DRAFT

VISION 2030 JAMAICA

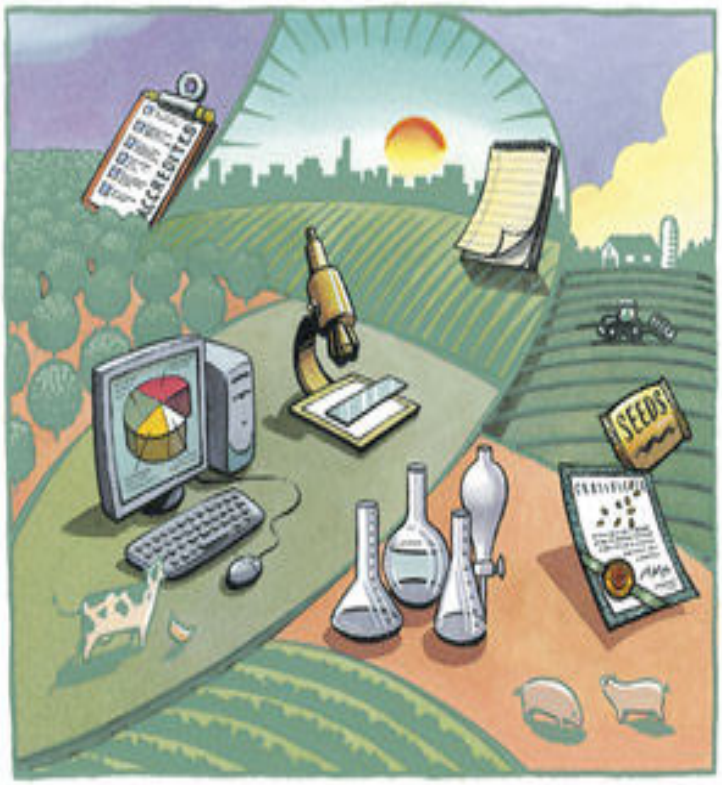
SCIENCE, TECHNOLOGY AND INNOVATION

SECTOR PLAN
2009 - 2030

JAMAICA 2030:
NATIONAL DEVELOPMENT PLAN

SCIENCE, TECHNOLOGY AND INNOVATION SECTOR PLAN

The Jamaica National Innovation System: Catalyzing Jamaica's Future Prosperity



Prepared by: Science, Technology and Innovation Task Force
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List of Acronyms

BSJ	Bureau of Standards Jamaica
CAPS	Community Access Points
CERE	Centre for Excellence in Renewable Energy
EMS	Environmental Management Systems
FDI	Foreign Direct Investment
HACCP	Hazard Analysis and Critical Control Points
ICT	Information and Communications Technology
IPR	Intellectual Property Rights
JEA	Jamaica Exporters Association
JIPO	Jamaica Intellectual Property Office
MEM	Ministry of Energy and Mining
MIIC	Ministry of Industry, Investment and Commerce
MIND	Management Institute for National Development
MSMEs	Medium, Small and Micro Enterprises
NCST	National Commission on Science and Technology
PIOJ	Planning Institute of Jamaica
PIOJ	Planning Institute of Jamaica
QMS	Quality Management Systems
R & D	Research and Development
SDC	Social Development Commission
SME	Small and Medium Enterprises
STI	Science, Technology and Innovation
UTECH	University of Technology
UWI	University of the West Indies

Chapter 1: Setting the Context

Introduction

Science, Technology and Innovation (STI) combined, are widely acknowledged as critical underpinnings of rapid economic and industrial growth, recent emergence of competitive nations and their remarkable prosperity. STI play a fundamental role in the creation of wealth, economic development and in the improvement of the quality of life for all citizens. STI are also critical in driving productivity and competitiveness. They generate employment and well-being through innovation and the commercialization of new products and services; help reduce poverty, improve education, health, nutrition and trade; and are essential for building new capacities that are important in the twenty-first century.

Drivers Propelling the Use of STI Globally

- *The pace of technology revolution is not expected to abate over the next 15 years and could in fact increase*
- *Perceived reduction of natural materials and resources (water, fossil fuels, agricultural products)*
- *International competition as result of globalization*
- *Investors place investment in "knowledge-enhanced countries"*
- *The need to adapt to changing environmental conditions and their impact on SIDS*
- *Increasing waste*
- *Addressing new health challenges and diseases*
- *Reducing poverty and improving quality of life by increasing access to basic social amenities (housing, education, health services etc) in relatively cost efficient ways*
- *Need to bridge STI divide as scientifically and technologically challenged countries will face severe capacity issues*

Innovation is recognized as the single most important ingredient in a successful modern economy. At its broadest, innovation means finding new or better ways to do things, creating new products or services, applying new technologies to solve existing problems, or using existing products and technologies to meet new needs.

Innovation delivers benefits in the form of new products and production processes and better quality goods and services. It also benefits the wider community through advances in vital community services such as healthcare, education, communications and transport.

Like other developing countries it is vital for Jamaica to become excited and engaged in using science and technology and in valuing the role of innovation in deriving greater economic, social and environmental benefits for the country.

Building the capacity for STI in Jamaica will enable us to:

- Make demonstrable progress in achieving the Millennium Development Goals (MDGs), tackle health and nutrition problems, avoid and/or mitigate the impacts of natural disasters, embarking on a path of sustainable poverty reduction, safeguarding fragile eco-systems, and improving the quality of daily 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
- Raise productivity, wealth, and standards of living by developing new, competitive economic activities to serve local, regional, and global markets.
- Develop appropriate R&D capacity to support technology-based economic growth and to address social, economic, and ecological problems specific to our country.

In summary, STI is fundamental in fostering economic growth and global competitiveness and is a *sine qua non* for advancing national development.

Vision 2030 Jamaica Sector Plan Planning Process

This Sector Plan for Science, Technology and Innovation is premised on a vision shared by hundreds of Jamaicans on the need to ensure that our country deepens the application of science and technology to benefit all aspects of national development. It is one of thirty-one chapters that would form the foundation for the development of Vision 2030 Jamaica – a 21-year plan designed to put Jamaica in a position to achieve developed country status by 2030. Vision 2030 Jamaica is based on a fundamental vision to make Jamaica *'the place of choice to live, work, raise families, and do business,'* and on guiding principles which put 'people' at the centre of Jamaica's transformation.

The preparation of the Plan was supported by a quantitative systems dynamics model – Threshold 21 Jamaica – which supports comprehensive, integrated planning that enable the consideration of a broad range of interconnected factors along economic, social and environmental considerations and project future consequences of different strategies across a whole range of indicators. In addition, it enables planners to trace causes of changes in any variable or indicator back to the assumptions.

The sector plan was developed using the following processes:

- Task Force Meetings and Working Group Meetings that were used to solicit ideas and views from members[1] on science, technology and innovation issues and challenges facing Jamaica as well as identifying a vision for the sector, and determining key goals, outcomes, strategies and actions for the sector over the period 2008 to 2030
- Workshops
- Strategic meetings of the working group, along with the chair of the Task Force

This document is structured as follows:

- Chapter 1: Setting the Context
- Chapter 2: Situational Analysis
- Chapter 3: SWOT Analysis
- Chapter 4: Strategic Vision and Planning Framework for the STI Sector Plans
- Chapter 5: Implementation Framework and Action Plan the Science and Technology Sector
- Appendices

[1] See Appendix 1 for List of Members of the STI Task Force

Chapter 2: Situational Analysis

STI is essential to the development and management of: agriculture, agro-processing, energy, waste, biodiversity, education; adaptation to climate change; the management of hazards and crime prevention and control. It is important in the creation of a knowledge-based economy, and the achievement of targets outlined in the Millennium Development Goals. More importantly, STI is fundamental in fostering economic growth and international competitiveness and is a *sine qua non* for advancing national development.

The most competitive economies are those that invest significantly in S&T and enjoy high levels of innovation. According to the Global Competitiveness Index and Report (2008/09) of which Jamaica ranks at 86 out of 134 countries, the country is defined as efficiency driven or at Stage 2 of development. However, if the country expects to meet the demands of globalization it must transition to an innovation-driven stage of economic development as is currently being practised by first world countries such as Japan and Australia but also economies such as Singapore and Ireland.

The Situational Analysis is presented under the following headings:

- Key Issues and Challenges Affecting STI in Jamaica
- Financing and Investments in STI
- Structure and Coordination of STI
- Science Education
- Jamaica's Innovation Infrastructure
- Technology Use and Transfer

Key Issues and Challenges Affecting STI in Jamaica

The following lists some of the key issues and challenges affecting STI in Jamaica

- Low levels of funding
- Size of main coordinating body, NCST, too small to effectively coordinate large number of STI agencies
- No clear consensus on desired STI profile of country
- No explicit understanding of or established role for STI in national vision and development objectives
- Insufficient public-private partnerships
- No structured national research programme geared towards high impact output
- Low capacity for enquiry based approach to learning as well as scientific inquiry are not core components of teacher training
- Research capacity and engineering intensity compromised by level of STI training
- Weak research and innovation culture

- Inadequately developed infrastructure
- Lack of awareness/knowledge of benefits of patenting

Financing and Investments in STI

Jamaica's capacity to effectively and efficiently exploit STI is hampered by numerous factors, chief among which is consistently low levels of investment. This is evidenced by the fact that despite path breaking work in agricultural research, and recent expansion of the science infrastructure, Jamaica spends less than 1% of GDP on scientific research and development. Comparatively, this rate of investment ranks low with developed countries. In 2005, developed countries spent an average of 1.7 % of GDP on R&D while the average for developing countries was 1% of GDP (UNESCO Science Report, 2005).

Jamaica's 0.3% of GDP in R&D as shown in the table below does not compare favourably with the rest of the world with an average of 1.7% and 0.6% attained by Latin America and the Caribbean The disparity is amplified by the difference in the size of the GDP in the countries compared. The table also shows that Singapore and Norway boast over 4,000 researchers in R&D per million people. Although statistics on the number of researchers in R&D are not available for Jamaica it is known to be significantly less than the two other countries. Jamaica's average expenditure on R&D of about 0.3% of GDP is lower than the average for Latin America and the Caribbean (0.6 % of GDP).

Table: Expenditure on R&D and Researchers in R&D, 2005

Country	Per Capita GDP	R&D Expenditure (% GDP)	Number of researchers in R&D (per million persons)
Jamaica	4 400	0.3	n/a
Norway	42 300	1.8	4,587
Singapore	28 100	2.15	4, 745
World		1.7	894
Developed Countries		2.3	3273
Latin America and the Caribbean		0.6	261

Source: World Development Report, 2006, S&T Indicators Report, 2005, UNESCO Science Report, 2005

Over the past four years actual budgetary allocation to S&T in Jamaica has increased in nominal terms. This has not however, translated into an increase in the proportion of GDP dedicated to the area. A point to note also is that a large proportion to the allocation in this sector is used to defray recurrent expenses leaving very little to support actual research. The government still bears the brunt of the weight of funding STI development although tertiary institutions obtain grants from local and overseas private organizations to complement their R&D budgets. In some instances, the universities and research agencies are contracted by the private sector to carry out specific research projects such as the testing of pesticide residues in fruits and vegetables, forensic investigations etc. Funds earned in these instances help to finance the institutions' research agendas and some state agencies like the Scientific Research Council (SRC) have commercial arms through which they market products and services. However, funding is often difficult to obtain for research given the perceived academic nature of some projects, potential risk of low applicability, high cost, time, availability of off-the shelf solutions and possible lack of confidence in local research capability.

The low investment levels act as a constraint to formation of a dynamic scientific community teeming with applied research development of new processes and products and publishing of scientific articles. In fact, the 'sector' experiences low retention of qualified personnel and at the same time lacks the environment to attract (in sufficient numbers) top scientists from across the world to further enhance scientific and technological development.

Structure and Coordination of STI

The National Commission on Science and Technology (NCST) is the main coordinating agency for STI in Jamaica. In terms of the legal and institutional framework governing STI in Jamaica, a Draft National Science and Technology Policy is currently being finalized. This is supported by various pieces of legislation and international protocols which the Government of Jamaica has already ratified. Notwithstanding, there is no specific vision, approach or agenda for STI development, nor specific approaches on how STI can advance a broader national vision.

At the institutional level, there is room for more synergistic operations among the public agencies which need to play a greater role in facilitating the conversion of scientific research into marketable goods and services. The public sector also needs to play a more proactive role in leading the way in facilitating a more widespread use and application of technology islandwide possibly through the forging of public private partnerships (PPP).

There is also a deficit in STI trained personnel. This is both as a result of a push factor - limited investment; and a pull factor – attractiveness of jobs in more scientifically advanced countries. While this has implications for compensation and related matters, there is a critical role for the educational institutions in addressing this. The educational institutions as well as the research institutions also need to play a role to popularize STI and to link persons involved in the creative industries and others with research institutions with a view to transforming their products and services. In other words, help to promote the developmental and commercial value of STI.

Science Education

A 1999 UNCTAD report suggested that the number of students being exposed to scientific knowledge is increasing in Jamaica from the primary to the tertiary level. It contended however, that at the primary level science teaching is of a low quality although there have been attempts at improvement. This undoubtedly impacts the overall system and can negatively impact students' interest in science. Analysis of the number of secondary school students pursuing science and related subjects shows that between 2003 and 2008 there was an increasing trend in the number of students sitting these subjects in the Caribbean Examination Council's (CXC) May-June examinations. Performance in core Science and Technology (S&T) subjects (Biology, Chemistry and Physics) while comparatively low has also shown an upward trend; however, there has been a downward trend in passes in Mathematics and Information Technology.

At the tertiary level there has been an increase in the number of students pursuing S&T related first degrees, certificates and diplomas and there has been a similar increase in the number of students pursuing higher degrees relating to STI. As such, the output of trained S&T professionals from tertiary institutions has been showing an overall increase

over time. Despite this, there remains a shortage of personnel in critical areas, especially in the education sector which would be the initial incubator for scientists and technologist. The personnel constraints are also manifested in the medical field where there is a shortage of nursing personnel, specialist doctors, medical physicists, among others. Similar constraints also are recognized in industry.

Jamaica's Innovation Infrastructure

Jamaica's innovation over the years has been low impact unlike countries like Singapore and Norway which expend greater effort and money in high impact, high technology R&D activities. Jamaica also has made strides in educating the public on Intellectual Property Rights and improving the intellectual property system. The government is now offering considerable support in the development of small businesses in line with global policies on entrepreneurship. Tax exemptions have also been granted on the purchase of R&D equipment, and a Science and Technology Policy that emphasizes the critical role of R&D and science education and popularization has been submitted to Parliament. Despite the above and the work of national STI and R&D institutions, a huge gap remains between R&D and inventions, especially in meeting the needs of the local private sector. The sector itself does some level of R&D but evaluation has shown that there are few coordinated and organized R&D initiatives (UNCTAD, 1999).

Technology Use and Transfer

Two indicators of technology use and transfer are e-readiness and e-government. In the latest update on the status of Jamaica's e-readiness the country ranked 49 of a total of 70 countries on the Economic Intelligence Unit's E-readiness rankings list. The rankings which was dominated in 2008 by Europe, has been in existence since 2000. The assessment includes over 100 quantitative and qualitative criteria, among them: ICT infrastructure, broadband access, mobile penetration, security, transparency, innovation and skills. Consistent with the e-readiness ranking, the Global IT Report 2007/08 ranked Jamaica 46 out of 127 countries.

The expansion of the ICT infrastructure has facilitated improvement and effectiveness of intra-governmental operations and the delivery of government services. This is made possible through the E-Governance Project under which the services of agencies such as

the Inland Revenue Department, Registrar General's Department, Jamaica Trade Board, Jamaica Trade and Invest and Jamaica Customs, can be accessed on-line.

The area of ICT has proved one of tremendous growth over the past several years with activities taking place both at the level of the government and private sectors. Much of the private sector work is in the financial sector which is modernizing at a fairly rapid pace. For example, in 2008, the financial services sector upgraded a number of systems and processes and provided technological products and services such as Internet and tele-banking to improve customer satisfaction, processing time, ease of money transfer and greater security. The expansion in access to automated banking machines (ABMs) exemplifies this, having increased three fold between 2000 and 2008[2].

[2] Moved from 163 to 499 machines across the island

Chapter 3: SWOT Analysis

Science, technology and innovation are essential ingredients in the industrialization and sustainable development of nations. The importance of these ingredients as crucial factors in the economic growth and competitiveness of countries has become all the more evident in the face of globalization, trade liberalization and the emergence of knowledge-based industries. Globalization has brought with it a more intense competitive environment and new requirements for sustained competitiveness. This new competitive environment has fuelled the growth of knowledge-intensive production by increasing scientific and technological interactions and the need for innovation. The active search for continuous improvements has created an urgent need to rely even more on scientific and technological innovation and to adjust policies and practices at both the enterprise and government levels.

This SWOT Analysis presents a review and analysis of the state of national science, technology and innovation, with a view to identifying goals, objectives and strategies technological capacity-building and strengthening technological capabilities, innovation and competitiveness and integrating them in the overall sector plan towards developed country status by 2030. The SWOT is categorized according to the following categories and presented in the Table below:

- Policy and Legislative Framework
- Capacity and Resources
- Institutional Framework
- STI Infrastructure and Environment
- Collaboration

	Policy and Legislative Framework	Capacity and Resources	Institutional Framework	STI Infrastructure and Environment	Collaboration
Strengths	• Enabling legislative environment	• Small cadre of S&T professionals • Evidence of positive effects of applied research • Experience in the development of various standards	• Liberalized and developing ICT sector	• Internationally recognized institutions – e.g. SRC	• Strong relationship with technologically advanced countries • Regional leader in STI
Weaknesses	• No clear consensus on desired STI profile of country or role of STI in the development process • No structured national R&D programme geared towards high impact output	• Applied R&D activity low due to inadequate human, technical and financial capacity • Approach, quality and relevance of STI education at all levels of the education system	• Inadequate coordination of STI system evidenced by overlapping and unclear roles of STI institutions	• Inadequate enabling environment for innovation	• Inadequate public-private sector partnerships

	Policy and Legislative Framework	Capacity and Resources	Institutional Framework	STI Infrastructure and Environment	Collaboration
		• Disconnect between R&D and productive sectors and the development of indigenous technology • Inability to attract and retain STI professionals			
Opportunities		• Presence of untapped natural and human resources • North/South and South/South model of international capacity building in STI, especially in developing countries • Latecomer		• Presence of S&T infrastructure • Presence of a National Commission on Science and Technology (coordinating agency) • Varied academic and research institutions	• Global developments in STI skewed towards biotechnology, genetic science and energy diversification (areas of priority for Jamaica) • International funding agencies receptive to the development of STI in developing

	Policy and Legislative Framework	Capacity and Resources	Institutional Framework	STI Infrastructure and Environment	Collaboration
		advantage for adoption, adaptation and creation of technology			countries
Threats	• The value of STI not seen as the driver for socio-economic well-being • Low local budgetary support for STI development	• Recruitment abroad of highly qualified Jamaican STI professionals (such as teachers) Natural disasters (re-allocation of funds for rehabilitation) • Tendency for the country to pay more attention and assign resources to immediate issues			

The SWOT along with the Situational Analysis presented above, will form the basis for identifying goals, objectives and strategies that could be employed to addresses the weaknesses endemic to the sector, and capitalize on the opportunities to ensure the transformation to a world class STI sector.

Chapter 4: Strategic Vision and Planning Framework

Proposed Vision Statements

Below are three vision statements written from ideas presented by the Task Force during its meetings. Whilst there was no agreed vision at the time of writing, members all had a common idea on what a vision for STI should be. These common ideas are presented below and are expected to be discussed and explored further. Notwithstanding, it was unanimously agreed that the selected vision would be geared towards catalyzing and advancing:

1. Creation and application of new knowledge (especially as it relates to exploitation of our natural resources, and unleashing the creativity of our people)
2. The number of people innovating
3. Economic expansion leading to prosperity
4. Trade competitiveness
5. Job creation
6. Security of our population (i.e. in areas of food, energy, water, health, defense, crime, hazards etc.)

The Visions:

1. *"Jamaica by 2030 will be internationally renowned for the excellence of its research, and will be at the forefront in generating and using new knowledge for economic and social progress, within an innovation driven culture."*

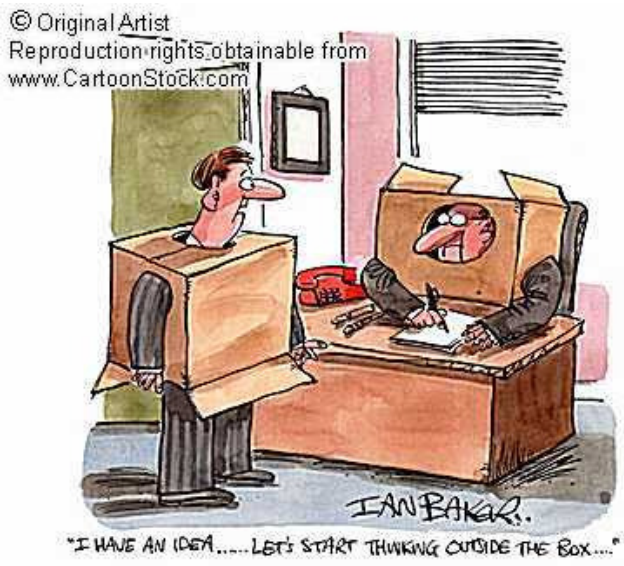
2. *"A dynamic STI culture unleashing the creative potential of the people and catalyzing development – a regional leader and world beater."*

3. *"A world class dynamic and innovative culture that is well entrenched in all areas of national life and through which it catalyzes and advances national prosperity and security by vigorously seeking, learning, generating and applying scientific and technological knowledge."*

The overarching mission of the STI sector is thus to create and operate an effective Jamaica National Innovation System (JNIS) that will:

- engage and unleash the creative potential of the people (especially in the creation of knowledge intensive businesses)
- enable sustainable exploitation of natural resources
- catalyse economic and quality employment expansion
- advance national trade competitiveness
- promote and advance national security by ensuring adequate and sustainable supplies of food, energy, clean water, health services and protection from crime and natural and man-made hazards.

GOALS AND OUTCOMES



The Sector Plan highlights the steps we need to take in Jamaica in order to develop an effective world-class Jamaica National Innovation System that will significantly contribute to the delivery of the anticipated economic and social prosperity. Of course, there are many real challenges ahead for the STI sector because this sector here in Jamaica is still relatively underdeveloped and the linkages between key players in the innovation process are weak or, in some cases, nonexistent when compared to those of the developed world, rapidly developing economies or those countries that are deliberately poised to catch up and leapfrog into developed country status. Without effective linkages among key JNIS stakeholders diffusion of STI into the economy will be a challenge. For example, the JNIS is unable to take advantage of the FDI in tourism; the major ingredients (e.g. food) to drive this investment are largely imported. Thus no significant indigenous STI knowledge, skill and investment for producing the required food has been developed. The desperate need to build STI capacity (laboratories, equipment, processes and organizations) and critical mass, especially in areas critical to Jamaica's economy and security are a major concern that must be addressed. The other critical challenge is that creative funding mechanisms will be needed to get the JNIS to operate effectively. Nevertheless, this STI sector plan will be designed to enable Jamaica to catch up as quickly as possible and take a leap forward and move to become an acknowledged leader in the application of STI for national economic and social development. This is to be achieved within the context of scarce resources, the position of which we trust, will improve as the sector picks up momentum and its benefits begin to reveal the JNIS potential to revolutionalize the economy.

Early Indicators of Success

Some early indicators that could be used to define the success of this sector plan can be identified as:

- increased participation of Jamaican enterprises in STI
- better linkages between JNIS stakeholders

- improved trend of R&D outputs (publications and patents)
- increased numbers of people with advanced qualifications – i.e. movement towards attainment of critical mass in STI
- enhanced contribution by research and innovation to economic and social development
- transformational change in the quality and quantity of research
- increased output and diffusion of demand lead STI results (i. e. economically relevant knowledge)
- an improved international profile for Jamaica in STI achievements
- new businesses (MSME) exploiting endogenous STI outputs

SECTOR GOALS	SECTOR OUTCOMES
A scientific culture entrenched into all aspects of national life	• Science, technology and innovation education institutionalized throughout the education system
	• Jamaica is a major generator and use of STI knowledge
	• National capability for the development of indigenous STI knowledge, intellectual property and businesses elevated and strengthened
	• a STI culture is popularized as a viable agent of social and economic transformation
Excellent and distinctive R&D capability and a reputation for innovation	• Dynamic, responsive National Innovation System created
	• A world-class, dynamic enabling environment for persistent R&D and innovation in line with national development goals developed
	• The national productive capacity and competitiveness through efficient application of innovation is improved
	• Regional Centre of excellence in STI
	• National productivity and competitiveness through efficient application is improved

SECTOR GOALS	SECTOR OUTCOMES
	• Creativity is fostered
A Knowledge Based Society	• Networks for knowledge exchange both locally and internationally developed and facilitated
Jamaica repositions itself to take advantage of STI in all Aspects of National Development	• Existing knowledge both local and international for socio-economic advancement adopted and adapted • New science and technology, for exploiting local resources created

Proposed Sector Indicators and Targets

The proposed indicators and targets for the STI Sector Plan over the period 2009 -2030 are presented in Table below.

Table : STI – Proposed Indicators and Targets

Sector Indicators	Baseline	Targets			Comments
	2007 or Most Current	2012	2015	2030	
1. # of scientists and engineers/population 2. # of professionals in R&D/million persons 3. % change in Gov't. investment in R&D (559717 from 440735) 4. Personal computers ownership per 100 population 5. # of government services available on-line					

Chapter 5: Implementation, Monitoring and Evaluation Framework

Components of Vision 2030 Jamaica - National Development Plan

The Vision 2030 Jamaica National Development Plan has three (3) components:

1. **Integrated National Development Plan:**

The integrated National Development Plan presents the overall plan for Vision 2030 Jamaica, integrating all 31 sector plans into a single comprehensive plan for long-term national development. The integrated National Development Plan presents the National Vision, the four National Goals and fifteen National Outcomes, and the National Strategies required achieving the national goals and outcomes.

2. **Medium Term Socio-Economic Policy Framework (MTF):**

The Medium Term Socio-Economic Policy Framework (MTF), is a 3-yearly plan which summarizes the national priorities and targets for the country and identifies the key actions to achieve those targets over each 3-year period from FY2009/2010 to FY2029/2030.

3. **Thirty-one (31) Sector Plans:**

At the sectoral level Vision 2030 Jamaica will be implemented through the strategic frameworks and action plans for each sector as contained in the respective sector plans. Vision 2030 Jamaica includes a total of thirty-one (31) sector plans covering the main economic, social, environmental and governance sectors relevant to national development.

Implementation Framework

The implementation of the Science, Technology and Innovation Sector Plan is an essential component of the implementation, monitoring and evaluation framework for the Vision 2030 Jamaica – National Development Plan. The Plan is implemented at the sectoral level by ministries, departments and agencies (MDAs) of Government as well as non-state stakeholders including the private sector, NGOs and CBOs. The involvement of stakeholders is fundamental to the successful implementation of the National Development Plan and STI Sector Plan.

Accountability for Implementation and Coordination

The Cabinet, as the principal body with responsibility for policy and the direction of the Government, has ultimate responsibility for implementation of the National Development Plan. Each ministry and agency will be accountable for implementing the National Development Plan (NDP) through various policies, programmes and interventions that are aligned with the strategies and actions of the NDP and the sector plans. A robust results-based monitoring and evaluation system will be established to ensure that goals and outcomes of the Plan are achieved. This system will build on existing national and sectoral monitoring and evaluation frameworks and will be highly participatory.

Resource Allocation for Implementation

Vision 2030 Jamaica places great emphasis on ensuring that resource allocation mechanisms are successfully aligned and integrated with the implementation phase of the National

Development Plan and sector plans. The requirements to ensure resource allocation for implementation will include alignment of organizational plans in the public sector, private sector and civil society with the National Development Plan, MTF and sector plans; coherence between the various agency plans with the National Budget; rationalization of the prioritisation process for public sector expenditure; and increased coordination between corporate planners, project managers and financial officers across ministries and agencies.

Action Plan

The Action Plan represents the main framework for the implementation of the Science, Technology and Innovation Sector Plan for Vision 2030 Jamaica. The tracking of implementation of the STI Sector Plan will take place through the Action Plan as well as the framework of sector indicators and targets.

The Action Plan contains the following elements:

i. Sector Goals
ii. Sector Outcomes
iii. Sector Strategies
iv. Sector Actions
v. Responsible Agencies
vi. Timeframe

LONG TERM ACTION PLAN
2009 – 2030

Goal # 1 - A Scientific culture entrenched into all aspects of national life

STRATEGIES	SPECIFIC ACTIONS	TIMEFRAME	RESPONSIBILITY
Outcome 1 **Science, technology and innovation education institutionalized throughout the education system**			
Create dynamic linkages between the social and natural sciences	Incorporate natural science programmes in social science programmes and vice versa	2011 – 2015	Tertiary institutions, SRC, Ministry of Education
	Link the relevance of STI in solving some of societal problems such as poverty, chronic diseases and crime	2011 – 2015 2009 – ongoing	Teaching institutions including Teacher Training Colleges, Ministry of Education SRC, NCST, PIOJ, UTech, UWI
	Have fora for the exchange of ideas among social and natural scientists on topical multi-disciplinary issues	2012 - 2015	UTech, UWI, and other tertiary institutions
	Have cross-faculty degrees at the tertiary level e.g. physics and management; chemistry and social policy etc	2012 – 2015	UTech, UWI, and other tertiary institutions
	Compulsory courses in natural and social sciences	2012 - 2016	UTech, UWI, and other tertiary institutions, Ministry of Education
	Create projects incorporating social science and natural science dimensions		

STRATEGIES	SPECIFIC ACTIONS	TIMEFRAME	RESPONSIBILITY
Improve the connections between educational institutions and industry to enhance mutual interaction, stimulate creativity and innovation	Conduct needs assessment of local industries, especially research needs	2013 - 2015	Ministry of Education, Ministry of Industry, Investment and Commerce,
	Develop research competence of local universities through training oriented to meeting industry demands and needs	2009 – ongoing	Ministry of Education, tertiary institutions
	Strengthen consultative capabilities of universities and other research institutions (though training and improved facilities) to provide adequate consultancies to Industry		UTech, UWI, and other tertiary institutions, Ministry of Education
	Have fora for exchange of ideas between industry and academia Customise courses to meet industry needs		UTech, UWI, and other tertiary institutions, Ministry of Education, Ministry of Industry, Investment and Commerce, JMA, JEA
Build high quality, dynamic and practical, interactive, inquiry based science curricula throughout the education system	Provide resources and facilities necessary for world class delivery of science and math education Review and improve science curricula throughout the education system		Ministry of Education, JTA, Teachers Colleges
	Provide high quality training for science and math teachers Provide science and math exchange programmes for		Teaching institutions including Teacher Training Colleges, Ministry of Education

STRATEGIES	SPECIFIC ACTIONS	TIMEFRAME	RESPONSIBILITY
	science teachers Scientific institutions playing greater role in exposing science teachers and students to science. Greater collaboration between the Ministry of Education, tertiary institutions and other scientific instutions Establish science museums where students are exposed to science Review and improve the salaries and benefits of science and math teachers to retain high quality professionals Expand awards for excellence in science and math teaching		
	Expand and improve science activities such as science fairs, exhibitions, seminars etc. Create opportunities for the development of problem-solving abilities thoughout the education system Expand and improve internship programmes in various industries for secondary and tertiary science students		UTech, UWI, and other tertiary institutions, Ministry of Education, Ministry of Industry, Investment and Commerce, JMA, JEA
Improve upon and create incentives schemes to attract and retain qualified science and mathematics	Review and improve the salaries and benefits of science and math teachers to retain high quality		

STRATEGIES	SPECIFIC ACTIONS	TIMEFRAME	RESPONSIBILITY
professionals throughout the education system	professionals		
Create partnerships among primary, secondary and tertiary institutions to stimulate and foster knowledge exchange both locally and internationally	Implement science programmes for select primary schools in collaboration with Ministry of Education, ASTJ and international science education organizations		SRC, NCST
	Strengthen capabilities of teachers at the primary level in collaboration with MIND, ASTJ, and international science education organizations		SRC, NCST
	Develop and implement science education programems for schools through linkages with schools science and technology societies Provide access to online science and technology networks and sites Have fora for knowledge exchange among educational institutions at all levels Assign tertiary science students to assist with the teaching and exposure of secondary and primary students to science		SRC
Improve infrastructural platform throughout the education system to augment the delivery of science education	Conduct needs assessment of resources needed to deliver high quality science education Improve laboratory facilities at all levels of		

STRATEGIES	SPECIFIC ACTIONS	TIMEFRAME	RESPONSIBILITY
	the education system Liaise and collaborate with private sector companies to assist with the improvement of facilities for science education.		
Objective 1.2 **Jamaica is a major generator and user of STI knowledge**			
Enhance public-private sector partnerships for furthering STI development	Create strategic partnerships between public and private sector to further STI by: Having more fora for knowledge exchange Providing incentives (such as tax concessions, funding, infrastructural improvements etc) to private sector companies Creating suitable STI policies to favour STI advancement in the private sector Align local development goals with FDI investments Engage the private sector in using STI to solve national problems Improve government services and facilities to support private sector STI initiatives		
Establish an effective STI funding agency –for both demand driven and	Assess and streamline the various STI funding mechanisms already in		

STRATEGIES	SPECIFIC ACTIONS	TIMEFRAME	RESPONSIBILITY
strategic research	place both locally and internationally Establish core funding mechanism for STI initiatives Align STI funding with development priorities Provide an information bank for various sources of funding for STI both locally and internationally Encourage private sector to fund local research projects		
Create a demand-led national research and development agenda and establish appropriate mechanisms to encourage the private sector to become the dominant player in STI and downstream R&D activities (testing, product and process development)	Develop and implement strategies to retool research infrastructure including the sourcing of local and international funding and contract research	2007-2010	SRC
	Provide services related to: ✓ Certificates of analysis for plan actives ✓ Juice processing, packaging options appropriate target market ✓ Implementing an approved project for plant breeding and disease diagnostics ✓ Tissue culture tech parks for high school students Provide incentives for	2007-2010	SRC

STRATEGIES	SPECIFIC ACTIONS	TIMEFRAME	RESPONSIBILITY
	private sector research, especially in priority areas Provide mechanisms for private sector to be more involved in solving national research problems Identify and align research priorities with national development goals		
Enhance Government's leadership that provides a secure enabling platform for greater STI investment by the productive and service sectors	Finalize and implement STI Policy and other related policies Strengthen the role of the NCST, SRC and other relevant institutions to provide policy support for the development of STI Improve necessary infrastructure for the development of STI such as roads, laboratory and other facilities Improve intellectual property rights Improve facilities to attract FDI oriented to the development of STI Encourage the diaspora through various mechanisms (fora for information exchange) to invest in STI Increase public sector funding for R&D Strengthen the Bureau of Standards Jamaica (BSJ)		

STRATEGIES	SPECIFIC ACTIONS	TIMEFRAME	RESPONSIBILITY
	to improve and apply standards to boost competitiveness of Jamaican Products		
Create and improve strategic public-private sector partnerships, especially in building STI knowledge, skills, competencies and processes for taking advantage of natural and human resources to diversify the economy	Increase customer productivity and improve the quality of goods and services to clients by: ✓ Developing external skills bank re: food, wastewater, tissue culture, packaging for access to external collaborators ✓ Completing and implementing marketing and promotional plans for SRC products	2007 – 2010	SRC
	Develop intermediaries for manufacturing and service sectors by: ✓ Conducting market and other background studies on potential food products and selecting target markets based on research results ✓ Designing and developing products to meet industry needs	2007 – 2010	SRC
	Develop tissue culture plantlets of crops with short production cycles and those of economic importance	2007 – 2010	SRC

STRATEGIES	SPECIFIC ACTIONS	TIMEFRAME	RESPONSIBILITY
	Explore 'roots' products to improve quality and marketability in overseas markets		
	Develop bio-fuels	2007 – 2010	SRC
	Develop nutraceuticals, cosmeceuticals and functional foods by: ✓ Completing documentation of protocols associated with extraction, characterization and standardization of 5 selected plant species (ginger, tumeric, lemongrass, sorrel and rosemary) ✓ Completing NHF project Strengthen the Bureau of Standards Jamaica (BSJ) to improve and apply standards to boost competitiveness of Jamaican Products		
Enhance mechanisms for the transfer of knowledge from research organizations and higher education institutions into marketable goods	Provide training opportunities on commercialization of research Conduct feasible studies on potential marketable products for industry and the wider society Improve intellectual property rights Have fora for knowledge exchange among private		

STRATEGIES	SPECIFIC ACTIONS	TIMEFRAME	RESPONSIBILITY
	sector, research institutions and public sector to inform on various requirements for commercialization of research into marketable goods. Provide funding for research and commercialization of products		
Promote formation of and nurture STI professional organizations as vehicles for STI capacity formation and conduits for the flow of STI knowledge and skills into the country's innovation system	Increase utilization of technologies in client enterprises through**:** ✓ Creating awareness of technology and its availability by developing and implementing public education programmes ✓ SRC keeping abreast of new technologies by attending relevant international conferences and subscribing to relevant publications ✓ Transfer of technologies developed to client enterprises – anaerobic (BST, biodigesters, UASB); convenience/minimally processed foods; extractions (actives, food); tissue culture (glove box, temporary immersion system); air water life system		
<u>Objective 1.3</u> National capability for the development of indigenous STI knowledge, intellectual			

STRATEGIES	SPECIFIC ACTIONS	TIMEFRAME	RESPONSIBILITY
property and businesses elevated and strengthened			
Identify and build capacity of indigenous industry to compete in the domestic and global marketplace	Develop and implement strategies to retool research infrastructure including the sourcing of local and international funding and contract research through: ✓ Formalizing agreements with traditional expertise, commodity boards, Ministry of Agriculture and other relevant organizations on indigenous material usage ✓ Formalize agreements with identified traditional research and development expertise and overseas research institutions Strengthen the Bureau of Standards Jamaica (BSJ) to improve and apply standards to boost competitiveness of Jamaican Products Provide funding for research and commercialization of indigenous products Provide funding and support for local SMEs to develop indigenous products Support SMEs in finding local and international markets for their products		SRC Ministry of Industry, Commerce and Investment, Jamaica Trade & Invest, Ministry of Agriculture, Jamaica Business Development Centre, Ministry of Finance and the Public Service

STRATEGIES	SPECIFIC ACTIONS	TIMEFRAME	RESPONSIBILITY
	Develop health food products for select target groups by: ✓ Designing and developing products following standard operating procedures to meet market demand		SRC
Promote business incubation and formation of STI MSME	Provide sustainable and affordable funding mechanisms and sources for the development of MSMEs Provide institutional support for MSMEs including training in business management Expand and improve the Technology Incubation Centre at Utech Encourage the formation of other Incubation Centres across the island and streamline their activities Provide information to businesses through various media, especially through ICTs Improve government services (including e-government) to support MSMEs Encourage collaboration between various business professional organizations such as the JMA, JEA,		

STRATEGIES	SPECIFIC ACTIONS	TIMEFRAME	RESPONSIBILITY
	JSA		
Create knowledge parks and centres of excellence to facilitate R& D and innovation, with emphasis on consolidation of indigenous technologies	Formulate a research agenda in line with development priorities Improve necessary infrastructure such as ICT, roads, land etc Strengthen existing centres of excellence such as Centre of Excellence in Renewable Energy (CERE) Create networks of knowledge exchange		
Strengthen the national Intellectual Property Rights System	Review and improve the current IPR system Strengthen JIPO to effectively carry out its functions Provide information to the public through various media on IPR Improve data systems on patents, trademarks, royalties etc		Ministry of Industry, Investment and Commerce, JIPO
Promote multi- and cross-disciplinary diversity in STI R&D teams	Provide training/fellowships in R&D areas of national importance Have cross-faculty degrees at the tertiary level e.g. physics and management; chemistry		

STRATEGIES	SPECIFIC ACTIONS	TIMEFRAME	RESPONSIBILITY
	and social policy etc		
Objective 1.4 **Popularize a STI culture as a viable agent of social and economic transformation**			
Entrench a dynamic national and local decision-making process based on reliable scientific and other relevant information	Identify and streamline existing databases on STI Identify, streamline and track STI indicators and other relevant indicators Identify relevant agency (maybe the NCST or the PIOJ) to coordinate and manage STI database Greater collaboration through various means with STATIN and relevant STI related agencies and ministries to identify relevant statistics Encourage evidence or information based decision and policy-making Teach the importance of information-based decision-making thoughout the school system Have regular fora (meetings, seminars, workshops, training) on the importance of information in the information society		NCST, PIOJ, relevant ministry

STRATEGIES	SPECIFIC ACTIONS	TIMEFRAME	RESPONSIBILITY
Promote lateral thinking in organizations to encourage management styles that are more receptive to and nurture and support creative ideas	Foster public-private sector partnerships in developing and rewarding creativity Provide mechanisms for creativity in organizations such as forming creative teams, empowering staff to solve organizational (an external) issues. Promote lateral thinking throughout the school system Promote lateral thinking as an important attribute of management Encourage and reward creativity in organizations by creating a working environment that encourages creativity Provide training for employees to develop entrepreneurial and creative skills		
Promote publication of indigenous STI outputs including conference proceedings; support local journals and STI publications	Produce publications related to the development of new products: Promote publication of relevant research and STI outputs Provide budgetary allocation or source of funding for publications Identify existing database	2007 – 2010	SRC STI agencies, ministries, teaching and research institutions

STRATEGIES	SPECIFIC ACTIONS	TIMEFRAME	RESPONSIBILITY
	of local and international publications done by Jamaicans Create and streamline STI publications database (with other STI database)		NCST, UWI, UTech, PIOJ NCST, PIOJ, UWI, UTech
Support access to STI in rural areas – e.g. via mobile STI labs and show	Expand and improve extensions services from relevant agencies, ministries such as Energy and Mining and Provide satellite STI labs oriented to the national research agenda in rural areas Use ICTs such as cable TVs, mobiles to provide relevant STI information across the country Expand and improve community access points (CAPS) in relevant communities		
Provide incentives for fostering an innovative culture	Expand and improve the Innovation Awards Have a national system for rewarding creativity and innovation in spheres related to national development Improve the socio-economic system/infrastructure to encourage competition in various industries and		

STRATEGIES	SPECIFIC ACTIONS	TIMEFRAME	RESPONSIBILITY
	sectors		

Goal # 2 - Excellent and distinctive R&D capability and a reputation for innovation

STRATEGIES	SPECIFIC ACTIONS	TIMEFRAME	RESPONSIBILITY
Objective 2.1 **Dynamic, responsive National Innovation System exists**			
Create access to venture capital, including attracting FDI and setting up revolving loan schemes for SMEs or implementing a tax credit all aimed at attracting more research intensive activity in Jamaica.	Improve the local infrastructure to attract FDI Re-engineer local policy framework to orient FDI to meet national goals and priorities Encourage and ensure knowledge and skills transfer from FDI		
	Develop and institutionalize a national system of innovation		
Align investment in STI infrastructure with national development goals	Conduct a review on gross expenditure on STI in Jamaica		
Promote formation of and nurture STI professional organizations as vehicles for STI capacity formation and conduits for the flow of STI knowledge and skills into the country's innovation system	Carry out and inventory of local STI professional organizations		
	Provide support for STI professional organizations		
	Greater collaboration with STI organizations to advance STI		
	Institutionalize local STI organizations as part of the National Innovation System.		

STRATEGIES	SPECIFIC ACTIONS	TIMEFRAME	RESPONSIBILITY
Outcome 2.2: **A world-class, dynamic enabling environment for persistent R&D and innovation in line with national development goals developed**			
Promote support for SMEs to diversify economy, provide jobs and boost innovation	Implement HACCP Training		
	Conduct wastewater feasibility studies and develop wastewater solutions		SRC
Review and define roles of R&D institutions to gain maximum output of STI investments	Participate in collaborative task group research e.g. Sweet Potato Task Group through CARDI and Ornamental Fish Industry Task Group through JEA Conduct Review and define roles of STI and R&D (especially in the public sector) institutions Promote collaboration among R&D institutions for joint research, better use of resources, reduce duplication and increase efficiency		
Support research institutions at all levels to work alongside business and industry to promote sharing of knowledge and skills and rationalize critical resources	Collaborate with and develop alliances with the following organizations: UWI, Utech, for student training RADA – Product development/training BSJ- Retort, Science popularization Ministry of Agriculture. SDC, Research Consortium		

STRATEGIES	SPECIFIC ACTIONS	TIMEFRAME	RESPONSIBILITY
Create an effective policy and legislative framework to support and advance STI including strengthening the Intellectual Property Rights (IPR) System	Conduct workshops on IPR Fast-track the enactment of Patent legislation Strengthen JIPO		
Create mechanisms to capture raw creativity and skills and put them into the formal sector	Create courses customized for persons who do not meet the normal standards of matriculation Have STI competitions to identify and capture innovation Provide incentives for innovative informal MSMEs to come into the formal economy		
Outcome 2.3 **The national productive capacity and competitiveness through efficient application of innovation improved**			
Encourage innovation as mainstream thinking in the productive sectors by creating a system of incentives and rewards for creativity	Institutionalize a national system of innovation Create a system of incentives and rewards for creativity		
Objective 2.4 **Regional Centre of excellence in STI**			
Build world class infrastructure to attract external STI investment	Develop Food Pilot Plant to be an Incubator for SME (locally and regionally)		
	Improve Infrastructure Capacity of the SRC		
Attract STI expertise within the Diaspora to build STI	Market the National S & T Conference to attract scientists from the region and form the Diaspora		

STRATEGIES	SPECIFIC ACTIONS	TIMEFRAME	RESPONSIBILITY
	Collaborate with Carlene Silvera to produce skills banks database of Jamaican technical experts/scientists abroad who may wish to collaborate with local scientists		
Create a platform that encourages the documentation and publication of scientific work on an ongoing basis	Use the following publications to document scientific work – Techpacks, Energy Ministers Bulletin, Jamaica Journal for S & T, Accessories Lists Databases – NCST Skills Banks Science Teachers Database SRC Catalogue Database		
Objective 2.6 **Foster Creativity**			
Increase patent applications	Enact Patent legislation		
Publicize the economic value of patents	Public education campaign through various media on IPR		

Goal # 3 - A Knowledge-Based Society

STRATEGIES	SPECIFIC ACTIONS	TIMEFRAME	RESPONSIBILITY
Objective 3.1 **Networks developed and facilitated for knowledge exchange both locally and internationally**			
Broaden access to knowledge	Expand and improve computer and internet access		
	Expand and improve government and national library services (by improving the use of ICTs)		
	Conduct business and household surveys to measure the penetration and use of ICTs in businesses and the wider society in order to inform policy decisions of ICT infrastructure expansion		
	Increase community access points Identify and track indicators relating to the information or knowledge society Build (and/or) create access to local and international STI knowledge networks		
3.1.3 Create a platform for community based approaches to information dispersion	Implement public education and on-site interactions in communities islandwide		

Goal # 4 - Jamaica repositions itself to take advantage of STI in all Aspects of National Development

STRATEGIES	SPECIFIC ACTIONS	TIMEFRAME	RESPONSIBILITY
Objective 4.1 **Existing knowledge both local and international for socio-economic advancement adopted and adapted/Public-private partnerships and commercialization of technologies**			
Scan international market in STI to determine the relevance of existing technologies to the Jamaican economy	Generate technical information e.g. reports on the technologies identified		
	Develop mechanisms e.g. brainstorming sessions, feasibility studies to determine capital outlay, maintenance, knowhow and equipment costs		
	Prepare necessary proposals and get approval		
	Develop project proposals with findings for relevant and appropriate technologies		
Reposition industry to take up new and emerging technologies to improve international competitiveness of local manufacturing	Conduct awareness sessions with industry on available training and technologies		MEM, MIIC, JMA
	Conduct training in specific areas – Cleaner production, EMS, HACCP, GMP, QMS		MEM, MIIC, MIND, JMA
	Provide incentives to industry to adapt appropriate technologies		Ministry of Energy and Mining; MIIC, MFPS

Appendix 1
Task Force - Science, Technology and Innovation

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