade disaster risks.

3.2.4 Encourage innovators to integrate risk reduction and resilience planning for continuity and recognition of risks posed by natural disasters and threats.

GOAL 4: An Excellent Research and Development Capability: Jamaica has an excellent world-class and distinctive R&D capability and a reputation for innovation.

Jamaica will have a framework to ensure valid investments by government and industry in ST&I. These strategic activities will result in an increased percentage of GDP being allocated to research and development. The aim, by 2029, is to achieve 1.5% of GDP. As a result, Jamaica will have modern world-class infrastructure to support frontier scientific work and training. Increased investments in human capital will ensure that there is a critical mass of competent scientists, technicians, engineers and STEM educators. Jamaica will become a world leader in providing knowledge and strategic innovations for Jamaica and beyond.

KEY ISSUES ADDRESSED

- Low R&D expenditure relative to GDP (GERD).
- Absence of systematic collection of ST&I data.
- Under-resourced and under-performing government laboratories.
- Shortage in key ST&I personnel.
- Low innovation outputs.

KEY PLAYERS

- Ministry of Science, Energy and Technology
- Ministry of Finance and the Public Service
- Ministry of Industry, Investment and Commerce
- Ministry of Agriculture and Fisheries
- Ministry of Education and Youth
- Ministry of Labour and Social Security
- Ministry of Economic Growth and Job Creation
- National Commission on Science and Technology
- Statistical Institute of Jamaica
- Academic and Research and Development Institutions
- Universities
- Private Sector Umbrella Organizations
- Urban Development Corporation
- Private Sector Enterprises
- Planning Institute of Jamaica
- Development Bank of Jamaica
- Local Authorities
- Institute of Jamaica

OBJECTIVE

4.1 To create sustainable mechanisms for financial support of R&D programmes targeting a GERD of at least 1.5% by 2029.

STRATEGIES

4.1.1 Develop a framework to guide and prioritize investments in ST&I projects and initiatives with transformative potential.

4.1.2 Establish a mechanism to quantify financial allocations to ST&I and the returns on R&D investments in high impact and mission-directed R&D and local technology (e.g. National Research Fund).

4.1.3 Promote the use of existing legal and regulatory frameworks (such as SIPP Act) that support the use of IP as collateral.

4.1.4 Review incentive schemes to facilitate public sector bodies benefitting from commercialization of their R&D findings.

4.1.5 Strengthen and leverage existing public sector funding schemes to support related ST&I initiatives.

4.1.6 Collaborate with the ministry with responsibility for Finance in the development of formal mechanisms for GoJ MDA's to report on R&D expenditure; this expenditure to be incorporated in the GoJ's national accounting system (expenditure on R&D apart of the classification in the GoJ Charter of Accounts).

OBJECTIVE

4.2 To strengthen and establish state of the art ST&I infrastructure (laboratories, libraries, museums, electronic platforms, etc.).

STRATEGIES

4.2.1 Conduct regular audits on national ST&I infrastructure, particularly those funded through public schemes.

4.2.2 Advocate for an entity responsible for standardization, licencing and accreditation across the scientific and technological professions.

4.2.3 Repair, refurbish, re-equip and rationalise existing laboratory facilities ensuring efficient, effective, collaborative and coordinated use across sectors.

4.2.4 Mandate, develop and implement a National Quality Infrastructure for certification and accreditation of services to increase competitiveness, market access and investor/consumer confidence.

4.2.5 Develop national standards/codes of operation for all training infrastructure to ensure facilities are safe and conducive to learning and innovation.

4.2.6 Encourage private sector involvement in the development of ST&I infrastructure through public-private-partnerships (PPPs).

4.2.7 Construct science/knowledge parks, centres of excellence, science museums and knowledge/technology transfer units.

OBJECTIVE

4.3 To increase and improve the human resource capital for ST&I, increasing representation of women and persons with disabilities.

STRATEGIES

4.3.1 Conduct comprehensive training needs assessment against medium to long-term market needs.

4.3.2 Undertake human resource capacity building to levels required to conduct competitive research and innovation activities.

4.3.3 Restructuring the organisational design of public ST&I entities to further coherence and efficiency.

4.3.4 Develop policy for STEM education starting at early childhood level, to include curricula development and delivery, and teacher capacity.

4.3.5 Align STEM curricula with medium to long-term key ST&I priority areas as identified by foresighting processes.

4.3.6 Encourage inquiry-based learning at all educational levels.

4.3.7 Encourage talented and competent ST&I subject teachers to remain active in Jamaica's education environment.

4.3.8 Develop special support mechanisms and facilities to identify gifted students and direct them towards ST&I disciplines.

4.3.9 Ensure ready access to local or overseas R&D facilities by key ST&I personnel.

4.3.10 Create and systematise a robust ST&I system to access incentives, volunteering, mentorship, internship, exchange and access programmes.

4.3.11 Create critical mass of ST&I graduates in relevant fields.

4.3.12 Conduct comprehensive assessment of gender disparity in various sectors and educational institutions, and implement appropriate monitoring and evaluation programmes to aid in addressing any existing gaps or gender barriers.

4.3.13 Encourage more women/girls in traditionally male-dominated fields and vice versa as well as retooling the elderly for a digital society.

GOAL 5: An Enabling ST&I Policy Environment: Jamaica has a dynamic policy, legislative and institutional framework that capitalises on ST&I for all aspects of national development.

The achievement of this goal, will ensure that there is a robust and responsive policy and regulatory environment that enables all key players in the complex innovation system. Competent oversight bodies will foster cohesion within the multi-sectoral ST&I machinery, enforce regulations to ensure high quality innovation outputs, and monitor progress of innovative sectors and develop balanced policy instruments.

KEY ISSUES ADDRESSED

- Limited cohesion or oversight of science policy.
- Inadequate capacity of ST&I Policy development, implementation and coordinating bodies.
- Non-responsive, outdated or lack of legal framework, especially in new and emerging fields of science.
- Limited over-arching protocols governing R&D and ST&I facilities.

KEY PLAYERS

- Ministry of Science, Energy and Technology
- Ministry of Justice
- Ministry of Economic Growth and Job Creation
- Ministry of Education and Youth
- Ministry of Finance and the Public Service
- Ministry of Industry, Investment and Commerce
- Ministry of Agriculture and Fisheries
- Ministry of Labour and Social Security
- Ministry of National Security
- Ministry of Culture, Gender, Entertainment and Sport
- National Commission on Science and Technology
- Office of the Cabinet
- Office of the Parliamentary Counsel
- Attorney General's Chambers
- Legal Reform Department
- Jamaica Intellectual Property Office
- Academic and Research and Development Institutions

OBJECTIVE

5.1 To ensure legislation and policies remain relevant and impactful.

STRATEGIES

5.1.1 Regularly assess, forecast and steer policy development to ensure full policy coherence and alignment with the National ST&I Policy. Policy development areas should include:

- Intellectual Property Rights
- Knowledge and Technology Transfer
- Gender Equity
- STEM Education
- Disruptive/Exponential Technology
- Indigenous Knowledge and Traditional Knowledge Systems
- Research Ethics
- National Quality Policy
- National Safety and Security
- Labour Force
- Energy/Environment/ Waste Management
- Bio-economy/Biotechnology
- Climate Change Adaptation and Mitigation
- Disaster Management (natural, manmade, pandemics/epidemics)

OBJECTIVE

5.2 To strengthen the National Commission on Science and Technology (NCST).

STRATEGIES

5.2.1 Re-scope NCST to the National Commission for Science, Technology and Innovation (NCSTI) to emphasize its key role in innovation.

5.2.2 Revise the NCST Act to entrench the new NCSTI, expanding its mandate to include ST&I-related policy formulation and review, advocacy, coordination, oversight, monitoring, capacity building and administration of funds to diversify Jamaica's base for wealth creation by 2029.

5.2.3 Create a structure for governance and management which enables the NCSTI to effectively undertake its coordinating functions.

5.2.4 Build capacity in NCSTI to function as the driving force for ST&I.

OBJECTIVE

5.3 To comprehensively monitor Jamaica's ST&I inputs, outputs, challenges and opportunities using globally accepted standards and against national policies and legislation.

STRATEGIES

5.3.1 Build capacity in NCSTI to collect and analyse scientometrics of the ST&I landscape.

5.3.2 Build capacity of stakeholders within the innovation system to collect and provide innovation input and performance data.

5.3.3 Establish baseline ST&I data mapping using the modern scientometric methods.

5.3.4 Produce and disseminate a detailed evaluative and critical annual report on the performance of ST&I and its institutions, adequacy and effectiveness of ST&I inputs and the quality and potential benefits of their outputs as well as their contribution or potential contribution to economic development.

5.3.5 Develop a performance evaluation mechanism on the following levels: individual, institutional, sub-national and national, benchmarked against internationally accepted standards.

5.3.6 Establish a network of focal points throughout the innovation system that will be responsible for providing information on sectoral performance and activities.

5.3.7 Conduct a stakeholder analysis, including women, the elderly, youth, children and persons with disabilities.

POLICY IMPLEMENTATION, MONITORING AND EVALUATION

INSTITUTIONAL FRAMEWORK

Among the most challenging tasks facing the Policy's implementation effort are coordination and coherence, which are vital for the success of this new Policy. The imperative of effective coordination and coherence is embedded in the cross sectoral (both public and private), inter-institutional, inter-ministerial and individually empowering ST&I policy's modus operandi.

ROLE OF THE MINISTRY WITH RESPONSIBILITY FOR SCIENCE AND TECHNOLOGY

The Ministry with the portfolio responsibility for Science and Technology will retain its development, oversight, support monitoring and review of all relevant policy framework.

OTHER KEY INSTITUTIONS

The other institutions that are critical to the successful implementation of the policy are:

- Bureau of Standards Jamaica
- Office of the Cabinet
- Institute of Jamaica
- Jamaica Intellectual Property Office
- Jamaica National Association for Accreditation
- Ministry of Agriculture and Fisheries
- Ministry of Economic Growth and Job Creation
- Ministry of Education and Youth
- Ministry of Finance and the Public Service
- Ministry of Industry, Investment and Commerce
- Office of the Prime Minister
- Planning Institute of Jamaica
- Private Sector Umbrella Organizations (including Jamaica Manufacturers and Exporters Association, Private Sector Organisation of Jamaica, Jamaica Chamber of Commerce, etc.)
- Scientific Research Council
- Statistical Institute of Jamaica
- Tax Administration of Jamaica

Strong relations between these entities will set the foundation for a national innovation ecosystem reliant on their work, technical and network capacity. For example, the Bureau of Standards Jamaica will be key in establishing minimum standards in the ST&I industry.

DISTRIBUTION OF ACTIVITIES THROUGH ST&I

The organizational chart (Figure 2) shows the distribution of activities throughout the ST&I landscape in Jamaica covering policy, innovation and services activities.

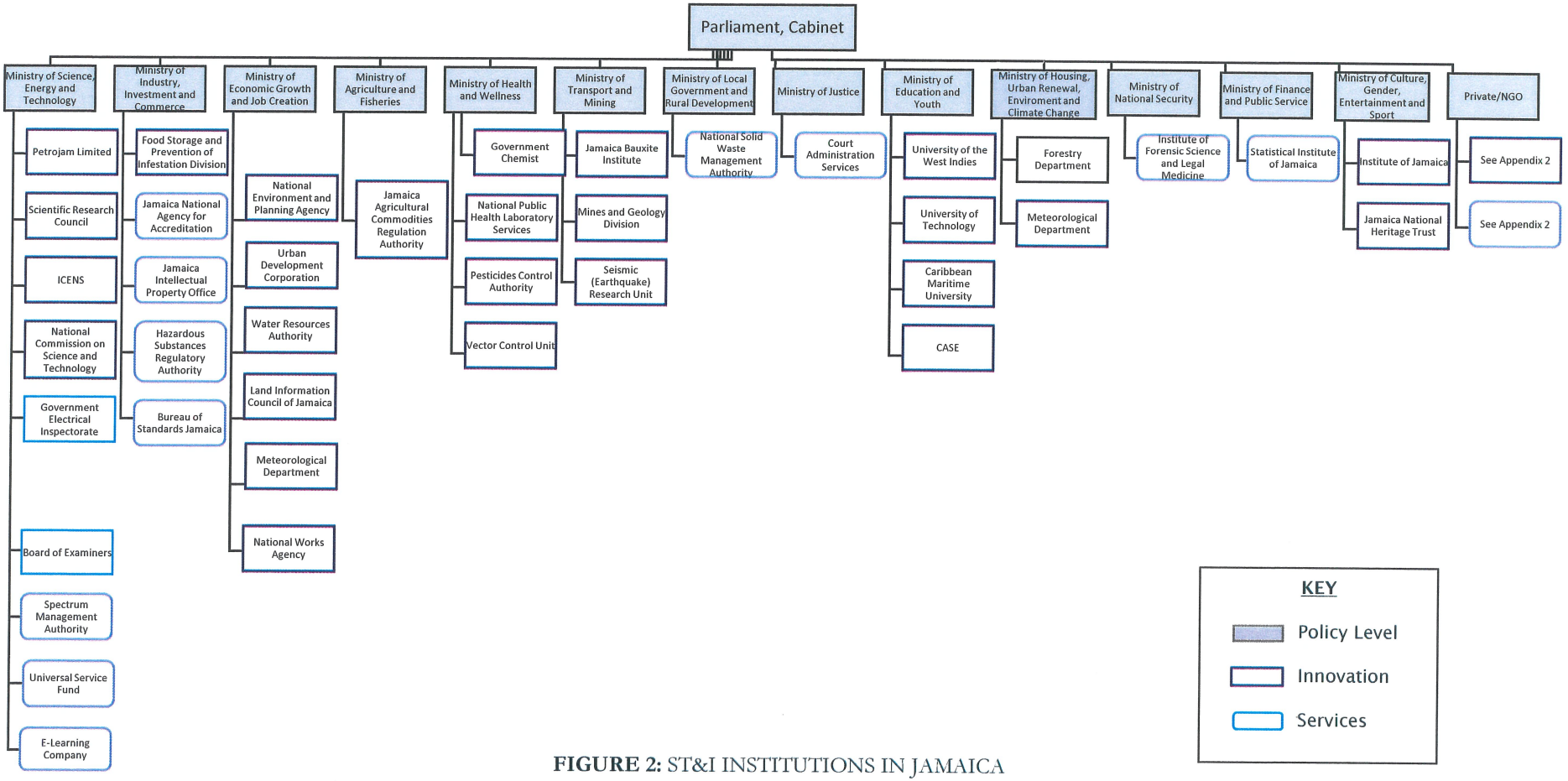

FIGURE 2: ST&I INSTITUTIONS IN JAMAICA

IMPLEMENTATION

The successful implementation of the National Science, Technology and Innovation Policy will be governed by the development of a National Implementation Plan (NIP). The NIP will detail specific programmes, activities, timelines, responsible entities and key performance indicators aligned with internationally accepted metrics.[22]

MDAs and academic entities will align their institutional work plans with the NIP, and the private sector will be encouraged to do the same. The sectors outlined below will have the following responsibilities in the policy implementation process:

GOVERNMENT

- To develop, promote and enforce enabling policy and legislative framework.
- Establish a dedicated National Research Fund (NRF) for ST&I and all areas prioritised for development.
- Incentivize R&D and innovation via grants, awards, tax schemes and other mechanisms.
- Develop ST&I capacities and research competency, particularly in prioritised economic sectors.
- Facilitate and incentivise technology and knowledge transfer, adaptation and diffusion through public-private partnerships.
- Foster STEM education throughout the formal educational systems.
- Upgrade ST&I infrastructure in public facilities.
- Develop a Communication strategy to popularise ST&I.
- Foster equitability of involvement, innovation and entrepreneurship within all gender groups.

ACADEMIA

- Knowledge creation/discovery.
- Align curricula to development needs and labour market requirements.
- Produce critical mass of trained ST&I professionals (including researchers).
- Screen research for commercial potential.
- Transfer technology through mechanisms such as incubators.
- Host and promote knowledge exchange fora.
- Provide high quality training for teachers of science.
- Provide advice for advancing industry/GoJ.

PRIVATE SECTOR

- Collaborate with knowledge centres to solve industry problems.

[22] The Global Innovation Index (GII), which details measures indicators of science, technology and innovation across 141 countries, including Jamaica will be used to align the indicators for the national policy.

- Utilise local services and indigenous technologies where available.
- Promote innovation at the organisational level.
- Provide Venture Capital and Public-Private Partnerships.
- Grow internship programmes to foster knowledge exchange, training and professional attachment programmes.

CIVIL SOCIETY

- Provide feedback, an important source of information for the government and private sector.
- Engage in advocacy and offer alternative policy considerations for government, private sector and other institutions.

KEY IMPLEMENTATION ACTIONS

The Ministry, with responsibility for Science and Technology, will continue to develop and drive ST&I-related policies and legislative programmes to support the ST&I Policy and align these activities with the National Development Plan. The new NCSTI will be the leading coordinating body to execute these activities along with collaborating with the other MDAs, academia, civil society and private sector to ensure the successful implementation of the Policy within/among the broad, multi-sectoral innovation system.

The ST&I Policy will be implemented over 10 years. The key Implementation Actions (below) details the activities for the first 3 years, with the first year budget costing approximately JMD $13,900,000.00.

Table 5: Commencement of Implementation Actions 2022-2024

ACTIONS	TIMEFRAME			KEY PLAYERS	Policy Goal	Indicators
	'22	'23	'24			
PRIORITY AREAS Agriculture, Health Management, Waste Management, Education and Training, Crime and Public Safety, Funding, Tourism						
Develop mechanisms and tools to ensure that ST&I are mainstreamed into all developmental planning processes and governance structures.	•			MSET, NCST. PIOJ, all MDAs	5	The number of mechanisms and tools being used to mainstream ST&I.
Integrate S&T to ensure efficient and impactful delivery of public goods such as education, health care, waste disposal and security.		•		MSET, NCST, All MDAs	5	% increase in efficiency and delivery of public goods after integration of S&T.
Repair, refurbish, re-equip and rationalise existing laboratory facilities ensuring efficient, effective, collaborative and coordinated use across sectors.		•		MSET, MOFPS, NCST, NFDST, MNS	1,4	% improvement in efficiency, effectiveness of existing laboratories, using the 2017 HALWAC Report as the baseline.
Develop national standards/codes of operation for all national/training infrastructure to ensure facilities are		•		MSET, NCST, MOEY, BSJ	4	The number of National Standards and Codes of Operation

safe and conducive to learning and innovation.						developed for all national/training infrastructure.
Encourage private sector involvement in the development of ST&I infrastructure through public-private-partnerships (PPPs).	•			MSET, NCST, DBJ, Private Sector Organizations	1,3,4	The number of public-private - partnerships (PPPs) involved in the development of ST&I infrastructure.
Develop policy for STEM education, to include curricula development and delivery and teacher capacity.		•		MSET, NCST, MOEY, AR&D	4	% completion of STEM Policy.
To encourage innovation through science and technology to improve the country's indigenous resources resulting in enhanced value-added products and services.	•			MSET, NCST, All MDAs, AR&D	3,4	Jamaica's Rank in the Global Innovation Index
PROMULGATION Widespread dissemination and adoption of the National Policy, particularly among stakeholders central to its successful implementation						
Develop a policy communication/marketing strategy and materials.	•			MSET, NCST	2	% completion of communication/marketing strategy. Number of Communication and marketing materials produced that are in line with the strategy.
Sensitization workshops with key stakeholders.	•			NCST	2	Number of stakeholder sensitization workshops held and reports produced (including list participants).
Capacity building with policy implementation bodies on adoption and alignment with institutional strategic plan.	•			MSET, NCST, PIOJ, AR&D	5	Number of capacity-building workshops/exercises held with implementation bodies.

Disseminate policy to implementation bodies within the innovation system.	•			MSET	5	Number of Policy Dissemination workshops/exercises held with implementation bodies.
LEGISLATIVE All acts and regulations and policies governing ST&I institutions.						
Conduct comprehensive legislative and regulatory review governing all agencies and institutions within the innovation system.		•		MSET, NCST	5	% completion of legislative and regulatory review.
Develop agenda to amend, establish and rationalise legislation required for successful implementation of the National ST&I Policy.		•		MSET, NCST, Office of the Cabinet, Parliament, Ministries with ST&I-related portfolios	5	% completion of Agenda.
Review of the National Commission on Science and Technology Act.	•			MSET, NCST, OPM	5	% completion of Review.
Obtain approval from Cabinet to issue drafting instructions to the Chief Parliamentary Counsel for the inclusion of innovation in the name and mandate of the NCST.	•			MSET, NCST, MOJ	5	% completion of name change for NCST.
Initiate process to amend and promulgate the NCSTI Act.		•		MSET, NCST, MOJ	5	% completion of the promulgation process.%
INSTITUTIONAL Business and operational arrangements to ensure successful policy implementation and coordination.						
Define the mandate, role, organizational structure, staffing requirements and protocols for the NCSTI.		•		MSET, NCST, MOFPS	1,5	% completion of the definition of the new NCSTI.
Identify and allocate the financial resources for the expansion of the NCSTI.		•		MSET, NCST, MOFPS, NFDST, Office of the Cabinet, Development Banks	1	% completion of the development of the Budget for the NCSTI.

Recruit/procure personnel and organizational resources.		•		MSET, NCST	1	The number of new personnel recruited. % completion of report on the resources available to the NCSTI.
Establish the NCSTI Council and Inter-ministerial Committee.		•		OPM, NCST	1,5	% completion of appointment of NCSTI Council and An Inter-Ministerial Committee.
Develop strategic partnership with underserved sectors- NGOs, Private Sector, etc.	•			MSET, NCST	1,3	Number of strategic partnerships developed with underserved sectors.
MAPPING Situational analysis of the national innovation system						
Assign multi-sectoral working group to lead data gathering and conduct a national mapping of the innovation system, including stakeholder analysis and mapping.	•			MSET, NCST, AR&D	1	The existence of Multi-sectorial Working Group for the mapping of the National Innovation System.
Conduct a full resource audit and gap analysis of the ST&I landscape to include polices, programmes, personnel, infrastructure and agendas.	•			NCST, PIOJ, AR&D , Private Sector Umbrella Organizations, All MDA's with ST&I-related portfolios	1	% completion of resource and audit gap analysis of ST&I landscape.
Establish an ST&I database and information sharing mechanisms for decision making processes.		•		NCST, MSET, eGOV	1	% completion of establishment of ST&I database and information sharing mechanisms.
Conduct a Risk Management assessment for the ST&I policy within the national and global landscape, to ensure measures related to fore-sighting, national security protocols, etc. may be employed.	•			MSET, NCST		% completion of a Risk Management assessment for the ST&I Policy within the global landscape.

PLANNING The development of the National Implementation Plan that will detail how the policy will be actioned and implemented by all stakeholders.						
Assign consultant or working group to lead the comprehensive stakeholder consultations.	•			MSET, NCST	1,2	% execution of Consultant Contract. Number of Reports on Stakeholder Consultations.
Develop a comprehensive National Implementation Plan for the ST&I Policy aligned with Vision 2030, Jamaica ST&I Sector Plan and Medium-Term Framework and Short-Term Growth Agenda.	•			MSET, NCST, AR&D , Private Sector Umbrella Organizations, All MDA's with ST&I- related portfolios	1	% completion of the National Implementation Plan for the ST&I Policy.
Develop a framework to guide and prioritize investments in ST&I projects and initiatives with transformative potential.	•			MSET, NCST, JAMPRO		% completion of framework.
Submit National Implementation Plan for Cabinet's approval.	•			NCST, MSET	1,5	Letter from Office of the Cabinet acknowledging receipt of the NIP.
Promulgate the National Implementation Plan.		•		MSET, NCST	1	% completion of the promulgation process.
Conduct wide sensitisation sessions with key agencies stakeholders.		•		NCST	1,2	Number of Stakeholder sensitization sessions held.
Align the institutional strategic and operational plan with all key national bodies.		•		NCST	5	% alignment of institutional strategic and operational plans with all key national bodies.
FINANCIAL Financial resources allocated to the successful implementation of the National Policy.						
Determine (quantify) necessary financial resources required for the execution of		•		MSET, NCST, MOFPS	1,2,3,4, 5	% completion of Budget for the National

the Policy though the National Implementation Plan.						Implementation Plan.
Identify and establish specific sources of funding and requisite facilities to support the Policy, particularly key priority areas as identified by the NIP		•		MSET, NCST, MOFPS, PIOJ, NFDST, Office of the Cabinet, AR&D	1,2,3,4, 5	% of funding identified to support the NIP
MONITORING AND EVALUATION Key performance indicators and targets to monitor the successful implementation of the policy, the returns of the investments in ST&I and the performance of national bodies of the implementation.						
Agree to national ST&I Indicators for successful alignment with the Global Innovation Index and other globally recognized standards, Vision 2030 Jamaica Indicators and the Sustainable Development Goals.		•		MSET, NCST, PIOJ, STATIN	1,2,3,4, 5	% of national ST&I indicators aligned with the Global Innovation Index, Vision 2030 and the Sustainable Development Goals.
Establish mechanisms for the systems of collection, reporting, translation and modelling of indicators.		•		MSET, NCST, MOFPS	1,2,3,4, 5	% completion of mechanisms and modelling of indicators.
Collect baseline data for all agreed indicators.		•		MSET, NCST, AR&D, Universities, Private Sector Umbrella Organizations, All MDA's with ST&I- related Portfolios	1,2,3,4, 5	Number of baseline data collected for agreed indicators.
Set national targets to align with the National Implementation Plan.		•		MSET, NCST, PIOJ	1	% of set targets aligned with the National Implementation Plan.
Sensitise all stakeholders of the innovation on targets and align these with institutional targets.		•		MSET, NCST	1	Number of sensitization sessions held. % of targets aligned with institutional targets.

Establish protocols and feedback mechanisms (institutional) for performance of key national ST&I Policy implementation bodies to include the NCSTI, SRC, AR&D, Universities and government laboratories.		•		MSET, NCST, AR&D, Universities, Private Sector Umbrella Organizations, All MDA's with ST&I- related Portfolios	1,4,5	Number of protocols and feedback mechanisms in place for institutional performance by ST&I policy implementation bodies.

FINANCING

Dedicated funding is critical to the success of the ST&I Policy. Without adequate funding for scientific activities, such as applied research and development, in support of the national priority areas and the economy, the policy cannot effectively be implemented to achieve any significant outcomes. Therefore, Jamaica will aim to invest wisely and adequately in ST&I exploitation and strategic engagement to drive economic growth. In addition, strategic support will be secured though appropriately established mechanisms to facilitate key activities across priority sectors. In ensuring a level playing field, funding opportunities will be made available on a transparent and competitive basis, consolidated and administered by an appropriate non-partisan body.

The estimated cost to implement the policy over 10 years will be calculated/established based on the National Implementation Plan. All policy development, facilitation, coordination and implementation across multiple stakeholders will be qualified.

Development of the National Implementation Plan and all other activities are to be financed through a combination of approaches, including:

I. The Government of Jamaica:

- MDAs with key roles will contribute by incorporating the policy's strategic objectives and aligning their budgetary requests and allocations to address the activities of the policy/National Development Plan within the priority areas to be addressed over the life of the Policy.

- The re-scoping of existing funding schemes, with a view to create a more targeted and comprehensive funding mechanism, such as the National Research Fund (NRF); coordinated by a multi-sectoral, non-aligned institution to direct funding towards high-impact, priority-driven projects, focused on delivering cutting-edge solutions in priority areas. This will support the call for initiatives focusing, inter alia, on basic, applied and experimental research, knowledge and technology transfer, education & training, capacity development, IP protection, commercial testing of innovation products, infrastructure development on competitive and non-competitive bases as per strategic priorities.

- Representation and advocacy to the Ministry of Finance and Public Service will be important, as the policy will aim to take advantage of the Government of Jamaica's comprehensive tax reform under the Omnibus Incentives[23], and in particular the regime

[23] The Omnibus Incentives Legislation refers to the slate of four new pieces of legislation that provide non-sectoral fiscal incentives aimed at increasing business competitiveness within the Jamaican economy. http://images.mofcom.gov.cn/jm/201801/20180105034944291.pdf

granting fiscal incentives benefitting companies to build their efficiency, effectiveness and productivity. The framework will advocate for innovation and R&D to be added to the existing special categories for tariff support in fostering economic growth. As such, strategic mechanisms designed to maximise the engagement and participation of the private sector and academic activities in support of the goals of the ST&I policy will be encouraged.

II. Investment Opportunities/ Public-Private-Partnership Investments

- Through strong partner relations with the PIOJ, assistance and guidance will be sought for the accessing of financing and development assistance through bilateral and multilateral arrangements for the implementation of certain aspects of the Policy.

- The establishment of Public–Private-Partnerships and other collaborative means to encourage private sector investments in priority areas/initiatives and programmes for the development of new useful products and solutions for local and international consumption.

III. Government of Jamaica Revenue

- Funds seeded by the government and enhanced by the securing of a small percentage (2-3%) of the cost of major government projects (such as infrastructure and building development), will be put towards strategic initiatives that may directly or indirectly affect priority areas. As a standard, all major projects, including that of Foreign Direct Investment (FDI), could be tapped for an allocation of 1-2% of its cost, for funding of relevant R&D.

- Each MDA will be expected to have the relevant ST&I and related R&D budget lines with agreed accounting mechanisms to track expenditure against the share of implementation of the National Implementation Plan for each entity.

MONITORING AND EVALUATION

The Ministry with responsibility for the science, technology and innovation portfolios will steer, monitor and evaluate the implementation of the ST&I Policy. Stemming from the Vision 2030 Jamaica: National Development Plan, National Outcome 11: A Technology-Enabled Society, outlines three main performance indicators:

- Number of scientific publications per million population
- Number of Patents granted
- Global Innovation Rank

These indicators are important but insufficient for monitoring the entire National Science, Technology and Innovation Policy. Additional performance indicators will include:

Expected Result	Indicator	Baseline	Target (Timeline)		
			Year 1	Year 2	Year 3
Established ST&I database and datasets developed.	Number of National Surveys successfully carried out yearly.	0	1 Survey conducted	1 Survey conducted	1 Survey conducted
	Collection of baseline data and creation of datasets.	0	Baseline data collected. 33% of National ST&I Database populated	Baseline data collected. 30% of National ST&I Database populated	Baseline data collected. 30% of National ST&I Database populated
Improved rank in the Global Innovation Index for Jamaica.	Jamaica's rank in the Global Innovation Index.	#72 (current ranking on GCI)	#71	#70	#69

Expected Result	Indicator	Baseline	Target (Timeline)		
			Year 1	Year 2	Year 3
Increases in partnerships and support within the ST&I ecosystem.	Number of strategic partnerships developed with underserved sectors.	Determined during year 1 through field study.	5% increase in the number of partnerships.	10% increase in the number of partnerships.	15% increase in the number of partnerships.
	Number of partnerships forged throughout the ST&I ecosystem.	Determined during year 1 through field study.	5% increase in the number of partnerships.	10% increase in the number of partnerships.	15% increase in the number of partnerships.
	Number of start-up businesses supported by PPPs.	Determined during year 1 through field study.	5% increase in the number of partnerships.	10% increase in the number of partnerships.	15% increase in the number of partnerships.
	The number of Public-Private - Partnerships (PPPs) involved in the development of ST&I infrastructure.	Determined during year 1 through field study.	5% increase in the number of partnerships.	10% increase in the number of partnerships.	15% increase in the number of partnerships.

NATIONAL SURVEYS

By employing the standardised, internationally-accepted methods of RICYT (the Network for Science and Technology Indicators – Ibero-American and Inter-American) three surveys will serve to measure the progress of the ST&I Policy within the ST&I landscape. These surveys are the:

1. **Knowledge, Attitudes and Perception (KAP) Survey**

   The KAP Survey is most useful for determining progress in Goal 2, "A Culture of Innovation". The Survey includes indicators measuring the level of interest in and knowledge of scientific topics, and understanding of the benefits and risks of science and technology.

2. **Research and Development (R&D) Survey**

   The R&D Survey, follows the methodology of the Frascati manual, a suite of 42 indicators covering the country context required for calculating the other indicators (e.g., population and GDP), financial inputs (including Gross Domestic Expenditure on R&D, or GERD, expressed in a variety of ways), human resource inputs (including sex-disaggregated indicators of researchers), higher education (including sex-disaggregated indicators of students), patents (including the number of patents requested nationally and through the WIPO PCT convention, and the number of patents granted), and publications (including the number of scientific publications per million population). This Survey is most useful for determining progress in Goal 1, "A Dynamic and Responsive National System of Innovation", and Goal 4, "An Excellent Research and Development Capability".

3. **Innovation Survey**

   The Innovation Survey, follows the methodology of the Oslo and Bogota manuals and is usually conducted by the economic sector. The considerable, if anecdotal, evidence of innovation in the Agri-Business and Culture industries make these sectors priorities for the Innovation Survey. Innovation Survey indicators include: spend on innovation activities, the number of firms that have introduced a new product or process, and the source of funding for innovations. This Survey is most useful for monitoring Goal 1, "A Dynamic and Responsive National System of Innovation", and Goal 3 "A Development Agenda Advanced by ST&I". It will also facilitate a more accurate ranking of Jamaica in the Global Innovation Index.

These surveys will be conducted on a three-year cycle—one per year—and together they will inform Goal 5, "An Enabling ST&I Policy Environment", allowing for an evidenced-based review of the policy every three (3) years to ensure its responsiveness and relevance.

The new NCSTI will be responsible for coordinating the various implementation activities by MDAs across sectors. The entity will provide a quarterly report to the portfolio Ministry on implementation activities. The Ministry will evaluate the activities and impacts, and submit a report to Cabinet on progress and possible changes to be made to the Policy.

CONCLUSION

The new Science, Technology and Innovation Policy aims to deepen the applications of ST&I throughout society in order to benefit all aspects of national development. The introduction of innovation serves to build on the possibilities that may be derived through the exploitation of science and technology. It is vital that Jamaica embraces and becomes more engaged in using ST&I in deriving greater economic, social and environmental benefits for the country. If fully embraced, the implementation of the ST&I Policy may result in numerous benefits including:

- Development of a sense of commitment in public and private sector institutions and individuals towards research and innovation as bases for human capital development, economic growth and wealth creation and international competitiveness;
- Improved strategic focus on endogenous knowledge creation, technologies and innovation, specifically that which advances our traditional and unique sectors, commodities and services making them more internationally competitive;
- Creation of strategic alliances and linkages within the Diaspora, recognizing it as an untapped resource for ST&I development; and
- Facilitate access to capital for industry to use science and technology to foster innovation.

The national ST&I Policy will help to mainstream science, technology and innovation across all sectors and services at the national level by facilitating the design, coordination and implementation of the multi-sectoral processes, and promoting ST&I as central to Jamaica's transformation and development.

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APPENDICES

APPENDIX 1: GLOSSARY OF TERMS

Academic and Research and Development Institutions	Institutions involved in the systematic work of creation and stewarding knowledge, this include universities and public bodies conducting R&D activities.
Artificial Intelligence (AI)	The theory and development of computer systems able to perform tasks normally requiring human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages.
Big Data	Extremely large data sets that may be analysed computationally to reveal patterns, trends, and associations, especially relating to human behaviour and interactions.
Bio-economy	Parts of the economy that use renewable biological resources from land and sea – such as crops, forests, fish, animals and micro-organisms – to produce food, materials and energy.
Bioengineering	A discipline that applies engineering principles of design and analysis to biological systems and biomedical technologies.
Biotechnology	The exploitation of biological processes for industrial and other purposes, especially the genetic manipulation of microorganisms for the production of antibiotics, hormones, etc.
Business Angels	Individuals who use their personal wealth to provide capital to start-up and early-stage businesses in return for a share of the company's equity.
Disruptive Technology	An innovation that creates a new market and value network and eventually disrupts an existing market and value network, displacing established market leading firms, products, and alliances.
Engineering	The process of utilizing knowledge and principles to design, build, and analyse objects.
Factor Driven Economy	A country (economy) which competes primarily on the use of unskilled labour and natural resources, buying and selling basic products or commodities.
Gross Expenditure on Research and Development (GERD)	GERD is total intramural expenditure on R&D performed in the national territory during a specific reference period.
Incubator	Facility which is a unique and highly flexible combination of business development processes, infrastructure and people designed to

	nurture new and small businesses by helping them to survive and grow through the difficult and vulnerable early stages of development.
Information Communication Technology (ICT)	All devices, networking components, applications and systems that combined allow people and organizations (i.e., businesses, non-profit agencies, governments and criminal enterprises) to interact in the digital world.
Innovation	Scientific, technological, organisational, financial and commercial steps which actually, or are intended to, lead to translating (new and/or existing) knowledge or technologies into a good or service that creates value for a customer/consumer.
Innovation System	The flow of technology and information among people, enterprises, and institutions is key to an innovative process. It contains the interactions between the actors needed in order to turn an idea into a process, product, or service on the market.
Intellectual Property (IP)	Creations of the mind, including but not limited to inventions; literary and artistic works; designs; symbols; names and images used in industry and trade.
Vision 2030 Jamaica	A strategic road map to guide the country to achieve its goals of sustainable development and prosperity by 2030.
Mathematics	The abstract science of number, quantity, and space, either as abstract concepts (pure mathematics), or as applied to other disciplines such as physics and engineering.
Nanoscience	The study of structures and materials on the scale of nanometres.
National Innovation System	The flow of technology and information among people, enterprises and institutions which is key to the innovative process on the national level.
National Quality Infrastructure	The institutional framework that establishes and implements the practice of standardization, including conformity assessment services, metrology, and accreditation.
Patent	A grant by the State, to the inventor, of a monopoly in the use of an invention, thereby excluding others from making, using or selling the invention within the country of grant for a specified period of time without the authorisation of the inventor.
Publications	In academic publishing, a scientific journal is a periodical publication intended to further the progress of science, usually by reporting new research.
Public-Private-Partnerships	A long-term procurement contract between the public and private sectors, in which the proficiency of each party is focused in the designing,

	financing, building and operating an infrastructure project or providing a service, through the appropriate sharing of resources, risks and rewards.
Research and Development (R&D)	Creative and systematic work undertaken in order to increase the stock of knowledge – including knowledge of humankind, culture and society – and to devise new applications of available knowledge.
Robotics	The branch of technology that deals with the design, construction, operation, and application of robots.
Science	The intellectual and practical activity encompassing the systematic study of the structure and behaviour of the physical and natural world through observation and experiment.
Scientometrics	The study of measuring and analysing science, technology and innovation.
Small and Medium Enterprises (SME's)	Non-subsidiary, independent firms which employ fewer than a given number of employees. This number varies across countries. The most frequent upper limit designating an SME is 250 employees.
South-South Coorporation	The exchange of resources, technology, and knowledge between developing countries, also known as countries of the Global South.
ST&I Indicators	Data that provide information that would allow successfully translating the activities and outputs of ST&I into development.
Sustainable Development Goals (SDG's)	A universal call to action, set by the United Nations, to end poverty, protect the planet and ensure that all people enjoy peace and prosperity.
Technology	The application of scientific knowledge for practical purposes.
Technology Transfer	Assignment of technological intellectual property, developed and generated in one place, to another through legal means such as technology licensing or franchising.
Traditional Knowledge Systems (TKS)	The knowledge systems developed and shared by a community as opposed to the scientific knowledge.
Venture Capital	Capital invested in a project in which there is a substantial element of risk, typically a new or expanding business.

APPENDIX 2: STAKEHOLDER CONSULTATIONS

Biotechnology Centre

Bodles Research Station

Broadcasting Commission

Bureau of Standards Jamaica (BSJ)

College of Agriculture, Science and Education

eGov Jamaica Ltd.

Environmental Health Foundation

HEART Trust NSTA

International Centre for Environmental and Nuclear Sciences

Jamaica Intellectual Property Office

Jamaica Manufacturers Association

Jamaica National Agency for Accreditation

Jamaica Promotions Corporation

Ministry of Education and Youth

Ministry of Industry, Commerce, Agriculture and Fisheries

Ministry of Labour & Social Security

Ministry of National Security

Ministry of Science, Energy and Technology

Ministry of Transport and Mining

Ministry of Economic Growth and Job Creation

National Certification Body of Jamaica

National Commission on Science and Technology

National Cultural and Creative Industry Commission - Office of the Prime Minister

National Environment & Planning Agency

Northern Caribbean University

Planning Institute of Jamaica

Private Sector Organization of Jamaica

Public Sector Transformation Unit - Office of the Cabinet

Scientific Research Council

Spectrum Management Authority

United Nations Development Programme

University of Technology Jamaica

United Nations Educational, Scientific and Cultural Organisation

University of the West Indies- Faculty of Science & Technology

University of the West Indies - Office of the Deputy Principal

UWI Solutions for Developing Countries

APPENDIX 3: Other Legislation governing Science, Technology and Innovation in Jamaica

ACT	OPERATIONAL DATE
Access to Information Act	2004
Agro-Investment Corporation Act	1952
Anatomy Act	1949
Animals (Artificial Insemination Control) Act	1950
Animals (Control of Experiments) Act	1949
Animals (Diseases and Importation) Act	1948
Anti-Doping in Sport Act	2015
Aquaculture, Inland and Marine By-Products (Inspection and Licensing) Act	1999
Architects Registration Act	1987
The Banana Board Act	1953
Bauxite and Alumina Industries (Encouragement) Act	1950
Beach Control Act	1956
Bees Control Act	1918
Broadcasting and Radio Re-Diffusion Act	1949
Calcium Carbide (Sale and Storage) Act	1901
Caribbean Accreditation Authority (Medicine and Other Health Professionals) Act	2006
The Caribbean Agricultural Research and Development Institute Act	1982
Caribbean Meteorological Organisation Act	1980
Caribbean Regional Organisation for Standards and Quality Act	2005
Clean Air Act	1964
Conch (Export Levy) Act	2009
Copyright Act	1993
Cybercrimes Act	2015
Data Protection Act	2020
Dangerous Drugs Act	1948
Dental Act	1974
Disaster Risk Management Act	2015
Education Act	1965
Electricity Act	2015
Electricity (Survey) Act	1956
Electronic Transaction Act	2007
Endangered Species (Protection, Conservation and Regulation of Trade) Act	2000
Evidence Act	1843
Evidence (Special Measures) Act	2015
Fertilizers and Feeding Stuffs Act	1942
Finger Prints Act	1936
Fiscal Incentives (Miscellaneous Provisions) Act	2014
Fisheries Act	2019
Flood –water Control Act	1958
Food and Drugs Act	1975
Food Storage and Prevention of Infestation Act	1958
Forest Act	1996

ACT	OPERATIONAL DATE
Human Employment and Resource Training/ National Service and Training Act	1982
Information and Communications Technology Authority Act *(not yet operational)*	2019
Institute of Jamaica Act	1978
Jamaica Agricultural Commodities Regulatory Authority Act	2017
Jamaica Agricultural Society Incorporation Act	1941
Jamaica Dairy Development Board Act	2012
Jamaica Intellectual Property Office Act	2002
Jamaica National Heritage Trust Act	1985
Layout-Designs (Topographies) Act	1999
Medical Act	1976
Mining Act	1947
National Commission on Science and Technology Act	2007
National Health Fund Act	2003
National Health Services Act	1997
National Solid Waste Management Act	2002
National Water Commission Act	1963
Natural Resource Conservation Authority Act	1991
Nuclear Safety and Radiation Protection Act	2015
Pesticides Act	1987
Petroleum Act	1979
Pharmacy Act	1975
Planning Institute of Jamaica Act	1984
Plants (Quarantine) Act	1994
Professional Engineers Registration Act	1987
Professions Supplementary to Medicine Act	1969
Protection of Geographical Indications Act	2009
Protection of Plant Genetic Resources for Food and Agriculture	2013
Public Health Act	1985
Quarantine Act	1951
Rice Industry Board Act	1956
Rural Agricultural Development Authority Act	1990
Scientific Research Council Act	1960
Standards Act	1969
Telecommunications Act	2000
University Council of Jamaica Act	1987
University Hospital Act	1948
University of Technology, Jamaica Act	1995
Urban Development Corporation Act	1968
Venereal Disease Act	1937
Veterinary Act	1976
Water Resources Authority Act	1996
Watersheds Protection Act	1963
Wildlife Protection Act	1945