GOVERNMENT OF JAMAICA

IAEA
International Atomic Energy Agency

COUNTRY PROGRAMME FRAMEWORK

2018 – 2023

On behalf of the Government of Jamaica:

Signature

Mr. Wayne Henry, PhD, JP
Director General
Planning Institute of Jamaica

09/08/2018
Place and date

On behalf of the International Atomic Energy Agency:

Signature

Mr. Dazhu Yang
Deputy Director General
Department of Technical Cooperation

Aug 09, 2018
Place and date

Option A:

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Contents

Table of Abbreviations

CDB	Caribbean Development Bank
CAIHR	Caribbean Institute for Health Research
CHASE Fund	Fund for Culture, Health, Arts, Science and Education
CRA	Coordinated Research Activities
CRP	Coordinated Research Projects
CPF	Country Programme Framework
DFID	Department for International Development
EU	European Union
FAO	Food and Agriculture Organization
GAC	Global Affairs Canada
GDP	Gross Domestic Product
GEF	Global Environment Facility
HSRA	Hazardous Substances Regulatory Authority
IARC	International Agency for Research on Cancer
ICENS	International Centre for Environmental and Nuclear Sciences
IDB	Inter-American Development Bank
INIS	International Nuclear Information System
MDGs	Millennium Development Goals
MEGJC	Ministry of Economic Growth and Job Creation
MICAF	Ministry of Industry, Commerce, Agriculture and Fisheries
MNS	Ministry of National Security
MFAFT	Ministry of Foreign Affairs and Foreign Trade
MOH	Ministry of Health
MSET	Ministry of Science Energy and Technology
NCDs	Non-Communicable Diseases
NEPA	National Environment and Planning Agency
NHF	National Health Fund
NIC	National Irrigation Commission
NWC	National Water Commission
ODPEM	Office of Disaster Preparedness and emergency Management
PAHO	Pan American Health Organization
PIOJ	Planning Institute of Jamaica
RADA	Rural Agriculture Development Authority
RTS	Radiation Technical Services
SRC	Scientific Research Council
SDGs	Sustainable Development Goals
UNMSDF	United Nations Multi-Country Sustainable Development Framework in the Caribbean
UTECH	University of Technology
UWI	University of the West Indies
WASP	Wien Automatic System Planning Package
WHO	World Health Organization
WRA	Water Resources Authority

Executive Summary

The Country Programme Framework (CPF) articulates a strategic structure for the programme of cooperation between the Government of Jamaica and the International Atomic Energy Agency (IAEA). It is focused on key areas of high priority in line with the national development agenda as well as the mandate of the IAEA. To this end, Jamaica's 2018-2023 CPF will focus on similar priority areas as the CPF for the previous period (2010-2015): Legislative Framework and Regulatory Infrastructure for Radiation and Nuclear Safety and Security; Human Health and Nutrition; Energy Planning and Industry; Management of Water Resources; Environmental Protection; Food and Agriculture; Radiation Technology; and Human Resource Development.

Major highlights of the cooperation programme under the previous CPF include the full establishment and operationalization of the Hazardous Substances Regulatory Authority (HSRA); the upgrading of the Slowpoke Research Reactor; support to the water sector for potable and irrigation purposes, capacity building for cancer treatment and control, improved ability to detect malnutrition (undernutrition and obesity) and to monitor intervention, as well as improvement in crop production. The CFP process is spearheaded by the Planning Institute of Jamaica (PIOJ) with support from key partners, including the National Water Commission (NWC), National Irrigation Commission (NIC), Ministry responsible for Agriculture, HSRA, the International Centre for Environmental and Nuclear Sciences (ICENS), Scientific Research Council (SRC), University of the West Indies (UWI), Ministry of Health (MOH), and the Ministry of Foreign Affairs and Foreign Trade (MFAFT).

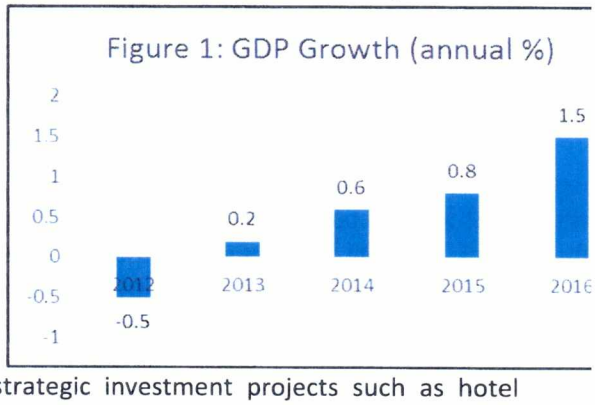
1. Situation Analysis

Country Context

Jamaica is the largest English-speaking country in the Caribbean. It is an island with an area of 10,991 km^2 and a population of approximately 2.7 million with an average annual growth rate of 0.1%, and is projected to reach 2.9 million by 2030. For decades, Jamaica's economy has been characterized by low GDP growth and very high levels of public debt. Over the past 20 years, annual growth rates have averaged a little over half a percent.[1] The country was hit particularly hard by the 2008 financial crisis and went into a full-scale recession. Economic output has been constrained by a series of natural disasters such as hurricanes and tropical storms in 2001, 2004, 2005, 2007, 2010, 2012 and more recently, by flood rains which significantly damaged road infrastructure.

Furthermore, the openness of the economy significantly contributes to its vulnerability to external shocks. Nevertheless, in recent years, government policies have successfully focused on reducing debt and achieving macroeconomic stability, while implementing structural policies to foster growth and reduce poverty. To achieve macroeconomic stability, Jamaica has run the most austere budget in the world over recent years, maintaining a primary surplus of more than 7.5 percent of GDP for three consecutive years.

Although remaining low, GDP growth rate has steadily risen in the past five years, reaching 1.5 percent in 2016 (See figure 1). In the first quarter of 2017, GDP growth showed an increase of 0.1 percent when compared to the corresponding quarter of 2016 with a projected range of 1.0-2.0 percent by the end of 2017[2]. The tourism, construction and manufacture sectors contributed to the growth and the mining sector is expected to grow due to the reopening of a key bauxite plant. However, the agricultural sector declined in the first quarter of 2017 owing to unfavourable weather conditions. Meanwhile, domestic consumption strengthened and the unemployment rate decreased. Short-term prospects for the economy are generally positive based on several factors, including strengthening performance of industries such as tourism, mining and quarrying, as well as continued implementation of strategic investment projects such as hotel construction, port expansion and logistic related activities.



National Goals, Outcomes and Strategies and Implementation of the Sustainable Development Goals (SDGs) in Jamaica

The country's development agenda is directed by its Vision 2030 Jamaica – National Development Plan which was published in 2009. The Plan provides a strategic road map to prepare the country for achieving developed country status by 2030. It envisages a major transformation of Jamaica from a middle-income developing country to one that affords its citizens a high quality of life and world-class standards in critical areas including education, health care, nutrition, basic amenities, access to

[1] STATIN, 2016
[2] PIOJ, 2017

environmental goods and services, civility and social order. The four national goals envisioned in the Plan are: (i) Jamaicans are empowered to achieve their fullest potential; (ii) Jamaican society is secure, cohesive and just; (iii) Jamaica's economy is prosperous; and (iv) Jamaica has a healthy natural environment.

Operationally, the 4 National Goals are mapped into 15 National Outcomes, which in turn will be pursued through National Strategies. The National Outcomes reflect the desired changes in development conditions and, when accomplished, lead to the achievement of the National Goals. Each outcome is aligned to a specific goal, and collectively they provide the roadmap for achievement and success.

Implementation of the National Development Plan is closely aligned with that of the SDGs which seek to build on the gains made under the Millennium Development Goals (MDGs) which fostered commitment and provided a roadmap for development efforts at the global and national levels. Jamaica made significant progress in achieving these goals, namely to: reduce extreme poverty and hunger; achieve universal primary education; promote gender equality and empower women; reduce child mortality; improve maternal health; combat HIV/AIDS, malaria, and other diseases; ensure environmental sustainability; and develop a global partnership for development.

An assessment of Jamaica's national planning documents, using the Rapid Integrated Assessment methodology developed by UNDP, showed that Vision 2030 Jamaica — National Development Plan, the Medium-Term Socio-Economic Policy Framework and sectoral policies are strongly aligned with the SDGs, as depicted in Table 1 below. Jamaica's planning documents reflect, either fully or partially, 91.3 percent alignment with the 115 SDG targets deemed relevant for the country[3]. Vision 2030 Jamaica will thus be the axis around which SDG implementation will be organized and this Roadmap for SDG Implementation will assist in achieving the objectives of the national development agenda set out in the Plan. The real challenge in Jamaica is therefore not about landing the 2030 Agenda, but about implementing policies through initiatives that will trigger fast and sustained progress towards the goals in a context of limited fiscal space.

The priority areas to be covered by this CPF are directly aligned to the national development goals as well as the SDGs as reflected (See table 1). The IAEA is directly supporting the achievement of at least 9 of the 17 SDGs, namely Zero Hunger; Good Health and Well-being, Clean Water and Sanitation; Affordable and Clean Energy; Industry Innovation and Infrastructure; Life on Land; Life Below Water; and Partnership for the Goals. National and regional initiatives provide unique and valuable assistance in critical areas of the country's development through the application of nuclear and isotopic techniques. The PIOJ is the national coordinating agency for the technical cooperation programme with the IAEA.

Despite the high level of alignment between Jamaica's own development plan and the SDGs as well as the United Nations Multi-Country Sustainable Development Framework (UNMSDF) and notwithstanding the Government's commitment to the implementation of the IAEA supported projects, the fiscal constraints faced by the country could impede sustainability of project outcomes. These constraints also affect retention of capacity built in critical specialized areas through training programmes supported by the IAEA. Consequently, the Government has sought to identify creative means of retaining capacity through partnerships with institutions such as UWI.

[3] A Road Map for SDG Implementation in Jamaica, January 2017

Table 1: Alignment of Vision 2030 Jamaica, SDGs, UNMSDF and IAEA Priority Areas

IAEA Priority Areas	UNMSDF Strategic Priorities/Outcomes	Vision 2030 Jamaica		SDGs
		National Goals	National Outcomes	
✓ Human Health and Nutrition ✓ Food and Agriculture ✓ Human Resource Development ✓ Radiation Technology ✓ Legislative Framework and Regulatory Infrastructure for Radiation and Nuclear Safety and Security	**Strategic Priority: An Inclusive Equitable and Prosperous Caribbean** Outcome 2: Access to equitable social protection systems, quality services and sustainable economic opportunities improved **Strategic Priority: A Healthy Caribbean** Outcome 1: Universal access to quality health care services and systems improved Outcome 2: Laws, policies and systems introduced to support healthy lifestyles among all segments of the population	**GOAL 1: Jamaicans are Empowered to Achieve their Fullest Potential**	A healthy and stable population Effective social protection	
✓ Radiation Technology ✓ Legislative Framework and Regulatory Infrastructure for Radiation and Nuclear Safety and Security	**Strategic Priority: A Cohesive, Safe and Just Caribbean** Outcome 2: Equitable access to justice, protection, citizen security and safety reinforced	**GOAL 2: Jamaican Society is Secure, Cohesive and Just**	Security and safety	
✓ Human Resource Development ✓ Food and Agriculture ✓ Energy Planning ✓ Radiation Technology and industrial applications	**Priority Area: A Sustainable and Resilient Caribbean** Outcome: 1: Policies and Programmes for climate change adaptation, disaster risk reduction, and universal access to clean and sustainable energy in place Outcome 2: Inclusive and sustainable solutions adopted for the conservation, restoration, and use of ecosystems and natural resources.	**GOAL 3: Jamaica's Economy is Prosperous**	Energy security and efficiency A technology-enabled society Internationally competitive industry structures Sustainable management and use of environmental and natural resources	  
✓ Radiation Technology ✓ Energy Planning ✓ Environmental Protection ✓ Management of Water Resources ✓ Legislative Framework and Regulatory Infrastructure for Radiation and Nuclear Safety and Security	**Priority Area: A Sustainable and Resilient Caribbean** Outcome: 1: Policies and Programmes for climate change adaptation, disaster risk reduction, and universal access to clean and sustainable energy in place Outcome 2: Inclusive and sustainable solutions adopted for the conservation, restoration, and use of ecosystems and natural resources.	**GOAL 4: Jamaica has a Healthy Natural Environment**	Hazard risk reduction and adaptation to climate change Sustainable urban and rural development	 
Source: Planning Institute of Jamaica, 2017				

Previous Assistance from the IAEA

Jamaica has been a Member State of the IAEA since 29, December 1965 and has derived significant benefit under national, regional and interregional projects in various fields of activities. Jamaica seeks to keep its contribution to the Regular Budget, Technical Cooperation Programme and National Participation Cost up-to-date, cognizant of the link between these payments and the Agency's ability to provide assistance to its member states at the desired level.

Under the previous CPF (2010-2015), Jamaica pursued eight national projects within similar focal areas as indicated above with combined funding of €2,535,938[4]. Of these projects, two were completed and eight are ongoing. Major highlights of the cooperation programme include the full establishment and operationalization of the HSRA; the upgrading of the Slowpoke Research Reactor; support to the water sector for potable and irrigation purposes, capacity building for cancer treatment and control as well as improvement in crop production.

Future TC Programme Envisaged

The future TC programme for Jamaica will be designed and delivered in accordance with the existing National Development Plan Vision 2030, and the associated Medium Term Socio-Economic Policy Framework as well as the SDGs and the UNMSDF 2017-2021. In this regard, the priority areas identified for the medium term are Legislative Framework and Regulatory Infrastructure for Radiation and Nuclear Safety and Security; Human Health and Nutrition; Energy Planning; Management of Water Resources; Environmental Protection; Food and Agriculture; Radiation Technology; Human Resource Development

The new strategy for technical cooperation pays a great deal of attention to the near-term as well as medium-term core programme, including high priority selection projects with model Project potential, which should meet the TC central criteria as set above. To date, four projects have been developed to be implemented under the 2018-2019 project cycle. All new projects have met the referenced criteria.

The CPF also serves to further the possibility of initiating regional projects where distinct benefits can be derived from coordinated and cooperative activities involving more than one recipient Member State in the region. Jamaica is more advanced in the use of nuclear technology to support its development in areas such as food and agriculture and; health and nutrition; water management and research relative to other countries in the Caribbean region, nine of which are now member states of the IAEA. The establishment of the HSRA represents another area of advancement for the country.

In light of this, and given the location of the Mona campus of UWI, a regional institution, Jamaica is well placed to function as focal point for collaboration with the IAEA on the use of nuclear technology to aide in the development of the region through partnerships and shared services. The growth in the number of Caribbean countries which are IAEA member states, signals the need for a regional institution such as UWI to function as the hub for nuclear knowledge management and information. Resources such as the International Nuclear Information System (INIS) is one such asset through which member states in the region could accessed nuclear related data and valuable information.

As it relates to Jamaica's own advancement, despite significant progress in developing sectors such as agriculture, water and health through the use of nuclear technology and capacity building with assistance from the IAEA, it is important to recognize that some challenges still remain. Among these

are issues of food security due to the impact of climate change on agriculture and water supply as well as the growing levels of non-communicable diseases, including cancer. As Jamaica strives to become a society that is productive, healthy and protected in times of natural disasters, technical cooperation with the IAEA is considered essential in addressing specific problems in which nuclear technology is viewed as a cost effective and viable solution and where such assistance in building local expertise and introducing new technologies is required.

Another area for expanded future support is vector control where the IAEA is in a unique position to assist Jamaica in its effort to minimize the effect of vector borne diseases such as dengue, Zika and chikungunya through the use of nuclear technology. Recently, the Agency supported the country through the provision of testing equipment at the national laboratory. Jamaica has also expressed interest in having the Agency's assistance with the implementation of a sterile mosquito programme. The IAEA also has a clear advantage in the area of plant and food irradiation, another field in which Jamaica has an interest for support to its agriculture sector.

Jamaica will seek to expand its research agenda to take advantage of the opportunity presented through the collaboration with the IAEA. Research Institutions in Jamaica are already participating in the IAEA Coordinated Research Activities (CRA). Currently Jamaican Institutions have signed 7 research contracts with the IAEA in the fields of Human Health, Nuclear Science, Nuclear Security and Nuclear Fuel Cycle. Coordinated Research Projects (CRPs) have the potential to lead to technical cooperation projects supported by the IAEA. Such Coordinated Research Projects provide the country with the ability to develop cutting edge technologies and to undertake research in nuclear techniques, through collaboration between their respective research institutions and IAEA experts. By advancing national knowledge and expertise in a particular area, Jamaica will be better equipped to implement technical cooperation projects. This moves scientific research and development out of the laboratory and into the field.

1.1 Nuclear and Radiation safety and security

The legal framework for the safe, secure and peaceful use of nuclear energy and ionizing radiation in Jamaica is mainly contained in the Nuclear Safety and Radiation Protection Act of 2015. As to the international legal framework, Jamaica is already a party to some international legal instruments adopted under IAEA auspices, such as the Convention on the Physical Protection of Nuclear Material and its Amendment, and will take steps to consider adhering to other relevant ones, such as the Convention on Early Notification of a Nuclear Accident, the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, the Convention on Nuclear Safety and the relevant nuclear liability instruments (see Annex). Jamaica will avail itself of the benefits of the relevant regional/interregional TC projects to receive legislative assistance in these endeavours, as may be required.

The Hazardous Substance Regulatory Authority (HSRA) was established in August 2015 by Nuclear Safety and Radiation Protection Act, 2015 and became fully functional in September 2017. The associated regulations are in effect since December 2017. Through the establishment and operationalization of the HSRA, Jamaica is seeking to, among other things, effectively regulate and monitor the activities, practices and facilities involving ionizing radiation and nuclear technology to ensure the protection of the health, safety and security of persons, property and the environment from the harmful effects of radiation. This approach supports the country's commitment towards safety and security across the various sectors utilizing nuclear techniques. However, there is specific relevance to the health and environment sectors. These are captured under Goals 1 on 4 of the

National Development Plan respectively, SDGs 3 and 15 as well as UNMSDF outcomes focused on improved universal access to quality health care services and systems and policies and programmes for disaster risk reduction (See table 1).

The assistance of the IAEA will continue to be critical to the maintenance of a good regulatory environment to ensure the proper use of nuclear technology in the country and compliance with international safety standards and related IAEA requirements including the Code of Conduct on the Safety and Security of Radioactive Sources and Guidance on the Import and Export of Radioactive Sources. Entities such as the HSRA, responsible for regulatory functions, as well as users of radioactive sources including ICENS, health facilities and the UWI could benefit from the capacity building to be provided by the IAEA. Assistance to be sought through all modalities such as expertise, group training for newly recruited regulatory staff, scientific visits and fellowships for designated technical staff of the regulatory authority, as well as the provision of essential radiation monitoring equipment. As part of developing broad-based infrastructure for sustainable radiation safety and nuclear security, there is a need to build capacity in these fields by the provision of training opportunities for trainers and radiation safety and nuclear security officers at licensee institutions and law enforcement agencies. There is also a need to improve the infrastructure for safe and secure storage of spent radioactive sources as well as a more robust inventory system to account for the over 450 nuclear and medical radioactive sources in the country (See table 3).

The increased number of trained personnel, the development of a National Plan on the use of Radioactive Sources improved availability of the relevant equipment to monitor the use of radioactive sources and the development of an action plan for the establishment of a dedicated disposal site for radioactive are crucial to the operations of the sector.

Table 3: Nuclear and Medical Radiation Source Inventory in Jamaica

Source(s)	Type of Operation	No. of Sources
Cs-137	Medical	59
Co-60	Medical	2
Am-241	Medical	10
Sr-90	Medical	3
Radium	Medical	380
Linear Accelerator	Medical	3
Ir-192	Industrial	3
Unknown	Industrial	Unknown
U-235	Academia	1
TOTAL		459

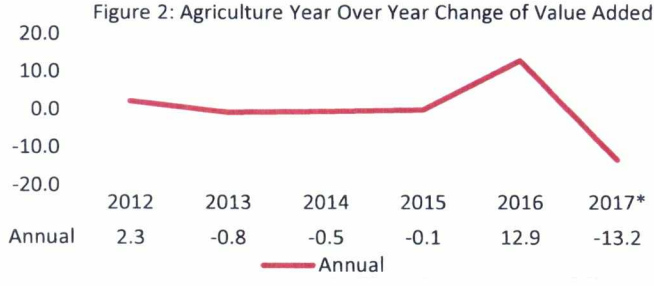
Source: HSRA, formerly under Bureau of Standards Jamaica, 2015

1.2 Food and agriculture

The Jamaican economy remains heavily reliant on the exploitation of its rich natural base including agriculture. This exposes the economy to vulnerability due to unfavourable weather conditions linked to climate change as well as effects of pests such as the beet army worm on crops among other factors. Performance of the agriculture sector was flat for the 2012-2015. However, there was marked improvement in 2016 with real value added for the sector expanding by 13.5 percent, accounting for 7.3 percent of gross domestic product (See Figure 2). This performance was mainly attributable to improved weather conditions. Performance in the sector for the first two quarters of 2017 reflects a decline which is expected to continue for the remainder of the year due to residual impact of unfavorable weather conditions.

As it relates to the medium to long-term priorities of the sector, Vision 2030 Jamaica National Development Plan provides for the reforms of the Jamaican agricultural sector through a research-oriented, technological, market-driven and private sector-led transformation, focusing on high value production and contributing to national food security. All policies and programmes of the Government are aligned with the objectives and outcomes of the Plan. These include a National Food and Nutrition Policy as well as National Seed Policy (referring to planting material). The outcome of effective social protection being pursued under the National Development Plan is directly aligned with SDG 2, related to ending hunger. Similarly, the achievement of food security and improved nutrition and promoting sustainable agriculture are also linked to the UNMSDF outcome related to access to equitable social protection systems.

Figure 2: Agriculture Year Over Year Change of Value Added



*The statistic reflected are for the first two quarters of 2017

Given the importance of the area of food and agriculture to the country, continued support from the IAEA will be critical to the advancement of the various programmes being pursued, as well as those that are planned under the thrust for attainment of economic growth in the medium term. The Ministry with responsibility for agriculture is keen on accessing assistance with screw worm eradication with the possibility of including beet army worm. In addition, entities such as the scientific Research Centre, Bodles Research Centre and ICENS will also continue to rely on the valuable assistance from the IAEA to pursue critical research aimed at advancing the sector through new and innovative approaches, involving nuclear technology.

The National Irrigation Commission and the Water Resources Authority (WRA) are also important to the success of the sector, given the essential nature of water and ensuring its availability in adequate quantities for crop irrigation. In fact, irrigated agriculture consumes a major share of water produced in Jamaica. However, there are significant challenges with improving the levels of irrigation and drainage management, including water productivity, irrigation efficiency, fertilizer use efficiency and movement of contaminants. Capacity building in the use of stable isotope technology will therefore contribute specially to increased irrigation water productivity and ensure Jamaica realize objectives outlined in Jamaica's Food and Nutrition Security Policy (2013) as well as the Water Sector Policy (2004, currently being revised). It is envisaged that the current approach of implementing initiatives to improve water and fertilizer productivity as well as improving water quality will continue, utilizing as far as possible interagency collaboration and stakeholder engagement.

Coming out of the support to be provided under the CPF, the Food and Agriculture Sector will be able to strengthen its plant diagnostic competencies and release improved varieties of specific tubers resistant to rhizome rot and anthracnose.

Additionally, the country has safeguarding human and animal health as a continued priority and is implementing several policies and programmes geared towards enhanced disease surveillance, monitoring and control and improvement of food safety systems. This includes ongoing work aimed at improving laboratory infrastructure capability, as well as capacity building of staff. Assistance from the IAEA would serve to enhance human capacity for the early and rapid diagnosis and control of transboundary animal and zoonotic diseases, thereby contributing to a reduction in the transmission and impact of zoonotic diseases on the population. The Ministry of Industry, Commerce, Agriculture and Fisheries recognizes the link between importation of animals and animal products and the risk of introducing zoonotic diseases into the country. Furthermore, in an effort to safeguard human and animal health, Jamaica has implemented and continues to strengthen stringent sanitary and phyto-sanitary guidelines for importation of foods, in keeping with international best practices. In addition, disease surveillance, inspection and monitoring procedures are routinely carried out.

The Animal Breeding and Husbandry Division of MICAF has taken a multi-disciplinary approach to conservation, development and utilisation of farm animal genetic resources, for the attainment of food security in animal protein. The Ministry seeks to facilitate exploitation of cost effective animal production systems through the development and application of new technologies. Among the primary activities undertaken are dairy cattle, breeding and genetics, production research, animal nutrition, forage and pasture research, sheep and goat improvement, and swine production research. Notwithstanding the significant strides made by the country in this area, the programme which focuses on improving animal reproduction and breeding and animal nutrition can be strengthened through the use of nuclear technology.

1.3 Health and nutrition

Good health and wellbeing, SDG 3, is reflected in the outcome #1, "A healthy and stable population" under Goal 1 of Vision 2030 Jamaica National Development Plan. The strategies articulated therein are aimed at the attainment of accessible, quality health services and the promotion of healthy lifestyles, also consistent with the UNMSDF outcome of universal access to quality health care services and systems. The health sector specific goals focus on strengthening disease surveillance, risk mitigation reduction, responsiveness of the health system, health promotion, primary health care and the health infrastructure. Priority areas for which IAEA's assistance is indicated are reduction of morbidity and premature mortality from chronic non-communicable diseases including cancers and communicable diseases, diagnostic services, vector control using the sterile insect technique, environmental health as well as nutrition and food safety. In 2014, 67% of deaths of persons 5 years and older were attributable to the main NCDs, an increase of 21.5% between 2010 and 2014[5], and distributed as cardiovascular disease 35%, cancer 19%, diabetes 11%, and chronic respiratory disease 2%. Additionally, from a 2001 study which found Obesity in 20% of the study population, a prevalence of 25% was estimated in 2007- 2008. According to the International Agency For Research on Cancer (IARC) (reference: Globocan 2012), the estimated 2012 incidence of cancer for all cancers and ages is 5804 . The most common sites are prostate (1230) and breast (843). It is estimated that by 2030, there will be 8652 new cases of cancer diagnosed. Estimated cancer mortality in 2012 was 3403 cases and is expected to increase by 2030 to 5158 cases annually.

In-keeping with Government's commitment to facilitating accessibility of the general population to quality health care, two linear accelerator centres with one linear accelerator and one high dose rate brachytherapy machine each and one nuclear medicine facility are being established. An ImPACT

[5] Demographic Statistics 2015.Statistical Institute of Jamaica & Ministry of Health, National Non-Communicable Disease Unit, 2016 unpublished data

mission was conducted to Jamaica in March 2012. The Ministry of Health (MoH) endorsed the recommendations of the report.
IAEA's complementary support is required to strengthen the capacity of professionals to effectively and safely apply advanced nuclear medicine and radiotherapy techniques to the diagnosis and treatment of chronic diseases. The interventions will focus on training of medical physicists, therapists, and oncologist in advanced treatment techniques; pharmacists, radiologists and technicians in the use of nuclear and stable isotopes; radiation safety officers and analysts skilled in mass spectrometry; and upgrading of laboratory infrastructure and analytical capabilities. Building local training capacity is a sustainability feature of the IAEA interventions to ensure replacement of qualified staff lost through attrition.

In relation to nutrition, the use of radioactive and stable isotope techniques can be applied to: Chronic lifestyles diseases such as obesity, diabetes and hypertension; Malnutrition – Childhood malnutrition and malnutrition in hospitalized patients; Breastfeeding and its effect on growth and cognition; Anaemia and micronutrient deficiencies in children and adult; the impact of environmental toxins on infant's nutrition, growth and cognition; Chronic renal disease and Oncology; Sickle Cell disease.

The objectives of the CPF will be realized through continued partnerships with the Caribbean Institute for Health Research (CAIHR) and other departments of UWI, MOH, Fund for Culture, Health, Arts Science and Education (CHASE Fund), National Health Fund (NHF) and the University of Technology (UTECH).

Given the resources and expertise to be derived under the CPF, the Health Sector will have enhanced capacity in radiation medicine towards the effective management of cancers, a key chronic non-communicable disease in Jamaica

1.4 Water and the environment

Outcome #13 under Goal 4 of Vision 2030 Jamaica National Development Plan calls for the sustainable management and use of the country's environmental and natural resources as a means of enhancing the quality of life for all Jamaicans, as well as advancing the sustainable prosperity agenda of the country. This is aligned to SDG 6 which speaks to clean water & sanitation as well as the UNMSDF outcome on Inclusive and sustainable solutions adopted for the conservation, restoration and use of ecosystems and natural resources.

The NWC is responsible for the production and management of the country's potable water with production of 177 million gallon per day, serving 470,000 customers or two (2) million of the country's 2.6 million residents, in keeping with the National Health and Environmental Regulatory Standards inclusive of that of the World Health Organization (WHO). In addition, the NWC operates some 70 wastewater treatment plants, more than 100 wastewater pump stations and over 500 kilometers of collector and trunk sewers. Furthermore, the Water Resources Authority is responsible for the management of water resources in Jamaica, including the monitoring and allocation of the resource. The agency has an island-wide Hydromet data collection network consisting of both stream flow and groundwater level monitoring stations.

Although the NWC currently conducts Chemistry and Microbiology testing of its potable water and wastewater, the application of the stable isotope technology will provide a comprehensive water quality analyses and testing towards the identification of source pollutants such as nitrates, phosphates, sulphates, sodium, chloride and heavy metals to which water sources are vulnerable to contamination. This will facilitate capacity of the country for improved integrated water supply and

sewerage system development planning, in keeping with the quality, accessibility, availability and vulnerability (to pollution) of the water resources on the island.

Application of isotopic finger printing technology will assist the country in reducing non-revenue water which accounts for about 70 percent of the 177mgd produced by providing guidance on the efficient operation and management of its water supply distribution network. It will also assist with the movement and interaction of water from the various sources; consistent and routine monitoring of the island's ambient water quality; a more complete understanding of precipitation and groundwater/surface water flow dynamics, including a more precise determination of the contributions of precipitation to groundwater recharge, precipitation to surface water discharge, groundwater flow to surface water discharge, and groundwater submarine discharge to the marine environment; and a more complete understanding of the age of water and travel times for water within the island's hydrosphere.

In this regard, possible areas for IAEA's support includes water quality control assurance and management potable and waste water service supply; non-revenue water management efficiency and reduction; water and sewerage systems/infrastructure development and planning; water retaining and storage structures and facilities; and technical capacity building and institutional strengthening in stable isotope technology. The NWC, WRA and NIC are the main counterparts working in specific areas that could benefit from IAEA support. In addition, potential partners who could assist in achieving the of the goals of the CFP include the National Environment and Planning Agency (NEPA), the Climate Change Division of the Ministry of Economic Growth and Job Creation (MEGJC), the MOH, WRA, NIC, UWI and the Planning Institute of Jamaica.

Strengthening of human and institutional capacity of key entities in the application of isotopic technology is essential to ensure improved efficiency and management of the country's water resources to ensure quality and reliable supply as well as the provision of suitably sewerage system.

1.5 Energy and industry

Under Goal 3 of the Jamaica's National Development Plan Outcomes 10 and 12 speak to "Energy security and efficiency" and internationally competitive industry structures" respectively, corresponding with SDGs 7 and 9. Additionally, under priority area on "A sustainable and Resilient Caribbean" the UNMSDF seeks to support governments to strengthen institutional and community resilience at both regional and national levels as it relates to renewable energy systems. The UNMSDF also speaks to supporting countries to address the need for policies and programmes for access to clean and sustainable energy.

The development of Jamaica's energy sector continues to demonstrate much promise in reducing dependence on imported petroleum, thereby lowering the cost of energy to consumers and creating a framework for better use of energy through conservation and efficiency. These positive advances have been facilitated by the country's first long-term National energy policy 2009-2030, promulgated in November 2010. Since this promulgation, the main focus of the energy sector has been on modernization of the energy infrastructure; diversifying fuel sources; improving energy efficiency and conservation; enhancing energy security; and developing the renewable energy sub-industry among others.

In the medium term, greater emphasis must be placed on strengthening the institutional capacity of the Ministry of Science, Energy and Technology (MSET) on energy technology, energy-environment issues, so that they can be better equipped for meeting future challenges on energy planning and policy making. In addition, supporting and developing programmes at tertiary institutions geared

toward research and the development and application of appropriate energy technologies would be beneficial as they could be permanent source of knowledge and expertise in future.

As it relates to support from the IAEA, consideration is beginning to be given to the feasibility of nuclear energy in Jamaica, using small nuclear reactors and this will lead to increased interest in reactor training, including the use of SLOWPOKE, for initial familiarization, nuclear physics, energy planning and further development of work in radiation monitoring and safety. Furthermore, the work of ICENS is essential across industries, as the country seeks benefit from enhanced radiation and nuclear safety; improved personnel radiation monitoring systems, including TLD dosimetry and area monitoring, enhanced elemental analysis for agriculture, food safety and security, the environment and human and animal health; in a variety of media (soil, water and biological samples); data interpretation and staff training by means of scientific visits to foreign institutions, fellowships, visiting experts etc.

The country therefore seeks improved human resource development in energy studies as well as renewed research and development of systems and technologies in the energy sector towards achievement of a modern, efficient, diversified and environmentally sustainable energy sector.
As it relates to industry, Jamaica aims to fully develop its competitive industry structures which would provide the microeconomic conditions for increased productivity throughout the economy. Among the targeted industries are Minerals, Construction and Shipping Logistics. Other important focal areas include coastal erosion, dam integrity, waste water and sewage facilities, oil refineries and sedimentation in the water supply network. This is critical in the country's efforts to strengthen the diversification of revenue sources and to be less dependent on the service industries such as hospitality and tourism.

Jamaica's development agenda in these areas is reflected in the various policy documents. The National Minerals Policy (2017-2030) creates a framework to attract investment in the industrial and metallic minerals sector which includes prospecting for gold and copper, as well as utilizing Jamaica's limestone potential. The Construction Industry Policy (2014) of Jamaica encourages innovation and modernization in assessing structures such as roads, bridges and buildings. Additionally, the Government of Jamaica has embarked on the development of a Global Logistics Hub to capitalise on the trade and business opportunities that will emanate from the expansion of the Panama Canal, which opened on 26 June 2016. Jamaica already has a very vibrant shipping industry, and Kingston Harbour is the seventh largest natural harbour in the world.

The IAEA is well placed to assist the country in enhancing its capacity to further exploit the benefits to be derived from these industries. Quality assurance and quality control are essential to the success of investment in these industries. Consequently, the application of radiation and radioisotope tracers would be important inputs in the development of these industries. This would also assist the country in meeting and maintaining critical international standards which could contribute to the expansion of the market share of exports. Furthermore, the use of radiotracers would assist in conducting sedimentation studies in the water supply network and exploitation of the country's mineral resources, and producing raw minerals and value-added mineral products consumed by various sectors of the economy. Finally, nucleonic systems would assist in the optimisation of dredging works in the Kingston Harbour.

2. Programme Plan

2.2 Nuclear and Radiation Safety and Security

Specific capabilities which could be developed to achieve sector outcomes include:

1) Enhanced capacity of HSRA staff to complete authorization and inspection processes
2) Capacity of technical services personnel enhanced across the sector in radiation safety, security and protection techniques and policies
3) Requisite equipment available to perform radiation inspection
4) Capacity of HSRA staff improved to implement protocols for radiation safety, security and protection
5) Availability of fully operational radiation technical services facilities
6) Requisite equipment available to perform quality control and calibration
7) Establishment of a national strategy for education and training in radiation, transport and waste safety

The establishment of a national strategy for education and training in radiation, transport and waste safety will facilitate the development of a national education and training programme based on the actual training needs: this will allow building competence of the regulatory staff and all the other relevant personnel in authorized facilities and activities in a timely and sustainable manner.

As part of these efforts, and to facilitate the IAEA's assistance, Jamaica should ensure that information on its national radiation safety infrastructure is kept up-to-date in IAEA's Radiation Safety Information Management System (RASIMS). With this purpose, HSRA as the new regulatory body should appoint a RASIMS national coordinator that is directly employed by HSRA. The RASIMS national coordinator should be a senior regulator who is technically competent in radiation safety and who has a good understanding of the IAEA safety standards and of regulatory infrastructure. The appointment of the new coordinator should be officially communicated to the IAEA, in order to register this person and grant him/her the needed access rights to the system. Once this process is completed, updating the information in the system should be initiated.

The following are the programmatic risks identified along with the relevant mitigating strategies:

1) Loss of trained personnel/trainers to be mitigated by training adequate numbers and robust selection of candidates (based on the training needs analysis carried out within the national strategy for education and, training), as well as application of innovative means to provide improved, competitive remuneration
2) Inability to maintain calibrated equipment to be mitigated by the establishment of a Secondary Standard Laboratory

Jamaica and the IAEA Division of Nuclear Security (IAEA/NSNS) jointly developed an Integrated Nuclear Security Support Plan (INSSP) in 2013, which was officially approved by the Government of Jamaica in 2014. The objective of the INSSP is to identify activities necessary to build an effective and sustainable national nuclear security regime in Jamaica. The INSSP identifies the nuclear security needs and necessary improvements for Jamaica based on the IAEA Nuclear Security Series guidance publications. Jamaica's INSSP provides a customized framework for coordinating and implementing nuclear security activities conducted by Jamaica, the IAEA, and other partners, in a systematic manner. The INSSP covers all aspects related to nuclear security: legislative and regulatory framework, threat and risk assessment, physical protection, detection of criminal and unauthorized acts involving material out of regulatory control (MORC), response to criminal and unauthorized acts including MORC, and sustaining the State's nuclear security

regime. Jamaica's INSSP contains activities from 2014 to 2016 and is planned to be updated and reviewed in 2018. The Division of Nuclear Security is the lead organization within the IAEA responsible for implementing all nuclear security activities.

2.3 Food and agriculture

Specific capabilities which could be developed to achieve sector outcomes include:

1) The establishment of adequate physical infrastructure to enhance the livestock disease screening capacity through upgraded laboratories
2) Enhanced human capacity for the early and rapid diagnosis and control of transboundary animal and zoonotic diseases
3) Improved animal reproduction and breeding and animal nutrition
4) Enhanced human and laboratory capacity in the use of nuclear techniques for crop improvement and phytosanitary measures, including the sterile insect technique for implementation of pest mitigation schemes to facilitate production and trade of horticultural products, among others
5) Enhanced capacity for early detection of non-native pests of quarantine significance and emergency response mechanisms
6) Fully operational self-contained gamma irradiation cell
7) Local researchers trained to use mutation techniques and biotechnology for development of improved vegetative propagated crops and other important staple crops
8) Development of improved disease-resistant mutant varieties of importance, such as ginger, sweet yam and other crops, which are resistant to rhizome rot and anthracnose respectively for implementation
9) Fully operational analytical laboratory, including analysis of isotopes of soil, plant and water for minimizing agriculturally derived pollutants
10) Training and capacity building for assessment of land degradation for climate resilience

The following are the programmatic risks identified along with the relevant mitigating strategies:

1) Absence of a national policy on land use for agricultural purposes to be mitigated by involving decision makers at all stages of the project to secure buy-in;
2) Inability to retain expertise gained through training of personnel to be addressed with the use of video and e-learning tools and written documentation of training material to facilitate sustainability;
3) In adequate budgetary support to be mitigated by ensuring that the required budgetary allocation is made by the counterpart through timely requests in the national budget.

2.4 Health and nutrition

As the country strives to improve the health sector, it is recognised that the health system itself is a key determinant of the health status of the population the health system itself plays an important role in influencing the health status of the population. Consequently, support from the IAEA is required in the following strategic areas:

1) Fully operational Nutritional Laboratory to assess and monitor obesity in research aiming to control obesity across the life course and prevent NCDs
2) Enhanced human capacity in use of nuclear nutrition techniques
3) Health professionals trained in radiation disciplines
4) Established protocols for safe and effective use of radiation medicine for diagnosis and treatment of cancers
5) Strategy developed for local training programmes in radiation medicine disciplines

6) Expansion of nuclear technology application to diagnose and treat diseases (NCDs & CD)
11) Innovative tools to manage the mosquito species, aedes aegypti, including the use of nuclear applications in vector control, such as the application of sterile insect technique.
7)

The main programmatic risk and the relevant mitigating strategy identified is the loss of trained personnel/trainers. This is to be mitigated by training adequate numbers and robust selection of candidates, as well as application of innovative means to provide improved, competitive remuneration. The recommendations from the imPACT review and the strategic plan and action plan for the prevention and control of cancer have further helped identify other areas to be addressed.

2.5 Water and the Environment

Key specific outputs expected from technical cooperation would be the application of stable isotope technology to water utility planning, operation and management as well as the use of nuclear analytical techniques to monitor air quality to provide as follows:

1) Data set in the identification of sources of pollutants such as raw water sources and heavy metals as well as interaction with other bodies of water to include identification of sources and contaminates among others (Q1 2019)
2) Measurement of particulate matter PM10 and PM 2.5 in urban centres, using cascade impactors and elemental quantification using neutron activation analysis and XRF
3) Generation of Hydrologic Maps: Age, Water Quality, Quantity among others (Q2 2020)
4) Technical/specialized training in Isotope Hydrology, testing of and analyses of stable isotopic data sets to enhance Microbiology and Chemistry testing which is being conducted by the NWC's Laboratories (Q1 2019-Q2 2020)
5) Development of Vulnerability Maps for water supply sources (Q3 2021)

The following are the programmatic risks identified along with the relevant mitigating strategies:

1) Lack of requisite staff to perform data collection, analyses and sampling to be addressed through training of personnel across organisations in adequate numbers;
2) Inadequate budgetary support to be mitigated by ensuring that the required budgetary allocation is made by the counterpart through timely requests in the national budget;
3) Unavailability of requisite laboratory equipment: provision of resources should be made to ensure that an alternate equipment is in place as required;
4) Inadequate security of resources such as field equipment: There is an existing mechanism in place among NWC, WRA and Meteorological Services of Jamaica to address this

2.6 Energy and industry

Key specific outputs to be developed for Energy and Industry from technical cooperation include:

1) Personnel trained in the use of the suite of IAEA Energy Planning Tools
2) Customization of the Energy Modelling Tools as follows:
    a. Model for the Analysis of Energy Demand (MAED)
        i. Final energy demand by sector/fuel, Electricity demand, Hourly electric load, Load duration curves
    b. Model for Energy Supply System and their Alternatives and their General Environmental Impacts (MESSAGE)

i. Primary and final energy mix, Emissions and waste streams, Health and environmental impacts (externalities), Resource use, Land use, Import dependence, Investment requirements.

c. Wien Automatic System Planning Package (WASP)
    i. Build schedule, Generation, Costs, Fuel consumption, Emissions.
d. Financial Analysis of Electric Sector Expansion Plans (FINPLAN)
    i. Cash flows, Balance Sheet, Financial Ratios.
e. Simplified Approach for Estimating Impacts of Electricity Generation (SIMPACTS)
    i. Quantification of health impact, estimates 1 adjusted for effective stack height, estimates for more accurate pollutant & receptor distribution.

3) Trained local professionals and establishment of local training programmes in energy management:
4) Trained local professionals in the use of radiotracers, nucleonic control systems and non-destructive testing techniques.
5) Provision of nucleonic control systems, sealed source technology, visualisation technology, radiotracer technology and any applicable non-destructive testing techniques.

The following are the programmatic risks identified along with the relevant mitigating strategies:

1) Availability of suitable Ministry personnel to be trained at the required level to be mitigated by targeted identification of the required staff to be extended outside of the central Ministry
2) Sustainability of programme to facilitate continued utilization of tools and expertise gained to be mitigated through the institutionalization of the resulting tools and expertise
3) Attrition of trained staff from the sector to be addressed through targeted succession planning in the relevant areas of the Ministry

3. Results framework and plan of action

Results framework

	Outcome	Indicator	Means of Verification
Radiation Safety and Security	Strengthened capacity of regulatory body in radiation safety and protection and technical services for quality control in radiation medicine	1. Enhanced capacity of the regulatory body (HSRA) by the end of 2019 2. Quality control system adopted and implemented by at least 3 radiation health facilities by the end of 2019 3. At least 3 facilities working according to the quality control standards by the end of 2019 4. National Strategy for E&T in radiation, transport and waste safety developed by the end of 2019	- Inventory of authorization, Inspection reports - Regulations and protocols adopted; Quality control reports - Audit quality control report on quality control standards - Document on the National Strategy for E&T endorsed by relevant stakeholders
	Indicative Outputs 1. Enhanced competence including nuclear and radiation safety culture of HSRA staff for effective operation of the Authority 2. Protocols and procedures for radiation safety and protection adopted by HSRA according to international standards 3. Radiation safety technical services (RTS) facilities available and fully operational with qualified staff 4. Radiation protection programmes for patients and workers established according to international standards 5. Inspection and medical equipment received and operational 6. Quality control protocols for medical exposure established and in use 7. Trained emergency response personnel across sectors including National Security, Health, Fire Services, coordinated by the Office of Disaster Preparedness and Emergency Management (ODPEM) 8. Training needs analysis carried out for regulatory staff and for the relevant personnel in authorized facilities and activities		

Food and Agriculture	Plant diagnostic competences at the Scientific Research Council strengthened and improved varieties of select crops resistant to rhizome rot and anthracnose respectively released. National Plant Protection Organisation strengthened in early detection of invasive pests and emergency response. Enhanced capacity for the early and rapid diagnosis and control of transboundary animal and zoonotic diseases. Improved animal reproduction and breeding and animal nutrition capacities.	1. Number of SRC Biotechnology staff trained and certified in plant diagnostics and microbiology techniques in agricultural research by the end of 2019 2. Mutants of two ginger varieties and sweet yam resistant/tolerant to rhizome rot and anthracnose respectively are developed for filed evaluation by the end of 2021 3. Standard operating manuals for equipment documented by end of 2019 4. Number of staff trained on harmonized methods for early detection and response 5. Number of animal production and health reports to OIE 6. Standardised fruit fly trapping computer model and database delivered and in use	- Certificates, reports and site visits - Documentation
	Indicative Outputs 1. Physical infrastructure in place to enhance disease screening capacity through upgraded molecular, diagnostic and microbiology laboratories 2. Local researchers trained to use mutation techniques and biotechnology for development of improved vegetatively propagated ginger and sweet yam varieties and screening for specific pathogens 3. Self-contained gamma irradiation facility installed and staff trained in its safe operation. 4. Modified varieties of selected crops resistant to rhizome rot and anthracnose		
Health and Nutrition	Enhanced capacity in radiation medicine for effective management of cancers, a key chronic non-communicable disease Enhanced capacity in nutrition for effective management of obesity and prevention of non-communicable diseases	2,000 eligible patients receive radiotherapy treatment per year by the end of 2021 in line with approved national protocols. Nuclear Medicine Centre is fully equipped and staffed by 2023. 1. Nutrition laboratory is fully equipped and staffed by 2019 2. Study outcomes influencing public health policy by 20122.	- Patients' records - Record of equipment - Statistical review reports - LINAC referral report - Records of equipment and publications and policy documents

Indicative Outputs

1. 100% of staff working in radiotherapy centres are trained in the safe operation and in efficient and effective patient management
2. Public nuclear medicine facilities are in operation and 100% of staff are competent in the application of the technologies and radiation protection
3. Self-contained gamma irradiation facility installed and staff trained in its safe operation
4. Pilot studies occur within a year, a mosquito insectary has been set and an expansion is planned to accommodate larger-scale rearing

Water and the Environment

Outcome statement(s) Strengthened technical capacity of public entities responsible for the supply of potable water towards effective decision-making related to the sustainable planning, management and use of water resources from the Rio Cobre Basin using isotopic techniques	1. Documented recommendations made on moratorium on water abstraction by the end of 2019 2. Improved water quality and quantity in the Rio Cobre Basin 3. At least 10% increase in the issuance of new abstraction licences in the Rio Cobre Basin by the Water Resources Authority (WRA) by the end of 2020	- Water Resources Authority reports on status of abstraction activities in the Rio Cobre Basin - Test results on chemical concentration in water in the Rio Cobre Basin based on international thresholds - Reports on available water to cover the Rio Cobre area

Indicative Outputs

1. Hydro-chemical and isotopic characterization of surface and groundwater in study area
2. Conceptual hydrological model developed, reflecting main processes governing the evaluation of groundwater flow and water quality
3. Capacity built in isotope hydrology and complementary techniques

Energy and Industry

Improved human resource capacity to support the development of a modern, efficient, diversified and environmentally sustainable energy sector Improved human resource capacity to support the development of innovative and modern industry infrastructure	1. Number of personnel trained in the use of IAEA energy modelling tools 2. At least 80 percent of trained staff using modelling tools 3. Number of personnel trained in use of radiotracers, nucleonic control systems and non-destructive techniques 4. At least 80 percent of trained staff using radiotracers, nucleonic control systems and non-destructive techniques	- Training certificates and reports - Reports on country situation

Indicative Outputs

1. Road map for diversification of the Energy Sector
2. Prediction of potential environmental impact of various energy sources
3. Increased efficiency of the energy grid
4. Improved accuracy and efficiency in assessing integrity of structures
5. Improved accuracy and efficiency in minerals value chain

Plan of action[6]

[6] The above stated figures are indicative. Signing of the CPF by the Agency does not commit to funding of the CPF implementation.

Indicative Output	Approximate costing in €	Resources currently available in €	Difference (€A – €B)	Relevant national counterpart/institution	Indicative timeframe

	Indicative Output	Approximate costing in €	Resources currently available in €	Difference (€A – €B)	Relevant national counterpart/institution	Indicative timeframe
Food and Agriculture	1. Physical infrastructure in place to enhance disease screening capacity through upgraded molecular, diagnostic, and microbiology laboratories 2. Local researchers trained to use mutation techniques and biotechnology for development of improved vegetatively propagated ginger and sweet yam varieties; and screening for specific pathogens 3. Modified varieties of ginger and sweet yam resistant to rhizome rot and anthracnose, respectively, are developed 4. Capacity to apply mutation induction and diagnostic technologies for coffee with improved resistance to leaf rust disease in Jamaica (2020-2023)	242,924	*109,574*	*133,350*	Scientific Nuclear Council	2018 - 2021

	Indicative Output	Approximate costing in €	Resources currently available in €	Difference (€A – €B)	Relevant national counterpart/institution	Indicative timeframe
Health and Nutrition	1. 100% of staff working in radiotherapy centres are trained in the safe operation and in efficient and effective patient management 2. Public nuclear medicine facilities are in operation and 100% of staff are competent in the application of the technologies and radiation protection 3. Self-contained gamma irradiation facility installed and staff trained in its safe operation 4. Pilot studies occur within a year; a mosquito insectary has been set and an expansion is planned to accommodate larger-scale rearing 5. Capacity to assess adiposity using isotopic technique (2020-2022)	651,789	*166,329*	*485,460*	Ministry of Health	2018 - 2021

	Indicative Output	Approximate costing in €	Resources currently available in €	Difference (€A – €B)	Relevant national counterpart/institution	Indicative timeframe
Water and the Environment	-1. Hydrochemical and isotopic characterization of surface and groundwater in the study area 2. Conceptual hydrological model developed, explaining main processes governing the evolution of groundwater flow and water quality 3. Capacity built in isotope hydrology and complementary techniques 4. Capacity built in evaluating groundwater and surface water interactions, flow dynamics and pathways in specific watersheds using isotopic techniques. 5. Capacity to assess coastal and marine pollutants and tracking the pathway using radiotracers (2020-2022)	257,610	*22,000*	*235,610*	National Water Commission/Water Resources Authority	2018 – 2021

	Indicative Output	Approximate costing in €	Resources currently available in €	Difference (€A – €B)	Relevant national counterpart/institution	Indicative timeframe
Energy and Industry	1. Road map for diversification of the Energy Sector 2. Prediction of potential environmental impact of various energy sources 3. Increased efficiency of the energy grid 4. Improved accuracy and efficiency in assessing integrity of structures 5. Improved accuracy and efficiency in minerals value chain 6. Multi-purpose gamma irradiation facility for the introduction of SIT and experimental mutagenesis and diagnostic technologies	110,000	*30,000*	*80,000*	Ministry of Science Energy and Technology, ICENS, National Works Agency, Municipal Corporations	2022-2023

Total estimated overall cost for CPF ***€1,736,151***	*Total estimated available resources for CPF* ***€1,475,837***	*Total difference in resources for CPF* ***(€C)*** ***€260,314***

Estimated Cost for CPF Supported by IAEA and Government of Jamaica

Projects	Total Core Budget	GOJ Cash Contribution	GOJ In kind Contribution	Total GOJ Contribution	Total Project Budget (Including IAEA Core Budget and GOJ Contribution)
JAM5013	242,924	-	109,574	109,574	352,498
JAM6014	486,460	59,484	166,329	225,813	712,273

32

4. Programme implementation and support

4.1 CPF coordination and review

As the main interlocutor with the international development community on technical cooperation matters and the National Liaison and Counterpart Agency for the Technical Cooperation Programme between the Government of Jamaica and the IAEA, the PIOJ spearheads the preparation process for the CPF with support from key partners, including the IAEA. The NWC, NIC, MICAF, HSRA, ICENS, SRC, Physics Department at UWI and the MOH act as focal points for technical input for the development of the CPF for the various priority areas to be pursued. The Ministry of Foreign Affairs and Foreign Trade is responsible for the signing of international agreements as well as monitoring efforts to fulfil the country's obligations under these treaties. This Ministry also facilitates high level communication between the country and the IAEA. As it relates to the involvement of the IAEA, the main interface on the preparation of the CPF is with the Programme Management Officer (PMO) who provides guidance to the country and coordinates the internal review process within the IAEA.

The review of the implementation of the CPF is slated to be conducted on an annual basis through the External Cooperation Management Division of the PIOJ, in keeping with established protocols. The review process will include all stakeholders mentioned above, as well as those with active projects under the IAEA programme, along with the Ministry of Finance. Specific effort will also be made to ensure that the PMO participates in the review sessions whether virtually or face-to-face. The review is intended to provide an opportunity to examine the status of project implementation across the portfolio, thereby identifying issues and corresponding solutions for more effective programme management. The review process will also include oversight by the PMO and relevant technical officers from the IAEA through missions as needed.

4.2 Partner coordination

Jamaica became a Member of the United Nations in 1962. As a member of the UN, Jamaica adopted the 2030 Agenda for Sustainable Development with the SDGs at its core.

The partnership between Jamaica and the UN is guided by the UNMSDF 2017-2021 which had been co-signed by the IAEA. The UNMSDF is linked with the SDGs and the national development plans of the Caribbean countries. The IAEA will provide support towards the achievement of three of the four strategic priority areas of the region, namely "A healthy Caribbean"; "A cohesive, Safe and Just Caribbean"; and "A sustainable and Resilient Caribbean".

This CPF has been developed based on Jamaica's National Development Plan - Vision 2030 – which was published in 2009, the UNMSDF and the SDGs that Jamaica has identified for achievement by 2030. These include SDGs 2, 3, 6, 7, 9, 13, 14, 15 and 17.

Implementation of the CPF will take account of the time lines reflected in national and relevant sector plans, as well as those contained in the IAEA Medium Term Strategy 2018-2023, the UNMSDF and the SDGs programme in Jamaica. In particular, special attention will be paid to alignment with time lines for implementation of national priorities in the various sectors as stated in the country's Medium-term Socio-Economic Framework as well as corporate and operational plans of the implementing entities for which are prepared every three and one year respectively. This will significantly aide in

ensuring buy-in towards effective project implementation, including the provision of the required human and financial resource from the country. In case of the SDGs, key accelerators have been identified and may require a review of support being provided to the country based on annual assessments to be conducted over the course of implementation.

Additionally, the time lines for implementation of the CPF may be impacted by partnerships involving key entities such as the Food and Agriculture Organization and the Pan-American Health Organization/World Health Organization. Given the PIOJ's role in external cooperation management for the country, coupled with that of National Liaison Office for the IAEA programme in the country, the onus on the organization is to ensure that all relevant stakeholders are involved in the implementation of the CPF.

The major donors and development partners assisting the development activities of Jamaica that are relevant for the implementation of the proposed TC programme under this CPF are FAO, PAHO, UNDP, USAID, IDB, CDB, World Bank, European Union, Commonwealth Secretariat, Organization of American States, United Kingdom Department for International development, Global Affairs Canada and the Global Water Partnership.

Annex 1: Partnership Framework

Thematic Area	Outcome in National Plan or Sector Strategy	CPF Outcomes	Links with SDGs	Links with UNMSDF Outcomes	Relevant Partners
Radiation Safety and Security	National Goal # 1: Jamaicans are Empowered to Achieve their Fullest Potential National Outcome # 1: Sector Strategies include: Enhance early screening/detection programmes; Strengthen the systems for the diagnosis, treatment and care of non-communicable diseases; Develop standards for physical infrastructure and equipment develop policy and institutional framework for human resource planning and management; Develop quality assurance mechanisms for both providers of health services; and improve access to health facilities and services by the vulnerable National Goal #2: The Jamaican Society is secure, cohesive and Just Outcome # 5: Security and Safety Sector Strategies include: Strengthen security mechanism at ports of entry and other ports; Improve technical and operational capabilities of relevant security	Regulatory body acquires the requisite capacity in radiation safety and protection as well as services for quality control in radiation medicine Regulatory body acquires the requisite capacity in radiation safety and protection as well as services for quality control in radiation medicine	**SDG # 3** to ensure healthy lives and promotion of well-being for all ages **National target:** % of healthcare staff to population with ratio per 1000 **2.5**	Universal access to quality health care services and systems improved Laws, policies and systems introduced to support healthy lifestyles among all segments of the population	National: HSRA MNS MOH Port Authority ICENS ODPEM International: PAHO/WHO IDB GAC EU DFID

Thematic Area	Outcome in National Plan or Sector Strategy	CPF Outcomes	Links with SDGs	Links with UNMSDF Outcomes	Relevant Partners
	agencies to reduce threats of terrorist activities within Jamaica's				
Food and Agriculture	National Goal #3: Jamaica's Economy is Prosperous National Outcome # 12: Internationally Competitive Industry Structures Sector Strategies include: Strengthening agriculture research institutions and programmes; provide adequate water supply, irrigation to boost agriculture productivity; increase resilience of agriculture sector to natural hazards; and promote national food and nutrition security and safety	Scientific Research Council strengthens its plant diagnostic competences and releases improved varieties of select tubers resistant to rhizome rot and anthracnose	**SDG # 2** to end hunger, achieve food security and improve nutrition and promote sustainable agriculture **National target:** Agriculture productivity - **176.4**	Access to equitable social protection systems, quality services and sustainable economic opportunities improved	National: MICAF RADA ICENS SRC NIC International: FAO IDB CDB EU DFID
Health and Nutrition	National Goal # 1: Jamaicans are Empowered to Achieve their Fullest Potential National Outcome # 1: Sector Strategies include: Enhance early screening/detection programmes; Strengthen the systems for the diagnosis, treatment and care of non-communicable diseases; Develop standards for physical infrastructure and equipment develop policy and institutional framework for human resource planning and management; Develop quality assurance mechanisms for both providers of health services; and	Enhanced capacity in radiation medicine for the effective management of cancers, a key chronic non-communicable disease Enhanced capacity in nutrition for effective management of obesity and prevention of non-communicable diseases	**SDG # 3** to ensure healthy lives and promotion of well-being for all ages **National target:** Unconditional probability of dying between ages 30 and 70 is **11.4%** Life expectancy at birth – **76.4 yrs** (Male:73.4 yrs; female: 79.4 yrs)	Universal access to quality health care services and systems improved Laws, policies and systems introduced to support healthy lifestyles among all segments of the population	National: MOH NHF Public and private health care facilities International: PAHO/WHO IDB GAC EU DFID

Thematic Area	Outcome in National Plan or Sector Strategy	CPF Outcomes	Links with SDGs	Links with UNMSDF Outcomes	Relevant Partners
	improve access to health facilities and services by the vulnerable				
Water and Environment	National Goal # 4: Jamaica has a Healthy Natural Environment National Outcome # 13: Sector Strategies include: Implement best management practices for air, forest, ground and surface water, land management, soils and resources consumption; promote sustainable management ad use of water resources; Create a framework for the management of air quality; and develop framework for non-regulated sources of pollution	Technical capacity of the NWC and WRA strengthened to make decisions relating to sustainable planning, management and use of water resources from the Rio Cobre Basin using isotopic techniques	**SDG # 6** to ensure availability and sustainable management of water and sanitation **National target:** At least 85% of population with access to potable water At least 30% of population with access to sewer	Inclusive and sustainable solutions adopted for the conservation, restoration and use of ecosystems and natural resources	National: NWC WRA NIC International: CDB IDB UN Environment
Energy and Industry	Jamaica's National Energy Policy (2009-2030) supports the implementation of Vision 2030 Jamaica –National Development Plan, particularly National Outcome #10 under Goal 3 on Energy Security and Efficiency. The policy places such places priority attention on security of energy supply through diversification of fuels and development of renewables; modernization of the country's energy infrastructure; development of renewable energy sources; energy conservation and efficiency; development of a	Improved human resource capacity to support the development of a modern, efficient, diversified and environmentally sustainable energy sector Improved human resource capacity to support the development of innovative and modern industry infrastructure	**SDG 7 to ensure access to affordable, reliable, sustainable and modern energy for all** **SDG 9 to build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation**	Policies and programmes for climate change adaptation, disaster risk reduction and universal access to clean and sustainable energy in place.	National: Ministry of Science, Energy and Technology International Centre for Environmental and Nuclear Sciences International: World Bank, IDB, European Union, UN Environment, UNDP, CFTC, USAID

Thematic Area	Outcome in National Plan or Sector Strategy	CPF Outcomes	Links with SDGs	Links with UNMSDF Outcomes	Relevant Partners
	comprehensive governance/ regulatory framework; and eco-efficiency in industries				

Annex 2: List of participating institutions

The **Planning Institute of Jamaica (PIOJ)** is the main interlocutor with the international development community on technical cooperation matters, managing external cooperation agreements and programmes and collaborating with external funding agencies in the identification and implementation of development projects. The PIOJ also acts as National Liaison and Counterpart Agency for the Technical Cooperation Programme between the Government of Jamaica and the IAEA.

The **Ministry of Foreign Affairs and Foreign Trade (MFAFT)** is responsible for conducting Jamaica's foreign relations. The organization is also responsible for the signing of international agreements and monitors the efforts to fulfil the country's obligations under these treaties. This Ministry also facilitates high level communication between the country and the IAEA.

Ministry of Health (MOH) is responsible for ensuring the provision of an adequate, effective and efficient health care service to the population. This includes a cancer treatment and control programme with significant emphasis on radiation technology. The Ministry also has oversight for **University Hospital of the West Indies,** a regional institution which serves patients from across the Caribbean. The re-establishment of the Nuclear Medicine Facility with support from the IAEA is viewed as a key feature of the hospital's service to aid in the country's efforts to provide quality diagnostic and treatment services to the public. This facility complements the service provided the MOH through the LINAC centres.

The **Ministry of Industry Commerce Agriculture and Fisheries (MICAF)** has responsibility for several agencies, including Bodles Research Centre, NIC, HSRA which are actively involved in the implementation of IAEA supported projects or are beneficiaries of capacity building assistance.

The **University of the West Indies (UWI)** is the region's premier educational institution, offering a wide range of undergraduate, masters and doctoral programmes in many specializations, including Science and Technology, Science and Agriculture, Medical Sciences, including the Medical Physics programme which was established through the assistance of the IAEA.

The **Ministry of Science, Energy and Technology (MSET)** has a mandate to provide the framework for innovation in the science, technology and energy, encourage improvement in national energy efficiency and conservation as well as increase the percentage of electricity generation from renewable sources. The Ministry also has direct responsibility for critical entities such as the **ICENS and SRC**, both of which are active participants in the implementation of IAEA supported projects in Jamaica. **ICENS** is a multi-disciplinary research centre whose work is largely based on applications of the "peaceful uses of the atom", including, conducting chemical analysis for minerals, food, environmental, agriculture, water and construction industries. ICENS also operates the only research reactor in the Caribbean region. The **SRC's** work supports the growth and development of the agro-industrial sector in Jamaica through research, adaptation of available technologies and creation of new ones.

Ministry of National Security (MNS) is responsible for facilitating the maintenance of law and order, protecting Jamaica against internal and external threats and ensuring the safety of Jamaica's borders, including against unlawful entry of nuclear and radiological materials at ports. The **Port Authority of Jamaica** is the principal maritime agency responsible for the regulation and development of Jamaica's port and shipping industry.

Annex 3: Jamaica-Status of Treaty Participation

Multilateral Agreements

TITLE	IN FORCE	STATUS
Agreement on the Privileges and Immunities of the IAEA	1967-09-05	Acceptance: 1967-09-05
Convention on the Physical Protection of Nuclear Material	2005-09-15	Accession: 2005-08-16
Vienna Convention on Civil Liability for Nuclear Damage	Non-Party	
Convention on Early Notification of a Nuclear Accident	Non-Party	
Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency	Non-Party	
Convention on Nuclear Safety	Non-Party	
Optional Protocol Concerning the Compulsory Settlement of Disputes	Non-Party	
Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention	Non-Party	
Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management	Non-Party	
Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage	Non-Party	
Convention on Supplementary Compensation for Nuclear Damage	Non-Party	
Co-operation Agreement for the Promotion of Nuclear Science and Technology in Latin America and the Caribbean (ARCAL)	Non-Party	
Revised Supplementary Agreement Concerning the Provision of Technical Assistance by the IAEA (RSA)	1989-04-11	Signature: 1989-04-11
Third Agreement to Extend the 1987 Regional Co-operative Agreement for Research, Development and Training Related to Nuclear Science and Technology (RCA)	Non-Party	
Co-operative Agreement for Arab States in Asia for Research, Development and Training Related to Nuclear Science and Technology (ARASIA)	Non-Party	
African Regional Co-operative Agreement for Research, Development and Training Related to Nuclear Science and Technology (AFRA) - Third Extension	Non-Party	
Amendment to the Convention on the Physical Protection of Nuclear Material	Non-Party	

Safeguards Agreements

TITLE	IN FORCE	STATUS
Application of safeguards in connection with the Treaty on Non-Proliferation of Nuclear Weapons and the Treaty for the Prohibition of Nuclear Weapons in Latin America (with Protocol)	1978-11-06	Signature: 1978-11-06
Protocol Additional to the Agreement between Jamaica and the International Atomic Energy Agency for the Application of Safeguards in Connection with the Treaty for the Prohibition of Nuclear Weapons	2003-03-19	Signature: 2003-03-19

in Latin America and the Treaty on the Non-Proliferation of Nuclear Weapons		

Annex 4: Details of Past TC Programme

- Jamaica joined the IAEA TC programme in 1965.
- Total of 27 TC projects have been concluded under the auspices of the TC programme.
- Key areas and major impact include:
    - Refurbishment and maintenance of nuclear research reactor
    - Establishment of national radiation protection regime
    - Upgrading nuclear medicine services
    - Capacity building in plant breeding and diagnostic technologies
    - Sustainable management of water resources
    - Development of national capacities for the application of Nuclear Science

Past Technical Cooperation Programme		
Thematic area	**Results of past technical cooperation**	**Key counterpart institutes and partners**
Radiation safety and security	Establishment of a radiation protection regime at the national level, inclusive of Regulatory Authority and supporting legislation.	Ministry of Science Energy and Technology, ICENS, Bureau of Standards, MICAF, Office of the Chief Parliamentary Counsel
Food and agriculture	Enhancement of soil fertility management techniques; assistance in determining residue levels in foods of animal origin; use of immunoassay methods for control of animal diseases; improvement in water management and quality control capacity for crop output	SRC, Bodles Research Centre, Ministry of Agriculture and Fisheries
Health and nutrition	Enhanced capacity for cancer control and addressing malnutrition; enhanced capacity to effect preventive measures aimed at controlling the obesity epidemic and its associated burden of chronic non-communicable diseases through isotopic and complementary techniques; upgraded nuclear medicine services; establishment of Medical Physics programme at UWI.	Ministry of Health, Tropical Medicine Research Institute
Water and environment	Increased capacity to detect contaminants in groundwater in the to determine conditions for environmental protection; improved management of groundwater aquifers using isotope hydrology	NWC, WRA, NIC

Energy and industry	Development of national energy policies and plans; refurbishment and maintenance of nuclear reactor	MSET, ICENS