

**NATIONAL INVASIVE ALIEN
SPECIES STRATEGY & ACTION
PLAN (NIASSAP)**

JAMAICA

2014-2020

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LETTER FROM NEPA AUTHORITIES

Add one-page letter from senior NEPA officials that speaks to the importance of this document and urges the relevant parties to move forward with implementation

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ABBREVIATIONS & ACRONYMS

CABI	CABI Caribbean and Latin America regional office
CBD	Convention on Biological Diversity
CBD-CHM	Convention on Biological Diversity Clearing-House Mechanism
CARDI	Caribbean Agricultural Research and Development Institute
CCAMF	Caribbean Coastal Area Management Fund
CEO	Communication, Education, and Outreach
CIASNET	Caribbean Invasive Alien Species Network
CIDA	Canadian International Development Agency
CISWG	Caribbean Invasive Species Working Group
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CMS	Convention on Migratory Species
COP	CBD Conference of the Parties
CPDN/DDIS	Caribbean Pest Diagnostic Network/Distance Diagnostic and Identification System
CPPC	Caribbean Plant Protection Commission
CRISAP	Strategy and Action Plan for Invasive Alien Species in the Caribbean Region 2011-2016
CSA	Critical Situation Analysis
CSI	Caribbean Seabird Initiative
DIISE	Database on Island Invasive Species Eradications
EDRR	Early Detection and Rapid Response
EPPO	European and Mediterranean Plant Protection Organisation
FAO	Food and Agriculture Organisation of the United Nations
GBIF	Global Biodiversity Information Facility
GEF	Global Environment Facility
GISD	Global Invasive Species Database
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome
KAP	Knowledge, Attitudes, and Practices
IAS	Invasive Alien Species
IABIN/I3N	Inter-American Biodiversity Information Network/Invasives Information Network
IICA	Inter-American Institute for Cooperation on Agriculture
IIF	International Iguana Foundation
IMO	International Maritime Organisation
IOJ/NHMJ	Institute of Jamaica/National History Museum of Jamaica
IUCN	International Union for the Conservation of Nature
IPPC	International Plant Protection Organisation
ISG	IUCN Iguana Specialist Group
ISSG	IUCN Invasive Species Specialist Group
Ja CHM	Jamaica's Clearing-House Mechanism
JCDT	Jamaica Conservation and Development Trust
JIRG	Jamaica Iguana Recovery Group
MDG	Millennium Development Goals
MTIASIC	Mitigating the Threats of Invasive Alien Species in the Insular Caribbean

MoAF	Ministry of Agriculture and Fisheries
NBSAP	National Biodiversity Strategy and Action Plan
NBWTF	National Ballast Water Task Force
NEPA	National Environment and Planning Agency, Jamaica
NIASSAP	National Invasive Alien Species Strategy and Action Plan
NISSAP	National Invasive Species Strategy and Action Plan
NOAA	United States National Oceanic and Atmospheric Organisation
NRCA	Natural Resources Conservation Authority
OAS	Organisation of American States
OIE	World Organisation for Animal Health
PEPA	Portland Environment Protection Association (PEPA)
PHCC	Plant Health Coordinating Committee
PIU	NEPA Project Implementation Unit
PPM	NEPA Projects Planning and Monitoring Branch
SIDS	Small Island Developing States
SPAW	Specially Protected Areas and Wildlife Protocol
SPS	Sanitary and Phytosanitary
TIB	Threatened Island Biodiversity database
TNC	The Nature Conservancy
UNCLOS	United Nations Convention on Law of the Sea
UNEP	United Nations Environment Programme
USDA	United States Department of Agriculture
UWI	University of the West Indies
WTO	World Trade Organisation

GLOSSARY OF TERMS¹

Alien Species:	A species, subspecies or lower taxon, introduced outside its natural past or present distribution; includes any part, gametes, seeds, eggs, or propagules of such species that might survive and subsequently reproduce
Alien Invasive Species:	See invasive alien species
Biodiversity:	See biological diversity
Biological Diversity:	The variability among living organisms from all sources including, <i>inter alia</i> , terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species and of ecosystems
Biological Invasion:	The process that occurs when an alien species is introduced to a new ecosystem (different from its origin) and proceeds to establish, naturalise, spread, and cause harm to biodiversity (and possibly human health, livelihoods, and development opportunities)
Control:	Containment of the entire population of non-native organisms within a specific ecosystem or other defined area ²
Ecosystem:	A dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit
Eradication:	Removal of the entire population of non-native organisms from a specific ecosystem or other defined area ³
Establishment:	The process of an alien species in a new habitat successfully producing viable offspring with the likelihood of continued survival
Intentional Introduction:	The deliberate movement and/or release by humans of an alien species outside its natural range
Invasive Alien Species:	An alien species whose introduction and/or spread threatens biological diversity

¹ Unless otherwise noted, the definitions provided are those commonly used within the context of the Convention on Biological Diversity (CBD): <http://www.cbd.int/invasive/terms.shtml>

² Not defined by the CBD. Definition provided by project consultant

³ Not defined by the CBD. Definition provided by project consultant

Native Species:	A species, subspecies, or lower taxon, occurring within its natural range (past or present) and dispersal potential (i.e. within the range it occupies naturally or could occupy without direct or indirect introduction or care by humans ⁴
Non-native Species:	See alien species
Pathway:	Any means that allows the entry or spread of an invasive alien species ⁵
Precautionary Approach:	Under the Rio Declaration, stated in Principle 15 as “In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation”
Risk Analysis:	(a) The assessment of the consequences of the introduction and of the likelihood of establishment of an alien species using science-based information (i.e., risk assessment), <i>and</i> (b) the identification of measures that can be implemented to reduce or manage these risks (i.e., risk management), taking into account socio-economic and cultural considerations ⁶
Spread	Expansion of the geographical distribution of an alien species within an area ⁷
Unintentional Introduction:	All other introductions which are not intentional

⁴ IUCN (2000)

⁵ Interpreted by the author from the definition used by the International Plant Protection Organisation (IPPC); www.ippc.org

⁶ Most other definitions of risk analysis also include: (c) risk communication - the interactive exchange of information among risk assessors, risk managers and other interested parties

⁷ Interpreted by the author from the definition used by the International Plant Protection Organisation (IPPC); www.ippc.org

ACKNOWLEDGEMENTS

The National Invasive Alien Species Strategy & Action Plan (NIASSAP) was produced through a multi-stakeholder process facilitated by the National Environment and Planning Agency (NEPA), and is a product of the *Mitigating the Threats of Invasive Alien Species in the Insular Caribbean* project funded by the Global Environment Facility (GEF). Sincere thanks are due to those who participated in the public consultations held on July 23, 24 (Kingston), and 26 (Montego Bay), as well as September 17, 18 (Kingston) and 20 (Montego Bay), 2013. The Invasive Alien Species Working Group provided information needed to complete the Critical Situation Analysis and finalized the Strategy and Action Plan. Their leadership on the IAS issue in Jamaica is greatly appreciated and vital to effective implementation of this NIASSAP.

EXECUTIVE SUMMARY

Invasive alien species (IAS) are alien (non-native) species whose introduction and/or spread threaten biological diversity. They are among the top drivers of biological diversity loss worldwide and place substantial constraints on sustainable development.

The *National Invasive Alien Species Strategy and Action Plan* (NIASSAP) aims to guide the work of the government of Jamaica and collaborators in their efforts to minimize the impact of IAS during the period 2014-2020. The NIASSAP serves as Output 1 of Jamaica's contribution to the Mitigating the Threats of Invasive Alien Species in the Insular Caribbean project (MTIASIC). It is also the 'Alien Invasive Species Management Plan' identified as a high priority project in the country's 2003 National Biodiversity Strategy and Action Plan (NBSAP).

The opening sections of the document provide the context for Jamaica's IAS strategy and associated activities. As a basis for the NIASSAP, the National Environment and Planning Agency (NEPA) undertook a critical situation analysis (CSA) to identify the country's current knowledge, challenges, capacities, and opportunities with regard to addressing IAS. Stakeholders were provided with a series of questions related to IAS scientific assessment, policy, and practice and invited to participate in a series of three-day workshops held in Kingston and Montego Bay in July and September 2013.

The key findings of the CSA are as follows:

- An unknown number of non-native plant and animal species have entered Jamaica through a wide variety of pathways (legal and illegal) and have already become established in the country. Although few quantitative studies have been undertaken, it is readily evident that several of these organisms are adversely impacting biodiversity at species- and ecosystem-levels.
- Jamaica's current biodiversity information needs in the context of IAS include:
 - Field-based inventories of native and/or non-native species;
 - Data mining of relevant publications;
 - Ecological and socio-economic impact assessments of non-native species already established in Jamaica; and

- Risk analyses for species being imported or proposed for importation into Jamaica.
- Invasion pathways of particular concern are: the trade and display of live animals, horticulture trade, shipping, fisheries/aquaculture, tourism, development assistance, the transportation of equipment, and subnational transportation activities.
- Priorities for near-term legal and institutional capacity building needs include development of:
 - A comprehensive law or strategic collective of laws that enable effective prevention, eradication, and control of IAS;
 - Voluntary codes of conduct that guide private sector efforts to prevent the introduction and spread of IAS through pathways of concern;
 - A comprehensive early detection/rapid response (EDRR) programme, including systems for the rapid reporting and identification of non-native organisms; and
 - A strategic programme for improving the detection of non-native species at ports of entry, including the hiring of more inspectors, enabling inspection of private vessels, providing identification tools and easy access to expert identifiers, and training staff in techniques for profiling smugglers.
- The Mitigating the Threats of Invasive Alien Species in the Insular Caribbean (MTIASIC) project has made substantial advances in education/outreach and social marketing in the context of IAS. This work needs to be continued and expanded upon.
- Research on IAS has been undertaken in Jamaica for decades, but generally in the agricultural sector under the topic of ‘quarantine pests.’ Although it is a relatively recent focus in the environmental context, several research projects are taking place in endangered species, fisheries conservation, and protected areas contexts. An incentives programme (e.g., small grants, student fellowships) could be employed to encourage additional research on IAS of priority concern.
- The government of Jamaica has already been successful in engaging a diversity of national and international stakeholders in its efforts to minimize the spread and impact of IAS. Existing relationships need to be fostered and new partnerships forged nationally, regionally, and at the global level, especially with other island nations.

The Strategy and Action Plan is divided into eight components, each containing several specific projects to be implemented in the short-term (two years), medium-term (four years), long-term (six years), and/or in an ongoing manner. The eight specific strategies are to:

1. *Facilitate NIASSAP Implementation.* Institutionalise an effective mechanism for promoting, coordinating, and monitoring the implementation of Jamaica’s NIASSAPs
2. *Prevent, eradicate and control IAS.* Strengthen existing and establish new “on-the-ground” programmes⁸ to prevent the introduction of IAS, as well as to minimize their spread and impact.
3. *Improve Legal and Institutional Capacity.* Strengthen and establish legal and institutional frameworks to enable the effective prevention, eradication, and control of IAS at regional, national, and local (site-specific) levels.
4. *Build IAS Information Capacity.* Enable access to and the exchange of reliable information in order to facilitate the prevention, eradication, and control of IAS in a timely and cost-effective manner.⁹
5. *Conduct Research and Monitoring.* Facilitate an evidence-based approach¹⁰ to the prevention, eradication, and control of IAS through information synthesis, scientific research, and ecological monitoring.
6. *Ensure effective communication, education, and outreach (CEO).* Strengthen and expand projects that raise awareness of the IAS issue and their potential impacts, as well as inspire and empower stakeholders to take the appropriate action to prevent, eradicate, and control IAS.
7. *Build Capacity.* Strengthen the capacity of individuals and institutions to prevent, eradicate, and control IAS.
8. *Make Funding Available.* Develop and implement a comprehensive fundraising plan that will secure adequate financing for NIASSAP activities.

The Appendix provides information that further supports the CSA findings and vision set forth in the Strategy and Action Plan. These include a copy of the questionnaire distributed to stakeholders; a list of relevant national regulations, as well as regional and global conventions and organisations; guiding principles for development of the NIASSAP, and a list of publications that will provide the reader with additional detail on the IAS issue in the regional and national context.

⁸ Including associated technical approaches and tools, as needed

⁹ Note: To the extent feasible, information will be verified by relevant experts prior to being made publically accessible

¹⁰Integration of: (a) technical expertise/expert opinion, (b) scientific research findings, and (c) stakeholder values to provide high-quality information for NIASSAP implementation

II. Background

A. Purpose

This document serves as Output 1 of Jamaica's contribution to the Mitigating the Threats of Invasive Alien Species in the Insular Caribbean project (MTIASIC)¹¹: development of a National Invasive Alien Species Strategy and Action Plan (NIASSAP). It is also the 'Alien Invasive Species Management Plan' identified as a high priority project in Jamaica's National Biodiversity Strategy and Action Plan (NBSAP)¹².

The opening sections of the document provide the context for Jamaica's invasive alien species (IAS) strategy and associated activities. Information is provided on the country's current ecological and socio-economic circumstances, as well as the state of (a) knowledge of and (b) engagement in the IAS issue. The latter is referred to as the Critical Situation Analysis (CSA) for IAS in Jamaica. The NIASSAP provides the basis for Jamaica's future efforts to protect the country from the adverse impacts of IAS. An overview of the strategic objectives and projects begins on page X.

B. Jamaica: A Place Worth Protecting

Jamaica is located in the Greater Antilles of the western Caribbean (See Figure 1). It is the third largest island in the Caribbean with a land area of 10,991km² (4,411 ml²). Jamaica is 236km long, 35km wide at its narrowest point and 52km at its widest. As an archipelagic state, Jamaica has stewardship over marine space 24 times its land area, with an exclusive economic zone of approximately 235,000km² (Ministry of Land and the Environment 2003).

¹¹http://jamaicachm.org.jm/Tool/Information%20sheet%20for%20the%20Invasive%20Alien%20Species%20_IAS_%20Project.pdf

¹²http://www.nepa.gov.jm/symposia_03/Policies/NBSAP.pdf



Figure 1: A Map of the Wider Caribbean

Jamaica is a middle income small island developing state (SIDS), ranked by the United Nations in the medium human development category. The country has been making good progress in eight out of the 14 Millennium Development Goal (MDG) targets for 2015. It has already achieved the targeted reduction in absolute poverty, malnutrition, hunger and universal primary enrolment and is on track for combating HIV/AIDS, halting and reversing the incidence of malaria and tuberculosis, access to reproductive health, and the provision of safe drinking water and basic sanitation. Unfortunately, it is not likely to meet the targets for gender equality and environmental sustainability (more below), and is far behind in child and maternal mortality targets. From a human health and safety perspective, there should be great concern regarding the significant increase in the proportion of the urban population in unacceptable living conditions or dwelling in slums (Planning Institute for Jamaica 2009).

Jamaica is a special place from both ecological and cultural perspectives. It hosts thousands of plant and animal species in a matrix of terrestrial, freshwater, and marine ecosystems¹³. Many of these organisms are only be found in Jamaica; the country is ranked 5th among islands in the world in terms of plant endemism¹⁴. The people of Jamaica are also diverse, and rich in history and tradition. The Taíno, largely seafaring peoples, migrated northward from South America and settled in the Caribbean region. In Jamaica, they were conquered by the Spanish, who later surrendered to the British. Slavery and indentured servitude led to the arrival of peoples from Africa, China, and India. Today, the descendants of all of these groups are collectively and rather proudly ‘Jamaicans.’

With pride in Jamaica’s biological and cultural heritage comes responsibility – the stewardship of an island that is home to so many inexplicitly connected through the need to survive and prosper. Jamaican peoples are dependent on natural resources for economic security and human wellbeing. Agriculture, mining, tourism, fisheries and numerous other industries all require a combination of conservation and sustainable use strategies to support Jamaica’s economy long-term. Likewise, the people living in Jamaica need an abundant supply of clean air and water, non-toxic foods, and landscapes that allow for safe and enjoyable recreation.

Jamaica’s MDG report indicates that the country has thus far failed in efforts at pollution controls and the protection of critical ecosystems. In addition, deforestation, destruction of wetlands and coastal ecosystems, and urban sprawl has been identified as some of the most serious threats to the country’s natural resources (Planning Institute for Jamaica 2009). Government officials hope that efforts to achieve the MDGs will ultimately enable the country to integrate the principles of sustainable development across sectors, thereby reducing environmental degradation, reversing the loss of environmental resources, and significantly limiting the rate of biodiversity loss.

Actions that protect Jamaica’s biodiversity safeguard Jamaicans. Therefore, it is imperative that Jamaican authorities and citizens work together to identify and effectively address factors that

¹³ References report inconsistent numbers of species across all taxonomic groups, indicating that up-to-date inventories and taxonomic assessment are needed

¹⁴ <http://www.ciasnet.org/countryprofiles/jamaica/>

present threats to the natural environment. This document serves as both planning guidance and an official directive for the National Environmental Protection Agency (NEPA) and collaborators to take specific actions to reduce the risk and impact of one of the major drivers of biodiversity loss in Jamaica: invasive alien species.

II. Introduction: Jamaica's Critical Situation Analysis

For the purpose of this document, 'invasive alien species' is abbreviated as IAS and IS defined as an alien (non-native) species whose introduction and/or spread threatens biological diversity¹⁵. Geographically and evolutionary isolated ecosystems, especially SIDS such as Jamaica, are particularly vulnerable to biological invasion. IAS is one of major drivers of biodiversity loss worldwide, across all ecosystems. In freshwater environments and in the island context, they are often the most significant environmental challenge.

As a basis for the NIASSAP, NEPA undertook a critical situation analysis (CSA) on IAS. A CSA is the process of systematic collection and evaluation of relevant past and present biological and socio-political information. The aim of this particular CSA was to identify: a) Jamaica's current knowledge, challenges and capacities with regard to addressing IAS (i.e., 'where the country is at') and b) internal and external forces that may influence Jamaica's success at reaching its goals and choice of strategies in the context of effectively minimizing the introduction, spread, and impact of IAS (i.e. 'what might stop us, as well as what could better enable us'). Stakeholders were provided with a series of questions related to IAS scientific assessment, policy, and practice and invited to respond in writing between 15 July and 31 August 2013 (Appendix I). They also had the opportunity to provide verbal input at consultations held in Kingston and Montego Bay during the weeks of 22 July and 16 September 2013. Participants included representatives of government agencies, non-governmental organisations, and academic institutions. A NEPA consultant conducted a review of available literature and datasets during the same time period.

A summary of the CSA findings follows.

¹⁵ For related definitions, see the Glossary of Terms

A. Scientific Assessment

i. Inventories and Information Capacity

Although a national biodiversity assessment and monitoring programme has not been established in Jamaica, inventories have been conducted for some taxonomic groups of native species. A comprehensive survey of non-native species has yet to be undertaken. Most of the detailed biological occurrence information that does exist is for specific species that are of concern to agriculture and fisheries [e.g., surveys for the giant African snail (*Achatina/Lissachatina fulica*) and lionfish (*Pterois volitans* and *P. miles*)].

Box 1: Examples of Non-native Species Known to Be Established in Jamaica. For a complete list, see the Invasive Species page of the Jamaica Clearing-House Mechanism (Ja CHM) website¹.

Classification	Common Name	Scientific Name
Insect	Pink hibiscus mealy bug	<i>Maconellicoccus hirsutus</i>
Arachnid	Red palm mite	<i>Raoiella indica</i>
Crustacean	Red-claw crayfish	<i>Cherax quadricarinatus</i>
Mollusk	Giant African snail	<i>Achatina fulica</i>
Freshwater Fish	Suckermouth catfish	<i>Pterygoplichthys pardalis</i>
Marine Fish	Indo-Pacific lionfish	<i>Pterois volitans</i> and <i>P. miles</i>
Amphibian	Cane (marine) toad	<i>Bufo marinus</i>
Reptile	Red-eared slider	<i>Trachemys scripta elegans</i>
Bird	Rose-ringed parakeets	<i>Psittacula krameri</i>
Mammal	Small Indian mongoose	<i>Herpestes auro punctatus</i>
Aquatic Plant	Water hyacinth	<i>Eichornia crassipes</i>
Terrestrial Plant	Paper bark tree	<i>Melaluca quinquenervia</i>

Box 2: What is Invasive in Jamaica? Work in Progress

Jamaica has been a participant in the Inter-American Biodiversity Information Network (IABIN)¹, including the thematic Invasives Information Network (I3N).¹ Activities have included: a) inventorying data, b) public awareness and outreach, and c) creating catalogs of species and literature, experts, and databases focused on IAS. The IAS database developed through the Jamaica Clearing House Mechanism (Ja CHM)¹ as a contribution to the I3N project is a work in progress that will be continually advanced through input from Jamaica's Invasive Alien Species Working Group (Box 2)¹.

In 2010, the Jamaica Invasive Alien Species Working Group began revising a previously existing list of actual and potential IAS for Jamaica; taxonomic nomenclature has been updated criteria and established for listing non-native species as 'invasive' based on: a) the CBD definition of 'invasive alien species' and b) scientific evidence of harm. Based on these criteria, the Working Group is currently developing a list of IAS documented as established in Jamaica. This list will be submitted to NEPA for approval in 2014 and guide further database development.

Interceptions of agricultural pests are recorded in the Ministry of Agriculture and Fisheries' pest interception database. This is not an open source information system and the data are thus not readily available for monitoring and evaluation. The government of Jamaica also utilizes the Caribbean Pest Diagnostic Network (CPDN) Distance Diagnostic and Identification System (DDIS)¹, run out of the University of Florida. CPDN/DDIS provides a collaboration and communication tool for plant inspectors, scouts, consultants, extension personnel and diagnosticians to share information on plant pests. The system uses field data and digital media as tools for enhancement of diagnosis of plant disease, insect, weed, invasive species, plant management, physiology, and nutrient problems.

A considerable amount of information on non-native species in Jamaica is undoubtedly contained in various governmental and non-governmental reports (e.g., CBD National Reports, NEPA State of the Environment report), as well as studies undertaken in the academic context [e.g., at the University of the West Indies (UWI) and the Institute of Jamaica (IOJ)]. Thus far, no effort has been made to conduct an inventory of these publications or strategically mine them for information and make it readily available to the public.

The Natural History Museum of Jamaica (NHMJ), a division of the IOJ, has been reviewing biological specimen collections in order to identify information needs and gaps on IAS in Jamaica. The majority of the 'introduced' organisms that have been placed in the collection since the Museum's founding in the late 1800s were collected as 'agricultural pests.' The NHMJ has also been serving as the focal point for the Inter-American Biodiversity Information Network (IABIN) and the CBD's Clearing-House Mechanism (CBD-CHM).

Although Jamaica is not a member of the Global Biodiversity Information Facility (GBIF)¹⁶, information on biodiversity in Jamaica is available via more than 350 datasets contributed into the GBIF system, largely by institutions outside of Jamaica. Some of these datasets report having thousands of occurrence records (e.g., eBird¹⁷ apparently includes more than 30,000 unique avian occurrence reports for Jamaica). The data available through GBIF have not yet been mined for information on non-native species in Jamaica.

The Global Invasive Alien Species Database (GISD)¹⁸ is the most comprehensive information system focused explicitly on IAS. It lists 52 species as being documented as non-native in Jamaica, five species for which 'biostatus is not specified,' and several species native to Jamaica that have been introduced and may be invasive elsewhere [e.g., the Jamaican anole (*Norops graham*) in Bermuda].

In an ongoing manner, CABI develops the Invasive Species Compendium as an encyclopaedic resource to assist in decision making. The Compendium includes datasheets and other resources on IAS documented in Jamaica, as well as with the potential to establish in the country. It also includes a datasheet specifically on biological invasion in Jamaica, with lists of non-native species and associated citations indicating observation records and evidence of harm where known.

Two relatively new global databases focused on IAS in the island context include the Database of Island Invasive Species Eradications (DIISE)¹⁹ and the Threatened Island Biodiversity database (TIB)²⁰. No vertebrate species eradications have been documented in DIISE for Jamaica. TIB reports on 18 IAS in Jamaica, as well as 21 threatened species that may be impacted by IAS.

Table 1 provides a list of free, open source information systems that place an emphasis on non-native/IAS and contain information for Jamaica.

¹⁶ <http://www.gbif.org>

¹⁷ <http://ebird.org/content/ebird/>

¹⁸ <http://www.issg.org/database/>

¹⁹ <http://eradicationsdb.fos.auckland.ac.nz/>

²⁰ <http://tib.islandconservation.org/>

Table 1: Sources of Data for Non-Native Species Documented in Jamaica

Information Source	Content	URL
Compendium of Invasive Species	Encyclopedic resource for information on IAS; includes datasheets and abstracts	http://www.cabi.org/isc/
FishBase	Fish species occurrences and related information globally	http://www.fishbase.org
Jamaica Invasive Alien Species Database	Data on IAS in Jamaica	http://jamaicachm.org.jm/ioj_wp/introduction-to-jamaican-biological-diversity/invasive-species/
Global Biodiversity Information Facility (GBIF)	Information about the occurrence of organisms over time and across the planet	http://www.gbif.org
Global Invasive Species Database (GISD)	Non-native species occurrences and related information globally; largely focused on biodiversity impact	http://www.issg.org/database/
Threatened Island Biodiversity (TIB) database	The most comprehensive global review of IUCN Threatened Species breeding on islands and at risk from invasive vertebrates	http://tib.islandconservation.org

Note:

- Terms such as invasive alien species, invasive species, non-native/alien species, naturalized, introduced, and established are not used consistently among information systems. In order to maintain data integrity, it is important to understand the terminology employed in each information system *prior* to data mining.
- Jamaica's non-native species database is a work in progress. Ideally, it will eventually be free and open access, clearly define and consistently use appropriate terminology²¹, include a wide range of environmental variables (e.g., vegetation cover, moisture, slope/aspect), integrate mapping and other analytical tools (e.g., climate match), and be inter-operable with relevant national, regional and global information systems.

ii. Impact Assessment

Although numerous non-native species are known to be established in Jamaica (see Ja CHM²²), relatively few have been assessed for ecological and/or socio-economic impact. Examples

²¹ For international consistency, terms/definitions used within the context of the Convention on Biological Diversity (CBD) are recommended: <http://www.cbd.int/invasive/terms.shtml>

²² http://jamaicachm.org.jm/ioj_wp/introduction-to-jamaican-biological-diversity/invasive-species/

include studies of: a) white-tailed deer (*Odocoileus virginianus*) impacts on crops (Chai 2007) and b) small Indian mongoose (*Herpestes auro-punctatus*) predation on the Jamaican iguana (*Cyclura collie*; Lewis et al. 2010). The vast majority of the impact assessments have been motivated by a desire to protect the Jamaican agriculture and fisheries sectors.

iii. Pathway Assessment

An invasion ‘pathway’ is any means that allows the entry or spread of an IAS. In 2009, the Caribbean Invasive Species Working Group and collaborators published an *Evaluation of Pathways for Exotic Plant Pest Movement into and within the Greater Caribbean Region*²³. Prior to development of the NIASSAP, Jamaica’s Plant Health Coordinating Committee (PHCC) conducted a pathway assessment of citrus greening (also known as Huanglongbing). A ballast water pathway assessment is currently in-progress through the University of the West Indies (UWI).

The legal pet trade pathway is the first invasion pathway to be addressed under this NIASSAP; a *Pet Trade Pathway Toolkit*, which includes a strategy and action plan, has been developed through a multi-stakeholder consultative process and is available at ([website URL](#)). Publication of the *Toolkit* is the first step in enacting a comprehensive approach to minimizing the introduction and impact of pets and associated organisms as IAS in Jamaica.

The following is a list of pathways identified as ‘of particular concern’ during NIASSAP stakeholder consultations. Although listed separately, there is substantial overlap among some of the pathways. For example, ornamental fish are cultivated in commercial aquaculture for the pet trade, and fishing often includes boating and the use of various types of equipment.

1. Cross-Cutting

- Pet trade (legal and illegal; priority on ornamental fish, parrots, reptiles/amphibians, and spay/neuter programmes for dogs and cats)
- Equipment (e.g., for agriculture, military, recreation, research)
- Food assistance (including agriculture and aquaculture)

²³ <http://caribbean-doc.ncsu.edu/index.htm>

2. *Terrestrial*

- Horticulture (legal and illegal; for ornamental use, commercial facilities, public display)
- Zoological parks (private and public collections) and circuses/animal shows
- Shipment conveyances (e.g., pallets, containers)
- Tourism (e.g., arts and crafts made from natural materials)
- In-country transportation (esp. the new Trans-Jamaica Highway)

3. *Marine and Freshwater*

- Commercial aquaculture
- Informal/community aquaculture
- Shipping/boating (commercial, recreational/tourism, subsistence activities)
- Fishing (commercial, subsistence, recreational)

Notes:

- Each pathway involves multiple stakeholders across governmental and non-governmental sectors. Ideally, work to minimize the risk of IAS entering Jamaica and/or spreading within Jamaica will be conducted through open and transparent multi-stakeholder processes.
- Addressing international trade, travel, and transport pathways will necessitate cooperation with trading partners and other island nations within the Caribbean region (e.g., along shipping and airline routes).

iv. Risk Analysis

In the IAS context, the CBD defines ‘risk analysis’ as: (a) the assessment of the consequences of the introduction and of the likelihood of establishment of an alien species using science-based information (i.e., risk assessment), and (b) the identification of measures that can be implemented to reduce or manage these risks (i.e., risk management), taking into account socio-economic and cultural considerations. Most other definitions of risk analysis also include: (c) risk communication - the interactive exchange of information among risk assessors, risk managers and other interested parties.

Risk analysis is used to set priorities for addressing IAS, as well as to determine the most cost-effective and socially-acceptable strategies for prevention, control, and eradication activities.

Most IAS risk analysis focuses on specific species or taxonomic groups (e.g., all catfish in the genus *Plecostomus*). Some governments are in the process of developing risk analyses for all of the organisms moving through a particular pathway (e.g., ballast water or hull fouling).

Risk analyses that have been conducted for IAS in Jamaica have thus far been limited to the agriculture (plant pests; e.g., red palm mite, *Raoiella indica*) and veterinary services (animal pathogens and parasites) sectors. The risk analysis procedures have been consistent with the guidance provided by the International Plant Protection Convention (IPPC) and World Organisation for Animal Health (OIE), respectively.

Notes:

- A substantial amount of reliable biological and socio-economic data is required in order to conduct a high quality risk analyses. Ideally, the relevant information will be incorporated in Jamaica's non-native species database and routinely updated.
- There is no single risk analysis model for IAS that has been adopted worldwide, and some countries have decided to use slightly different risk analysis procedures for each taxonomic group (e.g., birds, reptiles/amphibians, small mammals).

B. Policy and Practice

i. Authority/Coordination

Globally, 'invasive alien species' is a relatively new topic of focus in law and policy. However, aspects of the IAS issue have for decades been addressed by legal and policy instruments under other terminology. For example, the term 'quarantine pests' used by the IPPC is relevant to all non-native species that impact plant health, and pathogens and parasites that are non-native are technically 'invasive alien species.' More recently, some governments (e.g., New Zealand) have been incorporating 'invasive alien species' issues under the broader term, 'biosecurity' which generally refers to all efforts to prevent harm from the intentional and unintentional introduction of biological organisms.

Jamaica does not have a comprehensive law to address IAS or biosecurity. Instead, the coverage is piecemeal; relevant authorities fall under multiple Ministries that enact a wide variety of laws and policies with implications for IAS prevention, eradication, and/or control. Gaps in the legal and policy structure do exist and will need assessment under the NIASSAP.

A summary of relevant laws, policies, and associated authorities can be found in Appendix II. The capacity to address species-specific concerns largely exists in the context of endangered species (environment), quarantine pests (agriculture), and disease (human and animal health). Ecosystem-level concerns may be covered by protected areas legislation or legislation relevant to natural resource-based industries (e.g., lands primarily used for agriculture or waters for fisheries/aquaculture). Some legal instruments focused on pollution (e.g., effluent discharge from aquaculture facilities) may also be applicable. The ability to take legal and policy action to address invasion pathways at national and international levels generally necessitates working through instruments associated with the trade and transport sectors. For example, the International Maritime Organization (IMO) has been developing legally binding and voluntary approaches to limiting the spread of IAS through ballast water.²⁴ The IPPC and associated regional bodies have developed multiple standards for reducing infestations of shipping containers and packaging material.²⁵

At this time, Jamaica does not have any voluntary codes of conduct (aka ‘soft law’ tools; see Reaser 2011) to minimize the spread of IAS. There are, however, an increasing number of models that have been developed within the Caribbean and other parts of the world that could be used as models for working with industry and other stakeholders to address specific invasion pathways. For example, Anguilla has developed several different codes of conduct for invasion pathways,²⁶ while Saint Lucia has focused on the tourism sector.²⁷ The European and Mediterranean Plant Protection Organization (EPPO) has developed the *Guidelines for the Development of a Code of Conduct on Horticulture and Invasive Alien Plants* (EPPO 2009),²⁸ and collaborators based in the United States have published *Codes of Conduct to Reduce*

²⁴<http://globallast.imo.org/index.asp?page=GBPintro.html&menu=true>

²⁵<https://www.ippc.int/core-activities/standards-setting/ispms>

²⁶<http://www.anguillaenvironmentalmanagement.com/policy.htm>

²⁷<http://www.ciasnet.org/wp-content/uploads/2013/06/Tourism-VCoC-final.pdf>

²⁸http://www.eppo.int/INVASIVE_PLANTS/code_of_conduct.htm

the Threat of Invasive Alien Species Introduction and Spread Through Botanic Gardens (Reichard 2011).²⁹

In 2001, the Jamaican Invasive Alien Species Working Group³⁰ was established in order to provide cross-ministerial coordination on IAS. Their terms of reference include assisting with the development or revision of national policies, strategies, legislation, guidelines, management plans and projects relating to IAS. At the time the NIASSAP was being drafted, the IAS Working Group was: a) reviewing the outcomes and sustainability components of the MTIASIC pilot projects in order to develop strategies for continuing IAS eradication and control activities, b) finalizing Criteria for Listing IAS for Jamaica, and c) formulating/prioritizing projects and other activities related to IAS of major concern for the country.

A separate National Ballast Water Task Force is being used as a mechanism for national discussion, coordination and progression on ballast water issues. Jamaica has also served as Chair of the Regional Task Force on Control and Management of Ships' Ballast Water and Sediments in the Wider Caribbean Region.

Notes:

- Prior to developing or expanding additional laws and policies to address IAS, Jamaica needs to clearly define relevant terms³¹ and agree to criteria for determining if a non-native species warrants being labeled as an 'invasive alien species' in the context of Jamaica's ecosystems.
- Participants in the multi-stakeholder consultations felt that increased priority and enforcement capacity needs to be directed at smuggling interdiction. Participants believed that the vast majority of potentially harmful animals and plants are not entering Jamaica through the regulated trade, but are being illegally brought into the country by individuals and private business.

²⁹<http://www.bgci.org/resources/article/0698/>

³⁰ Previously known as the Alien Invasive Species Working Group

³¹ Participants in the multi-stakeholder consultations recommended using CBD terminology in the environmental context (<http://www.cbd.int/invasive/terms.shtml>)

ii. Education and Outreach

The Mitigating the Threats of Invasive Alien Species in the Insular Caribbean (MTIASIC) project has enabled Jamaica to undertake several projects aimed at raising awareness of the IAS issue, as well as fostering the change in behaviors needed to reduce the risk of IAS impact.

Knowledge, attitude, and practices (KAP) surveys have been conducted for the Black River watershed (Social Sciences Commission Research Division 2011) as well as the Hellshire Hills, Goat Island Protected Area communities (Urban Development Corporation 2013).

Examples of recent and ongoing projects include:

- In 2009, the United Nations declared “Alien Invasive Species” as the theme for the International Day for Biological Diversity³².
- Comprehensive social marketing campaigns for the Indo-Pacific lionfish (*Pterolis volitans* and *P. miles*) and Black River Lower Morass;
- ‘Don’t Pack a Pest’ campaign undertaken in partnership with the US Department of Agriculture;
- Publication of the *Aliens of Xamayca* newsletter, as well as of brochures, flyers, posters, and videos on various aspects of the IAS issue in Jamaica (e.g., posters encouraging protection of the Jamaican iguana from IAS);
- Television and radio appearances by those working on the MTIASIC project;
- Articles in newsletters, newspapers, and magazines;
- Exhibits at expos, fairs, and other public events; and
- School programmes and competitions.

Under the MTIASIC project, the participating governments collaborated in the development of the Caribbean Invasive Alien Species Network (CIASNET), a website for sharing information on IAS issues in the Wider Caribbean.³³ Jamaica is already making its education and outreach products available through CIASNET. At the time of MTIASIC project closure, Jamaica intends to make all of its IAS-related information available through a country-specific section of

³² <http://jamaica-gleaner.com/gleaner/20090520/news/news10.html>

³³ <http://www.ciasnet.org/>

CIASNET³⁴.

Notes:

- Participants in the multi-stakeholder consultations felt that Jamaica’s social marketing campaigns have been particularly effective and provide lessons learned, as well as a base of enthusiastic support, for building on these successes. They emphasized the need to focus on school groups since children often end up ‘educating’ parents, as well as rural communities because the impacts of IAS can directly impact personal safety and livelihoods. They also encouraged the government to work with the entertainment industry.³⁵
- In addition to the education/outreach activities proposed within this NIASSAP, please see those focused on the pet trade pathway included in *Jamaica’s Pet Trade Pathway Toolkit* (add URL).

iii. Prevention

IAS prevention is the first line of defense against biological invasion and is generally undertaken through a combination of legal instruments, inspection/quarantine at ports of entry, education and outreach, and voluntary codes of conduct for the trade, tourism, and transport sectors (see above).

Prevention programmes need to address individual species, as well as the pathways of biological invasion. Although prevention programmes are typically thought of as ‘national border protection’ measures, there is also a need to prevent IAS already in the country from moving subnationally. See Box 2 for information on the ‘Don’t Pack a Pest’ campaign.

³⁴ <http://www.ciasnet.org/countryprofiles/jamaica/>

³⁵ PCI-Media Impact was suggested as a potential partner; <http://mediainpact.org/>

Box 3: Illustration of an example of a campaign logo for invasive species

Jamaica's Ministry of Agriculture and Fisheries is the first official offshore partner in the "Traveler's Don't Pack a Pest" outreach program, a cooperative effort between the Florida Department of Agriculture and Consumer Services (FDACS), the U.S. Department of Agriculture / Animal and Plant Health Inspection Service (USDA/APHIS), and the U.S. Department of Homeland Security / Customs and Border Protection (CBP). Launched in Jamaica in October 2013, the campaign delivers the following message to travelers entering the country through airports and cruiseports: *"Help protect our food supply and natural resources . . . when you travel, declare agricultural items, don't pack a pest."* For more information, visit: <http://www.dontpackapest.com/jamaica.html>.]

Note:

- Participants in the multi-stakeholder consultations repeatedly emphasized the need for the country to build the capacity of officials at ports of entry. This will require increasing the number of inspection agents, expanding inspection/enforcement to include more private vessels, training in the identification of IAS and profiling people likely to be smuggling non-native organisms, the provision of tools for rapid identification, and a rapid reporting and response network that links agents at ports of entry taxonomic experts worldwide.

iv. Eradication and Control

The eradication and control of IAS requires substantial ‘on the ground’ action. For plants, this typically involves some combination of mechanical (e.g., pulling or cutting), chemical (e.g., herbicide application), and biological (e.g. introducing plant parasites) intervention. For animals, approaches may include, but not be limited to, baiting, trapping, and shooting. Regulatory measures may need to be in place in order to enable these actions and ensure that they are administered with adequate attention to human health/safety, and animal welfare (see Appendix II).

When prevention fails, eradication of introduced IAS is the ideal outcome. Ideally, eradication activities are undertaken early in the invasion process - before a small, localized population has the opportunity to establish and spread. ‘Early detection and rapid response’ programmes (EDRR; including non-native species reporting and identification networks) are put in place in order to improve the likelihood that non-native species can be eradicated before they become harmful. Jamaica has not yet established a comprehensive EDRR programme. It does, however, utilize surveillance programmes for specific species that would be of high risk to agriculture if they entered the country (e.g., the Mediterranean fruit fly, *Ceratitis capitata*)³⁶.

Box 4: Examples of recent and ongoing IAS eradication and control activities

Eradication

- Feral goats (*Capra aegagrus hircus*) from the Goat Islands
- Cats (*Felis silvestris catus*) from Middle Cay, Pedro

Control

- Paper bark tree (*Melaluca quinquenervia*) and wild ginger (*Alpinia allughas*) in the Black River Lower Morass
- Indo-Pacific Lionfish (*Pterolis volitans* and *P. miles*) in coastal/marine environments
- Citrus greening (caused by the bacterium *Candidatus liberibacter asiaticus*) throughout Jamaica and the Wider Caribbean
- Beet armyworm (*Spodoptera exigua*) in the parishes of St. Elizabeth, Manchester, and Clarendon
- Small Indian mongoose (*Herpestes auropunctatus*), feral cats (*Felis catus*), feral dogs (*Canis lupus familiaris*), pigs (*Sus scrofa*) in the Hellshire Hills

³⁶ The surveillance activity is being used to collect the data necessary to declare Jamaica a “No Medfly” zone. After the declaration has been made, a prevention programme can be established.

Research on IAS has been undertaken in Jamaica for decades, but generally in the agricultural under the topic of ‘quarantine pests’ [e.g., studies of strawberry guava (*Psidium cattleianum*); coffee berry borer (*Hypothenemus hampei*)]. Published literature can be found by searching the CABI Invasive Species Compendium for information specific to Jamaica.³⁷ Jamaica’s Plant Health Coordinating Committee (PHCC) produces action plans for those species determined to be invasive.

Research on IAS in the environmental context is a relatively recent focus, with emphasis on endangered species and protected areas. Prior to the MTIASIC project, faculty at the University of the West Indies (UWI) were studying the impacts of IAS on the critically endangered Jamaican iguana³⁸, as well as marine IAS and invasion pathways [e.g., the green mussel (*Perna viridis*) transported through ballast water]. A study of the non-native white-tailed deer (*Odocoileus virginianus*) in the Portland area was conducted in 2003 (Chai 2007). Research has also been conducted by technical experts based-outside of Jamaica. For example, a team of scientists from New Zealand and the United Kingdom of Great Britain and Northern Ireland found that hurricane disturbance accelerates invasion of Australian box (*Pittosporum undulatum*; Bellingham et al. 2005).

Under the MTIASIC project, Jamaica established three additional ‘pilot projects.’ These included:

- Controlling paper bark tree (*Melaluca quinquenervia*) and wild ginger (*Alpinia allughas*) in the Black River Lower Morass;
- Assessing the impact and potential for controlling the Indo-Pacific Lionfish (*Pterolis volitans* and *P. miles*); and
- Further assessing the impact of IAS on the Jamaican iguana (*Cyclura collei*), and designing strategies to safeguard the species.

Each of these projects has been led by UWI faculty and graduate students. At the time the NIASSAP was being developed, the potential for these projects to continue beyond the term of

³⁷ <http://www.cabi.org/isc/>

³⁸ The Jamaican Iguana Recovery Project preceded the MTIASIC pilot project. <http://www.iucnredlist.org/details/full/6027/0>

the MTIASIC (March 2014) was uncertain due to funding limitations.

v. National Stakeholder Engagement

The government of Jamaica recognizes the value of engaging a diversity of stakeholders in its efforts to minimize the spread and impact of IAS. National stakeholders:

- Can facilitate the introduction and spread of IAS, but also be subjected to the direct and indirect impacts of IAS;
- Have knowledge of specific species and pathways that can be applied for well-informed decision making; and
- Ultimately, are responsible for enacting the personal and institutional actions necessary to protect the country from the adverse impacts of IAS.

The MTIASIC project engaged stakeholders throughout Jamaica, from a wide range of sectors and socio-economic backgrounds. These included:

- Government officials in multiple ministries [esp. NEPA, MoAF, IOJ/Natural History Museum of Jamaica (NHMJ), Ministry of Health]
- Faculty and students at academic institutions (e.g., UWI).
- Non-governmental organizations [e.g., Jamaica Conservation Development Trust (JCDDT); Windsor Research Centre; Caribbean Coastal Area Management Foundation (CCAMF); Portland Environment Protection Association (PEPA)]
- Media specialists
- Hotel operators
- Fisher persons
- Donors (e.g., Environmental Foundation of Jamaica, Forest Conservation Fund)

vi. International Engagement

The government of Jamaica engages in numerous regional and global fora through which it can work with other governments to minimize the spread and impact of IAS. These include the:

- Caribbean Agricultural Research & Development Institute (CARDI)
- Caribbean Invasive Species Working Group (CISWG)

- Caribbean Pest Diagnostic Network (CPDN)
- Caribbean Seabird Initiative (CSI)
- Convention on Biological Diversity (CBD)
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
- Food and Agriculture Organization (FAO)
- Inter-American Institution for Cooperation on Agriculture (IICA)
- International Iguana Foundation (IIF)
- International Maritime Organization (IMO)
- International Plant Protection Convention (IPPC) and associated Caribbean Plant Protection Commission (CPPC)
- Convention on Wetlands of International Importance (Ramsar Convention)

Jamaica also greatly benefits from the direct support and cooperation that it receives from a wide range of other governments, inter-governmental bodies, academic institutions, non-governmental organizations, and donor agencies. In the context of addressing IAS, these have thus far included:

- CABI Caribbean & Latin America (CABI)
- Canadian International Development Agency (CIDA)
- Durrell Wildlife Conservation Trust
- Global Environment Facility (GEF)
- Inter-American Biodiversity Information Network (IABIN)
- International Iguana Foundation (IIF)
- IUCN – Invasive Species Specialist Group (IUCN-ISSG) and Iguana Specialist Group (IUCN-ISG)
- MacArthur Foundation
- The Nature Conservancy (TNC), Caribbean-Florida Fire & Invasives Learning Network
- Organization of American States (OAS)
- REEF
- U.S. Department of Agriculture (USDA)

- U.S. National Oceanic and Atmospheric Administration (NOAA)
- United Nations Environment Programme (UNEP)
- University of Florida
- University of the West Indies – St. Augustine

III. THE WAY FORWARD

The Conference of the Parties (COP) to the Convention on Biological Diversity (CBD)³⁹ has recognized that there is an urgent need to minimize the spread and impact of IAS. Article 8(h) of the Convention states: *Each Contracting Party shall, as far as possible and as appropriate, prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species.*

The need for governments to take immediate action to address IAS was recently reiterated under Target 9 of the Aichi Biodiversity Targets associated with the CBD's Strategic Plan for Biodiversity 2011-2020⁴⁰. Target 9 reads: *By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.*

Jamaica became a Party to the CBD on 6 January 1995. The country is thus obligated to implement COP decisions to the best of its ability.

Decision VI/23 under the CBD⁴¹ reaffirmed the importance of National Invasive Species Strategies and Action Plans (NISSAPs)⁴² as a means of developing a comprehensive approach to fulfilling the obligations under Article 8(h). It also provided elements of a programme of work for IAS and Guiding Principles (Appendix III)⁴³, but did not include specific guidance on how Parties should develop NISSAPs. Each country, therefore, needs to define its own process, ideally using NISSAPs previously produced by other countries for reference.

NISSAPs provide an opportunity for governments to envision and enact a comprehensive approach to minimizing the spread and impact of IAS. In order to be effective, each NISSAP

³⁹ For a summary of the CBD's work on IAS, please go to the Convention's Invasive Alien Species Portal: <http://www.cbd.int/invasive/background.shtml>

⁴⁰ <https://www.cbd.int/sp/>

⁴¹ <http://www.cbd.int/decision/cop/default.shtml?id=7197>

⁴² Also known as National Invasive Alien Species Strategies and Action Plans (NIASAPs)

⁴³ One representative entered a formal objection during the process leading to the adoption of this decision and underlined that he did not believe that the Conference of the Parties could legitimately adopt a motion or a text with a formal objection in place. A few representatives expressed reservations regarding the procedure leading to the adoption of this decision (see UNEP/CBD/COP/6/20, paras. 294-324)

needs to be developed and implemented in a manner that is relevant for a particular country. Ideally, NISSAPs are flexible, allowing for advancements as awareness of the importance of the issue grows, capacity to address the issue builds, and more financial and other resources become available.

The development of NISSAPs is in itself a capacity building process. Effective development of NISSAPs necessitates identifying and building cooperative programmes of work among government ministries, as well as creating constructive dialogue between the government and relevant stakeholders. Bringing key people to the table and facilitating discussions on IAS raises awareness of the issue and its potential impacts. Increased awareness of the challenges posed by IAS can result in far greater attention being given to the issue in policy and budgeting processes. In addition, NISSAPs help to identify national priorities to address IAS, the resources needs for addressing the priorities, and opportunities to obtain and/or share these resources.

NISSAPs also provide a starting point for broader-scale planning. For example:

- Abbreviated versions of the NISSAP can serve as the IAS component of the National Biodiversity Strategies and Action Plans (NBSAPs) requested by all Parties to the CBD.
- NISSAPs serve as the national-level contribution to the development of regional invasive alien species strategies and action plans.

Although it is logical that NISSAPs precede the IAS component of NBSAPs and regional strategies, historically this has not always been the case. Each country needs to determine what order of products makes the most sense given the previous work on IAS at the national and regional level, as well as the opportunities that might present themselves in the near future.

Jamaica produced its first NBSAP in 2003 (NEPA 2003)⁴⁴. An updated NBSAP is currently in preparation. The seven goals identified in the 2003 document, each with corresponding projects, are to:

- Conserve Jamaica's biodiversity;

⁴⁴ http://www.nepa.gov.jm/symposia_03/Policies/NBSAP.pdf

- Promote sustainable use of biological resources;
- Facilitate access to biological resources to promote biotechnology and ensure benefit sharing;
- Ensure safe transfer, handling and use of living modified organisms (LMOs);
- Enhance resource management capacity;
- Promote public awareness, education, and public empowerment; and
- Promote regional and international cooperation and collaboration.

The NBSAP lists the spread of IAS as a major factor contributing to the loss of Jamaica's biodiversity. Section 4.5.1.1.4 Control and/or Eradicate Invasive Introduced Species (pages 37-38) reads as follows:

“Recognising the severe impacts that have, and can result from introductions of alien species on ecosystems, habitats and native species, the following strategic directions are proposed:

- Undertake research and assessments of introduced species that now threaten Jamaica's biodiversity, with a view to identifying appropriate measures to reduce further impacts.
- Develop guidelines for the eradication and monitoring of IAS.
- Require risk assessment of species prior to granting an import permit and institute management assessments for importation.
- Improve management and strengthen enforcement capacity to implement quarantine control measures in order to control unintentional introductions at ports of entry.
- Develop contingency plans and action programmes to ensure rapid eradication of newly established and undesirable alien species.”

Specific activities to be taken toward implementation of these strategic objectives included (pages 61-62):

- Undertaking an in-depth review, based on existing knowledge, of all introduced species currently in Jamaica's ecosystems, i.e., density, reproductive output, habitat use, potential effects of these species on native biodiversity and options for their control;

- Conducting a pilot project on the impact of the White-tailed Deer (*Odocoileus virginianus*);
- Eradicating alien vertebrates on Great Goat Island;
- Estimating the economic costs of implementing control measures on a large scale;
- Reviewing current legislation on import and internal trade of introduced species and filling legislative gaps;
- Evaluating the enforcement of existing legislation; and
- Formulating an IAS management strategy based on a review of the pilot projects and best practices.

Preparation of an ‘Alien Invasive Species Management Plan’ was listed as one of the highest priority projects (page 94).

During the same time period, NEPA produced its *Third National Report for Jamaica 2003-2004* (Office of the Prime Minister 2009)⁴⁵ for the CBD. This document also emphasized the importance of addressing IAS and reported that “an Alien Invasive Species Working Group was established in 2001 and comprises representatives from organizations and government agencies. It continues to fulfill their mandate which includes assisting with the development of a National Policy and Management Plan on alien invasive species and to develop an action plan to eradicate invasive species in protected areas.” The following were listed as IAS for which population monitoring programs were in place: the small Indian mongoose (*Herpestes auro-punctatus*), red-claw crayfish, (*Cherax quadricarinatus*), white-tailed deer (*Odocoileus virginianus*), Australian box (*Pittosporum undulatum*), white ginger lily (*Hedychium coronarium*), combed fork fern (*Dicranopteris pectinata*), and feral pigs (*Sus scrofa*). It was further noted that the Institute of Jamaica (IOJ) was undertaking control programmes for strawberry guava (*Psidium cattleianum*) in the Mason River Reserve ecosystem. The CBD was referred to the NBSAP for further details regarding Jamaica’s focus on IAS.

Under the umbrella of the NBSAP, Jamaica began working on IAS from a variety of angles. For example, a database of IAS was being developed as a contribution of Jamaica’s Clearing House

⁴⁵<http://www.jm.undp.org/files/Jamaica%20Third%20National%20Report%202009%20on%20Biological%20Diversity.pdf>

Mechanism (Ja CHM), the Ministry of Agriculture and Fisheries (MoAF) initiated a pest database and been working to increase the taxonomic capacities of various agencies⁴⁶, the Jamaica Iguana Recovery Group (JIRG) began studies and control measures to protect the rediscovered Jamaican iguana (*Cyclura collei*) from feral vertebrates, and the Jamaica Conservation and Development Trust (JCDDT) engaged in the management of invasive alien plants, such as mock orange/wild coffee (*Pittosporum undulate*) and wild ginger (*Alina allughas*).⁴⁷ A draft Critical Situation Analysis (CSA)⁴⁸ for invasive alien species and National Invasive Species Strategy and Action Plan (NISSAP)⁴⁹ were produced in 2008 and 2009, respectively. These are, however, incomplete and now out-of-date.

In 2009, the Global Environment Facility (GEF) provided funding for Jamaica, Saint Lucia, Trinidad and Tobago, the Bahamas, and the Dominican Republic to collaborate through the Mitigating the Threats of Invasive Alien Species in the Insular Caribbean (MTIASIC) project, with the United Nations Environment Programme (UNEP) acting as project manager and CABI's Caribbean and Latin America office serving as the regional coordinating body⁵⁰. Through this four-year project these countries intend “to conserve globally important ecosystems, the species and genetic diversity within the insular Caribbean” (goal) by mitigating “the threat to local biodiversity and economy from IAS in the insular Caribbean, including terrestrial, freshwater, and marine ecosystems” (objective).

At the national level, Jamaica's contribution to the MTIASIC has been led by the National Environment and Planning Agency (NEPA) through its Projects Planning and Monitoring (PPM) Branch, where a Project Implementation Unit (PIU) has been established. The PIU has been working closely with the officers of the Ecosystems Management and Protected Areas Branches of NEPA for technical guidance. The work has been organised around five main initiatives:

1. Increasing the national capacity to address potential risks posed to biodiversity of global significance from invasive alien species;

⁴⁶ The current status of these projects is unknown and is being investigated

⁴⁷ Townsend, S. 2009. Draft National Invasive Species Strategy and Action Plan; IMIS#: GFL23282740XXXX; PMS#: GF103008XX; <http://www.ciasnet.org/wp-content/uploads/2010/08/Jamaicas-Draft-NISS.pdf>

⁴⁸ Townsend, S. 2009. Jamaica - Critical Situation Analysis; IMIS#: GFL23282740XXXX; PMS#: GF103008XX. Unpublished

⁴⁹ Townsend, S. 2009. Draft National Invasive Species Strategy and Action Plan; IMIS#: GFL23282740XXXX; PMS#: GF103008XX; <http://www.ciasnet.org/wp-content/uploads/2010/08/Jamaicas-Draft-NISS.pdf>

⁵⁰ http://jamaicachm.org.jm/Tool/Information%20sheet%20for%20the%20invasive%20Alien%20Species%20_IAS_%20Project.pdf

2. Increasing regional cooperation to reduce risk posed to biodiversity of global significance from invasive alien species;
3. Strengthening access to data and establishment of best practice, and public awareness of IAS;
4. Increasing capacity to strengthen prevention of new IAS introductions; and increased capacity to detect, respond, control and manage IAS impacting globally significant biodiversity; and
5. Implementation of pilot projects to: a) control and manage the spread of the lionfish (*Pterois volitans* and *Pterois miles*) in the marine/coastal environment, b) protection of the endemic Jamaican iguana (*Cyclura collei*) through monitoring and selective removal of invasive predators, and c) control and management of the invasive paper bark tree (*Melaluca quinquevervia*) and the invasive wild ginger (*Alpinia allughas*) in the Black River Lower Morass.

The major outputs of the national project are:

- Development of National IAS Strategy
- Establishment of Caribbean-wide Cooperation and Strategy
- Knowledge generation, management and dissemination
- Increase capacity to strengthen prevention of new IAS introduction in terrestrial, freshwater, and marine systems
- Increase capacity to detect, respond, control and manage IAS impacts in terrestrial, freshwater, and marine systems

In order to accomplish Output 2, the participating countries collaborated in the development of the *Strategy and Action Plan for Invasive Alien Species in the Caribbean Region 2011-2016*⁵¹ (CRIASAP). The strategy component of the CRIASAP focuses on the prevention and management of:

- Intentional introductions of species for use in biological production systems,

⁵¹ <http://www.ciasnet.org/2013/04/22/strategy-and-action-plan-for-invasive-alien-species-in-the-caribbean-region-2011-2016/>

including agriculture, forestry, fisheries, landscaping, recreational, ornamental purposes and for biological control of pests;

- Intentional introductions of species as a commodity for uses where there is a known risk of escape or release to the wild (e.g., zoos, aquaculture, aquariums, horticulture, pet trade); and
- Unintentional introductions of IAS through pathways involving transport, trade, travel or tourism, as well as natural pathways (e.g., climatic events, migratory birds, vegetation, debris, dust clouds).

As well as the:

- Rehabilitation and restoration of species, habitats or ecosystems; and
- Management of data, information and knowledge generated or acquired to assist in the management of IAS.

The action plan component of has seven objectives, each with associated activities. See pages 17-25 of the CRIASAP for a list of the specific tasks to be undertaken by the end of 2016.

CRIASAP objectives:

1. Establish a Regional Coordinating Mechanism by utilising existing mechanisms where appropriate, with the attendant political support at both the national and regional levels;
2. Establish mechanisms to reduce the spread of IAS within the region through trade and other identified pathways;
3. Strengthen national and regional institutional frameworks to allow effective national and regional management of IAS;
4. Strengthen mechanisms to enable the exchange of information between national, regional and international stakeholders;
5. Facilitate an evidence based approach to the management of IAS through the conduct of research and monitoring;
6. Design and utilise methodologies to prevent or control harmful national intentional and unintentional introductions and mitigate the regional spread of IAS; and

7. Develop a fundraising strategy that will secure adequate financing for implementation of activities under the CRIASAP and national IAS programmes.

IV. STRATEGY AND ACTION PLAN

This National Invasive Alien Species Strategy and Action Plan (NIASSAP)⁵² fulfills Output 1 of Jamaica's contribution to the Mitigating the Threats of Invasive Alien Species in the Caribbean (MTIASIC) project. The six month consultation and drafting process took place between June and December 2013.

In developing the NIASSAP, the consultant and contributors took the following into consideration:

- The Convention on Biological Diversity's *Guiding Principles for the Implementation of Article 8(h)* (Appendix III), as well as additional principles set forth by NEPA and the consultant (Appendix IV);
- The *Strategy and Action Plan for Invasive Alien Species in the Wider Caribbean Region 2011-2016* developed under the MTIASIC project (MTIASIC 2011);
- A draft *National Invasive Species Strategy for Jamaica* developed in 2008 (incomplete and unpublished⁵³);
- Stakeholder responses to a questionnaire circulated by NEPA (Appendix I);
- Findings made during stakeholder consultations in Jamaica (Kingston and Montego Bay) in July and September 2013;
- Published reports and scientific literature; and
- The consultant's expertise in IAS, international policy development, and programmatic implementation.

The NIASSAP has a six year implementation horizon. In the tables below, timeline references are as follows: 'short-term' means two years for implementation, 'medium-term' means four years for implementation, and 'long-term' means six years for implementation. 'Ongoing' indicates that the activity is an ongoing process that is intended to continue indefinitely.

⁵² The term NIASSAP (National Invasive Alien Species Strategy and Action Plan) is used rather than NISSAP (National Invasive Species Strategy and Action Plan) because 'invasive alien species' is the proper terminology within the CBD context and 'invasive species' may connote a different meaning in scientific and policy contexts.

⁵³ <http://www.ciasnet.org/wp-content/uploads/2010/08/Jamaicas-Draft-NISS.pdf>

Acronyms are listed on pages 6-7. A two-page summary, organized by implementation timeframe, can be found in Appendix VII.

Strategy 1: Facilitate NIASSAP Implementation. Institutionalize an effective mechanism for promoting, coordinating, and monitoring the implementation of Jamaica's NIASSAPs

Activity	Lead	Timeline
<p>Conduct an assessment of coordination needs, relevant authorities, existing policy guidance mechanisms, and opportunities for institutionalizing the 'IAS Coordinating Mechanism' (including the National Coordinator position)</p> <p>Outputs: Institutionalized Coordinating Mechanism and publicly available report</p>	<p>Multi-stakeholder assessment team under the auspices of NEPA</p>	<p>Short-term</p>
<p>Produce a brief operational plan (2014-2020) for the Coordinating Mechanism that includes information on institutional roles and responsibilities, timelines for meeting obligations, and relevant bylaws and governance policies, as needed</p> <p>Note: Consider subcommittees and task teams for implementing NIASSAP activities</p> <p>Output: Brief guidance document</p>	<p>NEPA, in partnership with other agencies and stakeholders, as appropriate</p>	<p>Short-term</p>
<p>Conduct a bi-annual review of NIASSAP progress and Coordinating Mechanism effectiveness</p> <p>Output: Report on implementation success, needs for improvement, and recommendations for strengthening implementation capacity</p>	<p>Multi-stakeholder assessment team in partnership with the Coordinating Mechanism</p>	<p>Ongoing</p>
<p>Update IAS critical situation analysis (CSA) and conduct a needs assessment for the next version of the NIASSAP</p> <p>Output: Report that includes a summary of CSA</p>	<p>Coordinating Mechanism</p>	<p>Medium- to Long-term</p>

Activity	Lead	Timeline
findings and recommendations for development of the next NIASSAP		
Through a multi-stakeholder consultation process and taking the findings of the aforementioned assessment into consideration, develop the next NIASSAP Output: Second edition of Jamaica's NIASSAP	Coordinating Mechanism	Long-term

Strategy 2: Prevent, eradicate and control IAS. Strengthen existing and establish new “on-the-ground” programmes⁵⁴ to prevent the introduction of IAS, as well as to minimize their spread and impact.

Activity	Lead	Timeline
<i>Cross-cutting</i>		
Create and promote application of a toolkit for minimizing the risk and impact of IAS introduced via the pet trade pathway Output: Pet Trade Pathway Toolkit for Jamaica	NEPA, through consultancy and multi-stakeholder consultation process	Short-term
<i>Prevention</i>		
Develop and institutionalize a risk analysis framework for pre-import screening of IAS Outputs: Guidelines for risk analyses by taxonomic group, personnel trained and hire/contracted to conduct risk analyses, results of risk analyses made publicly available	MOAF and NEPA	Short-term
Evaluate and strengthen the impact of the ‘Don’t Pack a Pest’ programme and make improvements, as appropriate Output: Brief report, including implementation plan	MoAF	Medium-term
Take action, as appropriate, based on the	National Ballast Water	Medium-term

⁵⁴ Including associated technical approaches and tools, as needed

Activity	Lead	Timeline
findings of the national ballast water assessment (in progress)	Task Force	
<i>Eradication</i>		
<p>Develop and institutionalize and early detection/rapid response programme for IAS of substantial concern</p> <p>Note: Explore opportunities for including a citizen science component</p> <p>Outputs: Guidelines for removal/ eradication of specific species, reporting hotline, institutionalized programme</p>	MoAF and NEPA	Medium-term
<p>Develop and implement a plan for eradicating white-tailed deer (<i>Odocoileus virginianus</i>) from Jamaica</p> <p>Outputs: White-tailed deer eradicated from Jamaica</p>	NEPA and MoFA	Short-term initiation, with potential for long-term implementation
<i>Control</i>		
<p>Assess and improve/expand the lionfish (<i>Pterois spp.</i>) harvesting programme</p> <p>Output: Lionfish population controlled in coastal waters of Jamaica, coral reef ecosystem and fisherpersons protected</p>	MoFA	Ongoing
<p>Continue/expand the programme to control non-native predators of the Jamaican iguana (<i>Cyclura collei</i>)</p> <p>Output: Jamaican iguana protected</p>	NEPA and UWI	Ongoing
<p>Continue/expand the control of non-native aquatic plants in the Lower Black River Morass</p> <p>Output: Aquatic plants protected and Ramsar site protected</p>	NEPA and UWI	Ongoing

Activity	Lead	Timeline
<p>Conduct an assessment of the barrier to and opportunities for the application of biocontrol agents to control IAS in Jamaica</p> <p>Output: Publicly available report, including a strategy and action plan for biocontrol application</p>	NEPA and MoAF, in partnership with CABI	Short-term

Strategy 3: Improve Legal and Institutional Capacity. Strengthen and establish legal and institutional frameworks to enable the effective prevention, eradication, and control of IAS at regional, national, and local (site-specific) levels.

Activity	Lead	Timeline
<i>Cross-cutting</i>		
<p>Establish an operational definition of IAS and related terms for consistent use in Jamaica's relevant laws and policies</p> <p>Output: Operational definition of IAS and related terms publish in official document and made available electronically</p>	NEPA and MoAF	Short-term
<p>Conduct a thorough review of relevant legal and institutional frameworks in order to assess the capacity of existing instruments, gaps, inconsistencies, needs, and potential barriers to improvement</p> <p>Output: Report of findings, including recommendations for building legal and institutional capacity</p>	Multi-stakeholder team led by the Coordinating Mechanism	Short-term
<p>Based on the aforementioned report, develop and implement a strategy to strengthen and fill the gaps in relevant national, regional, and global frameworks</p> <p>Output: Publically available strategy document</p>	Multi-stakeholder team lead by the Coordinating Mechanism	Short-term initiation, implementation ongoing
<i>Prevention</i>		

Activity	Lead	Timeline
See risk analysis framework under Strategy 2		
Develop and promote a voluntary IAS codes of conduct (VCoCs) for (a) zoos and aquaria; (b) farms (agriculture and aquaculture); (c) pet stores, breeders, and dealers; (d) pet owners, (e) veterinarians, and (f) eco-tourism industry Note: Take into consideration materials in the Pet Trade Toolkit and VCoCs completed by Anguilla and the Bahamas Outputs: Publicly available VCoCs and associated promotional campaign(s)	NEPA and MoAF	Short-term initiation to mid-term implementation
Become a member of the International Maritime Organisation and associated conventions Output: Jamaica engaged in and implementing IMO-related activities	National Ballast Water Task Force	In progress, ongoing
Join the Convention on Migratory Species (CMS) Output: Jamaica engaged in and implementing CMS-related activities	NEPA	Short-term initiation to long-term implementation
<i>Eradication</i>		
To be determined based on legal and institutional framework review	NEPA and MoAF	Medium- to long-term
<i>Control</i>		
To be determined based on legal and institutional framework review	NEPA and MoAF	Medium- to long-term

Strategy 4: Build IAS Information Capacity. Enable access to and the exchange of reliable information in order to facilitate the prevention, eradication, and control of IAS in a timely and cost-effective manner.⁵⁵

Activity	Lead	Timeline
<i>Generating Information</i>		
<p>Conduct baseline surveys of non-native species in Jamaica’s terrestrial, freshwater, and marine ecosystems, placing an emphasis on protected areas and landscapes managed for commercial purposes</p> <p>Output: Data contributed to the Jamaica IAS database that, as a minimum, includes information on species, species verification (method, expert name), date documented, specific locality, population size, and reproductive status</p>	NEPA and MoAF	Short-term initiation, then ongoing
See also Strategy 5		
<i>Mobilizing Information</i>		
<p>Mine relevant literature, specimen collections, and datasets for relevant information</p> <p>Output: Data contributed to the Jamaica IAS database</p>	IoJ and Ja CHM	Short-term initiation, then ongoing
<p>Repatriate relevant information and/or enable accessibility through inter-operable databases</p> <p>Output: Request to international institutions to repatriate relevant information made through the CBD, IPPC, IUCN, and other applicable bodies; useful responses contributed to the Jamaica IAS database</p>	IoJ and Ja CHM	Short-term initiation, then ongoing
<i>Making Information Accessible, Useful, and Secure</i>		
Conduct a review of the Jamaica IAS database and pest interception database and make	IoJ, Ja CHM, with	Short-term

⁵⁵ Note: To the extent feasible, information will be verified by relevant experts prior to being made publically accessible

Activity	Lead	Timeline
<p>recommendations for improvement of infrastructure, content, quality, as well as ensuring promotion (use) and long-term sustainability</p> <p>Note: Ideally the Jamaica database will incorporate pest interception information, have an open access policy, and the capacity for inter-operability with other major IAS databases, such as those managed by the IUCN and GBIF</p> <p>Output: Report of findings and recommendations for database improvement</p>	Coordinating Mechanism	
<p>Improvement of Jamaica IAS Database and pest interception database capacity and utilisation</p> <p>Output: Measurable progress in implementation of the recommendations made in the aforementioned report</p>	Ja CHM and MoAF	Short-term initiation, then ongoing
<p>Contribute relevant information to CIASNET.com and provide linkages through the Jamaica IAS database</p> <p>Output: Information posted on CIASNET.com tracked for annual reporting to NEPA/CM; CIASNET access point on Jamaica database site</p>	NEPA and Ja CHM	Short-term, then ongoing

Strategy 5: Conduct Research and Monitoring. Facilitate an evidence-based approach⁵⁶ to the prevention, eradication, and control of IAS through information synthesis, scientific research, and ecological monitoring.

Activity	Lead	Timeline
<i>Cross-cutting Catalytic Information</i>		
Create and maintain a 'watch list' of non-native	Coordinating Mechanism	Short-term initiation,

⁵⁶ Integration of: (a) technical expertise/expert opinion, (b) scientific research findings, and (c) stakeholder values to provide high-quality information for NIASSAP implementation

Activity	Lead	Timeline
<p>species documented in Jamaica</p> <p>Output: A publically-accessible list of non-native species documented in Jamaica that can be used as a point of reference for informing policy and management decisions, as well as developing research and monitoring programs</p>		then ongoing
<p>Create and maintain a ‘watch list’ of non-native species not yet documented in Jamaica, but known to be harmful in the Caribbean region and countries of major trading partners</p> <p>Output: A publically-accessible list of species of high risk of introduction into Jamaica that can be used as a point of reference for prioritizing risk analyses, informing policy, and the focusing early detection/rapid response programs</p>	Coordinating Mechanism	Short-term initiation, then ongoing
<p>Develop and promote a cross-cutting, prioritized research agenda based on an analysis of gaps in IAS information and tools</p> <p>Note: Include biological and socio-economic research needs, especially risk analyses, pathway analyses, environmental and economic impact analysis, and cost-benefit analyses of approaches to prevention, eradication, and control for species/ecosystems of particular concern</p> <p>Output: Report that is made publically-accessible and actively promoted to academic and other research institutions so as to inspire projects that meet high priority IAS research needs</p>	Coordinating Mechanism	Short-term
See also baseline inventories under Strategy 4		
<i>Institutional and Technical Capacity Building</i>		
Strengthen institutional arrangements for research on IAS between the national	Ministries, as appropriate	Ongoing

Activity	Lead	Timeline
<p>government and academic/research institutions in Jamaica and abroad</p> <p>Output: Established Memoranda of Cooperation (MoCs) with relevant institutions in order to facilitate research on and monitoring of IAS in Jamaica</p>		
<p>Build the capacity of national government agencies and partners to conduct: (a) species- and pathway-specific risk analyses and (b) socio-economic impact studies</p> <p>Output: Toolkits on risk and socio-economic analysis developed and made available as technical guidance documents; Training courses held at least annually for agency staff, as well as interested stakeholders (with particular outreach to universities)</p>	Ministries, as appropriate	Short-term product development, then to be updated/ repeated at least annually
<p>Establish scholarship and small grants programmes to support IAS research, with a priority on work that addresses: (a) elements of the aforementioned research agenda and (b) 'emergency response' studies that meet urgent information</p> <p>Output: Institutionalized scholarship and small grants program that is distributing financial resources annually to support IAS research in Jamaica</p>	Coordinating Mechanism	Medium-term implementation, long-term institutionalisation
<i>Specific Priority Projects</i>		
<p>Review progress and additional needs of the Jamaican pilot projects established under the regional MTIASIC project</p> <p>Output: Incorporate outstanding research needs into the aforementioned research agenda</p>	Coordinating Mechanism	Short-term
<p>As a priority, conduct risk analyses of:</p> <ul style="list-style-type: none"> • Pet trade pathway: birds, ornamental 	NEPA, MoAF, and relevant technical consultant(s)	Short-term

Activity	Lead	Timeline
<p>fish, and reptiles/amphibians</p> <ul style="list-style-type: none"> Horticulture pathway: bamboo <p>Output: Scientifically-credible, publicly accessible risk analyses that can be used to inform regulatory decisions and voluntary codes of conduct</p>		
<p>Create a list of IAS pathways into and within Jamaica, and conduct an analysis of associated risks and intervention opportunities</p> <p>Note: Participants in the NIASSAP consultations expressed particular concern about the following pathways: marine (various), pet trade, entertainment industry (including zoos and safari parks), and horticulture industry</p> <p>Output: Scientifically-credible, publicly accessible pathway analyses that can be used to inform regulatory decisions and voluntary codes of conduct</p>	<p>Coordinating Mechanism, with support from technical consultant(s)</p>	<p>Short-term: listing of major pathways</p> <p>Medium-term: priority pathways assessed for risk and intervention potential (management strategy)</p>

Strategy 6: Ensure effective communication, education, and outreach (CEO). Strengthen and expand projects that raise awareness of the IAS issue and their potential impacts, as well as inspire and empower stakeholders to take the appropriate action to prevent, eradicate, and control IAS.

Activity	Lead	Timeline
<i>Cross-cutting</i>		
<p>Conduct an assessment of CEO needs for the implementation of all NIASSAP activities</p> <p>Output: Report summarizing findings</p>	<p>Coordinating Mechanism</p>	<p>Short-term</p>
<p>Conduct an inventory of public environmental and agricultural events that could become venues for IAS CEO activities</p> <p>Output: Brief report and calendar that</p>	<p>Coordinating Mechanism</p>	<p>Short-term</p>

Activity	Lead	Timeline
summarizes findings		
<p>Based on the findings of the activities listed above, develop a comprehensive CEO plan and toolkit to support NIASSAP implementation, including an assessment of needs, best practice approaches for meeting those needs, and stakeholder-targeted messages</p> <p>Note: Explore engaging ‘non-traditional educators’ such as popular musicians</p> <p>Output: Comprehensive IAS-CEO Plan and complementary Toolkit that is readily available to the public</p>	<p>Relevant CEO experts in support of Coordinating Mechanism priorities</p>	<p>Short-term</p>
<p>Create an web-based site for the display and distribution of IAS CEO products</p> <p>Note: Explore use of the Jamaica CHM and CIAS.net</p> <p>Output: Open access website for Jamaica’s CEO products</p>	<p>Coordinating Mechanism</p>	<p>Short-term</p>
<p>Develop and execute a plan to incorporate the IAS issue into K-12 curricula</p> <p>Note: Consider how the IAS issue can be incorporated into a wide-variety of topics, including (but not limited to) biology, math, social studies, economics, and the arts</p> <p>Output: The IAS issue incorporated into K-12 education throughout Jamaica/targeted parishes</p>	<p>Relevant experts in academic curriculum development in support of Coordinating Mechanism priorities</p>	<p>Short-term plan completion, then ongoing with an annual progress report to NEPA</p>
<p><i>Pathway- and Site-Specific</i></p>		
<p>Strengthen and expand the lionfish social marketing project</p> <p>Output: Control of lionfish populations to the extent logistically feasible; Strategic plan, annual progress monitoring reports, and</p>	<p>NEPA and MoAF</p>	<p>Ongoing</p>

Activity	Lead	Timeline
associated CEO products		
Develop and implement separate but complementary ‘Do not release’ campaigns for ornamental fish, birds, and reptiles/amphibians Note: See Jamaica’s <i>Pet Trade Pathway Toolkit</i> Output: Campaign plans and products, and annual progress monitoring reports	NEPA with support with social marketing consultant(s)	Short-term initiation, then ongoing implementation
See also ‘Don’t pack a pest’ campaign, Strategy 2		

Strategy 7: Build Capacity. Strengthen the capacity of individuals and institutions to prevent, eradicate, and control IAS.

Lead(s)	Specific Actions	Expected Outcomes/Outputs
<i>Cross cutting</i>		
Conduct an analysis of technical and institutional capacity build that needs to be accomplished in order to fully implement the NIASSAP Output: Report of findings	Coordinating Mechanism	Short-term
Based on the findings of the above, develop a capacity building strategy, including roles/responsibilities, timelines, and budgets Note: As appropriate incorporate funding needs into the cross-cutting funding plan and associated fundraising activities (esp. the GEF 6 proposal) Output: Strategy and Action Plan	Coordinating Mechanism	Short-term
<i>Training Courses</i>		
Engage in the Green Customs Initiative (CGI) in order to improve the capacity of customs officer to prevent IAS from entering Jamaica	MoAF	Short-term initiation, then ongoing

Lead(s)	Specific Actions	Expected Outcomes/Outputs
<p>Conduct IAS training courses for focal points of all relevant regional and global conventions (e.g., CBD, CITES, IPPC) in order to help ensure that IAS is a high priority in international policy and for associated donor agencies, and that Jamaica's accomplishments and needs are widely recognized</p> <p>Output: Annual training course for relevant focal points and monitoring of focal point knowledge of IAS, as well as their accomplishments in international fora</p>	Relevant Ministries with support from expert consultant(s)	Short-term, then ongoing

Strategy 8: Make Funding Available. Develop and implement a comprehensive fundraising plan that will secure adequate financing for NIASSAP activities.

Activity	Lead	Timeline
<p>Conduct a cross-cutting analysis of: a) funding needs and associated timelines for implementation of the NIASSAP and b) potential fundraising opportunities to meet monetary needs</p> <p>Note: Explore fundraising opportunities through a variety of means, including grants⁵⁷; crowd funding; revenue from fees, fines, and secondary industry products; and public-private partnerships</p> <p>Output: Report on funding needs and opportunities to meet those needs</p>	Coordinating Mechanism	Short-term with annual updating
<p>Explore application of the Tourism Enhancement Fund and Forest Conservation Fund</p> <p>Output: Summary of findings incorporated into the aforementioned report</p>	Coordinating Mechanism	Short-term

⁵⁷ In addition to private funding foundations, explore opportunities for funding from development assistance agencies and the private sector

Activity	Lead	Timeline
<p>Based on the findings of the cross-cutting funding needs analysis, develop and submit a proposal for a GEF 6 project</p> <p>Output: Proposal submitted for GEF 5 financing</p>	<p>NEPA with support from the Coordinating Mechanism and expert consultant(s)</p>	<p>Short-term</p>
<p>Develop a strategic ‘fund solicitation package’ that will support all fundraising activities</p> <p>Output: Professionally developed fund solicitation package that includes an executive summary of the NIASSAP, project concept notes, promotional flyers, etc.</p>	<p>Coordinating Mechanism with support from expert consultant(s)</p>	<p>Short-term implementation with ongoing updating</p>
<p>Explore the feasibility and benefits of developing a cross-cutting budget analysis that identifies and tracks all federal resources contributing to IAS prevention, eradication and control</p> <p>Output: Brief summary of findings to be reviewed by the Coordinating Mechanism and relevant ministry leads</p>	<p>Coordinating Mechanism</p>	<p>Short-term</p>

Appendix I: Questions for Jamaica’s Critical Situation Analysis (Csa) of Invasive Alien Species

I. Scientific Assessment

A. Information Capacity

- 1) What credible biodiversity information sources exist for the country?
- 2) How can they be accessed?
- 3) Which particular information sources provided the data necessary to address any/all of the following CSA questions?
- 4) What are the information gaps with regard to the CSA questions and potential challenges to filling these gaps?

B. Biodiversity Inventories

- 1) What biodiversity inventories/assessments have been conducted for the country and how reliable (quality/date/tax id) is the resultant information?
- 2) What non-native (alien) species have already been detected in the country and what is their known occurrence in terms of ecosystem(s) and locality?

C. Impact Assessment

- 1) Which of the previously detected species fall into the following categories: managed/beneficial, harmful to biodiversity, impact unknown?
- 2) For those species considered harmful, what biological and/or socio-economic impacts have been documented and by what means? How reliable/current are these findings?

D. Pathway Assessment

- 1) What invasion pathway assessments/studies have already taken place and what were the findings?
- 2) To what extent can these pathways be linked to specific trade routes, conveyances, vectors, non-native species, and/or ecosystems?

E. Risk and Impact Analysis

- 1) To what extent have risks of new introductions and their potential impact been assessed?
- 2) Do ‘official’ or ‘unofficial’ lists of IAS in Jamaica currently exist? If so, how are they being used?
- 3) Is there a current, prioritized list of “least wanted/most feared” IAS? If so, how is it being used?

II. Policy and Practice

A. Authority/Coordination

- 1) Which ministries/agencies have authorities relevant to IAS, invasion pathways, and recipient ecosystems?
- 2) What are their specific roles and responsibilities with regard to IAS?
- 3) What is their current state of knowledge of and engagement in the IAS issue?
- 4) What relevant cross-ministerial coordinating mechanism(s) already exist with regard to IAS?

- 5) What are the capacity building needs and/or gaps in authorities and coordination regarding IAS and potential challenges to filling them?

B. Species

- 1) What are the species-level prevention, eradication, and control goals for the country?
- 2) Which of the species of concern are already regulated/managed in some way, through what means, and how successfully? What challenges exist? What opportunities exist?
- 3) What are the capacity building needs and/or gaps in prevention, eradication, and control measures with regard to these species and what are the potential challenges to addressing them?

C. Ecosystems

- 1) What are the ecosystem-level protection and management goals for the country?
- 2) Which ecosystems (types and specific sites) are already protected/managed in some way with regard to IAS, through what means, and how successfully? What challenges exist? What opportunities exist?
- 3) What capacity building needs and/or gaps in ecosystem protection and management in the context of IAS and what are the potential challenges to addressing them?

D. Pathways

- 1) What are the pathway intervention goals for the country?
- 2) What sector/stakeholders(s) are associated with each of the known invasion pathways?
- 3) What pathway regulations and other management opportunities are already in place and how successful have they been?
- 4) What are the capacity building and/or gaps in pathway regulation/management and what challenges exist to addressing them?

E. Education and Outreach

- 1) What are the country's goals for education and outreach in the context of IAS?
- 2) What is the current state of awareness of IAS issues among the public and the key sectors/stakeholders identified above?
- 3) Which of the country's IAS are already well-known by the public and key sectors/stakeholders, if any?
- 4) What public IAS education/outreach programs have been undertaken in the past and how successful were they? What were the lessons learned?
- 5) What public IAS awareness and education programs are currently in place and how successful are they? What lessons are being learned?
- 6) What are the capacity building needs and/or gaps in public awareness and education programs and the potential challenges to addressing them?

F. Research and Analysis⁵⁸

- 1) What are the country's goals with regard to the research and assessment of IAS?
- 2) What are the major institutions and scientists conducting research relevant to the country's IAS issues? How do they make their findings available to the government?
- 3) What are the major institutions funding research/analysis of the country's IAS issues?
- 4) What are the capacity building needs and/or gaps in IAS research/analysis programs and the potential challenges to addressing them?

⁵⁸ Please address biological research/assessment, as well as socio-economic research/assessment

G. National Stakeholder Engagement

- 1) What non-governmental organisations, academic institutions, and other bodies have programmes to address IAS and what projects are they engaged in? Please provide contact information.
- 2) In what way are these organisations working with the government of Jamaica? In what way could coordination/communication with the government be improved?
- 3) What are the major challenges these organisations are facing in effectively meeting their IAS programme/project goals? How might the government help them overcome these challenges?

H. International Engagement

- 4) What are the country's goals for international engagement with regard to IAS (esp. consider 'neighbors' and trading partners)
- 5) By what mechanisms (e.g., conventions, treaties, projects) does the country already engage internationally with regard to IAS? How effective are these mechanisms?
- 6) What are the capacity building needs and/or gaps in international engagement with regard to IAS and the potential challenges to addressing them?

Appendix II: RELEVANT LAWS, AGREEMENTS, AND INTERNATIONAL ORGANISATIONS

National Laws and Regulations⁵⁹

Regulation/ Year of issue	Legal Area	Summary of scope relevant to IAS in Jamaica; URL
Animal (Disease and Importation) Act, 1948	Agriculture	Control of animal diseases (e.g., procedures relevant to segregation, ports of entry procedures, slaughter, disposal, compensation) and animal importation issues (e.g., prohibition of birds, regulations, licensing, quarantine).
Customs Act, 1941	Tax	Inspection duties, regulations, and procedures to be followed by Customs officers at ports of entry.
Endangered Species (Protection, Conservation and Regulation of Trade) Act, 2000	Environment	Broad endangered species regulations relevant to trade, possession, breeding/propagation, identification/marketing, and transportation. Includes four 'Schedules' listing regulated species.
Fishing Industry Act, 1976	Agriculture	Provides for regulation of the fishing industry, including licensing and fisheries protection.
Maritime Areas Act, 1996	International Relations	Declares Jamaica to be an archipelagic State and makes provision with respect to certain Maritime Areas of Jamaica and their related issues (e.g., vessel routes, activities, pollution).
Natural Resources Conservation Authority (NRCA) Act, 1991	Environment	Addresses a broad range of conservation-related issues including parks and protected area designation, environmental impact statements, effluent discharge licensing, and water pollution. See Permit and License Regulation (1996): Permits are required for the introduction of new species (flora and fauna) into the country. The use of IAS and other non-native species in landscaping requires special permits which must be obtained in writing from the Authority.

⁵⁹ For additional information, see: <http://moj.gov.jm/laws?title>

Regulation/ Year of issue	Legal Area	Summary of scope relevant to IAS in Jamaica; URL
Plants (Quarantine) Act, 1994	Agriculture	Makes provision for the effective control of the importation of plants, plant products and articles which pose a threat of injurious plant pests (including IAS). Explicitly addresses inspection, quarantine, treatment, and disposal.
Public Health Act – Nuisance Regulation, 1985	Health and Safety	Enables the promotion of public health issues and preventing the spread of communicable and epidemic diseases (including those which are IAS or are vectored by IAS).
Wild Life Protection Act, 1945	Environment	Makes broad provision for the protection of certain wild animals, birds and fish and for other matters related to their survival and welfare. Issues addressed include hunting, gaming, poaching, collecting, protecting waters from effluent discharge. Note: New suggestions for the amendment of this act have been proposed which would make provisions for the management of IAS.

Regional Agreements and Organisations

Name of Agreement/ Organisation	Legal Area	Summary of scope relevant to IAS in Jamaica; URL
<i>Agreement</i>		
Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region, Cartagena de Indias (Cartagena Convention) 1987 [Date of Entry into Force]	Environment	The ‘Cartagena Convention’ is a comprehensive, umbrella agreement for the protection and development of the marine environment. It provides the legal framework for cooperative regional and national actions in the Wider Caribbean Region. It is supported by three protocols. Two of them address marine pollution. The third, Protocol Concerning Specially Protected Areas and Wildlife (SPA) in the Wider Caribbean Region, has direct relevance to IAS prevention and management. http://www.cep.unep.org/cartagena-convention
<i>Organisation</i>		
Caribbean Plant Protection Commission	Agriculture	Originally designated to assist region-level coordination and implementation of decisions and activities associated with the International Plant Protection Convention (IPPC).

Name of Agreement/ Organisation	Legal Area	Summary of scope relevant to IAS in Jamaica; URL
		It is currently in transition to a new organization and does not have a work programme. https://www.ippc.int/ar/partners/regional-plant-protection-organizations/caribbean-plant-protection-commission

International Agreements and Organisations

Name of Agreement or Organisation	Lead Area	Summary of scope relevant to IAS in Jamaica
<i>Agreements</i>		
Convention on Biological Diversity (CBD) 1993 [Date of Entry into Force]	Environment	United Nations convention with a broad focus on biodiversity conservation. Includes an Article (8h) and Aichi Biodiversity Target (#9) focused on IAS prevention, eradication, and control, as well as numerous relevant decisions. http://www.cbd.int
Convention on International Trade in Endangered Species of Fauna and Flora (CITES) 1975 [Date of Entry into Force]	Environment	Although explicitly focused on endangered species conservation in the trade context, includes multiple Resolutions (e.g., COP 14 Resolutions 10.17, 12.10 and 13.10) and Decisions (e.g. 15.57 and 15.58) relevant to preventing the movement of IAS through trade. http://www.cites.org
Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matters (London Convention) 1972 [Date of Entry into Force]	Environment	The "London Convention" is one of the first global conventions to protect the marine environment from human activities and has been in force. Its objective is to promote the effective control of all sources of marine pollution and to take all practicable steps to prevent pollution of the sea by dumping of wastes and other matter. http://www.imo.org/OurWork/Environment/SpecialProgrammesAndInitiatives/Pages/London-Convention-and-Protocol.aspx
Convention on Wetlands of International Importance (Ramsar	Environment	The 'Ramsar Convention' is an intergovernmental treaty that embodies the commitments of its member countries to maintain the ecological character of their Wetlands of

Convention) 1975 [Date of Entry into Force]		International Importance and to plan for the "wise use", or sustainable use, of all of the wetlands in their territories. Resolutions VII.14 and VIII.18 focus on the prevention, control, and eradication of IAS in wetland ecosystems. http://www.ramsar.org
International Plant Protection Convention (IPPC) April 1952; Revision October 2005 [Date of Entry into Force]	Agriculture, Trade	The IPPC aims to protect cultivated and wild plants by preventing the introduction and spread of pests, including IAS. IPPC activities include standard setting, communications, capacity building, and dispute resolution. http://www.ippc.int
United Nations Convention on Law of the Sea (UNCLOS) 1994 [Date of Entry into Force]	Environment	UNCLOS lays down a comprehensive regime of law and order in the world's oceans and seas establishing rules governing all uses of the oceans and their resources. It enshrines the notion that all problems of ocean space are closely interrelated and need to be addressed as a whole. Article 196 requires nations to "take all measures necessary" to prevent the intentional or accidental introduction of non-native species to a new part of the marine environment. http://www.un.org/depts/los/convention_agreements/convention_overview_convention.htm
<i>Organisations</i>		
Food and Agriculture Organisation of the United Nations (FAO) Multiple agreements have been established, each with different dates of entry into force	Agriculture	Multiple divisions are relevant, especially the Fisheries and Aquaculture Department. Several codes of practice, guidelines, reports, and datasets contain information relevant to IAS prevention and management. http://www.fao.org
International Maritime Organisation (IMO)	Environment, Trade	Member countries negotiate, develop, agree, adopt, ratify, enter into force and administer international Conventions as well as other legal instruments on maritime safety, maritime security and marine pollution. The IMO has been focused of prevention of IAS

Multiple Conventions have been established, each with different dates of entry into force		movement through ballast water, but may also be expanding its scope of engagement to include hull fouling. http://www.imo.org
World Organisation for Animal Health (OIE)	Agriculture, Environment	The OIE plays a role of international leadership in controlling pathogens and disease vectors, as relevant to the diseases listed by the OIE, for terrestrial and aquatic animals. The OIE international standards help to prevent the entry and spread of listed animal diseases via international trade, and also provide a basis for early detection and effective action to control and eliminate listed diseases. http://www.oie.int
World Trade Organisation (WTO) Multiple agreements have been established, each with different dates of entry into force	Trade	One of the WTO trade agreements named the Agreement on the Application of Sanitary and Phytosanitary Measures (the "SPS Agreement"), addresses measures that governments may take to minimize the risks to human, plant and animal life and health that may be associated with the movement of goods through trade, in particular risks of unsafe food, or the introduction or spread of animal diseases or plant pests. The SPS Agreement also permits governments to impose measures to protect their territory from other potential damages from the entry, establishment or spread of pests. These provisions were intended to address measures that governments may take to minimize the spread, through trade, of IAS. http://www.wto.org

Appendix III: Guiding Principles for the Prevention, Introduction and Mitigation of Impacts of Alien Species that Threaten Ecosystems, Habitats or Species

At the sixth Conference of the Parties (COP), non-binding guidance was adopted⁶⁰ for developing effective strategies to minimize the spread and impact of IAS. While each country faces unique challenges and will need to develop context-specific solutions, the Guiding Principles give governments clear direction and a set of goals to aim toward. The extent to which these Guiding Principles can be effectively implemented through NISSAPs ultimately depends on available resources. Their purpose is to strategically assist governments to address IAS as an integral component of conservation and economic development.

A. GENERAL

Guiding Principle 1: Precautionary approach

Given the unpredictability of the pathways and impacts on biological diversity of IAS, efforts to identify and prevent unintentional introductions as well as decisions concerning intentional introductions should be based on the precautionary approach, in particular with reference to risk analysis, in accordance with the guiding principles below. The precautionary approach is that set forth in Principle 15 of the 1992 Rio Declaration on Environment and Development and in the preamble of the Convention on Biological Diversity⁶¹.

The precautionary approach should also be applied when considering eradication, containment and control measures in relation to alien species that have become established. Lack of scientific certainty about the various implications of an invasion should not be used as a reason for postponing or failing to take appropriate eradication, containment and control measures.

Guiding Principle 2: Three-stage hierarchical approach

1. Prevention [the first stage] is generally far more cost-effective and environmentally desirable than measures taken following introduction and establishment of an IAS.
2. Priority should be given to preventing the introduction of IAS, between and within States. If an IAS has been introduced, early detection and rapid action are [a] crucial [second stage] to prevent its establishment. The preferred response is often to eradicate the organisms as soon as possible (principle 13). In the event that eradication is not feasible or resources are not available for its eradication, containment (principle 14) and long-term control measures (principle 15 [and the third stage]) should be implemented. Any examination of benefits and costs (environmental, economic and social) should be done on a long-term basis.

⁶⁰ One representative entered a formal objection during the process leading to the adoption of this decision and underlined that he did not believe that the Conference of the Parties could legitimately adopt a motion or a text with a formal objection in place. A few representatives expressed reservations regarding the procedure leading to the adoption of this decision (see UNEP/CBD/COP/6/20, paras. 294-324)

⁶¹ <http://www.unep.org/Documents.Multilingual/Default.asp?documentid=78&articleid=1163>; <http://www.cbd.int/convention/articles/?a=cbd-00>

Guiding Principle 3: Ecosystem Approach

Measures to deal with invasive alien species should, as appropriate, be based on the ecosystem approach, as described in decision V/6 of the Conference of the Parties.

Guiding Principle 4: The Role of States

1. In the context of IAS, States should recognize the risk that activities within their jurisdiction or control may pose to other States as a potential source of IAS, and should take appropriate individual and cooperative actions to minimize that risk, including the provision of any available information on invasive behaviour or invasive potential of a species.
2. Examples of such activities include:
 - a. The intentional transfer of an IAS to another State (even if it is harmless in the State of origin); and
 - b. The intentional introduction of an alien species into their own State if there is a risk of that species subsequently spreading (with or without a human vector) into another State and becoming invasive;
 - c. Activities that may lead to unintentional introductions, even where the introduced species is harmless in the state of origin.
3. To help States minimize the spread and impact of IAS, States should identify, as far as possible, species that could become invasive and make such information available to other States.

Guiding Principle 5: Research and Monitoring

In order to develop an adequate knowledge base to address the problem, it is important that States undertake research on and monitoring of IAS, as appropriate. These efforts should attempt to include a baseline taxonomic study of biodiversity. In addition to these data, monitoring is the key to early detection of new IAS. Monitoring should include both targeted and general surveys, and benefit from the involvement of other sectors, including local communities. Research on an IAS should include a thorough identification of the invasive species and should document: (a) the history and ecology of invasion (origin, pathways and time-period); (b) the biological characteristics of the IAS; and (c) the associated impacts at the ecosystem, species and genetic level and also social and economic impacts, and how they change over time.

Guiding Principle 6: Education and Public Awareness

Raising the public's awareness of the IAS is crucial to the successful management of invasive alien species. Therefore, it is important that States should promote education and public awareness of the causes of invasion and the risks associated with the introduction of alien species. When mitigation measures are required, education and public-awareness-oriented programmes should be set in motion so as to engage local communities and appropriate sector groups in support of such measures.

B. PREVENTION

Guiding Principle 7: Border Control and Quarantine Measures

1. States should implement border controls and quarantine measures for alien species that are or could become invasive to ensure that:
 - a. Intentional introductions of alien species are subject to appropriate authorization (principle 10);
 - b. Unintentional or unauthorized introductions of alien species are minimized.
2. States should consider putting in place appropriate measures to control introductions of IAS within the State according to national legislation and policies where they exist.
3. These measures should be based on a risk analysis of the threats posed by alien species and their potential pathways of entry. Existing appropriate governmental agencies or authorities should be strengthened and broadened as necessary, and staff should be properly trained to implement these measures. Early detection systems and regional and international coordination are essential to prevention.

Guiding Principle 8: Exchange of Information

1. States should assist in the development of an inventory and synthesis of relevant databases, including taxonomic and specimen databases, and the development of information systems and an interoperable distributed network of databases for compilation and dissemination of information on alien species for use in the context of any prevention, introduction, monitoring and mitigation activities. This information should include incident lists, potential threats to neighbouring countries, information on taxonomy, ecology and genetics of invasive alien species and on control methods, whenever available. The wide dissemination of this information, as well as national, regional and international guidelines, procedures and recommendations such as those being compiled by the Global Invasive Species Programme⁶² should also be facilitated through, *inter alia*, the clearing-house mechanism of the Convention on Biological Diversity.
2. The States should provide all relevant information on their specific import requirements for alien species, in particular those that have already been identified as invasive, and make this information available to other States.

Guiding Principle 9: Cooperation, including Capacity-building

Depending on the situation, a State's response might be purely internal (within the country), or may require a cooperative effort between two or more countries. Such efforts may include:

- a. Programmes developed to share information on IAS, their potential uneasiness and invasion pathways, with a particular emphasis on cooperation among neighbouring countries, between trading partners, and among countries with similar ecosystems and histories of invasion. Particular attention should be paid where trading partners have similar environments;
- b. Agreements between countries, on a bilateral or multilateral basis, should be developed and used to regulate trade in certain alien species, with a focus on particularly damaging IAS;

⁶² The Global Invasive Species Programme (GISP) was closed in 2011

- c. Support for capacity-building programmes for States that lack the expertise and resources, including financial, to assess and reduce the risks and to mitigate the effects when introduction and establishment of alien species has taken place. Such capacity-building may involve technology transfer and the development of training programmes;
- d. Cooperative research efforts and funding efforts toward the identification, prevention, early detection, monitoring and control of IAS.

C. INTRODUCTION OF SPECIES

Guiding Principle 10: Intentional Introduction

1. No first-time intentional introduction or subsequent introductions of an alien species already invasive or potentially invasive within a country should take place without prior authorization from a competent authority of the recipient State(s). An appropriate risk analysis, which may include an environmental impact assessment, should be carried out as part of the evaluation process before coming to a decision on whether or not to authorize a proposed introduction to the country or to new ecological regions within a country. States should make all efforts to permit only those species that are unlikely to threaten biological diversity. The burden of proof that a proposed introduction is unlikely to threaten biological diversity should be with the proposer of the introduction or be assigned as appropriate by the recipient State. Authorization of an introduction may, where appropriate, be accompanied by conditions (e.g., preparation of a mitigation plan, monitoring procedures, payment for assessment and management, or containment requirements).
2. Decisions concerning intentional introductions should be based on the precautionary approach, including within a risk analysis framework, set forth in principle 15 of the 1992 Rio Declaration on Environment and Development, and the preamble of the Convention on Biological Diversity. Where there is a threat of reduction or loss of biological diversity, lack of sufficient scientific certainty and knowledge regarding an alien species should not prevent a competent authority from taking a decision with regard to the intentional introduction of such alien species to prevent the spread and adverse impact of invasive alien species.

Guiding Principle 11: Unintentional Introductions

1. All States should have in place provisions to address unintentional introductions (or intentional introductions that have become established and invasive). These could include statutory and regulatory measures and establishment or strengthening of institutions and agencies with appropriate responsibilities. Operational resources should be sufficient to allow for rapid and effective action.
2. Common pathways leading to unintentional introductions need to be identified and appropriate provisions to minimize such introductions should be in place. Sectoral activities, such as fisheries, agriculture, forestry, horticulture, shipping (including the discharge of ballast waters), ground and air transportation, construction projects, landscaping, aquaculture including ornamental aquaculture, tourism, the pet industry and game-farming, are often pathways for unintentional introductions. Environmental impact assessment of such activities should address the risk of

unintentional introduction of invasive alien species. Wherever appropriate, a risk analysis of the unintentional introduction of invasive alien species should be conducted for these pathways.

D. MITIGATION OF IMPACTS

Guiding Principle 12: Mitigation of Impacts

Once the establishment of an IAS has been detected, States, individually and cooperatively, should take appropriate steps such as eradication, containment and control, to mitigate adverse effects. Techniques used for eradication, containment or control should be safe to humans, the environment and agriculture as well as ethically acceptable to stakeholders in the areas affected by the invasive alien species. Mitigation measures should take place in the earliest possible stage of invasion, on the basis of the precautionary approach. Consistent with national policy or legislation, an individual or entity responsible for the introduction of IAS should bear the costs of control measures and biological diversity restoration where it is established that they failed to comply with the national laws and regulations⁶³. Hence, early detection of new introductions of potentially or known invasive alien species is important, and needs to be combined with the capacity to take rapid follow-up action.

Guiding Principle 13: Eradication

Where it is feasible, eradication is often the best course of action to deal with the introduction and establishment of invasive alien species. The best opportunity for eradicating IAS is in the early stages of invasion, when populations are small and localized; hence, early detection systems focused on high-risk entry points can be critically useful while post-eradication monitoring may be necessary. Community support is often essential to achieve success in eradication work, and is particularly effective when developed through consultation. Consideration should also be given to secondary effects on biological diversity.

Guiding Principle 14: Containment

When eradication is not appropriate, limiting the spread (containment) of IAS is often an appropriate strategy in cases where the range of the organisms or of a population is small enough to make such efforts feasible. Regular monitoring is essential and needs to be linked with quick action to eradicate any new outbreaks.

Guiding Principle 15: Control

Control measures should focus on reducing the damage caused as well as reducing the number of the IAS. Effective control will often rely on a range of integrated management techniques, including mechanical control, chemical control, biological control and habitat management, implemented according to existing national regulations and international codes.

⁶³ Known as the “polluter pays principle”; http://en.wikipedia.org/wiki/Precautionary_principle

Appendix IV: Additional NIASSAP Principles

In addition to the Guiding Principles contained in the previous Appendix, the following additional principles were taken into consideration during the NIASSAP development and will provide further direction for the implementation process, as appropriate.

Context Relevant

- The NIASSAP considers issues particular to the country, for example: geography (including size and connectivity), ecosystems, climate, capacity (esp. legal, institutional, human, financial, technical), pathways of entry, existing knowledge of IAS, IAS pathways (patterns and trends), current status of invasion, and severity of IAS impacts (current and projected).

Well-informed

- Prior to NIASSAP development, reasonable efforts are made to identify and analyze the body of knowledge currently available on IAS and potential IAS that are already within the country. This study is based on the best available scientific data. Ideally, the study also includes information on potentially harmful alien species found within the region and among trading partners (i.e. potential new invaders).
- The NIASSAP provides for ongoing scientific assessment and a means of storing and disseminating the information generated. Provisions are necessary for making adjustments to the NIASSAP, as well as relevant policies and programmes as new, credible information becomes available (see “Adaptable” below).
- NIASSAPs developed by other countries are used as references for information on species and pathways of concern, organizational and technical approaches, and opportunities for international cooperation and capacity building. See, for example: <http://www.cbd.int/invasive/national-reports.shtml>.

Foundation Setting

- The NIASSAP serves as the basis for the development of legal and institutional frameworks, programmes of work, and financial decisions at the national level. Considerable attention, therefore, is given to making the NIASSAP as consistent with the principles listed in the Appendix as possible. The first NIASSAP also functions as a starting point for the development of subsequent updated NIASSAPs. Ideally, the term period for each NIASSAP is determined at the time of its development (generally one to five years).

Risk-based

- Not all alien species are harmful, and those that are harmful are not equally so. The NIASSAP establishes a risk-based approach for addressing IAS, enabling priorities to be placed on the highest risk species, pathways, and ecosystems (see below). The risk of adverse impact by a non-native species is best evaluated by a scientifically-credible risk analysis as defined in the Glossary of Terms herein.

Priority Setting & Cost Effective

- A truly comprehensive approach to preventing, controlling, and eradicating all IAS within a Jamaica is not logistically feasible. Therefore, priorities need to be established to determine the most cost-effective means of addressing current and future IAS issues. Risk analysis (see above) provides a valuable tool for informing priorities and economic analyses.

Cross-sectoral

- The impact of IAS is not limited to biodiversity, and the same species of IAS can threaten multiple sectors. IAS also move and are moved through the activities associated with various sectors. Examples of sectors both vulnerable to IAS and serving as pathways for their movement include: agriculture, forestry, fisheries/aquaculture, commerce, transportation, tourism and recreation. The NIASSAP thus needs to consider the full array of relevant sectors. As a minimum, this will include multi-stakeholder engagement in the development and implementation of the NIASSAP (see below), education/outreach to the IAS-relevant sectors, and effective utilization of the applicable laws and policies associated with the various sectors to limit the spread and impact of IAS.

Stakeholder Inclusive

- IAS impact a wide range of sectors (see above) and ecosystems, as well as people at all socio-economic levels. The NIASSAP development and implementation process will, therefore, effectively facilitate stakeholder input and engagement.
- Stakeholder initiatives need to include indigenous and local communities, relevant non-governmental organisations, academic/scientific institutions, and the private sector, as well as all levels of government.
- In some contexts, non-governmental stakeholders may be better poised to prevent, control, and/or eradicate certain IAS than government agencies.

Capacity Building

- The development of NIASSAPs is in itself a capacity building process. Effective development of Jamaica's NIASSAP necessitates identifying and building cooperative programmes of work among government ministries, as well as creating constructive dialogue between the government and relevant stakeholders. Bringing key people to the table and facilitating discussions on IAS will raise awareness of the issue and its potential

impacts (see Stakeholder Inclusive). Increased awareness of the challenges posed by IAS can result in far greater attention being given to the issue in policy and budgeting processes. In addition, the NIASSAP will help to identify national priorities to address IAS, the resources needs for addressing the priorities, and opportunities to obtain and/or share these resources (see Priority Setting).

Fostering of International Cooperation

- Once the IAS becomes established within one country, they can pose a threat to an entire region, as well as to trading partners and every country along a trading pathway. Therefore, Jamaica's NIASSAP needs to take an international perspective and consider approaches for effective implementation of relevant international standards and codes of conduct; engagement in international dialogue and cooperation, particularly with a view toward improving the coverage of international instruments and establishing effective regional approaches; and supporting strategies that raise the capacity of other nations to manage their IAS problems.
- It is also important that work on coordination, synergies, and filling of gaps in authorities among the relevant Conventions is undertaken through implementation at national levels. Jamaica's NIASSAPs will provide a strategic context for this work.
- Thus far, national governments worldwide have done relatively little to establish policies and programmes intended to limit the export of organisms which may be harmful to recipient countries. This is an important topic for work for Jamaica to consider in the future, especially in the context of regional trade and tourism.

Measureable

- Ideally the elements of the NIASSAP programme of work are presented in a manner that enables progress to be quantified. Measuring success is important for several reasons: for example, it informs decisions about priorities and cost effectiveness, allows for corrective action if policies and/or projects are not as effective as desired, and helps to justify expenditures, as well as support future requests for programme funding. Effort will be made to identify measurable outcomes that are timely and cost-effective to monitor.

Adaptable

- The IAS issue is characterised by complexity, uncertainty, and self-perpetuating organisms that may spread quite readily. The NIASSAP will be designed in a manner that allows for an adaptive management approach to project and policy implementation. For example, as more information becomes available on the status and impacts of certain IAS, priorities and/or techniques might need to change. New technologies could make it feasible to address species previously thought to be beyond control. New species may invade and/or new pathways might emerge. Climate change might lessen the impact of some non-native species while facilitating the spread and impact of others. Findings from

routine programme assessment (see above) will be taken into consideration when changes to the NIASSAP are warranted.

Appendix V: NIASSAP Summary Table

Activity leads are listed in brackets. Acronyms can be found on page X.

A. Short-term (Two years to implement)

Conduct an assessment of coordination needs, relevant authorities, existing policy guidance mechanisms, and opportunities for institutionalizing the 'IAS Coordinating Mechanism' (including the National Coordinator position) [Multi-stakeholder assessment team under the auspices of NEPA]
Produce a brief operational plan (2014-2020) for the Coordinating Mechanism that includes information on institutional roles and responsibilities, timelines for meeting obligations, and relevant bylaws and governance policies, as needed [NEPA, in partnership with other agencies and stakeholders, as appropriate]
Create and promote application of a toolkit for minimizing the risk and impact of IAS introduced via the pet trade pathway [NEPA, through consultancy and multi-stakeholder consultation process]
Develop and institutionalize a risk analysis framework for pre-import screening of IAS [MOAF and NEPA]
Develop and implement a plan for eradicating white-tailed deer (<i>Odocoileus virginianus</i>) from Jamaica [NEPA and MoAF; May require long-term implementation]
Conduct an assessment of the barrier to and opportunities for the application of biocontrol agents to control IAS in Jamaica [NEPA and MoAF, in partnership with CABI]
Establish an operational definition of IAS and related terms for consistent use in Jamaica's relevant laws and policies [NEPA and MoAF]
Conduct a thorough review of relevant legal and institutional frameworks in order to assess the capacity of existing instruments, gaps, inconsistencies, needs, and potential barriers to improvement [Multi-stakeholder team led by the Coordinating Mechanism]
Based on the aforementioned report, develop and implement a strategy to strengthen and fill the gaps in relevant national, regional, and global frameworks [Multi-stakeholder team lead by the Coordinating Mechanism; Implementation of report ongoing]
Develop and promote a voluntary IAS codes of conduct (VcoCs) for (a) zoos and aquaria; (b) farms (agriculture and aquaculture); (c) pet stores, breeders, and dealers; (d) pet owners, (e) veterinarians, and (f) eco-tourism industry [NEPA and MoFA; May require mid-term implementation]
Join the Convention on Migratory Species (CMS) [NEPA; May require long-term implementation]
Conduct baseline surveys of non-native species in Jamaica's terrestrial, freshwater, and marine ecosystems, placing an emphasis on protected areas and landscapes managed for commercial purposes [NEPA and MoAF; Ongoing after initiation]

Mine relevant literature, specimen collections, and datasets for relevant information [IOJ and Ja CHM; Ongoing after initiation]
Repatriate relevant information and/or enable accessibility through inter-operable databases [IOJ and Ja CHM; Ongoing after initiation]
Conduct a review of the Jamaica IAS database and pest interception database and make recommendations for improvement of infrastructure, content, quality, as well as ensuring promotion (use) and long-term sustainability [IoJ, Ja CHM, with Coordinating Mechanism]
Improvement of Jamaica IAS Database and pest interception database capacity and utilization [Ja CHM and MoAF; Ongoing after initiation]
Contribute relevant information to CIASNET.com and provide linkages through the Jamaica IAS database [NEPA and Ja CHM; Ongoing after initiation]
Create and maintain a 'watch list' of non-native species documented in Jamaica [Coordinating Mechanism; Ongoing after initiation]
Create and maintain a 'watch list' of non-native species not yet documented in Jamaica, but known to be harmful in the Caribbean region and countries of major trading partners [Coordinating Mechanism; Ongoing after initiation]
Develop and promote a cross-cutting, prioritized research agenda based on an analysis of gaps in IAS information and tools [Coordinating Mechanism]
Build the capacity of national government agencies and partners to conduct: (a) species- and pathway-specific risk analyses and (b) socio-economic impact studies [Ministries as appropriate; annual updating]
Review progress and additional needs of the Jamaican pilot projects established under the regional MTIASIC project [Coordinating Mechanism]
As a priority, conduct risk analyses of pet trade pathway (birds, ornamental fish, and reptiles/amphibians) and horticulture pathway (bamboo) [NEPA, MoAF, and relevant technical consultant(s)]
Create a list of IAS pathways into and within Jamaica [Coordinating Mechanism, with support from technical consultant(s)]
Scientifically-credible, publicly accessible pathway analyses that can be used to inform regulatory decisions and voluntary codes of conduct [Coordinating Mechanism]
Conduct an assessment of CEO needs for the implementation of all NIASSAP activities [Coordinating Mechanism]
Conduct an inventory of public environmental and agricultural events that could become venues for IAS CEO activities [Coordinating Mechanism]
Based on the findings of the activities listed above, develop a comprehensive CEO plan and toolkit to support NIASSAP implementation, including an assessment of needs, best practice approaches for meeting those needs, and stakeholder-targeted messages [Relevant CEO experts in support of Coordinating Mechanism priorities]

Create an web-based site for the display and distribution of IAS CEO products [Coordinating Mechanism]
Develop and execute a plan to incorporate the IAS issue into K-12 curricula [Relevant experts in academic curriculum development in support of Coordinating Mechanism priorities]
Develop and implement separate but complementary ‘Do not release’ campaigns for ornamental fish, birds, and reptiles/amphibians [NEPA with support with social marketing consultant(s); ongoing after implementation]
Conduct an analysis of technical and institutional capacity build that needs to be accomplished in order to fully implement the NIASSAP [Coordinating Mechanism]
Based on the findings of the above, develop a capacity building strategy, including roles/responsibilities, timelines, and budgets [Coordinating Mechanism]
Engage in the Green Customs Initiative (CGI) in order to improve the capacity of customs officer to prevent IAS from entering Jamaica [Coordinating Mechanism]
Conduct IAS training courses for focal points of all relevant regional and global conventions (e.g., CBD, CITES, IPPC) in order to help ensure that IAS is a high priority in international policy and for associated donor agencies, and that Jamaica’s accomplishments and needs are widely recognized [Relevant Ministries with support from expert consultant(s); Ongoing after implementation]
Conduct a cross-cutting analysis of: a) funding needs and associated timelines for implementation of the NIASSAP and b) potential fundraising opportunities to meet monetary needs [Coordinating Mechanism; Annual updating]
Explore application of the Tourism Enhancement Fund and Forest Conservation Fund [Coordinating Mechanism]
Based on the findings of the cross-cutting funding needs analysis, develop and submit a proposal for a GEF 6 project [NEPA with support from the Coordinating Mechanism and expert consultant(s)]
Develop a strategic ‘fund solicitation package’ that will support all fundraising activities [Coordinating Mechanism with support from expert consultant(s); Ongoing updating]
Explore the feasibility and benefits of developing a cross-cutting budget analysis that identifies and tracks all federal resources contributing to IAS prevention, eradication and control [Coordinating Mechanism]

B. Medium-term (Four years to implement)

Update IAS critical situation analysis (CSA) [Coordinating Mechanism]
Evaluate and strengthen the impact of the ‘Don’t Pack a Pest’ programme and make improvements, as appropriate [MOAF]
Take action, as appropriate, based on the findings of the national ballast water assessment (in progress) [National Ballast Water Task Force]
Develop and institutionalize an early detection/rapid response programme for IAS of substantial concern

[MoAF and NEPA]
Conduct analysis of risks and intervention opportunities for high priority pathways [Coordinating Mechanism, with support from technical consultant(s)]

C. Long-term (Six years to implement)

Conduct a needs assessment for the next version of the NIASSAP [Coordinating Mechanism]
Through a multi-stakeholder consultation process and taking the findings of the aforementioned assessment into consideration, develop the next NIASSAP [Coordinating Mechanism]

D. Ongoing

Conduct a bi-annual review of NIASSAP progress and Coordinating Mechanism effectiveness [Multi-stakeholder assessment team in partnership with the Coordinating Mechanism]
Assess and improve/expand the lionfish (<i>Pterois</i> spp.) harvesting programme [MoAF]
Continue/expand the programme to control non-native predators of the Jamaican iguana (<i>Cyclura collei</i>) [NEPA and UWI]
Continue/expand the control of non-native aquatic plants in the Lower Black River Morass [NEPA and UWI]
Become a member of the International Maritime Organisation and associated conventions [National Ballast Water Task Force]
Strengthen institutional arrangements for research on IAS between the national government and academic/research institutions in Jamaica and abroad [Ministries, as appropriate]
Strengthen and expand the lionfish social marketing project [NEPA and MoAF]

Appendix VI: Recommended Reading

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