
**National Strategy for
Preventing and Mitigating the
Impact of Invasive Alien Species (IAS) in the
Maltese Islands**



EXECUTIVE SUMMARY

Invasive alien species are non-native organisms introduced outside of their natural range into a new environment, where they would not naturally occur. They are termed “invasive” because when their introduction is met with favourable conditions, they rapidly grow in abundance and spread in distribution, causing impacts that are detrimental to the environment, to society and the economy. The increase in bioinvasions over the years has been attributed to increased commercial trade and greater mobility of travellers and tourists by means of improved travel and transport by air, land and sea. Invasive alien species are considered to be one of the major causes of biodiversity loss worldwide. Indeed, adverse effects brought about by invasive alien species have been observed in terrestrial and aquatic ecosystems, as well as in man-made ecosystems.

Over the years, several alien species have been introduced, whether deliberately for specific purposes (e.g. food production, pet trade, horticulture etc.) or accidentally in the Maltese Islands. Such introduction has occurred via a number of pathways that vary for the terrestrial and aquatic environments. Of these introduced alien species, only a few have actually become invasive. Even so, their impact on the environment has been to the detriment of local biodiversity. Some invasive alien species are in fact a common sight in both urban and semi-natural settings (e.g. cape sorrel, tree-of-heaven, acacias/wattles, century plants and rats). Certain invasive alien species create significant socio-economic impacts, such as plant pests that are a scourge to the agriculture and horticulture sectors, resulting in crop and plant losses (e.g. red palm weevil) or those species that cause health problems (e.g. Asian tiger mosquito).

Without a doubt the increase in the introduction of invasive alien species and, the resulting environmental and financial implications, is a burgeoning concern also in the Maltese Islands. Small island States are also considered to be particularly vulnerable to bioinvasions in view of the endemic biodiversity that is harboured in such isolated systems and which may be easily displaced by invasive alien species, resulting in a loss of natural heritage. For instance, cliff communities in Malta, which are pivotal for supporting endemic biodiversity, are under pressure/threatened by certain invasive alien species (e.g. rats impacting protected seabirds, and the kaffir fig, which can carpet a whole area smothering rare and protected species). Efforts are ongoing or earmarked to curb such pressures as part of the management of protected areas.

Concern over the environmental, social and economic impacts of invasive alien species, combined with the ever increasing intercontinental movement of goods and people that can facilitate new introductions and spread, has spurred the enactment of treaties and policies at global and EU levels to deal specifically with this “bioinvasion” problem. At a global level, under the framework of the Convention on Biological Diversity, Heads of State adopted as one of the global Aichi biodiversity targets, the target that ‘*By 2020, invasive alien species and pathways are identified and prioritised, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment*’. At EU level, Regulation No. 1143/2014 on the prevention and management of the introduction and spread of invasive alien species came into effect on 1 January 2015. This regulation places onerous obligations on Member States, including Malta, to adopt measures to address invasive alien species identified as being of Union concern. Malta is further duty bound to address issues related to invasive alien species via a number of Multilateral

Environmental Agreements, additional EU environmental, trade and sanitary-related regulations as well as obligations stipulated in domestic law.

While national legislation has been enacted to prevent the introduction of unwanted invaders, accidental introduction is still a problem, while progress in the field to eradicate invasive alien species has been localised to priority areas and is often hindered by resource constraints and lack of contingency funding. This is coupled with limited public understanding of invasive alien species, their impact, why they should not be released into the natural environment and, what can be done to curtail their spread in local settings, especially in natural and semi-natural ecosystems. In fact, a few cases of introductions of invasive alien species into the Maltese countryside have been done deliberately by misguided individuals (e.g. levant water frog and goldfish).

Comprehensive and coordinated strategic direction is needed to address invasive alien species effectively and efficiently from all relevant aspects (environment, travel, trade, and health). The purpose is to primarily prevent the introduction and spread of new, potentially invasive, alien species. Responding to existing invasive alien species in the country for which management is feasible is also required to restore invaded ecosystems. Such remedial action would also contribute to EU and national targets on ecosystem restoration. While prevention is better than cure, addressing biological invasions is however fraught with difficulties and uncertainties, especially with regard to the likelihood of invasiveness and other unpredictable characteristics and impacts.

Decisions related to the introduction, trade and use of alien species warrant the adoption of the precautionary approach whenever faced with insufficient scientific data; consideration of the ecosystem approach is also needed. Timely detection of new incursions and rapid eradication also requires investment in capacity building and having secured resources and clear defined departmental roles and responsibilities so as not to delay action on the ground. Focus on prevention and management of priority pathways of introduction is also necessary, especially when noting that more than one species can use the same pathway, and accidental introductions are very challenging to prevent, especially in the marine environment. Outreach and education on invasive alien species is crucial to prevent misguided deliberate release into the environment, while accidental introductions may also be avoided by way of best practice and biosecurity controls (that is all policies that minimise the harmful effects of bioinvasions, ranging from prevention, including quarantine, to management).

The National Strategy on Invasive Alien Species has been drawn up with the aim to establish a streamlined and proactive framework for dealing with bioinvasions. It does this by proposing coordinated measures and cooperative efforts, from the aspects of prevention of harmful introductions, risk assessments, early detection, rapid response and factors to consider for effective management and follow-up. The ultimate goal of the Strategy is to contribute to the conservation of ecosystems and associated services, as well as social and economic safeguards through the elimination of the pressures and threats posed by invasive alien species. This Strategy describes the characteristics of alien species, their invasive counterparts and the threats they cause in Chapter 1. It then goes on to explain the legal requirements of global, regional and national legislation in Chapter 2. Strategic direction on how to address IAS at a national level is presented

in Chapter 3 in the form of recommendations that are accompanied by expected outcomes and timelines for delivery. A summary of the Strategy is provided in Chapter 4.

This Strategy and accompanying National Codes of Best Practice (drawn up in tandem with the strategy but as separate documents) have been designed for use by all those stakeholders involved in the regulation, movement and use of, as well as management of, alien species in the Maltese Islands. This Strategy fulfils the requirements of Malta's National Biodiversity Strategy and Action Plan (NBSAP, 2012-2020; Measures B11 to B13). The National Strategy on IAS and its recommendations will create the impetus needed to achieve the national target that: *'By 2020, measures are in place to prevent, in so far as practical, the introduction and establishment of new invasive non-native species, while those that are established are identified and prioritised for eradication or control, where feasible'*. This requires a cross-sectoral approach to tackle IAS by identifying all sectoral stakeholders, raising their awareness and motivating them to contribute to the prevention, early detection and control of invasive alien species. Collective action will contribute towards the achievement of goals to combat invasive alien species for the benefit of all.

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GLOSSARY

Alien species	Any live specimen of a species, subspecies or lower taxon of animals, plants, fungi or micro-organisms introduced outside its natural range; it includes any part, gametes, seeds, eggs or propagules of such species, as well as any hybrids, varieties or breeds that might survive and subsequently reproduce. Source: Regulation (EU) No 1143/2014
Archaeophyte	Taxon introduced before 1492
Biodiversity	The variability among living organisms from all sources including, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems. Source: Regulation (EU) No 1143/2014
Casual Alien Species	An alien species that may flourish and even reproduce occasionally in an area, but which does not form self-replacing/self-sustaining populations, and which relies on repeated introductions for its persistence Source: Adapted from <i>Naturalisation and invasion of alien plants: concepts and definitions</i> . Richardson <i>et al.</i> , 2000.
Conservation	A series of measures required to maintain or restore the natural habitats and the population of species of wild fauna and flora at a favourable status
Contained holding	Keeping an organism in closed facilities from which escape or spread is not possible Source: Regulation (EU) No 1143/2014
Contaminant	Organisms transported unintentionally via a specific commodity from one country to another
Ecosystem	A dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit
Ecosystem services	The direct and indirect contributions of ecosystems to human wellbeing Source: Regulation (EU) No 1143/2014
Early detection	The confirmation of the presence of a specimen or specimens of an invasive alien species in the environment before it has become widely spread Source: Regulation (EU) No 1143/2014
Endemic	Those species found in Malta and which are either species of biogeographical importance or species whose native distribution range is limited to Malta only or to the Central Mediterranean region only
Eradication	The complete and permanent removal of a population of invasive alien species by lethal or non-lethal means Source: Regulation (EU) No 1143/2014
Escapes	Alien species that have been legally imported and set free, accidentally. Escapees may be from botanic gardens, greenhouses, arboreta, fish farms and breeding establishments.
Establishment	The process of an alien species in a new habitat successfully producing viable offspring with the likelihood of continued survival Sources: CBD Guiding Principles for the Prevention, Introduction and Mitigation of Impacts of Alien Species that threaten Ecosystems, Habitats or Species – Annexed to CBD Decision VI/23; European Strategy on Invasive Alien Species
Hitchhikers	Organisms that disperse in association with some vector, for example, through being attached to the outside of plants or animals, or to packaging material, or attached to or within a vessel
Intentional Introduction	The deliberate movement and/or release by humans of an alien species outside its natural range

	Sources: CBD Guiding Principles for the Prevention, Introduction and Mitigation of Impacts of Alien Species that threaten Ecosystems, Habitats or Species – Annexed to CBD Decision VI/23; European Strategy on Invasive Alien Species
Introduction	The movement, as a consequence of human intervention, of a species outside its natural range. Source: Regulation (EU) No 1143/2014
Invasive alien species	An alien species whose introduction or spread has been found to threaten or adversely impact upon biodiversity and related ecosystem services. Source: Regulation (EU) No 1143/2014
Invasive alien species of Union concern	An invasive alien species whose adverse impact has been deemed such as to require concerted action at Union level pursuant to Article 4(3) of Regulation No 1143/2014 on the prevention and management of the introduction and spread of invasive alien species Source: Regulation (EU) No 1143/2014
Lessepsian migrant	An alien species entering the Mediterranean Sea, via the Suez Canal, typically originating from the warm/tropical waters of the Red Sea and Indian Ocean.
Native Species	A species, which occurs naturally in the Maltese Islands
Pathways	The routes and mechanisms of the introduction and spread of invasive alien species Source: Regulation (EU) No 1143/2014 As applicable: - the geographic route by which a species moves outside its natural range (past or present); - the corridor of introduction (e.g. road, canal, tunnel); and/or - the human activity that gives rise to an intentional or unintentional introduction. Source: European Strategy on Invasive Alien Species
Plant Pest	Any form of plant or animal life or any pathogenic agent, other than a beneficial organism, capable of directly or indirectly injuring any plant material or beneficial organism
Precautionary Principle	The principle whereby appropriate measures are taken to protect the environment and to ensure sustainable management of natural resources in the absence of absolute or conclusive scientific proof of the need for such measures
Protected Area	A geographically defined area, which is designated or regulated and managed to achieve specific conservation objectives
Risk Analysis	(1) 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 (2) 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 Sources: CBD Guiding Principles for the Prevention, Introduction and Mitigation of Impacts of Alien Species that threaten Ecosystems, Habitats or Species – Annexed to CBD Decision VI/23; European Strategy on Invasive Alien Species
Stowaways	Organisms transported inadvertently from one country to another
Transformers	A subset of invasive plants which change the character, condition, form or nature of ecosystems over a substantial area relative to the extent of that ecosystem Source: <i>Naturalisation and invasion of alien plants: concepts and definitions</i> . Richardson <i>et al.</i> , 2000.
Unintentional Introduction	All other introductions which are not intentional Sources: CBD Guiding Principles for the Prevention, Introduction and Mitigation of Impacts of Alien Species that threaten Ecosystems, Habitats or Species – Annexed to CBD Decision VI/23; European Strategy on Invasive Alien Species
Vector	The physical means or agent (i.e. aeroplane, ship) in or on which a species moves outside its natural range (past or present) Source: European Strategy on Invasive Alien Species

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Vision, Objectives and Scope of the National Strategy

The **Vision of this Strategy** is the following: "Cooperative, coordinated and committed efforts of all key governmental and non-governmental stakeholders, combined with secured effective means and optimal use of existing resources, and mobilisation of additional ones, results in the reduction in the trend of new incursions of invasive alien species in the Maltese Islands, while priority invasive alien species are effectively eradicated, contained and/or controlled, benefitting the safeguard of the economic, social and environmental interests of the Maltese Islands."

The primary purpose of this Strategy is to serve as a policy framework to ensure the proper implementation of Council Regulation No. 1143/2014 on the prevention and management of the introduction and spread of invasive alien species and related implementing national legislation. Another purpose of the Strategy is to serve as a guiding framework via its recommendations to address the issue of invasive alien species in the Maltese Islands, in a streamlined and efficient manner, mainly from (but not limited to) an environmental perspective, with the **objectives** to:

- as the first line of action, **prevent** the unwanted/unintentional introduction (incl. escapees from containment), and spread, of IAS in the Maltese Islands as well as illegal misguided deliberate introductions into the environment;
- **timely detect and respond** to new incursions of alien species, by adopting appropriate mechanisms that ensure early detection and rapid contingency responses, with special attention given to invasive alien species of Union concern and national concern, priority pathways, and high risk entry points (ports, harbours, border inspection points) as well as vulnerable areas of biodiversity value, including but not limited to protected areas;
- **assist decision-making processes** on import/export, use, keeping and trading of alien species;
- **mitigate the pressures of existing invasive alien species** by defining and implementing coordinated and effective measures of eradication, containment and/or control, where ecologically and financially feasible;
- **protect native and endemic biodiversity** from the detrimental effects of invasive alien species and restore ecosystems to a healthy state, also by promoting natural regeneration and increasing resilience, thereby contributing towards national goals of ecosystem restoration;
- **increase awareness, outreach and accessible information** about alien species so as to increase public understanding and engage responsible behaviour/attitudes,
- **address knowledge gaps** through targeted scientific research, citizen science and a national integrated surveillance framework; and
- **address capacity needs** to undertake risk assessments, for surveillance and monitoring as well as identification, enforcement and also to strengthen expertise to ensure that national agencies are well equipped to address the various challenges faced when dealing with invasive alien species.

As regards **scope**, this Strategy applies to terrestrial and aquatic alien species, subspecies and varieties in all taxonomic groups, which have adverse effects on elements of native biodiversity and, which are invasive in the terrestrial and aquatic ecosystems. This Strategy excludes genetically modified organisms, bacteria, viruses and prions, as well as archaeophyte species or long-established alien species with no observable negative effects on the environment, society and the economy. It is recognised that certain aspects of IAS

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management that are specific to pathways would need to be addressed through additional tailored action plans, not necessarily adopted within the ecological sphere of competence. This Strategy has a broader coverage than the EU IAS Regulation and hence broad endorsement of the Strategy is solicited.

1.0 The Nature of Alien Species and their Invasive Counterparts

1.1 What are alien species?

Human's increasing use of the environment, combined with the increasing intercontinental mobility of people and goods, and more efficient commerce (through better and faster modes of trade, travel and transport) have resulted in what are termed "**bioinvasions**". The latter is defined as '*the colonisation of species native to other areas of the planet in new locations*'.¹ When a species colonises an area where it does not occur naturally, it is said to be "alien" to that area. "**Alien species**" are hence non-native/non-indigenous/exotic taxa that are introduced into areas outside of their natural range.

Alien species are **taxonomically diverse**, ranging from fungi, plants, invertebrates (including insects), mammals, fish, reptiles, and birds. Assigning the status of "alien" relies on accurate taxonomic identification and, on the knowledge of the species' origin. In other words, one needs to know whether the species in question is native to the country or whether, when and how it has been introduced. A problem therefore arises when dealing with a "**cryptogenic species**", that is, a species whose origin is unknown or uncertain. '*Cryptogenic species result when there is lack of information concerning the putative transfer that might have occurred in the past without being demonstrated*'.²

Those plants and animals that have been introduced into the Maltese Islands in antiquity, that is, before the year 1492, are considered to be "**archaeophytes**". Examples of the latter, include the carob tree (*Ceratonia siliqua*, Maltese: *il-harruba*) and the fig tree (*Ficus carica*, Maltese: *is-sigra tat-tin*); both species dominate Maltese maquis. These introduced species have long become established locally and are now considered to be part of the natural environment. The approach to dealing with archaeophytes as proposed by Genovesi and Shine (2004) is their conservation, when '*recovery of the original ecosystems is no longer feasible*' and if '*their conservation does not conflict with the primary aim of conserving the native biological diversity*'.³ This same approach has been followed in Malta in which case certain archaeophytes have been afforded some level of legal protection. For instance, the carob tree is protected in selected areas as per Schedule II of the "Trees and Woodland Protection Regulations" (S.L.549.123).

Introduction of alien species can be intentional or unintentional. Many **intentional introductions** of alien species are intended to bring benefits to human society, such as crop plants, ornamental plants, game and domestic animals. Reasons for deliberate introduction can be economic (agriculture and aquaculture), scientific for research or, commercial (e.g. pet and aquarium trade, and horticulture). In fact deliberate introduction of an alien species generally occurs with a particular use in mind, not always, however in the knowledge of what undesirable effects/consequences such introduction might have in the long run.

¹ *Biological invasions as a component of global change in stressed marine ecosystems*. Occhipinti-Ambrogi & Savini, 2003.

² *Biological invasions as a component of global change in stressed marine ecosystems*. Occhipinti-Ambrogi & Savini, 2003.

³ *European Strategy on Invasive Alien Species*. Genovesi & Shine, 2004.



Figure 1 – Kaffir fig
 (Photo Credit - ERA)

For instance, the Kaffir fig (*Carpobrotus edulis*, Maltese: *is-swaba tal-Madonna*; [Figure 1](#)) is a prostrate evergreen succulent that originates from South Africa. It was originally intentionally introduced as a sand stabiliser and ornamental. It has escaped from cultivation as an ornamental in public places as a result of plant pruning. It has also been regularly planted in coastal areas by misguided individuals. This succulent spreads aggressively once it becomes established. It is in fact invasive in cliff communities and some sand dunes. The brown plots left once this succulent dies after a number of years, are not only unsightly, but also inhibit colonisation by other plant species due to the release of toxic substances by the Kaffir fig.

Another example is the prickly pear (*Opuntia ficus indica*, Maltese: *il-bajtra tax-xewk* – [Figure 2](#)). It was intentionally introduced probably at the beginning of the sixteenth century for its fruit, use as fodder and as a hedge plant. Nowadays, this plant is still used in cultivated fields while its fruit is sold for consumption. The prickly pear has escaped from cultivated land, colonised maquis communities and is now invading cliff communities. Its seeds are bird dispersed facilitating its spread to new areas.



Figure 2 – Prickly pear
 (Photo Credit - ERA)

Man has been moving species from one location to another for millennia, with introduction of alien species into Europe showing a progressing increase since the 1800 AD coinciding with the Industrial Revolution. Both the Mediterranean and Europe are centre hubs for international trade, though the highest rates of introduction have occurred in the last 25 years suggesting an “era of globalisation”.⁴ This is due to the fact that the speed at which movement of species is being carried out nowadays has increased due to more effective means of transportation. The increased speed of movement means that whereas in the past the chances of survival of the transported species were diminished by long journeys, in contrast, the potential for establishment of a species being carried by modern means remains once the species reaches its new environment.

⁴ *Trade, transport and trouble: managing invasive species pathways in an era of globalisation*. Hulme, 2009.

The Maltese Islands are found in the Central Mediterranean and in the passageway between Europe and Africa. The islands have consequently experienced the introduction and establishment of alien species over the years, with similar increasing trends. While many alien species pose no impact and on the contrary provide benefits to society and the economy, concern arises for those species that are invasive, that is, those species whose introduction and spread poses serious environment, social and economic consequences. It is therefore important to distinguish between those taxa that may become invasive from those that are not harmful.

It is not at all surprising that the issue of **invasive alien species (IAS)** has become of great concern worldwide as well as in the Maltese Islands, due to the increase in **human mediated activities** that facilitate the entry, transfer and spread of alien and potentially invasive species into new environments. Such activities do this by providing **vectors** (means of transfer) and **pathways** (route by which the species moves from one location to a new one). Out of the estimated 12,000 alien species introduced into the environment of the European Union and other European countries, some 10 to 15% are thought to be invasive.^{5,6} Some of the invasive alien species present in Malta have been intentionally (deliberately) introduced without the knowledge of their eventual impact, while others have and continue to be unintentionally (accidentally) introduced into the Maltese Islands. Species introductions regionally and nationally have generally increased along with increasing trends of trade and travel. Globalisation will likely continue to set in motion future introductions beyond natural barriers.⁷

Bioinvasions are also exacerbated by activities, such as changes in climate and land use, which affect the susceptibility of a habitat to invasion (**invasibility**) and alter species abundance, distribution and spread (and impact).⁸ **Climate change** affects native biodiversity in terms of changes in phenology (plant and animal life cycle events), genetic composition, species ranges, and affecting species interactions and ecosystem processes. However, climate change also affects bioinvasions, including invasions of plants pests and species causing human diseases, with economic and health consequences. In this context, Hellmann *et al.* (2008) identify five non-exclusive consequences of climate change for invasive species on the basis of processes involved in the invasion pathway: (1) altered transport and introduction mechanisms, (2) establishment of new invasive species, (3) altered impact of existing invasive species, (4) altered distribution of existing invasive species, and (5) altered effectiveness of control strategies.⁹ These authors draw attention to the differences between native species (possibly rare with specialised ecological requirements) and invasive alien species (in contrast generally high in abundance with broad ranges of environmental tolerances) and their consequent difference in responding to climate change. Consequences 1, 4 and 5 are unique to invasive species.

It is held that a healthy and diverse ecosystem or community creates a natural impediment/barrier to bioinvasions. Where this is however disturbed/disrupted, resulting in a reduction of **ecosystem resistance**

⁵ Preamble of the Regulation (EU) No 1143/2014 on the prevention and management of the introduction and spread of invasive alien species

⁶ *The Impacts of Invasive Alien Species in Europe*. EEA, 2012.

⁷ *Trade, transport and trouble: managing invasive species pathways in an era of globalisation*. Hulme, 2009.

⁸ *Pilot Assessments - The Ecological and Socio-Economic Impacts of Invasive Alien Species on Island Ecosystems*. UNEP/CBD/SBSTTA/9/INF/33

⁹ *Five Potential Consequences of Climate Change for Invasive Species*. Hellmann *et al.*, 2008.

and resilience, bioinvasions are more likely to occur and disturbance impacts may intensify.¹⁰ Factors that modify or disrupt existing habitat, create new habitat, or alter physical and biological environments may in fact facilitate invasion. Altered ecosystems subject to human intervention, such as agroecosystems, urban areas, road verges, ports, marinas, and gardens are susceptible to biological invasions. In areas where there is also a high influx of alien organisms, the likelihood of establishment increases. Bax *et al.* (2003) note that environmental modifications caused by one alien species also provide increased opportunities for further alien species to invade.¹¹ This escalating problem has been termed “**Invasional Meltdown**” by Simberloff and von Holle (1999, as cited in Bax *et al.*, 2003).¹²

Conservation of biodiversity and restoration of degraded ecosystems plays an important role as an overall strategy to combat IAS and to deal with environmental stressors that can facilitate bioinvasion.¹³ The increasing demand for commodities and most efficient transport networks dictates that IAS are addressed through **pathway risk assessments and pathway management**. Indeed addressing pathways of introduction of IAS is a crucial strategy to combat biological invasions and has become a top priority at European level.

1.2 Pathways of Introduction and Methods of Spread

Modes of introduction of alien species along some pathway into a country or region can be classified as: (1) intentional and legal, (2) intentional and illegal, (3) accidental/unintentional or (4) natural. In the latter case, species naturally extending their range in response to climate change are not deemed to be “alien”. A “**pathway**” of introduction comprises ‘*any human mediated means that enables the entry or spread of an alien species within a region or beyond; it includes physical vectors, as well as general activities causing the introduction of alien species*’.¹⁴ Major pathways occurring via the terrestrial and aquatic environments are summarised in [Table 1](#). In this table, the different pathways are grouped into two categories depending on whether the introduction is considered intentional or unintentional.

¹⁰ *Pilot Assessments - The Ecological and Socio-Economic Impacts of Invasive Alien Species on Island Ecosystems*. UNEP/CBD/SBSTTA/9/INF/33

¹¹ *Marine invasive alien species: a threat to global biodiversity*. Bax *et al.*, 2003.

¹² *Positive interactions of nonindigenous species: Invasional meltdown*. Simberloff & von Holle, 1999.

¹³ *Biological invasions as a component of global change in stressed marine ecosystems*, Occhipinti-Ambrogi & Savini, 2003.

¹⁴ *Analysis on Pathways for the Introduction of Invasive Alien Species: Updates*. UNEP/CBD/COP/12/INF/10

Table: 1 - Examples of major pathways depending on type of introduction

Intentional Introductions	Unintentional Introductions
VIA TERRESTRIAL ENVIRONMENT	
<ul style="list-style-type: none"> ▪ Foreign genotypes of native plants used for habitat restoration/afforestation ▪ Crops and livestock introduced for agricultural purposes ▪ Alien plants used for soil improvement and habitat restoration ▪ Alien ornamental plants used in landscaping, gardening/horticulture ▪ Alien game and mammals released for hunting purposes ▪ Alien invertebrates used as biological control agents or for other uses ▪ Unwanted pets discarded into the wild and other misguided introductions 	<ul style="list-style-type: none"> ▪ Contaminants of agriculture produce ▪ Seed and invertebrate contamination of nursery plants ▪ Trade and movement of goods - hitchhikers in or on packaging material, species translocated in containers and planting media ▪ Transportation of specimens via machinery, equipment and vehicles ▪ Car travel for business or tourism ▪ Escaped organisms while in transit ▪ Diseases and parasites in animals traded for agriculture ▪ Aviation through cargo or on or in the aircraft itself
VIA AQUATIC ENVIRONMENT	
<ul style="list-style-type: none"> ▪ Aquaculture and fishery releases of alien fish, molluscs and crustaceans imported for production ▪ Discards from cultivation or captive stocks ▪ Trade ▪ Unwanted aquarium species discarded into the wild and other misguided introductions 	<ul style="list-style-type: none"> ▪ Shipping - ballast water, sediment, hull and anchor fouling ▪ Aquaculture – diseases or other organisms on imported and cultured fish and shellfish, or imported with fry ▪ Aquaria – accidental discharge of organisms in the marine environment ▪ Tourism – accidental importation of species ▪ Escapes

Pathways enabling alien species to surmount **geographical, environmental and landscape barriers** (see [Section 1.5](#) below) are usually linked to transport, travel, and trade through **sectoral activities**, such as fisheries, aquaculture, agriculture, horticulture, landscaping, shipping, tourism, aquarium trade, and pet trade, amongst others. Such activities can result in both intentional and unintentional introductions. Movements, such as the trade of ornamental plants and of animals to be kept as pets, involves small amounts of specimens, which if adaptable to the receiving environmental factors (including climatic and edaphic conditions), may widely spread, if they escape or become released into the environment. Establishment of such species is more likely to be aided initially because the organisms are cared of and maintained where they are planted or kept.

Introduction can also occur via **postal and courier services**, including material purchased via **Internet** market places and online pet shops. Species that may be purchased online include aquatic species, insects, molluscs, mammals, plants, seeds, fruit and vegetables and microorganisms/pathogens carried on these organisms.¹⁵ Internet commerce, as a convenient method of trade, is also a pathway of alien species introductions and is also an issue in Malta. For instance, there has recently been the case of the offering of

¹⁵ *Pets, Aquarium, and Terrarium Species: Best Practices for Addressing Risks to Biodiversity* – CBD Technocal Series No. 48. Secretariat of the Convention on Biological Diversity, 2010.

sale of the giant African land snail (*Achatina fulica*) on a Maltese trading website.¹⁶ E-commerce is not constrained in type of transportation and distance by which invasive alien species may travel from shop to customer. This generates regular, frequent and long-distance dispersal opportunities.¹⁷ Thus the role of e-commerce in the spread of IAS is also a growing concern. Unregulated sales of alien species (sometimes even misidentified by the suppliers) can also be associated with the risk of the eventual release of unwanted pets into the environment.¹⁸

Aquatic ecosystems are particularly susceptible to the pressures and threats posed by invasive alien species due to the fact that organisms are hard to detect coupled with the ease of distribution in such environments. Bax *et al.* (2003) document fifteen broad categories of vectors that transport marine organisms from shallow coastal waters to similar habitats outside the species' natural range (Table 2).¹⁹ These authors also mention that the changing nature of domestic and international **shipping** is altering the diversity and speed of potential vectors, which increases the probability that previously non-transported species will find suitable vectors.

Source	Vector	Target Taxa
Commercial shipping	Ballast water	Plankton, nekton, benthos in sediment
	Hull fouling	Encrusting, nestling and some mobile species
	Solid ballast (rock, sand, etc.)	Encrusting species, benthos, meiofauna and flora
Aquaculture and fisheries	Intentional release for stock enhancement	Single species
	Discarded nets, floats, traps etc.	Various
Drilling platforms	Ballast water	Plankton, nekton, benthos in sediment
	Hull fouling	Encrusting, nestling and some mobile species
Aquarium industry	Accidental or intentional release	Aquarium fauna and flora
Recreational boating	Hull fouling	Encrusting, nestling and some mobile species
Dive practice	Snorkelling and scuba gear	Algal spores, bacteria, some small mobile species
Floating debris	Discarded plastic debris	Encrusting and some mobile species

Shipping is a major contributor of unintentional introduction of IAS, via hull fouling and ballast water. The latter is receiving more focus nowadays as it is thought that '*...more than 4000 species are in transit with ships at any one time*'.²⁰ **Hull fouling** mainly occurs by encrusting or sessile species. These fouling organisms are usually attached to ships' hulls and external structures. Once the ship enters a port or harbour, these

¹⁶ Available at: <https://lovinmalta.com/lifestyle/community/someone-is-trying-to-sell-baby-giant-african-snails-in-malta-again-and-farmers-are-concerned>

¹⁷ *Effect of the Internet Commerce on Dispersal Modes of Invasive Alien Species*. Lenda *et al.*, 2014.

¹⁸ *Pets, Aquarium, and Terrarium Species: Best Practices for Addressing Risks to Biodiversity* – CBD Technocal Series No. 48. Secretariat of the Convention on Biological Diversity, 2010.

¹⁹ *Marine invasive alien species: a threat to global biodiversity*. Bax *et al.*, 2003.

²⁰ *A Global Perspective on Shipping as a Vector for New Species Introductions*. Gollasch, 2004.

organisms may become dislodged into the water either through abrasion with wharf structures or else during hull cleaning operations. The fouling organisms may eventually spawn and settle in the new environment establishing into a reproductive population. The widespread use of anti-fouling paints and the increased speeds of modern vessels have reduced hull fouling as a vector, but it still occurs, especially for smaller vessels (Bax *et al.*, 2003).

On the other hand, ships carrying **ballast water** from one port and then discharging it into another foreign port, pose considerable risks of introducing alien species. Ballast water, which provides stability for large vessels, can carry various types and life stages of species, not only carried in the water itself but also in the sediments that accumulate in the bottom of ballast tanks. Organisms that have a resistant stage or resting cyst as well as adult stages of organisms can all be transported via ballast as **aquatic hitchhikers**. Plankton, crustaceans, fish, larvae, eggs or cysts can in fact all be found in ballast water and ballast tanks.²¹ As documented by Gollasch (2004), worldwide studies involving end-point sampling of unmanaged ballast water revealed that '*ballast kept on board for longer than 100 days still contained a large number of organisms*'.²² **Ships' sea chests**, consisting of intake chambers of seawater used as cooling water, fire-fighting water and for pumping ballast water aboard, can also serve as a vector of dispersal.

The **Mediterranean basin** is a major recipient of marine alien species, with numbers ranging from 573 to 986.^{23, 24} In Malta's case, confirmed records of alien species (excluding those considered to be cryptogenic, or having arrived through range expansion) amounts to at least 64 species. These mainly comprise marine molluscs, fish, crustaceans and rhodophytes (see Table 6 later in this chapter).²⁵ The main vectors of introduction in the Mediterranean Sea are introduction through corridors namely the Suez Canal, shipping (especially via hull fouling and ballast waters) and aquaculture/fish farming (deliberate or accidental as contaminants and escapes). Secondary introductions and further spread of marine alien species from the area(s) of their first arrival could proceed by natural and man-mediated means.

In terms of marine introductions, the pathway of introduction in Malta's case (that is secondary spread from other areas of the Mediterranean) for recent introductions is documented to be either shipping or is not known. The **general warming trend** observed in the Mediterranean basin and ever increasing **maritime traffic** are also considered to be facilitating the introduction and establishment of **thermophilic species** - originating in the tropical Indo-Pacific or tropical Atlantic - through the Suez Canal and the Straits of Gibraltar, respectively, and subsequent spread to the central Mediterranean, including the Maltese Islands. Such thermophilic invasive species can have a distinct advantage over native biota.²⁶

The identification of mode of entry and the responsible pathway is not always clear-cut. Apart from such difficulty in apportioning the mode of arrival of a species, it is also difficult to determine the **founder population**.²⁷ The number of individuals introduced/released in one event (**propagule size**) and multiple discrete introduction/release events of the same species (**propagule pressure**) would also facilitate

²¹ *Marine Bioinvasions: A Challenge for the Mediterranean to Address a Borderless Issue*. IUCN, 2003.

²² *A Global Perspective on Shipping as a Vector for New Species Introductions*. Gollasch, 2004.

²³ *Taking stock: inventory of alien species in the Mediterranean Sea*. Galil, 2009.

²⁴ *Alien species in the Mediterranean Sea by 2012. A contribution to the application of European Union's Marine Strategy Framework Directive (MSFD). Part 2. Introduction trends and pathways*. Zenetos *et al.*, 2012.

²⁵ Evans *et al.* (2015) review a total of 73 species, of which 66 are considered alien, including those with uncertain origin, and the remaining 7 having their mode of entry as range expansion.

²⁶ *Alien Species in the Mediterranean Sea: Risks, Drivers and Vectors*. Galil, 2004.

²⁷ *Vectors, Detectors and Inspectors*. Minchin, 2004.

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successful establishment and possibly invasiveness.²⁸ Another aspect that is not always clear is how and when to make the distinction between intentional and unintentional acts. In this respect, another way of **classifying pathways** is represented in the work by Hulme *et al.* (2008) and Hulme (2009). The latter also provides management strategies for each type of pathway (Figure 3).^{29,30} These authors propose the following management strategies for the respective pathways:

- **Release** – intentional introduction as a commodity for release – regulated via national legislation and permits;
- **Escape** – intentional introduction as a commodity but escapes unintentionally – regulated via national legislation and screening risk analysis;
- **Contaminant** – unintentional introduction with a specific commodity – regulated via international law and quarantine procedures;
- **Stowaway** – unintentional introduction attached to or within a transport vector – regulated via international law and quarantine measures;
- **Corridor** – unintentional introduction via human infrastructures linking previously unconnected regions – regulated via international law and environmental impact laws (e.g. Lessepsian migrants); and
- **Unaided** – unintentional introduction through natural dispersal of alien species across political borders – regulated via international law and “polluter pays”.

Release	Escape	Contaminant	Stowaway	Corridor
<ul style="list-style-type: none"> • Release in nature for use • Hunting in the wild • Biological control • Erosion control/dune stabilisation • Landscape/flora/ fauna improvement • Conservation introduction • Other intentional release 	<ul style="list-style-type: none"> • Ornamental • Pet/domestic aquarium • Agriculture • Aquaculture • Forestry • Botanical garden/zoo/aquaria • Farmed animals • Fur animals • Horticulture • Research • Other escape 	<ul style="list-style-type: none"> • Seed contaminant • Food contaminant • Contaminant of nursery material • Contaminated bait • Live food • Contaminant of animals or plants • Organic packaging material • Parasites on animals or plants • Timber trade • Transportation of habitat material 	<ul style="list-style-type: none"> • Vehicles • Container • Hitchhikers in or on plane • Hitchhikers on ship/boat • Machinery/equipment • Angling/fishing equipment • Military • People and their luggage/equipment • Ship ballast water • Other means of transport 	<ul style="list-style-type: none"> • Interconnected waterways/basins/seas

Figure 3 – Pathways (after Hulme, 2009)

²⁸ *The role of propagule pressure in explaining species invasions.* Lockwood, Cassey & Blackburn, 2005.

²⁹ *Grasping at the routes of biological invasions: a framework for integrating pathways into policy.* Hulme *et al.*, 2008.

³⁰ *Trade, transport and trouble: managing invasive species pathways in an era of globalization.* Hulme, 2009.

1.3 Introduced Alien Chromists, Fungi and Plants into the Maltese Islands

A non-exhaustive **review of alien plants and fungi recorded from the Maltese Islands** has been carried through a preliminary, though extensive, study commissioned in 2002 by the former Malta Environment and Planning Authority (MEPA). The purpose of this study was *'to identify the alien flora of the Maltese Islands, their invasiveness and extent, and to suggest ways to be followed for their eradication'*.³¹ Data was mostly collected over the period from 2002 to 2005, and a final report was compiled (Lanfranco & Pace, 2006, unpublished).³²

The study in question reviewed more than 496 taxa (belonging to approximately 312 genera). The review process consisted of the selection of species, which qualify as "alien". The selection excluded: species that are certainly native; species that are probably native but which may have conceivably been introduced centuries ago; and species that occur in cultivation and cultivated plants which may germinate spontaneously but which do not reach maturity. For all the species which have been included, their identity and actual occurrence was verified via extensive research in the literature and in herbaria.

Looking at [Figure 4](#), 92% of introduced alien species as reviewed by this study are angiosperms, 74% of which are dicots and the remaining 21% are monocots. Considering the dicots, the plant families with the largest number of introduced alien species are Asteraceae, Brassicaceae, Fabaceae, Rosaceae and Solanaceae. For the monocots, the Family Poaceae has the largest number of introduced alien species.

³¹ *Biodiversity Action Plan: Alien Flora Data Sheets reported from the Maltese Islands*. Report commissioned by the Environment Protection Department as part of the Biodiversity Action Plan and Habitat Inventorying Programme. Lanfranco, 2005. (unpublished)

³² *Setting up a list of Alien Flora for the Maltese Islands – Final Report*. Lanfranco & Pace, 2006.

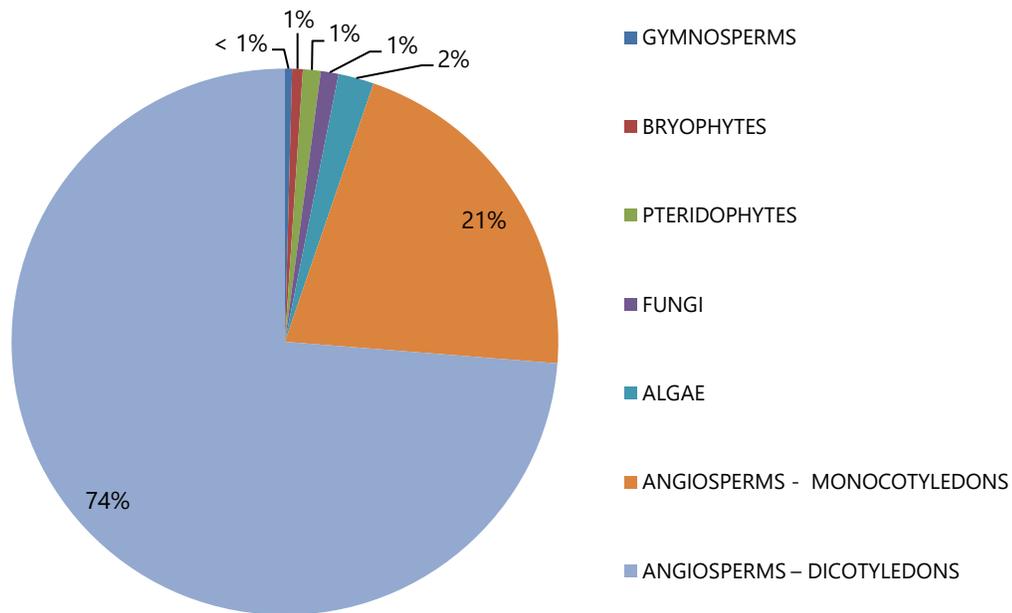


Figure 4 - Pie chart depicting proportion (percentage values) of alien species
(categorised according to major taxonomic groups – excluding animals)

The low percentage of fungi is probably a result of limited data at the time, as only macrofungi were considered. Since this commissioned study, more information has become available on Maltese macromycoflora albeit more research is still required and bearing in mind that “certified” aliens among the macrofungi seem to be few. More work is also needed with respect to microfungi due to their potential negative effects from an economic perspective (Lanfranco, 2016, pers. comm.)

The most represented genera (in decreasing order) were the following:

- *Vicia* (vetches) - escaped from cultivation (as forage/fodder) or namely introduced accidentally as a contaminant of bird seed,
- *Amaranthus* (collectively known as amaranth or pigweed, is a cosmopolitan genus of herbs) - as seed contaminant or cultivation as ornamental,
- *Centaurea* (herbaceous thistles and thistle-like flowering plants in the family Asteraceae) - accidentally introduced with animal feed, as birdseed contaminant or imported with wheat,
- *Setaria* (bristle grasses) - accidentally imported with crop seed and or bird seed, or escape from cultivation as ornamental, and
- *Chenopodium* (goosefoots) - escape from cultivation, contaminant of compost, seed contaminant.

The majority of species were originally deliberately introduced for horticultural purposes or because of their usefulness (Figure 5). Others were introduced accidentally, as contaminants of crop seeds or, the seeds of

ornamental plants, contaminants in the soil of imported plants or, with bird seed; this last being the source of several **casual aliens**. The mode of introduction for 12% of introduced alien flora remains unknown.

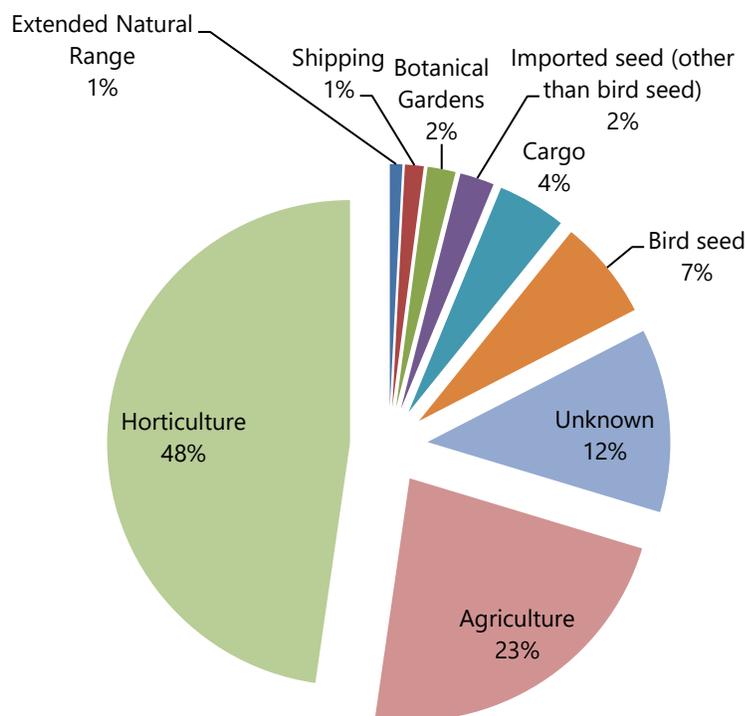


Figure 5 – Pathways of introduction of alien flora into the Maltese Islands

A number of **ornamental plants and trees** have been and are still deliberately introduced into the Maltese Islands, sold in nurseries or garden centres, and used for landscaping. Ornamental plants and trees that are invasive include the Brazilian pepper (*Schinus terebinthifolia*, Maltese: *is-siġra tal-bżar*), the castor oil plant (*Ricinus communis*, Maltese: *is-siġra tar-riġnu* – [Figure 6](#)), and the common freesia (*Freesia refracta*, Maltese: *il-freżja*), just to mention a few.



Figure 6 – Castor oil plant

(Photo Credit - ERA)

The Brazilian pepper has become naturalised in valley watercourses, such as at Wied Ħarq Ħamiem (Stevens, 1995 as cited in Schembri and Lanfranco,

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1996) and has invaded Maltese maquis.³³ The castor oil tree invades disturbed habitats, watercourses and other natural communities. The common freesia is naturalised in maquis and woodland undergrowth such as at Buskett, and in various other habitats, from the bastions of the Valletta-Floriana area, the cliffs of Comino and the garigue communities of Wied Ħarq Ħamiem (Schembri *et al.*, 2002).³⁴ A more recent introduction for landscaping purposes is fountain grass (*Pennisetum setaceum*, Maltese: *il-pjuma*), which has escaped from cultivation and has become naturalised. It is on the increase mostly in urban areas, but other invadable habitats, such as garigue, steppe and dunes are at a threat.

In the same study by Lanfranco (2005), alien species were further categorised according to their **invasive ability** based on a modified Cronk and Fuller classification system (as explained in the legend of [Figure 7](#)).³⁵ From [Figure 7](#) and the categorisation applied, only a minority of alien plants are currently deemed invasive. It may be also the case that certain introduced plants still have to pass through the lag phase after which they may exhibit invasiveness. Climate change is also a factor to consider here. In any case the traffic light system is applied here whereby categories from 4 to 5 would be prioritised for management, as deemed appropriate.

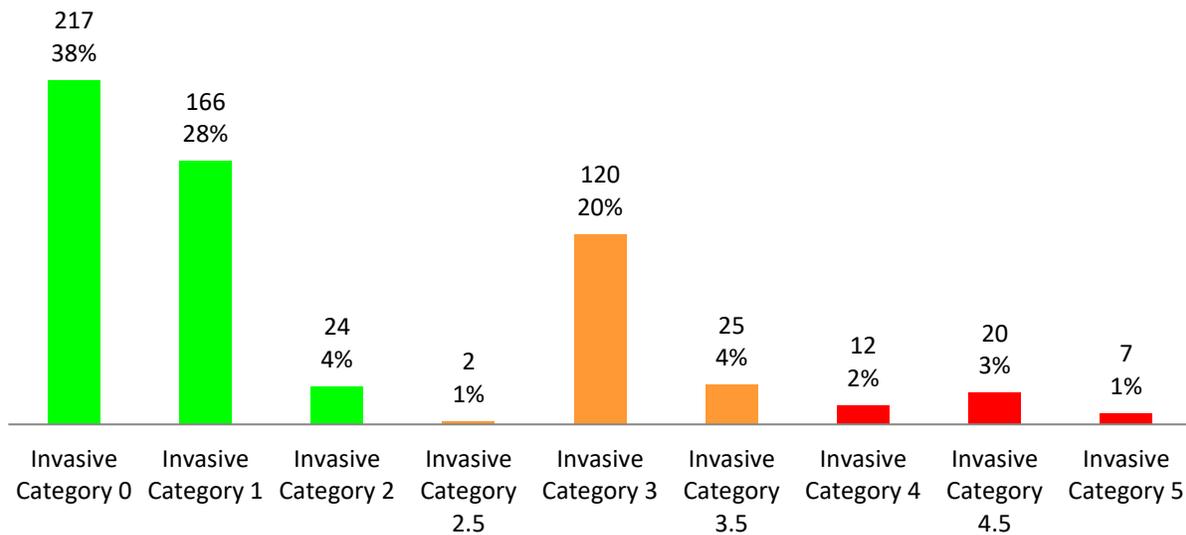


Figure 7 - Number and percentage of alien species per Invasion Category

Legend:	
Low priority	0 - Not weedy or invasive. Includes casual aliens
	1 - Minor weed of highly disturbed or cultivated land (man-made artificial landscapes)
	2 - Weeds of pastures managed for livestock, forestry plantations or artificial waterways
Medium priority	2.5 - Serious or widespread invaders of 2
	3 - Invading semi-natural or natural habitats (of some conservation interest)
	3.5 - Serious or widespread invaders of 3

³³ *Introduced species in the Maltese Islands*. Schembri & Lanfranco, 1996.

³⁴ *Natural Resources, Fisheries and Agriculture*. Schembri *et al.*, 2002.

³⁵ *Plant Invaders – The Threat to Natural Ecosystems*. Cronk & Fuller, 2001.

High priority	4 - Invading important semi-natural or natural habitats (i.e. species rich vegetation, protected areas, areas containing rare and/or endemic species)
	4.5 - Serious or widespread invaders of 4
	5 - Invasion threatening other species of plants or animals with extinction

Focusing on invasive categories from 3.5 to 5, [Table 3](#) summarises the attributes assessed for terrestrial alien species covered by the study (arranged in alphabetical order, for marine species see instead [Table 4](#)). Successful invaders tend to either be hermaphrodite or else make use of more than one reproduction and dispersal strategies.

Legend	
Mode of Introduction	Hort = Horticultural; introduced as ornamentals Hort-Acc = Introduced accidentally with horticultural products (e.g. in soil, seed including contaminant of lawn grass seed) Hort-Med = Horticultural; cultivated for medicinal use Agr = Agricultural; introduced for their product; includes both species cultivated on a large scale, on kitchen garden scale or as stocks for agricultural species Agr-Acc = Introduced accidentally with agricultural products including crop seed BS = Species introduced as bird-seed BS-Acc = Species introduced accidentally with bird seed SI = Imported as seed BG = Species originally introduced in botanical gardens BG-Acc = Species introduced accidentally to botanical gardens Cargo = Species introduced accidentally with cargo – often confined to harbour area NK = Method of introduction unknown – often in connection with very old records NRE = Natural Range Extension - The status of such species is not clear. They are not really non-native since they have colonised without direct/indirect human intervention; yet they are not real natives since their presence post-dates human colonisation. N/A Not assessed
Status	Rel = Relict of Cultivation Cltv = Cultivated Cas = Casual Alien + = On the increase Nat = Naturalised Ex = Extinct Nat-Inf = Naturalised alien but infrequent Nat-Frq = Naturalised alien but frequent Nat-R = Naturalised alien but rare Arch = Archaeophytic Nv = Perhaps a true native Inv = Invasive
Breeding System	Veg = Vegetative (bulbs, rhizomes, fragmentation, apomixis), Dio = Dioecious,

	<p>Mono = Monoecious, Herm = Hermaphrodite</p>
Dispersal Mechanism	<p>Mech-Veg = Type of Authocory – Active self-dispersal/mechanical dispersal by plant by vegetative means - trailing stems, broken off pieces which root, offsets, bulbils, suckering Mech-Deh = Type of Authocory – Active self-dispersal/mechanical dispersal by plant where dehiscent fruit opens setting seeds free which may then be secondarily dispersed Mech-NonDeh = Type of Authocory –Non-dehiscent fruit containing seeds breaks off and is secondarily dispersed Anemo = Anemochory – Type of Allochory where plant disperses by external factors in the case wind dispersal of seeds (achene with pappus; samaroid fruits) or disseminules/seeds drop off by wind and then are secondarily dispersed Hydro = Hydrochory – Type of Allochory where plant disperses by external factors in the case water dispersal of plant parts such as seeds, achenes, broken off pieces of rhizomes Zoo-Ext = External Zoochory – Type of Allochory where plant disperses by external factors in the case animal dispersal by plant part being caught on fur or feathers or carried by birds or ants Zoo-Int = Internal Zoochory – Type of Allochory where plant disperses by external factors in the case animal dispersal through digestion of fruit following by defecation of seeds by birds and mammals Soil Movement</p>
Impacts	<p>- Nil; + Low; ++ Moderate; +++ High</p>
Ease of Control	<p>* Probably easy; ** Easy; *** Probably difficult; **** Difficult; NR Not Recommended</p> <p>N.B.: This categorisation is purely indicative as ease of control would be entirely case and context specific (<i>i.e.</i> depending on species’ characteristics, its abundance and ease of spread, whether it would respond well to control methods, and what level of effort is applied in its control)</p>

Table: 3 - Attributes of Terrestrial Alien Species assigned with invasive categories 3.5, 4. 4.5 and 5								
Species	Native Origin by Region	Possible Mode of Intro	Invasive Category	Status	Breeding System	Dispersal Mechanism	Level of Impact	Ease of Control
<i>Acacia cyclops</i>	Australasia (Western Australia)	Hort	3, 3.5*	Nat-R	Herm	Zoo-Ext	++	*
<i>Acacia karroo</i>	Ethiopia (South Africa)	Hort	3, 4.5*	Nat-R+	Herm	Mech-Deh	++	***

Table: 3 - Attributes of Terrestrial Alien Species assigned with invasive categories 3.5, 4, 4.5 and 5

Species	Native Origin by Region	Possible Mode of Intro	Invasive Category	Status	Breeding System	Dispersal Mechanism	Level of Impact	Ease of Control
<i>Acacia saligna</i>	Australasia - (Western Australia)	Hort	4.5	Nat-Freq; Cltv; Inv	Herm	Mech-Deh	+++	****
<i>Aeonium arboreum</i>	West Palaearctic (Morocco)	Hort	3, 3.5*	Nat-R	Herm; Veg	Mech-NonDeh; Mech-Veg	+	**
<i>Agave americana</i>	Nearctic (Mexico)	Hort	4.5	Nat-Freq; Inv	Herm; Veg (Ins Poll)	Mec-Deh; Mech-Veg	+++	****
<i>Agave sisalana</i>	Nearctic (Mexico)	Agr	4.5	Nat-Inf; Inv	Herm; Veg (Insect Pollinated)	Mec-Deh; Mech-Veg	+++	****
<i>Ailanthus altissima</i>	East Palaearctic (China)	Hort	4.5	Nat-Freq; Inv	Herm; Dio	Anemo; Mech-Veg	+++	****
<i>Amaranthus blitum</i>	West Palaearctic (Mediterranean)	Agr-Acc	3, 4*	Nat-Freq	Mono	Anemo	++	***
<i>Amaranthus cruentus</i>	Neotropic	Agr-Acc	3, 4*	Nat-Freq	Mono	Anemo	++	****
<i>Amaranthus graecizans</i>	West Palaearctic	NK	3, 4*	Arch? Nat-Freq	Mono	Anemo	+++	***
<i>Amaranthus viridis</i>	Neotropic	Agr-Acc	3, 4*	Nat-Freq	Mono	Anemo	+++	****
<i>Amygdalus communis</i>	West Palaearctic (Levant)	Agr	3.5	Nat-Freq	Herm; (Ins and Bird Poll)	Mech-Deh	+++	*
<i>Aptenia cordifolia</i>	Ethiopia (South Africa)	Hort	3.5, 5*	Nat-Freq	Herm	Hydro	+	***
<i>Aptenia lancifolia</i>	Ethiopia (South Africa)	Hort	3.5*	Nat-R+	Herm	Hydro	+	***
<i>Arundo donax</i>	East Palaearctic	Agr	4.5	Arch; Inv	Herm; Veg	Mech-Veg	+++	****

Table: 3 - Attributes of Terrestrial Alien Species assigned with invasive categories 3.5, 4, 4.5 and 5

Species	Native Origin by Region	Possible Mode of Intro	Invasive Category	Status	Breeding System	Dispersal Mechanism	Level of Impact	Ease of Control
					(Wind Poll)			
<i>Symphyotrichum squamatus</i> (= <i>Aster squamatus</i>)	Nearctic & Neotropic	BG-Acc	4.5, 5*	Nat-Freq; Ubq; Inv	Herm	Anemo	+++	****
<i>Cardiospermum grandiflorum</i>	Neotropic & Ethiopia	Hort	4.5, 5	Nat-Freq; Inv	Mono (Ins Poll)	Anemo; Hydro	+++	***
<i>Carpobrotus edulis</i>	Ethiopia (South Africa)	Hort	5	Nat-Freq; Inv	Herm	Mech-Veg	+++	****
<i>Chasmanthe bicolor</i>	Ethiopia (South Africa)	Hort	3.5	Nat-Freq	Herm; Veg (Ins Poll)	Mech-Deh; Mech-Veg	+++	***
<i>Chenopodium album</i>	West & East Palaeartic	NK	3, 3.5*	Nat-Freq	Herm (Wind & Self Poll)	Hydro; Zoo-Ext; Soil Movement	++	*
<i>Chenopodium strictum</i>	West Palaeartic (Cont. Europe)	Hort-Acc	3, 3.5*	Nat	Herm (Wind Poll)	Hydro; Zoo-Ext	+	**
<i>Freesia refracta</i>	Ethiopia (South Africa)	Hort	3.5	Nat-Inf	Herm (Ins Poll)	Mech-Deh; Meg-Veg	+	**
<i>Freesia x hybrida</i>	N/A (cultigen)	Hort	3.5	Nat-R	Herm (Ins Poll)	Mech-Deh; Meg-Veg	+	**
<i>Glebionis coronaria</i>	West Palaeartic	Agr-Acc	3.5	Nat-Freq; Arch?	Herm (Ins Poll)	Hyro; Zoo-Ext; Soil Mov	+	***
<i>Sulla coronaria</i>	West Palaeartic	Agr	3, 3.5*	Nat-Freq	Herm (Ins Poll)	Zoo-Ext	+++	***
<i>Ipomoea indica</i>	Neotropic	Hort	3, 3.5*	Nat-Inf	Herm	Mech-Deh	++	***
<i>Leucaena leucocephala</i>	Neotropic	Hort	4.5	Nat-Inf+; Inv	Herm (Ins Poll)	Mech-Deh	+++	*
<i>Limonium sinuatum</i>	West Palaeartic	Hort	3, 3.5*	Nat-Inf	Herm (Ins or Self Poll)	Anemo	+	**

Table: 3 - Attributes of Terrestrial Alien Species assigned with invasive categories 3.5, 4, 4.5 and 5

Species	Native Origin by Region	Possible Mode of Intro	Invasive Category	Status	Breeding System	Dispersal Mechanism	Level of Impact	Ease of Control
<i>Malephora crocea</i>	Ethiopia (South Africa)	Hort	3, 3.5*	Nat-R	Herm (Ins Poll)	Hydro	+	*
<i>Mirabilis jalapa</i>	Neotropic	Hort	3, 3.5*	Nat-Freq	Herm	Mech-NonDeh	+	***
<i>Mirabilis odorata</i>	Neotropic	Hort	3, 3.5*	Nat-Freq	Herm	Mech-NonDeh	+	***
<i>Opuntia stricta</i> subsp. <i>dillenii</i>	Neotropic	Hort	3, 4*	Nat-R	Hem; Veg	Zoo-Ext; Veg	++	***
<i>Opuntia ficus-indica</i>	Neotropic	Agr	5	Nat-Freq; Inv	Herm; Veg	Zoo-Ext; Veg	+++	****
<i>Opuntia stricta</i> subsp. <i>stricta</i>	Nearctic	Hort	4, 4.5*	Nat-Inf	Herm; Veg	Zoo-Ext; Veg	++	***
<i>Oxalis pes-caprae</i>	Ethiopia (South Africa)	BG	5	Nat; Ubq; Inv	Veg	Veg	+++	****
<i>Paspalum distichum</i>	Neotropic	NK	4.5, 5*	Nat-Inf+	Herm; Veg	Hydro	+++	****
<i>Persicaria glabra</i>	Ethiopia	NK	3, 3.5*	Nat-R	Herm; (Ins Poll)	Hydro	+	*
<i>Persicaria lanigera</i>	Ethiopia; West Palaeartic	NK	3, 3.5*	Nat-R	Herm; (Ins Poll)	Hydro	+	*
<i>Persicaria senegalensis</i>	Ethiopia; West Palaeartic	NK	3, 3.5*	Nat-R	Herm; (Ins Poll)	Hydro	+	*
<i>Pittosporum tobira</i>	East Palaeartic	Hort	3, 3.5*	Nat-Freq	Dio; (Ins Poll)	Zoo-Ext	+	*
<i>Ricinus communis</i>	Ethiopia	Hort	4.5, 5*	Nat-Freq; Inv	Mono	Mech-Deh	+++	****
<i>Sinapis alba</i>	West Palaeartic	Agr-Acc	3, 3.5*	Nat-Freq	Herm (Ins Poll)	Mech-Deh	+	***
<i>Tropaeolum majus</i>	Neotropic	Hort	3, 4.5	Nat-Inf+	Herm	Nech-NonDeh	++	**

Table: 3 - Attributes of Terrestrial Alien Species assigned with invasive categories 3.5, 4, 4.5 and 5

Species	Native Origin by Region	Possible Mode of Intro	Invasive Category	Status	Breeding System	Dispersal Mechanism	Level of Impact	Ease of Control
<i>Vitis vinifera</i> subsp. <i>vinifera</i>	West Palaearctic	Agr	4, 4.5*	Nat-Inf	Herm (Ins & Wind Poll)	Zoo-Int	++	***
<i>Vitis rupestris</i>	Nearctic	Agr	4, 4.5*	Nat-Inf	Dio (Ins & Wind Poll)	Zoo-Int	++	*
<i>Xanthium strumarium</i>	Nearctic & Neotropic	NK	4.5	Nat-Inf; Inv	Mono	Zoo-Ext	+++	***
<i>Zantedeschia aethiopica</i>	Ethiopia (South Africa)	Hort	4	Nat-R	Mono	Zoo-Ext; Veg	+	***

The following seven plant species are assigned the highest invasive category: heart-leaved ice plant (***Aptenia cordifolia***; Maltese: *widnet il-ġurdien*), sea aster (***Symphotrichum squamatus*** = *Aster squamatus*; Maltese: *is-settembrina s-selvaġġa*); Kaffir fig (***Carpobrotus edulis***; Maltese: *is-swaba' tal-Madonna*), prickly pear (***Opuntia ficus-indica***; *il-bajtar tax-xewk*); Cape sorrel (***Oxalis pes-caprae***, Maltese: *il-ħaxixa Inglīza*); water finger-grass (***Paspalum distichum***; Maltese: *in-niġem tal-ilma*) and castor oil plant (***Ricinus communis***; Maltese: *ir-riġnu*). Other plant species that feature as serious and widespread invaders include ***Acacia*** spp. (particularly *A. saligna* and *A. karroo*), ***Agave*** spp. (particularly *A. americana* and *A. sisalana*), tree-of-heaven (***Ailanthus altissima***; Maltese: *ix-xumakk il-falz*), white lead tree (***Leucaena leucocephala***; Maltese: *il-gażżija l-bajda*) and garden nasturtium (***Tropaeolum majus***; Maltese: *il-kaboċċinella*). The control of such species is very challenging also due to the plant characteristics that make such species very successful invaders in the first place. For instance, eradication of **ubiquitous species**, such as Cape sorrel and sea aster would no longer be feasible however control in certain areas may still be possible depending on site specificities. The erect prickly pear - ***Opuntia stricta*** with its subsp. *dillenii* - has become much more invasive; not to mention fountain grass (***Pennisetum setaceum***, Maltese: *il-pjuma*) which has become widespread, even in some natural habitats (Lanfranco, 2016, pers. comm.)

Amongst the species that are assigned in the invasive category number 3, are species that have recently also emerged as warranting some form of control such as the balloon vine (***Cardiospermum grandiflorum***; Maltese: *tursin ir-riħ*). The latter is a popular garden climber but has escaped from cultivation and is for instance seen as invasive at Wied Babu (l/o Żurrieq). The species is also found in other localities e.g. Wied Ghollieqa, Wied Imselliet, Wied Balluta, and Wied Ghomor (Lanfranco, 2016, pers. comm.). The species has only been recently added to the European Plant Protection Organisation (EPPO) Alert List. In the EPPO Region, *C. grandiflorum* is found in Malta, Sicily, Madeira and Canary Islands.

The fast increase of duckweeds (***Lemna*** spp.) - small-free floating plants - is becoming of growing concern, not only due to the difficulty to control their spread but also because they cover whole watercourses during the wet season. The ecological concern is due to the fact that duckweeds can rapidly form dense mats on

the surface of waters, reducing light penetration and oxygen exchange (leading to deoxygenation). *Lemna* species are probably migrants introduced by water-birds (Lanfranco, 2016, pers. comm.).

Turning to the marine scene, information on three species of chromists and nine species of plants is presented in [Table 4](#) on the basis of separate studies and other documented literature. The predominant group of introduced species in the case of the plants is the **rhodophyta (red algae)** amounting to six introduced species. The red alga *Womersleyella setacea* and the green algae *Caulerpa cylindracea* and *Caulerpa taxifolia* var. *distichophylla* would be of most concern, as they pose a high ecological impact on native macrophytic and zoobenthic assemblages through the dense, fast-growing, creeping and permanent meadows they form, combined with the synthesis of secondary metabolites.

Table: 4 - Marine alien species of chromists and plants (Source – MEPA – NIS Report drawn up as part of Malta’s Initial Assessment pursuant to the MSFD, and updated using information provided by Evans <i>et al.</i> 2015) ³⁶				
Taxonomic Group	Species	Country of Origin	Means of Arrival	Status in Malta
Chromista (Ocrophyta)	<i>Colpomenia peregrina</i> ³⁷	Pacific Ocean	Not known for Malta (According to MAMIAS entered the Mediterranean as contaminant in aquaculture)	Casual
	<i>Padina cf. boergesenii</i> ³⁸	Pacific Ocean	Not known for Malta (According to MAMIAS entered Mediterranean via Suez Canal/Shipping-Fouling)	Questionable
Chromista (Foraminifera)	<i>Amphistegina lobifera</i> ³⁹	Indo-Pacific & Atlantic Ocean	Means of arrival not known for Malta (According to MAMIAS entered Mediterranean through Suez Canal)	Established
Plantae (Chlorophyta)	<i>Caulerpa cylindracea</i> ^{40,41}	South Western Australia	Unknown	, Invasive
	<i>Caulerpa taxifolia</i> var. <i>distichophylla</i> ⁴²	Western Australia	Secondary spread via shipping	Established
Plantae (Rhodophyta)	<i>Acanthophora nayadiformis</i>	Red Sea and Indian Ocean	Unknown	Established
	<i>Acrothamnion preissii</i> ⁴³	Indo-Pacific	Means of arrival not known	Established

³⁶ Updated review of marine alien species and other ‘newcomers’ recorded from the Maltese Islands (Central Mediterranean). Evans, Barbara & Schembri, 2015.

³⁷ A critical review of records of alien marine species from the Maltese Islands and surrounding waters (Central Mediterranean). Sciberras & Schembri, 2007.

³⁸ A critical review of records of alien marine species from the Maltese Islands and surrounding waters (Central Mediterranean). Sciberras & Schembri, 2007.

³⁹ On the presence of alien foraminifera *Amphistegina lobifera* Larsen on the coasts of the Maltese Islands. Yokes, Meric & Avsar, 2007.

⁴⁰ Report on a survey of the marine infralittoral habitats and benthic assemblages in the Qawra/Dwejra area (Gozo). Borg *et al.*, 1997.

⁴¹ Now you see it, now you don’t: presence of *Caulerpa racemosa* var. *cylindracea*. Barbara & Borg, 2014.

⁴² It was only a matter of time: occurrence of *Caulerpa taxifolia* (Vahl) C. Agardh var. *distichophylla* (Sonder) Verlaque, Huisman and Procaccini in the Maltese Islands (Chlorophyta, Ulvophyceae, Caulerpaceae). Schembri *et al.*, 2015.

⁴³ First record of *Acrothamnion preissii* (Rhodophyta, Ceramiaceae) from the Maltese Islands (central Mediterranean Sea). Evans *et al.*, 2015.

Table: 4 - Marine alien species of chromists and plants (Source – MEPA – NIS Report drawn up as part of Malta’s Initial Assessment pursuant to the MSFD, and updated using information provided by Evans *et al.* 2015)³⁶

Taxonomic Group	Species	Country of Origin	Means of Arrival	Status in Malta
	<i>Asparagopsis taxiformis</i> ⁴⁴	Unknown	Lessepsian Migrant? (According to MAMIAS entered Mediterranean via shipping/fouling/contaminant of aquaculture)	Established
	<i>Botryocladia madagascariensis</i> ⁴⁵	Indian Ocean	Lessepsian migrant? (According to MAMIAS entered Mediterranean via shipping/fouling)	Established?
	<i>Chondria pygmaea</i> ⁴⁶	Indo-Pacific	Not known for Malta (According to MAMIAS entered Mediterranean via the Suez Canal)	Established?
	<i>Lophocladia lallemandii</i> ⁴⁷	Indo-Pacific	Unknown	Established, Invasive
	<i>Womersleyella setacea</i> ⁴⁸	Indo-Pacific	Unknown	Established, Invasive
Plantae (Tracheophyta)	<i>Halophila stipulacea</i> ⁴⁹	Red Sea & Indian Ocean	Lessepsian migrant; Spread via seacraft/shipping	Established

Lessepsian migration refers to the colonisation by Red Sea/Indian Ocean species also known as Lessepsian migrants, which have been entering into the Mediterranean Sea through the **Suez Canal** from the Red Sea since its completion in 1869 as reported by Occhipinti-Ambrogi and Savini (2003). It has been calculated that over 300 Lessepsian migrants now constitute nearly 5% of the global Mediterranean fauna (Occhipinti-Ambrogi and Savini, 2003). Examples of Lessepsian migrants found locally are the established *Halophila stipulacea* and *Lophocladia lallemandii*. Concerns have been expressed over plans to widen the Suez Canal and this facilitating further introduction of alien species into the Mediterranean Sea.⁵⁰

1.4 Alien Fauna introduced into the Maltese Islands

⁴⁴ Contribution to the knowledge of benthic marine algae on rocky substrata of the Maltese Islands (Mediterranean Sea). Cormaci *et al.*, 1997. - (as *A. armata*)

⁴⁵ Contribution to the knowledge of benthic marine algae on rocky substrata of the Maltese Islands (Mediterranean Sea). Cormaci *et al.*, 1997.

⁴⁶ Contribution to the knowledge of benthic marine algae on rocky substrata of the Maltese Islands (Mediterranean Sea). Cormaci *et al.*, 1997.

⁴⁷ Contribution to the knowledge of benthic marine algae on rocky substrata of the Maltese Islands (Mediterranean Sea). Cormaci *et al.*, 1997.

⁴⁸ Contribution to the knowledge of benthic marine algae on rocky substrata of the Maltese Islands (Mediterranean Sea). Cormaci *et al.*, 1997.

⁴⁹ The occurrence of *Halophila stipulacea* (Forsk.) Ascherson in the Maltese waters. Lanfranco, 1970.

⁵⁰ The Enlargement of the Suez Canal and Introduction of Non-Indigenous Species to the Mediterranean Sea. Galil *et al.*, 2015.

A **review of alien fauna introduced into the Maltese Islands** was also commissioned by the former Malta Environment and Planning Authority (MEPA) with a view to *inter alia* identify the alien fauna of the Maltese Islands, their invasiveness, extent and threats to native biodiversity.⁵¹ The review in question categorised the assessed species into five lists as follows:

- List A - comprises 150 alien species deemed of highest priority;
- List B - comprises 8 alien species, which should be also considered of high priority;
- List C - comprises 25 alien species, which require further investigation;
- List D - comprises 70 alien species considered of low priority; and
- List E - comprises 9 alien species excluded from the study.

Focusing on the species in List A, these species are considered as highest priority for the following reasons:

- they are already established in the natural environment of the Maltese Islands;
- in a number of ways they are damaging or potentially damaging to local flora and fauna;
- they are known from more than one location, and hence their distribution in the Maltese Islands is widespread;
- their origins are known;
- they have been introduced after 1492.

The taxonomic composition of the 150 species considered of highest priority is shown in [Figure 8](#), where it is clearly evident that introductions to date mostly comprised **insects** (77%; 114 species), usually accidentally as plant pests.

⁵¹ *Setting up a List of Alien Fauna. Malta.* EMDP Ltd., 2008 (Unpublished).

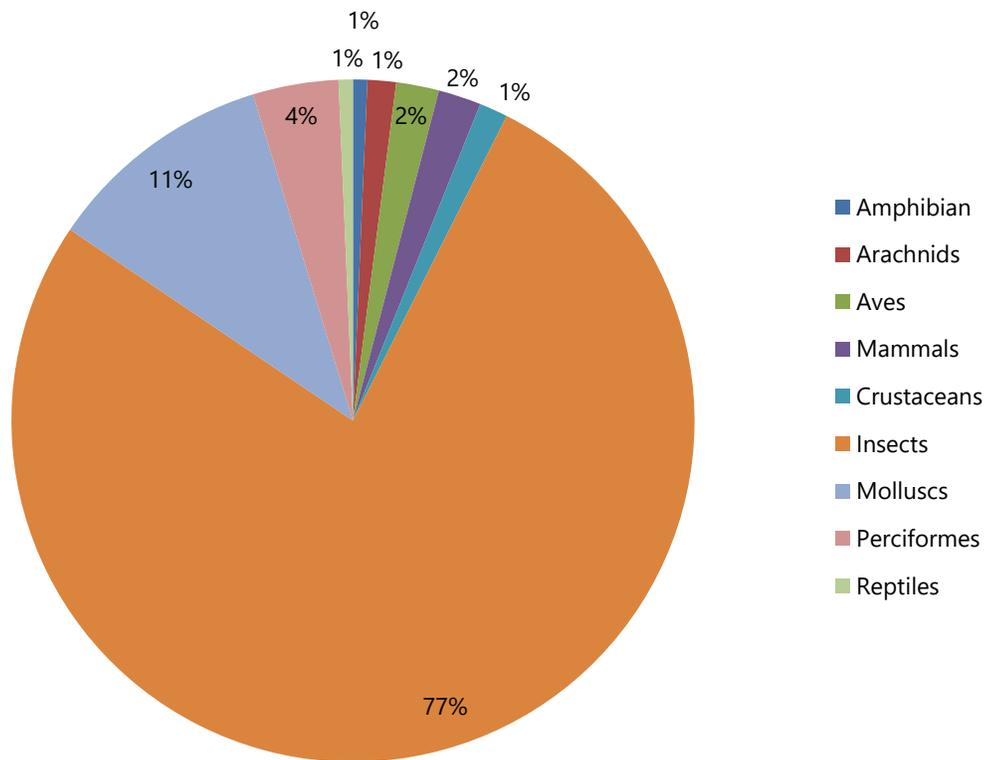


Figure 8 – Pie chart showing taxonomic representation of the 150 species in list A

From [Figure 9](#), amongst the 150 species deemed of highest priority are in the region of 116 terrestrial arthropods. The picture at European level is provided by Roques *et al.* (2009) who mention that 1590 terrestrial arthropod species of non-European origin are established in Europe, including 1390 insects, 47 spiders, 102 mites, 34 myriapods and 17 crustaceans.⁵² A review of the effects of alien terrestrial arthropods on the economy, society and environment in Europe is in turn provided by Kenis and Branco (2010).⁵³

A further breakdown of taxonomic group – insecta - reveals that introductions were mainly of coleopterans and hemipterans ([Figure 9](#)). Amongst the introduced insects, are the following species that are identified as EPPO A2 Listed Quarantine pests:

- sweet potato whitefly (***Bemisia tabaci*** - accidental; 1993; mostly near agricultural land; invasive);
- western flower thrips (***Frankliniella occidentalis*** - accidental through horticultural trade; when found it is very common where its host plant is present; invasive);

⁵² *Alien terrestrial invertebrates of Europe*. Roques *et al.*, 2009.

⁵³ *Impact of alien terrestrial arthropods in Europe Chapter 5*. Kenis & Branco, 2010.

- serpentine leaf miner (*Liriomyza huidobrensis* - accidental most likely along with agricultural crops; common, can be found in high densities where there is an infestation; mainly in or around agricultural fields); and
- cotton leafworm (*Spodoptera littoralis* - accidental through horticultural trade mostly agricultural crops, common where found).

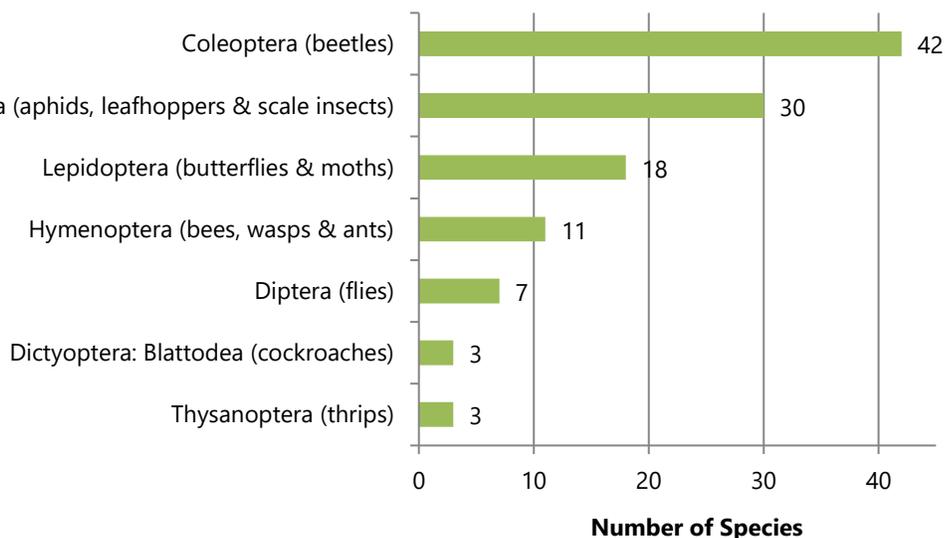


Figure 9 – Bar chart showing breakdown of insects into sub-groups

Several species of insects have been intentionally introduced locally to act as **biological control agents** for controlling exotic plant pests that were in turn accidentally introduced. Mifsud (1997) provides an account of introduced predators and parasites (parasitoids) for biological control programmes.⁵⁴ Examples of biological control agents include:

- Vedalia beetle (*Rodolia cardinalis*, Maltese: *in-nannakola tas-salib*), introduced into Malta from Portici (Naples) in 1911 to control infested gardens at St. Julians (Schembri *et al.*, 1999),
- *Encarsia formosa* (wasp), *Eretmocerus californicus* (wasp) and *Macrolophus caliginosus* (mirid) for the control of the sweet potato whitefly (*Bemisia tabaci*),
- Predatory mites - *Phytoseiulus persimilis* and *Amblyseius californicus* - for the control of the red spider mite,

⁵⁴ *Biological control in the Maltese Islands – past initiatives and future programmes*. Mifsud, 1997.

- the entomophagous parasitoid ***Cales noacki*** for the control of the citrus whitefly (*Aleurothrixus floccosus* Maltese: *id-dbejbna qotnija*),
- the predatory ***Orius laevigatus*** and ***O. insidiosus*** and the predatory mite ***Neoseiulus cucumeris*** against thrips,
- the parasitic wasps - ***Dacnusa sibirica*** and ***Diglyphus isaea*** for the control of leafminers, and
- ***Aphidius colemani*** (parasitic wasp) and ***Aphidoletes aphidimyza*** (cecidomyiid fly) for the control of glasshouse aphids.

Looking at the other taxonomic groups, the introduced **alien arachnids** comprise one species of ectoparasitic mite - *Varroa destructor* - introduced accidentally through the importation of bees in the early 1990s and one species of spider - *Hasarius adansoni* – cosmopolitan introduced accidentally in 1994. *Varroa destructor* attacks all stages of life cycle of honey bees including of *Apis mellifera*.⁵⁵

The one species of alien amphibian is the Levant water frog (***Pelophylax bedriagae*** Maltese: *il-qorru* or *iz-żring l-għarib* – Figure 10) which has been deliberately released in open freshwater pools. It entered the Maltese Islands through the pet and aquarium trade. Initially kept as a pet, it was deliberately discarded in the late 1990s in *l-Għadira ta' Sarraflu*, where it has established a population. This alien can out-compete the Siculo-Maltese endemic painted frog (*Discoglossus pictus pictus*, Maltese: *iz-żring*).⁵⁶ Other misguided introductions of this alien frog have occurred at Xlendi Valley (Gozo) and Marsascala (Malta). Locally this species has been documented to prey on dragonflies and damselflies, especially on their eggs and juveniles (nymph stage). *P. bedriagae* has also been observed preying on the larval and juvenile stages of the painted frog.⁵⁷



Figure 10 – Levant water frog

(Photo Credit - MEPA)

The three mammals consist of the ferret (***Mustela putorius furo***) through escapes though is very rare, and the invasive rats (*Rattus rattus* and *Rattus norvegicus*). The latter two have become established worldwide including the Maltese Islands where they are causing considerable habitat destruction and ecosystem perturbations including contributing to the decline of native fauna through predation. The brown rat (***Rattus norvegicus***) is larger and predominantly terrestrial, while the black rat (***Rattus rattus***) is smaller, more agile and may show arboreality.⁵⁸ Species vulnerable to these rats include those which are ground dwelling, have low productivity, are defenceless and have accessible nests or retreat sites. Both the black rat followed by

⁵⁵ Available at: <http://www.cabi.org/isc/datasheet/107784>

⁵⁶ *A tale of two frogs*. Schembri, 2010.

⁵⁷ *Occurrence of the alien Bedriaga's frog (Rana bedriagae) Camerano, 1882 in the Maltese Islands, and implications for conservation*. Sciberras & Schembri. 2006.

⁵⁸ *Norway Rats (Rattus norvegicus) on Frégate Island, Seychelles: the invasion, subsequent eradication attempts and implications for the island's fauna*. Thorsen et al., 2000.

the brown rat were introduced in the Maltese islands between the late Bronze Age and the Phoenician times.⁵⁹ Rats are being targeted for removal from *Rdum tal-Madonna*, which harbours the largest breeding colony of Yelkouan shearwater (*Puffinus yelkouan*; Maltese: *il-garnija*). Rat eradication was indeed one of the activities of the now completed EU Life Garnija project. This protected cliff-nesting shearwater is at great risk from rat predation. Indeed, Varnham & Meier (2007) note that annual losses of eggs and chicks range between 40% and 100%.⁶⁰ Rat control under this project applied a network of regularly inspected permanent bait stations.

Another project called, LIFE Arcipelagu Garnija (LIFE14 NAT/MT/991), also targeting eradication of rats, amongst other objectives, have been carried out in 13 locations in Malta. This ongoing project has started in 2015 and includes a feasibility study for the eradication of rats and other alien invasives on Comino and Cominotto.

Introduction of birds into the wild (all on Comino) has been deliberate and has comprised three species of **Phasianidae** (pheasants and partridges) - Chukar partridge (*Alectoris chukar* - [Figure 11](#)), golden pheasant (*Chrysolephus pictus*) and common pheasant (*Phasianus colchicus*). In terms of **reptiles**, striped necked terrapins (*Mauremys caspica*) were probably introduced for aquaria and have been released in freshwater ponds and reservoirs, though localised and in low numbers. Species of **herpetofauna**, such as the lizard *Agama agama*, have been introduced into the country most probably with cargo. The snake *Natrix natrix* was collected from Floriana after an Italian circus left from the area (Schembri, *et al.*, 1999).⁶¹



Figure 11 – Chukar partridge on Comino

(Photo Credit - MEPA)

Following the insecta, the next dominant taxonomic group with respect to alien fauna introduction is that comprising **molluscs** (11%, 16 species) both in the terrestrial and aquatic environments. Introduced terrestrial and freshwater molluscs comprise *Cecilioides jani*, *Trochoidea meda*, *Lehmannia valentiana* (three banded garden slug – noted in 2003 in a plant nursery), *Physa acuta*, *Helisoma duryi* and *Succinea putris* (European amber snail – accidental possibly via trade of garden plants – noted in 2003 and found in gardens and nurseries).⁶²

Alien freshwater fish that have been released into the environment comprise mosquitofish (*Gambusia affinis* – released into the wild; common) and goldfish (*Carassius auratus* – released into the wild; common). The mosquitofish has been deliberately released in reservoirs for the control of mosquitoes and has become subsequently naturalised and common in *Wied il-Qlejgħa* (Malta), in *l-Għadira ta' Sarraflu* (Gozo) and in

⁵⁹ *Holozäne Kleinsäugerfunde aus der Ghar Dalam-Höle, Malta (Mammalia: Insectivora, Chiroptera, Rodentia)*. Stoch, 1970.

⁶⁰ *Rdum tal-Madonna rat control project – Final Report to Birdlife Malta and RSPB*. Varnham & Meier, 2007.

⁶¹ *State of the Environment Report for Malta 1998: Living resources, fisheries and agriculture*. Schembri *et al.*, 1999.

⁶² *On some alien terrestrial and freshwater gastropods (Mollusca) from Malta*. Mifsud, Sammut & Cachia, 2003.

several reservoirs in Malta and Gozo. This species is highly adaptable to different environments and has a high reproductive potential. It is an aggressive and selective predator and hence may also alter communities.

Exotic animal species are imported into the country for the **pet and aquarium trade**, with some having subsequently been found released in the environment. Recent cases of potentially invasive species include the report of specimens of the Indian palm squirrel (*Funambulus sp.*) at the Malta Freeport and Buskett, and reports of the giant African land snail (*Achatina fulica*) being brought into Malta and also offered for sale online.⁶³ Indian palm squirrels have a high reproductive potential, high vagility, varied preferred habitats though generally arboreal in deciduous forests, and diverse food habits (essentially herbivores though may also feed on chicks of birds, insects and soft fruit trees). Palm squirrels can be readily domesticated and trained to accept food from people. Hence people might aid in their establishment through provision of food. They may also be of a social nuisance as they are quite vocal.⁶⁴

Achatina fulica on the other hand is a fast-growing polyphagous plant pest originally a native of East African coastal regions.⁶⁵ It can spread very easily over distances not only attached to any means of transport or machinery, but also by going into a state of aestivation in cooler conditions. It (as well as its eggs) can also be readily transported in garden waste. One externally fertilised snail can establish a population. It feeds on all stages of development of most ornamentals, vegetables and leguminous crops leading to severe damage. It can also transmit plant pathogens. Decaying bodies release a bad odour and the calcium carbonate in their shells neutralises acid soils, altering soil properties and the types of plants that can grow in the soil.⁶⁶

When considering **marine fauna introductions**, assessments have been carried out by Sciberras and Schembri (2007), Evans, Barbara and Schembri (2015) and also as part of Malta's Initial Assessment of Good Environment Status (GES) of the marine environment as required by the Marine Strategy Framework Directive.^{67,68,69} An update to these lists was published in 2016 by Evans & Schembri⁷⁰. A summary is available in Table 5. Species that are considered by Zenetos *et al.* (2012) to occur in the Mediterranean as a consequence of **natural range expansion** (e.g. *Cephalopholis taeniops*, *Seriola fasciata* and *Spherooides pachygaster*) are excluded from the table.⁷¹

⁶³ Available at: <http://maltairightnow.com/news/2014/11/11/bebbux-li-jista-jkun-perikoluz-impurtat-fmalta-bil-catamaran/> and <http://maltairightnow.com/news/2014/11/11/jitnehha-r-riklam-tal-bejgh-ta-bebbux-perikoluz-fmalta/>

⁶⁴ *Indian Palm Squirrels Risk Assessment*. Department of Employment, Economic Development and Innovation Biosecurity Queensland

⁶⁵ Ability to feed on a variety of food

⁶⁶ Available at: <http://www.cabi.org/isc/datasheet/2640> & <http://www.issg.org/database/species/ecology.asp?si=64>

⁶⁷ *A critical review of records of alien marine species from the Maltese Islands and surrounding waters (Central Mediterranean)*. Sciberras & Schembri, 2007.

⁶⁸ *Updated review of marine alien species and other 'newcomers' recorded from the Maltese Islands (Central Mediterranean)*. Evans, Barbara & Schembri, 2015.

⁶⁹ NIS Report compiled as part of Malta's Initial Assessment as per Marine Strategic Framework Directive - Available at: <https://era.org.mt/en/Pages/MSFD-IAs-GES-Targets.aspx>

⁷⁰ Evans, J. & Schembri, P.J. (2016) Newcomer species from Maltese waters: additions and amendments. *Rapp. Comm. Int. Mer. Medit.* 41, 424

⁷¹ Zenetos *et al.* (2012) exclude species of tropical Atlantic origin that have expanded their distribution range. Experts indicate that there may be other species of Atlantic origin (in addition to *Seriola fasciata* and *Spherooides pachygaster*) for which means of introduction into the Mediterranean from the Atlantic is still unclear at this stage.

Table 5 – Introduced marine alien fauna (2018)

Taxonomic Group	Species	Country of Origin	Means of Arrival	Status in Malta ⁷²
Animalia (Polychaeta)	<i>Branchiomma bairdi</i> ⁷³	Caribbean Sea	Unknown	Established
	<i>Branchiomma boholense</i> ⁷⁴	Indo-West Pacific	Not known for Malta (According to MAMIAS entered Mediterranean via shipping/fouling)	Questionable
	<i>Eurythoe laevisetis</i> ⁷⁵	Atlantic Ocean	Unknown	Casual?
Animalia (Bryozoa)	<i>Celleporaria aperta</i> ⁷⁶	Indo-Pacific	Shipping (ballast water); accidental importation with species used for aquaculture	Established?
	<i>Celleporaria pilaefera</i> ⁷⁷	Indo-West Pacific	Shipping (ballast water); accidental importation with species used for aquaculture	Established?
Animalia (Cnidaria) -	<i>Cassiopea andromeda</i> ⁷⁸	Indo-Pacific & Red Sea	Lessepsian migrant; Shipping (either through transport of larvae in ballast water, or, of scyphistoma on hulls)	Established?
	<i>Rhopilema nomadica</i> ⁷⁹	East Africa & Red Sea	Lessepsian migrant;	Casual

⁷² Terminology used as per Evans *et al.* (2015):

Questionable: Species for which insufficient information exists and records of which are therefore doubtful; includes newly reported alien or range-expanding species not verified by experts and supposedly alien/rangeexpanding species which are very similar to native species and which are difficult to identify by non-specialists.

Casual: Species which find their way outside their native range but which do not seem to become established as they do not form self-sustaining populations; this term includes species which have been recorded only once or twice from the study area, or whose persistence in an area depends on repeated introductions; 'Casual?' is used for species which have only been recorded once or twice from the study area, but which are easily overlooked (e.g. because they belong to poorly studied groups, or are very similar to native species and difficult to identify by non-specialists) and may hence be more common than the presently available records suggest.

Established: An organism that is capable of reproducing and maintaining self-perpetuating populations in the wild, without deliberate human intervention, outside its native range; The term 'Established?' is used for species that appear to have been established within the study area at some point in time, but for which no recent data to ascertain whether they are still established or not is available. This is often the case with species that are easily overlooked or not easy to identify in the field.

Invasive: An established species whose population has undergone an exponential growth phase and may threaten the diversity or abundance of native species and the ecological stability of the impacted ecosystem and which may also threaten economic activities dependent on these ecosystems, and/or human health.

⁷³ *Biology and new records of the invasive species Branchiomma bairdi (Annelida: Sabellidae) in the Mediterranean Sea.* Arias *et al.*, 2013.

⁷⁴ *Sabelliform polychaetes, mostly from Turkey's Aegean coast.* Knight-Jones *et al.*, 1991.

⁷⁵ *Updated review of marine alien species and other 'newcomers' recorded from the Maltese Islands (Central Mediterranean).* Evans, Barbara & Schembri, 2015.

⁷⁶ *Updated review of marine alien species and other 'newcomers' recorded from the Maltese Islands (Central Mediterranean).* Evans, Barbara & Schembri, 2015.

⁷⁷ *Updated review of marine alien species and other 'newcomers' recorded from the Maltese Islands (Central Mediterranean).* Evans, Barbara & Schembri, 2015.

⁷⁸ *First record of Cassiopea andromeda (Scyphozoa: Rhizostomeae: Cassiopeidae) from the central Mediterranean Sea.* Schembri, Deidun & Vella, 2010.

⁷⁹ *The westernmost record of Rhopilema nomadica (Galil, 1990) in the Mediterranean – off the Maltese Islands.* Deidun, Arrigo & Piraino, 2011.

Table: 5 – Introduced marine alien fauna (2018)				
Taxonomic Group	Species	Country of Origin	Means of Arrival	Status in Malta ⁷²
Animalia (Crustacea)	<i>Callinectes sapidus</i> ⁸⁰	W Atlantic	Transported in ballast from the western Atlantic	Casual
	<i>Caprella scaura</i> ⁸¹	Indian Ocean	Unknown	Established
	<i>Cymadusa filosa</i>	Indo-Pacific	Unknown	Casual?
	<i>Dosima fascicularis</i>	Cosmopolitan?	Unknown	Casual
	<i>Megabalanus tintinnabulum</i> ⁸²	East Atlantic, South of Gibraltar	Shipping (fouling on ship hulls)	Casual
	<i>Percnon gibbesi</i> ⁸³	W Atlantic	Possibly attributed to larvae washed out during tank cleaning of marine aquarium in Monaco which then found its way in the Mediterranean Islands;	Invasive
	<i>Portunus segnis</i>	Indo-Pacific	Unknown	Casual
	<i>Spinocalanus terranovae</i> ⁸⁴	Antarctic – Sub-Antarctic	Unknown for Malta (According to MAMIAS entered Mediterranean via shipping ballast)	Casual?
	<i>Stenothoe gallensis</i> ⁸⁵	Circumtropical	Unknown	Casual?
Animalia (Echinodermata)	<i>Eucidaris tribuloides</i> ⁸⁶	(Atlantic Ocean)	Shipping (ballast water)	Established
Mollusca Gastropoda	<i>Anteaeolidiella lurana</i>	Atlantic Ocean	Unknown for Malta - probably shipping transported on ship hulls from the Indian Ocean	Established?
	<i>Aplysia dactylomela</i> ⁸⁷	Atlantic	Unknown - marine traffic (shipping/ballast) may be the vector; could also have reached the Maltese islands by natural dispersal from the closest established populations, which seem to be those on the islands of Lampedusa and Sicily	Established

⁸⁰ *Marine Brachyura (Crustacea: Decapoda: Brachyura) from the Maltese Islands and surrounding waters (Central Mediterranean)*. Schembri & Lanfranco, 1984.

⁸¹ *First occurrence of Caprella scaura Templeton, 1836 (Crustacea: Amphipoda) on off-coast fish farm cages in the Mediterranean Sea*. Fernandez-Gonzalez & Sanchez-Jerez, 2014.

⁸² *Updated review of marine alien species and other 'newcomers' recorded from the Maltese Islands (Central Mediterranean)*. Evans, Barbara & Schembri, 2015.

⁸³ *The grapsid crab Percnon gibbesi (Milne Edwards, 1853) (Crustacea, Decapoda, Brachyura), a new addition to the marine fauna of Malta*. Borg & Attard-Montalto, 2002.

⁸⁴ *Updated review of marine alien species and other 'newcomers' recorded from the Maltese Islands (Central Mediterranean)*. Evans, Barbara & Schembri, 2015.

⁸⁵ *First occurrence of Caprella scaura Templeton, 1836 (Crustacea: Amphipoda) on off-coast fish farm cages in the Mediterranean Sea*. Fernandez-Gonzalez & Sanchez-Jerez, 2014.

⁸⁶ *A synthesis of the echinoderm fauna of the Maltese Islands*. Tanti & Schembri, 2006.

⁸⁷ *Updated review of marine alien species and other 'newcomers' recorded from the Maltese Islands (Central Mediterranean)*. Evans, Barbara & Schembri, 2015.

Table: 5 – Introduced marine alien fauna (2018)

Taxonomic Group	Species	Country of Origin	Means of Arrival	Status in Malta ⁷²
	<i>Aplysia parvula</i> ⁸⁸	Circumtropical	Lessepsian migrant (According to MAMIAS entered Mediterranean via shipping/ballast)	Casual?
	<i>Alys macandrewi</i> ⁸⁹	Atlantic and possibly Mediterranean	Unknown	Established
	<i>Bursatella leachii</i> ⁹⁰	Circumtropical	Lessepsian migrant; Either by ships from the tropical Atlantic or via the Suez Canal	Established
	<i>Cerithium scabridum</i> ⁹¹	Red Sea; Indian Ocean	Unknown - possibly through passive movement of larvae or through vessels' ballast tanks	Established
	<i>Chelidonura fulvipunctata</i> ⁹²	Indo-Pacific	Unknown	Established
	<i>Crepidula fornicata</i> ⁹³	NW Atlantic	Probably by foreign vessels calling at Malta, or with oyster experimental farming	Casual
	<i>Gibbula cineraria</i> ⁹⁴	East Atlantic from Norway to Gibraltar	Accidental introduction via oyster cultivation	Casual
	<i>Haminoea cyanomarginata</i> ⁹⁵	Red Sea	Unknown - either through ships' ballast tanks or by passive dispersal of the larvae.	Established
	<i>Leucotina eva</i> ⁹⁶	Indo-Pacific	Shipping?	Casual?
	<i>Melibe viridis</i> [= <i>Melibe fimbriata</i>] ⁹⁷	Indo-Pacific	Shipping; Range expansion of surrounding populations, either those in Tunisia or those on the eastern coast of Sicily, or from as yet unreported populations closer to the Maltese Islands	Established?

⁸⁸ Updated review of marine alien species and other 'newcomers' recorded from the Maltese Islands (Central Mediterranean). Evans, Barbara & Schembri, 2015.

⁸⁹ Updated review of marine alien species and other 'newcomers' recorded from the Maltese Islands (Central Mediterranean). Evans, Barbara & Schembri, 2015.

⁹⁰ *Aplysiid species from Malta with notes on the Mediterranean Aplysiomorpha (Gastropoda, Opisthobranchia)*. Bebbington, 1970.

⁹¹ *Cerithium scabridum* Philippi, 1848 (Gastropoda: Cerithiidae), a new invader to the Maltese Islands. Mifsud & Sammut, 2006.

⁹² Updated review of marine alien species and other 'newcomers' recorded from the Maltese Islands (Central Mediterranean). Evans, Barbara & Schembri, 2015.

⁹³ Notes on some uncommon species of molluscs from the Maltese Islands. Cachia, 1981.

⁹⁴ On the occurrence of *Gibbula (Steromphala) cineraria* (L.) (Trochidae) in the Maltese Islands. Schembri, 1979.

⁹⁵ *Haminoea cyanomarginata* Heller & Thompson, 1983 (Gastropoda: Haminoeidae), a new invader for the Maltese Islands. Mifsud, 2007.

⁹⁶ New additions and corrections, with annotations, to the check-list of the marine Mollusca of the Maltese Islands. Mifsud & Cachia, 2011.

⁹⁷ Updated review of marine alien species and other 'newcomers' recorded from the Maltese Islands (Central Mediterranean). Evans, Barbara & Schembri, 2015.

Table: 5 – Introduced marine alien fauna (2018)					
Taxonomic Group	Species	Country of Origin	Means of Arrival	Status in Malta ⁷²	
	<i>Notocochlis gualteriana</i> [= <i>Natica gualteriana</i>] ^{98,99}	Indian Ocean, Red Sea, Tropical Eastern Pacific	Unknown	Casual	
	<i>Ondina michaelae</i>		Shipping	Casual	
	<i>Polycerella emertoni</i> ¹⁰⁰	Tropical Atlantic	Unknown - probably shipping (on boat hulls)	Established?	
	<i>Stomatella</i> species	Depends on species identification	Unknown	Casual?	
	Bivalvia	<i>Atactodea striata</i> ¹⁰¹	Indo-Pacific	Lessepsian migrant	Casual
		<i>Brachidontes pharaonis</i> ^{102,103}	Red Sea & Indian Ocean	Possibly through foreign vessels via Suez Canal	Established, Invasive
		<i>Crassostrea gigas</i> ¹⁰⁴	NW Pacific Ocean	Deliberate introduction for aquaculture	Established
		<i>Fulvia fragilis</i> ¹⁰⁵	Indian Ocean	Lessepsian migrant; Ballast water transport	Established?
		<i>Pinctada imbricata radiata</i> ¹⁰⁶	Indo-Pacific	Through currents or visiting vessels through the Suez Canal	Established
	Animalia (Porifera)	<i>Paraleucilla magna</i> ¹⁰⁷	SW Atlantic	Shipping & Aquaculture Activities	Established
Animalia (Asciacea)	<i>Herdmania momus</i> ¹⁰⁸	Indo-Pacific	Shipping	Established	
	<i>Microcosmus squamiger</i> ¹⁰⁹	Cosmopolitan	Shipping - hull fouling?	Established	
Animalia (Sipuncula)	<i>Aspidosiphon mexicanus</i> ¹¹⁰	West Atlantic Ocean	Unknown	Established	

⁹⁸ *The marine Mollusca of the Maltese Islands. Part two. Neotaenioglossa.* Cachia, Mifsud & Sammut, 1996.

⁹⁹ *New additions and corrections, with annotations, to the check-list of the marine Mollusca of the Maltese Islands.* Mifsud & Cachia, 2011.

¹⁰⁰ *A preliminary check-list of Opisthobranchia (Mollusca, Gastropoda) from the Maltese Islands.* Sammut & Perrone, 1998.

¹⁰¹ *The marine Mollusca of the Maltese Islands. Part four. The classes: Caudofoveata, Solenogastres, Bivalvia, Scaphopoda & Cephalopoda.* Cachia, Mifsud & Sammut, 2004.

¹⁰² *On the presence of a colony of Brachidontes pharaonis (P. Fischer, 1870) (Bivalvia: Mytilidae) in Maltese waters (central Mediterranean).* Mifsud & Cilia, 2009.

¹⁰³ *Branching out: mapping the spatial expansion of the Lessepsian invader mytilid Brachidontes pharaonis around the Maltese Islands.* Cilia & Deidun, 2012.

¹⁰⁴ *Introduced species in the Maltese Islands.* Schembri & Lanfranco, 1996.

¹⁰⁵ *Updated review of marine alien species and other 'newcomers' recorded from the Maltese Islands (Central Mediterranean).* Evans, Barbara & Schembri, 2015.

¹⁰⁶ *Catalogue des mollusques du littoral méditerranéen méditerranéen de l' Egypte.* Pallary, 1912.

¹⁰⁷ *Occurrence of Paraleucilla magna Klautau et al., 2004 (Porifera: Calcarea) in Malta.* Zammit, Longo & Schembri, 2009.

¹⁰⁸ *First record of Herdmania momus (Asciacea: Pyuridae) from the central Mediterranean Sea.* Evans, Borg & Schembri, 2013.

¹⁰⁹ *Updated review of marine alien species and other 'newcomers' recorded from the Maltese Islands (Central Mediterranean).* Evans, Barbara & Schembri, 2015.

¹¹⁰ *A contribution to the knowledge of the phylum Sipuncula in the Maltese Islands (central Mediterranean).* Mifsud & Saiz Salinas, 2012.

Table: 5 – Introduced marine alien fauna (2018)

Taxonomic Group	Species	Country of Origin	Means of Arrival	Status in Malta ⁷²	
	<i>Apionosoma misakianum</i>		Unknown	Established	
Animalia (Fish)	Perciformes	<i>Abudefduf</i> cfr <i>saxatilis</i> ¹¹¹	Atlantic Ocean	Unknown	Established?
		<i>Acanthurus coeruleus</i> ¹¹²	Atlantic Ocean	Unknown	Casual
		<i>Acanthurus monroviae</i>		Unknown	Casual
		<i>Alepes djedaba</i> ¹¹³	Indo-Pacific	Lessepsian Migrant	Established
		<i>Epinephelus malabaricus</i> ¹¹⁴	Indo-Pacific	Lessepsian migrant; Shipping	Casual
		<i>Heniochus intermedius</i> ¹¹⁵	Red Sea & Gulf of Aden	Unknown	Casual
		<i>Lutjanus fulviflamma</i> ¹¹⁶	Indo-Pacific	Unknown	Questionable
		<i>Oplegnathus fasciatus</i> ¹¹⁷	Pacific Ocean	Probably Shipping (via sea chests?)	Casual
		<i>Pomacanthus maculosus</i>		Shipping/Aquarium trade	Casual
		<i>Sargocentron hastatum</i>		Unknown	Casual
		<i>Scatophagus argus</i> ¹¹⁸	Indo-Pacific	Aquarium Trade - escape or deliberate release (regularly imported into Malta for aquarium trade since 1986)	Established?
		<i>Selene dorsalis</i> ¹¹⁹	W Atlantic	Not known - ship ballast water transport, casual Atlantic entry or northward range expansion	Cryptogenic (may be range expansion)
		<i>Siganus luridus</i> ¹²⁰	Indian Ocean	Lessepsian migrant	Invasive?

¹¹¹ First record of *Abudefduf* cfr *saxatilis* Linnaeus, 1758 (Perciformes: Pomacentridae) from the Maltese Islands (Central Mediterranean). Deidun & Castriota, 2014.

¹¹² Portent or accident? Two new records of thermophilic fish from the central Mediterranean. Evans, Tonna & Schembri, 2015.

¹¹³ The fish around Malta (Central Mediterranean). Lanfranco, 1993.

¹¹⁴ Occurrence of the Malabar grouper *Epinephelus malabaricus* (Bloch & Schneider, 1801) (Actinopterygii, Perciformes, Serranidae), in the Maltese Islands. Schembri & Tonna, 2011.

¹¹⁵ Portent or accident? Two new records of thermophilic fish from the central Mediterranean. Evans, Tonna & Schembri, 2015.

¹¹⁶ New alien species and declining local species in our sea. Available at: <http://www.um.edu.mt/news/campus/research-initiatives/archive/newaliendeclininglocalspecies>

¹¹⁷ Occurrence of barred knifejaw, *Oplegnathus fasciatus* (Actinopterygii: Perciformes: Oplegnathidae), in Malta (central Mediterranean) with a discussion on possible modes of entry. Schembri et al., 2010.

¹¹⁸ Updated review of marine alien species and other 'newcomers' recorded from the Maltese Islands (Central Mediterranean). Evans, Barbara & Schembri, 2015.

¹¹⁹ First record of *Selene dorsalis* (Osteichthyes: Carangidae) in the Mediterranean Sea, from coastal waters off the Maltese Islands. Vella & Deidun, 2009.

¹²⁰ Updated review of marine alien species and other 'newcomers' recorded from the Maltese Islands (Central Mediterranean). Evans, Barbara & Schembri, 2015.

Table: 5 – Introduced marine alien fauna (2018)

Taxonomic Group	Species	Country of Origin	Means of Arrival	Status in Malta ⁷²
	<i>Sphyraena chysotaenia</i> ¹²¹	Indo-Pacific	Lessepsian migrant	Established
	<i>Stegastes variabilis</i> ¹²²	Western Atlantic	Unknown	Casual
	<i>Stephanolepis diaspros</i> ¹²³	Red Sea	Lessepsian migrant	Established
Syngnathiformes	<i>Fistularia commersonii</i> ¹²⁴	Indo-Pacific	Lessepsian migrant;	Invasive

Species whose abundance is high tend to also exhibit characteristics of invasiveness. *Fistularia commersonii*, *Percnon gibbesi* and *Pinctada radiata* are all on the increase. **Lessepsian migration and shipping** are both major pathways of introduction of marine invasive alien species. Harbours/port areas are main points of entry in view of shipping activities (i.e. Grand Harbour and Marsamxett Harbour) and associated activities, such as hull cleaning, as well as bays, where aquaculture was or is practised or, where recreational boating and fishing is common, since such activities can spread alien species by way of yacht anchors and fishing gear.

Attempts to start an aquaculture industry in the Maltese islands in the mid/late 1970s lead to the deliberate and accidental introduction of alien species, where the number of accidental introductions outnumbers deliberately introduced species. The Maltese Islands are also important staging points for drilling platforms, and their occasional duration moored in coastal waters (can be for weeks), provides the opportunity for movement of biota associated with the platform to inshore waters.¹²⁵

1.5 The Invasion Process and Characteristics conferring Invasive Ability

The **process of invasion** involves a number of phases and also requires an organism to overcome various barriers. Introduction into new areas hence occurs by some form of intervention, intentionally or unintentionally, beyond the constraints of natural barriers or boundaries and beyond the species' natural ability of mobility or dispersal potential. In order for a species to become invasive it needs to overcome a number of **barriers or environmental filters** that limit introduction and spread. These are: geographic barriers (intercontinental and/or infra-continental), environmental barriers at site of introduction (biotic and abiotic), reproduction barriers (prevention of production of offspring), dispersal barriers (local and regional) and landscape barriers (in human-modified environments and in natural/semi-natural environments).

¹²¹ *The fish around Malta (Central Mediterranean)*. Lanfranco, 1993.

¹²² *New alien species and declining local species in our sea*. Available at: <http://www.um.edu.mt/newsoncampus/research/initiatives/archive/newaliendeclininglocalspecies>

¹²³ *The fish around Malta (Central Mediterranean)*. Lanfranco, 1993.

¹²⁴ *Updated review of marine alien species and other 'newcomers' recorded from the Maltese Islands (Central Mediterranean)*. Evans, Barbara & Schembri, 2015.

¹²⁵ *Occurrence of the Malabar grouper *Epinephelus malabaricus* (Bloch & Schneider, 1801)*. Schembri & Tonna, 2001.

The invasion process involves the following phases: Introduction/ Transport ⇒ Colonisation ⇒ Establishment/ Naturalisation ⇒ Invasion. The types of barriers that are involved can be described using the schematic representation shown in [Figure 13](#).¹²⁶

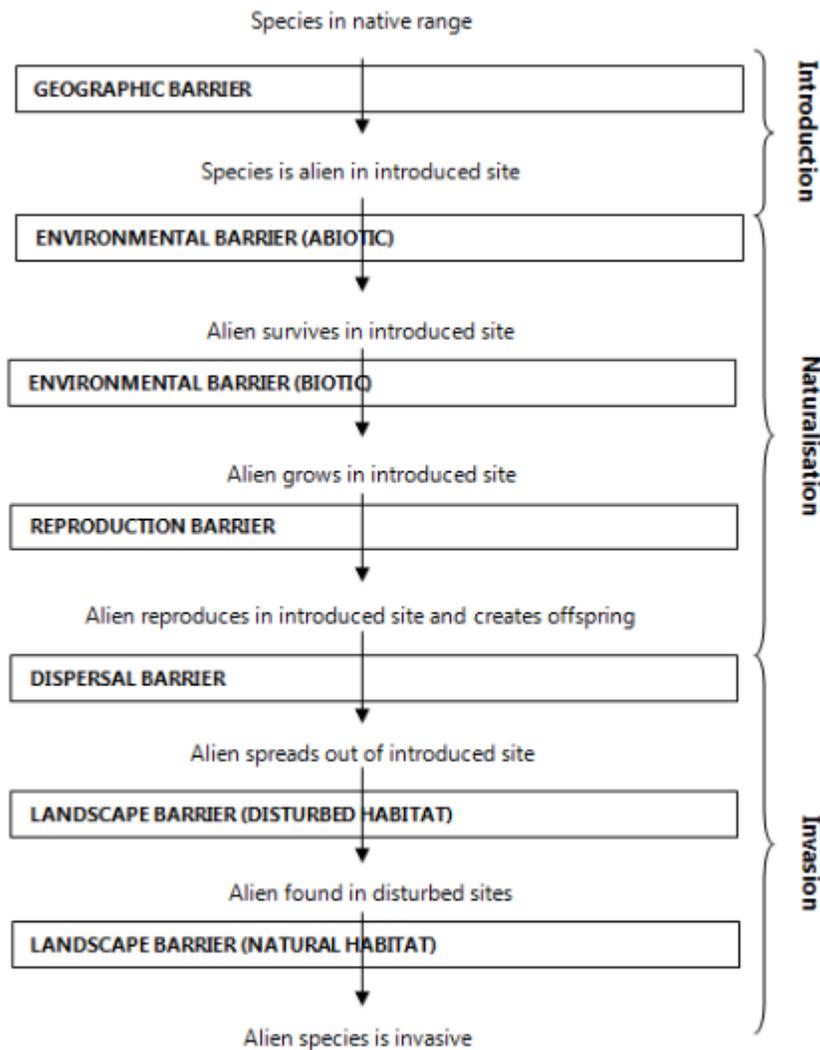


Figure 13 - A schematic representation of major barriers limiting the spread of introduced alien species

(Source: Adapted from Richardson *et al.*, 2000)

Arrows indicate the paths followed by taxa to reach different states from introduced to invasive. Crossing of the barriers is not irreversible. For example, climatic fluctuations can either pose new barriers (which could drive alien taxa to extinction at local and/or regional scales), or enable the taxon to survive or spread.

Once alien species are

introduced into a new environment they may become established and naturalised. The **eucalyptus trees** (Maltese: *l-ewkaliptus* or *is-sigra tal-gamiem*) - Murray red gum (*Eucalyptus camaldulensis*) and the gum tree

¹²⁶ *Naturalisation and invasion of alien plants: concepts and definitions.* Richardson *et al.*, 2000.

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(*E. gomphocephala*) - are examples of established alien trees in the Maltese Islands but are not invasive. Eucalyptus trees originate from Australia. They require water in great abundance; hence apart from depleting the water table, they also compete with native species for this water resource, which is already inherently scarce in Malta. In addition, leaves of eucalypts exude toxic substances that inhibit native species from growing in the direct surrounding area. Thus although not invasive, eucalypts are an example of an alien species that poses ecological (and economic) impacts.

Expansion of an alien species beyond the point of primary introduction indicates that the ecological conditions are suitable for establishment. If the introduced taxon adapts to the new receiving environmental conditions, successfully establishes itself and, subsequently reproduces in the new colonised area without intervention by man, it is said to have become “**naturalised**”. Alien species are deemed harmful when once established in natural and semi-natural ecosystems, they become “invasive” by spreading rapidly well beyond the introduction focus, and causing significant losses of native biodiversity and possibly irreversible impacts. The shift from “naturalised, non-invasive” to “invasive” represents the point at which the presence of an alien species may become evident/detectable in view of its ecological impacts or economic impacts (Richardson *et al.*, 2000).¹²⁷ Alien species become invasive after a certain time lag. This further depends on the absence of limiting factors, such as predation and competition. Eventual spreading into other areas (**secondary introduction**) beyond the point of introduction (primary introduction) may occur via dispersal or migration mechanisms, aided by vectors.

The **characteristics that confer invasive ability/invasiveness** are listed in [Table 6](#). This also lists the characteristics of habitats that make them susceptible to invasion. Invasive ability is generally linked to fast growth rate, rapid reproduction, different modes of reproduction, and the ability to make use of various strategies that enable wide-ranging dispersal. The invasion process may be further influenced by a number of factors, such as suitability of the receiving environment, the frequency and extent of disturbance (past and present) of the receiving environment and recovery rate of **resident biodiversity**, species and **functional diversity in the receiving environment**, amount of available resources and whether resident native species are able to compete for resources with the alien species. Alien species are however unpredictable in nature in terms of their environmental adaptability (depending on the ecosystem’s heterogeneity and the species flexibility), their potential for rapid growth, dispersal and transmission of diseases and the way in which they may alter the genetic make-up of populations of native species.

Table: 6 - Characteristics of invasiveness and invasibility	
Major characteristics of successful invaders	Major characteristics of invadable habitats
<ul style="list-style-type: none"> ▪ High reproductive rate ▪ Pioneer species (species to first colonise newly created or disturbed areas) 	<ul style="list-style-type: none"> ▪ Early successional (habitat is in the early stage of colonisation by native plants)

¹²⁷ *Naturalisation and invasion of alien plants: concepts and definitions*. Richardson *et al.*, 2000.

Table: 6 - Characteristics of invasiveness and invasibility

Major characteristics of successful invaders	Major characteristics of invadable habitats
<ul style="list-style-type: none"> ▪ Short generation time (time required for the population to double in size) ▪ Long-lived ▪ High dispersal ability ▪ Vegetative reproduction (propagation of plants by means of cuttings or root runners but not seeds) ▪ Habitat generalists (species that can live in many different habitats) ▪ Adapt well to altered habitats brought about by the activities of man ▪ Broad diet 	<ul style="list-style-type: none"> ▪ Similar climatic conditions as to those of the country of origin of the invasive species ▪ Low native species diversity ▪ Absence of predators of the invasive species ▪ Disturbed by human activity ▪ Simple communities ▪ Absence of native species ecologically similar to the invasive species

The issues to consider when attempting to predict whether a species will become problematic or not, include, if the species has been flagged as invasive elsewhere and, whether such invasion has happened under similar **(climatic and geographic) conditions** and in related ecosystems.¹²⁸ Regions that have similar climatic Mediterranean conditions include the Cape Province in South Africa, South Western Australia, Central California and Central Chile. Species introduced from these regions are more likely to become invasive in the Maltese Islands, as they would be already pre-adapted to the Mediterranean climate. Evidence for this is given by the successful invaders – Cape sorrel and Kaffir fig, which originate from the Cape Province of South Africa.

While only a small number of introduced alien species may become invasive, the growing concern on actual or potential IAS lies with the fact that even a single invasive species can cause impacts that are very rapid, cryptic (and hence not immediately detectable), acute, long-term, magnifying, possibly irreversible and cascading.¹²⁹ The following section in this chapter delves into the impacts of IAS.

1.6 Impacts of Invasive Alien Species with a Focus on Islands

The **impacts of alien species** may range from harmless or neutral (e.g. a species using an unoccupied niche) to extremely adverse and far-reaching effects (in the case of those alien species that are invasive). This depends on the characteristics of the species in question and the conditions of the receiving environment. The effect of an introduced alien species can be harmless or neutral to the environment when the species finds an unoccupied niche and does not cause any disruption to the habitat and to the other species found in that habitat. For example, the Mediterranean chameleon (*Chamaeleo chamaeleon*, Maltese: *il-kamaleonte*) was originally introduced into the Maltese Islands as an exotic pet from North Africa. Once it escaped from captivity, it spread into the environment and is now fully established and naturalised.¹³⁰ As mentioned by Schembri and Lanfranco (1996) '*this species has not caused any impact on local biota possibly due to the fact that no other local species occupies its arboreal niche*'. Knowledge of the ecological role of the

¹²⁸ *Marine Bioinvasions: A Challenge for the Mediterranean to Address a Borderless Issue*. IUCN, 2003.

¹²⁹ *Pilot Assessments - The Ecological and Socio-Economic Impacts of Invasive Alien Species on Island Ecosystems*. UNEP/CBD/SBSTTA/9/INF/33

¹³⁰ *Introduced species in the Maltese Islands*. Schembri & Lanfranco, 1996.

chamaeleon in local settings would benefit from further study as it has seemingly moved from its arboreal niche (noting the rarity of this habitat) and is indeed often encountered in garrigue, phrygana, steppic habitats as well as in urban settings. The impact on native species would also require assessment.

Alien species that are invasive have been identified as one of the most important direct drivers of biodiversity loss and ecosystem services changes.¹³¹ The impacts of IAS are multi-faceted and can affect a wide range of environmental and socio-economic activities at global, regional, national and local levels. The comprehensive review done by DAISIE on the **ecological and economic impacts** of alien species in Europe has revealed that at least 11% and 13% of European alien species are known to exert adverse ecological or economic impacts, respectively (1,094 species with documented ecological impacts and 1,347 with economic impacts).¹³² The **DAISIE project** has also revealed that the two taxonomic groups comprising the most species causing impacts are **terrestrial invertebrates** (create greater economic impacts) and **terrestrial plants** (create greater ecological impacts). This is also the case of Malta when recalling the information presented in Sections 1.3 and 1.4.

Impacts vary not only across taxonomic groups but also across ecosystems in which the species is introduced. IAS can impact biodiversity and related ecosystem functioning, recreational activities, economic sectors (agriculture and fisheries) and human, animal and plant health. The report on “The Impacts of Invasive Alien Species in Europe” (EEA 2012, Technical Report No 16/2012) identifies various types of IAS impacts categorised into (1) impacts on biodiversity, (2) impacts on ecosystem services, (3) impacts on human health, and (4) impacts on economic activities. Figure 14, overleaf details the type of impacts classified according to these classifications.

Insular ecosystems, such as the ones harboured in the Maltese Islands, are particularly susceptible to damage from biological invasions. This is because of the endemic biological diversity present and the constrained size of such islands, whereby more often than not, local ecosystems are small scale (restricted in size and distribution) coupled with the high extent of disturbed land due to human intervention. **Endemic species** found on oceanic islands are particularly threatened by alien species. The isolation of such species is essential, because it contributes towards the evolution and the maintenance of biodiversity. The impacts of IAS can lead to the extirpation and even extinction of such endemic species. Furthermore, endemic flora and fauna rely on specific and limited habitats for their survival, such as the national plant – the Maltese rock centaury (*Palaeocyanus crassifolius*, Maltese: *il-widnet il-baħar*) - and the Maltese cliff-orache (*Cremnophyton lanfrancoi*, Maltese: *il-bjanka ta' l-irdum*). These are both confined to Maltese cliffs, locally known as *Rdum*. If these areas are degraded and altered by IAS (such as by *Opuntia* and *Agave* species), the endemic species may inevitably be displaced due to unavailable land surface (crevices in cliffs and screes) for re-colonisation or re-establishment.

¹³¹ Ecosystems and Human Well-being - Biodiversity Synthesis Report. Millennium Ecosystem Assessment, 2005.

¹³² *How well do we understand the impacts of alien species on ecosystem services? A pan-European cross-taxa assessment.* Vilà et al., 2010.



Figure 14 – Summary of Types of IAS Impacts and Examples of IAS causing such impacts in Malta

Because of the considerable ecological fragility of islands, the introduction of alien species currently constitutes a major threat to most of the endemic species on numerous islands, including the Maltese Islands. While IAS are a global problem with far-reaching challenges, impacts of IAS may be distributed unevenly. This calls for the need of tailored solutions according to local context, while also requiring **concerted action across borders** worldwide and regionally.

The following **traits of IAS impacts on islands** are documented:

- Impacts occur at any level or across levels of biotic organisation - at the genetic level by hybridisation and introgression; at the species level by predation and competition; at the habitat level by leading to fragmentation, destruction and alteration of the habitat; at the ecosystem level, by alteration of trophic structure, shift in the demands of resources, alteration of resource availability, and invasional meltdown;
- Impacts result from direct and/or indirect influences of the invasive alien species;
- Impacts occur immediately or years after the introduction;
- Impacts persist for the short or long term;
- Impacts act synergistically to magnify or amplify other impacts on the system;
- Impacts may be so subtle that they are not readily perceived, but be cumulative over time; and/or
- Impacts interact and have cascading effects.¹³³

1.6.1 Environmental/Ecological Impacts

The introduction and establishment of alien species, especially those that are invasive, can cause significant impacts on receiving/recipient ecosystems. Biological invasions cause considerable direct or indirect damage to native fauna and flora by ways of predation, competition for resources, transmission of diseases, alteration of ecosystem processes, degradation or destruction to habitats supporting the native species, displacement, and hybridisation. An IAS can also impact one particular ecosystem service (e.g. food provision by acting as an agricultural pest) or multiple **ecosystem services** (e.g. through altering supporting and regulating services – altering physical habitat, nutrient cycling, etc.). For instance, the giant reed (***Arundo donax***; Maltese: *il-ħażrun or qasab*) is a perennial grass native to India. It was intentionally introduced in Malta during the Roman period probably for the exploitation of its canes. Although it is considered an “archaeophyte”, it invades watercourses, riparian woodlands and other moist places. Upon establishment, it spreads at a rapid rate and smothers native plants by out-competing and eventually replacing them. Being a hydrophyte, it tends to consume a lot of water, and also increases fire potential within an area since it ignites easily. Roots and stem fragments may root and initiate new infestation by means of vegetative reproduction. Both stems and rhizomes are able to propagate in a wide range of physical conditions. Hence this species disrupts both regulating and supporting services, apart from competing with native reed species. The introduction of **non-native stocks of indigenous species** or else species that are closely related to native ones in the Maltese islands may result either in the introduced species dying out, or coexistence, extinction, displacement of the native species or else hybridisation. For example, the closely related wall lizard *Podarcis wagneriana* from Sicily could easily hybridise with the endemic Maltese wall lizard (***Podarcis filfolensis***, Maltese: *il-gremxula ta’ Malta*). **Hybridisation** is a common occurrence in plants, birds, fish and other taxa such as insects with recent attention drawn for instance to the Maltese sub-species of honey bee – ***Apis mellifera ruttneri*** being at risk of genetic pollution by the introduction alien sub-species of honey bees. Usually hybridisation is limited from taking place by way of geographical isolation. However, due to the creation of pathways by anthropogenic activities, once isolated related species and sub-species are brought into contact, this may result in interbreeding. Non-native and native taxa belonging to the same species (conspecifics) also may exhibit differences in their biology. For example, the Spanish holm oak (***Quercus ilex***, Maltese: *is-sigra tal-ballut*) produces acorns in early October while the local species (dominant in sclerophyllous woodlands, such as *il-Buskett* and *il-Miżieb*) produces acorns in late December.

¹³³ *Pilot Assessments: The Ecological and Socio-economic Impact of Invasive Alien Species on Island Ecosystems.*
 UNEP/CBD/SBSTTA/9/INF/33

Hybridisation with closely related non-native species pollutes the gene pool of native and endemic species. The resulting hybrids are genetically different from the native species and could become invasive, out-competing and displacing the native species. For instance, the naturalised alien **English elms** *Ulmus minor* (Maltese: *l-ulmu tal-Buskett*) and *Ulmus procera* (Maltese: *l-ulmu Ingliz*), which were initially introduced in certain valleys, hybridise freely with the rare native hoary/grey leaved elm (*Ulmus canescens*, Maltese: *in-nemmiesa* or *is-sigra tan-nemus*). The hybrids produced are replacing the “pure” hoary elm, which is characteristic of riparian woodlands. Since the native elm is rare, the chances of its displacement by the hybrid elm are more imminent. Hybridisation leads to genetic erosion of native gene pools. In addition, the resulting offspring may be sterile, resulting in the decrease of the population size.

Certain alien species in addition to the main characteristics that confer invasiveness (see [Section 1.5](#)) exhibit other **strategies to outcompete native species**. For instance, some alien plants also use toxic **metabolites or allelopathic substances** to keep away native flora and consequently they occupy more space. A case example is the tree-of-heaven (*Ailanthus altissima*, Maltese: *ix-xumakk falz* – [Figure 15](#)). This deciduous tree was intentionally introduced during the nineteenth century into Malta as an ornamental. It has invaded many local habitats, namely maquis communities. This fast growing tree tends to out-compete and over-run native vegetation for resources and space. The species produces a toxin known as ailanthone, which prevents other flora establishing in the area where it is found. The female tree is a prolific producer of wind-dispersed seeds. Reproduction can also be asexually by means of vegetative sprouts. Once this tree becomes established, it quickly dominates the site it invades by forming a dense thicket.



Figure 15 – Tree-of-heaven

(Photo Credit - ERA)

Examples of notorious **marine invaders** comprise *Caulerpa taxifolia* and *C. racemosa*. *C. taxifolia* was accidentally introduced in the Mediterranean by the discharge from aquarium tanks as reported by Occhipinti-Ambrogi and Savini (2003) and secondarily spread by shipping and currents.¹³⁴ It was thought that this alga could serve as an “algal killer” because of the presence of terpenoid compounds such as “caulerpenylna” and was also used for decorative purposes in aquaria. On the other hand, while the presence of *C. racemosa* into the Mediterranean was initially thought to be due to Lessepsian migration, it is now considered to have been introduced from South-Western Australia, *Caulerpa cylindracea*.^{135, 136} *C. taxifolia*

¹³⁴ Available at: http://www.europe-aliens.org/pdf/Caulerpa_taxifolia.pdf

¹³⁵ Available at: http://www.europe-aliens.org/pdf/Caulerpa_racemosa.pdf

¹³⁶ *The Caulerpa racemosa invasion: A critical review*. Klein & Verlaque, 2008.

is distinguished by its spherical, club-shaped or mushroom- to disc-shaped branchlets, while *C. cylindracea* is feather-like.

Since their introduction in the Mediterranean Sea, *Caulerpa* spp. have become both extremely invasive in sub-tidal habitats where they alter the structure and function of benthic communities and cause a decrease in biodiversity. The success of these at invading is promoted according to Occhipinti-Ambrogi and Savini (2003) by 'easy dissemination, high environmental fitness and tolerance to pollution, and a strongly disturbed receiving environment'.¹³⁷ Relini, Relini, and Torchia (2002) note that the spreading of *C. taxifolia* is facilitated by fishing activities in particular by bottom otter trawls and trammel nets. These authors also reported that fishermen are strongly affected by the spreading of *C. taxifolia* not only because of qualitative change in catch composition of commercially important fish but also because of the presence of the large quantity of algal fronds, which interfere with the use of the gears.¹³⁸ Ceccherelli *et al.* (2002) studied the spread of both *Caulerpa* species with the aim of identifying Mediterranean macroalgal assemblages that are more successfully invaded by these two introduced species.¹³⁹ *Caulerpa* species do not only pose environmental impacts but may also adversely affect economically-important activities, such as fisheries.

When considering the local scene, *C. cylindracea* was first reported (as *C. racemosa*) from the Qawra/Dwejra area in Gozo in 1997.¹⁴⁰ Since then it rapidly spread in coastal areas, with its increase in abundance related to areas of poor water quality and elevated nutrient enrichment.^{141, 142} After 2006, it declined rapidly (possible reason being related to efforts to improve coast water quality) and is nowadays rarely encountered as confirmed by Barbara and Borg (2013).¹⁴³ The gracile form of *Caulerpa taxifolia* (var. *distichophylla*) has on the other hand only been recently confirmed as present in Malta.

Some species, referred to as “transformers”, change the character, condition or form of the receiving environment to suit their needs whilst possibly (depending on the type of transformer) rendering it inhospitable for resident native species. The following categories of transformers are documented (adapted from Rejmánek, Richardson and Pyšek, 2013):¹⁴⁴

- Excessive users of resources, such as water (water depleters);
- Donors of limiting resources, such as nitrogen;
- Fire promoters/suppressors;
- Sand stabilisers;
- Erosion promoters;
- Cycle disruptors;
- Colonisers of intertidal mudflats – sediment stabilisers;

¹³⁷ *Biological invasions as a component of global change in stressed marine ecosystems*. Occhipinti-Ambrogi & Savini, 2003.

¹³⁸ The role of fishing gear in the spreading of allochthonous species: the case of *Caulerpa taxifolia* in the Ligurian Sea. Relini, Relini, and Torchia, 2002.

¹³⁹ *Spread of introduced Caulerpa species in macroalgal habitats*. Ceccherelli *et al.*, 2002.

¹⁴⁰ *Report on a survey of the marine infralittoral habitats and benthic assemblages in the Qawra/Dwejra area (Gozo). Stage I*. Borg *et al.*, 1997.

¹⁴¹ *Caulerpa racemosa* impact on phytobenthic /macroalgal communities at Tad-Debbra (Marsaxlokk). Camilleri, 2005.

¹⁴² *Caulerpa racemosa* (Chlorophyta, Caulerpales) in the Maltese Islands (Central Mediterranean). Mifsud & Lanfranco, 2007.

¹⁴³ *Now You See It, Now You Don't: Presence of Caulerpa racemosa var. cylindracea* (Chlorophyta, Caulerpales) in the Maltese Islands. Barbara & Borg, 2013.

¹⁴⁴ *Plant invasions and invisibility of plant communities*. Rejmánek, Richardson & Pyšek, 2013.

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- Litter accumulators;
- Soil carbon storage modifiers;
- Disease causers;
- Land destroyers (e.g. grazing land);
- Crop decimators;
- Species eliminators, and
- Salt accumulators/redistributors.

Because type of impact and **impact magnitude** varies greatly among species, preventive and management actions to combat IAS need to be prioritised to those that pose significant impacts. Blackburn *et al.* (2014) propose a standardised system for classifying alien species according to the magnitude of their environmental impacts into impact mechanisms on the basis of semi-quantitative scenarios. The **impact mechanisms** are: competition, predation, hybridisation, disease transmission, parasitism, poisoning/toxicity, bio-fouling, grazing/herbivory, chemical/physical or structural impact on ecosystem, interaction with other invasive species, and other. The **semi-quantitative scenarios** are: (0) no discernible impact; (1) discernible impacts, but no effects on individual fitness; (2) effects on fitness, but not on populations; (3) changes to populations, but not to community composition; (4) community changes, which are reversible; and (5) irreversible community changes and extinctions. Species are assigned to different levels of impact bearing in mind ecological complexity and different spatial and temporal scales, and taking into consideration the worst observed case for a species and potential consequences in terms of impact of an introduction. The **levels of impact** are: massive (MA), major (MR), moderate (MO), minor (MI) and minimal (ML).¹⁴⁵ As noted by the authors of this work, this standardised system can be of assistance to national assessments when compiling species listings: white lists (having ML or MI impact), grey lists (assumed or uncertain impact) and black lists (having MO, MR or MA impact).

1.6.2 Social and Economic Impacts

'Ecological impacts translate into socio-economic impacts when they influence the ability of ecosystems to provide goods and services for humanity' (UNEP, 2003).¹⁴⁶ Ciruna, Meyerson and Gutierrez (2004) categorise socio-economic impacts of IAS into market impacts (e.g. changes in prices) and non-markets impacts (e.g. changes in ecosystem services).¹⁴⁷ **Socio-economic impacts** arise when IAS directly affect human health and sectors (such as industry, agriculture, horticulture, fisheries and tourism), in terms of introduction of pests, pathogens and diseases as well as loss of aesthetic value, reduction of land value, loss of natural heritage and of scientific opportunities. This poses constraints on sustainable development and on economic growth due to economic loss ensuing from management and restoration costs.

Alien species affect **health** in various ways, such as through pollen dispersal causing hay fever (e.g. blue-leaved wattle - ***Acacia saligna***; Maltese: *l-akaċja*), production of seeds that are poisonous if ingested by man (e.g. castor oil tree - ***Ricinus communis***; Maltese: *is-siġra tar-riġnu*) and by direct harm such as stings and spread of disease.

¹⁴⁵ *A Unified Classification of Alien Species Based on the Magnitude of their Environmental Impacts.* Blackburn *et al.*, 2014.

¹⁴⁶ *Pilot Assessments: The Ecological and Socio-economic Impact of Invasive Alien Species on Island Ecosystems.* UNEP/CBD/SBSTTA/9/INF/33

¹⁴⁷ *The ecological and socio-economic impacts of invasive alien species in inland water ecosystems.* Ciruna, Meyerson & Gutierrez, 2004.

IAS that are **disease vectors** are a major health concern. A case in point is the incursion of the Asian tiger mosquito (*Aedes albopictus*) into various parts of Europe through international trade (eggs transported globally via the used tire trade and the importation of *Dracaena* spp.). This species of mosquito is one of the top 100 invasive species (Invasive Species Specialist Group 2009), and is considered to be the most invasive mosquito species in the world. *A. albopictus* is an important known vector of chikungunya virus (CHIKV), implicated as a vector of dengue virus (DENV) and a known vector of *Dirofilaria*, a parasite transmitted primarily between dogs and mosquitoes, but which can also affect humans. *A. albopictus* is also a serious nuisance biting species.¹⁴⁸ The presence of this species in Malta (first observed at *Għajn Żejtuna* in September 2009) was first documented by Gatt, Deeming and Schaffner (2009), who mention that time of introduction and origin are not known.¹⁴⁹ Following its discovery, its presence and behaviour during the winter was assessed by Gatt, Schaffner and Cassar (2010).¹⁵⁰ These authors confirm that local climatic conditions prevalent during the wet season (colder winter months) do not prevent larval development and adult emergence of *A. albopictus* in Malta, warranting the application of control measures throughout the year. The medical significance of the Asian tiger mosquito is reviewed by Melillo (2013).¹⁵¹

IAS can also pose **social impacts** by degrading site characteristics that have society values and landscape.



Figure 16 – Red palm weevil
(Photo Credit - Dr. D. Mifsud)

An example is the devastating effect of tunnelling and feeding by the larvae of the red palm weevil (*Rynchophorus ferrugineus* – [Figure 16](#)) on palm trees (preferred host is *Phoenix canariensis*; when populations increase, the weevil also infests *Phoenix dactylifera* and *Washingtonia* spp.), which eventually die. This curculionid beetle is of South East Asia origin. It was accidentally introduced into various Mediterranean countries, including Malta, through the movement of infested palm trees, which have not been intercepted through phytosanitary controls.¹⁵² In Malta, it was introduced and has become established since 2007, with adult populations peaking in October.¹⁵³ Since then, it

has had a profound infestation impact on hundreds of specimens of *P. canariensis*, which had to be destroyed. Palm trees in Malta are not only used in landscaping but the palm fronds are also used in the fishery targeting dolphin fish (*lampuki*).

¹⁴⁸ *A Review of the Invasive Mosquitoes in Europe: Ecology, Public Health Risks, and Control Options*. Medlock et al., 2012.

¹⁴⁹ *First records of Aedes (Stegomyia) albopictus in Malta*. Gatt, Deeming & Schaffner, 2009.

¹⁵⁰ *Aedes (Stegomyia) albopictus (Skuse) (Diptera: Culicidae) in Malta – the first winter*. Gatt, Schaffner & Cassar, 2010.

¹⁵¹ *Asian mosquito tiger: A nuisance, threat or both?* Melillo, 2013.

¹⁵² Available at: http://www.agric.gov.mt/Downloads/red_palm_weevil_presentation.pdf

¹⁵³ *The Red Palm Weevil, Rynchophorus ferrugineus (Olivier, 1790) in Malta (Coleoptera: Curculionoidea)*. Mizzi, Dandria, Mifsud & Longo, 2009.



Figure 17 - *Phryneta leprosa* on black mulberry

(Photo Credit - Dr D. Mifsud)

Another plant pest of economic importance is the longhorn beetle (*Phryneta leprosa*; [Figure 17](#)), which originates from Tropical Africa. It was accidentally introduced through the importation of tree logs. Invaded natural habitats are areas that harbour the black mulberry (*Morus nigra*). The latter is cultivated for its fruit and is also planted as an ornamental in road verges. This locally naturalised beetle infests and damages black mulberry trees by way of larval mining.

Examples of current concern over risk of introductions of highly problematic species relate to the small hive beetle (*Aethina tumida*), and the Asian hornet (*Vespa velutina*). *Aethina tumida* is native to Sub-

Saharan Africa. In Europe, it has been introduced in Portugal and Italy.¹⁵⁴ This invasive and predatory coleopteran is of great concern to apiculture since it infests and is a scavenger of bee colonies (of species of the genera *Apis* and *Bombus* and also stingless bees).¹⁵⁵ *A. tumida* is capable of prolific multiplication and can result in the collapse of honey bee colonies when infestation is high. Adult beetles and larvae of the small hive beetle feed on honeybee larvae, pollen, honey and brood. Consequences of infestation are brood death, fermentation of honey and comb destruction.¹⁵⁶ *A. tumida* infestation is a notifiable disease of honey bees in the European Union, where importation of honey bees is strictly regulated by Article 7 of Commission Regulation (EU) No. 206/2010.¹⁵⁷ EFSA published in 2013 a scientific opinion on the risk of entry of *Aethina tumida* (and *Tropilaelaps* spp.) in the EU.^{158, 159}

The Asian hornet or yellow-legged hornet, originates from Asia, where it is found in climate ranges close to those found in the south of Europe. It was first spotted in France, where it was accidentally introduced via trading activities and is spreading rapidly.¹⁶⁰ Indeed it has recently spread to Spain, Portugal, Belgium and Italy.¹⁶¹ It not only preys on bees and other beneficial insects, but is also of a health concern in view of the painful stings it can cause and potentially deadly to people allergic to stings.¹⁶²

The main economic and social impacts of marine invasive alien species are negative impacts on human health and decreases in economic production of activities based on the marine environment and on marine

¹⁵⁴ Available at: <http://www.cabi.org/isc/datasheet/3459>

¹⁵⁵ OIE's Terrestrial Animal Health Code - Available at: http://www.oie.int/index.php?id=169&L=0&htmfile=chapitre_aethina_tumida.htm

¹⁵⁶ Available at: http://www.oie.int/fileadmin/Home/eng/Health_standards/tahm/2.02.05_SMALL_HIVE_BEETLE.pdf

¹⁵⁷ Available at: <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32010R0206&from=en>

¹⁵⁸ Available at: <http://www.efsa.europa.eu/en/search/doc/3128.pdf>

¹⁵⁹ *Tropilaelaps* is an ectoparasite that does not survive long without honey bee brood and cannot fly by itself

¹⁶⁰ The small hive beetle (*Aethina tumida* Murray, Coleoptera: Nitidulidae): distribution, biology and control of an invasive species. Neumann & Ellis, 2008.

¹⁶¹ Available at: <http://www.cabi.org/isc/datasheet/109164>

¹⁶² *Vespa velutina*: a new invasive predator of honeybees in Europe. Monceau, Bonnard & Thiery, 2014.

resources, such as fisheries, aquaculture, tourism and marine infrastructure. These effects have related social impacts through decreases in employment in economic activities directly affected by invasive alien species but also through decreases in people's welfare from the reduced quality of their environments and natural surroundings (Bax *et al.*, 2003).

1.7 Options and Needs for dealing with Invasive Alien Species

Dealing with actual and potential IAS involves the use of a **combination of options**, which can also target specific types of pathways as seen in [Section 1.2](#) earlier. Options generally include:

- PREVENTION of introduction via dedicated regulatory frameworks combined with issuance of permits and licences addressing those activities that move and use alien species, plus controls/inspections at entry points;
- RISK ASSESSMENT to inform decision-making processes that involve alien species;
- ERADICATION, CONTAINMENT or CONTROL of introduced IAS, when feasible;
- PATHWAY MANAGEMENT;
- OUTREACH to educate the public and stakeholders on IAS issues and the risks involved;
- BEST PRACTICE across sectors;
- EARLY WARNING AND TIMELY DETECTION via surveillance and monitoring
- RAPID RESPONSES via contingency planning and funding;
- RESEARCH to understand the characteristics of IAS and their impacts as well as their relationship with other pressures;
- TRAINING to ensure effective responses; and
- NETWORKING to share data and experiences.

The International Freshwater Invasives - Networking for Strategy (FINS) Conference that convened in Ireland in April 2013 applied a **horizon scanning and issue prioritisation approach** to elucidate the top 20 IAS issues in Europe.¹⁶³ The 20 issues that were identified are summarised hereunder as follows:

- Raising biosecurity awareness from government level to individuals;
- Coherent EU legislation for an effective and unified EU strategic approach to biosecurity;
- Sharing of best practice in Europe and internationally through an established forum;
- Developing a regulatory framework (responsible organisation) to prevent introduction of IAS via setting of standards;
- Dedicated and appropriate (funding) resources for IAS;
- New technologies for early detection and sharing equipment and specialist personnel across Member States;
- Agreed early warning mechanisms to communicate and process early warning/species alert information;
- Rapid risk assessment methods to prioritise IAS and future invasion events;
- Standardised pan-European risk assessment to underpin EU IAS black list;

¹⁶³ *Tackling Invasive Alien Species in Europe: the top 20 issues.* Caffrey *et al.* 2014.

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- Addressing knowledge gaps in risk assessment by targeting the research and development needed to increase the confidence levels in risk assessment methods;
- The importance of economic analysis in risk assessment by increasing the level of communication between IAS scientists and economists;
- Rapid response - a vital tool in IAS management - A lead agency to coordinate rapid response is required in each Member State;
- Emergency powers to manage IAS;
- Novel control in IAS management - Provide funding for research and development of novel control methods;
- Knowledge transfer to improve IAS management by encouraging cooperation and knowledge exchange between scientists, practitioners and policy makers;
- Outreach to foster improved IAS management - Provide European funding for public engagement, awareness raising and establishment of local action groups;
- Effective communication to raise awareness of IAS;
- Educate policy makers about existence of non-market costs and ensure their inclusion in IAS management evaluations;
- Cost analysis in IAS management must include both cost benefit and cost effectiveness analysis; and
- Clear lines of responsibility between national agencies and government departments are needed at a national level.

These issues are relevant to both marine and terrestrial situations. The next chapter provides information on the regulatory frameworks for dealing with IAS, while [Chapter 3](#) defines the strategic directions and recommendations for increasing Malta's capacity to deal with IAS promptly and effectively. [Chapter 2](#) and the issues listed above that are relevant at the national level were taken into account in the drawing up of [Chapter 3](#).

2.0 Legal Aspects of Invasive Alien Species

Legal instruments can influence the impacts of invasive alien species, if effective, consistent and comprehensive. Over the years various **binding international agreements** (treaties and conventions) and **non-binding resolutions** (recommendations, technical guidance) have been adopted to deal, in one way or another, with the prevention of introduction of alien species, and remedial measures to control or eradicate them. Issues associated with invasive alien species are multi-sectoral in nature. Indeed these various policy instruments range in subject (specific to a sector, taxonomic group or the type of harm they cause and to what) and cover terrestrial, freshwater, coastal and marine ecosystems, including pathways and processes causing the introduction and spread of alien species. Malta is duty-bound to address alien species under a range of key international conventions and agreements as well as EU and national regulatory instruments, which recognise the threats posed by alien species. The main instruments, in particular those relevant at an EU and national level, are reviewed in this chapter.

2.1 International Conventions and Organisations that address IAS

Multilateral environmental agreements (MEAs) deal with alien species from various perspectives, depending upon the primary aim of the treaty; whether nature conservation, health, trade, or sector targeted (Figure 18). The main key international instruments that include provisions on alien species are reviewed in the following sections in this chapter. Those instruments that apply at a national level are those where Malta is a signatory/ contracting party. Information on international organisations that are instrumental in the field of knowledge generation and information exchange on IAS aspects is also provided.

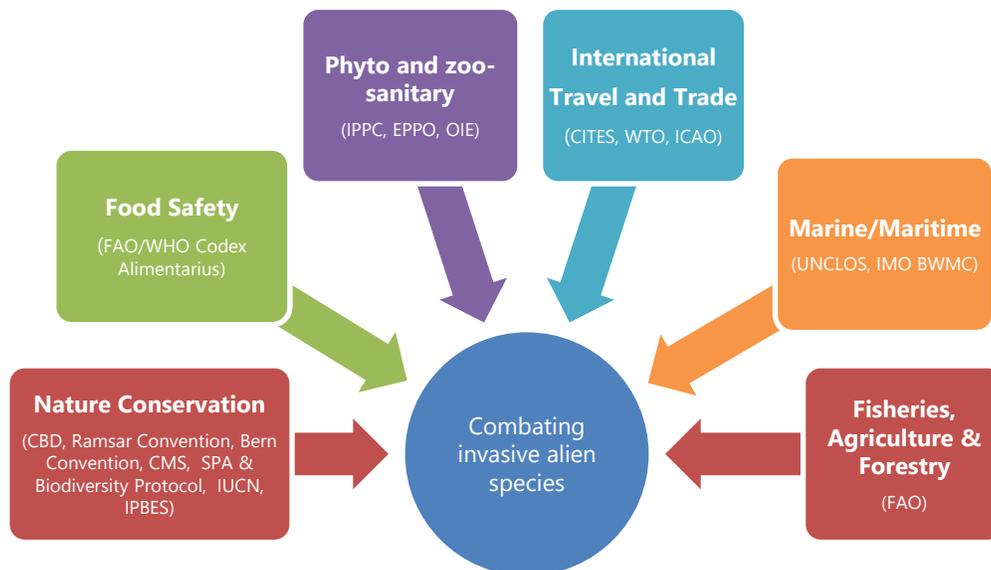


Figure 18 - International instruments and organisations that address IAS from different perspectives

2.1.1 Convention on Biological Diversity (CBD)

The main global treaty that safeguards all aspects of biodiversity at all levels of biological organisation is the UN Convention on Biological Diversity (CBD).¹⁶⁴ Its **objectives** are threefold: the conservation of biological diversity, the sustainable use of its components and, the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources.¹⁶⁵ Malta became a contracting party to the CBD on 12 December 2001 through ratification. **Article 8(h) of the CBD** on “*in situ* conservation” states that: ‘*Each Contracting Party shall, as far as possible and as appropriate (...) [p]revent the introduction of, control or eradicate those alien species, which threaten ecosystems, habitats, or species*’. **Article 6 on general measures** for conservation and sustainable use is also pertinent to the issues of alien species whereby Parties are required to develop national strategies for the conservation and sustainable use of biodiversity. For this reason measures to address alien species should be integrated into relevant plans, programmes and policies for the conservation and sustainable use of biodiversity.

In order to advance the implementation of the Convention text by Parties, the Conference of the Parties to the Convention (CBD COP), adopts decisions that address the various issues covered by the Convention, including on invasive alien species.¹⁶⁶ The latter is addressed as a cross-cutting theme under the CBD framework.¹⁶⁷ The decisions that have been adopted up to CBD COP11 are reviewed in [Table 7](#).

Table: 7 - COP Decisions on Article 8(h) and IAS

COP 5 Decision V/8 on Alien species that threaten ecosystems, habitats and species¹⁶⁸

Parties are urged to apply the interim guiding principles contained in annex I to the present decision, as appropriate, in the context of activities aimed at implementing Article 8(h) of the CBD, and in the various sectors (subsequently replaced by the Guidelines in Decision VI/23 – see below) and to give priority to the development and implementation of invasive alien species strategies and action plans.

COP 6 Decision VI/23 on Alien species that threaten ecosystems, habitats and species¹⁶⁹

Parties are urged to promote and implement the “Guiding Principles for the Prevention, Introduction and Mitigation of Impacts of Alien Species that threaten Ecosystems, Habitats or Species” annexed to the present decision (reviewed in [Table 8](#)). In paragraph 10, Parties, in implementing the said Guiding Principles, and when developing, revising and implementing national biodiversity strategies and action plans (NBSAPs) to address the threats posed by invasive alien species, are urged to:

- *Identify national needs and priorities;*
- *Create mechanisms to coordinate national programmes;*
- *Review, in the light of the Guiding Principles, relevant policies, legislation and institutions to identify gaps, inconsistencies and conflicts, and, as appropriate, adjust or develop policies, legislation and institutions;*
- *Enhance cooperation between the various sectors, including the private sector that might provide pathways or vectors for the unintended transfer of invasive alien species, in order to improve prevention, early detection, eradication and/or control of invasive alien species, and in particular, ensure communication between focal points of respective relevant international instruments;*

¹⁶⁴ Available at: <http://www.cbd.int/>

¹⁶⁵ Available at: <http://www.cbd.int/convention/text/>

¹⁶⁶ Available at: <http://www.cbd.int/cop/default.shtml>

¹⁶⁷ Available at: <http://www.cbd.int/invasive/>

¹⁶⁸ Available at: <http://www.cbd.int/decision/cop/default.shtml?id=7150>

¹⁶⁹ Available at: <http://www.cbd.int/decision/cop/default.shtml?id=7197>

- Promote awareness of the threats to biological diversity and related ecosystem goods and services posed by IAS and of the means to address such threats, among policy makers at all levels of government, and in the private sector; quarantine, customs and other border officials; and the general public;
- Facilitate the involvement of all stakeholder groups ... in national IAS strategies and action plans, and in decisions related to the use of alien species that may be invasive; and
- Collaborate with trading partners and neighbouring countries, regionally, and with other countries, as appropriate, in order to address threats of IAS to biological diversity in ecosystems that cross international boundaries, to migratory species, and to address matters of common interest'.

When developing priority actions, Parties are also encouraged to consider the need to:

- 'Develop capacity to use risk assessment/analysis to address threats of IAS to biological diversity, and incorporate such methodologies in environmental impact assessments, and strategic environmental assessments, as appropriate and relevant;
- Develop financial measures, and other policies and tools, to promote activities to reduce the threat of IAS;
- When necessary, develop recommendations and strategies to take account of effects of alien species on populations and naturally occurring genetic diversity; and
- Incorporate IAS considerations into national biodiversity strategies and action plans and into sectoral and cross-sectoral policies, strategies and plans, taking into account the ecosystem approach, and in order to ensure full implementation of the national IAS strategies and action plans as called for in paragraph 6 of decision V/8 of the Conference of the Parties'.

In terms of undertaking research and assessments, Parties are urged to address:

- 'The characteristics of invasive species and the vulnerability of ecosystems and habitats to invasion by alien species, and the impact of climate change on these parameters;
- The impact of alien species on biological diversity;
- Analysis of the importance of various pathways for the introduction of IAS;
- The socio-economic implications of IAS particularly the implications for indigenous and local communities;
- The development of environmentally benign methods to control and eradicate IAS, including measures for use in quarantine and to control fouling of ship hulls;
- The costs and benefits of the use of biocontrol agents to control and eradicate IAS;
- Means to enhance the capacity of ecosystems to resist or recover from alien species invasions;
- Priorities for taxonomic work through, inter alia, the Global Taxonomy Initiative; and
- Criteria for assessing risks from introduction of alien species to biological diversity at the genetic, species and ecosystem levels'.

COP 7 Decision VII/13 on Alien species that threaten ecosystems, habitats or species (Article 8 (h))¹⁷⁰

Through this decision, Parties are *inter alia* invited to improve communication and cooperation between national environment, plant protection, trade and other relevant authorities with a view to increasing awareness on issues related to the prevention and management of risks from potentially invasive alien species and ensuring consistency of national policies and programmes. In paragraph 6, Parties are invited to *inter alia*:

- 'Support national and regional decision-making and rapid response through the further development of risk analysis which include environmental risk assessment, as well as alert lists, diagnostic tools and capacity development;
- Incorporate IAS considerations, including monitoring and reporting and notification of new threats, into regional agreements and other instruments, and make information on IAS status and trends available through the clearing-house mechanism and other relevant regional information systems;
- Strengthen, as appropriate the cooperation between biodiversity, agriculture, forestry, land and water management agencies in the application of risk analysis standards and guidance;

¹⁷⁰ Available at: <http://www.cbd.int/decision/cop/default.shtml?id=7750>

- Consider the introduction of positive incentive measures for the prevention, mitigation, eradication or control of IAS and the use of native species taking into consideration effectiveness in control and impact on the other native species in land and water management and other programmes; and
- Proactively engage relevant stakeholders in the eradication, the prevention of introductions, and mitigation of impacts of IAS, including by awareness-raising and training as well as through the design and implementation of appropriate incentive measures.'

COP8 Decision VIII/27 on Alien species that threaten ecosystems, habitats or species (Article 8 (h)): further consideration of gaps and inconsistencies in the international regulatory framework¹⁷¹

In paragraph 8, Parties are encouraged 'to ensure close inter-agency collaboration at the national and regional levels among the various sectors and interest-holders relevant to the introduction, control and management of IAS, for example through the establishment of national coordination committees'.

This decision addresses various IAS-related issues in the context of the following and addressed at Parties:

- Conveyances as pathways for invasive alien species (e.g., vessels, floating timber, equipment and machinery, household goods, packaging and containers, waste materials, air transport vessels, tourist vessels, etc.) – 'to organise training and promote education and awareness raising of border control officials and other relevant persons regarding IAS, recognising that such activities will require adequate resources' (paragraph 17)
- Aquaculture/mariculture – 'to implement the Code of Practice on the Introduction and Transfers of Marine Organisms of the International Council for the Exploration of the Sea, the Code of Conduct on Responsible Fisheries of the Food and Agriculture Organization of the United Nations, and Article 196 of the United Nations Convention on the Law of the Sea' (paragraph 21); 'to develop and implement national programmes of work for the sustainable management of aquaculture as well as for the control of aquatic invasive species' (paragraph 23); and 'to promote aquaculture of native species with the aim to avoid accidental introduction of alien species and their parasites' (paragraph 24)
- Ballast water – 'to ratify and implement the International Convention on the Control and Management of Ships' Ballast Water and Sediments as soon as possible' (paragraph 25); 'to address, in their national legislation, the issue of domestic translocation of ballast water, by vessels requiring equivalent compliance with but not covered by the International Convention on the Control and Management of Ships' Ballast Water and Sediments' (paragraph 26); and 'to increase the degree of communication and coordination between national agencies responsible for inputs to and implementation of the Convention on Biological Diversity and International Maritime Organisation' (paragraph 27)
- Marine biofouling, particularly hull-fouling – 'to implement controls at national level, for example through appropriate measures (e.g., regulations and standards), on marine biofouling as a pathway for introduction and spread of invasive alien species, including for recreational vessels' (paragraph 29)
- Civil air transport – 'to promote collaboration at the national level among relevant agencies responsible for matters of invasive alien species and/or civil air transport (e.g., civil aviation, transport, customs, trade, plant protection, environment) so that all relevant issues are raised through national participation in the International Civil Aviation Organisation' (paragraph 37)
- Military activities – 'to ensure that they promote good practice in relation to IAS in any military-aid or joint exercises, and to develop procedures and build capacity among their military forces to avoid the introduction of potentially invasive species into new areas, taking into account relevant international guidance, and to detect and rectify any problems of IAS created during military operations' (paragraph 39)
- Emergency relief, aid and response – 'to take measures to prevent and minimize the introduction and spread of invasive alien species as part of their emergency relief, aid and any response efforts, and to take into account any relevant codes of practice or guidelines that may be developed at international level, or national legislation as

¹⁷¹ Available at: <http://www.cbd.int/decision/cop/default.shtml?id=11041>

appropriate, in their national aid operations or in the operations of non-governmental organizations within their country' (paragraph 42)

- International development assistance – *'to consider, through collaboration with biosecurity, biodiversity and aid organizations, national controls or codes of practice to address invasive alien species in development assistance efforts' (paragraph 44)*
- Scientific research – *'to raise awareness among scientific research organizations of existing measures to control the spread of invasive alien species, and to put in place measures to prevent or minimize the risks of introduction and spread of invasive alien species associated with scientific research activities' (paragraph 45)*
- Tourism – *'to take measures to address the issue of tourism as a pathway for introduction and spread of invasive alien species, taking into account the Guidelines on Biodiversity and Tourism Development adopted in decision VII/14, with particular emphasis on tourism in sites of high conservation value' (paragraph 50)*
- Pets, aquarium species, live bait, live food and plant seeds – *'to raise awareness with consumers, including through Internet sites that facilitate transactions or may otherwise be visited by consumers, and to further study, as appropriate, current safe disposal measures for imported alien species, with a view to considering development of guidance or codes of practice regarding trade in pets, aquarium species and plant seeds, in particular disposal and discard of such species' (paragraph 52); 'to take measures, as appropriate and consistent with their national and international obligations, to control import or export of pets, aquarium species, live bait, live food or plant seeds, that pose risks as invasive alien species' (paragraph 53); and 'to take action, as appropriate and consistent with their national and international obligations, to prevent and minimize introductions of known invasive species into the wild, including through measures addressing disposal and discard of such species' (paragraph 54)*
- Biocontrol agents – *'to evaluate and take appropriate measures (e.g., develop guidance or codes of practice regarding the trade and use of biocontrol agents) at national level to address the potential risks of biocontrol agents as IAS, taking into account the work of relevant international bodies and agreements such as the International Plant Protection Convention, as well as the experience of countries at national level (paragraph 55)*
- Ex situ animal breeding programmes – *'to take measures as appropriate and consistent with national and international obligations, based for example on risk assessment, to control movements of animals used for ex situ breeding, including controlling the movements of fish between water bodies and drainage basins as well as containing the movements of animals within safari parks and zoos' (paragraph 57)*
- Action or lack of action to address spread of invasive alien species – *'to develop procedures and/or controls to ensure that cross-border impacts of potentially IAS are considered as part of national and regional decision-making processes' (paragraph 60) and 'to share information on domestic occurrences of alien species that may be invasive elsewhere, through appropriate information-sharing mechanisms' (paragraph 61)*
- Unintended protection of invasive alien species – *'to ensure that relevant laws and provisions, such as those related to conservation, do not inadvertently constrain the use of appropriate measures to address invasive alien species' (paragraph 64)*
- Inconsistency in terminology – *'to facilitate common understanding of terminology through collaboration and communication among relevant agencies, and through appropriate design of training and operational materials' (paragraph 68)*

COP9 Decision IX/4 on In-depth review of ongoing work on alien species that threaten ecosystems, habitats or species¹⁷²

This Decision reaffirms the need to address the gaps and inconsistencies identified by the *Ad Hoc* Technical Expert Group on Gaps and Inconsistencies in the International Regulatory Framework in Relation to Invasive Alien Species¹⁷³. This Decision puts forward the following recommendation to Parties:

- Paragraph 1 - *'to make use of the risk assessment guidance and other procedures and standards developed by the International Plant Protection Convention, the World Organisation for Animal Health (OIE) and other relevant organisations, in order to contribute to closing the identified gaps on IAS at national level, and in particular, to consider applying, where appropriate, the procedures and standards for quarantine pests under the International Plant Protection Convention, to all IAS that have adverse impacts on plant biodiversity, consistent with international obligations'*;
- Paragraph 7 - *'to collaborate on the development and use of early warning systems, including networks of focal points, and on the development and use of rapid response mechanisms'*;
- Paragraph 11 - *'to take into account and, as appropriate, build capacity to address, how climate change affects the risks associated with the introduction, establishment, spread and impacts of invasive alien species'*;
- Paragraph 18 - *'to consider, and where necessary, to put in place mechanisms to manage pathways, for potential invasive alien species, especially in inland water, marine and coastal ecosystems, including shipping, trade and aquaculture and mariculture bearing in mind national capacities consistent and in harmony with the Convention and relevant international obligations'*;
- Paragraph 20 - *'to ratify the International Convention for the Control and Management of Ships' Ballast Water and Sediments'*;
- Paragraph 24 - *'to study the impact of other drivers, in particular, land use change, climate change adaptation and mitigation activities, on the introduction, establishment and spread of invasive alien species, and their related socio-economic, health and environmental impacts'*;
- Paragraph 25 - *'strengthen national level communication and synergy across sectors, including where appropriate through the use of the TEMATEA Issue-Based Modules on invasive alien species'*¹⁷⁴;
- Paragraph 26 - *'to ensure greater cooperation and coordination between relevant agencies and authorities at the national and regional level, including those responsible for veterinary, phytosanitary, agriculture, forestry, fisheries, environment and biodiversity issues, and to consider the advisability of establishing or designating national coordination centres. in order to ensure a coordinated and coherent science-based approach to addressing threats from invasive alien species'*; and
- Paragraph 27 - *'to support awareness-raising programmes at all levels for decision-makers and practitioners in the freshwater, marine and terrestrial environment sectors, in particular in agriculture, aquaculture and forestry, and in the horticulture trade and pet trade, and more generally, in the transportation, trading, travel and tourism sectors that are potential pathways of biological invasions'*.

¹⁷² Available at: <http://www.cbd.int/decision/cop/default.shtml?id=11647>

¹⁷³ UNEP/CBD/SBSTTA/11/INF/4

¹⁷⁴ Available at: <http://www.tematea.org/?q=node/14>

COP10 Decision X/38 on Invasive Alien Species¹⁷⁵

This Decision established an *ad hoc* technical expert group (AHTEG) to suggest ways and means, including, *inter alia*, providing scientific and technical information, advice and guidance, on the possible development of standards by appropriate bodies that can be used at an international level to avoid spread of invasive alien species that current international standards do not cover, to address the identified gaps and to prevent the impacts and minimize the risks associated with the introduction of invasive alien species as pets, aquarium and terrarium species. Terms of Reference of the AHTEG are annexed to the Decision. In paragraph 6 of this Decision Parties are urged 'to apply the precautionary approach with regards to the introduction, establishment and spread of invasive alien species, for agricultural and biomass production, including biofuel feedstocks, and for carbon sequestration, following the guiding principles on invasive alien species contained in the annex to Decision VI/23'.

COP11 Decision XI/28 on Invasive Alien Species¹⁷⁶

This Decision is a follow-up of the previous COP 10 Decision X/38 with respect to the work of the AHTEG and their report on addressing the risks associated with the introduction of alien species as pets, aquarium and terrarium species, and as live bait and live food.¹⁷⁷ This Decision addresses the following pathways:

- international web-based market places, including for the sale and purchase of live animal species by web-based traders;
- risks of introduction and spread of invasive alien animal species from commercial zoos and safari parks, and breeding and trade centres, resulting from escapes of the animals or the release or escape of animals used as live food
- intentional and unintentional release or escape of individuals of captive-bred alien populations and genotypes of pets, aquarium and terrarium species, or species used as live bait and live food, which may have an impact on native genetic diversity

Referring to Paragraph 4 of this Decision, Parties are encouraged: '(i) to ensure at national level, effective collaboration among national authorities and focal points that deal with the Convention on Biological Diversity, the International Plant Protection Convention, the World Organisation for Animal Health (OIE), the Codex Alimentarius Commission, the World Trade Organization Agreement on the Application of Sanitary and Phytosanitary Measures, the Convention on International Trade in Endangered Species of Wild Fauna and Flora, and the Food and Agriculture Organization of the United Nations, (ii) to address threats from invasive alien species, and, (iii) as appropriate, to make full use of existing standards in addressing the risks associated with the introduction of alien species as pets, aquarium and terrarium species, and as live bait and live food'. Through paragraph 19, Parties ... are encouraged 'to develop capacity, *inter alia* in line with the Capacity-Building Strategy for the Global Taxonomy Initiative, so that Parties to the Convention on Biological Diversity can meet Aichi Biodiversity Target 9. Emphasis should be placed on developing tools to strengthen the capacity of border control authorities and other competent authorities to identify invasive alien species or potentially invasive alien species, to assess risks and take steps to manage or minimize those risks and to control and eradicate prioritised invasive alien species.'

COP12 Decision XII/16 on Invasive alien species: management of risks associated with introduction of alien as pets, aquarium and terrarium species, and as live bait and live food, and related issues¹⁷⁸

This decision adopts voluntary guidance on devising and implementing measures to address the risks associated with the introduction of alien species as pets, aquarium and terrarium species, and as live bait and live food, as contained in the annex to this decision, noting that measures taken under this guidance are to be consistent with applicable national and international obligations.

The main aspects included in the guidance document are the following:

- Objectives and nature of this guidance – 'This guidance is voluntary and is not intended to affect any existing national and international obligations. This guidance is intended to apply to the import or transport to a country or distinct biogeographical area within the country, of pets, aquarium and terrarium species, live bait and live food,

¹⁷⁵ Available at: <http://www.cbd.int/decision/cop/default.shtml?id=12304>

¹⁷⁶ Available at: <http://www.cbd.int/doc/decisions/cop-11/cop-11-dec-28-en.pdf>

¹⁷⁷ UNEP/CBD/SBSTTA/15/INF/1

¹⁷⁸ Available at: <https://www.cbd.int/doc/decisions/cop-12/cop-12-dec-16-en.pdf>

including trade via the Internet. This guidance is relevant to States, relevant organizations, the industry and consumers, including all actors along the value chain (such as importers, breeders, wholesalers, retailers and customers). For the case of live food, this also includes restaurants and markets.’

- Prevention and responsible conduct – ‘Industry and all actors should be aware of the risk of alien organisms becoming invasive and their potential negative impacts on biodiversity at ecosystem, habitat, species and gene levels, and related impacts on human health, livelihoods and economies. States, industry and relevant organizations should undertake public awareness campaigns to this effect.’
- Risk assessment and management – ‘When planning to import or transport pets, aquarium and terrarium species, live bait and live food to a country, or distinct biogeographical area within a country, where they are non-native, States, relevant organizations or the industry, should undertake a risk assessment. The risk assessment may draw on previously conducted assessments and other available information.’
- Measures – ‘A number of measures are available to address the risks associated with alien species introduced as pets, aquarium and terrarium species, live bait and live food.’
- Information sharing – ‘States should maintain lists of species with the assessed potential to become invasive and associated with unacceptable risks for biodiversity and make it available through the clearing-house mechanism or other appropriate means.’
- Consistency with other international obligations – ‘Measures under this guidance should be undertaken in a manner that is consistent with applicable international obligations, for example, the Agreement on the Application of Sanitary and Phytosanitary Measures of the World Trade Organization, and the standard-setting organizations recognized by this agreement, as well as the Convention on International Trade in Endangered Species of Wild Fauna and Flora.’

Additionally, through this decision Parties are urged ‘to disseminate this guidance widely and to promote its use for the development of regulations, codes of conduct and/or other guidance, as appropriate, by States, industry and relevant organizations at all levels, and to facilitate the harmonization of measures.’

COP13 Decision XIII/13 on Invasive alien species: addressing risks associated with trade, experiences in the use of biological control agents, and decision support tools¹⁷⁹

This decision builds up on previous decisions VI/23* and X/2 and Aichi Biodiversity Target 9, as well as welcomes the International Convention for the Control and Management of Ships’ Ballast Water and Sediments¹⁸⁰ meeting the conditions for entry into force on 8 September 2017. Decision XIII/13 also includes summary of technical considerations for the use of biological control agents to manage invasive alien species featuring the following sections:

- Classical biological control;
- Precautionary approach and risk assessment and management;
- Planning and implementation of biological control programmes;
- Post-release monitoring, emergency plan and rapid response;
- Decisions on the release of biological control agents;
- Capacity development.

¹⁷⁹ Available at: <https://www.cbd.int/doc/decisions/cop-13/cop-13-dec-13-en.pdf>

¹⁸⁰ [http://www.imo.org/en/About/Conventions/ListOfConventions/Pages/International-Convention-for-the-Control-and-Management-of-Ships'-Ballast-Water-and-Sediments-\(BWM\).aspx](http://www.imo.org/en/About/Conventions/ListOfConventions/Pages/International-Convention-for-the-Control-and-Management-of-Ships'-Ballast-Water-and-Sediments-(BWM).aspx)

Table: 8 - CBD Guiding Principles for the Prevention, Introduction and Mitigation of Impacts of Alien Species that threaten Ecosystems, Habitats or Species (Annexed to Decision VI/23) - Summary	
The following 15 non-binding principles are intended to assist Parties in developing effective strategies (with context-specific solutions) to minimise the spread and impact of invasive alien species as an integral component of conservation and economic development.	
Guiding principle 1: Precautionary approach	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 and also be applied when considering eradication, containment and control measures in relation to alien species that have become established
Guiding principle 2: Three-stage hierarchical approach	Prevention is generally far more cost-effective and environmentally desirable than measures taken following introduction and establishment of an invasive alien species and should be given priority. If an invasive alien species has been introduced, early detection and rapid action are crucial to prevent its establishment. The other steps in sequence are eradication (principle 13), containment (principle 14) and control (principle 15).
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	States should recognise the risk that activities within their jurisdiction or control may pose to other States as a potential source of invasive alien species, and should take appropriate individual and cooperative actions to minimise that risk.
Guiding principle 5: Research and monitoring	In undertaking research on and monitoring of invasive alien species, States should attempt to include a baseline taxonomic study of biodiversity. Monitoring should include both targeted and general surveys, and benefit from the involvement of other sectors, including local communities. Research on an invasive alien species 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 invasive alien species; 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	States should promote education and public awareness of the causes of invasion and the risks associated with the introduction of alien species.
Guiding principle 7: Border control and quarantine measures	States should implement border controls and quarantine measures for alien species that are or could become invasive to ensure that: <ul style="list-style-type: none"> - Intentional introductions of alien species are subject to appropriate authorization (principle 10); - Unintentional or unauthorized introductions of alien species are minimised.
Guiding principle 8: Exchange of information	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. 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	Whether the State's response is within the country, or requiring a cooperative effort between two or more countries, measures may include: programmes developed to share information on invasive alien species; Agreements between countries, on a bilateral or multilateral basis to regulate trade in certain alien species, with a focus on particularly damaging invasive species; Support for capacity-building programmes for States that lack the expertise and

	resources, and Cooperative research efforts and funding efforts toward the identification, prevention, early detection, monitoring and control of invasive alien species.
Guiding principle 10: Intentional introduction	Intentional introduction within a country should take place with prior authorisation 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 authorise a proposed introduction to the country or to new ecological regions within a country. 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). Decisions concerning intentional introductions should be based on the precautionary approach.
Guiding principle 11: Unintentional introductions	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. Environmental impact assessment of 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 activities should address the risk of unintentional introduction of invasive alien species.
Guiding principle 12: Mitigation of impacts	Once the establishment of an invasive alien species 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.
Guiding principle 13: Eradication	The best opportunity for eradicating invasive alien species 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. 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 invasive alien species 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 invasive alien species. 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.

To further assist Parties in the implementation of Article 8(h), the CBD Secretariat has also published the following **technical publications**:

- “Assessment and management of alien species that threaten ecosystems, habitats and species” (2001) - CBD Technical Series No. 1,¹⁸¹

¹⁸¹ Available at: <http://www.cbd.int/doc/publications/cbd-ts-01.pdf>

- “Review of the Efficiency and Efficacy of Existing Legal Instruments Applicable to Invasive Alien Species” (2001) - CBD Technical Series No. 2¹⁸² and
- “Pets, Aquarium, and Terrarium Species: Best Practices for Addressing Risks to Biodiversity” (2010) - CBD Technical Series No. 48.¹⁸³

At the tenth meeting of the Conference of the Parties to the CBD in 2010 (Nagoya, Japan), the 20 **Aichi biodiversity targets** were agreed, including Target 9 on IAS which states that: ‘By 2020, invasive alien species and pathway are identified and prioritised, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.’¹⁸⁴ A prototype CBD toolkit has been drawn to facilitate Parties to achieve Aichi Biodiversity Target 9 on invasive alien species.¹⁸⁵ This toolkit explains the international agreements related to IAS and examples of implementation in different countries.

Malta as a Party to the CBD has incorporated the provisions of the Convention text, including Article 8(h) in the “Convention on Biological Diversity Incorporation Regulations, 2002” (S.L. 549.27) as well as the “Flora, Fauna and Natural Habitats Protection Regulations, 2006” (S.L. 549.44).^{186, 187} Malta adopted its **National Biodiversity Strategy and Action Plan (NBSAP)** entitled “Working Hand-in-Hand with Nature” on 12 December 2012 in line with Article 6 of the CBD.¹⁸⁸ This national strategy adopts the following national target (number 9) on IAS: ‘By 2020, measures are in place to prevent, in so far as practical, the introduction and establishment of new invasive non-native species, while those that are established are identified and prioritised for eradication or control, where feasible.’ Moreover within the theme on “biological introductions”, the NBSAP includes the following measures:



- **BI1:** A national information and early warning system (e.g. species black list + existing border controls and permitting procedures) is in place to prevent the introduction and spread of invasive non-native species via priority pathways. Accidental introductions are addressed by way of contingency planning thereby avoiding/minimising any socio-economic and environmental impacts.
- **BI2:** A systematic and coherent national strategy on invasive non-native species is in place by 2015 and is based on the CBD’s three-stage hierarchical approach, which includes prevention, early detection of the species, and rapid action by eradication, containment and control (where feasible). This strategy is supported by other policy guidance on the removal of invasive species.
- **BI3:** Endemic species and areas of conservation value at risk by invasive species are identified, and prioritised for targeted, well-planned, ecologically and financially feasible remedial action, with the goal of reinstating self-sustaining native communities and healthy ecosystems.
- **BI4:** Key stakeholder groups, such as traders (pet shops, breeders and nurseries), as well as land and sea users cooperate to prevent the unwanted release/escape and spread of non-native and invasive species into the environment. To assist this, national codes of best practices are established in consultation with key stakeholders and adopted for those sectors that can aid the introduction and

¹⁸² Available at: <http://www.cbd.int/doc/publications/cbd-ts-02.pdf>

¹⁸³ Available at: <http://www.cbd.int/doc/publications/cbd-ts-48-en.pdf>

¹⁸⁴ Available at: <http://www.cbd.int/sp/targets/>

¹⁸⁵ Available at: <http://www.cbd.int/invasive/cbdtoolkit/>

¹⁸⁶ Available at: <http://www.justiceservices.gov.mt/DownloadDocument.aspx?app=lom&itemid=11527&l=1>

¹⁸⁷ Available at: <http://www.justiceservices.gov.mt/DownloadDocument.aspx?app=lom&itemid=11550&l=1>

¹⁸⁸ Available at: <https://era.org.mt/en/Documents/NBSAP%202012-2020.pdf>

spread of invasive species. The drawing up of such codes builds on the European Codes of Conduct as adopted under the Bern Convention.

The Secretariat of the CBD cooperates with the secretariats of various other Multilateral Environmental Agreements as well as international organisations to combat IAS. Indeed, it is acknowledged that international instruments such as the ones reviewed in the following paragraphs also contribute to the implementation of Article 8(h). The **Inter-Agency Liaison Group on Invasive Alien Species (IALG-IAS)** of the CBD facilitates cooperation among relevant organisations to support measures to prevent the introduction and mitigate the impacts of invasive alien species.¹⁸⁹

2.1.2 **Convention on the Conservation of Migratory Species of Wild Animals (CMS)**

The Convention on the Conservation of Migratory Species of Wild Animals (CMS in short) under the aegis of the United Nations Environment Programme (UNEP) is a global environmental treaty that deals with the conservation and sustainable use of migratory animals and their habitats.¹⁹⁰ Malta became a Party to the CMS in 2001. Within the framework of this Convention, it is acknowledged that IAS also endanger **migratory species** (e.g. through predation, competition, hybridisation, disease transmission, and habitat loss). **Article III (4) (c)** of the Convention text requires Range States of a migratory species listed in Appendix 1 '*... to prevent, reduce or control factors that are endangering or are likely to further endanger the species, including strictly controlling the introduction of, or controlling or eliminating, already introduced exotic species.*' **Article V (5) (e)** states: '*Where appropriate and feasible, each agreement (for Annex II) should provide for, but not be limited to protection of such habitats from disturbances, including strict control of the introduction of, or control of already introduced, exotic species detrimental to the migratory species.*'¹⁹¹

The Eleventh Meeting of the Conference of the Parties to the CMS (CMS COP 11 - Quito, Ecuador - 4 to 9 November 2014) adopted Resolution 11.2 on the **Strategic Plan for Migratory Species 2015-2023**.¹⁹² Parties are urged to integrate the goals and targets of the Strategic Plan within relevant policy and planning instruments, and also to take action to raise awareness of the Plan. The purpose of this Strategic Plan is '*to provide vision, leadership, and a driving force toward the full and effective implementation of goals and targets related to migratory species*'. It comprises five goals articulated as strategic outcomes of the Plan. Performance targets are provided under each goal. These targets define priorities and clarify what constitutes successful performance. Target 7 states: '*Multiple anthropogenic pressures have been reduced to levels that are not detrimental to the conservation of migratory species or to the functioning, integrity, ecological connectivity and resilience of their habitats.*' Included in the term "pressure" are invasive species.

This COP also adopted Resolution 11.28 on **Future CMS Activities** related to Invasive Alien Species.¹⁹³ In this Resolution, Parties and non-Parties are called upon '*to address threats from IAS and particularly to undertake concrete dedicated actions aimed at preventing and mitigating the negative impact of IAS on*

¹⁸⁹ Available at: <https://www.cbd.int/invasive/lg/>

¹⁹⁰ Available at: <http://www.cms.int/en>

¹⁹¹ Available at: <http://www.cms.int/en/node/3916>

¹⁹² Available at: http://www.cms.int/sites/default/files/document/Res_11_02_Strategic_Plan_for_MS_2015_2023_E_0.pdf

¹⁹³ Available at: http://www.cms.int/sites/default/files/document/Res_11_28_Invasive_Alien_Species_Future_Activities_E.pdf

migratory species, consistent with applicable international obligations and with a focus on CMS-listed species, including the elaboration of national lists of species for which restrictions might apply, development and further implementation of specific and/or thematic action plans and management plans for species and pathways of greater concern, focusing on Best Practices for addressing Risks to Biodiversity including preventing the introduction of listed species, and where IAS threats have established eradicating priority IAS from priority sites, or controlling priority IAS threats (where eradication isn't feasible) also at priority sites' (paragraph 1). Parties and non-parties are also invited to: 'take into account the risk of migratory species to become invasive themselves if translocated and/or introduced outside their natural range, by undertaking dedicated risk assessments incorporating future climate change scenarios for any movement of animals, including measures related to conservation actions targeting endangered species' (paragraph 4) and 'to take into account the risk of facilitating the introduction or spread of IAS while implementing any climate change mitigation or adaptation measures' (paragraph 5). In paragraph 12, Parties are requested 'to avoid policies and initiatives that either limit the use of effective measures to eradicate or control IAS threatening migratory species or facilitate the introduction and further spread of IAS which represent or might present a threat to migratory species'.

The requirements of the Bonn Convention are transposed in the "Flora, Fauna and Natural Habitats Protection Regulations, 2006" (S. L. 549.44). The IAS targeted and related measures in Malta's NBSAP also apply within the context of preventing and minimising the impacts of IAS on migratory species for which Malta is a range state.

2.1.3 Ramsar Convention on Wetlands

The Ramsar Convention focuses on the **conservation and wise use of all wetlands** in a very broad sense (*i.e.* ranging from lakes and rivers, underground aquifers, marshes, peatlands, estuaries, mangroves and other coastal areas, coral reefs, to human-made sites, such as fish ponds, rice paddies, reservoirs and salt pans).¹⁹⁴ IAS are recognised as a threat to the ecological character of wetlands. Malta became a Party to this Convention on 30 January 1989. All Parties are required to work towards the wise use of all their wetlands, designate suitable wetlands for the list of Wetlands of International Importance and ensure their effective management and cooperate internationally on transboundary aspects.

The Conference of the Parties (COP), consisting of representatives of the governments of each of the Contracting Parties, meets every three years to agree on a work programme through the adoption of resolutions and recommendations. Guidance to the Contracting Parties is provided by the current **Ramsar Strategic Plan covering the period 2009 to 2015**.¹⁹⁵ Ramsar COP 12 that convened in June 2015 adopted the **Fourth Strategic Plan 2016-2020** through Resolution XII.2.¹⁹⁶

The Fourth Strategy includes the target 4 (under Goal 1; and related to Aichi Target 9) which reads: '*Invasive alien species and pathways of introduction and expansion are identified and prioritised, priority invasive alien species are controlled or eradicated, and management responses are prepared and implemented to prevent*

¹⁹⁴ Available at: <http://www.ramsar.org/>

¹⁹⁵ Available at: <http://www.ramsar.org/sites/default/files/documents/pdf/strat-plan-2009-e-adj.pdf>

¹⁹⁶ Available at: http://www.ramsar.org/sites/default/files/documents/library/4th_strategic_plan_2016_2024_e.pdf

their introduction and establishment.' The identified tools to achieve this target are: complete inventory for all sites, preparing management response as appropriate (national policies or guidelines), trends in invasive alien species and a red list indicator. The indicators are the following:

- % of Parties that have established or reviewed national policies or guidelines on invasive wetland species control and management. (Data source: National Reports).
- % of Parties having a national inventory of invasive alien species that currently or potentially impact the ecological character of wetlands. (Data source: National Reports).

Guidelines on various matters formally adopted by the COPs to the Ramsar Convention have been prepared as a series of 21 handbooks to serve of assistance in the implementation of the Convention at all levels. The **Ramsar Technical Reports series** in turn comprises technical notes, reviews and reports on wetland ecology, conservation, wise use and management, (including those prepared by the Convention's Scientific and Technical Review Panel - STRP - at the request of Contracting Parties) as an information support service to Contracting Parties.¹⁹⁷ The Ramsar Scientific and Technical Briefing Notes series on the other hand is prepared by the STRP in order to share scientific and technical information on wetlands with a broad audience.

Within the framework of the Convention it is acknowledged that alien species pose a threat to the ecological character of wetlands, and to wetland species, terrestrial and marine, if they become invasive. Other resolutions that deal with IAS have been adopted by the COP:¹⁹⁸

- In **Resolution VII.14 on invasive species and wetlands**, which was adopted by COP7, Contracting Parties are called upon:
 - *'to wherever possible address the environmental, economic and social impact of invasive species on wetlands within their jurisdictions'* (paragraph 12); and
 - *'to take account of the methods of control and solutions for combating invasive species outlined in the special intervention on wetlands and invasive species presented at this Conference for the management of invasive species (background document Ramsar COP7 DOC. 24)'* (paragraph 13).¹⁹⁹

This Resolution through paragraph 18, also urged Contracting Parties to:

- *'prepare, within their jurisdictions, an inventory of alien species in wetlands and to assess them so as to identify and prioritise those which pose a threat to wetlands and wetland species ('risk assessment'), and those which may be adequately controlled or eradicated;*
- *establish programmes to target priority invasive species with a view to control or eradication, as well as to implement other related international programmes;*
- *address, wherever possible in their actions, the environmental, economic and social impact of the movement and transport of alien species on the global spread of invasive wetland species;*

¹⁹⁷ Available at: <http://strp.ramsar.org/>

¹⁹⁸ Available at: http://ramsar.rgis.ch/cda/en/ramsar-documents-resol/main/ramsar/1-31-107_4000_0

¹⁹⁹ Available at: <http://ramsar.rgis.ch/cda/en/ramsar-documents-cops-cop7-ramsar-cop7-doc-24>

- *review existing legal and institutional measures pursuant to Resolution VII.7 and, where necessary, to adopt legislation and programmes to prevent the introduction of new and environmentally dangerous alien species into their jurisdictions and the movement or trade of such species within their jurisdictions;*
 - *develop capacity for the identification of new and environmentally dangerous alien species (including those being tested for agricultural and horticultural use) and the promotion and enforcement of legislation and best practice management;*
 - *facilitate awareness of, and resource the identification and control of, new and environmentally dangerous alien species; and*
 - *collaborate with other Contracting Parties with a view to exchanging information and experience, increasing overall capacity to deal with wetland invasive species and promoting regional coordination of invasive species programmes’.*
- In **Resolution VIII.18 on invasive species and wetlands**, which was adopted by COP8, Contracting Parties are urged:
- *‘to address the problems posed by invasive species in wetland ecosystems in a decisive and holistic manner, making use, as appropriate, of the tools and guidance developed by various institutions and processes, including any relevant guidelines or guiding principles adopted under other conventions’ (paragraph 12);*
 - *‘to undertake risk assessments of alien species which may pose a threat to the ecological character of wetlands, taking into account the potential changes to ecosystems from the effects of global climate change, and applying the guidance available in Ramsar’s Risk Assessment Framework (Resolution VII.10)’ (paragraph 15);*
 - *‘with shared wetlands, river systems, and coastal/marine zones to cooperate fully in the prevention, early warning in transboundary wetlands, eradication and control of invasive species, applying the Guidelines for international cooperation under the Ramsar Convention (Ramsar Handbook 20)’ (paragraph 18); and*
 - *‘prior to moving water between river basins, to examine carefully the potential environmental impacts due to invasive species’ (paragraph 20).*

The requirements of the Ramsar Convention are transposed in the “Flora, Fauna and Natural Habitats Protection Regulations, 2006” (S. L. 549.44). Malta designated two **Ramsar Sites: L-Għadira and Is-Simar nature reserves**.²⁰⁰ Both sites are also designated as Natura 2000 sites and as such are covered by management plans, which comprise objectives to remove alien and invasive species and to control ground predators. The management plan on *l-Għadira* documents *Acacia* trees as impacting the site (in particular Annex I habitats 5330 and 5410) and resulting in habitat modification and loss of representativity, and competition with indigenous species (assessed as being medium/localised). The past planting of *Acacia saligna* is also an issue at *is-Simar*, in which case the current trees are a source of propagules that can spread to the rest of the protected area and hence they need to be removed to allow for the restoration of garrigue in the area.

²⁰⁰ Available at: <http://www.ramsar.org/wetland/malta>

2.1.4 Convention on the conservation of European wildlife and natural habitats (Bern Convention)

The Bern Convention covers the natural heritage of Europe and some States of Africa. It aims at conserving wild flora and fauna and their natural habitats, with a particular focus on **endangered natural habitats and endangered vulnerable species**, including migratory species.²⁰¹ Malta became a contracting party to Bern Convention on 26 November 1993 by accession. **Article 11 paragraph 2(b)** of the Bern Convention calls on its Contracting Parties to '*strictly control the introduction of non-native species*'²⁰². The Bern Convention is managed by a Standing Committee, which adopted a number of recommendations, technical reports, assessments, and **codes of conduct on invasive alien species** in relation to alien trees, horticulture, zoos and aquaria, botanic gardens, hunting, pets international travel, recreational boating and recreational fishing throughout the years. The work towards such recommendations and IAS-related reports is done by the **Group of Experts on Invasive Alien Species** to the Bern Convention in collaboration with the IUCN Invasive Species Specialist Group.²⁰³ The GoE on IAS meets every two years and meetings are regularly attended by Malta. The third and ninth meetings of this group were also hosted by Malta, in 1999 and 2011 respectively. This group of experts developed a **European Strategy on Invasive Alien Species** presented at the 22nd meeting of the Standing Committee in 2002. The final version of this strategy (T-PVS (2003) 7 revised) was presented at the 23rd meeting of the Standing Committee. The strategy addresses the constraints that many European States face in their common efforts to address IAS.²⁰⁴ The Standing Committee has to date adopted *inter alia* the following recommendations on IAS:

- Recommendation No. 195 (2017) on the control and eradication of invasive alien species on islands;
- Recommendation No. 194 (2017) on the European Code of Conduct on International Travel and Invasive Alien Species;
- Recommendation No. 193 (2017) on the European Code of Conduct for Invasive Alien Trees;
- Recommendation No. 189 (2016) of the Standing Committee, adopted on 18 November 2016, on the control of the American mink (*Neovison vison*) in Europe;
- Recommendation No. 188 (2016) of the Standing Committee, adopted on 18 November 2016, on the European Code of Conduct on Recreational Boating and Invasive Alien Species;
- Recommendation No. 185 (2016) of the Standing Committee, examined on 18 November 2016, on the eradication of the ruddy duck (*Oxyura jamaicensis*) in the Western Palaearctic by 2020;
- Recommendation No. 179 (2015) on action to promote and complement the implementation of EU Regulation 1143/2014 on invasive alien species;
- Recommendation No. 178 (2015) on the control of feral ungulates in islands of the Mediterranean and Macronesian Regions;
- Recommendation No. 170 (2014) on the European Code of Conduct on Recreational Fishing and Invasive Alien Species;
- Recommendation No. 167 (2013) on the European Guidelines on Protected Areas and Invasive Alien Species;
- Recommendation No. 166 (2013) on the European Code of Conduct on Hunting and Invasive Alien Species

²⁰¹ Available at: http://www.coe.int/t/dg4/cultureheritage/nature/Bern/default_en.asp

²⁰² Available at: <http://conventions.coe.int/Treaty/en/Treaties/Html/104.htm>

²⁰³ Available at: http://www.coe.int/t/dg4/cultureheritage/nature/bern/IAS/default_en.asp

²⁰⁴ Available at: http://www.coe.int/t/dg4/cultureheritage/nature/bern/ias/Documents/Publication_Strategy_en.pdf

National Strategy on Invasive Alien Species

- Recommendation No. 161 (2012) on the European Code of Conduct for Zoological Gardens and Aquaria on Invasive Alien Species
- Recommendation No. 160 (2012) on the European Code of Conduct for Botanic Gardens on Invasive Alien Species
- Recommendation No. 154 (2011) on the European Code of Conduct on Pets and Invasive Alien Species
- Recommendation No. 142 (2009) on interpreting the CBD definition of invasive alien species to take into account climate change
- Recommendation No. 141 (2009) on potentially invasive alien plants being used as biofuel crops
- Recommendation No. 134 (2008) on the European Code of Conduct on Horticulture and Invasive Alien Plants
- Recommendation No. 126 (2007) on the eradication of some invasive alien plant species
- Recommendation No. 125 (2007) on trade in invasive and potentially invasive alien species in Europe
- Recommendation No. 114 (2005) on the control of the Grey squirrel (*Sciurus carolinensis*) and other alien squirrels in Europe
- Recommendation No. 99 (2003) on the European Strategy on Invasive Alien Species
- Recommendation No. 91 (2002) on Invasive Alien Species that threaten biological diversity in Islands and geographically and evolutionary isolated ecosystems
- Recommendation No. 77 (1999) on the eradication of non-native terrestrial vertebrates,
- Recommendation No. 57 (1997) on the introduction of organisms belonging to non-native species into the environment, and
- Recommendation No. 45 (1995) on controlling proliferation of *Caulerpa taxifolia* in the Mediterranean.

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Parties to the Bern Convention, including Malta, are required to submit written contributions on their implementation of the European Strategy on IAS and related recommendations at a national level prior to the meeting of the group of experts. The requirements of the Bern Convention are transposed in the “Flora, Fauna and Natural Habitats Protection Regulations, 2006 (S. L.549.44).

2.1.5 Barcelona Convention, RAC/SPA and the Protocol concerning specially protected areas and biological diversity in the Mediterranean (SPA & Biodiversity Protocol)

The Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (**Barcelona Convention**) deals with the promotion of sustainable development, the protection of the environment, as well as the conservation and preservation of natural resources in the Mediterranean Sea.²⁰⁶ Amongst the general provisions of the Convention, Contracting Parties are required, whether individually or jointly, to *‘take all appropriate measures in accordance with the provisions of this Convention and those Protocols in force to which they are party to prevent, abate, combat and to the fullest possible extent eliminate pollution of the Mediterranean Sea Area and to protect and enhance the marine environment in that Area so as to contribute towards its sustainable development’*. Within the context of this Convention, the term “pollution” refers to *‘the introduction by man, directly or indirectly, of substances or energy into the marine*

²⁰⁵ All recommendations and codes are available for download from:

http://www.coe.int/t/dg4/cultureheritage/nature/bern/IAS/default_en.asp

²⁰⁶ Available at: <http://www.unepmap.org/index.php?module=content2&catid=001001004>

environment, including estuaries, which results, or is likely to result, in such deleterious effects as harm to living resources and marine life, hazards to human health, hindrance to marine activities, including fishing and other legitimate uses of the sea, impairment of quality for use of seawater and reduction of amenities'. The provisions of the Convention addresses:

- Pollution caused by Dumping from Ships and Aircraft or Incineration at Sea (Article 5)
- Pollution from Ships (Article 6)
- Pollution Resulting from Exploration and Exploitation of the Continental Shelf and the Seabed and its Subsoil (Article 7)
- Pollution from Land-Based Sources (Article 8)
- Pollution emergencies (Article 10)
- Pollution Resulting from the Transboundary Movements of Hazardous Wastes and their Disposal (Article 11)

Article 10 deals with the protection and preservation of biological diversity, rare or fragile ecosystems, as well as species of wild fauna and flora which are rare, depleted, threatened or endangered and their habitats, in the area to which this Convention applies. The Barcelona Convention acts as the legal system of the **Mediterranean Action Plan (MAP)** under the aegis of the United Nations Environment Programme (UNEP). The MAP has 22 Contracting Parties, amongst which is Malta. The Barcelona Convention is supplemented by seven Protocols, which include the Protocol concerning specially protected areas and biological diversity in the Mediterranean (**SPA & Biodiversity Protocol**), which came into effect in 1999. **Article 6** of this Protocol requires Parties to '*...take the protection measures required, in particular: the regulation of the introduction of any species not indigenous to the specially protected area in question*' while **Article 13** requires Parties to '*...take all appropriate measures to regulate the intentional or accidental introduction of non-indigenous ... to the wild and prohibit those that may have harmful impacts on the ecosystems, habitats or species in the area to which this Protocol applies. The Parties shall endeavour to implement all possible measures to eradicate species that have already been introduced when, after scientific assessment, it appears that such species cause or are likely to cause damage to ecosystems, habitats or species in the area to which this Protocol applies.*'²⁰⁷

The **Regional Activity Centre for Special Protected Areas (RAC/SPA)** was established by the Contracting Parties to the Barcelona Convention and its Protocols in order to assist Mediterranean countries in implementing the SPA & Biodiversity Protocol in the Mediterranean.²⁰⁸ In 2004, RAC/SPA launched the implementation of the **Strategic Action Programme for the Conservation of Biological Diversity in the Mediterranean (SAP BIO)**, which defines strategic actions to *inter alia* protect species and habitats, improve knowledge about marine and coastal biodiversity, and reduce negative impacts on biological diversity in the Mediterranean.²⁰⁹ The thirteenth ordinary meeting of the Contracting Parties to the Barcelona Convention (Catania, November 2003) adopted the "**Action Plan on Introductions of Species and Invasive Species**"²¹⁰. UNEP/MAP RAC/SPA also published "**Guidelines for controlling the vectors of introduction into the**

²⁰⁷ Available at: http://www.rac-spa.org/sites/default/files/protocole_aspdb/protocol_eng.pdf

²⁰⁸ Available at: <http://www.rac-spa.org/background>

²⁰⁹ Available at: <http://sapbio.rac-spa.org/>and <http://sapbio.rac-spa.org/sapbioeng.pdf>

²¹⁰ Available at: http://www.rac-spa.org/sites/default/files/action_plans/invasive.pdf

Mediterranean of non-indigenous species and invasive marine species” and a “Guide for risk analysis assessing the impacts of the introduction of non-indigenous species”.^{211, 212}

The Twelfth Meeting of Focal Points for Specially Protected Areas under the RAC/SPA and UNEP MAP framework that convened on 25 to 29 May 2015 in Athens adopted an **Updated Action Plan concerning species introduction and invasive species in the Mediterranean Sea (Annex XI to the Meeting Report)**.²¹³ The following actions are directed to Parties for their implementation:

- Preparation of national reports (paragraph 17) by 2015
- Set up a mechanism to promote and coordinate the actions listed in paragraph 22 of the action plan by 2015
- Baseline study with information for MAMIAS (paragraph 19) by 2016
- Develop programmes for data collection and monitoring (paragraph 18) by 2016
- Launch the procedures for enacting or strengthening national legislation governing the control of alien species introduction (paragraph 21) by 2016
- Establish/update a directory of relevant specialists and organisations (paragraph 22) by 2016
- Develop programmes to raise the awareness of the general public and target groups, including decision-makers, concerning the risks associated with species introduction (paragraph 22) by 2016
- Annual updates of national data for MAMIAS (paragraph 20) 2017-2019 (annually)
- Develop and implement risk-assessment techniques (paragraph 22) by 2017
- Elaborate the National Plans (paragraph 23) by 2018
- Preparation of material for public education and awareness (paragraph 27) by 2019

The requirements of the SPA and Biodiversity Protocol are transposed in the “Flora, Fauna and Natural Habitats Protection Regulations, 2006(S. L. 549.44).

2.1.6 Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

CITES is a global multilateral environmental agreement, which regulates, via international cooperation, the international trade in specimens of wild animals and plants, and parts/derivatives thereof that are covered by the Convention’s appendices. It does this to ensure that such trade does not threaten the species’ survival.²¹⁴ Regulation is done by means of the issuance of permits/certificates subject to specified conditions. Malta became a Party to CITES in 1989 by accession. COP13 (Revised by COP14) adopted **Resolution 13.10 on trade in alien invasive species**. In paragraph (a) Parties are recommended ‘to consider the problems of invasive species when developing national legislation and regulations that deal with the trade in live animals or plants’. Paragraph (b) recommends that Parties ‘consult with the Management Authority of a proposed country of import, when possible and when applicable, when considering exports of potentially

²¹¹ Available at: http://www.rac-spa.org/sites/default/files/doc_alien/ld_controle.pdf

²¹² Available at: http://www.rac-spa.org/sites/default/files/doc_alien/ld_analyse.pdf

²¹³ Twelfth Meeting of Focal Points for Specially Protected Areas – Available at: <http://www.rac-spa.org/node/1265> and http://rac-spa.org/nfp12/documents/working/wg.408_18_rev1_eng.pdf

²¹⁴ Available at: <http://www.cites.org/eng>

*invasive species, to determine whether there are domestic measures regulating such import.*²¹⁵ The “Trade in Species of Fauna and Flora Regulations, 2004” (S.L. 549.38) enable the enforcement of CITES on a national scale.²¹⁶

2.1.7 United Nations Convention on the Law of the Sea (UNCLOS)

UNCLOS is a comprehensive global legal regime dealing with all issues concerning the law of the sea and all aspects of ocean space.²¹⁷ Malta became a Party to UNCLOS in 1993. Marine invasive species are addressed in the Convention via its **Article 196** on the “Use of technologies or introduction of alien or new species”. This article dictates that ‘*States shall take all measures necessary to prevent, reduce and control pollution of the marine environment resulting from the use of technologies under their jurisdiction or control, or the intentional or accidental introduction of species, alien or new, to a particular part of the marine environment, which may cause significant and harmful changes thereto*’ (paragraph 1).²¹⁸ Paragraph 2 clarifies that ‘[t]his article does not affect the application of this Convention regarding the prevention, reduction and control of pollution of the marine environment’. Article 194 on Measures to prevent, reduce and control pollution of the marine environment deals with all sources of pollution of the marine environment. ‘*The measures taken in accordance with this Part shall include those necessary to protect and preserve rare or fragile ecosystems as well as the habitat of depleted, threatened or endangered species and other forms of marine life*’ (paragraph 5 of Article 194).

2.1.8 Ballast Water Management within the framework of the International Maritime Organisation (IMO)

The International Maritime Organisation (IMO) is the United Nations’ specialised agency responsible for the safety and security of shipping and the **prevention of marine pollution from ships**.²¹⁹ Acknowledging the concern that ballast water used in shipping (also due to increased trade and traffic volume) is a major pathway for the introduction of alien and invasive species into the marine environment, the **Convention for the Control and Management of Ships’ Ballast Water and Sediments (BWMC)**²²⁰ was adopted in February 2004 under the IMO framework²²¹. It entered into force on the 8 September 2017.

This Convention requires all internationally going ships to implement a “**Ballast Water and Sediments Management Plan**”. The plan enables the ship to manage its ballast water and sediment discharge to meet the requirements for compliance with the Convention and the guidelines produced by the IMO. All ships will also have to carry a ballast water record book and an international BWM certificate. This will involve keeping

²¹⁵ Available at: <http://cites.org/sites/default/files/eng/res/all/13/E13-10R14.pdf>

²¹⁶ Available at: <http://www.justiceservices.gov.mt/DownloadDocument.aspx?app=lom&itemid=11541&l=1>

²¹⁷ Available at: http://www.un.org/depts/los/convention_agreements/convention_overview_convention.htm

²¹⁸ Available at: http://www.un.org/depts/los/convention_agreements/texts/unclos/unclos_e.pdf

²¹⁹ Available at: <http://www.imo.org/pages/home.aspx>

²²⁰ <http://www.imo.org/en/MediaCentre/HotTopics/BWM/Pages/default.aspx>

²²¹ Available at: [http://www.imo.org/About/Conventions/ListOfConventions/Pages/International-Convention-for-the-Control-and-Management-of-Ships%27-Ballast-Water-and-Sediments-\(BWM\).aspx](http://www.imo.org/About/Conventions/ListOfConventions/Pages/International-Convention-for-the-Control-and-Management-of-Ships%27-Ballast-Water-and-Sediments-(BWM).aspx)

a “Ballast Water Record Book” and carrying out ballast water management procedures to a given standard according to ship’s plan, approved by the Member’s Flag Administration.

IMO’s **Marine Environment Protection Committee (MEPC)**, constituted by all Member States, addresses environmental issues under IMO’s remit and considers any matter within the scope of IMO concerned with prevention and control of pollution from ships, including the adoption and amendment of conventions and other regulations and measures to ensure their enforcement. One matter that is addressed by MEPC is the prevention of the transfer of marine invasives through ballast water management. Guidelines²²² for the uniform implementation of the BWM Convention that have been adopted by MEPC to date are listed below:

- MEPC.152 (55) on Guidelines for sediment reception facilities
- MEPC.173 (58) on Guidelines for ballast water sampling
- MEPC.123 (53) on Guidelines for ballast water management equivalent compliance
- MEPC.127 (53) on Guidelines for ballast water management and development of ballast water management plans
- MEPC.153 (55) on Guidelines for ballast water reception facilities
- MEPC.124 (53) on Guidelines for ballast water exchange
- MEPC.162 (56) on Guidelines for risk assessment under regulation A-4 of the BWM convention
- MEPC.174 (58) on Guidelines for approval of ballast water management systems
- MEPC.169 (57) on Procedure for approval of ballast water management systems that make use of active substances
- MEPC.140 (54) on Guidelines for approval and oversight of prototype ballast water treatment technology programmes
- MEPC.149 (55) on Guidelines for ballast water exchange design and construction standards
- MEPC.209 (63) on 2012 Guidelines on design and construction to facilitate sediment control on ships
- MEPC.161 (56) on Guidelines for additional measures regarding ballast water management including emergency situations
- MEPC.151 (55) on Guidelines on designation of areas for ballast water exchange
- MEPC.163 (56) on Guidelines for ballast water exchange in the Antarctic treaty area
- MEPC.252 (67) on Guidelines for port State control under the BWM Convention.

Affiliated bodies of IMO that are relevant to the spread of marine invasives via ballast water are GESAMP and the GloBallast Partnerships. The **Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP)** advises the UN system on the scientific aspects of marine environmental protection.²²³ The “GESAMP Ballast Water Working Group on Active Substances” (GESAMP BWWG, or WG 34), was established in 2005 to review any proposals submitted to IMO in preparation for the BWMC for approval of ballast water management systems that make use of “active substances”, that is “*substances or organisms, including a virus or a fungus, that have a general or specific action on or against harmful aquatic organisms and pathogens*”. The approval of BWM systems using such substances is described in Resolution MEPC.126 (53). The GESAMP Reports and Studies No. 83 looks at ballast water

²²² Available at: <http://www.imo.org/en/ourwork/environment/ballastwatermanagement/pages/bwmconventionandguidelines.aspx>

²²³ Available at: <http://www.gesamp.org/>

systems of the future, which could reduce the risks of transporting invasive species but without using chemicals.²²⁴

The GEF/UNDP/IMO Global Ballast Water Management Programme (**GloBallast**) is an initiative between IMO, GEF and the UNDP that provides assistance on aspects of reduction of the transfer of harmful aquatic organisms and pathogens in ships' ballast water, the implementation of the afore-mentioned IMO ballast water guidelines and to assist countries (developing) in preparing for the BWMC²²⁵. The GloBallast monograph series comprises information reports and proceedings of conferences and workshops as well as technical, scientific and consultancy activities.²²⁶ Recent publications as part of this series are listed below:

- GloBallast Monograph No. 25. - The GloBallast Story: Reflections from a Global Family;
- GloBallast Monograph No. 24. - Economic Assessment of Ballast Water Management - A Synthesis of the National Assessments conducted by the Lead Partnering Countries of the GEF-UNDP-IMO GloBallast Partnerships Programme;
- GloBallast Monograph No. 23. - Guidance on Best Management Practices for Sediment Reception Facilities under the BWM Convention;
- GloBallast Monograph Series No. 22 - Guidance on port biological baseline surveys (PBBS);
- GloBallast Monograph Series No. 21 - Identifying and Managing Risks from Organisms Carried in Ships' Ballast Water;
- GloBallast Monograph Series No. 20 - Establishing Equivalency in the Performance Testing and Compliance Monitoring of Emerging Alternative Ballast Water Management Systems;
- GloBallast Monograph Series No. 19 - Economic assessment for Ballast Water Management: A Guideline;
- GloBallast Monograph Series No. 18 - Guidelines for Development of National Ballast Water Management Strategies; and
- GloBallast Monograph Series No. 17 - Guidelines for National Ballast Water Status Assessments.

The requirements of the BWMC are transposed through the Merchant Shipping (Ballast Water Management Convention), 2017 (S.L. 234.55)

2.1.9 Food and Agriculture Organisation (FAO)

*The Food and Agriculture Organisation (FAO) of the United Nations deals with aspects of **food security** and amongst its strategic goals is making agriculture, fisheries and forestry more sustainable and productive.*

*Within the context of fisheries and under the framework of the FAO, the **Code of Conduct on Responsible Fisheries** includes Article 9.3.2. The latter requires States to 'cooperate in the elaboration, adoption and implementation of international codes of practice and procedures for introductions/transfers of aquatic organisms'. In **Article 9.3.3**, 'States should, in order to minimise risks of disease transfer and other adverse*

²²⁴ Available at:

http://www.gesamp.org/data/gesamp/files/media/Publications/Reports and studies 83/gallery_1751/object_1940_large.pdf

²²⁵ Available at: <http://globallast.imo.org/index.asp>

²²⁶ Available at: <http://globallast.imo.org/index.asp?page=monograph.htm&menu=true>

effects on wild and cultured stocks, encourage adoption of appropriate practices in the genetic improvement of broodstocks, the introduction of non-native species, and in the production, sale and transport of eggs, larvae or fry, broodstock or other live materials. States should facilitate the preparation and implementation of appropriate national codes of practice and procedures to this effect'.^[1]

*The issue of invasive species is also pertinent to sustainable forest management, since forest ecosystems also require protection from the impacts of IAS. The **FAO Forestry Paper 156 on the Global review of forest pests and diseases** provides regional analyses (covering also Europe) and also provides profiles of selected forest pests.^[2]*

2.1.10 International Plant Protection Convention (IPPC) and the European Plant Protection Organisation (EPPO)

The IPPC provides an international framework for cooperation to protect cultivated and wild plants against the introduction and spread of **pests of plants and plant products** (*i.e.* any species, strain or biotype of plant, animal or pathogenic agent injurious to plants or plant products), while minimising interference with international trade.²²⁷ It deals with the spread of pests between countries and phytosanitary measures within a country. Pests regulated under the IPPC fall either into “**quarantine pests**” (*i.e.* a pest of potential economic importance to the area endangered thereby and not yet present there, or present but not widely distributed and being officially controlled) or “**regulated non-quarantine pests**” (*i.e.* a non-quarantine pest whose presence in plants for planting affects the intended use of those plants with an economically unacceptable impact and which is therefore regulated within the territory of the importing contracting party).

As mentioned in **Article I** of the Convention text, Contracting parties are required to adopt the legislative, technical and administrative measures specified in this Convention with the purpose of securing common and effective action to prevent the spread and introduction of pests of plants and plant products, and to promote appropriate measures for their control.²²⁸ Pursuant to **Article IV** ‘Each Contracting party shall make provision, for an official national plant protection organisation responsible for the implementation of phytosanitary measures in that country such as *vis-à-vis* issuance of phytosanitary certificates ensuring that exported plants and plant products are in conformity with the IPPC requirements and taking into account relevant international standards, surveillance and inspection of consignments with the purpose of intercepting and reporting on the occurrence, outbreak and spread of pests, and of controlling those pests, and conducting pest risk analyses’. The Secretariat of the IPPC is provided by the FAO (see Section 2.1.9). The “**Plant Quarantine Act**” (Act XVIII of 2001, as amended by Act III of 2004; Legal Notice 426 of 2007; and Act V of 2011; CAP. 433), implements the IPPC at a national level.²²⁹

^[1] Available at: <http://www.fao.org/docrep/005/v9878e/v9878e00.HTM>

^[2] Available at: <http://www.fao.org/docrep/011/i0640e/i0640e00.htm>

²²⁷ Available at: <https://www.ippc.int/en/>

²²⁸ Available at: <https://www.ippc.int/en/core-activities/governance/cpm/cpm-recommendations/cpm-recommendations/threats-biodiversity-posed-alien-species-actions-within-framework-ippc/> and https://www.ippc.int/static/media/files/publications/en/2013/06/03/13742.new_revised_text_of_the_international_plant_protectio_201304232117en.pdf

²²⁹ Available at: <http://www.justiceservices.gov.mt/DownloadDocument.aspx?app=lom&itemid=8899&l=1>

The **Commission on Phytosanitary Measures (CPM)** within the framework of the FAO can adopt recommendations and **international standards for phytosanitary measures (ISPMs)** consistent with the principles of this Convention. The CPM Recommendation **ICPM-3/2001** clarifies that the coverage of the IPPC definition of “plant pests” includes weeds and other species that have indirect effects on plants. Therefore the scope of the Convention applies to the protection of wild flora resulting in an important contribution to the conservation of biological diversity. The CPM Recommendation **ICPM-7/2005** on “Threats to Biodiversity posed by Alien Species: Actions within the Framework of the IPPC” provides recommendations regarding the various actions that can be taken to deal with plants that are invasive alien species. Paragraph 7 on this Recommendation, recommends Contracting Parties and NPPOs to:

- *‘Enhance plant protection laws and policies, where needed, to include the protection of wild flora and biodiversity from pests of plants (including plants that are invasive alien species);*
- *Promote the IPPC and participate in broader national strategies to address threats to biodiversity posed by invasive alien species, so that maximum advantage can be taken of existing structures and capacities under the IPPC;*
- *Reinforce efforts to apply and utilise relevant ISPMs and related phytosanitary measures to address threats to biodiversity posed by invasive alien species that are pests of plants (including plants that are invasive alien species);*
- *Give particular attention, when carrying out pest risk analysis, to the possibility that introduced plants could act as invasive alien species, taking into consideration available information on the types of plants for which this has already occurred;*
- *Enhance linkages between environmental, plant protection and agricultural authorities and related ministries, in order to articulate and achieve common goals in work involving the protection of plants and biodiversity from, invasive alien species;*
- *Improve communication between national CBD focal points and IPPC contact points;*
- *Collect, where appropriate, information on the alien invasions of pests of plants (including plants that are invasive alien species), and forward this to the CBD national focal points, to assist in monitoring progress towards the 2010 biodiversity targets outlined in the COP-7 Decision VII/30;*
- *Establish or adapt existing pest alert systems to include all pests of plants (including plants that are invasive alien species) that threaten the environment and biological diversity, including those affecting uncultivated/unmanaged plants, wild flora, habitats and ecosystems, and ensure that relevant agencies and officials have access to lists of plants, plant products, other regulated articles and trade pathways that may carry such pests;*
- *Report to the IPPC Secretariat on actions and progress on the above recommendations’.*

IPPC does not distinguish between terrestrial and aquatic plants and does not specifically refer to aquatic plants. The IPPC also deals with the protection of plants whether cultivated, managed or wild. In CPM Recommendation **CPM-9/2014/1**, the CPM confirms that aquatic plants should be protected and invasive aquatic plants considered as potential pests under the IPPC framework.²³⁰

To date the following standards have been adopted by the CPM:

- Guidelines for pest risk analysis (ISPM #2);

²³⁰ Available at: <https://www.ippc.int/en/core-activities/governance/cpm-recommendations/ippc-aquatic-plants/>

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- Code of Conduct for the Import and Release of Exotic Biological Control Agents (ISPM #3);
- Glossary of phytosanitary terms (ISPM#5) and its Supplement No. 2 on Guidelines on the understanding of 'Potential economic importance' and related terms including reference to environmental considerations;
- Guidelines for surveillance (ISPM #6);
- Determination of pest status in an area (ISPM #8);
- Guidelines for pest eradication programmes (ISPM #9);
- Guidelines for the notification of non-compliance and emergency action (ISPM #13);
- Pest reporting (ISPM #17); and
- Pest risk analysis for quarantine pests (ISPM #11) and its Supplement on Analysis of Environmental Risks²³¹.

Such standards may also be developed by regional organisations under the IPPC. Contracting parties to the IPPC are required to cooperate with one another in establishing regional plant protection organisations in appropriate areas. The **European Plant Protection Organisation (EPPO)** is recognised regional plant protection organisations within the framework of the IPPC. They advise member governments on the technical, administrative and legislative measures necessary to prevent the introduction and spread of pests and diseases of plants and plant products.

EPPO is responsible for cooperation in plant protection in the European and Mediterranean region.²³² Initially focused on pests of cultivated plants (*i.e.* insects, nematodes, fungi, bacteria and viruses), the activities of EPPO now also give attention to the prevention of the introduction and spread of organisms, which are harmful to plants in the European and Mediterranean region. In the context of invasive alien plants, the **“Panel on Invasive Alien Plants” under EPPO** meets once a year to provide information on invasive alien plants for the EPPO region, to conduct studies on risk analysis of specific invasive alien plants, and to recommend measures to prevent their introduction and spread, and measures to eradicate, suppress and contain invasive alien plants already introduced. This Panel has established Lists of Invasive Alien Plants whereby listing of pests is based on the findings of pest risk assessments (PRA) and follows the **EPPO prioritisation process**, which has been adopted as Standard PM5/6(1) by the Council of EPPO (Figure 19).²³³ This process takes into account:

- whether the plant is considered invasive or potentially invasive by several EPPO countries,
- whether the plant is absent or still containable by appropriate measures in several EPPO countries,
- the potential of the plant for further spread and damage into significant areas where it is absent, and
- whether the plant is reported to be actively spreading or becoming more damaging in its current distribution area.

²³¹ Available at: <https://www.ippc.int/en/core-activities/standards-setting/ispm/>

²³² Available at: <http://www.eppo.int/>

²³³ EPPO (2012) EPPO Standards - Guidelines for pest risk analysis. PM5/6(1) EPPO prioritization process for invasive alien plants. *Bulletin OEPP/EPPO Bulletin* 42, 463-474.)

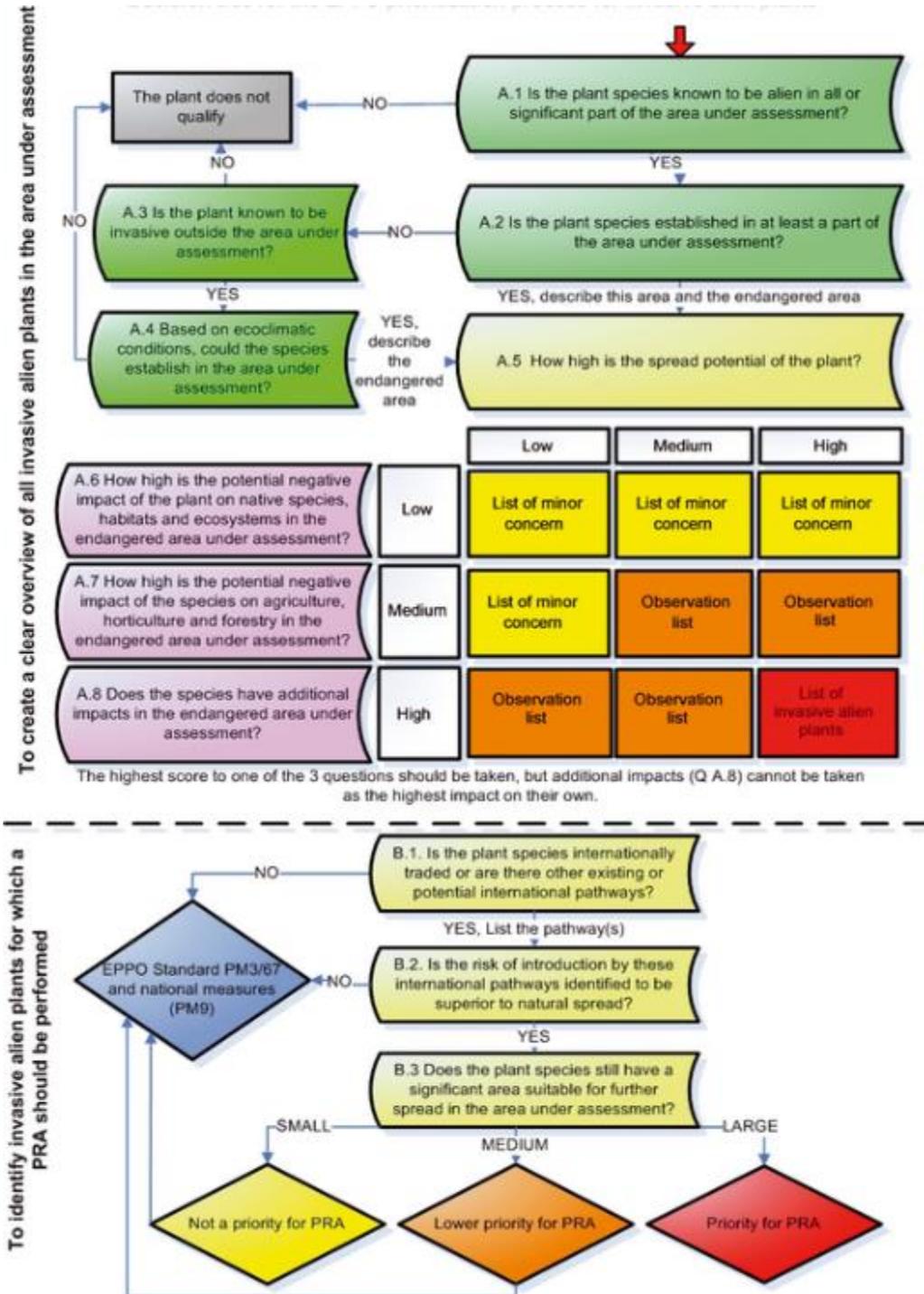


Figure 19 – Decision tree for the EPPO Prioritisation Process for Invasive Alien Plants

When a new species is identified as a potential threat to the EPPO region (already present in the EPPO region or absent) by a member country or by the EPPO Secretariat, the species is included on the “**EPPO Alert List**”

to provide early warning and eventually to propose candidates, which may be subjected to a PRA.²³⁴ If the species has a high spread potential and has a high impact to plant health or the environment and biodiversity, the species may be registered on the “**EPPO List of invasive alien plants**” giving priority to those species considered to pose the greatest threat to species and ecosystems in the EPPO region.²³⁵ If information about the plant species is not considered sufficient or if the impacts appear to be moderate, the species is registered on the “**EPPO Observation List**”.²³⁶ Invasive alien plants, added to the “**EPPO A1/A2 lists of pests recommended for regulation as quarantine pests**” comprise those organisms of serious phytosanitary concern that should be regulated as quarantine pests by EPPO member countries (A1 pests are absent from the EPPO region and A2 pests are locally present in the EPPO region).²³⁷ EPPO makes recommendations to the NPPOs of its member countries in the form of regional Standards on plant protection products and on phytosanitary measures. These standards are published in the EPPO Bulletin:

- EPPO Standards on plant protection products
 - Efficacy Evaluation of Plant Protection Products (PP1);
 - Good Plant Protection Practice (PP2); and
 - Environmental Risk Assessment of Plant Protection Products (PP3)

- EPPO Standards on phytosanitary measures
 - General Phytosanitary Measures (PM1);
 - Pest-specific Phytosanitary Measures (PM2);
 - Phytosanitary Procedures (PM3);
 - Production of Healthy Plants for Planting (PM4);
 - Pest Risk Analysis (PM5);
 - Safe use of Biological Control (PM6) and the list of biological control agents widely used in the EPPO region;
 - Diagnostics (PM7);
 - Commodity-specific Phytosanitary Measures (PM8);
 - National Regulatory Control Systems (PM9); and
 - Phytosanitary Treatments (PM10).

²³⁴ Available at: http://www.eppo.int/INVASIVE_PLANTS/ias_lists.htm#AlertList

²³⁵ Available at: http://www.eppo.int/INVASIVE_PLANTS/ias_lists.htm#IAPList

²³⁶ Available at: http://www.eppo.int/INVASIVE_PLANTS/ias_lists.htm#ObservList

²³⁷ Available at: http://www.eppo.int/INVASIVE_PLANTS/ias_lists.htm#A1A2Lists

2.1.11 World Organisation for Animal Health (OIE)

The OIE is the intergovernmental organisation responsible for improving animal health worldwide.²³⁸ The **main objectives of the OIE** are:

- to promote and coordinate research work on **contagious diseases of livestock**;
- to collect and disseminate knowledge on the spread of **epizootic diseases** and the means to control them, ensuring coordination between sanitary services; and
- to examine international draft agreements regarding **animal sanitary measures** and to provide signatory Governments with the means of supervising their enforcement.

The OIE is the WTO reference organisation for standards relating to animal health and zoonoses. OIE's "**Terrestrial Animal Health Code**" and "**Aquatic Animal Health Code**" respectively aim to assure the sanitary safety of international trade in terrestrial animals and aquatic animals, and their products. More specifically the codes contain science-based recommendations for **disease reporting, prevention and control** and for assuring safe international trade in terrestrial animals (mammals, birds and bees) and aquatic animals (amphibians, fish, crustaceans and molluscs) and their products.²³⁹ The international movement of animals has associated risks in terms of a non-native animal becoming invasive or pathogens being introduced with the animal. The OIE published the "**Guidelines for Assessing the Risk of Non-native Animals Becoming Invasive**" in November 2011.²⁴⁰ These Guidelines are intended to address the process of assessing the risk of imported non-native animals becoming invasive as well as the risks posed by hitchhiker organisms. They complement the OIE standard for import risk analysis.

OIE's Scientific and Technical Review is a peer-reviewed scientific publication, which plays a significant role in fulfilling some of the priority functions of the OIE. Invasive alien species were the focus of the 29th edition of the Scientific and Technical Review. Part 1 addresses general aspects of invasive species while part 2 provides concrete examples (both edited by Pastoret and Moutou, 2010).²⁴¹

2.1.12 FAO/WHO Codex Alimentarius

In recognition of the need for developing international standards for the purposes of protecting public health and minimising disruption of **international food trade**, the Food and Agriculture Organisation (FAO) of the United Nations and the World Health Organization (WHO) established in 1963 the Joint **FAO/WHO Food Standards Programme**. The Codex Alimentarius Commission was designated to administer the

²³⁸ Available at: <http://www.oie.int/>

²³⁹ Available at:

http://www.oie.int/fileadmin/Home/eng/International_Standard_Setting/docs/pdf/A_OIE_procedures_stand_recom_2011.pdf

²⁴⁰ Available at:

http://www.oie.int/fileadmin/Home/eng/Our_scientific_expertise/docs/pdf/OIEGuidelines_NonNativeAnimals_2012.pdf

²⁴¹ Available at: <http://www.oie.int/en/our-scientific-expertise/biodiversity/>

programme.²⁴² All standards, guidelines, codes of practice and advisory texts that compose the Alimentarius are available from the List of standards.²⁴³

2.1.13 World Trade Organisation (WTO) Agreement on the application of sanitary and phytosanitary measures (SPS Agreement)

Since IAS are spread through international transport and trade pathways, lack of national measures to prevent the spread of IAS would have adverse consequences and risks for the broader multilateral trading system.²⁴⁴ The setting of standards at an international level and, these being followed by complementary measures, is crucial within this context. Internationally coordinated procedures are also required since unilateral actions do not suffice when dealing with IAS.

The World Trade Organisation (WTO) serves as an international forum for governments to negotiate trade agreements. One such agreement is the WTO **Sanitary and Phytosanitary (SPS) Agreement**, which entered into force on 1 January 1995. It provides a multilateral framework of rules that apply within the Member's Territory (a) to protect human, animal or plant life or health from the entry, establishment or spread of **pests, diseases, and disease-carrying organisms**; and (b) to prevent or limit other damage from the entry, establishment or spread of pests.²⁴⁵ This Agreement applies to all sanitary and phytosanitary measures which may, directly or indirectly, affect international trade. The WTO recognises international standards, guidelines or recommendations developed within the IPPC framework (plant health), by OIE (animal health) and by Codex Alimentarius Commission (food safety) (see Article 3 on harmonisation). The SPS Agreement does not interfere with the decisions of its members concerning the appropriate level of protection of the environment. Sanitary and phytosanitary measures should be applied only to the extent necessary to protect human, animal or plant life or health and be based on scientific principles and evidence (see Article 5 on Assessment of Risk and Determination of the Appropriate Level of Sanitary or Phytosanitary Protection).

2.1.14 International Civil Aviation Organisation (ICAO)

The ICAO is a specialised agency of the United Nations and serves as the global forum of States for international civil aviation.²⁴⁶ ICAO works with its Member States and global aviation organisations to develop international **Standards and Recommended Practices (SARPs)** for the safe and orderly development of international civil aviation. Malta is one of the States that signed the Convention on International Civil Aviation (Chicago Convention). Environmental protection features as one of ICAO's strategic objectives for the triennium 2017 to 2019, vis-à-vis the minimisation of the adverse **environmental effects caused by civil aviation activities**. The Assembly, comprised of all Member States of ICAO is the organisation's sovereign body and as such has numerous powers and duties, among them to examine and

²⁴² Available at: <http://www.codexalimentarius.org/>

²⁴³ Available at: <http://www.codexalimentarius.org/standards/list-of-standards/>

²⁴⁴ *Review of the efficiency and efficacy of existing legal instruments applicable to invasive alien species*. Secretariat of the Convention on Biological Diversity, 2001.

²⁴⁵ Available at: https://www.wto.org/english/tratop_e/sps_e/spsagr_e.htm

²⁴⁶ Available at: <http://www.icao.int/Pages/default.aspx>

take appropriate action on the reports of the Council and decide upon any matter reported to it by the Council.

There is **no binding international legislation under the Chicago Convention** relating to IAS. However, recognising that **international transportation**, including civil air transportation, represents a potential **pathway for the introduction of IAS**, the 32nd ICAO Assembly requested the ICAO Council to study the matter further to enable the Organisation to make a decision on the action it might take in assisting to reduce the risk of such introductions. In 2001, the 33rd Assembly took note of ICAO's preliminary investigation into the matter, which pointed to a shortage of documentation vis-à-vis a universal **IAS problem in civil aviation** that could be addressed by ICAO on a multilateral basis. The Assembly therefore requested the Council to conduct a survey on the pathway assessment of the transport of invasive alien species by air. The results were presented at the 35th Assembly. Forty-nine States responded to an ICAO survey. Examples of **IAS invasions via aircraft** that were given by the responding States included micro-organisms (in discarded aircraft food, through sick passengers and in cargo), insects (in packing material, passenger baggage, cargo, aircraft cabin, containers, cargo hold and on imported animals), plants and plant weeds (in passenger baggage and cargo), mammals (in the aircraft structure and containers) and reptiles (in passenger baggage, wheel wells and containers). In terms of measures that States have in place to prevent IAS invasions by aircraft, respondents mentioned: border entry controls and/or management programmes, including brochures handed out to passengers (both in-flight and on disembarkation), Internet sites, media advertisements, airport notices, quarantine declaration on arrival cards, information workshops and awareness campaigns in schools and villages. Mentioned physical interventions comprised the use of detector dogs; the disinfection of aircraft; passenger, cargo and baggage searches; the use of shoe disinfectant mats; the use of light traps at airports; and post office mail inspection.²⁴⁷

The 36th Assembly adopted **Resolution A36-21 on preventing the introduction of invasive alien species**. This resolution urges Contracting States *'to support one another's efforts to reduce the risk of introducing, through civil air transportation, potentially invasive alien species to areas outside their natural range'* (paragraph 1) and requests the ICAO Council *"to continue working with the appropriate organizations in this regard"* (paragraph 2).²⁴⁸ The 37th Assembly in turn adopted Resolution A37-14 on non-chemical disinsection of the aircraft cabin and flight deck for international flights. In 2016, the 39th Assembly adopted **Resolution A39-28** superceding A37-14 which gave direction to develop **Performance-based criteria and guidance material on aircraft disinsection and vector control measures** in conjunction with the World Health Organisation (WHO), including recommendations regarding non-chemical disinsection methods and guidance on the components of a scientifically-based risk assessment model for Contracting States to use in determining whether to employ vector control measures that include but are not limited to aircraft disinsection. At the same time this resolution urges Contracting States to require pest management control programmes around airports and related facilities, which would mitigate the need to impose aircraft disinsection requirements as well as encouraging airport reporting to the ICAO Airport Vector Control Registry. Malta International Airport does not report under this Registry.

²⁴⁷ Available at: http://www.icao.int/Meetings/AMC/MA/Assembly%2035th%20Session/wp012_en.pdf

²⁴⁸ Available at: https://www.icao.int/publications/Documents/10075_en.pdf

2.1.15 International Union for Conservation of Nature - Invasive Species Specialist Group (IUCN-ISSG)

The IUCN is a global environmental organisation that deals with environment and development challenges. The framework for planning, implementing, monitoring and evaluating the conservation work undertaken by the IUCN is set out in the **Global Programme**. The latter focuses on the following three programme areas: (a) valuing and conserving nature, (b) ensuring effective and equitable governance of its use, and (c) deploying nature-based solutions to global challenges in climate, food and development. The work of the IUCN also covers **theme-based programmes** amongst which are on ecosystem management, forest, marine and polar programme, protected areas and species. Invasive alien species are addressed within the theme-based programme on species.²⁴⁹ The Global Programme is implemented by the IUCN Secretariat and its six Commissions. One of these commissions is the **Species Survival Commission (SSC)**, which is a scientific-based network of experts that advises the Union on the technical aspects of species conservation.²⁵⁰

The SSC Chair, in consultation with the SSC Steering Committee established a number of sub-committees to govern a specific portion of the SSC network or SSC's activities. Members of the SSC are also deployed in more specialist groups that address conservation issues related to particular taxonomic groups or focus on topical issues, such as species reintroduction. Amongst these specialist groups is the **Invasive Species Specialist Group (ISSG)**.²⁵¹ The latter group promotes and facilitates the exchange of information and knowledge of invasive species through online tools and networking and focuses on policy and technical advice as its core areas of activity. The ISSG publishes the biannual newsletter entitled "Aliens" comprising featured articles on issues related to invasive species.²⁵² The ISSG also manages the online databases: **Global Invasive Species Database (GISD)**; and the Island Biodiversity and Invasive Species Database (IBIS).^{253,254} The ISSG published the document entitled "**100 of the World's Worst Invasive Alien Species**" by Lowe, Browne and Boudjelas (2000).²⁵⁵ The ISSG prepared the "**IUCN Guidelines for the Prevention of Biodiversity Loss caused by Alien Invasive Species**" and approved by the 51st Meeting of the IUCN Council in February 2000.²⁵⁶ These Guidelines focus on four main aspects on IAS: (a) improving understanding and awareness; (b) strengthening the management response; (c) providing appropriate legal and institutional mechanisms; and (d) enhancing knowledge and research efforts. Outcomes of conferences are also available.²⁵⁷

2.1.16 Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES)

One of the major challenges for the conservation and sustainable use of biodiversity and related ecosystem services is ensuring that decisions and policies are made with the **best available scientific information**.

²⁴⁹ Available at: <http://www.iucn.org/about/work/programmes/species/>

²⁵⁰ Available at: http://iucn.org/about/work/programmes/species/who_we_are/about_the_species_survival_commission/

²⁵¹ Available at: <http://www.issg.org/>

²⁵² Available at: <http://www.issg.org/publications.htm#aliens>

²⁵³ Available at: <http://www.issg.org/database/welcome/>

²⁵⁴ Available at: <http://ibis.fos.auckland.ac.nz/>

²⁵⁵ Available at: http://www.issg.org/pdf/publications/worst_100/english_100_worst.pdf

²⁵⁶ Available at: http://www.issg.org/pdf/guidelines_iucn.pdf

²⁵⁷ Available at: <http://www.issg.org/publications.htm#worst100>

The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (hereafter IPBES) was established in April 2012 with the purpose of enhancing the credibility, legitimacy and saliency of the **science-policy interface** relating to biodiversity and ecosystem services.^{258, 259} The **functions of IPBES** are:

- To respond to the requests from Governments, including those conveyed to it by biodiversity-related MEAs focusing on government needs and based on priorities established by the Plenary;
- To identify and prioritise key scientific information needed for policymakers at appropriate scales and to catalyse efforts to generate new knowledge by engaging in dialogue with key scientific organisations, policymakers and funding organisations, but should not directly undertake new research;
- To perform regular and timely assessments of knowledge on biodiversity and ecosystem services and their interlinkages, which should include comprehensive global, regional and, as necessary, subregional assessments and thematic issues at appropriate scales and new topics identified by science and as decided upon by the Plenary;
- To support policy formulation and implementation by identifying policy relevant tools and methodologies, such as those arising from assessments, to enable decision makers to gain access to those tools and methodologies and, where necessary, to promote and catalyse their further development; and
- To prioritise key capacity-building needs to improve the science-policy interface at appropriate levels and then provide and call for financial and other support for the highest-priority needs related directly to its activities, as decided by the Plenary, and catalyse financing for such capacity-building activities by providing a forum with conventional and potential sources of funding.²⁶⁰

The Plenary is the Platform's decision-making body. The subsidiary bodies of the **Plenary**, to support the smooth, effective and timely operation of the Platform are (1) the **IPBES Bureau** comprising the chair and four vice-Chairs and five additional officers entrusted with overseeing the administrative functions of IPBES; and (2) a **Multidisciplinary Expert Panel (MEP)** that will carry out the scientific and technical functions of IPBES.

As part of an intersessional process to facilitate operationalisation of the Platform, two activities were requested from the IPBES Secretariat with respect to an "overview of assessments" as preparation for an initial work programme. Specifically the Secretariat was requested:

- to prepare a **catalogue of assessments**, including relevant thematic and comprehensive assessments at the national, regional, subregional and global levels, building on existing initiatives and drawing on the Platform's gap analysis and other relevant information; and
- to compile a **critical review of the assessments** in the catalogue and highlight the implementation of capacity-building activities, the use of conceptual frameworks, the scope of assessments, the experiences with the integration of knowledge systems, the use of scenarios and other tools, the lessons learned with respect to achievement of the policy impact of assessments, the gaps in knowledge and coverage of assessments and capacity-building needs.

²⁵⁸ Available at: <http://www.ipbes.net/>

²⁵⁹ Available at: http://www.ipbes.net/images/Resolution%20establishing%20IPBES_2012.pdf

²⁶⁰ Available at: http://www.ipbes.net/images/Functions%20operating%20principles%20and%20institutional%20arrangements%20of%20IPBES_2012.pdf

The catalogue of assessments has been developed as an online catalogue, with the intention that those involved in assessments can submit information on their assessments directly.²⁶¹ The critical review of assessments provides a synthesis of lessons learned from existing assessments and assessment processes.

The agreed **work programme for IPBES** includes activities related to assessments, activities related to knowledge generation, activities related to policy support and activities related to capacity building. More specifically the work programme has four objectives each with defined deliverables as follows:

- Objective 1 – To strengthen the capacity and knowledge foundations of the science-policy interface to implement key functions of the Platform
 - Deliverable 1(a): Priority capacity-building-needs to implement the Platform’s work programme matched with resources through catalysing financial and in-kind support
 - Deliverable 1(b): Capacities needed to implement the Platform’s work programme developed
 - Deliverable 1(c): Procedures, approaches and participatory processes for working with indigenous and local knowledge systems
 - Deliverable 1(d): Priority knowledge and data needs for policymaking addressed through catalysing efforts to generate new knowledge and networking
- Objective 2 – To strengthen the science-policy interface on biodiversity and ecosystem services at and across subregional, regional and global levels
 - Deliverable 2(a): Guide on production and integration of assessments from and across all scales
 - Deliverable 2(b): Regional/subregional assessments on biodiversity and ecosystem services
 - Deliverable 2(c): Global assessment on biodiversity and ecosystem services
- Objective 3 – To Strengthen the science-policy interface on biodiversity and ecosystem services with regard to thematic and methodological issues
 - Deliverable 3(a): Thematic assessment of pollinators, pollination and food production
 - Deliverable 3(b): Thematic assessments
 - Thematic assessment on land degradation and restoration
 - Thematic assessment on invasive alien species and their control
 - Thematic assessment on sustainable use and conservation of biodiversity and strengthening capacities and tools
 - Deliverable 3(c): Policy support tools and methodologies for scenario analysis and modelling of biodiversity and ecosystem services based on a fast track assessment and a guide (by August 2015)
 - Deliverable 3(d): Policy support tools and methodologies regarding the diverse conceptualization of values of biodiversity and nature’s benefits to people including ecosystem services based on an assessment and a guide
- Objective 4 – To communicate and evaluate Platform activities, deliverables and findings
 - Deliverable 4(a): Catalogue of relevant assessments
 - Deliverable 4(b): Development of an information and data management plan
 - Deliverable 4(c): Catalogue of policy support tools and methodologies

²⁶¹ Available at: <http://catalog.ipbes.net/>

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- Deliverable 4(d): Set of communication, outreach and engagement strategies, products and processes
- Deliverable 4(e): Reviews of the effectiveness of guidance, procedures, methods and approaches to inform future development of the Platform

The programme of work of IPBES, under Objective 3 and deliverable 3b, hence includes the development of a **thematic assessment on invasive alien species and their control**. This will assess the threat that IAS pose to biodiversity, ecosystem services and livelihoods. It will also assess the global status of, and trends in, IAS impacts by region and sub-region, taking into account various knowledge and value systems.

While the preceding sections have given an insight to how IAS is address by global instruments, the following sections in the chapter provide information on relevant EU and national instruments.

2.2 EU Policy on IAS and the National Regulatory Framework

Until the recent adoption of a comprehensive EU legal instrument on IAS, the EU regulatory framework covered the IAS problem only in part, within the context of nature conservation, health, trade, sanitation, pest control and use of alien species in aquaculture ([Figure 20](#)).

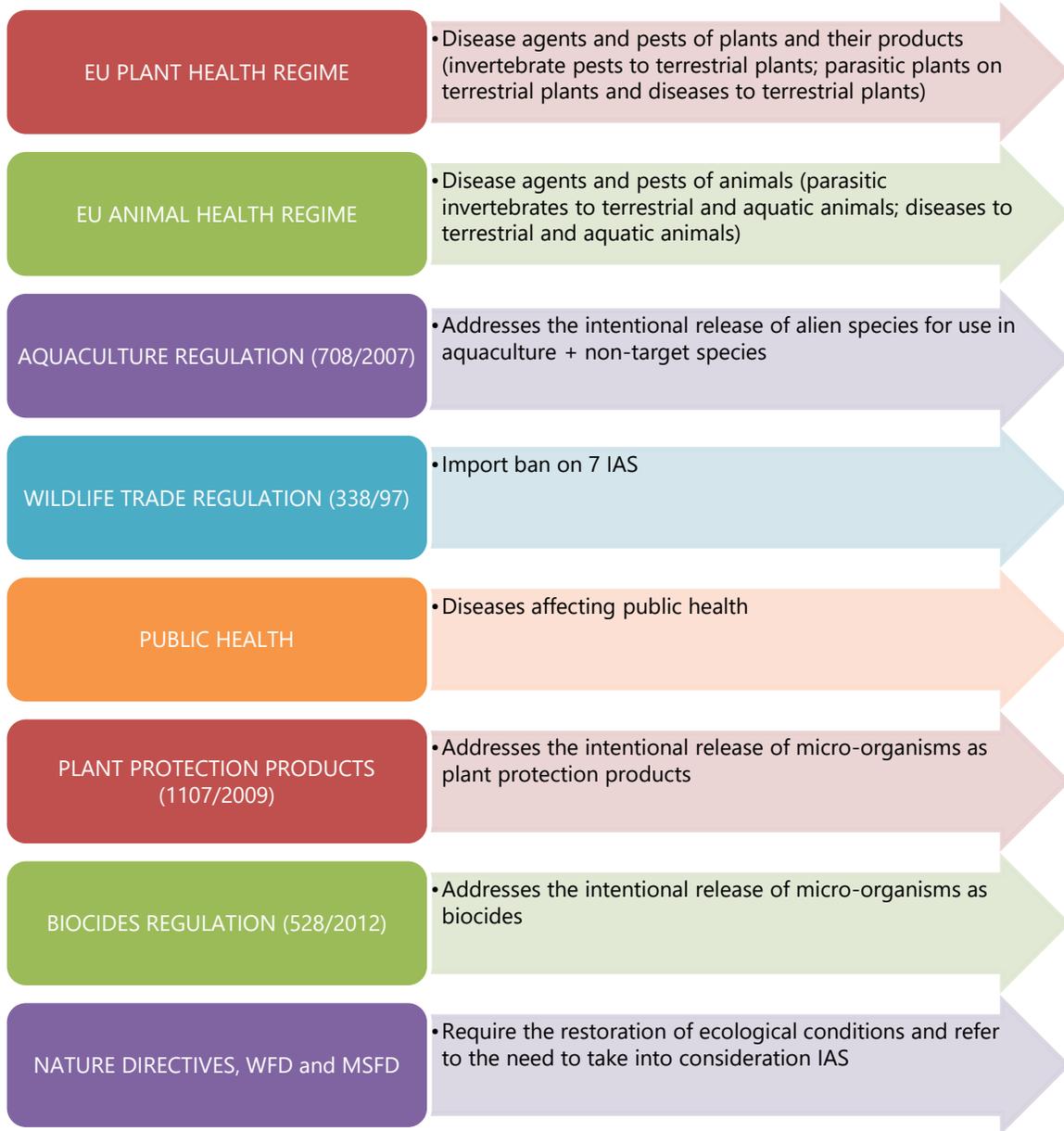


Figure 20 - IAS coverage in EU Legislation

2.2.1 EU Biodiversity Strategy to 2020

The Commission Communication on "Our life insurance, our natural capital: an EU biodiversity strategy to 2020" was adopted on 3 May 2011 and endorsed by the Council on 19 December 2011.²⁶² In this EU strategy, the spread of invasive species is seen as one of the continued and growing pressures in Europe that outweigh the benefits of combating biodiversity loss. The strategy in question also calls for more robust action taken at all levels to control IAS. Amongst the six targets defined in the strategy, **Target 5**. This states: '*By 2020, Invasive Alien Species (IAS) and their pathways are identified and prioritised, priority species are controlled or eradicated, and pathways are managed to prevent the introduction and establishment of new IAS*'. The accompanying actions address the need to strengthen the plant and animal health regimes (**Action 15**) and to establish a dedicated legislative instrument on IAS (**Action 16**). The results of the mid-term view of the Biodiversity Strategy have just been issued by the Commission on 2 October 2015.²⁶³ Positive progress is given vis-à-vis the implementation of Target 5 in view of the work achieved on the coming into force by EU level of the first comprehensive legal instrument dedicated to IAS and the adoption of the list of IAS of Union concern. Implementation by Member States of the EU Regulation will be the next step to advance this target.

2.2.2 EU Regulation on the prevention and management of the introduction and spread of invasive alien species

Following the adoption of the EU Biodiversity Strategy to 2020, the Commission launched, on 9 September 2013, a proposal for a dedicated legislative instrument on IAS. It was accompanied by a regulatory impact assessment of the options explored for building the legislative proposal.²⁶⁴ **Council Regulation (EU) No. 1143/2014** on the prevention and management of the introduction and spread of invasive alien species was subsequently published in the Official Journal on 4 November 2014 and came into force on 1 January 2015.²⁶⁵ It sets out rules to prevent, minimise and mitigate the adverse impacts of the introduction and spread, both intentional and unintentional, of invasive alien species (IAS) on biodiversity within the Union (**Article 1**). The EU Regulation on IAS is structured as follows:

- **Preamble** - This includes 38 paragraphs, which essentially describe the legal text of the Regulation.
- **Chapter I on General provisions** - This section sets out the subject matter (Article 1), the scope (Article 2), definitions (Article 3), and obligations for prioritising IAS of Union concern into a list (Article 4) to enable Union resources to be prioritised on the basis of risk assessments and scientific evidence (Article 5). Provisions on outermost regions (which would not apply to Malta) are defined in Article 6.

²⁶² Available at: <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52011DC0244&from=EN>

²⁶³ Available at: http://ec.europa.eu/environment/nature/biodiversity/comm2006/pdf/mid_term_review.pdf

²⁶⁴ Available at: http://ec.europa.eu/environment/nature/invasivealien/index_en.htm

²⁶⁵ Available at: <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014R1143&from=EN>

- **Chapter II on Prevention** - This section sets out the measures necessary to prevent the introduction into the Union and the introduction or release into the environment of IAS via: restrictions on IAS of Union concern (Article 7), permitting procedures for use of IAS of Union concern for research or *ex situ* conservation (Article 8), granting authorisations in exceptional cases for other uses (Article 9), adopting emergency measures for non-listed IAS (article 10), enabling enhanced regional cooperation of IAS of regional concern (Article 11), establishing national lists of IAS of Member concern to which Member States may apply certain provisions while remaining in line with the TFEU (Article 12), and by way of establishing action plans for priority unintentional pathways of introduction and spread of IAS of Union concern (Article 13).
- **Chapter III on Early detection and rapid eradication** - This section sets out the tools to ensure that IAS of Union concern can be detected early in the environment and at the Union borders via the adoption of surveillance systems (Article 14) and official controls (Article 15). It also describes the measures that are triggered when these IAS are detected, that is, by way of early detection notifications (Article 16), and rapid eradication (Article 17) with the possibility of derogating from this obligation (Article 18).
- **Chapter IV on Management of IAS that are widely spread** - This section sets out the obligations necessary to tackle IAS of Union concern that are already present in the Union or new ones that have evaded the prevention measures and early detection measures, and subsequently managed to spread widely. Obligations include management measures (Article 19) and restoration of damaged ecosystems (Article 20).
- **Chapter V on Horizontal Provisions** – This section includes provisions on costs recovery (Article 21), on cooperation and coordination (Article 22), and on enabling more stringent national rules by Member States (Article 23).
- **Chapter VI on Final provisions** - This section sets out reporting and review obligations (Article 24) and the legal tools needed to ensure implementation vis-à-vis an information support system (Article 25), public participation (Article 26), setting up a committee (Article 27) which is to be assisted by a scientific forum (Article 28), as well as other provisions on exercise of delegation (Article 29), enforcement via penalties (Article 30) and transitional provisions for non-commercial (Article 31) and commercial owners (Article 32) of IAS that are included in the list of Union concern. The final article deals with entry into force (Article 33).

Article 2 of the EU Regulation clarifies that the following are outside the **scope of the regulation**:

- genetically modified organisms as defined in Article 2 of Directive 2001/18/EC;²⁶⁶
- pathogens that cause animal diseases;²⁶⁷
- harmful organisms listed in Annex I or in Annex II to Directive 2000/29/EC, and harmful organisms for which measures have been adopted in accordance with Article 16(3) of that Directive;²⁶⁸
- species listed in Annex IV to Regulation (EC) No 708/2007 when used in aquaculture;²⁶⁹

²⁶⁶ Directive 2001/18/EC of the European Parliament and of the Council of 12 March 2001 on the deliberate release into the environment of genetically modified organisms and repealing Council Directive 90/220/EEC

²⁶⁷ for this purpose, animal disease means the occurrence of infections and infestations in animals, caused by one or more pathogens transmissible to animals or to humans;

²⁶⁸ Council Directive 2000/29/EC of 8 May 2000 on protective measures against the introduction into the Community of organisms harmful to plants or plant products and against their spread within the Community

²⁶⁹ Council Regulation (EC) No 708/2007 of 11 June 2007 concerning use of alien and locally absent species in aquaculture

- micro-organisms manufactured or imported for use in plant protection products already authorised or for which an assessment is on-going under Regulation (EC) No 1107/2009;²⁷⁰ and
- micro-organisms manufactured or imported for use in biocidal products already authorised or for which an assessment is ongoing under Regulation (EU) No 528/2012.²⁷¹

The main obligations that are accompanied with a **timeframe** are the following:

- *Submission of the List of IAS of Union concern by the Commission via implementing act* - 12 months (2 January 2016) of entry into force of this Regulation, and updated every six years;
- *Risk assessment by Member States of non-listed species subject to emergency measures* - carried out within 24 months from day of the adoption of the decision to introduce emergency measures;
- *Comprehensive analysis by Member States of the pathways of unintentional introduction* - within 18 months of the adoption of the list;
- *Establishment and implementation by Member States of Action Plans to address priority pathways* - within 3 years after the list is adopted, and reviewed at least every six yrs;
- *Establishment of Surveillance System by Member States* - with 18 months after the list is adopted
- *Member States to put in place functioning structures to perform official controls* - in place by 12 months from the date of entry into force of this Regulation;
- *Early detection notifications by Member States* - without delay in writing to the Commission;
- *Eradication measures by Member States* - within three months after the transmission of the early detection notification;
- *Derogations from rapid eradication* - decision to be made by Member State within 2 months of the detection;
- *Management measures for widely spread IAS* - by 18 months of an IAS being included on the list;
- *Reporting* - By 1 June 2019, and every six years thereafter;
- *Notification of national competent authorities* - one year following publication of Regulation;
- *Information support system* - By one year from the date of entry into force the system shall interconnect existing data systems on IAS; By four years of the entry into force (1 January 2020), it shall become a mechanism for exchanging information on other aspects of the application of this Regulation;
- *Penalties*: communicate national provisions to the Commission one year from date of entry; and
- *Selling and handing over of commercial stocks of listed species by commercial owners to authorised establishments*: up to two years after inclusion of the species in that list.

One of the rules applies a number of restrictions to **invasive alien species of Union concern** (Article 7). Such IAS of Union concern are specified in the list that adopted by the Commission via implementing acts (Article 4) and on the basis of risk assessments (Article 5). The Commission and Member States have embarked on negotiating the implementing acts and considering which species to include in the List of IAS of Union concern and its reviews. The list has been drawn up and further updated (see [Chapter 3](#) on species listing)²⁷² through implementing EU regulations: *Commission Implementing Regulation (EU) 2016/1141 of 13*

²⁷⁰ Regulation (EC) No 1107/2009 of the European Parliament and of the Council of 21 October 2009 concerning the placing of plant protection products on the market and repealing Council Directives 79/117/EEC and 91/414/EEC

²⁷¹ Regulation (EU) No 528/2012 of the European Parliament and of the Council of 22 May 2012 concerning the making available on the market and use of biocidal products

²⁷² Updates may be attained from http://ec.europa.eu/environment/nature/invasivealien/index_en.htm and the CIRCABC Library - <https://circabc.europa.eu>

July 2016 adopting a list of invasive alien species of Union concern pursuant to Regulation (EU) No 1143/2014 and Commission Implementing Regulation (EU) 2017/1263 of 12 July 2017 updating the list of invasive alien species of Union concern established by Implementing Regulation (EU) 2016/1141 pursuant to Regulation (EU) No 1143/2014. Malta has been attending the meetings of the Committee on Invasive Alien Species with agreed rules of procedure to discuss the implementing acts required by Regulation (EU) No. 1143/2014, as well as the meetings of the Scientific Forum on Invasive Alien Species in line with Article 28 of the Regulation (EU) No 1143/2014. This Regulation is addressed more in depth in [Chapter 3](#). The national Control of Invasive Alien Species of European Union Concern Regulation (S.L. 549.119) designates the competent authorities responsible for the implementation of the EU IAS Regulations, as well as provides penalties for infringements. Further national regulation on IAS are currently being drafted and these shall complement the provisions laid down under S.L. 549.119.

Addressing IAS in line with this EU Regulation has positive implications for the achievement of other EU legal obligations, such as the targets of the Birds and Habitats Directives (favourable conservation status), the Water Framework Directive (good ecological status) and Marine Strategy Framework Directive (good environmental status), as reviewed below.

2.2.3 Nature Directives and transposing domestic legislation

The Nature Directives consists of the Birds Directive (EEC **Directive 2009/147/EC**) and the Habitats Directive (EEC **Directive 92/43/EEC**); both underpin biodiversity policy in the EU. The Birds Directive provides a comprehensive protection regime for all wild bird species naturally occurring in the Union. The Habitats Directive, on the other hand, aims to maintain or restore, to a favourable conservation status, natural habitats of Community interest and species of wild fauna and flora of Community interest mainly through two pillars of activity: (1) the Natura 2000 network of protected sites and (2) a strict species protection regime.

Article 11 of the Birds Directive states: *'Member states shall see that any introduction of species of bird which do not occur naturally in the wild state in the European territory of the member states does not prejudice the local fauna and flora'*.²⁷³ The Conservation of Wild Birds Regulations, 2006 (S.L. 549.42) transpose the Birds Directive in Malta.²⁷⁴ Article 11 of the Directive is reflected in Regulation 10 sub-regulation 6 paragraph (p), which requires the National Ornithology Committee to *'recommend measures to the Minister to control and monitor that the introduction of any species of bird not occurring naturally in the wild state in the European territory of the Member States of the European Union does not prejudice the Maltese flora and fauna'*.

Article 22 of the Habitats Directive, states that in implementing the provisions of this Directive, Member States shall: *'ensure that the deliberate introduction into the wild of any species which is not native to their territory is regulated so as not to prejudice natural habitats within their natural range or the wild native fauna and flora and, if they consider it necessary, prohibit such introduction'*.²⁷⁵ The requirements of the Habitats Directive are transposed in the "Flora, Fauna and Natural Habitats Protection Regulations, 2006 S. L. 549.44). Alien species are addressed under "Part V – Introduction and Reintroduction of Species", specifically under

²⁷³ Available at: <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009L0147&from=EN>

²⁷⁴ Available at: <http://www.justiceservices.gov.mt/DownloadDocument.aspx?app=lom&itemid=11548&l=1>

²⁷⁵ Available at: <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:01992L0043-20070101&from=EN>

Regulation 28. Provisions under this Regulation address a number of issues related to the control of alien species including *inter alia* the possibility to regulate the importation and/or keeping of any species of flora and fauna, if deemed that such importation and/or keeping may harm or lead to the endangering of biodiversity of Malta; and the possibility to develop eradication or control plans and related programmes for established alien species, invasive species and those alien species with a potential to become established and subsequently invasive. The Competent Authority may issue guidelines on the keeping, monitoring, prevention, control, and eradication measures of established alien species. Regulation 28(3) enables the Competent Authority to compile and publish a list of those species that are invasive or deemed to be invasive to Malta. This provision is accompanied by the provisions of Regulations 28(4) and 28(5) which add that '*no person shall import and, or keep any species in the list mentioned in sub-regulation (3)*' and that '*no person shall deliberately release or attempt to release, maintain and, or in any way intentionally assist the establishment or potential establishment, of a species included in the list referred to in sub-regulation (3) hereof, into natural habitats without prior authorisation by the Competent Authority, or, allow the escape of such species into natural habitats as a result of negligence*'. At present the required list declaring which species are invasive under this Regulation is yet to be published. With respect to activities carried out in Natura 2000 sites, Regulation 18 provides restrictions on any operation or activity related to development, or any endeavour, which is envisaged to have an impact on biodiversity and the specialised areas of conservation. Written notice of the proposal of an activities or operation to be carried out needs to be sent to the Competent Authority who may consent or otherwise to the carrying out of such activity or operation. Consent may be accompanied by a set of conditions that need to be adhered to by the applicant (owner or occupier of the site in question). These provisions shall be complemented through additional national legislation on invasive alien species.

While both Birds and Habitats Directives contain provisions with explicit references to IAS, their implementation has not been coherent in the EU territory as revealed by the regulatory impact assessment that accompanied the proposal for an EU Regulation on IAS. Moreover as acknowledged in the regulatory impact assessment , '*Certain measures under the Directives may have unintended consequences for IAS: some alien species are currently listed for protection and as priority species for co-financing; certain species are protected in their whole current range although they are native only in part of the European range; some bird species alien to the whole of Europe are listed in the birds Directive and subject to the same protection/management and derogation provisions as naturally occurring species; for some habitat types, alien species are included in the EU Habitats Interpretation manual as characteristic species*'.²⁷⁶

As part of the **Regulatory Fitness and Performance Programme (REFIT)** initiated by the Commission, the Nature Directives are being subjected to a fitness check to assess whether they are "fit-for-purpose" in terms of criteria on effectiveness, efficiency, coherence, relevance and EU added value. A key input to the fitness check is the Commission's **State of Nature in the EU Report**, based on Member States' conservation status assessments of the species and habitat types protected by the two Nature Directives.²⁷⁷ The report was published on 20 May as COM (2015) 219 Final and also as EEA Report No 2/2015.²⁷⁸ Invasive alien species

²⁷⁶ Available at: <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52013SC0321>

²⁷⁷ Available at: <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52015DC0219&from=EN>

²⁷⁸ Available at: <http://www.eea.europa.eu/publications/state-of-nature-in-the-eu>

was one of the pressures and threats for which MS were required to report vis-à-vis the Directives. The publication of a Commission report on the results of the Fitness Check was published in March 2016.²⁷⁹

Another importance IAS-related issue of the EC Nature Directives is the designation and management of Natura 2000 sites. The Project "*Management Planning and Implementation of Communication measures for Terrestrial Natura 2000 Sites in the Maltese Islands*" which was co-funded by the European Agricultural Fund for Rural Development (EAFRD) and pioneered by the then MEPA, resulted in the establishment of 22 management plans and 8 conservation orders for the management of all terrestrial Natura 2000 sites in the Maltese Islands. Management objectives (MO) are defined for each terrestrial Natura 2000 site. Through these objectives, targeted conditions are to be achieved for key features in the protected area vis-à-vis Annex I habitats and Annex II species of the EC Habitats Directive. Each management objective is accompanied by one or more operational objectives (OP). The latter are found in the respective management plans or conservation orders. There are a number of OPs that deal with the removal of invasive alien species, such as at the following:

L-Inħawi tar-Ramla

OO8.1 - To protect the development of the structure and function of habitat 2210 by controlling the spread and density of *Arundo donax* through targeted rhizome removal.

OO10.1 - To protect natural development opportunities for habitat 2220 by controlling the spread and density of *Arundo donax* through targeted rhizome removal.

Is-Salini

OO12.4 - To take measures against invasive plant species.

Ix-Xagħra tal-Kortin

OO9.2 - To establish a rat eradication programme.

Il-Gzejjer ta' San Pawl (Selmunett)

OO9.2 - To establish a rat eradication programme.

Il-Magħluq tal-Baħar ta' Marsaskala

OO1.3 - To remove alien invasive species from the wetland.

OO2.3 - To remove the domestic waterfowl population and ensure that no more domestic fowl are introduced.

Rdumijiet ta' Malta: Ras il-Pellegrin sax-Xaqqa

OO10.1 - To eradicate/control alien and invasive species from habitats including 92A0

L-Inħawi tad-Dwejra u tal-Qawra

OO5.1 - To remove the alien fish species from habitat 3140.

Il-Ballut ta' Marsaxlokk

OO6.1 - To plan, implement and monitor an alien plant eradication programme

²⁷⁹ Available at:

http://ec.europa.eu/environment/nature/legislation/fitness_check/docs/study_evaluation_support_fitness_check_nature_directives.pdf

2.2.4 Other Nature Protection Legislation requiring the Control of Alien Species

Subsidiary environmental legislation is enacted under the legal vires of the **Environment Protection Act, 2016 (ACT No I of 2016)**, which makes provision for the protection of the environment and for the establishment under its Article 6 of the new **Environment and Resources Authority**, with its functions defined in Article 7. Under Article 31, the Minister responsible for the environment is required to refer the **National Strategy for the Environment** and the State of the Environment Report to the **Standing Committee on the Environment and Development Planning**. The National Strategy for the Environment is addressed in more detail under Article 45. The Strategy is intended to determine the policy framework for the preparation of plans, policies and programmes issued under this Act or under any other Act for the protection and sustainable management of the environment, including land and sea resources. Via Article 54, the Minister has powers to make regulations for the better carrying out of the provisions of this Act. IAS feature in the EPA, 2016 under this Article specifically under paragraph 2 (m) (iii) which states '*declare any species to be an invasive species and establish rules for its assessment, monitoring, control and/or eradication, and other prevention and management mechanisms to control the introduction and spread of such species*'. There is also mention of IAS under the Schedule on Article 58 (2), paragraph (a) (ix): '*manage invasive and alien species as may be prescribed*'.

Under the "Trees and Woodland Protection Regulations (S.L.549.123), the species included in **Schedule II** are deemed to be species causing damage to biological diversity of trees or woodlands in Malta, or to the natural environment in general.²⁸⁰ The species in question are *Acacia cyclops*, *Acacia saligna* [= *Acacia cyanophylla*], *Ailanthus altissima* [= *Ailanthus glandulosa*], *Casuarina* spp., *Eucalyptus camaldulensis* [= *Eucalyptus rostrate*], *Eucalyptus gomphocephala*, *Leucaena leucocephala* [= *Acacia leucocephala*; *Albizzia lebbek* auct. Fl. Melit], *Nicotiana glauca*, *Pittosporum tobira*, *Ricinus communis*, *Schinus terebinthifolius* and *Vachellia karroo* [= *Acacia karroo*; = *Acacia horrida* auct. Fl. Melit]. **Regulation 9, paragraph 2**, prohibits the propagation, sowing, import, export, transportation, selling, donating or exchanging any of these species.. Apart from these species, **Regulation 11** enables the Competent Authority to stop the transport and importation of trees, which may endanger the biological diversity of trees or woodlands in Malta, or other reasons as stated in the provision. In this respect, it should be noted that the species listed in the Regulations have all been proven to have an adverse impact on Maltese biodiversity. Such regulations are currently being amended in order to afford additional safeguards to trees in the Maltese Islands through: the protection of additional species; the extension of protection to cover trees within urban public open spaces and additional controls on harmful activities and invasive alien species.

The "Marine Mammals Protection Regulations, 2003" (S.L. 549.35) includes **Regulation 5 paragraph 1**. The latter prohibits the direct or indirect harm to any cetacean species mentioned in the schedule to this notice.

²⁸¹ Such harm may be caused by the introduction of an alien species into the Maltese Islands.

2.2.5 EU Environmental Liability Directive

²⁸⁰ Available at: https://era.org.mt/en/Documents/SL_549_123.pdf

²⁸¹ Available at: <http://www.justiceservices.gov.mt/DownloadDocument.aspx?app=lom&itemid=11538&l=1>

Directive 2004/35/EC (as amended by Directive 2006/21/EC, Directive 2009/31/EC and Directive 2013/30/EU) on environmental liability with regard to the **prevention and remedying** of environmental damage (ELD) establishes a framework to prevent and remedy environmental damage.²⁸² "Environmental damage" is defined as damage to protected species and natural habitats, damage to water and damage to soil. The liability framework is based on the **polluter pays principle**. This Directive is mentioned in Regulation (EU) No. 1143/2014 specifically in Article 21 on Cost Recovery. This reads: *'In accordance with the polluter pays principle and without prejudice to Directive 2004/35/EC of the European Parliament and of the Council, Member States shall aim to recover the costs of the measures needed to prevent, minimise or mitigate the adverse impact of invasive alien species, including environmental and resources costs as well as the restoration cost.'* Directive 2004/35/EC has been transposed into national law via the "Prevention and Remedying of Environmental Damage Regulations, 2015" (S.L. 549.97).²⁸³

2.2.6 EU and National Wildlife Trade Regulations

Council Regulation 338/97/EC on the protection of the species of wild flora and fauna by regulating trade therein deals with the import, export and re-export as well as internal EU trade in specimens of species listed in its four Annexes.²⁸⁴ The aim is for trade not to have a negative impact on the species' conservation. It does this by way of providing for procedures and documents required for such trade. This Regulation implements the requirements of CITES in the Union. It however also covers endangered EU species not threatened by international trade to ensure policy coherence with the afore-mentioned Nature Directives. **Commission Regulation (EC) No 865/2006, as amended** by Commission Regulation (EC) No 100/2008, Commission Regulation (EU) No 791/2012, Commission Implementing Regulation (EU) No 792/2012 and Commission Regulation (EU) 2015/56), lays down detailed rules for the implementation of Council Regulation (EC) No 338/97 and addresses practical aspects of its implementation.

Article 4(6)(d) of Council Regulation 338/97/EC establishes powers to restrict the introduction into the Community of live specimens of species for which it has been established that their introduction into the natural environment of the Community presents an ecological threat to wild species of fauna and flora indigenous to the Community. **Article 9(6)** establishes powers to prohibit or restrict the holding or movement of live specimens of species that are subject to import restrictions under Article 4(6). Since 1997, the following seven animal species have been banned for import (*i.e.* are included in **Annex B** to Council Regulation (EC) No 338/97): *Callosciurus erythraeus*, *Sciurus carolinensis*, *Oxyura jamaicensis*, *Lithobates (Rana) catesbeianus*, *Sciurus niger*, *Chrysemys picta*, and *Trachemys scripta elegans*. This Regulation however applies no restriction on their intra-EU movement/holding, no provisions ensuring early warning or rapid response in case of detection of such species in the environment, and no provision on management aspects. These species were automatically included in the List of IAS of Union concern through *Commission Implementing Regulation (EU) 2016/1141 of 13 July 2016 adopting a list of invasive alien species of Union concern pursuant to Regulation (EU) No 1143/2014* and in this respect the provisions under Council Regulation (EU) No. 1143/2014 apply.

²⁸² Available at: <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02004L0035-20130718&from=EN>

²⁸³ Available at: <http://www.justiceservices.gov.mt/DownloadDocument.aspx?app=lom&itemid=11562&l=1>

²⁸⁴ Available at: <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31997R0338&from=EN>

The “Trade in Species of Fauna and Flora Regulations, 2004” (S.L. 549.38) transposes the EU Wildlife Trade Basic and Implementing Regulations into national law.²⁸⁵ Consequently the import, export and re-export is regulated by a certification procedure and system of national permitting in line with the EU and CITES. Regulation 6(1) enables the **CITES Scientific Authority and Management Authority** to advise the Minister responsible for the environment to prohibit the import, export, re-export and possession of any species of fauna or flora, if, in the opinion of the said authorities, such transactions or possession would endanger the biological identity of any ecosystem or any species of flora or fauna in Malta. Regulation 6(2), on the other hand, places the responsibility on ‘... *the person, who is seeking to import or is in possession of any live specimen, to obtain the necessary information from the Management Authority...*’, in order to establish whether such specimen is of any species referred to in Regulation 6(1). The Environment and Resources Authority is the CITES Management Authority for Malta. The Authority issues CITES permits and certificates for the import, and export/re-export of CITES listed species in accordance with Legal Notice 236 of 2004, as amended, and on the advice of the CITES Scientific Authority. The latter is composed of individuals with appropriate qualifications and expertise.

2.2.7 Water Framework Directive (WFD) and transposing domestic legislation

The “**Directive 2000/60/EC** on establishing a framework for the Community action in the field of water policy” (otherwise known in short as the Water Framework Directive or WFD) deals with the protection of inland surface waters, transitional waters, coastal waters and groundwater. It does this by laying down a comprehensive framework of measures for each river basin district.²⁸⁶ The WFD defines three types of objectives: “**Good Ecological Status**” in surface waters, “**Good Chemical Status**” for groundwater and surface waters, and “**Good Quantitative Status**” for groundwater bodies. The following timelines are set under the WFD:

- Achieving good status for all water bodies by 2015; and if this is not possible, aim to achieve good status by 2021 or 2027;
- The reduction and progressive removal of hazardous pollutants and priority substances into the aquatic environment within a 20 year time frame from the date of adoption of the WFD; and
- The achievement by 2015 of all objectives and compliance with relevant threshold values for areas that are protected under other European directives.

The WFD provides for indicators to assess and monitor water status (Article 8 and Annex 5). The provisions of the WFD do not make explicit reference to IAS. IAS can however undermine the achievement of good ecological status by altering biological elements, such as taxonomic composition and abundance, and physico-chemical elements supporting the biological elements, apart from detracting from naturalness.

The WFD is transposed nationally by the “Water Policy Framework Regulations, 2015” (S.L. 549.100), with administration entrusted to two designated national competent authorities –the Ministry for Energy and Water Management and Environment and Resources Authority).²⁸⁷ The Water Framework Directive requires each Member State to regularly update its River Basin Management Plan for each River Basin District within its territory. Since there are no rivers in the Maltese islands, the River Basin Management Plan has been

²⁸⁵ Available at: <http://www.justiceservices.gov.mt/DownloadDocument.aspx?app=lom&itemid=11541&l=1>

²⁸⁶ Available at: <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32000L0060&from=EN>

²⁸⁷ <http://www.justiceservices.gov.mt/DownloadDocument.aspx?app=lom&itemid=10683&l=1>

renamed to Water Catchment Management Plan (WCMP). Furthermore, due to the small size of the islands, the Water Catchment District is considered to encompass the three islands of Malta, Gozo and Comino, and consists of all hydrological sub-catchments, coastal waters up to one nautical mile from the baseline and all ground waters.

The second Water Catchment Management Plan, adopted in April 2016, updates Malta's first WCMP issued in 2010, and continues to develop the Programme of Measures required to achieve the environmental objectives set under the first plan. The WCMP mentions invasive alien species as one type of biological pressure having an impact on biological resources within the context of surface waters.

The second Water Catchment Management Plan identifies management measures for surface waters that are intricately linked to the Natura 2000 Management Plans and the water-related measures that were defined therein. The measures cover:

- Monitoring programmes for specific protected water-dependent habitats and species;
- Elaboration of action plans for the protection of Red Data Book water-dependent species;
- Undertaking regular water quality monitoring;
- Carrying out studies related to the hydrological regime of specific watercourses and transitional waters;
- Measures to assist in achieving compliance with the Code of Good Agricultural Practice and the Nitrates Action Programme.

In addition to the measures extracted from the Natura 2000 management plans, additional measures that are considered to be necessary include the development of a strategic framework for integrated valley management and measures related to dealing with emergency response situations within environmentally sensitive terrestrial areas.

Bearing in mind that the conservation status of water-dependent species and habitats requires good water quality as well as the need to adequately conserve water bodies within protected areas, a national register is available of protected areas that are covered by the WFD in Malta. The register not only comprises areas designated for the protection of habitats or species but also includes waters used for the abstraction of drinking water, recreational waters and nutrient sensitive areas. The water register incorporates the following water-dependent protected habitat types:

- Habitats that occur entirely within surface water systems, such as watercourses (*e.g. Baħrija, and Wied Il-Luq*);
- Habitats that depend on the frequent inundation of coastal waters, such as transitional marshlands and wetlands (*e.g. Is-Salini, Il-Magħluq ta' Marsascale and Il-Ballut ta' Marsaxlokk*), and
- Habitats that depend on a connection with percolating water, such as permanent freshwater pools (*Il-Qattara and L-Għadira ta' Sarraflu*).

2.2.8 Marine Strategy Framework Directive (MSFD) and transposing domestic legislation

Directive 2008/56/EC establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive) requires Member States to take the necessary measures to achieve or maintain **good environmental status (GES) in the marine environment** by the year 2020 at the latest.²⁸⁸ Actions should be based on the principles of preventive action, rectification of environmental damage at source and the polluter pays principle. GES means *'the environmental status of marine waters where these provide ecologically diverse and dynamic oceans and seas which are clean, healthy and productive within their intrinsic conditions, and the use of the marine environment is at a level that is sustainable, thus safeguarding the potential for uses and activities by current and future generations, i.e.:*

(a) the structure, functions and processes of the constituent marine ecosystems, together with the associated physiographic, geographic, geological and climatic factors, allow those ecosystems to function fully and to maintain their resilience to human-induced environmental change. Marine species and habitats are protected, human-induced decline of biodiversity is prevented and diverse biological components function in balance;
(b) hydro-morphological, physical and chemical properties of the ecosystems, including those properties which result from human activities in the area concerned, support the ecosystems as described above. Anthropogenic inputs of substances and energy, including noise, into the marine environment do not cause pollution effects'.

Annex I to the MSFD lists 11 qualitative descriptors to support the determination of GES at sea (which are also referred to in Articles 3(5), 9(1), 9(3) and 24). Amongst these is the **descriptor 2** *'Non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystems'*. The **Commission Decision (EU) 2017/848** specifies the criteria to be used by the Member States to assess the extent to which GES is being achieved, accompanied with references to applicable methodological standards where available, as set out in the Annex to this Decision.²⁸⁹ The criteria for assessing descriptor 2 are the following:

- Criterion 2.1 Newly-introduced non-indigenous species.
- Criterion 2.2 Established non-indigenous species, particularly invasive non-indigenous species, which include relevant species on the list of invasive alien species of Union concern adopted in accordance with Article 4(1) of Regulation (EU) No 1143/2014 and species which are relevant for use under criterion D2C3
- Criterion 2.3 Species groups and broad habitat types that are at risk from non-indigenous species, selected from those used for Descriptors 1 and 6.

The MSFD has been transposed into domestic law via the "Marine Policy Framework Regulations, 2011" (S.L. 549.62) enacted under the auspices of the Environment Protection Act (CAP. 549), the Territorial Waters and Contiguous Zone Act (CAP. 226), the Continental Shelf Act (Cap. 194), the Fishing Waters (Designation) and Extended Maritime Jurisdiction Act (CAP. 479), the Fisheries Conservation and Management Act (Cap. 425), the Authority for Transport in Malta Act (Cap. 499) and Malta Resources Act (CAP. 423).²⁹⁰ The Competent Authority is the Office of the Prime Minister (OPM). In accordance with these regulations, other entities may be designated as the Competent Authority for different provisions and different purposes of these regulations. Within this context, OPM has entrusted the Environment & Resources Authority (ERA) with the

²⁸⁸ <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32008L0056>

²⁸⁹ Commission Decision of 1 September 2010 on criteria and methodological standards on good environmental status of marine waters

²⁹⁰ Available at: <http://www.justiceservices.gov.mt/DownloadDocument.aspx?app=lom&itemid=11632&l=1>

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technical implementation of the Directive. In January 2012, OPM, whilst retaining its role as Competent Authority, delegated its tasks to the Ministry responsible for the Environment.

As part of the first implementation cycle, Malta has defined Good Environmental Status (GES) for Malta's marine waters. Within the context of NIS the GES is '*The introduction and establishment of new invasive non-indigenous species as a result of human activities is, in so far as practicable prevented.*' Environmental targets were also elaborated as follows::

- Efforts are undertaken to detect the occurrence of new NIS in defined assessment areas and to address gaps in knowledge on non-indigenous species, particularly invasive NIS.
[Applies to: non-indigenous species in general, particularly those species that exhibit characteristic of invasiveness elsewhere in the Mediterranean or which have already been identified to be invasive in Malta.]
- Evaluate the effectiveness of current measures in relation to non-indigenous species, in the light of increasing knowledge on such species through proposed interim MSFD target to address current knowledge gaps, and take such measures further if necessary.
[Applies to: existing measures related to the control of NIS introduction]

Malta acknowledges the need for updating both the GES descriptors and environmental targets articulated to date, and where necessary, elaborate further targets on the basis of data and information that will be generated through the implementation of a **marine monitoring programme**.

2.2.9 EU and National Plant Health Regimes

The EU plant health regime establishes protective measures against the introduction into the EU and the intra-EU spread of organisms harmful to plants or plant products. One of the main pieces of legislation in place was "**Council Directive 2000/29/EC** on protective measures against the introduction into the Community of organisms harmful to plants or plant products and against their spread within the Community".²⁹¹ This Council Directive includes species listings in its annexes for which specific control measures should be applied by Member States. Plants, plant products and other objects which are potential carriers of harmful organisms are listed in Part A of Annex V of Directive 2000/29/EC. The EU plant health regime is however under revision to take account of emerging threats linked to globalisation and climate change, consistent with key international instruments, notably the IPPC. The scope of the revised plant health law will cover harmful organisms (any species, strain or biotype of plant, animal or pathogenic agent injurious to plants or plant products). The Regulation (EU) 2016/2031 on protective measures against pests of plants came into force in December 2016 and repealed partially Directive 2000/29/EC. Invasive plants other than parasitic plants (physically feeding on host plants) are excluded from the scope, in line with the outcome of the impact assessment that accompanies the proposal. However, it is intended that it will be complementary to Council Regulation (EU) No. 1143/2014. This Directive is transposed into Maltese law via the "Plant Quarantine (Harmful Organisms) Regulations, 2004 (S.L. 433.03).

²⁹¹ Available at: <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02000L0029-20140630&from=EN>

The Plant Protection Directorate within the Ministry for the Environment, Sustainable Development and Climate Change (MESDC) is the Maltese National Plant Protection Organisation (NPPO) as foreseen in the International Plant Protection Convention (IPPC) and the European Union's legislative provisions. It is entrusted with the role of promoting quality **phytosanitary standards** in the country and for adopting and implementing phytosanitary regulations, the marketing of seeds and other plant propagation material and the conservation of local genetic resources.²⁹² The Plant Protection Directorate is composed of different functions covering: Plant Health Diagnostics; Monitoring and Control; Scientific and Technical Co-ordination within the Directorate; Seeds and Other Propagation Material; Surveillance and Inspectorate; and Facilities, Management and Maintenance. The diagnostic laboratories are equipped to carry out a number of tests enabling the identification of plant diseases. The Plant Protection Directorate conducts surveillance activities according to an annual Work Plan and implements an annual Pest Survey Programme to monitor the status of a list of pests.

Inspections are carried out at local nurseries and retail outlets for any presence of harmful organisms and also to determine whether these entities are complying with local and EU legislation. Plants and plant products are checked for **plant passports** and also checks are carried for the necessary documentation. The Directorate will conduct inspections as of 2020 at the **Border Inspection Post** to inspect against the introduction of harmful organisms (HO) to plants and plant products in connection to the Regulation (EU) 2016/2031 and the Plant Quarantine Act (see below). Therefore, these inspections are only limited, and do not cover the pathways of unintentional introduction and the spread of invasive alien species (unless these are not harmful organisms).

Any non-compliant imports of plants and plant material are notified to the EU by using the **Europhyt Database**.²⁹³ This database is accessible to all national plant protection organisations and to the country of Export depending on the imports. This notification database is also used to notify any non-compliance related to the movement of plant and plant products from other Member States. Other means of notification, especially about the presence of harmful organisms, are also made to the EU Commission. The detection of harmful organisms is also notified to EPPO and the IPPC.

The national plant health regime is governed by the **Plant Quarantine Act** (CAP. 433)²⁹⁴ and subsidiary legislation thereto. The aim of this Act is essentially the prevention of the introduction into Malta of **plant pests and diseases**, and the control of their spread. This Act provides for *inter alia*:

- the carrying out of inspections of cultivated plants, plant products in storage or in transit, and consignments;
- the disinfection of plants and plant products and their packaging material, containers and transport facilities;
- the issuance of phytosanitary certificates for exporting and re-exporting consignments and local passports similar to those used by EU member states;
- the periodic update and issuance of a list of species whose importation in Malta is prohibited;
- the distribution of information on plant pests and ways to control them;

²⁹² Available at: https://agriculture.gov.mt/en/phd/Pages/about_us.aspx

²⁹³ Available at: <http://ec.europa.eu/idabc/en/document/2267/5926.html>

²⁹⁴ Available at: <http://www.justiceservices.gov.mt/DownloadDocument.aspx?app=lom&itemid=8899&l=1>

- the promotion of integrated pest management, and
- the undertaking of research and surveys.

Through this Act, a **Plant Protection Board** has been set up to discuss phytosanitary matters that are of concern to Malta and to review the state of plant quarantine in Malta on the formulation of policies (Article 4). The Board includes representatives from the Plant Protection Directorate, University of Malta, Public Health Department, the Environment & Resources Authority, the Malta Competition and Consumer Affairs Authority, the Occupational Health and Safety Authority and the Department of Agriculture.

With respect to import, Article 6 requires import into Malta of any plant material, plant pest, beneficial organism, soil or packaging material to be done only in accordance with this Act. When imported, goods should pass through a designated point of entry and the importer should declare the goods by presentation of prescribed import permits and certificates submitted for inspection (Article 7). Article 10 provides legal power to seize any plant and its container suspected of harbouring a pest. Via Article 13 the introduction, sale, cultivation, propagation or movement of any plant material, plant pest, beneficial organism, soil, packaging or any other thing capable of harbouring or spreading a plant pest may be prohibited or restricted. The inspector responsible for administrative enforcement in compliance with the provisions of this Act can demand to examine and perform routine sampling of imported goods to see whether the regulations within this act where abided to by the importer as stated by Article 18. Part V of the Act deals with provisions on eradication and control. Under Article 20, a plant pest may be declared to be “**a notifiable plant pest**” if it presents, or is likely to present, a threat to the production of, or trade in, plant materials or, to the natural environment and, if it is either not known to be established in Malta or is established in Malta, but is subject to eradication or containment measures. Pursuant to Article 21, areas in Malta infested or suspected of being infested with any plant pest are declared to be an infested area and measures are prescribed for that area whether vis-à-vis treatment or quarantine.

The Plant Quarantine Act is accompanied by numerous pieces of subsidiary legislation including amongst others:²⁹⁵

- the “Plant Quarantine (Harmful Organisms) Regulations, 2004” (S.L. 433.03) – The main aspects of the Legislation include: (i) Prohibition on importation and movement, (ii) Phytosanitary controls of production and movements of plant material within (iii) Provisions relating to plant passports, (iv) Official measures, (v) Protected zones, (vi) Requirements for importation/export of regulated plants, plant products and other objects, (vii) Phytosanitary certificates and phytosanitary certificates for re-export, (viii) Conditions for the introduction into Malta of certain harmful organisms, plants and plant material for trial and scientific purposes by any scientific institutions (ix) Enforcement, (x) Issue of guidelines, and (xi) Offences. Regulation 4 lays down prohibitions on introduction into Malta and movement within Malta for:
 - the harmful organisms or plants, plant products or other objects contaminated with the harmful organisms listed in Part A of Schedule I;
 - the plants and plant products listed in Part A of Schedule II, where these are contaminated by harmful organisms from a third country;
 - the plants or plant products listed in Part A of Schedule III; and

²⁹⁵ A full list is available from: <http://www.agric.gov.mt/acts-legal?l=1>

- the plants, plant products and other objects listed in Part A of Schedule IV, unless they satisfy the requirements specified:

Under Regulation 20, the importation into Malta or movement and use within the country of prohibited harmful organisms, regulated articles and every development stage of other viable harmful organism listed in Schedules I to V may be allowed for trial and scientific purposes and for work on varietal selection (research) if the general requirements specified in Part A of Schedule XI are met.

Regulation 13 covers “**protected zones**” where prohibitions of introduction and spread apply for:

- harmful organisms listed in Part B of Schedule I;
 - plants and plant products listed in Part B of Schedule II, where they are contaminated by the relevant harmful organisms listed therein;
 - plant material listed in Part B of Schedule III;
 - plants, plant products and other objects listed in Part B of Schedule IV, unless the relevant special requirements indicated in that part of the Schedule are met;
 - plants, plant products and other objects listed in Section II of Part A of Schedule V, and seeds mentioned in regulation 5(a), unless a plant passport valid for that zone is attached to them.
- “Plant Quarantine (National Certification Scheme) Regulations, 2005” (S.L. 433.18) – These make provisions with regards to certification in order to: (a) regulate the production, marketing and control of propagation material of vegetables (excluding seeds), fruit trees, vines and ornamental plants, and (b) improve the sanitary qualities of propagation material of vegetables (excluding seeds), fruit trees, vines and ornamental plants and other reproductive vegetative species; establishes a **National Certification Service** (made up of the Plant Health Service and the Seeds and other Propagation Material Unit) with the aim to regulate the certification of the various vegetatively propagated species and is responsible inter alia for the verification of the sanitary status (i.e. virus free and virus tested) of the mother plants and propagation material during each certification phase according to the technical protocols established for each species or group of species.²⁹⁶

In addition there are specific regulatory instruments to address plant pests that are also deemed to be invasive species such as:

- “*Tuta absoluta* (Control) Regulations” (S.L. 433.26) – lay down the measures to be taken control and contain the tomato leaf miner moth (*Tuta absoluta*)²⁹⁷, and
- “Control of the Red Palm Weevil Regulations, 2009” (S.L. 433.24) – deal with measures to be taken to control and contain the red palm weevil [*Rhynchophorus ferrugineus* (Olivier)] and to prevent it from spreading and the implementation of Commission Decision (2007/365/EC) of 25th May 2007 on emergency measures to prevent the introduction into and the spread within the Community of *Rhynchophorus ferrugineus* (Olivier), and Commission Decision 2010/467/EU as regards susceptible plants and the measures to be taken in cases where *Rhynchophorus ferrugineus* (Olivier) is detected.²⁹⁸

²⁹⁶ Available at: <http://www.justiceservices.gov.mt/DownloadDocument.aspx?app=lom&itemid=10839&l=1>

²⁹⁷ Available at: <http://www.justiceservices.gov.mt/DownloadDocument.aspx?app=lom&itemid=10847&l=1>

²⁹⁸ Available at: <http://www.justiceservices.gov.mt/DownloadDocument.aspx?app=lom&itemid=10845&l=1>

'Control of *Xylella fastidiosa* (Wells et a.) Regulations' (S.L. 433.29) which provides measures to control and contain *Xylella fastidiosa* and to prevent it from spreading and the implementation of Commission Implementing Decision (EU) 2015/789 of 18 May 2015 as regards measures to prevent the introduction into and the spread within the Union of *Xylella fastidiosa* (Wells et al.) and its amendments. The Competent Authority draws up eradication plans, control plans, surveys and contingency plans aimed at monitoring, preventing and controlling the introduction of harmful pests on plants in order to eradicate, contain and control pests, which are already established in the Maltese islands and prevent the entry of harmful organisms, which are not present in Malta. The Competent Authority may issue guidelines on the keeping, monitoring, prevention, eradication and control measures of established harmful organisms.

Phytosanitary implementation measures are ongoing. These include:

- obligatory surveys within the Maltese territory by the Plant Protection Directorate;
- as from 2020, inspections and surveys in Natura 2000 sites, public areas, public gardens, border inspections posts, on consignments, nurseries, agricultural land, warehouses in accordance to Regulation (EU) 2016/2031 and the Plant Quarantine Act;
- designing action and contingency plans, and pest risk analyses for any quarantine pests found in the Maltese Islands;
- eradication measures for quarantine pests found in the Maltese territory;
- preventive measures, such as the installation of pheromone traps at border inspection posts for the vector *Monochamus*, which can carry the quarantine pest – pine wood nematode;
- dissemination of information via seminars, leaflets, radio, TV, website etc.;
- use of EU funds in particular Regulation (EU) 652/2014 the management of expenditure relating to the food chain, animal health and animal welfare, and relating to plant health and plant reproductive material; and
- Training abroad of staff in relation to Better Training for Safer Foods (BTSF), European and Mediterranean Plant Protection Organisation (EPPO) workshops, COST and Diagnostic Procedures.

2.2.10 EU and National Animal Health Regimes

The EU Animal Health Regime focuses on prevention and provides an integrated approach to animal health and welfare. Similar to the Plant Health Regime, the EU Animal Health Regime is also under revision with the intention of establishing a simplified regulatory framework for improved coordination. The European Parliament and the Council adopted a Regulation on transmissible animal diseases ("Animal Health Law") in March 2016, which supports risk-based prioritisation of EU interventions, improved border and on-farm biosecurity, and, improved science, innovation and research.²⁹⁹ The regime aims to cover the **health of all animals in the EU**, including wild animals. Recital 21 of the Regulation states '*Animal diseases may have detrimental effects on the distribution of animal species in the wild, and thus affect biodiversity. Microorganisms causing such animal diseases can therefore be considered as invasive alien species within the framework of the United Nations Convention on Biological Diversity. The measures provided for in this Regulation also take account of biodiversity and thus this Regulation should cover animal species and disease*

²⁹⁹ Available at: http://ec.europa.eu/food/animal/docs/ah-law-proposal_en.pdf

agents, including those defined as invasive animal species, which play a role in the transmission of, or are affected by, diseases covered by this Regulation. The Regulation however does not address environmental risks associated with the import, release and/or escape of alien animals. The revised animal health framework would still contribute to IAS prevention by providing a basis to regulate import and intra-EU movement of **animals that are vectors of diseases** that could affect native biodiversity. Import restrictions do not apply to captive-bred species reared or kept in captivity for breeding or re-stocking supplies of game; birds imported for approved conservation programmes; pets accompanying their owner; or birds imported for zoos or experiments.

The Food and Veterinary Regulation Directorate within MESDC is responsible for implementing the “**Animal Welfare Act**” (CAP. 439), and the “**Veterinary Service Act**” (CAP. 437).³⁰⁰ The former provides for the protection of the life of animals and the prevention and punishments of acts of ill-treatment in their regard. The Veterinary Services Act on the other hand deals mainly with zoosanitary measures to prevent the introduction and spread of diseases associated with animals and produce of animal origin. Provisions for the movements of live animals and germinal products, and import conditions relating to live animals and germinal products are dictated by Articles 8 and 9, respectively. Importation of live animals and animal products likely to constitute a danger to animal or human health can be refused authorisation for free circulation in Malta as imposed by Article 16 of this Act, which also enables the Minister to prescribe regulations for the approval of border inspection posts in Malta.

Regulation (EU) 2017/625 defines the arrangements for the external border checks and for the internal movement of live animals from third countries. All consignments of live animals from a third country are subject to the **veterinary checks** carried out at border inspection posts by the competent authority under the responsibility of the official veterinarian as required by this Directive before they can be introduced into the European Union (EU). These checks include:

- a documentary check: verification of the certificates or veterinary documents accompanying each consignment of animals;
- an identity check: verification by visual inspection only for consistency between the documents or certificates and the animals and for the presence and conformity of the marks, which must appear on the animals;
- a physical check: a check of the animal itself, possibly including sampling and laboratory testing and, where appropriate, additional checks during quarantine.

Commission Decision 97/794/EC provides specific provisions with respect to these checks.) Veterinary checks in respect of animals from third countries entering the European Community via border inspection posts situated on the territory of Malta are carried out by the Veterinary Services Authority in accordance with ‘Principles Governing the Organisation of Veterinary Checks on Animals Entering the Community from Third Countries via Border Inspection Posts of the Territory of Malta Regulations, 2003’ (S.L. 437.40). A system is also in place for controlling importation of animals from non-EU countries. An **import license**, issued by the Trade Services Directorate in accordance with Regulation 3 of the “Importation Control regulations, 2004” (S.L. 117.14) is required before animals listed in Schedule II of the said regulations, can be imported from non-EU countries.³⁰¹

³⁰⁰ Available at: <http://www.justiceservices.gov.mt/DownloadDocument.aspx?app=lom&itemid=8903&l=1>

³⁰¹ Available at: <http://www.justiceservices.gov.mt/DownloadDocument.aspx?app=lom&itemid=9290&l=1>

The 'Protection of Animals offered in Pet Shops (Minimum Standards) Regulations, 2014' (S.L. 439.16) issued in July 2013 include the concept of contingency with regards to escapees and in cases of emergency.³⁰²

"**Owning and Keeping of Dangerous Animals Regulations, 2016**" lay down the procedures for the registration as keeper and the proper keeping of dangerous animals in Malta³⁰³ Regulation 4 (9) states '*No person shall deliberately release or attempt to release a dangerous animal falling within the ambit of these regulations into the environment or otherwise dispose of any such dangerous animal in his possession.*'

2.2.11 Zoos Directive

Council Directive 1999/22/EC relating to the keeping of wild animals in zoos lays down provisions for the **licensing and inspection of zoos** by Member States.³⁰⁴ Such requirements are specified in Article 4. The intended aim is to protect wild fauna, to conserve biodiversity, and to strengthen the role of zoos in the conservation of biodiversity (Article 1). The licensing and inspections are meant to ensure that all zoos meet the requirements of Article 3 vis-à-vis the mentioned **conservation measures**, which are complementary. One of the conservation measures to be implemented is that of '*preventing the escape of animals in order to avoid possible ecological threats to indigenous species and preventing intrusion of outside pests and vermin*' (Article 3). Hence existing zoo licenses also include measures for the control of escapees. The EC Zoo Directive is transposed into Maltese law via "The Keeping of Wild Animals in Zoos Regulations, 2003" (S.L. 439.08) under the Animal Welfare Act (CAP. 439).³⁰⁵

The European Commission recently published in July 2015 an **EU Zoos Directive Good Practice Document**. The purpose of the document is '*to summarise the current state of knowledge and highlight good practices to support practitioners and Member States with a view to helping them achieve the overall objective of strengthening the role of zoos in the conservation of biodiversity.*' Article 3, fourth indent on preventing escape and the intrusion of pests and vermin, is addressed in Section 2.5 of the best practice document. This section refers specifically to alien and invasive species and to Regulation 1143/2014.

2.2.12 Official Controls Regulation

Regulation (EU) 2017/625 aims to provide a legal framework applicable to official controls, and to promote an integrated approach to official controls across the entire agri-food chain, amongst others.

Regulation (EU) 2017/625 of the European Parliament and of the Council establishes the framework for official controls and other official activities to verify the correct application of Union food law and feed law. That framework includes official controls performed on animals and goods entering the Union from third countries through designated border control posts (BCP). The competent authorities of the BCP must be able to plan and perform official controls and other official activities in timely and effective manner. This regulation lays down the detail rules on minimum requirements for BCP in order to take account to specific

³⁰² Available at: <http://www.justiceservices.gov.mt/DownloadDocument.aspx?app=lom&itemid=12084&l=1>

³⁰⁴ Available at: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:1999:094:0024:0026:EN:PDF>

³⁰⁵ Available at: <http://www.justiceservices.gov.mt/DownloadDocument.aspx?app=lom&itemid=11047&l=1>

features and logistic needs related to the performance of official controls and to the application of certain measurements on non-compliant consignments of animals and goods entering the Union.

2.2.13 Regulation on the use of alien and locally absent species in aquaculture

Council Regulation (EC) No 708/2007 concerning use of alien and locally absent species in aquaculture establishes a dedicated legal framework to limit the environmental risks related to the **movement of alien species (introductions) or locally absent species (translocations) for their use in aquaculture** in the EU. The Regulation covers all aquatic species, including any part that might survive and reproduce, as well as to all types of aquacultural installation, though in particular to closed aquaculture facilities. It also covers environmentally harmful non-target species moved with introduced or translocated organisms, excluding disease-causing organisms, which are regulated under the Animal Health Regime.

The Regulation does not cover translocations within Member States except if there is a risk to the environment, nor to pet shops, garden centres or aquaria where there is no contact with EU waters. Member States must take all appropriate measures to avoid adverse effects on biodiversity resulting from the movement of aquatic organisms for aquaculture purposes and from the spreading of those organisms by **monitoring and carrying out inspections of aquaculture activities** to make sure that closed aquaculture facilities comply with the requirements laid down by this Regulation, and, transport to or from such facilities takes place under conditions which prevent the escape of alien species or non-target species. Movement is subject to the issue of a permit by the receiving Member State. The Regulation introduces a list of alien species that can be released without a permit (effectively a list of permitted species). Malta makes use of local stock only for aquaculture purposes.

Malta's national fisheries and aquaculture policy is built on the provisions of the **Fisheries Conservation and Management Act** (CAP. 425) and subsidiary legislation 425.12 'Aquaculture Operations Regulations' of 2017. This Act *inter alia* covers the conservation of naturally occurring fish stocks and the regulation of the conduct of fishing operations including aquaculture and operations ancillary thereto. The Competent Authority responsible to oversee to the implementation of this Act and subsidiary legislation issued under its auspices is the Department of Fisheries and Aquaculture.

In the "Aquaculture Operations Regulations, 2017"³⁰⁶ (S.L. 425.12), Regulation 10 stipulates that in case of *"use of alien and locally absent species in aquaculture the operator shall be responsible to perform the environmental risk assessment referred to therein and shall bear the applicable costs related thereto."* Additionally, the Director is responsible for ensuring that all obligations within Council Regulation (EC) No 708/2007 of 11 June 2007 concerning use of alien and locally absent species in aquaculture. For this purpose, the Director may issue binding instructions to operators, provided that such instructions are reasonable, proportionate and effective.

The 'Enforcement of Sea Fishing Conventions Order, 2011' (S.L. 425.08) deals with the enforcement of restrictions and obligations relating to sea fishing in Conventions to which Malta is a Party, to provide for infringements of such conventions to constitute an offence against the Fisheries Conservation and

³⁰⁶ Available at: <http://www.justiceservices.gov.mt/DownloadDocument.aspx?app=lom&itemid=12668&l=1>

Management Act and to establish the applicable penalties (Article 2).³⁰⁷ These regulations apply to the conventions related to sea fishing listed in the Schedule and any amendments thereto. The schedule included under part (A) European Union Legislation, which comprises multilateral instruments, such as the United Nations Convention on the Law of the Sea, and also lists Council Regulation (EC) No 708/2007 of 11 June 2007 concerning use of alien and locally absent species in aquaculture. Any person found guilty to having committed, or held liable for, an offence, that is shown to be serious in terms of the convention from which it arises, shall be liable to a fine (*multa*) of five times the value of the fishery products obtained by committing the serious infringement (Article 4, paragraph 2).

³⁰⁷ Available at: <http://www.justiceservices.gov.mt/DownloadDocument.aspx?app=lom&itemid=11667&l=1>

3.0 National Strategic Goals and Measures to combat IAS

On the basis of the background information presented respectively in, [Chapter 1](#) on existing invasive alien species in Malta and the continued risks of new incursions, and, [Chapter 2](#) on the regulatory framework targeting prevention and control, it is clearly evident that the bioinvasion problem can only be addressed by having an effective strategic policy and coordinated framework in place at a national level. To that end, [Chapter 3](#) sets out the vision, goals and recommended measures that make up a strategy to combat IAS in Malta.

The drawing up of this strategy also builds on the recommendations by the Global Invasive Species Programme (GISP), the IUCN Invasive Species Specialist Group (IUCN-ISSG), as well as recommendations of the Conference of the Parties to the Convention on Biological Diversity (CBD), recommendations by the Standing Committee to the Bern Convention and the European Strategy on Invasive Alien Species, amongst others. In particular, the **national recommendations** are intended to place Malta on the right track to meet the new onerous obligations stemming from Council Regulation No. 1143/2014 on the prevention and management of the introduction and spread of invasive alien species.

The implementation of the Council Regulation No. 1143/2014 in Malta will also mutually support the achievement of the objectives of the Habitats Directive (92/43/EEC), the Birds Directive (2009/147/EC), the Water Framework Directive (2000/60/EC) and the Marine Strategy Framework Directive (2008/56/EC). Joint and integrated efforts and mobilising resources to translate these measures into action on the ground will help advance Malta's contribution to deliver the **2020 targets on invasive alien species** adopted at a global level (Aichi Target 9), at EU level (EU Target 5) and at a national level (NBSAP Target 9).

3.1 Strategic Goals and Recommendations

3.1.1 COMPETENT AUTHORITIES: *To strengthen the capacity and resources of the relevant competent authorities to ensure that they are properly trained and equipped to implement and enforce the legal regime on IAS in Malta in the environmental, plant health, animal health and trade spheres.*

Expected outcome: The lead authority and other bodies responsible for the implementation of the EU IAS Regulation in Malta are designated by quarter 2 and quarter 3 of 2017, and gaps in capacity and expertise are addressed via the mobilisation of adequate resources and training to ensure proper implementation of EU obligations on IAS at a national level.

Under the Regulation (EU) No 1143/2014 Member States were required to notify the Commission and inform the other Member States of the competent authorities in charge of applying this Regulation. Such competencies were designated through the provisions of the Control of Invasive Alien Species of European Union Concern Regulations, 2017 (S.L. 549.119) which entered into force on 1st December 2017. The various provisions of the Regulation are pertinent to the portfolio of different governmental departments *vis-à-vis* environmental protection, animal welfare, pet trade, border controls and pathways of introduction and spread. Implementation of the various recommendations set out in this national strategy also dictates the need for a **lead Ministry and lead Competent Authority** in order to achieve an **overarching**

administrative structure that can ensure successful coordination not only of the implementation Regulation (EU) No 1143/2014, but also Malta’s overall IAS legal regime.

The **Environment Protection Act, 2016** (ACT No I of 2016) makes provision for the protection of the environment and for the establishment under its Article 6 of the **Environment and Resources Authority**, with its functions defined in Article 7. This authority will also take on the role of CITES Management Authority in Malta. In this role, the Authority also regulates the introduction of IAS via wildlife trade in cooperation with the Customs Department. Plant health aspects and related phytosanitary measures are the other hand overseen by the **Plant Health Directorate** (also the National Plant Protection Organisation) while the remit of the **Veterinary Services Directorate** is animal health and related zoonosanitary measures. The implementation of legislation regulating plant protection products falls within the responsibility of the **Malta Competition and Consumer Affairs Authority** (MCCAA).

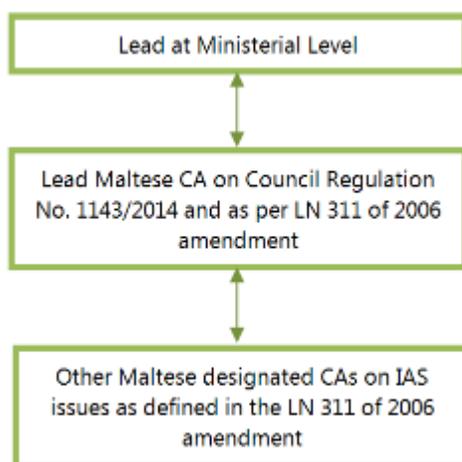


Figure 21 – Organisation Chart

Due to the nature of the various IAS-related obligations, implementation will only be effective and cost-efficient if the following entities are also involved: Wild Birds Regulations Unit, Department of Fisheries and Aquaculture, Ports and Yachting Directorate, Merchant Shipping Directorate, Customs, Ambjent Malta, Plant Health Directorate, Veterinary Regulation Directorate, Animal Welfare Directorate, Trade Services Department, and Transport Malta. [Figure 21](#) present an organisational chart of the various entities that would need to be involved while [Figure 22](#) indicates which roles are pertinent of each respective authority. In this respect such authorities are also required to oversee IAS related issues that fall within their respective portfolios. Other instruments and forms of collaboration may be considered and implemented as relevant when required.

Lead CA	<p>Environment and Resources Authority: responsible for the administration and implementation of the "Flora, Fauna and Natural Habitat Protection Regulations (S.L. 549.44) and Regulation (EU) No. 1143/2014 including the provisions of alien and invasive species, (excluding the undertaking of Official Controls in line with Article 15)</p>
Other Entities	<ul style="list-style-type: none"> • Wild Birds Regulations Unit: provisions concerning wild birds • Directorate Responsible for Animal Welfare: aspects related to animal welfare as laid down in the "Animal Welfare Act", and provisions concerning the humane culling or disposal of alien invasive fauna, where required • Customs Department: in relation to its role as specified in the Customs Ordinance, Council Regulation (EC) No. 338/97 and Commission Regulation (EC) No. 865/2006, and relevant roles in connection with Regulation (EU) No. 1143/2014 • Trade Services Department: import licensing in line with the Importation Control Regulations, 2004 • Ambjent Malta: provisions concerning the implementation of control, management and eradication of invasive alien species in terrestrial settings • Department of Fisheries and Aquaculture: in relation to the occurrence of alien species intercepted through fisheries surveys, the organisms found in fish farms, the fouling of fishing gear, as well as the provisions concerning species falling within their competency in terms of Regulation (EC) No 708/2007 • Veterinary Regulations Department: for obligations laid down in the "Veterinary Service Act", as well as the undertaking of official controls in line with the provisions of Article 15 of Regulation (EU) No. 1143/2014 • Plant Health Directorate: obligations laid down in the Plant Quarantine Act, as well the undertaking of official controls in line with the provisions of Regulation (EU) No. 1143/2014 • Merchant Shipping Directorate & Ports and Yachting Directorate: in relation to the regulation of the shipping industry, in particular concerning ballast water management, as laid down in the Authority for Transport in Malta Act and the Merchant Shipping Act

Figure 22 – Role of Lead Authority and Other Entities on IAS related issues

- 3.1.2 NATIONAL IAS LEGAL REGIME:** *To subject the national legal regime on IAS to regular reviews as part of the better regulation initiative to ensure that it is comprehensive, robust and fit-for-purpose with respect to the regulation of importation, keeping, trade, use and release of alien species.*
- Expected outcome:** National legislation to complement the provisions of Regulation (EU) No. 1143/2014 and which focus principally on the prevention and control of invasive alien species in Malta.

Regulation (EU) No 1143/2014: Article 23 – More stringent national rules

The national regulatory regime on IAS in Malta is dictated by relevant EU Directives and Regulations as reviewed in [Chapter 2](#). Regulation (EU) No 1143/2014 places clear obligations on the designated competent authorities of Member States vis-à-vis restrictions, risk-based official controls at borders, issuance of permits

(and their withdrawal if unforeseen events with an adverse impact on biodiversity or related ecosystem services occur), inspections of permitted establishments, liaising with the Commission on special authorisations, adopting emergency measures, reporting, adoption of penalties and regulating non-commercial and commercial owners of species acquired before they became listed as being of Union concern.

As indicated by Genovesi and Shine (2004) legal frameworks and strategies should contain stricter measures for islands and centres of endemism.³⁰⁸ The Regulation (EU) No 1143/2014 allows Member States to adopt **stricter measures** to address IAS, if so desired. If this is done, however, national policy must remain in line with the **Treaty on the Functioning of the European Union (TFEU)**, especially its provisions on the single market.

Provisions on environment protection are defined under **Part V of the Environment Protection Act, 2016 (ACT No I of 2016)**. Protection and effective management is carried out through plans, policies and regulations, which are prepared and amended from time to time in accordance with the provisions of this Act. Via Article 54, the Minister has powers to make regulations for the better carrying out of the provisions of this Act. In relation to in relation to the protection of biodiversity and other natural features, such regulations are *inter alia* to '*declare any species to be an invasive species and establish rules for its assessment, monitoring, control and, or, eradication, and other prevention and management mechanisms to control the introduction and spread of such species*'.

New national legislation shall be drafted which principally strengthens the provisions on IAS to enhance the restrictions and control on alien species which are causing damage or of potential damage in the Maltese Islands.

3.1.3 PRECAUTIONARY APPROACH/PRINCIPLE: *To continue to apply the precautionary approach in national decision-making processes related to alien species and activities that act as pathways of introduction and spread, as feasible and applicable, in order to avoid both the impact of potentially invasive species and the financial expenditure required for remedial measures, in line with environmental legislation and the Treaty of the Functioning of the European Union (TFEU).*

Expected outcome: Unintentional introductions of IAS and related impacts are prevented when faced with scientific uncertainty by adopting the precautionary approach as an ongoing practice of decision-making processes.

CBD Guiding principle 1: Precautionary approach

With the accession of Malta to the EU and the fact that within the EU the single market provides for the free movement of people and goods, applying the precautionary approach/principle when faced with uncertainties is of essence to prevent, reduce and control the introduction and transfer of new invasive alien species into the Maltese Islands. The **lack of scientific certainty** coupled with the unpredictability of impact/s (environmental, social, economic) caused by invasive alien species, unintentional introductions and the time lag before an alien species becomes invasive, should not be used as reasons for postponing action.

³⁰⁸ *European Strategy on Invasive Alien Species*. Genovesi & Shine, 2004.

Unless there is a reasonable likelihood that an introduction will be beneficial or harmless, it should be treated with caution on the assumption that its introduction might be harmful or have undesirable consequences. The precautionary approach/principle should be applied in the following instances:

- When potential detrimental effects of introductions on priority native species, habitats and ecosystems, need to be prevented;
- When carrying out risk assessments of alien species and in decision-making processes on whether to issue a permit authorising the introduction, trading and/or other activities of use of a potentially invasive species, especially when there is insufficient evidence indicating whether the species may become invasive in the Maltese context and, bearing in mind future scenarios e.g. climate change; and
- When establishing measures to control, manage and wherever possible eliminate the risks that alien species pose without causing other impacts on non-target species.

Regulation (EU) No 1143/2014 mentions the precautionary principle within the context of taking emergency measures for alien species not on the List of Union concern, but which may still be problematic and present imminent danger of entry into the Union. The precautionary principle is also encountered in the context of withdrawing a permit if unforeseen events with an adverse impact on biodiversity or related ecosystem services occur. Such withdrawal is to be justified on scientific grounds and, where scientific information is insufficient, on the grounds of the precautionary principle.

3.1.4 ECOSYSTEM APPROACH: *To implement the ecosystem approach when addressing alien species and their invasive counterparts in national decision- and policy-making processes.*

Expected outcomes: Cost-savings, resource efficiency and prevention of undesired effects are benefits accrued from adopting the ecosystem-based approach as an ongoing practice in national decision- and policy-making processes.

CBD Guiding principle 3: Ecosystem approach

The CBD guiding principles recommend Contracting Parties to adopt relevant measures to address alien-related problems based on the ecosystem approach that is described in **Decision V/6**.³⁰⁹ This approach entails that issues are addressed as part of the **integrated management** of land, water and living resources and based on the application of appropriate scientific principles ([Table 9](#)). Essentially addressing alien species from an ecosystem approach would require the assessment of the interaction of IAS with native species, the changes it causes to the ecosystem structure and functioning, as well as analysing the role of humans as agents of modification, introduction and spread, and then based on such knowledge (assisted by scientific studies), applying appropriate measures to tackle the issue as a whole.

Table: 9 - CBD's Ecosystem Approach

³⁰⁹ Available at: <https://www.cbd.int/decision/cop/?id=7148>

Article 2 of the Convention on Biological Diversity (CBD) defines an **ecosystem** as ‘a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit’. The CBD encourages the adoption of the ecosystem approach in biodiversity conservation and describe this approach as ‘a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way’. This approach consists of **integrating ecological considerations, economic considerations and social considerations**. The ecosystem approach is based on the following **12 principles**:

Principle 1	The objectives of management of land, water and living resources are a matter of societal choices.
Principle 2	Management should be decentralized to the lowest appropriate level.
Principle 3	Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems.
Principle 4	Recognising potential gains from management, there is usually a need to understand and manage the ecosystem in an economic context. Any such ecosystem-management programme should: <ul style="list-style-type: none"> ▪ Reduce those market distortions that adversely affect biological diversity; ▪ Align incentives to promote biodiversity conservation and sustainable use; ▪ Internalise costs and benefits in the given ecosystem to the extent feasible.
Principle 5	Conservation of ecosystem structure and functioning, in order to maintain ecosystem services, should be a priority target of the ecosystem approach.
Principle 6	Ecosystem must be managed within the limits of their functioning.
Principle 7	The ecosystem approach should be undertaken at the appropriate spatial and temporal scales.
Principle 8	Recognising the varying temporal scales and lag-effects that characterize ecosystem processes, objectives for ecosystem management should be set for the long term.
Principle 9	Management must recognise that change is inevitable.
Principle 10	The ecosystem approach should seek the appropriate balance between, and integration of, conservation and use of biological diversity.
Principle 11	The ecosystem approach should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices.
Principle 12	The ecosystem approach should involve all relevant sectors of society and scientific disciplines.
Source: Adapted from www.biodiv.org/programmes/cross-cutting/ecosystem/principles.asp	

- 3.1.5 PREVENTION:** *To prevent the introduction of IAS, as the first line of action, via the setting of restrictions/prohibitions and a permitting framework to regulate introduction and activities of use of alien species, coupled with effective pathway management, border controls and quarantine measures.*
Expected outcome: Restrictions are defined in law and enforced resulting in the effective prevention of introductions into the Maltese Islands of IAS on the EU list and the Malta list.

CBD Guiding principle 7: Border control and quarantine measures

Regulation (EU) No 1143/2014: Article 7 – Restrictions; Article 8 – Permits; Article 9 – Authorisations; Article 31 – Transitional provisions for non-commercial owners; Article 32 – Transitional provisions for commercial owners

Upon the introduction of an IAS into the environment, financial costs and environmental damage begin to ensue depending on how timely the species is detected (that is before it becomes established and invasive

beyond the point of introduction) and how effective the deployed remedial/management measures are to remove it. If action is delayed or introduction goes unnoticed, impacts and damage may be irreversible or too costly to rectify. The most cost-effective and environmentally desirable action to safeguard islands against IAS is by way of **prevention from entering the country or the environment** in the first place. This is even more crucial for the aquatic environment, since remedial action is particularly challenging, if at all possible, once the species becomes established and widespread.

Preventive measures comprise prohibitions/restrictions (to prohibit the import or movement or use of alien species), permits (to control import and export, research and trade activities), quarantine (to reduce the risk of unintentional introduction of species), customs (border controls to check for illegal movement of species) and prior risk assessment of contemplated intentional introductions as part of decision-making processes. Preventive measures should also be managed in a consistent and coordinated way (depending on organisation/administrative responsibilities) and should also be backed up by robust legislation and effective surveillance.

National legal frameworks should support the continued application of the precautionary approach with the objective of preventing unwanted introductions. Moreover, prohibition should not only apply to **first-time introductions** (and activities of use) but should also prohibit **subsequent introductions** (and activities of use) of alien species that are already invasive in a country irrespective of the purpose of introduction. This is for instance done for species of invasive trees under the "Trees and Woodland Protection Regulations (S.L.549.123).

Management of alien species in the Maltese islands should therefore be primarily addressed through preventive measures by **application of best practices**. Priority should be given to adopt preventive measures effective at halting the arrival/entry and spread of those alien species of Union concern and those on the Malta list as well as any others that would cause severe economic, health and/or ecological effects. Regulation (EU) No 1143/2014 as well as the EU Animal and Plant Health Regimes adopt a preventive approach, and require rapid response in case of introduction and outbreaks, respectively. Action focuses on species listings, risk assessments, permitting, and border controls. The enactment of national legislation to implement the preventive measures defined in EU law is an ongoing practice. Now efforts are needed towards strengthening implementation by ensuring that the respective competent authorities are adequately resourced.

New introductions as well as further invasions can thus be curbed by means of preventive measures as an integral part of a national strategy on IAS. Prevention measures need to begin at the place of origin or export, and applied to the vector (means) and pathway (route) of movement in conjunction with surveillance of exit and entry points. **Management of pathways** is also more feasible for islands considering that there are fewer points of entry.³¹⁰ Although pathways for entry and establishments are similar for unintentional and intentional introductions, they differ in the measures of prevention that are undertaken. These are tackled separately below.

³¹⁰ *Pilot Assessments - The Ecological and Socio-Economic Impacts of Invasive Alien Species on Island Ecosystems.*
UNEP/CBD/SBSTTA/9/INF/33

3.1.5.1 INTENTIONAL (DELIBERATE) INTRODUCTION: *To continue to regulate the intentional introduction of alien species into the country and into the environment via clear permitting and enforcement procedures.*

Expected outcome: Restrictions are defined in law and enforced resulting in the effective prevention of the intentional introductions of IAS of Union concern and national concern into the Maltese Islands and into the environment. There is a decreasing trend in reports of deliberate and illegal introduction into the environment.

CBD Guiding principle 10: Intentional introduction

Regulation (EU) No 1143/2014: Article 7 – Restrictions; Article 8 – Permits; Article 9 - Authorisations

An **authorisation/permitting system** is essential to regulating first time intentional introductions including subsequent introductions of taxa already invasive in a country. Through the process of authorisation, the competent authority may involve some form of **risk assessment** before a decision is made as to whether or not to authorise a proposed introduction to the country or to new ecological regions within the country. A **permit or licence** may be given by the competent authority, involving a risk assessment by the applicant indicating or ascertaining that the species can be considered as “low-risk”, that is, unlikely to cause unacceptable harm to local biodiversity. In this respect, the risk level that can be deemed acceptable would need to be determined in terms of the level of benefit to be expected from the introduction. Even in the circumstances when permission is granted, caution should be exercised by requiring the preparation of a contingency/mitigation plan, monitoring procedures, or containment requirements. As aforementioned, the precautionary approach should be applied in cases of scientific uncertainty and when faced with inadequate knowledge of the potential invasiveness of the species of concern.

Components of a permit system providing a framework within which applications to introduce alien species can be assessed, may include the following information:

- Details of information on the species in question, to be supplied by the applicant;
- Scientifically based assessment of the risks;
- Possibility of permit conditions (monitoring, emergency plans, containment procedures, liability for mitigation measures if the species becomes invasive);
- Public access to information on applications, criteria, hearings and decisions; and
- Penalties for breach and non-compliance with the permit.³¹¹

National permitting procedures are defined in domestic legislation. Regulation 43 of the “Flora, Fauna and Natural Habitats Protection Regulations, 2006, S.L. 549.44 enables the competent authority to issue a permit prior to the introduction of species. Penalties for any introductions carried out without a permit or in violation of the permit conditions follow Regulation 49, which specifies the fines to pay and possibly even imprisonment, depending on the nature of the offence.

Under the Trade in Species of Fauna and Flora Regulations, 2004 S.L. 549.38 , application for a CITES permit or certificate, is done by filling in the appropriate application form depending on whether the CITES listed

³¹¹ *Global Invasive Species Programme: Legal & Institutional Frameworks.* Shine, Williams, Burhenne-Guilmin, 2000.

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species is to be imported or exported/re-exported. Both forms request the following information from the applicant:

- a) Details of the importer and exporter;
- b) Purpose of the import or export/re-export (e.g. re-introduction or introduction to the wild)
- c) Declaration from the applicant that transport conditions, if the specimen is living, conform to the guidelines for transport of live animals or, in the case of air transport, to the IATA live animals regulations;
- d) Details of the specimen (scientific name, description of the specimen, identification marks or number, quantity and source specified according to a code system).

The importation of plant species at present does not require the issuance of permits. Nonetheless, importation must be done in conformity with nature protection legislation. On the other hand, an import licence is required for the importation of animal species in line with the "Importation Control Regulations, 2004", S.L. 117.14 as detailed further in [Table 10](#).

Table: 10 - Steps to be taken to apply for and procure an Import Licence

1. The applicant must first procure an application for an import licence from the Trade Services Department.
 - The applicant must then fill the application form specifying the scientific name, the quantities, and country of origin as well as the country from where such specimens will be exported.
 - Endorsement with possible imposed conditions from the following departments must then be attained:
 - The Environment and Resources Authority,
 - The Veterinary Regulation Directorate concerned with the effect of imported specimens on the health of local animals,
 - The Port Health Services responsible for the control of the importation of foodstuffs
 In certain instance endorsement should also be obtained from the Agriculture Department, and in the case that the imported specimen is a fish, and then the Department for Fisheries and Aquaculture should be involved.
2. Once endorsement and a stamp on the application form are obtained from all of the entities as applicable, the applicant should then return to the Trade Services Department where the Import Licence is issued for the importation of the requested animals.

Regulation (EU) No 1143/2014 applies the following **restrictions in Article 7(1)** to IAS listed as being of Union concern:

- a) Intentional bringing into the territory of the Union, including transit under customs supervision;
- b) Intentional keeping, including in contained holding;
- c) Intentional breeding, including in contained holding;
- d) Intentional transportation to, from or within the Union, except for the transportation of species to facilities in the context of eradication;
- e) Intentional placing on the market;
- f) Intentional use or exchange;
- g) Intentional permitting to reproduce, grow or cultivate, including in contained holding; or
- h) Intentional release into the environment.

Permits may be issued **derogating from the restrictions** in points (a), (b), (c), (d), (f) and (g) of Article 7(1) for specific activities (research on, or *ex situ* conservation of, invasive alien species of Union concern, or when unavoidable to advance human health) on condition that:

- the invasive alien species of Union concern is kept in and handled in contained holding;
- the activity is to be carried out by appropriately qualified personnel as laid down by the competent authorities;
- transport to and from contained holding is carried out under conditions that exclude escape of the invasive alien species, as established by the permit;
- in the case of invasive alien species of Union concern that are animals, they are marked or otherwise effectively identified where appropriate, using methods that do not cause avoidable pain, distress or suffering;
- the risk of escape or spread or removal is effectively managed, taking into account the identity, biology and means of dispersal of the species, the activity and the contained holding envisaged, the interaction with the environment and other relevant factors; and
- a continuous surveillance system and a contingency plan covering possible escape or spread is drawn up by the applicant, including an eradication plan. The contingency plan shall be approved by the competent authority. If an escape or spread occurs, the contingency plan shall be implemented immediately and the permit may be withdrawn, temporarily or permanently.

The following information needs to be made publicly available on the internet for all issued permits:

- the scientific and common names of the invasive alien species of Union concern for which the permit has been issued;
- the number or the volume of specimens concerned;
- the purpose for which the permit has been issued; and
- the codes of Combined Nomenclature as provided by Regulation (EEC) No 2658/87.

Member States shall ensure that inspections are carried out by their competent authorities to verify that the establishments comply with permit conditions. Malta's permitting procedures as required by the EU IAS Regulation are detailed in the Control of Invasive Alien Species of European Union Concern Regulations, 2017 (S.L. 549.119).

Furthermore, permits may also be issued for activities concerning IAS of national concern, as indicated in Regulation 28 (5) of the Flora, Fauna and Natural Protection Regulations (S.L. 549.44).

3.1.5.2 UNINTENTIONAL (ACCIDENTAL) INTRODUCTION: *To assess which pathways (and vectors) are responsible for accidental introductions and which are deemed of priority for action.*

Expected outcomes: A comprehensive analysis of the pathways of unintentional introduction of IAS of Union concern and national concern (as applicable) is completed. Where deemed required, action plan(s) is/are to be adopted for those pathways identified as being of priority; such action plan(s) is/are reviewed at least every six years.

CBD Guiding principle 11: Unintentional introductions

Regulation (EU) No 1143/2014: Article 7 – Restrictions; Article 13 – Action plans on the pathways of invasive alien species

Unintentional introductions are much harder and challenging to prevent and detect since they are much less predictable than intentional introductions. Further to this, unintentional introductions require more information gathering, education and surveillance. The best way to prevent unintentional introductions is by identifying and intercepting their vectors and by carrying out risk assessments of activities that facilitate these unwanted introductions. However this requires knowledge of the various types of potential vectors and pathways responsible for introductions in the first place. Such knowledge should be supplemented with regulatory measures enforced by well-resourced entities so as to allow for rapid and effective action.

Unintentional introduction into the environment can involve escapes, contaminants, stowaways, or hitchhikers. “**Escapes**” should be prevented by way of ensuring secure enclosures, strict contained holding, licensing of establishments for keeping captive alien species, registering relevant alien species kept in captivity, as required, and by setting standard rules for disposal, especially from aquariums. “**Contaminants**”, “**Stowaways**” and “**Hitchhikers**” can be prevented by carrying out veterinary and plant health inspections in regard to animal or plant consignments as well as the packaging material used for transportation, and by undertaking adequate treatment methodologies.

Under **Article 7(2) of Council Regulation (EU) No 1143/2014**, Member States are required to take all necessary steps to prevent the unintentional introduction or spread of invasive alien species of Union concern. Furthermore, **Article 13** requires Member States to undertake a **comprehensive analysis of unintentional pathways of introduction and spread of IAS of Union concern** in their territory, as well as in their marine waters as defined in Article 3(1) of the Marine Strategy Framework Directive. Each Member State shall establish and implement one single action plan or a set of **action plans to address priority pathways**. The action plan shall include measures based on an analysis of costs and benefits, in order to: (a) raise awareness; (b) minimise contamination of goods, commodities, vehicles and equipment by specimens of invasive alien species, including measures to tackle transportation of invasive alien species from third countries; and (c) ensure appropriate checks at the Union borders, other than the official controls pursuant to Article 15.

3.1.6 **CONTAINED HOLDING:** *To regularly monitor IAS of Union concern and national concern that are authorised to be kept in contained holding to ensure that such conditions are met.*

Expected Outcome: Authorised holders/owners of IAS of Union concern and national concern, which are kept in contained holdings, guarantee that such conditions are secure.

Regulation (EU) No 1143/2014 specifies that the keeping of specimens in contained holding is considered as such when the following conditions are met:

- the specimens are physically isolated and they cannot escape or spread or be removed by unauthorised persons from the holdings where they are kept;
- cleaning, waste handling and maintenance protocols ensure that no specimens or reproducible parts can escape, spread or be removed by unauthorised persons;
- the removal of the specimens from the holdings, disposal or destruction or humane cull is done in such way as to exclude propagation or reproduction outside of the holdings.

3.1.7 PRIORITISING VIA SPECIES LISTING: *To develop a national illustrated list/inventory of those alien species (both present and not yet present) of concern to the Maltese Islands and to make this easily and widely accessible to key actors (importers, traders, gardeners and landscapers, farmers etc.).*

Expected outcome: Malta’s list of species deemed to be invasive alien species is published in 2018 and is reviewed every six years.

Regulation (EU) No 1143/2014: Article 4 – List on Invasive Alien Species of Union Concern; Article 11 - Invasive alien species of regional concern and species native to the Union; Article 12 - Invasive alien species of Member State concern

Species listing facilitates the prioritisation of alien species for prevention, management and research purposes. Such listing systems need to be comprehensive and regularly updated. The list should be available in an accessible and organised format such as an online database or Clearing House Mechanism. A species listing also facilitates the screening of permit applications and to alert officials at border inspection posts. Genovesi and Shine (2004) in the European Strategy on Invasive Alien Species identify three types of listings of IAS:

- *Black list:* this would include those alien species whose introduction is strictly regulated; species that are already deemed invasive in Malta and those species that have not yet been introduced but have a high potential of introduction and are likely to cause problems upon introduction would be included in such as list;
- *Grey list:* this would include species for which data is deficient thereby a risk assessment may be required prior to a decision on authorisation or, else being guided by the precautionary principle; and
- *White list:* this would include those alien species declared as low risk and whose introduction may be authorised; use of these species should however not be done in preference to native species.³¹²

Regulation (EU) No. 1143/2014 distinguishes between **IAS of “Union Concern”** (Article 4), **IAS of “regional concern and species native to the Union”** (Article 11) and **IAS of “Member State Concern”** (Article 12). The EU Regulation focuses its provisions primarily on preventing the introductions into the Union of those IAS that are in the Union List. Article 4 specifies, via paragraph 3, the criteria upon which IAS will be included in the Union List adopted by the Commission by means of implementing acts. Listing of species is on the basis of the species meeting all of the following criteria (Article 4.3):

- they are found, based on available scientific evidence, to be alien to the territory of the Union, excluding the outermost regions;
- they are found, based on available scientific evidence, to be capable of establishing a viable population and spreading in the environment under current or foreseeable climate change conditions in one biogeographical region shared by more than two Member States or, one marine subregion, excluding their outermost regions;
- they are, based on available scientific evidence, likely to have significant adverse impacts on biodiversity or the related ecosystem services, and may also have an adverse impact on human health or the economy;

³¹² *European Strategy on Invasive Alien Species.* Genovesi and Shine, (2004).

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- it is demonstrated, by a risk assessment, that action at Union level is required to prevent their introduction, establishment and spread; and
- it is likely that the inclusion in the list will effectively prevent, minimise or mitigate their adverse impacts.

In adopting or updating the list, the Commission shall apply the above-mentioned criteria with due consideration to the implementation cost for the Member States, the cost of non-action, the cost-effectiveness and the socio-economic aspects. The list shall include as a priority those invasive alien species that: (1) are not yet present in the Union or are at an early stage of invasion and are most likely to have significant adverse impacts; and (2) are already established in the Union and have the most significant adverse impacts (Article 4.6). Member States may submit to the Commission requests for the inclusion of IAS on this list. Such requests shall include the name of the species, a risk assessment (Article 5 of the EU Regulation), and evidence that the above-mentioned criteria are met.³¹³

The **Commission Implementing Regulation (EU) 2016/1141 of 13 July 2017** adopting a list of invasive alien species of Union concern pursuant to Regulation No 1143/2014 establishes that the following species meet the conditions of Article 4(6) of the latter regulation:

Baccharis halimifolia [Plant - groundsel-bush]
Cabomba caroliniana [Aquatic Plant - Carolina fanwort],
Callosciurus erythraeus [Mammal - Pallas's squirrel],
Corvus splendens [Bird - house crow],
Eichhornia crassipes [Aquatic plant – water hyacinth]
Eriocheir sinensis [Crustacean – Chinese mitten crab]
Heracleum persicum [Plant – Persian hogweed]
Heracleum sosnowskyi [Plant - Sosnowskyi's hogweed]
Herpestes javanicus [Mammal - Indian mongoose]
Hydrocotyle ranunculoides [Aquatic plant – floating pennywort]
Lagarosiphon major [Aquatic plant – African elodea]
Lithobates (Rana) catesbeianus [Amphibian - American bullfrog]
Ludwigia grandiflora [Aquatic plant – water primrose]
Ludwigia peploides [Aquatic plant – water primrose]
Lysichiton americanus [Plant – American skunk cabbage]
Muntiacus reevesii Mammal – Reeves muntjac]
Myocastor coypus [Mammal/Rodent – Coypu]
Myriophyllum aquaticum [Aquatic plant – parrot feather]
Nasua nasua [Mammal – coati]
Orconectes limosus [Crustacean - spiny-cheek crayfish]
Orconectes virilis [Crustacean – virile crayfish]
Oxyura jamaicensis [Bird – ruddy duck]
Pacifastacus leniusculus [Crustacean – American signal crayfish]
Parthenium hysterophorus [Plant – Parthenium weed]

³¹³ A technical and objective process of evaluating biological or other scientific and economic evidence to identify potentially IAS and determine the level of invasion risk associated with a species or pathway and specifically whether an alien species will become invasive

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Perccottus glenii [Fish – Amur sleeper]
Persicaria perfoliata (*Polygonum perfoliatum*) [Plant – mile-a-minute weed]
Procambarus clarkia
Procambarus sp. (Crustacean - marbled crayfish)
Procyon lotor [Mammal – raccoon]
Pseudorasbora parva [Fish – topmouth gudgeon]
Pueraria montana var. lobata [Plant – tropical kudzu]
Sciurus carolinensis [Mammal – gray squirrel]
Sciurus niger [Mammal – fox squirrel]
Tamias sibiricus [Mammal – Siberian chipmunk]
Threskiornis aethiopicus [Bird- sacred ibis]
Trachemys scripta [Reptile – red-eared slider]
Vespa velutina nigrithorax [Insect – yellow-legged hornet]

The first update of the Union list entered into force on the 2 August 2017 through the adoption of Commission Implementing Regulation (EU) 2017/1263

Alopochen aegyptiacus [Bird- Egyptian goose]
Alternanthera philoxeroides [Plant-Alligator weed]
Asclepias syriaca [Plant-Common milkweed]
Elodea nuttallii [Aquatic Plant-Nuttall's waterweed]
Gunnera tinctoria [Plant- Chilean rhubarb]
Heracleum mantegazzianum [Plant-Giant hogweed]
Impatiens glandulifera [Plant-Indian balsam]
Microstegium vimineum [Plant-Japanese stiltgrass]
Myriophyllum heterophyllum [Plant-Broadleaf watermilfoil]
Nyctereutes procyonoides [Mammal-Raccoon dog]
Ondatra zibethicus [Mammal-Muskrat]
Pennisetum setaceum [Plant- Crimson fountaingrass]

Member States may establish a **national list of invasive alien species** of Member State concern. For those invasive alien species, Member States may apply, in their territory, measures such as those provided for in Articles 7 (Restrictions), 8 (Permits), 13 (Action plans on the pathways of invasive alien species), 14 (Surveillance system), 15 (Official controls), 16 (Early detection notifications), 17 (Rapid eradication at an early stage of invasion), 19 (Management measures) and 20 (Restoration of the damaged ecosystems), as appropriate. Such measures need to be compatible with the TFEU and be notified to the Commission in accordance with the Union law. Member States are also required to inform the Commission and the other Member States of the species they consider as IAS of Member State concern and of the restrictions. Member States may identify, from their national list of invasive alien species of Member State Concern, in accordance with Article 12, species native or non-native to the Union that require enhanced regional cooperation substantiated by a comprehensive analysis of the justification.

When inventorying species that are already present in the country, apart from collecting presence/absence data, it is also important to take note of their abundance and distribution; which habitat types and native species are affected, and finally what impacts they are having on natural and semi-natural ecosystems. Such

data is required so as to judge whether action is required and whether it can succeed. Such data is also required to assess progress towards achieving legally-set targets, such as achieving GES for Descriptor 2 of the MSFD and for achieving the CBD, EU and national 2020 targets on IAS.

Information on introduced species into the Maltese Islands is presented in Chapter 1 of this document. Efforts to inventory alien species already present in the country was mainly done via the mentioned studies commissioned by the former MEPA with the intent of assessing their invasiveness and extent, the threats they pose on local biodiversity, their present exploitation and other uses, and suggest ways how to control or eradicate as well as the implications resulting from such measures.

Easy access to data on species is of essence to inform species listing, the evaluation of a permit application requesting authorisation or, to build a methodology to address a particular IAS. There are a number of **online information systems** that can facilitate the data gathering as well as the development and update of a national IAS list. These are reviewed in Table 11 below. Some, such as GIASIP and EASIN, have been particularly created to assist CBD Parties and EU Member States to facilitate implementation of IAS targets and policy.

Table: 11 - Online Information Systems on Alien and Invasive Species
<p>Global Invasive Alien Species Information Partnership (GIASIP) – http://giasipartnership.myspecies.info/ This partnership was formed to address the problem with respect to the lack of coordination between information producers and the information they make available in different places and in different ways with the consequence of unfilled gaps in knowledge and duplication of work. The Gateway of GIASIP provides links to necessary information of IAS enabling interoperability of existing information resources and also creates a forum to raise issues for discussion with the purpose of assisting Parties, and others, to implement Article 8(h) of the Convention on Biological Diversity and Target 9 of the Aichi Biodiversity Targets on IAS.</p>
<p>Global Invasive Species Database (GISD) - http://www.issg.org/database/welcome/ Managed by the Invasive Species Specialist Group (ISSG) of the Species Survival Commission of the IUCN, this database provides information on invasive alien species, their taxonomy, their characteristics, distribution, impacts and management.</p>
<p>Delivering Alien Invasive Species Inventories for Europe (DAISIE) - http://www.europe-aliens.org/ This portal and associated database provides a one-stop-shop for information on biological invasions in Europe by providing an exhaustive inventory of invasive species that threaten European terrestrial and aquatic environments and structured in a way to provide the basis for prevention and control of biological invasions. There are three main search options:</p> <ul style="list-style-type: none"> ▪ By species - from out of the 12,122 alien species occurring in Europe; ▪ By expert - from out of the 2,440 experts on biological invasions in Europe; or ▪ By region - to explore the alien species threats across Europe. <p>There is also a section listing “100 of the worst” invasive alien species in Europe: http://www.europe-aliens.org/speciesTheWorst.do</p>
<p>European Alien Species Information Network (EASIN) - http://easin.jrc.ec.europa.eu/ This is an online platform that aims to facilitate the exploration of existing information on alien species from distributed sources. It is an initiative of the Joint Research Centre (JRC) of the European Commission together with several partners to develop an information exchange mechanism to facilitate easy access to data on IAS with the purpose of advancing the implementation of EU policy on IAS.</p>
<p>Global Invasive Species Information Network (GISIN) – http://www.gisin.org</p>

Table: 11 - Online Information Systems on Alien and Invasive Species

This network provides a platform for sharing information on invasive species at a global level. It is a web-based network of databases connected by a common set of data types, with the purpose of enabling increased access to data and information that will in turn help detect, rapidly respond to, and control invasive species.

EPPO Global Database – <https://gd.eppo.int/>

This database gathers both basic and detailed information on pest-related aspects that have been produced by EPPO, such as EPPO Datasheets, EPPO standards, all articles from the EPPO reporting service and an extensive collection of pictures of pests, including IAS.

CABI's Invasive Species Compendium - <http://www.cabi.org/isc/>

This compendium is an encyclopaedic resource that draws together scientific information on all aspects of invasive species. It allows the user to search over 9,000 datasheets and over 170,000 abstracts on IAS by entering a keyword or phrase.

Marine Mediterranean Invasive Alien Species (MAMIAS) – www.mamias.org

This database is created under the framework of RAC/SPA in collaboration with the Hellenic Centre for Marine Research (HCMR). It is an online database on marine invasive species in the Mediterranean Sea. It provides amongst others a list of alien species, a list of marine invasive species, a list of vectors, and allows the use of different filters to find required data and retrieve statistics at regional and national level about alien and invasive species.

3.1.8 RISK ASSESSMENT: *The applicant is to carry out, as applicable, risk assessments for new species, to assess the risk of invasiveness and provide scientifically-based justifications as to whether and how such introduction would/would not harm native biodiversity, before authorisation is given or refused for intentional introductions of alien species deemed to be potentially invasive. Risk assessments may also be undertaken for new or untested techniques for eradication or control, including the use of alien biological control agents.*

Expected outcomes: Risk assessments may be undertaken for the introduction of non-listed species not yet present in the Maltese Islands and when new non-listed alien species are detected in the environment on the basis of the criteria established by Roy *et al.*, 2014.³¹⁴

Regulation (EU) No 1143/2014: Article 5 – Risk Assessment

In order to be in an informed position to decide whether (a) to authorise the introduction of an alien species into the Maltese islands, (b) to authorise introduction/release into the environment, or (c) whether a novel alien species requires actual management, some form of **risk analysis (risk assessment + risk management)** may be required. The purpose is to gather information/evidence that enables the assessment/evaluation (early warning) of risk of whether the species will become introduced, established and invasive (risk assessment) and the evaluation of what options are available to reduce such risk (risk management). The risk assessment, which can be done at different levels of accuracy, should aim at predicting the **epidemiology of biological invasions**, whether the non-native species is likely to become established and be invasive by analysing the characteristics of the species in question and the ecological relationships within its native range, and the resemblance between the native range and the potential area for introduction in the country.

³¹⁴ *Organisation and running of a scientific workshop to complete selected invasive alien species (IAS) risk assessments - ARES(2014)2425342 - 22/07/2014. Roy et al., 2014.*

Available at: <http://ec.europa.eu/environment/nature/invasivealien/docs/Workshop%20report.pdf>

Figure 23 illustrates the steps required when deciding whether to authorise or not an application for the introduction of an alien species and when a risk assessment may be required. The proposer of the introduction of an alien species not on the EU and Malta lists would need to contend with any finances incurred to undertake a risk assessment when required by the competent authority. Figure 24 on the other hand illustrates the decision-making steps involved once a new alien species is detected.

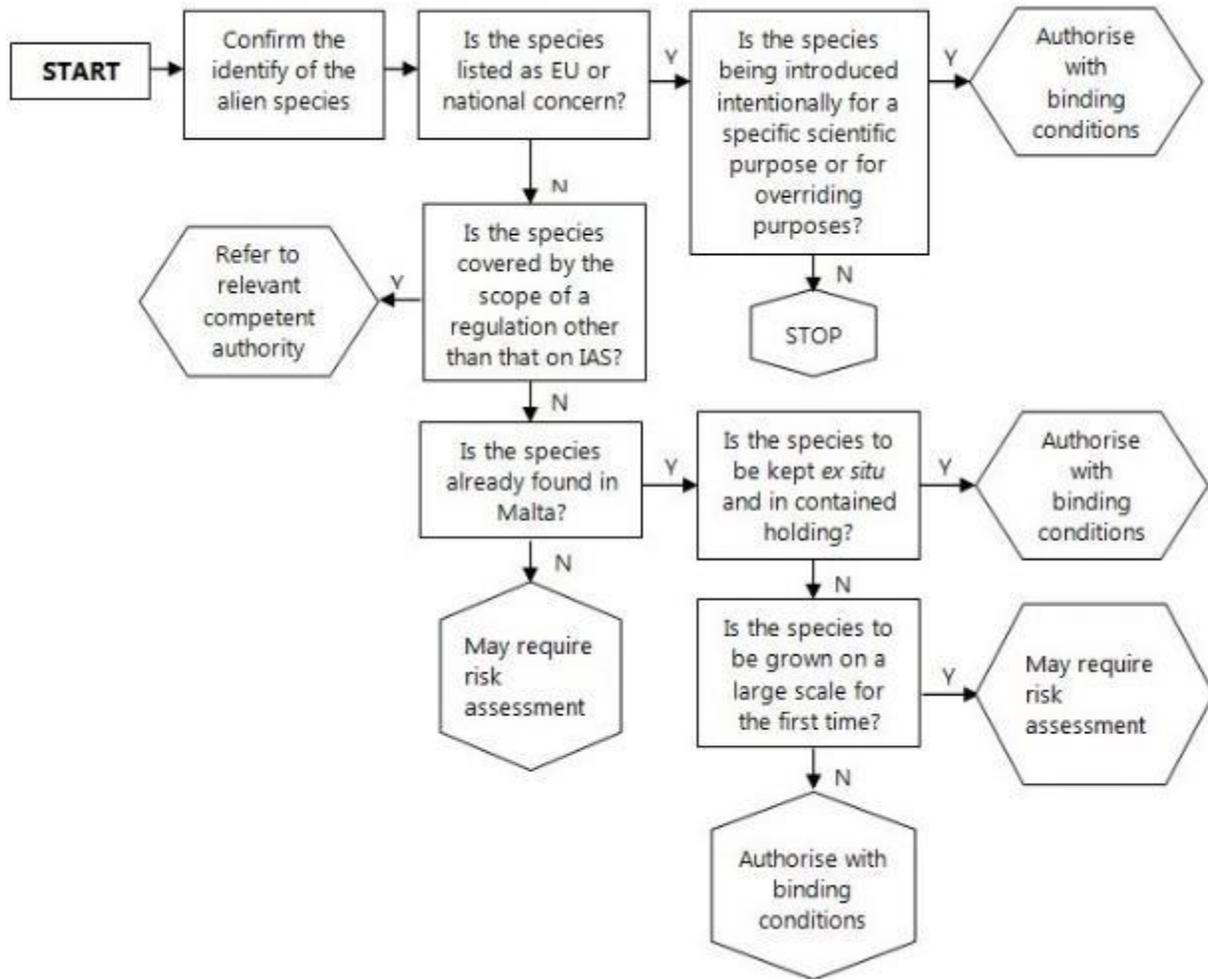


Figure 23 – Decision-making process when receiving an application for the introduction of an alien species

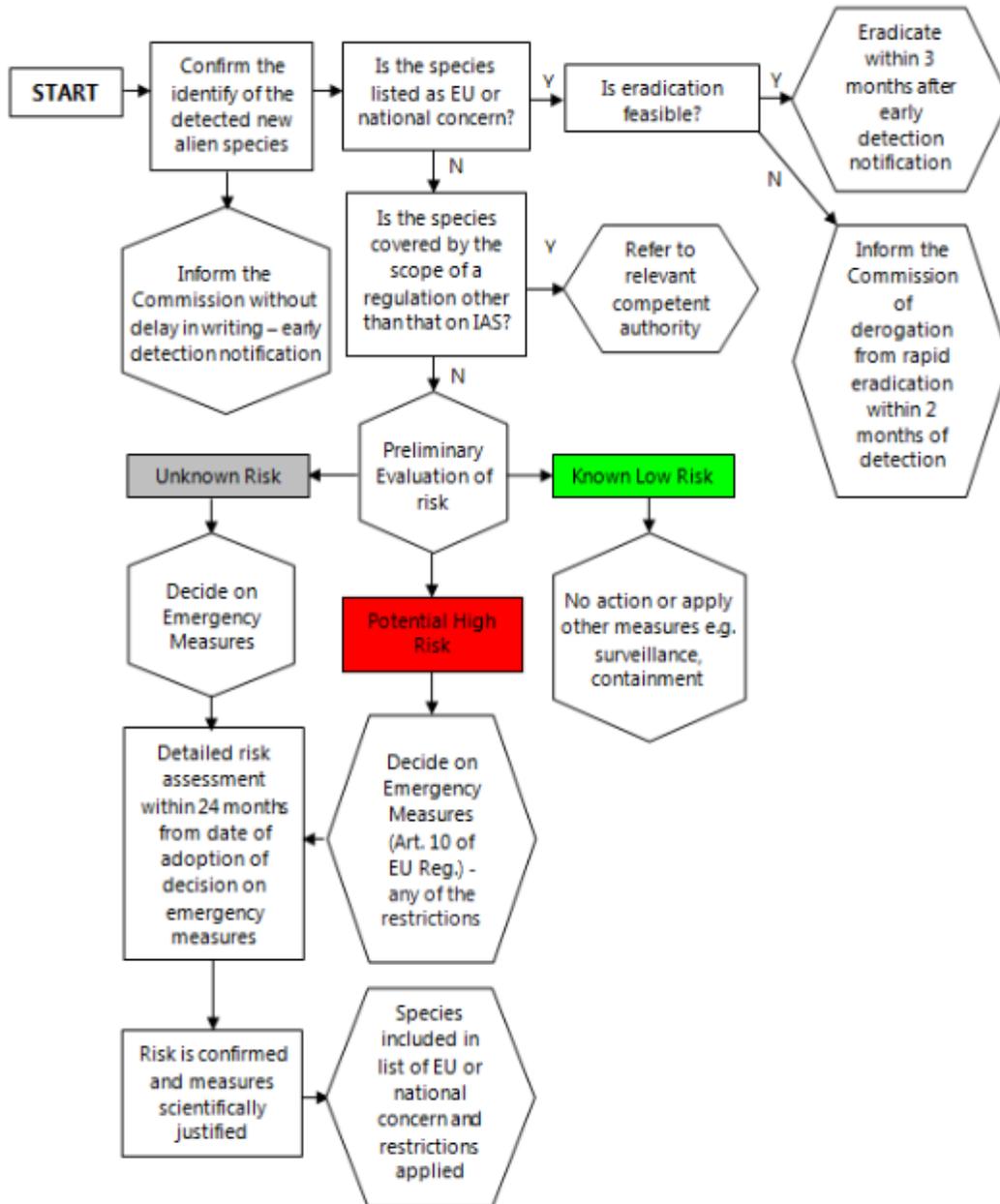


Figure 24 – Decision-making process when detecting a new alien species

A **quick/rapid screening** (based on available data, and standardised protocols) may be done to assess whether a more detailed and comprehensive risk analysis (which may require additional data gathering in the field) is required since risk analyses can be costly and resource demanding. [Table 12](#) shows the type of questions to consider. The nature of the question to address in screening and assessments also depends on whether the species is a plant or an animal.

Table: 12 - Factors to consider when carrying out the risk assessment

Alien Species is a Plant	Alien Species is an Animal
<ul style="list-style-type: none"> ▪ Is the species known to be a problem elsewhere? ▪ Is the species already present in the Maltese Islands? If yes, what habitat types is it found in and are there signs of invasive ability? ▪ Is the climate in the species' natural geographical distribution/range similar to that of the Maltese Islands? ▪ Is the species native to Europe? ▪ Has the species become naturalised where grown? ▪ Is the species a prolific seed producer? ▪ Has the species been reported as a pest/harmful organism from elsewhere? ▪ Does the species reproduce by vegetative propagation? ▪ Does the species produce viable seed? ▪ Are propagules dispersed by animals, wind and/or water? ▪ What is the life form of the species? ▪ What habitat types does the species colonise? ▪ Does the species produce allelopathic substances or alter in some way the habitat it invades? ▪ Has the species been documented as being parasitic on other species? ▪ What ecosystems and related ecosystem services might the species affect? ▪ Is the species toxic to animals and/or humans? ▪ Is the species a recognised host of pests or pathogens? ▪ Is the species pyretic and hence liable to cause fire hazards? ▪ Are there natural enemies of the species in the Maltese Islands? ▪ Is there a documented method of control/eradication for the species? ▪ Is the technology available for eradication/control and how successful was it where applied? ▪ Is it feasible to restore the systems the species invades? 	<ul style="list-style-type: none"> ▪ Is the species known to be a problem elsewhere? ▪ Is the species already present in the Maltese Islands? If yes, what habitat types is it found in and is there signs of invasive ability? ▪ Is the climate in the species' natural geographical distribution/range similar to that of the Maltese Islands? ▪ Is the species native to Europe? ▪ Has the species been reported as a pest/harmful organism from elsewhere? ▪ Is the species capable for bearing a large amount of young? ▪ Is the species a habitat generalist? ▪ Is the species a carrier of disease? ▪ What ecosystems and related ecosystem services might the species affect? ▪ Does the species have a history of introductions outside its natural range? ▪ Does the species have biological attributes and/or ecological needs that would limit chances of its establishment in a local context (e.g. size, resource requirements)? ▪ Are there natural enemies of the species in the Maltese Islands? ▪ Is the species likely to predate on native species of flora and/or fauna? ▪ Is there a documented method of control/eradication for the species? ▪ Is the technology available for eradication/control? ▪ Is it feasible to restore the systems the species invades?

Authorisation of introduction and activities of use may be tied with certain conditions, such as a cost-benefit analysis of the introduction/use of an alien species especially if this might have the characteristics that confer invasiveness, the preparation of a contingency plan, monitoring procedures, and contained holding requirements, to which the proposer/applicant must comply. The application for introducing an alien species and activities of its use should be reviewed especially in terms of potential impacts and risks/benefits of the proposed introduction/use. Once this is done, the competent authority may then accept, refine or reject the proposal. Provided that the intentional introduction is carefully planned in advance, based

on an ecological and taxonomic analysis of risks and dangers, exemptions or derogations may be considered when:

- introduction (and activities of use) of the alien species will bring benefits to society or to biodiversity;
- no native species present in the Maltese Islands would serve the purpose for which the alien species is being introduced into the country; and
- the area where introduction/use is to take place does not include a centre of high endemism or a legally protected or scheduled area.

The findings of a risk assessment however should also be interpreted with caution since species may alter their behaviour or adapt to the new habitat they invade, not to mention that risks may intensify with climate change. Hence relying only on information of the ecological and characteristics of the species in their natural habitat may not be fully reliable. Again here the precautionary approach should be applied to decision-making. Genovesi and Shine (2004) propose as a key action in the European Strategy on Invasive Alien Species, the incorporation of criteria related to IAS risks into **environment impact assessments (EIA) and strategic environment assessment (SEA) procedures** as appropriate and relevant.

In the case of introduction into the environment, field trials may first be carried out in a controlled manner before the actual introduction into the environment takes place. However, a problem associated with **field trials** is the time lag *i.e.* when it turns out that the alien species has become invasive from the time it became first established. Therefore the precautionary approach should be applied by assuming that any alien species that shows it is capable of establishing itself in the natural environment may have the potential of becoming invasive. This is required because even by simply occupying space, the species is already competing to a certain extent with local species.

Regulation (EU) No. 1143/2014 addresses **risk assessments in Article 5** for drawing up the List of IAS of Union concern in Article 4, as well as for justifying the **taking of emergency measures of non-listed IAS** by Member States as per Article 10. The risk assessment should have regard to the following elements:

- a description of the species (taxonomic identity, history, natural and potential range);
- a description of its reproduction, spread patterns, dynamics and whether the environmental conditions necessary for reproduction and spread exist;
- a description of the potential pathways of introduction and spread (intentional and unintentional), including where relevant the commodities with which the species are generally associated;
- a thorough assessment of the risk of introduction, establishment, spread in relevant biogeographical regions in current conditions and in foreseeable climate change conditions;
- a description of the current distribution of the species including whether the species is already present in the Union or in neighbouring countries and a projection of its likely future distribution;
- a description of the adverse impact on biodiversity and the related ecosystem services, including on native species, protected sites, endangered habitats, as well as on human health, safety, and the economy including an assessment of the potential future impacts;
- an assessment of the potential costs of damage; and
- a description of the known uses and social and economic benefits deriving from those uses.

Minimum standards on the basis of **14 criteria** necessary to ensure effective risk assessment methods for the EU are provided in the completed workshop report by Roy *et al.* (2014). The minimum standards of effective risk assessment are that the assessment:

- includes a description (taxonomy, invasion history, distribution range (native and introduced), geographic scope, socio-economic benefits);
- includes the likelihood of entry, establishment, spread and magnitude of impact;
- includes a description of the actual and potential distribution, spread and magnitude of impact;
- has the capacity to assess multiple pathways of entry and spread in the assessment, both intentional and unintentional;
- can broadly assess environmental impact with respect to biodiversity and ecosystem patterns and processes;
- can broadly assess environmental impact with respect to ecosystem services;
- can broadly assess adverse socio-economic impact;
- includes status (threatened or protected) of species or habitat under threat;
- includes possible effects of climate change in the foreseeable future;
- can be completed even when there is a lack of data or associated information;
- documents information sources;
- provides a summary of the different components of the assessment in a consistent and interpretable form and an overall summary;
- includes uncertainty; and
- includes quality assurance.³¹⁵

The main objective of the mentioned workshop was to analyse a set of species that have been risk assessed using protocols meeting the minimum standards to develop the List of IAS of Union concern. The list of 80 species provided by the Commission was analysed against those protocols for risk assessment that were considered as “substantially compliant” to the 14 criteria. Initially 50 species were identified through the “substantially compliant” risk assessments as posing a medium to high risk on biodiversity and/or human health and the economy. These comprise 25 plants, 12 vertebrates, 13 invertebrates of which most are found in the terrestrial and freshwater environments (24 and 20 respectively whereas only six marine species are included). The EU IAS Committee has considered a number of submitted risk assessments on various species to assess whether such species merit inclusion in the List of IAS of Union concern on the basis of these 14 criteria. These 14 criteria should also be considered as a basis for the formulation of risk assessment at a national level.

A precondition for considering the inclusion of a species on the list of invasive alien species of Union concern is the preparation of a risk assessment, when relevant, for that species which is to be backed by robust science addressing all the elements laid out by Article 5(1) of the IAS Regulation. The latter regulation moreover, empowers the Commission to adopt delegated acts to further specify the type of evidence/information to be included in such risk assessments. In this regard the Commission is currently proposing dedicated regulations with regard to risk assessments in relation to invasive alien species.

³¹⁵ *Organisation and running of a scientific workshop to complete selected invasive alien species (IAS) risk assessments - ARES(2014)2425342 - 22/07/2014. Roy et al., 2014.*

<http://ec.europa.eu/environment/nature/invasivealien/docs/Workshop%20report.pdf>

3.1.9 CONTINGENCY PLANNING: *To ensure a rapid response when an IAS of Union concern or national concern is detected by devising contingency plans for the terrestrial and marine environments. Contingency planning is also a requirement of establishments permitted to use IAS of EU and national concern for research, ex situ conservation or for reasons of compelling public interest, including those of a social or economic nature.*

Expected outcome: Approved contingency plans are drawn up as part of the authorisation of permits.

Regulation (EU) No 1143/2014: Article 10 – Emergency Measures

Contingency planning is of essence to reduce the time between detecting an introduction and implementing a response. A rapid response can only be ensured if there are adequate materials and equipment on hand to enable immediate action to be taken when an alien species is found, especially high-risk species, such as IAS of EU and national concern. A contingency plan should provide an exact schedule for what to do and who to do it as well as what equipment is needed and where it is stored. The plan must also contain a contact list of stakeholders that may need to be contacted. There should be different contingency plans for the terrestrial and marine environments in view of the different approaches and stakeholders' groups involved. The contingency plans must also make considerations for the major taxonomic groups e.g. plants, birds, mammals and insects, which would all require different responses and roles. **Contingency funding** should also be made available for emergency eradication or control.

Regulation (EU) No 1143/2014 addresses contingency plans in Articles 8 and 9 within the context of permitting and authorisations, respectively. Amongst the requirements that are to be complied by the permitted/authorised establishments using in some way IAS of Union concern (for research, *ex situ* conservation or for reasons of compelling public interest, including those of a social or economic nature), is the drawing up of a contingency plan, which is to be approved by the competent authority. The plan is to cover possible escape or spread of the IAS in question. If an escape or spread occurs, the contingency plan shall be implemented immediately and the permit may be withdrawn, whether temporarily or permanently.

Of relevance to contingency planning are **Conservation orders** as addressed in Article 69 of the Environment Protection Act, 2016 (ACT No I of 2016). Such orders are intended to regulate the protection, conservation and management of protected areas, habitats and species which are to be protected for conservation. The Conservation order sets out prohibitions or restrictions that apply to a particular site or species. An emergency conservation order may be established for an unprotected site which may be at risk of being damaged or destroyed. Similar provisions in relation to any species, habitat and, or any natural feature affected by the impacts of IAS are being considered for integration in the Flora, Fauna and Natural Habitats Protection Regulations.

3.1.10 EARLY DETECTION & SURVEILLANCE: *To adopt an early warning and rapid response system (EWRR) that ensures timely detection via a robust and coordinated national surveillance system and, implementation of appropriate responses without delay.*

Expected outcomes: A national IAS surveillance system is in place and detected species are notified to the Commission without delay.

Regulation (EU) No 1143/2014: Article 14 – Surveillance System; Article 16 – Early notifications

It is not always possible to prevent the inadvertent incursion of new IAS since even the best quarantine systems and standards may sometimes fail to do so. Consequently, an **early warning and rapid response system (EWRR)** is of essence as part of an effective and complete strategy to combat IAS. The EWRR is defined in the EEA Technical Report No 5/2010 as *'a framework designed to respond to biological invasions through a coordinated system of surveillance and monitoring activities; diagnosis of invading species; assessment of risks; circulation of information, including reporting to competent authorities; and identification and enforcement of appropriate responses.'*³¹⁶ An EWRR hence involves the following steps: Detection ⇒ Species Identification ⇒ Quick Screening of Risk ⇒ Reporting and Circulation of Information ⇒ Response ⇒ Follow-up. Each step may involve different actors (competent authorities, other departments, scientific experts etc.). Hence the system only works if there is effective and optimal coordination and networking between all those involved especially when relaying information, instructions and decisions throughout the process. Effective cooperation also necessitates clearly defined roles and responsibilities of the different actors.

Early detection means detecting a newly introduced species ideally before it becomes established, or when it is at an early stage of establishment (enabling removal over a small scale and hence more likely to succeed). It must certainly be ideally detected before it spreads extensively and becomes widespread in distribution as this would make eradication/ control even more difficult and costly. Early detection however also needs to be coupled with capacity to guarantee **rapid follow-up**. Early detection of a potentially invasive species in ecologically sensitive areas further avoids any significant and irreversible damage from taking place. If the species goes unnoticed and remedial measures are not taken soon enough, it may be too late to avoid the damage caused and thus the invasion may no longer be controlled or may be too costly to undertake. As documented in Wittenberg and Crock (2001), *'Waiting for some person to happen upon and report a new invader often means that the invader will be well established by the time relevant authorities become aware of it'*³¹⁷

Early detection requires a **surveillance programme** to be in place and that is supported by means of information that enables quick and ascertained **taxonomic identification** of the species (e.g. specific guides, manuals, species profiles, and other more advanced diagnostic tools, such as DNA barcoding), plus a **register of experts** to enable seeking required expertise. Information would be required on the species' biology (covering all the life stages), ecology, distribution, management options and supported by images (covering all the life stages). The accessibility and quality of information are important issues in order to carry out appropriate quick screening and risk assessments as well as to determine the right course of action to take on the basis of various considerations, such as ease of spread and severity of impact/threat.

³¹⁶ *Towards an early warning and information system for invasive alien species (IAS) threatening biodiversity in Europe.* EEA, 2010.

³¹⁷ *Invasive alien species: a toolkit of best prevention and management practices.* Wittenberg and Cock, 2001.

Surveillance refers to the process of intentionally searching for the occurrence (presence/absence) of an alien species. A surveillance programme may include:

- **active surveillance** by starting with targeted baseline surveys to gather knowledge of current status and presence/absence and follow-up with continuous monitoring to keep track of, and detect, changes/trends as well as new arrivals, and/or
- **passive surveillance** by raising awareness of stakeholders to increase their ability to recognise the species and report its occurrence as part of citizen science.

Surveillance is also needed to gather information that facilitates rapid responses when detecting an alien flagged as being of concern (such as included in an alert list – national list or EU list of IAS). Surveillance involves both **surveying** (providing a snapshot in time) and **monitoring** (to gather more detailed information on trends and for predicting patterns of spread and responses to management). Surveying involves a systematic process of observation and record taking via the carry out of repeated, replicated and correctly timed surveys to adapt to seasonal variation.³¹⁸ Surveying and monitoring of IAS needs to bear in mind that not all alien species become established. However those that eventually do may pose significant impact to society, the economy and/or the environment, especially if they quickly spread and invade beyond the foci of introduction. Hence knowing **what, when, where and how** through surveillance, often is crucial to ensure timely detection of those species with a potential for invasiveness. It should also address contingency planning to increase chances of timely and rapid action.

Due to the time lag when a species exhibits its invasive characteristics, early detection would also assist in detecting those alien species deemed initially harmless. Biological characteristics that lead to invasiveness as well as environmental and man-mediated factors that can aid invasiveness need to be borne in mind when designing generic and targeted surveys:

- **Generic surveys** – these are more opportune for readily identifiable and conspicuous species. In the latter case a citizen science approach may be applied involving members of the public and particular stakeholder groups e.g. ramblers, birdwatchers, land and sea users (in other words passive surveying).
- **Site-specific surveys** – these would target areas of a predicted spread of established species, areas of conservation value, high risk entry points (e.g. points of import/entry: airports, seaports, harbours, containers or freight unpacking areas); areas adjacent to contained holding facilities, as well as areas where disturbance occurs regularly (e.g. roads, construction sites). Consideration of vectors and pathways of spread is also essential to know and prioritise what and where to survey. Site-specific surveys are intended to minimise risk of introduction or to protect vulnerable areas.
- **Species-specific surveys** - Surveys that are specific for plants, birds, mammals, reptiles, fish and invertebrates *etc.* For instance, surveys for the presence of terrestrial fauna should search for animal tracks, droppings and feeding damage. Such surveys should be planned using specific, designed and adapted methods depending on the species concerned. The surveying (and sampling) methods to employ (as well as the effort) will also differ between taxonomic groups and the degree of conspicuousness of the target species (e.g. cryptic species or species present in low numbers with sparse distribution, may go unnoticed) as well as habitat preferences of the species in order to increase

³¹⁸ temperatures, nutrient cycle and ecological conditions relevant to each season in order to detect species that may have high seasonal variation in their populations and distributions

chance of detection. Species-specific surveys are necessary for providing the scientific basis upon which to build effective management measures and to determine follow-up requirements.

Monitoring, through repeated and standardised surveying, provides insight to:

- Trends over time *i.e.* whether a species is spreading (increasing in spatial extent) at such a rate that it is deemed invasive – for instance the preliminary survey will reveal the area of occupation at that time, this data will act as the baseline data for further monitoring to reveal changes in occupation;
- What impacts are being caused by the species shown to be invasive;
- What management decisions should be taken to effectively address alien species and mitigate their impacts; and
- Degree of success and effectiveness of management programmes *i.e.* whether the measures implemented are effective in mitigating the spread and impacts of the species of concern and hence enabling to assess the recovery of the impacted system due to management action and inform requirements of **adaptive management**.

Monitoring provides the required scientific data to inform decision-making on what actions are needed for prevention and management. The success of early detection hence relies on the frequency of surveillance activities dedicated to alien species. To make best use of existing resources and procedures, any tailored alien surveillance programme should also be supported by native species monitoring programmes that integrate the need to report the sightings of aliens (apart from natives). The means to prevent further re-invasion should be addressed by **post-eradication monitoring** and monitoring the recovery of native plant and animal populations. Monitoring of impacts on the receiving ecosystems is also required. As indicated by Wittenberg and Cock (2001), continued monitoring is needed for risks posed by a changing environment, changing practices in land use, increasing trade, new pathways, and climatic changes. Apart from entry points, site and species-specific surveys should be carried out around nurseries, coasts, botanical gardens, breeding farms and disturbed areas in order to immediately detect presence/escape from cultivation or contained holding and eventual spread.

Training is also required to generate the capacity to identify alien species and distinguish them from native ones. For instance, generic surveys require well-trained personnel in taxonomic knowledge. Training of personnel and the public could be addressed through the use of databases, identification tools and by educating in survey methods for different taxonomic groups, by making available field guides, and fact sheets as hard copy and on the Internet.

Data of alien species, generated through surveillance programmes, also needs to be analysed, stored and circulated using standardised procedures. **Data collection** requires a standardised collection sheet to be filled when surveying and would need to include data describing the alien species detected, the site and also its vulnerability, in other words whether the area sustains endemic or rare species. An example of a simple field data collection form is shown in [Figure 25](#). Mapping would also be required on site combined with taking of coordinates. Information on, and reports of, sightings including, action taken against an IAS, needs to be stored as a regularly updated, dedicated and accessible centralised database.

SITE INFORMATION

Name of Site:			Coordinates:			
Is the site within a protected area?	Yes <input type="checkbox"/>		No <input type="checkbox"/>			
			Is it instead adjacent to a protected site: Yes <input type="checkbox"/> No <input type="checkbox"/>			
Description of Site:						
Is site disturbed?	Yes <input type="checkbox"/>		No <input type="checkbox"/>			
Define form of disturbance:						
EXISTING COMMUNITY INFORMATION						
Community:			Habitat Description:			
Dominant Species:			Co-dominant Species:			
DATA ON ALIEN SPECIES						
Genus:			Species:			
Life Form:	Plant <input type="checkbox"/>	Reptile <input type="checkbox"/>	Fish <input type="checkbox"/>	Bird <input type="checkbox"/>	Mammal <input type="checkbox"/>	Invertebrate <input type="checkbox"/> State what:
Estimation of abundance and methodology:						
Noticeable species interactions on site (e.g. smothering, predation, etc.):						
Comments (detailed description of location, direction of site and map, vulnerability and importance of site and other relevant information)						

Figure 25 – Simple Field Form for Reporting Invasive or Novel Alien Species

National Strategy on Invasive Alien Species

Under Article 14 of Regulation (EU) No 1143/2014, Member States are required to establish a surveillance system of IAS of Union concern, or include it in existing monitoring systems. Pursuant to the requirements of the EU Regulation on IAS, Member States need to establish a surveillance system of IAS of Union concern, or include it in their existing system, within 18 months of the adoption of the Union list (Article 14). This system would collect and record data on the occurrence in the environment of IAS by survey, monitoring or other procedures to prevent the spread of IAS into or within the Union. Surveillance systems should imply paying continuous attention to any new IAS anywhere in the EU and aim to provide an effective and complete picture at Union level. The surveillance system should:

- cover the whole territory (and include marine territorial waters) of that Member States,
- determine the presence and distribution of new and already established IAS of Union concern;
- be sufficiently dynamic to detect rapidly the appearance in the environment of any IAS of Union concern;
- build upon, be compatible with, and avoid duplication with existing systems of surveillance and monitoring set out in Article 11 of the Habitats Directive, Article 8 of the WFD and Article 11 of the MSFD;
- take into account the relevant transboundary impact and transboundary features, to the extent possible;
- be used to confirm early detection of the introduction or presence of IAS of Union concern (Article 16); and
- be used to monitor the effectiveness of eradication and management measures as well as the impact on non-target species

Monitoring of alien species through **Rapid Assessment Surveys** in hotspots (namely harbours, which are considered to be the main points of entry in view of shipping activities) is included in **Malta's monitoring programme for the marine environment** under the MSFD framework. This would allow detection of alien species at an early stage. Amongst the eleven monitoring factsheets incorporating the thirteen monitoring programmes in accordance with MSFD GES descriptors, is that on non-indigenous/alien species for Descriptor 2. This monitoring programme includes the following four sub-programmes:

- occurrence of alien species in marine protected areas via dedicated surveys,
- occurrence of alien species in hotspots – selected harbour areas and marinas,
- abundance of alien species within specific taxonomic groups (benthic invertebrates, phytoplankton/zooplankton) and in fisheries independent (MEDITS) and dependent (on-board observer) surveys; and
- information on relevant anthropogenic activities (shipping) – data will be collected depending on availability e.g. number of vessels calling at Maltese ports. The samples of marine growth on vessels before and after underwater cleaning as per ERA's GBR's would also provide data on hull cleaning as a vector.

Monitoring is intended to shed light on the trends in temporal occurrence of alien species as well as ratio between invasive alien species and native species. Sampling methodologies and analysis of samples will be carried out in line with defined standards and guidance documents.

3.1.11 RISK-BASED OFFICIAL CONTROLS: *To strengthen administrative capacity to ensure consistent inspections and interception at entry points of IAS of Union concern and national concern, and of animals and plants most at risk of bringing diseases and pathogens, and related imported goods by means of trained personnel.*

Expected outcomes: Review and assess the implementation the Official controls system.

Regulation (EU) No 1143/2014: Article 15 – Official Controls; Article 16 – Early notifications

Legislation is implemented and enforced by carrying out inspections at high-risk entry points namely airports, marinas, dry-docks, harbours and fishing ports. Such **border/customs control** aims at intercepting illegal/unauthorised and accidental introductions of novel alien species. Surveillance protocols of potential vectors and pathways are essential, coupled with a framework of rules that are enforced by trained staff and officials at customs/border control and, abided to by trade/transport bodies, tourist operators, and airport and harbour authorities. A references list of species of risk of being invasive as well as risk goods should not only be given to the enforcers but also the other bodies mentioned.

National **customs and quarantine procedures** operating and related to importation have been mentioned in [Chapter 2. Figure 26](#) summarises the controls and inspections by the relevant competent authorities.

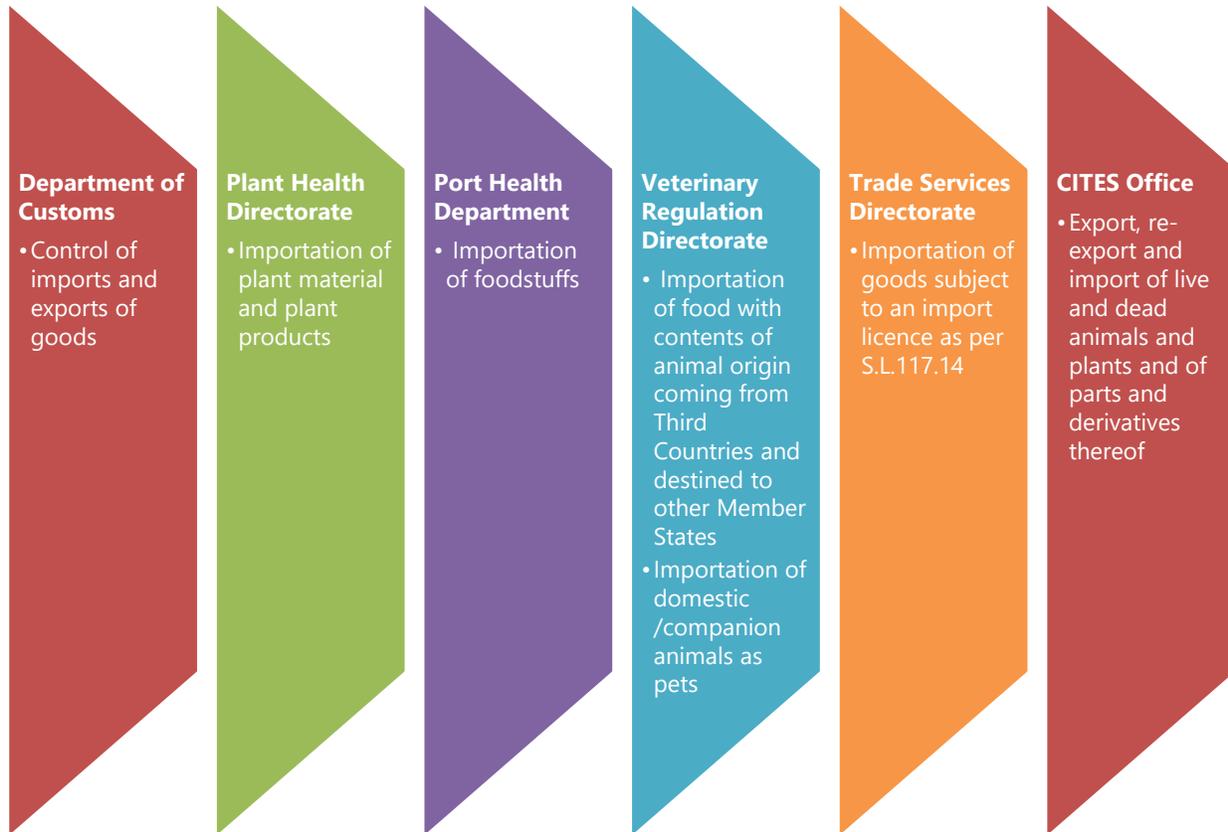


Figure 26 – Competent Authorities involved in the regulation of importation into the country

At the Malta International Airport, commercial goods, whether for sale in Malta or in transit, must be declared to customs through the red channel. Amongst the goods that are prohibited or restricted importation, include animals and birds (alive or dead), certain articles derived from protected species and plants and plant products, including trees and shrubs, and soils. On the other hand, the Freight Forwarding Agent is responsible for customs clearance. The inspectorate within the Plant Quarantine Section is responsible to ensure that each entry point (Airport Old terminal for cut flowers, seeds and vegetables; Seaports (Menqa / Laboratory Wharf / Silos) for grains; Hal Far for fruit, vegetable and plants; Ta' Qali for fruit and vegetables and Places of destination, *e.g.* at the importer's premises) is under surveillance to prevent the entry of harmful organisms and to inspect the plants and plant products, in collaboration with the Customs and postal authorities, for any suspicious containment of harmful organisms, along with other responsibilities it has.

Fully functioning structures need to be in place to perform **official controls** as required by Article 15 of Regulation (EU) No 1143/2014. This article mentions that where Union legislation on official controls already provides for specific official controls at border entities, as in accordance with Regulation (EU) No 2017/625 on official controls and other official activities performed to ensure the application of food and feed law, rules on animal health and welfare, plant health and plant protection products , or, points of entry in

accordance with Directive 2000/29/EC on protective measures against the introduction into the Community of organisms harmful to plants or plant products and against their spread within the Community. For those categories of goods falling within the **Combined Nomenclature codes** to which a reference is made in the list of IAS of Union concern, Member States shall confer the responsibility of performing the controls to the competent authorities tasked with those controls in accordance with the provisions of Regulation (EU) 2017/625 or in Article 2(1)(g) of Directive 2000/29/EC. Such controls need to verify that the goods are not on the list of Union concern, or that they are covered by a valid permit as referred to in Article 8.

3.1.12 PENALTIES: *To adopt a strict national penalty system that punishes perpetrators but also acts a deterrent for illegal introductions and uses as well as accidental introductions resulting from negligence; The polluter pays principle and environmental liability are procedures that are applied to promote accountability and to be able to gain recompensation for enabling rectification of damage, where possible.*

Expected Outcomes: Provisions on the national penalty system are defined in the domestic legal framework and communicated to the Commission; any infringements are duly enforced and fines applied accordingly.

Regulation (EU) No 1143/2014: Article 30 - Penalties

Problems related to alien species can also result as a consequence of non-compliance with legal regulations, unauthorised introductions, and breach of permit conditions or quarantine/containment measures or even from gross negligence. **Types of infringements** may comprise:

- permit-related violations (failure to obtain a permit or certificate, breach of permit conditions etc.);
- operational violation (non-compliance with operating rules for breeding/cultivation facilities, safety standards etc.);
- unlawful trade and transport;
- breach of monitoring and notification requirements;
- failure to take required mitigation measures; and
- grossly negligent conduct giving rise to introduction or escape from contained holding.

Such actions may be punishable by law through the setting up of penalties/fines, which can reflect the seriousness of the type of infringement to enable compensation for the harm or damage caused. In this context, Regulation (EU) No 1143/2014 requires Member States to set up **effective, proportionate and dissuasive penalties**, which may comprise fines; seizure of specimens, or permit withdrawals or suspensions. The **"introducer/polluters pays principle"** is also required to promote accountability for such illegal actions, to support responsibility via dissuasive penalties, and also for generating funding for remediation measures and prevention measures. Article 21 of Regulation (EU) No 1143/2014 states: *'In accordance with the polluter pays principle and without prejudice to Directive 2004/35/EC of the European Parliament and of the Council, [on environmental liability with regard to the prevention and remedying of environmental damage] Member States shall aim to recover the costs of the measures needed to prevent, minimise or mitigate the adverse impact of invasive alien species, including environmental and resources costs as well as the restoration cost.'*

However, it needs to be borne in mind that responsibility for many introductions cannot be easily traced to a perpetrator or else there are cases where the intentional introduction was legal, but the introduced alien was not identified as being potentially invasive, or, in cases where introduction was unintentional, but was hard to detect, or, else because it occurred via a pathway that was considered as being 'low-risk'.

3.1.13 REMEDIAL/MANAGEMENT MEASURES: *To adopt remedial measures that are proportional to the impact of the introduced IAS on the environment and that avoid impacts on non-target species, habitats, ecosystems and protected areas; To target resources towards the management of widespread IAS deemed of priority for feasible management, including within, but not limited to protected areas.*

Expected outcome: Management measures (including considerations for control and/or containment) are in place for widespread IAS of Union concern and national concern ; choice of management option is on the basis of various factors, including the duration of the species in question since its introduction/establishment.³¹⁹

Regulation (EU) No 1143/2014: Article 19 – Management measures

When prevention measures have not succeeded and introduction has already taken place, there are then four options for how to deal with the alien species. These options are **eradication, containment, control and the do-nothing approach**. The latter option is followed when action is not practically or financially feasible or when the action is considered socially unacceptable. Eradication takes precedence over containment and control as the most cost-effective management option, while containment takes precedence over control. Indeed eradication is the favoured approach to mitigate impacts exerted by alien species, and further spread, since it can be more cost-effective than the other alternatives, especially if action is not delayed and complete removal is supported by the required investments and resources over the whole duration of required management. The duration may span months to years depending on various factors. Complete removal of the IAS via eradication also provides the best opportunity for the recovery of native biodiversity.³²⁰ However, it should be borne in mind that eradication success is more likely with manageable sizes of infestation – such as small islands/islets or where the infested area is limited in extent. Indeed eradication is only practical when invasion/introduction is at its early stages, that is, when populations are small and localised. On the other hand, both control, which reduces the presence/abundance of the invader, and containment, which limits further spread, require indefinite investments of time, effort and money to keep an invader at bay. All options are reviewed more in detail in the following sections.

3.1.13.1 ERADICATION: *To ensure that practical measures are in place to enable rapid eradication, through complete and permanent removal, of new introductions IAS of EU and national concern whenever detected and where feasible; Eradication of animals is done in accordance with rules on animal welfare to avoid any undue pain, distress and suffering.*

Expected outcome: Detected new IAS of Union concern are rapidly eradicated; where not feasible, a derogation request is made within two months of detection to the Commission.

³¹⁹ Depending on the species being addressed and extent of infestation; for widespread species that have been in the environment for less than 5 years, control might preferred, whilst for those species have been in the environment for longer than 5 years, containment might be preferred.

³²⁰ *Viewing invasive species removal in a whole-ecosystem context.* Zavaleta, Hobbs and Mooney (2001).

CBD Guiding principle 13: Eradication
**Regulation (EU) No 1143/2014: Article 17 – Rapid eradication at an early stage of invasion;
Article 18 – Derogations from the obligation of rapid eradication**

The eradication of those alien species which threaten ecosystems, habitats or species is a legal requirement stemming from international and regional MEAs, Regulation (EU) No 1143/2014 and national legislation. Eradication may involve **lethal and non-lethal means**. Methods of eradication also differ depending on the taxonomic group to which the species targeted for eradication belongs. The ecological feasibility of a method intended to eradicate a target invasive alien species needs to be assessed according to the biological characteristics of that invasive species and its ecological relationship with the area it has invaded. Methods may involve **physical means, chemical means or a combination of both**. In the case of animals, **animal welfare considerations** need to be made by ensuring that the means of eradication spares the animal avoidable pain, distress and suffering during the process, taking into account as far as possible the best practices in the field, for example the “**OIE Guiding Principles on Animal Welfare**”.³²¹ Non-lethal methods should be considered and any action taken should minimise the impact on non-targeted species.

As mentioned by Genovesi and Shine (2004), ‘**Species-based priorities for eradication** should be (1) newly arrived alien species, especially where non-reversible effects are predicted (2) species representing a major threat to native biodiversity (3) species already established in the wild, causing reversible effects on native ecosystems, and (4) species for which eradication is most feasible’. Other priority species targeted for removal would be those species considered as “transformers” with large-scale environmental impacts.³²² Article 17 of Regulation (EU) No 1143/2014 places a **rapid eradication obligation** on all Member States should the surveillance system established in accordance with Article 14 and the information collected at official controls provided for by Article 15 confirm early detection of the introduction or presence of IAS of Union concern. Member States may derogate from this obligation when at least one of the following conditions are met (Article 18):

- eradication is demonstrated to be technically unfeasible because the eradication methods available cannot be applied in the environment where the IAS is established;
- a cost-benefit analysis demonstrates on the basis of the available data with reasonable certainty that the costs will, in the long term, be exceptionally high and disproportionate to the benefits of eradication;
- eradication methods are not available or are available but have very serious adverse impact on human health, the environment or other species.

Although eradication is the best course of action for dealing with IAS, consideration of such an approach relies on a cost/benefit analysis as well as the **likelihood of eradication success**. Criteria for designing successful eradication programmes include the following:

- The programme is backed by scientific data;

³²¹ Available at: <http://www.oie.int/animal-welfare/animal-welfare-key-themes/>

³²² *Plant invasions and invisibility of plant communities*. Rejmánek, Richardson and Pyšek, 2013.

- There is legal backing for dealing with the species in question;
- There is community support of the plans to eradicate;
- Sufficient funding is secured to see the programme to completion;
- Eradication of all individuals is guaranteed and in this respect all individuals of the target population must be susceptible to the eradication method;
- Preventative measures are adopted to prevent re-invasion, from environs;
- Pre-eradication surveillance identifies the extent of the alien population(s) to eradicate;
- Post-eradication surveillance ensures that eradication has been achieved, and to intercept any last survivors for removal;
- Methodologies/techniques must be environmentally, socially and ethically acceptable; and
- Measures to restore ecosystems, after eradication are integrated, into the programme.³²³

Zavaleta, Hobbs and Mooney (2001) suggest that eradication methodologies should be viewed in the context of the overall ecosystem that is being managed.³²⁴ These authors suggest that two forms of assessments should be carried out: a pre-assessment and a post-assessment. A **pre-assessment** is first carried out to tailor eradication so as to avoid secondary impacts (unwanted and unexpected) on non-target species. For instance, broad-spectrum pesticides should not be used as they impact non-target species of the ecological community and can also be amplified along the food web. Other considerations should be made; for instance eradication of plant invaders should be carried out gradually to avoid environmental shock which would result through sudden obliteration.³²⁵ When planning an eradication programme, attention should be drawn to any implications of **multiple, interactive invaders** and how the removal of one invader (**ecological release**) may influence the abundance of another alien species and on native species present in the invaded ecosystem. Therefore, during the pre-assessment phase it is also important to qualitatively evaluate trophic interactions among alien species and between native and alien species, and potential functional roles of alien species (e.g. as predators/herbivores consuming both alien and native species). This is further illustrated in [Figure 27](#).³²⁶ Undesirable eradication outcomes may ensue in the case of the following three classes of species interactions:

- Top-down and bottom-up trophic and competitive interactions both between alien and native species and among alien species themselves;
- Provision of habitat by one species for another, and
- Indirect interactions through the alteration by one species of site conditions for another.³²⁷

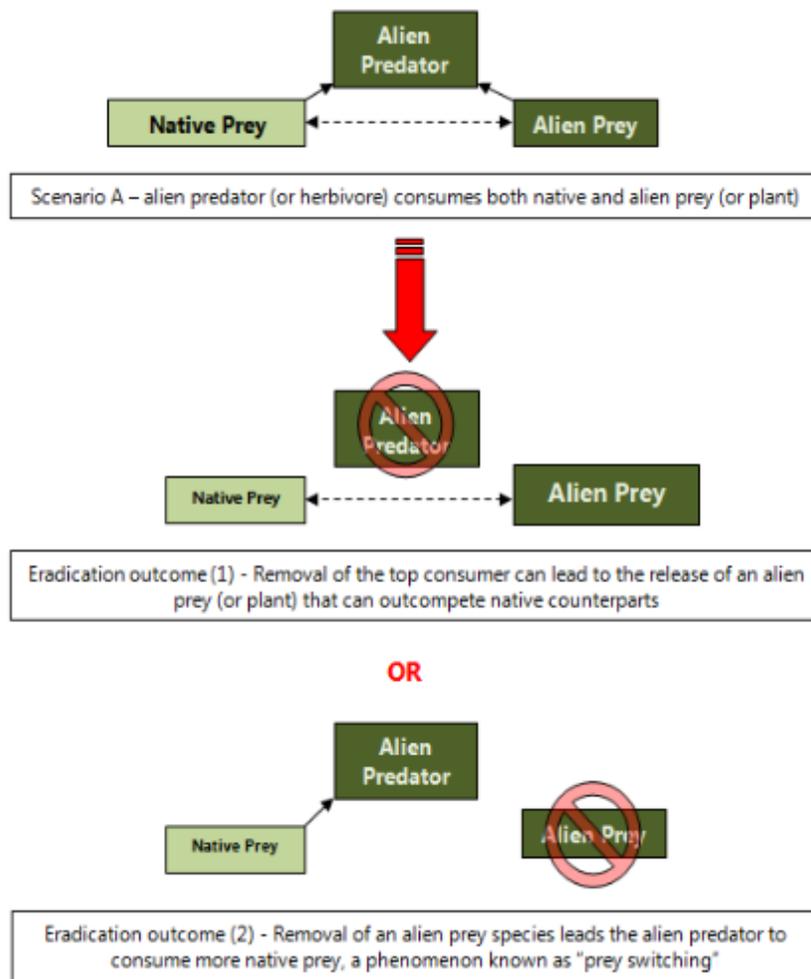
³²³ *A Global Strategy on Invasive Alien Species*. McNeely *et al.*, 2001.

³²⁴ *Viewing invasive species removal in a whole-ecosystem context*. Zavaleta, Hobbs and Mooney (2001).

³²⁵ *Introduced species in the Maltese Islands*. Schembri and Lanfranco, (1996).

³²⁶ *Viewing invasive species removal in a whole-ecosystem context*. Zavaleta, Hobbs and Mooney (2001).

³²⁷ *Turning the tide; the eradication of invasive species*. Zavaleta, 2004.



**Figure 27 - Ecological release following removal of an alien species
(Adapted from Zavaleta, 2004)**

Dark green boxes are alien species, while light green boxes are native species; dashed arrows indicate competition, while solid arrows point to consumers from the organism consumed.
Font size indicates population size.

The removal of an invasive species from a specific area it invades may result in the re-establishment and recovery of the native species although this may be a slow process. However in the meantime the area can be invaded by another alien species. A **post-removal assessment** of eradication effects should also be employed to document the positive and negative outcomes of eradication. This allows the chance not only to learn from mistakes but also to curtail negative effects before they become too severe to be able to mitigate them via **adaptive management**. Eradication and control programmes also warrant the undertaking of risk assessments to cover impacts, reversibility of effects and risk of re-invasion. Only those methods with proved efficacy should be undertaken, if possible. Once eradication has been completed it

should also be followed by **post-eradication monitoring** to prevent re-invasion from occurring by the same alien species or a different invasive species.³²⁸ Areas given priority for eradication measures should be those designated as special areas of conservation, especially those areas harbouring endemic species.

Upon implementation of the eradication programme, irrelevant of whether it was successful or not, it should be documented as a report with information provided on the following:

- Site location,
- Identification of the alien species and its biology,
- The vector/pathway of invasion and whether deliberate and legal, deliberate and illegal, accidental or natural,
- How and when it was detected,
- Description of the ecosystem it invaded,
- Impacts caused,
- Time period between the initial entry of the species and the development of impacts, if known
- Options considered for mitigating the impacts and reasons for selecting the action taken,
- Decision making process,
- Stakeholders involved,
- Consultation process used,
- Actions taken (prevention, early detection, eradication, containment, control, restoration, research, monitoring, public education and regulatory measures),
- Costs of actions and benefits achieved,
- Timeframe of operation, and
- Lessons learned from the operation.

3.1.13.2 CONTAINMENT: *To identify which IAS of priority are to be subjected to containment measures and to design containment measures with clearly defined goals to ensure that they are efficient and fool proof.*

Expected Outcome: IAS of priority, which cannot be eradicated in the short term are subjected to containment measures where this is financially and practically feasible; such containment may also facilitate eventual eradication.

CBD Guiding principle 14: Containment

When pre-assessments indicate that eradication is not ecologically or economically feasible in terms of for instance, possible secondary impacts to non-target species or else insufficient resources to eradicate, then, containment is the next option to explore. Containment measures need to be designed with clear goals in mind such as containment within barriers beyond which the invasive species should not spread or else containment where particular protected habitats should not to be invaded. Containment may also be considered as a means of increasing the efficiency of eradication and control measures by preventing further spread or growth of the alien species population and allowing time for mobilising other remedial measures.

³²⁸ *Eradication revisited: dealing with exotic species.* Myers, Simberloff, Kuris and Carey, 2000.

³²⁹ Species that are amenable to successful containment measures are those that have limited dispersal abilities *i.e.* spread slowly and over short distances, and where their particular habitat is naturally constricted. Containment however will require constant monitoring and control of the species to prevent its spread beyond the confined area.

3.1.13.3 CONTROL: *To adopt effective control methods that are specific to the IAS being targeted and that do not result in secondary negative impacts to the environment.*

Expected outcome: Control measures are tailored and effective for their intended purpose, without causing undesirable effects.

CBD Guiding principle 15: Control

When eradication is no longer feasible because the species has become widespread, then efforts should aim to control the negative impacts on native and endemic flora and fauna. Control refers to maintaining and reducing the density and abundance of an alien species below a pre-set acceptable threshold whereby '*harm caused by the species under this threshold is considered acceptable with regard to damage to biodiversity and economy*'.³³⁰ Examples of **methods of control** include biological control, mechanical control, chemical control, habitat management or a combination of some or all of these based on the **principles of integrated management**.

Biological control is the intentional introduction of living organisms known as biological control agents as a form of pest control to reduce undesirable or otherwise harmful organisms in agroecosystems. Biological control agents are categorised into predators, parasitoids, pathogens and weed-feeders. An example of a predatory biological agent that has been introduced in the Maltese Islands is the Vedalia ladybeetle. Ladybirds are predatory of the soft-bodied aphids, soft-scale insects, mealy bugs, spider mites and eggs of the Colorado potato beetle and European corn borer and cotton cushion scale. Concerns when releasing such alien biocontrol agents into the environment include the effectiveness of actually reducing the target pest, whether the agent will affect non-target species and whether it may become established and itself harmful in the future. Ideally the biological agent used is a native species or else imported species, not known to cause harm in areas with the same climatic conditions.

Treatment technologies for controlling alien species include fumigation, temperature treatments, spraying aircraft cabins, plant and animal health measures, ultra violet light sterilisation, filter systems aboard ships, ballast water exchange and a combination of treatment technologies. Control methods may need to be applied long term and therefore recurrent funding and commitment would be required. Certain methods of control would need to be subject to a risk assessment. *Before starting a control programme a cost/benefit analysis should be realised, desired outcomes should be clearly defined and appropriate monitoring of the results should be planned.*³³¹

IAS control measures are currently being implemented or are earmarked to take place, within a number of protected areas. Such measures are combined with monitoring to assess progress and effectiveness of the

³²⁹ *Invasive alien species: a toolkit of best prevention and management practices.* Wittenberg and Cock, (2001).

³³⁰ *Invasive alien species: a toolkit of best prevention and management practices.* Wittenberg and Cock, (2001).

³³¹ *European Strategy on Invasive Alien Species.* Genovesi and Shine, (2004).

National Strategy on Invasive Alien Species

measures adopted, as well as planting of native species, as appropriate. Remedial action has been, or is being, undertaken at the following sites:

- L-Għadira vis-à-vis the control of *Eucalyptus* spp., *Myoporum* spp., *Schinus* spp., and *Acacia* spp., which is carried out on a yearly basis by the site managers; by the end of 2016 it is foreseen that:
 - 50% of *Eucalyptus* spp., is removed
 - 100% of *Myoporum* spp., is removed
 - 100% of *Schinus* spp., is removed
 - 70% of *Acacia* spp., is removed
 Removal of other pests is also carried out especially feral cats (which are given to animal sanctuaries) and rats;
- Wied Ghollieqa vis-à-vis the removal of *Opuntia ficus-indica* and *Ricinus communis*;
- Għajn Tuffieħa vis-à-vis the removal of *Acacia* spp. and *Agave* spp.;
- Ir-Ramla il-Ħamra vis-à-vis the control of *Arundo donax* on the sand dune;
- Ir-Ramla tal-Mixquqa vis-à-vis the removal of *Agave americana*, *Agave attenuata*, *Aloe ferox*, *Aptenia cordiflora*, *Carpobrotus* spp., *Lavatera arborea*, *Opuntia stricta* and *Yucca gloriosa* – with the end goal of restoring the sand dunes;
- L-Inħawi tar-Ramla tat-Torri u ta' l-Irdum tal-Madonna vis-à-vis rat eradication and removal of *Agave americana*;
- Il-Magħluq tal-Baħar vis-à-vis the removal of domestic waterfowl as part of conservation measures to safeguard the Maltese killifish (*Aphanius fasciatus*);
- Buskett as part of the EU LIFE Saving Buskett Project – the species targeted are *Agave* spp., *Ailanthus altissima*, *Ricinus communis*, and *Vitis* sp.; and
- Pembroke vis-à-vis the removal of *Acacia saligna* [= *cyanopylla*].

The removal of invasive alien plants is also earmarked for:

- Majjistral Nature and History Park – removal of *Agave americana* and *Agave sisalana*.

Since these activities are being implemented within protected areas, a nature permit is first issued before such activities can take place. IAS considerations have also been integrated in the management plans for terrestrial Natura 2000 sites drawn up as part the EAFRD Funded Project on Natura 2000 Management Planning for Malta and Gozo.

3.1.14 IMPACT MITIGATION: *To explore native conservation introductions in cases where the impact of IAS is irreversible and where there is no other alternative to ensure the long-term survival of the affected native/endemic species.*

Expected outcome: Impact mitigation via species translocations is only carried out as a last resort to ensure the long-term survival of rare and endangered species and where it is of added-value.

CBD Guiding principle 12: Mitigation of impacts

When planning and implementing eradication, containment and/or control measures, the opinion of expert botanists or ecologists should be sought so as to avoid inappropriate measures from taking place as these

can exacerbate an invasion or the ecological damage caused by it. When eradication, containment and control have all failed in managing an invasive alien species and these are already well established in the area of concern, mitigation measures may be explored to reduce the impact of the IAS on very rare and endangered species. Such mitigation measures would for example consist of relocating a viable population of the endangered species to an area where the invasive alien species is not found (**assisted colonisation or benign introduction**).³³² This is only resorted to in situations where population restoration within the native species' suspected natural range cannot take place, because there is no remaining habitat left that meets the species' requirements or, because important ecological processes are no longer operational. Such introductions outside the species' natural range would however require prior assessment of the potential impact that the introduced native species may have on its new environment.

- 3.1.15 RESTORATION:** *To promote natural regeneration and resilience of ecosystems following the implementation of remedial measures and to assist such regeneration by any restoration measures, where deemed of added value and, always in keeping with the ecological context of the site.*
Expected outcome: IAS removal activities contribute to the restoration and resilience of ecosystems and in so doing to the EU and national targets on restoration (the 15% target).

**Regulation (EU) No 1143/2014: Article 20 – Restoration of the damaged ecosystems;
 Article 21 – Cost recovery**

There are instances when IAS removal needs to be coupled with additional site restoration measures to assist or enhance recovery. This is because particular alien species (transformers) are known to alter the condition of the habitat rendering it unsuitable for native species to become re-established. The effects of IAS can indeed result in the damage, degradation or destruction of ecosystems and alteration of soil properties. Invaded ecosystems are also more susceptible to other pressures due to a **reduction in resilience**.³³³ Such effects also hinder the attainment of conservation goals of EU Directives – that is reaching favourable conservation status of species and habitats of Community importance in accordance with the Birds and Habitats Directives, the good ecological status of surface waters in accordance with the Water Framework Directive, and, the good environmental status of marine waters in accordance with the Marine Strategy Framework Directive. This warrants the implementation of restoration measures as part of the **package of remedial/management measures**. The element of restoration is covered by Regulation (EU) No 1143/2014 (Article 20), for the purposes of **ecosystem recovery** and to prevent reinvasion. The Regulation also mentions the polluter pays to recover restoration costs (Article 21).

Remedial measures for responding to bioinvasions should allow for the **natural regeneration** of the site and re-establishment of native species formerly present in the affected area. When natural regeneration needs to be assisted by restoration measures, the latter would comprise of native planting or **species**

³³² *Guidelines for Reintroductions and Other Conservation Translocations*. IUCN/SSG, 2013. Available at: <https://portals.iucn.org/library/efiles/documents/2013-009.pdf>

³³³ "Resilience" refers to the 'Capacity of an ecosystem to regain its fundamental structure, processes and functioning when altered by a stressing factor'. This differs from the term "Resistance" which on the other hand means the 'Capacity of an ecosystem to retain its fundamental structure, processes and functioning (or remain largely unchanged) despite stresses'. Man can alter the resistance of a habitat through disturbance and make the habitat less resilient to recovery. "Resistance to invasion", is the ecosystem's ability (by way of abiotic and biotic attributes and ecological processes) to limit the population growth of an invading species (based on Chambers *et al.*, 2013).

reintroductions and reinforcements in accordance with best practice guidelines. Species reintroduction involves releasing native individuals with the objective of creating a new population in the native species' original environment from where it was completely extirpated. Species reinforcement, on the other hand, boosts the numbers of existing native populations nearing extirpation, with the addition of individuals of the same race/subspecies thereby safeguarding the native species' long-term survival. Restoration will also increase the ecosystem's resilience to further invasions. A component of the "Guidelines on Managing Non-Native Plant Invaders and restoring Native Plant communities in terrestrial settings in the Maltese Islands" (MEPA 2013) addresses what aspects to consider when planning and implementing native species reintroduction or reinforcement programmes aimed at restoring plant communities.³³⁴ This guidance document integrates the recommendations of the "**Guidelines for Reintroductions and Other Conservation Translocations**" (IUCN/SSG, 2013).³³⁵

3.1.16 SCIENTIFIC RESEARCH: *To further liaise with the scientific community to ensure that IAS research in Malta responds to policy demands and contributes to generating a strong scientific knowledge base upon which to direct policy and decision making on IAS-related issues and to guide national implementation of Regulation (EU) No 1143/2014, amongst others.*

Expected outcome: Knowledge gaps on IAS are addressed and published scientific data is readily accessible to inform policy development and assist in the implementation of legislation at national and local level.

CBD Guiding principle 5: Research and monitoring

Scientific research in the field of **invasion biology** is of growing interest from an ecological perspective since IAS present an opportunity to learn how alien species colonise communities and how they interact with native species and ecosystems.³³⁶ Scientific research is indispensable to understand the process of invasion and to gain insight on the characteristics of alien species in terms of invasive ability, their social, economic and environmental impacts, how best to prevent and manage these, as well as to test the efficacy of management options. Scientific knowledge is required for instance on which types of habitats, alien species are the most successful at invading; the traits and pathways of invasive species; the impacts and cascading effects of different invasive species through ecological and socio-economic systems; reliable predictors of invasion by a species; as well as successful methods of prevention and management.

Regulation (EU) No 1143/2014 places emphasis on available scientific knowledge and evidence for:

- justifying Union action against IAS as well as for carrying out risk assessments (Articles 4 and 5),
- the taking of measures by Member States for IAS identified as being of member state concern, including for revoking a permit (Article 9),
- for emergency measures to be taken on non-listed alien species (Article 10) and
- for derogating from the obligation of rapid eradication (Article 18).

³³⁴ Available at: <https://era.org.mt/en/Documents/PlantInvaders-RestorationGuidelines-MEPA-2013.pdf>

³³⁵ *Guidelines for Reintroductions and Other Conservation Translocations*. IUCN/SSG, 2013.

³³⁶ *Eradication revisited: dealing with exotic species*. Myers, Simberloff, Kuris & Carey, 2000.

Research is also needed to investigate the interaction between alien species and their combined effects and also to improve the knowledge of competitive relations between the alien species and the native species on the Maltese islands. This will help to build capacity to identify and manage threats and where required, to better predict management outcomes. Such investigation should be linked to monitoring systems to support management programmes and provide a scientific basis for decision-making. Research, with the assistance of monitoring, should involve targeted and general surveys carried out at vulnerable or risk entry points (see [Section 3.2.11](#)). Any species, which may by research or otherwise prove to be invasive or harmful to the environment, would have to be tackled within a certain timeframe. Genovesi and Shine (2004) suggest **prioritising research** that directly supports prevention and minimisation of impacts.³³⁷ Results from such research on alien species should be disseminated to generate awareness and should be rapidly and openly accessible. Ideally a repository is created as a centralised system whereby all published research undertaken locally is made easily available.

In Malta, research is either done as part of dissertations by University students, as part of commissioned work, in the form of documenting new records of alien species in the country or as part of regional projects. For instance, the Marine Ecology Research Group (University of Malta) is currently participating in the **CIESM Tropical Signals programme**.³³⁸ The latter focuses on the detection and monitoring of a number of indicator species, including alien species, likely to be affected by the ongoing warming trend of Mediterranean waters.

Another example of a key project that is worth mentioning is the **MedPAN North project**, which has involved the participation of the former Malta Environment and Planning Authority. One of the research activities of this project was data acquisition on the presence of selected alien species in the marine waters around Malta, including all the marine protected areas. Two surveys were carried out in January and June 2013. Data gathering was mainly limited to sites from within MPAs. The alien species were: *Lophocladia lallemandii*, *Halophila stipulacea*, *Caulerpa cylindracea*, *Asparagopsis* spp., *Percnon gibbesi*, *Bursatella leachi*, *Spherooides pachygaster*, *Fistularia commersonii*, *Siganus luridus*, *Stephanolepis diaspros*, *Brachidontes pharaonis*, *Pinctada radiata* and *Crassostrea gigas*. These were depicted on diving plates together with a data recording form ([Figure 28](#)).

³³⁷ *European Strategy on Invasive Alien Species*. Genovesi & Shine, 2004.

³³⁸ Available at: <http://www.ciesm.org/marine/programs/tropicalization.htm>

Regulation (EU) No 1143/2014 defines “research” as ‘*descriptive or experimental work, undertaken under regulated conditions to obtain new scientific findings or to develop new products, including the initial phases of identification, characterisation and isolation of genetic features, other than those features which make a species invasive, of invasive alien species only insofar as essential to enable the breeding of those features into non-invasive species*’. The EU Regulation on IAS requires that scientific research using IAS of Union concern should be authorised through the issuance of permit and be carried out in closed establishments where the organisms are in contained holding and with all the necessary measures taken to avoid the escape or unlawful release of these species following the obligations defined in Article 8.

3.1.17 BEST PRACTICE: *To ensure that action to combat IAS in Malta is done on the principles of best practice, which is facilitated via the adoption of guidelines and agreed codes of conduct/best practice, where required.*

Expected outcome: Publication of policy guidance documents and widely accepted and applied national codes, as deemed required to support best practice standards.

Conservation endeavours involving the removal of IAS and the restoration of native biodiversity need to be developed on a **sound information basis** so as to avoid undesirable effects, whilst maximising beneficial effects on local biodiversity in the most financially and ecologically viable manner. Best practices may be encouraged and facilitated via the publication of supporting policy guidance documents. Within the context of invasive alien plants, the former MEPA adopted on 7 March 2013 the publication entitled “**Guidelines on managing non-native plant invaders and restoring native plant communities in terrestrial settings in the Maltese Islands**”.³³⁹ These guidelines have been drawn up with the purpose to: (1) assist the planning and implementation of management programmes, aimed at counteracting the spread of existing plant invaders in important natural and semi-natural areas as well as rural areas, where the removal of non-native plants is desired; and (2) assist the design and implementation of native plant conservation translocations (such as plant reintroductions or reinforcements), aimed at reinstating native plant communities to a favourable conservation status or to reinstate an ecological function. The document also serves as guidance to be followed when drawing up method statements on the removal of invasive plants and when implementing conditions that accompany development permits. Ultimately, the Guidelines have been developed with the aim of ensuring that best practices are followed in line with requirements of biodiversity-related Multilateral Environmental Agreements and other guidance documented in both fields. The Guidelines have been designed with the aim of being concise, informative and user-friendly. A clear stepwise approach (including use of flow charts and tables) is adopted to enable consideration of crucial elements, risks to avoid, and any required safeguards, in order to increase as much as possible the success of the intended intervention on the basis of appropriate planning and adaptive management. It is underlined however that methodologies described in the Guidelines are not prescriptive, since such endeavours should be tailored and planned on a case-by-case basis. Moreover, the Guidelines are intended to be a living document, and in this respect should be periodically updated to reflect experiences in management and operational advancements in both fields. These guidelines also make reference to other relevant national policy guidance including the “**Guidelines on Trees, Shrubs and Plants for Planting and Landscaping in the Maltese Islands**” which were adopted in 2002³⁴⁰. While there may be plans to update/supplement these

³³⁹ Available at: <https://era.org.mt/en/Documents/PlantInvaders-RestorationGuidelines-MEPA-2013.pdf>

³⁴⁰ www.mta.com.mt/loadfile.ashx?id=e9194c07-8ae9-49f6-866a-99b1b2a41d2a

guidelines, the 2002 version still remains relevant to preventing the use of invasive species in landscaping. Indeed the 2002 guidelines aim to:

- promote environmentally-sound planting and soft-landscaping by guiding genuine efforts made by interested agencies (e.g. Government Departments, Local Councils, voluntary organisations) and by the general public;
- encourage incentives for environmentally-compatible improvements in planting and landscaping projects, and to deter unsustainable, or environmentally-damaging practice;
- further promote the demand for the propagation of suitable indigenous vegetation, and encourage Governmental and private nurseries to satisfy such demand; and
- enable clients/developers, as well as their architects and consultants, to produce appropriate landscaping layouts and drawings for specific development projects.

Appendix V to the 2002 guidelines lists those species that are unacceptable in rural areas. This list includes plants species that are invasive in the Maltese Islands.

With respect to regulation of potential vectors of NIS, the former Malta Environment and Planning Authority (MEPA) issued **general binding rules (GBRs) on underwater cleaning of maritime vessels**.³⁴¹ These GBRs are aimed at improving the environmental performance of operations involved in water cleaning and maintenance of marine vessel hulls, underwater sea apertures and propellers. Only registered operators are allowed to carry out in-water vessel cleaning and maintenance. Cleaning is only allowed in approved areas, while no cleaning is allowed in bathing areas and protected sites designated under S.L. 549.44. One of the conditions is that no marine fouling removed during the underwater cleaning operation shall be released into the sea.

Common concerns over the significant detrimental impacts of invasive alien species may bring together interest groups to draw focus on the human actions or interventions that may facilitate the introduction and spread of invasive alien species. Fundamental solutions indeed require addressing the ultimate **human causes of the bioinvasions problem**, that is, often the economic motivations that drive or enable species introductions.³⁴² Malta's National Biodiversity Strategy and Action Plan (2012-2020) includes a measure that calls for the cooperation of key stakeholder groups, such as traders (pet shops, breeders and nurseries), as well as land and sea users to prevent the unwanted release/escape and spread of alien and invasive species into the environment. To assist this, the NBSAP requires the drawing up of **national codes of best practices** in consultation with key stakeholders and adopted for those sectors that can aid the introduction and spread of invasive species. The NBSAP specifies that the drawing up of such codes will build on the series of European Codes of Conduct adopted under the framework of the Council of Europe/Bern Convention.

Such sector-specific recommendations while remaining in line with those of the Bern Convention would also need to take into consideration national contexts and priorities. National codes of best practice are being prepared separately from this national strategy and adopt the **principle of self-regulation**. The codes are intended to be additional but complementary, to the legally-binding obligations defined in national

³⁴¹ Available at: <https://era.org.mt/en/Documents/GN%2017%20Hull%20cleaning.pdf>

³⁴² A *Global Strategy on Invasive Alien Species*. McNeely et al., 2001.

legislation to entice compliance. The recommendations are also meant to raise awareness and be of assistance to the targeted stakeholder groups by providing practical and concise guidance in establishing **common standards of good practice and responsible attitudes** and behaviours when using alien species. Stakeholder groups may wish to publicise their adherence to the recommendations through adopting, in cooperation with the national competent authority, a symbol or logo indicating such adherence. Wide dissemination of, and media campaigns to promote, these national codes to the target stakeholders is also of essence in order to create partnerships and encourage voluntary adoption in order to overcome any malpractices that may occur as a result of lack of knowledge or understanding of the risks that alien and invasive species pose. NGOs and associations also play a key role in helping to promote and encourage uptake amongst their members.

3.1.18 Communication, Education & Public Awareness: *To include IAS as a recurrent topic in biodiversity-information campaigns and tailored to target audiences, resulting in a higher level of public awareness and education on the potentials risks of alien species.*

Expected outcome: Members of the public and stakeholders are more aware of, and understand, the problems associated with invasive alien species; Such increased understanding helps increase compliance with national legislation on IAS, as well as avoid, as a result of more responsible behaviour when keeping or using alien species, any misconceptions and misguided deliberated releases into the environment, or accidental introduction.

CBD Guiding principle 6: Education and public awareness

Ignorance about the **risks associated with alien species**, especially those that are invasive or potentially so, as well as lack of clear and accessible **information about regulatory and mitigation measures** in place, may result in introductions that might have otherwise been prevented or mitigated. Adopting and maintaining a high level of **communication, education and public awareness (CEPA)** of the risks and impacts caused by IAS would contribute towards strengthening the prevention of biological invasions. This can be achieved by informing and enticing the general public to notice, observe, report and aid in mitigating IAS problems. This would further help in building cooperation, support, shared responsibility, commitment and compliance by local communities, and relevant sectors and stakeholders. It also contributes partly to the success of management measures.³⁴³

Education and public awareness programmes are in fact pivotal to reduce the risks involved in private handling of alien species and to modify consumer attitudes and preferences over time. Such CEPA programmes may indeed make a significant contribution over the long term to curb the rate of new introductions and effectively control invasions.³⁴⁴ The need to inform and involve the relevant stakeholders on the issues of alien species and in the decision-making process has been highlighted in this strategy. Stronger awareness should be built among the general public, decision makers, academic institutions, tourist organisations, agricultural organisations, transport authorities, commercial establishments, such as fish farms, ornamental fish and aquaria, pet and animal retail establishments, and other stakeholders, such as

³⁴³ *Guideline for the Prevention of Biodiversity Loss caused by Alien Invasive Species.* IUCN, (2002).

³⁴⁴ *A Guide to Designing Legal and Institutional Frameworks on Alien Invasive Species.* Shine, Williams and Gündling, 2000.

gardeners and landscapers and other target groups with regards to the causes of invasion and threats caused by alien species. Widespread public awareness on IAS could be attained through:

- The circulation of information via **electronic taxonomic and species databases** (clearing-house mechanism, apps etc.) – this allows rapid identification of alien species therefore facilitating early detection of novel alien species and consequently assist in rapid reporting and action;
- Launching **workshops and seminars** to discuss proposals on actions and programmes;
- **Media promotion** (including social networks) as an efficient means of promoting wider public awareness;
- **Public display boards and active displays** e.g. within protected areas, botanic gardens and zoological gardens;
- **Interaction with the various stakeholders** - most of the stakeholders namely the concerned public, farmers, gardeners, landscape managers, fishermen and ecologists as well as environmental groups, and divers could notice new alien species in the course of their activities. Therefore they warrant involvement in awareness raising activities;
- The build up of **educational programmes** on IAS and environmental issues such as species and habitat conservation in the Maltese Islands targeting different audiences;
- **Awareness material such as posters** illustrating unwanted non-native species – such posters should be affixed at high-risk entry points in full view for the public to see and should illustrate photo identifications giving the name of the species, a description of its size and appearance, the damage it causes and what the person who sees it should do and to whom he/she should report the observation.

A key seminar that was undertaken in the past and which focused solely (and for the first time) on the problem of alien species in Malta was that held in March 1996 on the “Introduction of alien species of flora and fauna”. The proceedings of this seminar were published and remain to this day very informative.³⁴⁵ The educational campaign on the “Use and Importance of Maltese Trees” held in October 1998 included a presentation on Alien Trees in the Maltese Islands. This campaign was also supplemented by the publication of a book, a poster and a leaflet.³⁴⁶ More recently, as part of the hosting in Malta, of the Ninth Meeting of the Group of Experts on Invasive Alien Species to the Bern Convention, the former MEPA worked on designing artwork for an **information campaign on IAS** where major invaders are depicted as evil cartoon characters (also illustrated on the cover page of this document). The invaders in question are the brown rat, the Levant water frog, the red palm weevil, the mosquito fish and the Kaffir fig. The initiative was launched in 2011 by the publication of a generic poster on invasive species with key messages aimed at a wide audience (Figure 29). The campaign also included the publication of a booklet on the Code of Conduct on Horticulture and Invasive Alien Plants which was adopted by EPPO and the Council of Europe. This booklet was an abridged version of the Code, and provides national information.³⁴⁷

³⁴⁵ *Introduction of alien species of flora and fauna*. [Proceedings of a seminar held at Qawra, Malta, 5th March 1996]. Baldacchino & Pizzuto, (eds.), 1996.

³⁴⁶ *Is-Siġar Maltin – l-użu u l-importanza*. [Seminar Nazzjonali ta’ Ġurnata imlaqqa’ l-Furjana, Malta]. Baldacchino & Stevens, (eds.), 1998.

³⁴⁷ Available at: <https://era.org.mt/en/Documents/CodeOfConduct-InvasiveAlienPlants-MEPA-2011.pdf>

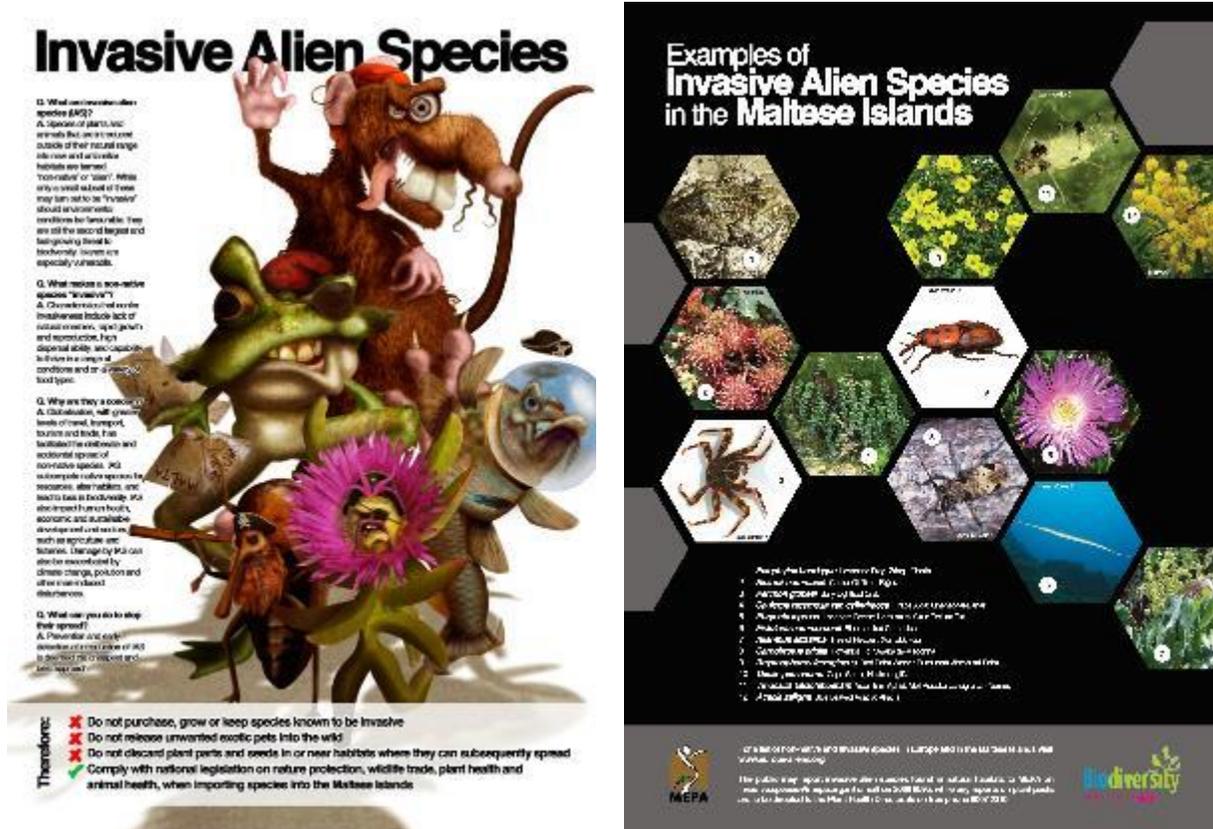


Figure 29 – IAS Poster (front and back)

Ongoing efforts to control plant pests that are coordinated by the Plant Health Directorate also involve maintaining the public and stakeholders **aware of phytosanitary risks**. This is done by holding public/stakeholder seminars as well as through the publication of leaflets and posters, such as on alien insects that are plant pests.³⁴⁸ As examples, the Plant Health Directorate recently organised the following seminars:

- Meetings for growers on the fig tree borer held during 2017 and a seminar to be held in the first quarter of 2018.
- Information Session on Phytosanitary Issues (6 February 2015, Malta) – This session was targeted at registered activities in the trading of plants and plant materials (covered by S.L. 433.03) with the purpose of providing information on latest amends to the regulatory framework, phytosanitary risks (including diseases carried by vectors – such as olive quick decline syndrome caused by *Xylella fastidiosa*, and quarantine pests, such as the longhorn beetles - *Anoplophora chinensis* and *Anoplophora glabripennis*).³⁴⁹

³⁴⁸ Available at: <http://www.agric.gov.mt/pub-articles?l=1> and <http://www.agric.gov.mt/plant-health-dloads?l=1>

³⁴⁹ Available at: http://www.agric.gov.mt/seminar_6th_feb_2015

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- An information campaign to create awareness on *xylella fastidiosa* among the general public but particularly targeted to travellers was implemented since 2015. The awareness campaign involved the creation of a mascot and specific messages to raise awareness about the risk of entry into Malta of harmful organisms to plants through uncontrolled movement of plants. The promotion campaign was also featured in the IPPC news³⁵⁰.

Various articles on plant pests by local researchers, at times in collaboration with foreign researchers, have also been published in peer-reviewed international scientific journals, such as BioRisk and the EPPO Bulletin, and in the Bulletin of the Entomological Society of Malta.^{351, 352, 353} Outreach on IAS issues is required on a regular basis to engage the public and relevant stakeholders in assisting national efforts to minimise the spread of existing IAS while preventing the introduction of new IAS. Non-governmental organisations, government agencies as well as education institutions, all play important roles in building awareness on IAS in the Maltese Islands.

An Awareness Raising Strategy for Plant Health in the European Union was adopted during the Maltese Presidency in June 2017³⁵⁴. The strategy is structured on the basis of the following five priority actions which build upon each other: 1. Development of awareness-raising strategies; 2. Creation of a Commission Working Group of Member States Experts; 3. Creation of toolkit and awareness-raising materials; 4. Engagement with target groups and training of communicators; 5. Monitoring and Evaluation. The benefits derived from the implementation of awareness raising strategies will result in better knowledge about the role of Plant Health and create a more resilient plant health sector. The strategy allows Member States to develop their national/regional strategy to meet their specific needs and contexts.

³⁵⁰ Available at: <https://www.ippc.int/en/news/blobby-purple-xylellu-character-to-promote-awareness-about-xylella-fastidiosa/>

³⁵¹ Available at: <http://www.pensoft.net/journals/biorisk/>

³⁵² Available at: <http://onlinelibrary.wiley.com/journal/10.1111/%28ISSN%291365-2338>

³⁵³ Available at: <http://www.entomologicalsocietymalta.org/>

³⁵⁴ Available at: <http://www.consilium.europa.eu/media/23990/awareness-raising-strategy-for-plant-health-in-the-eu.pdf>



3.1.19 CITIZEN SCIENCE: *To adopt and promote additional citizen science based initiatives for a nation-wide recording effort on the occurrence of targeted IAS in Malta.*

Expected outcome: Regular data flows are provided via citizen-science initiatives targeting the sightings of new alien species and targeted IAS on the EU and Malta lists of concern in the Maltese countryside and seaside. Participation of members of the public in such initiatives also contributes to generate awareness, understanding and, in instilling responsible attitudes when dealing with alien species.

Citizen science involves engaging the active participation of volunteers, members of the public, and stakeholder groups, in particular those who are regularly in close association with the natural environment (e.g. ecologists, farmers, birdwatchers, hunters, divers, fishers, hikers, ramblers, NGOs, beach users *etc.*) to assist in collecting data on species. It is a form of **informal science education** since through observing nature first hand, participants also gain a better understanding and appreciation for mitigating pressures, such as IAS that can be a detriment to nature. The use of widespread participants in citizen science also enables **research at broad scales** as opposed to localised research projects. The involvement of members of the public and their agreement to divulge data on species found on their property or their land also overcomes the barrier to biological recording on private property/land. Data is also generated in a cost-effective manner. The success of citizen science however is determined by good engagement and participation. This may be achieved by adequately advertising initiatives on social media/networks and creating incentives for participation. Data on sightings would need to be validated and interpreted for

generating information on the status of alien species within Malta. In this way knowledge gaps are addressed via the participation of the public and hence participatory conservation is actively promoted while at the same time increasing awareness.

Documenting the occurrence of an alien species through citizen science can be easily done when the species in question is readily identifiable and by using **online reporting systems or even mobile apps**. Malta's NBSAP (2012-2020) advocates both citizen science and participatory conservation. Citizen science on IAS would involve the development of a dedicated online biological recording portal or app. This is easily achievable and can also prove to be a success as for instance demonstrated by the citizen-science "**Spot the Jellyfish**" initiative under the framework of IOI-Kids.³⁵⁵ This initiative engages young children, their parents and their teachers in recording the sightings of species of jellyfish in the coastal waters around the Maltese Islands during the summer period. Apart from increasing the awareness of children, the data obtained via this initiative also supports monitoring undertaken by local marine experts and the tourism authority. Amongst the jellyfish on the online reporting form are not only those species that are common to the Mediterranean, or that pose a health concern (e.g. the mauve stinger, *Pelagia noctiluca* and the Portuguese man o' war, *Physalia physalis*), but also included are those that are identified as invasive in the Mediterranean Sea – e.g. *Rhopilema nomadica* (nomadic jellyfish). More information on native and invasive jellyfish species in the Mediterranean is provided by Brotz and Pauly (2012).³⁵⁶

This initiative was followed-up by the 'Spot the Alien Fish'³⁵⁷ campaign which was launched by the University of Malta in 2016 and dealt with non-indigenous fish species. Through the campaign a poster was launched featuring 32 fish species known to have entered the Mediterranean through the Suez Canal or through the Straits of Gibraltar and which had either been recently recorded in Maltese waters or had been recorded in the contiguous regions, such as Sicily and Tunisia.

In March 2017, the MESDC launched a mobile app on Maltese Flora and Fauna including IAS of EU concern. The purpose of the app is to enable species reporting, allowing citizens to contribute to early detections of new invasive pests and species. User can use factsheets and pictures for identification of species that have been observed. Once validated by experts, the data will be manually input into back-end information system. Currently the project can serve as potential Citizens Science tool to collect data and build community around citizens, NGO's, University of Malta, schools and experts to validate records and data. In the future this mobile app will be released with additional content for all **terrestrial Natura 2000 sites for Malta**.

3.1.20 COOPERATION & COORDINATION: *To facilitate and maximise close cooperation and efficient and effective coordination by defining clear administrative roles and legal responsibilities as well as through designating formal channels to enable rapid exchange of relevant information between competent authorities. To cooperate with neighbouring and trading countries and EU Member States in tackling biological invasions via inter alia the implementation of international law on IAS, the exchange of information via established portals under MEAs, the undertaking of collaborative research and via participation in the various meetings of MEAs as well as EU meetings.*

³⁵⁵ Available at: <http://oceania.research.um.edu.mt/jellyfish/index.html>

³⁵⁶ *Jellyfish populations in the Mediterranean Sea*. Brotz & Pauly, 2012.

³⁵⁷ Available at: <https://www.um.edu.mt/newspoint/news/features/2017/05/spotthealienfishcampaignlaunched>

Expected outcomes: Direct communication channels between competent authorities helps to foster ongoing coordination to combat IAS at high-risk entry points. Concerted bilateral and regional cooperation is ongoing.

CBD Guiding principle 9: Cooperation, including capacity-building

Regulation (EU) No 1143/2014: Article 22 – Cooperation and coordination

Rapid national coordination, close cooperation, secured commitment and good practices by all stakeholders as well as the various sectors acting as pathways for the introduction of alien species, are essential for implementing effective action against IAS. **Mechanisms for cooperation** include exchange of information and data, action plans on pathways, exchange of best practice on management, control and eradication of invasive alien species, early warning systems and programmes related to public awareness or education. The responsibility for initiating, overseeing and coordinating prevention and control measures essentially lies with the responsible competent authorities from relevant aspects of nature protection, phytosanitation, zoosanitation and trade. A **coordinated response to alien species** is facilitated when every competent authority has defined roles and responsibilities as well as direct communication channels and focal points. In the context of national official controls, the Regulation (EU) No 1143/2014, in Article 15 paragraph 7, requires Member States to adopt procedures to ensure the exchange of relevant information and the efficient and effective coordination and cooperation between all authorities carrying out the appropriate risk-based controls to the goods falling within the Combined Nomenclature codes to which a reference is made in the Union list of IAS.

Cooperation is also required from **land owners/occupiers** especially of land that is legally protected. Such cooperation would be in terms of notifying the relevant competent authority of the presence of listed alien species on their land, and where required by law, to take specified management measures. However incentives may be required to promote the active participation of land owners and users. **NGOs** that are responsible for managing protected areas also cooperate in national efforts to combat IAS by removing existing alien species within the area, preventing the introduction of alien species within those areas and closely monitoring these areas as part of the overall implementation of the site's management plan. Cooperation is also required with **stakeholders in the various sectors** that use or may inadvertently aid the introduction and spread of alien species. Such cooperation may be facilitated through the provision of guidance material.

Since biological invasions are a **transboundary issue** of concern, **cooperation and coordination with international and regional organisations, as well as neighbouring and trading countries**, is also essential to guarantee joint and coherent approaches to address those species that cross borders and to halt invasions at their source. Effective management requires not only national legal frameworks but also **concerted bilateral and global action** based on common goals and agreed international frameworks.

Regulation (EU) No 1143/2014 also requires cooperation at Union level and regionally for the IAS in the Union List. The Regulation also advocates **enhanced regional cooperation** for those IAS not able to establish a viable population in a large part of the Union but which are of regional concern in line with its Article 11. The EU IAS Regulation also acknowledges the need for cross-border cooperation, particularly with neighbouring countries, and coordination between Member States, particularly within the same

biogeographical region of the Union as detailed in Article 22. The latter also mentions the use of existing structures arising from regional or international agreements, where practical and appropriate. Malta cooperates with trading countries through the implementation of relevant permitting procedures that are adopted at EU and international level. Malta also cooperates with other Parties of MEAs and EU Member States via the sharing of information through established portals under MEA frameworks, as well as through participation in meetings and conferences abroad. Cooperative research efforts with other countries may be required to address **capacity building needs** with respect to technology transfer and development of training programmes given that Malta has limited experience on managing the impacts of IAS.

To encourage regional cooperation and responsibility, Genovesi and Shine (2004) propose as a key action, the development of procedures to provide any available information on a species' invasive behaviour to neighbouring states, trading partners and countries with similar ecosystems and histories of invasion. [Table 11](#) in this Chapter lists a number of **online databases** that enable countries to share data and expertise on alien species.

4.0 Conclusion

Introduction of invasive alien species into the country can occur either accidentally or deliberately, or through importation for a given purpose followed by escape into the environment. Attention must be given to **introductions into the country** as well as to **introductions into areas within the country**, including the environment. Invasive alien species adversely impact the environment, many **economic and production sectors** (e.g. as pests of economic importance damaging agricultural and horticulture sectors) and human health (e.g. as vectors of disease or through the stings they cause or due to allergic reactions). When introduced into the country, these alien species pose significant **ecological risk** as they are harmful to native and endemic species, they alter habitats and can disrupt ecosystem functioning and associated services, resulting in the overall loss of native biodiversity in the invaded ecosystem.

The **extent and degree of impact** by an invasive alien species depends on characteristics, resistance and resilience of the receiving habitat/ecosystem. This is because factors determining whether the alien species will most likely become established in the new area include the status of the habitat/ecosystem, climatic conditions, disturbance factors, the biology of the alien species, and its ecological needs (if these are met) and the biology of native species with which it will interact.

Small island states, such as the Maltese Islands, are particularly vulnerable to the impacts posed by invasive alien species. The intrinsic resilience of island ecosystems is determined by the inherent ecological factors that enable them to resist or cope with alien species (e.g. existence of refugia, native predators, and niche differentiation). An island ecosystem's extrinsic resilience is dictated by external factors (e.g. natural disasters and socio-economic factors) that influence its integrity.³⁵⁸ The ecological impacts posed by invasive alien species may be irreversible and can also have economical consequences since sectors, such as agriculture, fisheries, and tourism, when affected result in a loss of income, costs for remedial measures and monitoring costs. It should be kept in mind that the introduction of invasive alien species into the Maltese Islands could also further aggravate the negative impacts of anthropogenic activities that would be already impacting vulnerable habitats, such as sand dunes, valleys and cliff communities.

For islands, the best strategy to deal with IAS is to prevent their entry in the first place. However, this is not always possible since certain introductions occur inadvertently and this is increasingly being facilitated through the increased movement of people and goods across borders via various pathways as a result of globalisation. The **main pathways for introduction**, such as trade, e-commerce, and shipping require not only regulatory measures but also good practice standards. Greater efficiency and effectiveness is also required to detect and respond quickly to new incursions before invasion of a particular species gets out of hand and becomes too costly to rectify.

³⁵⁸ *Pilot Assessments: The Ecological and Socio-Economic Impact of Invasive Alien Species on Island Ecosystems*. UNEP, 2003.

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The prevention and management of invasive alien species requires a **cross-sectoral approach** as well as the involvement of relevant stakeholders. This approach is essential since solutions to alien-related problems require the cooperation and commitment of many sectors and different groups of stakeholders that may either rely on the use of alien species or may inadvertently aid the introduction and spread of invasive alien species unaware of the implications this can have to the environment, the economy and to society.

This **National Strategy** has been compiled to address invasive alien species in the Maltese Islands, as well as curb risks of new introductions, with the aim of implementing provisions of domestic, EU and international legislation. Prevention of invasive alien species entering the country is the primary objective of the Strategy, as it will avoid costly expenses for implementing remedial measures. **Preventive measures coupled with conservation efforts** to protect native fauna and flora needs to be mobilised to address the problems associated with invasive alien species.

A review of the alien species introduced into the Maltese Islands is given in [Chapter 1](#) of this document. This chapter also provides background information on the documented negative impacts caused by alien and invasive species, the invasion process, and the invasion pathways. [Chapter 2](#) reviews the various international and national legal provisions addressing the prevention, control, eradication and monitoring of alien species. This chapter serves as a basis for drawing up [Chapter 3](#), which in turn comprises the strategy *per se* by putting forward 25 **recommendations** intended for implementation between 2020 and 2025. These recommendations and related expected outcomes as well as indicative resource requirements are summarised in [Table 14](#). In conclusion, this strategy is intended to be a living document. Its status of implementation shall be subject of a review process in 2023. The review will assess the strategy's effectiveness in preventing and mitigating invasive alien species in the Maltese Islands and what future work would be required.

Table: 14 - Recommendations, Expected Outcomes and associated Resource Requirements			
Legend for Timeframes:			
■ = Implementation due 2020			
■ = Ongoing			
Timeframes	Issue	Recommendation	Expected Outcome
■	Competent Authorities	1. To strengthen the capacity and resources of the relevant competent authorities to ensure that they are properly trained and equipped to implement and enforce the legal regime on IAS in Malta in the environmental, plant health, animal health and trade spheres.	Gaps in capacity and expertise are addressed via the mobilisation of adequate resources and training to ensure proper implementation of EU obligations on IAS at a national level.
■	National IAS Legal Regime	2. To subject the national legal regime on IAS to regular reviews as part of the better regulation initiative to ensure that it is comprehensive, robust and fit-for-purpose with respect to the regulation of importation, keeping, trade, use and release of alien species.	National legislation aimed at implementing the EU provisions of member state competence is in force.

■	Precautionary Approach/ Principle	3. To continue to apply the precautionary approach in national decision-making processes related to alien species and activities that act as pathways of introduction and spread in order to avoid both the impact of potentially invasive species and the financial expenditure required for remedial measures.	Unintentional introductions of IAS and related impacts are prevented when faced with scientific uncertainty by adopting the precautionary approach as an ongoing practice of decision-making processes.
■	Ecosystem Approach	4. To implement the ecosystem approach when addressing alien species and their invasive counterparts in national decision- and policy-making processes.	Cost-savings, resource efficiency and prevention of undesired effects are benefits accrued from adopting the ecosystem-based approach as an ongoing practice in national decision- and policy-making processes.
■	Prevention	5. To prevent the introduction of IAS, as the first line of action, via the setting of restrictions/ prohibitions and a permitting framework to regulate introduction and activities of use of alien species, coupled with effective pathway management, border controls and quarantine measures.	Restrictions are defined in law and enforced resulting in the effective prevention of introductions into the Maltese Islands of IAS on the EU and MT list
■	Intentional (Deliberate) Introduction	6. To continue to regulate the intentional introduction of alien species into the country and into the environment via clear permitting and enforcement procedures.	Restrictions are defined in law and enforced resulting in the effective prevention of the intentional introductions of IAS of Union concern and national concern into the Maltese Islands and into the environment. There is a decreasing trend in reports of deliberate and illegal introduction into the environment.
■	Unintentional (Accidental) Introduction	7. To assess which pathways (and vectors) are responsible for accidental introductions and which are deemed of priority for action.	A comprehensive analysis of the pathways of unintentional introduction of IAS of Union concern and national concern (as applicable) is completed. Where deemed required, action plan(s) is/are adopted for those pathways identified as being of priority; such action plan(s) is/are reviewed at least every six years.
■	Contained holding	8. To regularly monitor IAS of Union concern and national concern that are authorised to be kept in contained holding to ensure that such conditions are met.	Authorised holders/owners of IAS of Union concern and national concern, which are kept in contained holdings, guarantee that such conditions are secure.

■	Prioritising via Species Listing	9. To develop a national illustrated list/inventory of those alien species (both present and not yet present) of concern to the Maltese Islands and to make this easily and widely accessible to key actors (importers, traders, gardeners and landscapers, farmers etc.).	Malta's list of IAS of national concern is published and is reviewed every six years.
■	Risk Assessment	10. To carry out, where applicable, risk assessments for new species, to assess the risk of invasiveness and provide scientifically-based justifications as to whether and how such introduction would/would not harm native biodiversity, before authorisation is given or refused for intentional introductions of alien species not listed as being of EU or national concern. Risk assessments may also be undertaken for new or untested techniques for eradication or control, including the use of alien biological control agents.	Risk assessments may be undertaken for the introduction of non-listed species not yet present in the Maltese Islands and when new non-listed alien species are detected in the environment
■	Contingency Planning	11. To ensure a rapid response when an IAS of EU or national concern is detected by devising contingency plans for the terrestrial and marine environments. Contingency planning is also a requirement of establishments permitted to use IAS of EU and national concern for research, <i>ex situ</i> conservation or for reasons of compelling public interest, including those of a social or economic nature.	Approved contingency plans are drawn up as part of the authorisation of permits.
■	Early Detection & Surveillance	12. To adopt an early warning and rapid response system (EWRR) that ensures timely detection via a robust and coordinated national surveillance system and, implementation of appropriate responses without delay.	A national IAS surveillance system is in place and detected species are notified to the Commission without delay.
■	Risk-based Official Controls	13. To strengthen administrative capacity to ensure consistent inspections and interception at entry points of IAS of Union concern and national concern, and of animals and plants most at risk of bringing diseases and pathogens, and	Review and assess implementation of the Official controls system. .

		related imported goods by means of trained personnel.	
■ ■	Penalties	14. To adopt a strict national penalty system that punishes perpetrators but also acts a deterrent for illegal introductions and uses as well as accidental introductions resulting from negligence; The polluter pays principle and environmental liability are procedures that are applied to promote accountability and to be able to gain recompensation for enabling rectification of damage, where possible.	Provisions on the national penalty system are defined in the domestic legal framework and communicated to the Commission; any infringement is duly enforced and a fine/s applied accordingly.
■	Remedial/ Management Measures	15. To adopt remedial measures that are proportional to the impact of the introduced IAS on the environment and that avoid impacts on non-target species, habitats, ecosystems and protected areas; To target resources towards the management of widespread IAS deemed of priority for feasible management, including within, but not limited to protected areas.	Management measures (including considerations for control and/or containment) are in place for widespread IAS of Union concern and national concern; choice of management option is on the basis of various factors, including the duration of the species in question since its introduction/establishment.
■	Eradication	16. To ensure that practical measures are in place to enable rapid eradication, through complete and permanent removal, of new introductions IAS of EU and national concern, whenever detected and where feasible. Eradication of animals is done in accordance with rules on animal welfare.	Detected new IAS of Union concern and national concern are rapidly eradicated; where not feasible, a derogation request to the Commission is made within two months from detection of species of Union concern.
■	Containment	17. To identify which IAS of priority are to be subjected to containment measures and to design containment measures with clearly defined goals to ensure that they are efficient and fool proof.	IAS of priority, which cannot be eradicated in the short term are subjected to containment measures where this is financially and practically feasible; such containment may also facilitate eventual eradication.
■	Control	18. To adopt effective control methods that are specific to the IAS being targeted and that do not result in secondary negative impacts to the environment.	Control measures are tailored and effective for their intended purpose, without causing undesirable effects.
■	Impact Mitigation	19. To explore native conservation introductions in cases where the impact of IAS is irreversible and where there is no other alternative to ensure the long-term	Impact mitigation via species translocations is only carried out as a last resort to ensure the long-term

		survival of the affected native/endemic species.	survival of rare and endangered species and where it is of added-value.
■	Restoration	20. To promote natural regeneration and resilience of ecosystems following the implementation of remedial measures and to assist such regeneration by any restoration measures, where deemed of added value and, always in keeping with the ecological context of the site.	IAS removal activities contribute to the restoration and resilience of ecosystems and in so doing to the EU and national targets on restoration (the 15% target).
■	Scientific Research	21. To further liaise with the scientific community to ensure that IAS research in Malta responds to policy demands and contributes to generating a strong scientific knowledge base upon which to direct policy and decision making on IAS-related issues and to guide national implementation of Regulation (EU) No 1143/2014, amongst others.	Knowledge gaps on IAS are addressed and published scientific data is readily accessible to inform policy development and assist in the implementation of legislation at national and local levels.
■	Best Practice	22. To ensure that action to combat IAS in Malta is done on the principles of best practice, which is facilitated via the adoption of guidelines and agreed codes of conduct/best practice, where required.	Publication of policy guidance documents and widely accepted and applied national codes, as deemed required to support best practice standards.
■	Communication, Education & Public Awareness	23. To include IAS as a recurrent topic in biodiversity-information campaigns and tailored to target audiences, resulting in a higher level of public awareness and education on the potential risks of alien species.	Members of the public and stakeholders are more aware of, and understand, the problems associated with invasive alien species; Such increased understanding helps in guaranteeing compliance with national legislation on IAS, as well as avoid, as a result of more responsible behaviour when keeping or using alien species, any misconceptions and misguided deliberate releases into the environment, or accidental introductions.
■	Citizen Science	24. To adopt and promote additional citizen science based initiatives for a nation-wide recording effort on the occurrence of targeted IAS in Malta.	Regular data flows are provided via citizen-science initiatives targeting the sighting of new alien species and targeting IAS on the EU and Malta lists of concern in the Maltese countryside and seaside. Participation of members of the public in such initiatives also contributes to generate awareness,

			understanding, and instilling responsible attitudes when dealing with alien species.
■	Cooperation & Coordination	25. To facilitate and maximise close cooperation and efficient and effective coordination by defining clear administrative roles and legal responsibilities as well as through designating formal channels to enable rapid exchange of relevant information between competent authorities. To cooperate with neighbouring and trading countries and EU Member States in tackling biological invasions via <i>inter alia</i> the implementation of international law on IAS, the exchange of information via established portals under MEAs, the undertaking of collaborative research and via participation in the various meetings of MEAs as well as EU meetings.	Direct communication channels between competent authorities helps to foster ongoing coordination to combat IAS at high risk entry points. Concerted bilateral and regional cooperation is ongoing.

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