A toolkit for developing legal and institutional frameworks for invasive alien species
A toolkit for developing legal and institutional frameworks for invasive alien species

Clare Shine
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Table of contents

Introduction to the toolkit ................................................................. 1
  Why strong legal frameworks are so important .................................. 3
  The toolkit ................................................................................. 3
  About GISP ............................................................................... 4
  Acknowledgements .................................................................... 4

Module 1 what decision-makers need to know about invasive species .... 5
  1A What this module covers ....................................................... 7
  1B Understanding what invasive alien species are ....................... 7
  1C Understanding the invasion process ....................................... 9
  1D Understanding the pathways and causes for species introductions 11
  1E Understanding the impacts of invasive alien species ............. 16
  1F Prediction and linkages to other environmental pressures .......... 21
  1G Compiling baseline information: useful resources ................. 24
  1H Key readings for further information ..................................... 26

Module 2 laying the foundations for effective national frameworks ........ 29
  2A What this module covers ....................................................... 31
  2B Key points to address .......................................................... 31
  2C Getting started: identifying your country’s international commitments 33
  2E Mainstreaming invasives: the importance of institutional coordination 36
  2F Deciding what kind of policy framework is needed ................. 39
  2G Deciding what type of legislation is most suitable ................. 41
  2H Getting down to detail: objectives, scope and definitions ....... 43
  2I Cross-cutting principles that should underpin legislation ......... 46
  2J References ......................................................................... 48

Module 3 preventing biological invasions .......................................... 49
  3A What this module covers ....................................................... 51
  3B Why is prevention so important? .......................................... 51
  3C Where are prevention measures applied? .............................. 52
  3D Dealing with risk and uncertainty ........................................ 54
  3E Regulating intentional introductions ..................................... 57
  3F Managing pathways to minimise unintentional introductions .... 62
  3G Education and public awareness .......................................... 65
  3H References ....................................................................... 66

Module 4 responding to biological invasions .................................... 67
  4A What this module covers ....................................................... 69
  4B Policy context for response measures .................................... 69
  4C Early detection and rapid response ....................................... 69
  4D Eradication, control and mitigation ....................................... 72
  4E Strengthening the legal basis for response measures ............. 74
  4F Addressing conflicts of interest ............................................ 77
  4G Providing incentives for control and restoration ..................... 78
  4H References ....................................................................... 78

Module 5 getting results: compliance, enforcement and liability ............ 81
  5A What this module covers ....................................................... 83
  5B First things first: oversight and monitoring ............................ 83
  5C Enforcement and its limitations ............................................ 87
  5D Liability and its limitations .................................................. 90
  5E Fostering voluntary compliance .......................................... 91
  5F Designing economic and financial instruments to tackle invasives 92
  5G References ....................................................................... 94

Module 6 legal frameworks for cooperation beyond national borders ....... 95
  6A What this module covers ....................................................... 97
  6B International mandate for transboundary cooperation on invasives 97
  6C Addressing invasive alien species through existing regional processes 99
  6D Components of regional cooperation and collaboration ........ 100
  6E Interface between national regulations and the international trade regime 102
  6F References ...................................................................... 106

Key readings on legal issues relevant to invasives ................................ 107
## List of boxes, figures and tables

### Boxes

<table>
<thead>
<tr>
<th>Box</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Box 1</td>
<td>key definitions</td>
<td>8</td>
</tr>
<tr>
<td>Box 2</td>
<td>practical help on terminology</td>
<td>9</td>
</tr>
<tr>
<td>Box 3</td>
<td>examples of intentional introductions</td>
<td>14</td>
</tr>
<tr>
<td>Box 4</td>
<td>relationship between international trade and species introductions</td>
<td>15</td>
</tr>
<tr>
<td>Box 5</td>
<td>examples of ecological impacts</td>
<td>17</td>
</tr>
<tr>
<td>Box 6</td>
<td>examples of economic impacts</td>
<td>20</td>
</tr>
<tr>
<td>Box 7</td>
<td>examples of health-related impacts</td>
<td>20</td>
</tr>
<tr>
<td>Box 8</td>
<td>examples of species with multiple impacts</td>
<td>21</td>
</tr>
<tr>
<td>Box 9</td>
<td>examples of invasive alien species databases</td>
<td>25</td>
</tr>
<tr>
<td>Box 10</td>
<td>checklist of main stakeholders who should be involved</td>
<td>31</td>
</tr>
<tr>
<td>Box 11</td>
<td>challenges identified in the European Strategy on Invasive Alien Species</td>
<td>32</td>
</tr>
<tr>
<td>Box 12</td>
<td>TEMATEA: interactive information on relevant treaty commitments</td>
<td>34</td>
</tr>
<tr>
<td>Box 13</td>
<td>examples of legislation relevant to the review process</td>
<td>36</td>
</tr>
<tr>
<td>Box 14</td>
<td>addressing specific issues through a legal review process</td>
<td>38</td>
</tr>
<tr>
<td>Box 15</td>
<td>legal and policy development in Brazil</td>
<td>43</td>
</tr>
<tr>
<td>Box 16</td>
<td>the legal status of codes of conduct in the United Kingdom</td>
<td>43</td>
</tr>
<tr>
<td>Box 17</td>
<td>example of definitions in national legislation</td>
<td>46</td>
</tr>
<tr>
<td>Box 18</td>
<td>risk analysis for the intentional introduction of blue shrimp to Fiji</td>
<td>55</td>
</tr>
<tr>
<td>Box 19</td>
<td>examples of regulatory controls on introductions</td>
<td>59</td>
</tr>
<tr>
<td>Box 20</td>
<td>example of regulatory controls on a packaging pathway</td>
<td>63</td>
</tr>
<tr>
<td>Box 21</td>
<td>example of pre-entry treatment for a transport pathway</td>
<td>64</td>
</tr>
<tr>
<td>Box 22</td>
<td>example of risk analysis to assess disease risk in an imported commodity</td>
<td>64</td>
</tr>
<tr>
<td>Box 23</td>
<td>DNA Barcoding – a breakthrough for species detection?</td>
<td>65</td>
</tr>
<tr>
<td>Box 24</td>
<td>vigilance pays off</td>
<td>65</td>
</tr>
<tr>
<td>Box 25</td>
<td>the 100th Meridian Initiative</td>
<td>70</td>
</tr>
<tr>
<td>Box 26</td>
<td>developing a centralised information point for recording invasives</td>
<td>71</td>
</tr>
<tr>
<td>Box 27</td>
<td>designating lead agencies for control programmes</td>
<td>72</td>
</tr>
<tr>
<td>Box 28</td>
<td>eradication of Mytilopsis sallei in Darwin, Australia</td>
<td>72</td>
</tr>
<tr>
<td>Box 29</td>
<td>example of an integrated approach to control</td>
<td>73</td>
</tr>
<tr>
<td>Box 30</td>
<td>inadvertent protection of invasive alien species under treaties</td>
<td>75</td>
</tr>
<tr>
<td>Box 31</td>
<td>example of regulations mandating invasives control by landowners</td>
<td>76</td>
</tr>
<tr>
<td>Box 32</td>
<td>decision analysis to evaluate alternative management strategies for controlling invasive weeds in Australia</td>
<td>76</td>
</tr>
<tr>
<td>Box 33</td>
<td>conflict resolution through control of invasive deer</td>
<td>77</td>
</tr>
<tr>
<td>Box 34</td>
<td>Working for Water programme, South Africa</td>
<td>78</td>
</tr>
<tr>
<td>Box 35</td>
<td>inspection powers linked to import control</td>
<td>84</td>
</tr>
<tr>
<td>Box 36</td>
<td>enforcement of invasive plant controls in South Africa</td>
<td>88</td>
</tr>
<tr>
<td>Box 37</td>
<td>stakeholder contribution to building awareness of penalties</td>
<td>89</td>
</tr>
<tr>
<td>Box 38</td>
<td>the Bahamas Code of Conduct for Government</td>
<td>91</td>
</tr>
<tr>
<td>Box 39</td>
<td>use of economic and financial instruments to tackle invasions</td>
<td>93</td>
</tr>
<tr>
<td>Box 40</td>
<td>SADC and invasive alien species</td>
<td>99</td>
</tr>
<tr>
<td>Box 41</td>
<td>examples of regional capacity-building initiatives</td>
<td>102</td>
</tr>
</tbody>
</table>

### Figures

<table>
<thead>
<tr>
<th>Figure</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 1</td>
<td>graph showing the phases of invasion over time</td>
<td>11</td>
</tr>
<tr>
<td>Figure 2</td>
<td>primary and secondary pathways</td>
<td>12</td>
</tr>
<tr>
<td>Figure 3</td>
<td>types of alien species introductions</td>
<td>14</td>
</tr>
<tr>
<td>Figure 4</td>
<td>invasions, ecosystem services and human wellbeing</td>
<td>17</td>
</tr>
<tr>
<td>Figure 5</td>
<td>a farm road becomes a secondary pathway for invasive grasses in Mexico</td>
<td>23</td>
</tr>
<tr>
<td>Figure 6</td>
<td>steps in reviewing and strengthening policy, legal and institutional frameworks</td>
<td>33</td>
</tr>
<tr>
<td>Figure 7</td>
<td>what legislation to address invasive alien species needs to cover</td>
<td>41</td>
</tr>
<tr>
<td>Figure 8</td>
<td>summary of pre-border, border and post-border prevention tools</td>
<td>52</td>
</tr>
<tr>
<td>Figure 9</td>
<td>components of risk analysis</td>
<td>56</td>
</tr>
<tr>
<td>Figure 10</td>
<td>example of management procedures for an intentional import (United Kingdom)</td>
<td>58</td>
</tr>
<tr>
<td>Figure 11</td>
<td>Australian quarantine practices</td>
<td>65</td>
</tr>
<tr>
<td>Figure 12</td>
<td>quarantine posters to improve law enforcement</td>
<td>87</td>
</tr>
</tbody>
</table>

**Legal and Institutional Frameworks for Invasive Alien Species**
Tables

Table 1: some pathways for different types of introductions ................................................................. 13
Table 2: examples of the direct and indirect economic causes of invasions ........................................... 15
Table 3: questions for assessing legal and institutional frameworks ...................................................... 36
Table 4: checklist of prevention elements .................................................................................................. 51
Table 5: risk analysis of pathways as a basis for prioritising management measures .................................... 55
Table 6: checklist of basic components for a permit system ........................................................................ 60
Table 7: overview of WTO Agreements ..................................................................................................... 103
### Photo credits

<table>
<thead>
<tr>
<th>Cover pages</th>
<th>Lianes - exotic vines covering native vegetation in the Seychelles. © Geoffrey Howard.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title page of Module 1</td>
<td>Pickerel weed (<em>Pontederia cordata</em>) - originates in southern USA, and invasive in wetlands in parts of Africa. © Geoffrey Howard.</td>
</tr>
<tr>
<td>Title page of Module 2</td>
<td>Invasive species introduced accidentally in shipping containers Rotterdam Netherlands. © Jeff McNeely.</td>
</tr>
<tr>
<td>Title page of Module 5</td>
<td>Wetland with Typha an invasive grass in Komadugu Yobe river basin North East Nigeria. © Danièle Perrot-Maitre.</td>
</tr>
<tr>
<td>Title page of Module 6</td>
<td>United Nations Foundation staff controlling invasive species on Santa Cruz Island Galapagos. © Jim Thorsell.</td>
</tr>
<tr>
<td>Title page of Key readings</td>
<td><em>Lantana camara</em>, an invasive plant on Easter Island Chile. © Imène Meliane.</td>
</tr>
</tbody>
</table>
Legal and Institutional Frameworks for Invasive Alien Species

Introduction to the toolkit
Introduction

Why strong legal frameworks are so important

Human activities that lead to alien species introductions and, in some cases, to biological invasions are addressed by legal systems from many angles. A mass of sectoral laws for agriculture, fisheries, forestry, industry, research, transport, trade, environmental management and nature conservation tackle different aspects of the subject, often from very different perspectives. Your country’s policies and plans for economic development, regional cooperation, land and water use and social welfare will be relevant, along with its general regimes for tax, public spending, administrative organisation, property rights and even animal welfare.

At the international level, the web of organisations and instruments that address some aspect of invasive alien species is equally extensive. The issue affects a country’s relations with its neighbours, the wider region and its global trading partners because invasive species can trigger environmental, social or economic damage across borders.

Over the last decade, along with rising global awareness of the scale of the problem, there has been growing recognition in the international community of the need to develop robust strategies, legal frameworks and management plans to address this shared threat.

All too often, existing national systems do not perform effectively because of the piecemeal and fragmented way in which invasive alien species issues are addressed. Although several countries and some regions have made significant progress in developing baseline information resources, much more needs to be done to equip each country with a streamlined legal framework to tackle the problem in a sustained and efficient way.

The toolkit

The toolkit provides a practical resource tailored to the specific issues and legal challenges associated with invasive alien species prevention and control. It contains examples and background information to support and inform real-world policy, planning and management.

The primary aim of the toolkit is to provide a user-friendly guide to strengthening national policy, legal and institutional frameworks in this field. It provides detailed guidance on how to mainstream invasive alien species into planning and policy-making and draft new or amended legislation for all aspects of prevention and management. However, no blueprint is proposed. Countries need to find the best way forward for their particular needs, depending on their biological situation, the status of invasive-species science and the way in which the national legal system already operates.

The toolkit has been produced as a stand-alone resource that can also be used for in-country and regional training courses. Although it is concerned with law, it recognises that some of the people involved in strengthening national frameworks will have little or no formal legal knowledge of law and others will have little or no understanding of invasion biology. The toolkit therefore avoids the use of legal or technical jargon and tries to explain key concepts and legal approaches in a clear and accessible way.

The main audience for this toolkit is likely to include:

- governments seeking to develop invasive alien species policies and to strengthen applicable legislation;
- national legislative draftsmen tasked with reviewing and drafting such legislation;
- legislators, ministry decision-makers and others who need to understand and negotiate such legislation once it has been drafted; and
- (ultimately) implementing agencies and officers who apply the legislation.

The toolkit employs a modular approach, and works through a series of iterative steps that can be followed in order to identify, understand, address and manage legal aspects of invasive species.

Module 1 gives decision-makers an overview of what invasive alien species are and why they matter for economic as well as environmental reasons. It outlines how the international community approaches the issue and the implications for national governments, specifically as regards the collection of baseline information.
Module 2 looks at the overall design of your legal and institutional framework, pointing up the need to mainstream invasive alien species across all concerned sectors and walking you through the process of conducting a legal review and choosing between different options for the design of national policies, coordination arrangements and laws. The next two modules address concrete legal requirements for implementing prevention (Module 3) and responding to biological invasions (Module 4).

Module 5 focuses on getting results, in terms of effective oversight, enforcement and compliance mechanisms. It identifies the limitations of conventional approaches to liability in this area and provides an overview of the way in which economic and financial instruments can be used to tackle biological invasions.

Lastly, Module 6 brings together the different components of international and regional cooperation and provides specific guidance on the interface between national regulations and the international trade regime. The toolkit also contains a list of key readings on policy and legal aspects of invasive alien species.

About GISP

The toolkit has been produced under the auspices of the Global Invasive Species Programme (GISP). GISP was founded in 1997 as a small, mainly voluntary partnership programme, by three international organizations: The International Union for the Conservation of Nature (IUCN), CAB International (CABI), and the Scientific Committee on Problems of the Environment (SCOPE). In early 2005, GISP was constituted as a legal entity with Founding Members IUCN, CAB International, The Nature Conservancy (TNC), and the South African National Biodiversity Institute (SANBI). GISP is headquartered in Nairobi, Kenya at CABI Africa.

The GISP mission is to conserve biodiversity and sustain human livelihoods by minimising the spread and impact of invasive alien species. To this end, GISP seeks to:

- improve the scientific basis for decision-making on invasive species
- develop capacities to employ early warning and rapid assessment and response systems
- enhance the ability to manage invasive species
- reduce the economic impacts of invasive species and control methods
- develop better risk assessment methods, and
- strengthen international agreements.

In addition, GISP strives to:

- develop public education about invasive species
- improve understanding of the ecology of invasive species
- examine legal and institutional frameworks for controlling invasive species
- develop new codes of conduct for the movement of species, and
- design new tools for quantifying the impact of invasive species.

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Module 1
what decision-makers need to know about invasive species

Legal and Institutional Frameworks for Invasive Alien Species
what decision-makers need to know about invasive species

Module 1

1A What this module covers

This module explains what is meant by ‘invasive alien species’ and why they are such an important cross-sectoral policy issue for social, economic and environmental reasons.

It provides background scientific information on the process, pathways and causes of biological invasion and includes an introduction to key technical terms but does not expect the reader to be a biologist. Typical characteristics of invasive alien species and invaded environments are explained, together with global trends that contribute to the problem. The aim is to familiarise people involved in developing and implementing legal frameworks with the basic concepts to enable them to work with scientists and technical specialists for this purpose.

By the end of this module, the reader will have acquired an understanding of:

- the current situation of invasive species nationally, regionally and globally;
- the impacts on human development, livelihoods, health and well-being as well as on biodiversity upon which so many depend;
- how the international community and the international legal system have responded to this international problem;
- the need for baseline scientific information to underpin effective legal and institutional frameworks.

1B Understanding what invasive alien species are

What is meant by “invasive alien species” and why do we care?

Species moving beyond their natural range is nothing new. Over the millennia, they have dispersed throughout the world by natural processes like ocean currents, winds, earth movements and continental shifts. But there were limits to their spread. These included their own dispersal abilities (small terrestrial mammals cannot travel far, unlike many birds), natural geological barriers (rivers, mountains and oceans) and environmental factors (temperature, altitude, disease, predators). The resulting changes to global fauna, flora and ecosystems were therefore gradual.

Once people began to move around the world, they aided the process of species dispersal by carrying organisms or their propagules (i.e. seeds, roots, eggs and larvae) to new places, often beyond natural barriers. Over the last two centuries, the frequency of species’ introductions increased as means of travel became more sophisticated and effective and countries encouraged exploration, colonisation and global trade.

In recent decades, opportunities for movement of species have risen dramatically along with the expansion of trade, transport and travel associated with globalisation (Perrings et al. 2005a). This has transformed the way in which the world economy operates. Exports are now quickly transported to almost anywhere in the world in quantities unheard of a century ago. The value of worldwide exports grew from US$192 billion in 1965 to $6.2 trillion in 2000 and the global shipping industry will more than double by the year 2020. Furthermore, with the advent of the internet, even private individuals can easily order almost anything from across the globe.
Many of these introductions were deliberate, for agriculture, forestry and other socio-economic purposes, and many introduced species became and still are the bedrock of biological production systems. What we are concerned with here is the minority of species that manage to proliferate and spread, disturbing the balance of plant and animal communities in their new environment and often damaging human interests. It is now well understood that species spread and species invasions have had negative as well as positive impacts both on human development and the natural world of animals, plants and micro-organisms. Biological invasions have shown a dramatic increase in frequency, extent and damage over the last half-century.

The pathways and impacts of biological invasions discussed in 1D and 1E below. For now, it is enough to say that the identified cost of biological invasions to the global economy is in the trillions of dollars and that invasive alien species have been recognised as one of the greatest threats to global biodiversity.

**Key terms associated with invasive alien species**

Invasive alien species affect many sectors and are addressed in many different legal and technical fora (see 2C) in which different terminology has evolved. This means that there is currently no widely accepted, comprehensive glossary of terms: instead, we have widespread use of apparently interchangeable but often ambiguous terms, which can hinder understanding. The same terms may be used differently in different sectors and/or that different sectors may use different terms for the same concepts. This is a problem in nearly all legal systems (see 2H).

This section provides simple working definitions for two key terms (see Box 1), while recognising that there are others, more detailed and more complex, that can also apply. It also highlights sources of ambiguity or overlap with synonymous or similar terms.

From Emerton and Howard 2008

<table>
<thead>
<tr>
<th>Box 1: key definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>alien species</strong></td>
</tr>
<tr>
<td><strong>invasive alien species (IAS)</strong></td>
</tr>
</tbody>
</table>

**Alien species**

The key biological point is that the organism concerned comes from another place and is not part of the flora or fauna of the recipient ecosystem. In legal and technical documents, terms used to convey this ‘foreign-ness’ include more precise synonyms such as **non-native** or **non-indigenous** species and depending on the sector, introduced, exotic, feral, foreign, ornamental or weedy species.

An expanded definition is proposed in Guiding Principles adopted under the Convention on Biological Diversity (CBD) which define alien species as a ‘species, subspecies or lower taxon, introduced outside its natural past or present distribution, including any part, gametes, seeds, eggs, or propagules of such species that might survive and subsequently reproduce’ (CBD Guiding Principles, 2002).

**Invasive alien species**

The key biological point is that the organism has established and spread, or has the potential to do so, and causes or may cause harm to human interests and natural systems. It is the invasiveness of a species that causes the problem, not the fact that it is alien. Alien species that do not become invasive may not be a serious threat, though they should be monitored in case they do start to spread.

Since the majority of invasive species are alien, this term ‘invasive alien species’ is now widely used although the shorter term ‘invasive species’ is sometimes preferred. There are various versions of the definition. The Convention on Biological Diversity states that ‘each Contracting Party shall, as far as possible and as appropriate, prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species’ (Article 8 (h)). A shorter definition of ‘invasive alien species’ proposed under the CBD Guiding Principles is ‘a species whose introduction and/or spread threaten biological diversity’. IUCN-The World Conservation Union defines an invasive alien species as an alien
species which becomes established in natural or semi-natural ecosystems or habitat, is an agent of change, and threatens native biological diversity (IUCN 2000).

Such definitions do not explicitly refer to socio-economic and cultural impacts of invasive alien species but are clearly broad enough to encompass such harms. Definitions adopted in national legal frameworks should preferably be more specific (see 2H).

Other terms commonly used in legal and technical instruments for species that generate damage include *noxious species, nuisance species, pests and weeds*. These are terms commonly used for organisms that have adverse impacts on the primary sector of the economy (e.g. agriculture, forestry or fishing) or that affect humans in some way. However, they are not necessarily alien.

Some native species may also become invasive, under altered environmental conditions. For example, the bulrush (*Typha sp*.) has become invasive in many Africa water bodies as a result of nutrient enrichment (eutrophication), altered flow regimes and changes caused by invasive alien waterweeds such as water hyacinth (*Eichhornia crassipes*) and salvinia (*Salvinia molesta*).

**Box 2: practical help on terminology**

A comprehensive practical tool to help readers understand how different terms are used is now available through the Invasive Alien Species Concepts, Terms and Context (IAS-CTC) database, developed by CABI International (http://www.cabi.org/ias). The database shows how specific terms associated with ‘alien’ and/or ‘invasive’ species are defined in particular contexts, with reference to scientific, policy, legal and other literature. Terms and their definitions, together with synonyms or near-synonyms and contextual notes, have been extracted from a variety of important and/or representative documents, including definitions from agreements, conventions and standards from the following international organisations: Secretariat of the Convention on Biological Diversity; Secretariat of the International Plant Protection Convention; IUCN-World Conservation Union; World Organisation for Animal Health; and the World Trade Organisation.

The CBD webpage also provides useful definitions for terms related to the issue of invasive alien species. This list is less comprehensive as it focuses mainly on definitions that have been agreed at the international level and on terms that are most directly relevant to the CBD.

**1C Understanding the invasion process**

*What types of organism can become invasive?*

Every species taken out of its natural environment has the potential to become invasive, although particular characteristics and circumstances make some species more likely to invade than others.

For legislators, the point to emphasise is that there is no failsafe way to predict which species will go on to become invasive, where and why. This is a priority area for invasion biologists with much international work under way (see 1F). Such uncertainty has legal implications because specific principles, approaches and procedures are needed to evaluate risk as an aid to decision-making (see 3D).

The taxa or types of organisms that can become invasive are animals (vertebrates and invertebrates), plants and micro-organisms – including those that are free-living as well as those that cause disease in plants, animals and people, as long as they are ‘new’ to a particular ecosystem or area. However, the actual development of invasiveness will depend upon the suitability of the new ecosystem or area for the organism concerned as well as its own characteristics. Tropical species are unlikely to become invasive in the temperate zone and forest species are unlikely to become invasive in grasslands.

Some common types of invasive organisms include:

*micro-organisms* – microscopic algae that form “algal blooms” in new areas; free-living protozoans that can become invasive in new ecosystems; plant and animal (and human) pathogens like viruses, bacteria and yeasts; fungal pathogens of both animals and plants;

---

1 An “area” is not necessarily a geographical surface but can be a volume (of water or air) or a locality, say, within another organism (for a parasite or pathogen). Another subtlety is that a particular area can become changed by human or other means so that it becomes “alien” to the organisms within it – then they are “alien” to that ecosystem and can become invasive. An example is when overgrazing by livestock changes a pasture such that the balance of vegetation is lost and then some species (which are non-palatable to the livestock) can become dominant and invasive in their new situation.
Module 1 what decision-makers need to know about invasive species

plants – both higher and lower plant groups (marine, freshwater and terrestrial) including mosses, liverworts and ferns;

invertebrates – alien species from many phyla, including marine groups like comb jellies (Ctenophora); terrestrial and aquatic molluscs; arthropods including marine and freshwater crustaceans, spiders; insect pests and disease vectors;

vertebrates – fish (often intentionally) introduced to new waters have become invasive in both freshwater and marine situations; amphibians (e.g. the notorious cane toad); reptiles; birds; both small and large mammals.

The invasion process

Invasive biology has identified four major stages that an alien organism needs to go through before it is judged to be invasive: Introduction ⇒ Establishment ⇒ Spread (Naturalisation) ⇒ Spread = Invasion.

Introduction is the entry of an alien species into a new area (a habitat, ecosystem, biome, country or new continent where it has not been native before). Many species fail to survive unless they are cared for, due to unsuitable environmental conditions such as light, salinity, nutrient levels and so on. Legal systems and tools need to distinguish between intentional and unintentional introductions (see 1D and Module 3).

Establishment occurs when the introduced species survives long enough to develop a population in its new environment that is able to reproduce and establish a ‘founder’ population 2 (e.g. weed species that survive in a new country in disturbed areas like roadsides, but do not spread further).

Spread – Naturalisation is when the established animal, plant or microorganism starts to spread and reproduce without any assistance. It becomes part of the natural flora or fauna and “blends in” with native species.

Spread – Invasion is when the naturalised alien species spreads to the disadvantage of other species and disrupts the receiving ecosystem in some way (see 1E on impacts).

The probability that an introduced species will actually pass on to each successive stage of invasion is small. An occasionally used rule of thumb is that each step reduces the species by ninety percent of the numbers that reached it. Thus 10% of those species that are introduced actually become established; 10% of those that establish become naturalised and around 10% (or less) of those that become naturalised turn into invasives. Thus the chance of an introduced species becoming invasive is around 0.1% - some say as little as one in a million! This is fortunate as many thousands of species (or other taxa) are introduced to new ecosystems every year.

A complicating factor for decision-makers as well as scientists is that the invasion process usually involves a lag phase during which introduced species are low in abundance and their impacts are not noticeable. However, this phase is unpredictable in duration. The time from introduction to invasion may vary considerably as progression from one stage to another is variable and different for species and new habitats/ecosystems. Some organisms have virtually no time lag, and the effects of their invasiveness can be seen almost immediately (e.g. some parasites, diseases, algal blooms). For others, such as trees, the time from introduction to naturalisation may be years, decades or even centuries.

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2 The founder population is the initial group of organisms of the same species that establishes in the new environment. A minimum number of individuals, referred to as a minimum viable population, is usually necessary for such a population to expand successfully. The size of a minimum viable population will vary depending on the species and also on environmental conditions.
what decision-makers need to know about invasive species

Module 1

Figure 1: graph showing the phases of invasion over time

After Williams, 2003. Phases of invasions are expressed as a proportion of the habitat occupied by an invading species. The first four stages shown are equivalent to SPREAD (naturalisation and invasion) and are followed by a longer term “consolidation” by the invader.

As Figure 1 shows, it will be cheaper (and probably easier) to address the impact of an invading species at the very outset of this process from introduction to consolidation. In policy terms, there is consensus that prevention of unwanted introductions is the best way to stop invasions, followed by action during the escape or early establishment phases (e.g. management actions involving eradication or containment). Once the population of the invasive species explodes, the economic and social cost and management effort increases sharply while the value of the invaded habitat decreases and may trigger the need for restoration.

1D Understanding the pathways and causes for species introductions

What are invasion pathways and vectors?

Species introductions take place through a variety of pathways, between continents, between regions, between neighbouring countries and within countries (when a species moves from its native range to a new ecosystem or habitat). Knowledge and understanding of invasion pathways will enable countries to take appropriate action to minimise arrivals of unwanted species.

A pathway is basically the route along which an alien species may be transported to a new location. Pathways are typically described by reference to one or more of their defining features, such as the means of transport (e.g. aircraft, freshwater and marine shipping, roads), reason for the transfer of the species (e.g. farming, shipping or the pet trade) or the commodity involved (e.g. wooden packaging). Trade can be considered as a pathway in itself because it does not always follow regular routes, yet is responsible for the movement of goods over short and long distances.

The more specific mechanism for species transfer within each pathway is referred to as a vector. As an example, a tourist carrying seeds in muddy boots is a vector, whereas tourism and international flights are the pathways.

One way of thinking about this is to consider a large ship carrying goods and people from one continent to another. Along the shipping pathway, there will be opportunities for species to move on vectors as:

- the outside of the ship, especially the submerged part (‘hull fouling’ refers to organisms that cling to the undersides and are transported across the deep ocean (or lake) as well as moved from port to port;
- the ballast water tanks inside the vessel, used for stabilisation. Ballast water can be taken up in rivers and ports or in the open sea and discharged anywhere;

Legal and Institutional Frameworks for Invasive Alien Species
Module 1  what decision-makers need to know about invasive species

- the holds and other storage areas (including decks) where cargo is taken on, stored and then taken off again in port;
- steel containers loaded with goods, sometimes at vast distances from ports, then moved to other ports and on to their final destination by road, rail, canal etc.;
- the crew and passengers, whose luggage and clothes may carry seeds, spores or small animals;
- animals (such as birds and rats) that may inhabit the ship and move between ports;
- plants taken as souvenirs or plant parts taken as food – but which are still viable.

Commercial airliners, military and freight aircraft, interstate trucks, buses, trains and even bicycles can all become vectors of propagules of species that can be introduced and may become invasive.

Pathways can be divided into primary and secondary categories. Primary pathways enable species to move to new regions or provinces across major oceanic, landmass or climatic barriers. Secondary pathways help spread and disperse invasive species within or between neighbouring regions. Natural secondary pathways for dispersal could include winds and storms, water currents, movement of native animals (mammals, birds, reptiles, fish, insects, crustaceans, molluscs, etc.). Man-assisted secondary pathways include pathways taken by agricultural and construction machinery, on-road and off-road vehicles, livestock movements, highways, local roads and footpaths.

Secondary range expansions can start quickly or be triggered years or decades later, when new circumstances facilitate the local spread of an invasive species after its founder population has established e.g. through the construction of new transport infrastructure such as canals and highways. Both the Suez and Panama Canals have opened up new pathways for species introduction.

Figure 2: primary and secondary pathways

![Primary and secondary pathways](image-url)
Direct causes of species introductions

As noted, the introduction of species beyond their natural range is closely linked to historical and present-day movement of humans across the globe.

Wherever humans have travelled, they have deliberately introduced species to new locations for food, social or economic purposes. This type of introduction is referred to as an **intentional introduction**. Many of the items that humans produce and consume are based on (or use as inputs) introduced or imported species that have the potential to become invasive. Exotic species are increasingly used commercially. Examples include the use of potentially invasive species for mariculture, aquaculture, sport fishing, farming (including both crop and livestock production), biofuel production, or as foods. Other intentional introductions include plants and animals that are used for biological control and landscape restoration or are kept by people in aquaria, as pets, or are planted in their gardens.

Many more species have been accidentally transported around the world as a consequence of human activities such as trade, travel and transport. These are called **unintentional introductions**.

Table 1 provides an overview of activities leading to intentional and unintentional introductions. Even at a quick glance, this shows the sheer number of sectors whose activities drive or are affected by introductions. The necessity of engaging all key sectors when developing national frameworks – i.e. going outside the environmental or agricultural ‘box’ - is discussed in detail in Module 2.

<table>
<thead>
<tr>
<th>Direct Introductions into the Environment</th>
<th>Introductions into Captivity/Containment</th>
<th>Unintentional Introductions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>Botanical and private gardens</td>
<td>Vessels/aircrafts/vehicles/ trains, etc.</td>
</tr>
<tr>
<td>Forestry</td>
<td>Zoos</td>
<td>Ballast water</td>
</tr>
<tr>
<td>Soil improvements</td>
<td>Farmed animals</td>
<td>Hull fouling</td>
</tr>
<tr>
<td>Horticulture (ornamentals, nursery stock, house plants, etc.)</td>
<td>Beekeeping</td>
<td>Sea fouling</td>
</tr>
<tr>
<td>Conservation</td>
<td>Aquaculture</td>
<td>Sea cargo</td>
</tr>
<tr>
<td>Fishery releases</td>
<td>Pet trade</td>
<td>Sea containers</td>
</tr>
<tr>
<td>Hunting and fishing</td>
<td>Aquarium and horticultural pond trade</td>
<td>Personal baggage/equipment</td>
</tr>
<tr>
<td>Release of mammals on islands as food sources</td>
<td>Research</td>
<td>Agricultural produce</td>
</tr>
<tr>
<td>Biological control</td>
<td></td>
<td>Seed contaminants</td>
</tr>
<tr>
<td>Aid trade</td>
<td></td>
<td>Soil, gravel, sand, etc.</td>
</tr>
<tr>
<td>Smuggling</td>
<td></td>
<td>Timber</td>
</tr>
<tr>
<td>Aesthetics</td>
<td></td>
<td>Packaging material</td>
</tr>
<tr>
<td>Medicinal</td>
<td></td>
<td>Dirty equipment, machinery, vehicles - including military</td>
</tr>
<tr>
<td>Religious</td>
<td></td>
<td>Hitchhikers – including parasites and diseases – associated with aquaculture introductions, cut flowers, and introductions for the nursery trade</td>
</tr>
</tbody>
</table>

Different types of introductions raise different challenges for legislators. Intentional introductions provide clear opportunities to apply legal tools to analyse, regulate and manage associated risks (see 3E). Illegal introductions (smuggling of prohibited animals and plants, for example) are hard to detect but can be addressed by establishing clear prohibitions and meaningful penalties.

In contrast, unintentional introductions potentially pose a bigger threat to the environment and society because of their number and unplanned nature and because legal frameworks must focus on pathway-related measures to minimise associated risks (see 3F). This complexity is one of the reasons why awareness-raising and communication at all levels of government and across society is so important.
Module 1 what decision-makers need to know about invasive species

**Figure 3: types of alien species introductions**

Authorised intentional introductions can be loosely divided into two categories:

- species that are directly introduced into the wild for economic reasons (e.g. crops, domestic animals, game species, biological control agents, or plants intended to improve soil condition, to provide fuelwood or pasture or to prevent erosion). These species are introduced with the specific purpose of them establishing in their new ranges and are usually cared for to ensure a greater chance of establishment;

- species that are introduced into captivity (e.g. pets or species kept in zoos, botanical gardens, private gardens, aquaculture facilities, farms or scientific research establishments). There is usually no intention or economic motivation to introduce such species to the wild, at least at the outset, yet escapes or spread regularly occur. For example, the vast majority of invasive alien plants in Europe were originally introduced as ornamental plants, as was the water hyacinth in Africa. In Europe, several invasive animals now causing major economic and environmental damage (American mink, muskrat, coypu) were introduced for fur farming. In addition, private actors may also carry out deliberate releases (e.g. abandonment of an exotic pet).

**Box 3: examples of intentional introductions**

The South American nutria or coypu, *Myocastor coypu*, was deliberately introduced into the wild in East Africa and many other regions of the world as a source of food and fur, but is now widely considered a pest. Its destructive feeding causes considerable losses in crops such as rice, sugarcane, corn and soybean, as well as some fruit and vegetables. Its burrowing weakens the banks of rivers, dams and irrigation canals, and may undermine building foundations and road beds. By gnawing on wooden structures, it may also damage buildings and jetties.

Africa’s waterbodies are being choked by a number of invasive aquatic weeds that were originally introduced as ornamental plants for garden ponds. These include water hyacinth, giant salvinia, parrot’s feather, red water fern and water lettuce, all of which are native to South America. After ‘escaping’ into rivers and wetlands, these weeds thrive in the absence of their natural enemies. They grow rapidly and form dense infestations that have a variety of socio-economic impacts, as well as causing a decline in water quality and an overall reduction in biodiversity.
**Unintentional introductions** occur in an unplanned, unpremeditated manner, when species enter new geographic areas as hitchhikers or stowaways in the course of trade, travel and transport. Frequently, they occur in association with intentional introductions, as parasites and diseases associated with shipments of commercial species. For example, many of the plant diseases and insect pests affecting fruit and vegetable crops were introduced on commercial imports of whole plants or products.

Measures to protect plant and animal health to safeguard important agricultural interests are the most-developed type of pathway management legislation in place today at national as well as international level (see 2C and Module 6).

As mentioned, transportation pathways provide vectors to move organisms over huge distances. The pathway that has received most attention from the international community is ballast water. It is estimated that up to 14 billion tonnes of ballast water are transported around the world each year, and between 7,000 and 10,000 species of marine microbes, plants and animals may be present in ballast water at any given time.

It was via ballast water that the zebra mussel *Dreissena polymorpha* was introduced to North America’s Great Lakes in the mid-1980s. Damage to underwater structures and pipes caused disruption to supplies of drinking, cooling, processing and irrigating water: the cost of mitigating these impacts was estimated at US$750 million to US$1 billion between 1989 and 2000. In addition, zebra mussels compete with zooplankton and other filter-feeders for planktonic food, affecting natural food webs. Damage for the period 2000-2010 has been assessed at US$ 3.1 billion (intake pipes, water filtration equipment, power plants), US $100 million/year (lost power generation based on a one to two day downtime and a 1% reduction in plant heat rate) and $5 billion (potential economic impact).

**Indirect causes of species introductions**

When developing legal frameworks, it is also important to understand underlying causes in terms of economic patterns and market forces. Invasions are the outcome of a very complex set of processes. Many of these processes are economically motivated – including the use of exotic species in a variety of economic activities, the conversion and fragmentation of habitat, the liberalisation and deregulation of markets, expansion in the trade of goods and services, and increasing mobility of people. In many cases, opportunities to generate and access food, cash and employment are limited and heavily dependent on activities which utilise potentially invasive species. e.g. subsidies designed to promote the export of cash crops that reduce plant genetic diversity or encourage the use of agro-inputs that lay agro-ecosystems open to invasion (Perrings 2000).

**Box 4: relationship between international trade and species introductions**

A recent study (Ding et al. 2008) analysed the implications for alien species introductions of China’s expanding international trade (total value of imports and exports grew from US$20.6billion in 1978 to US$1422.1 billion in 2005). China now has 253 airports, seaports and stations designated as international ports of entry, double the number in 1987. The total numbers of harmful alien animals, plants, and other pest organisms intercepted at international borders grew at least 10-fold from 1990 to 2005. The growth of industrial and transportation infrastructures, including vast construction projects like the Three Gorges Dam and the new rail link to Tibet could further spread invasive species to once-isolated portions of the country. Recently-introduced species already causing economic and environmental damage include the American vegetable leaf miner and the fall webworm).

The Global Invasive Species Programme has developed a Toolkit for the Economic Analysis of Invasive Species (Emerton and Howard, 2008) that provides practical step-by-step advice on analysing the costs and benefits of invasive alien species themselves as well as the policy measures to address them. This may be particularly useful to decision-makers when considering the design and effects of subsidies, taxes, incentives and other economic instruments (see 2D). Table 2 is taken from this Toolkit and illustrates the relationship between activities that legislation may directly address and the underlying economic causes to be taken into account.

**Table 2: examples of the direct and indirect economic causes of invasions**

<table>
<thead>
<tr>
<th>Steps to invasion</th>
<th>Examples of indirect economic causes</th>
<th>Examples of direct economic causes</th>
</tr>
</thead>
</table>
| Introduction      | Forces and conditions which determine trade, production and consumption practices and preferences, such as:  
1. Expanding domestic and international travel and tourism trade  
2. High reliance of the economy on agriculture, forestry. | Introduction of species for commercial purposes, such as:  
- Fish and molluscs for aquaculture and mariculture  
- New (=alien) species for sport fishing |
Module 1
what decision-makers need to know about invasive species

<table>
<thead>
<tr>
<th>Table 2: examples of the direct and indirect economic causes of invasions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Steps to invasion</strong></td>
</tr>
</tbody>
</table>
| Establishment | fisheries and tourism | • Agricultural seeds and crops  
• Livestock for meat, wool and fur  
• Food plants  
• Biofuel plants  

*Introduction of species for control purposes, such as:*  
• Insects, mites and fungi for biocontrol  
• Fast-growing foreign plants for landscape restoration  

*Introduction of species for lifestyle and aesthetic purposes, such as:*  
• Exotic pets  
• Foreign/modified Ornamental plants  
• New (= foreign) aquarium fish  

| Spread | Forces and conditions which determine land and resource use practices and preferences, such as:  
• High reliance of the economy on agriculture, forestry, fisheries and tourism  
• Economic and fiscal incentives encouraging land and resource uses which lead to reduced genetic diversity, increased use of agrochemicals, biodiversity loss, ecosystem degradation, conversion and fragmentation  
• Institutional and property rights regimes which discourage action  
• Lack of budgets and funding to control programmes  |
| naturalisation | | • Unintentional or accidental introductions via another economic activity, such as:  
• Contaminated livestock, plants and aquatic species  
• Plant and animal “hitch-hikers” in freight, packaging or travellers’ luggage  
• Ballast water  
• Dumping of unwanted waste, plants, fish or pets |
| invasion | | |

From Emerton and Howard 2008

1E Understanding the impacts of invasive alien species

Invasive alien species are associated with a wide range of negative consequences for the environment and local biodiversity, for industries and users of natural resources, and for the health and well-being of affected communities.

Impacts can be direct or indirect and can be grouped into three main categories - ecological, economic and health impacts. However, it should be emphasised that many if not most invasive alien species have multiple impacts affecting different sectors and are or should be a concern for more than one government department or agency.

Ecological impacts

Many alien species that become invasive have serious impacts on biodiversity and ecological processes. All types of ecosystems (terrestrial, freshwater, marine and coastal) may be invaded.

Impacts may not be obvious initially but will increase in severity over time as the invading population increases. Such impacts are often not seen as economically important because of the difficulty in assigning monetary values to species extinctions, loss of biodiversity and loss of ecosystem services. However, stable ecosystems play a key role in providing goods and services to people and industry that are necessary both for human well-being and economic productivity.

Ecological impacts may include:

• Direct predation/herbivory on native species
• Competition with native species for resources such as light (for plants), breeding sites or preferred food/nutrients
• Habitat alteration, such as shading out native species, clogging freshwater systems, increasing erosion, changing fire regimes, and permanently altering nutrient cycles or soil properties
• Disturbance to ecological processes such as pollination, by for example producing more attractive flowers for pollinators, or causing a decline in pollinator populations
what decision-makers need to know about invasive species

- Disruption of ecosystem services such as flood attenuation and shore protection
- Transmission and spread of pathogens and parasites
- Environmental degradation that facilitates further invasions.

**Box 5: examples of ecological impacts**

The brown tree snake, *Boiga irregularis*, shows how direct predation can impact biodiversity. The snake was accidentally introduced to the island of Guam from its native range in the South Pacific in the late 1940s, probably as a stowaway in ship cargo. Since then it has caused the disappearance of 9 out of 11 native forest birds, 5 of which were endemic species that are now extinct on Guam. The birds had evolved in the absence of snake predators, so they lacked protective behaviours against the nocturnal brown tree snake. A number of the island’s lizard species, as well as its native bat species, were also decimated by the invasive snake (for education materials, see http://www.fort.usgs.gov/Resources/Education/BTS/).

Various species of *Acacia* are invasive in many parts of the world, causing a loss of biodiversity by outcompeting native species and disrupting natural ecosystem functioning. These are nitrogen-fixing plants that increase nitrate levels in the soil, inhibiting the survival of native species adapted to nutrient-poor soils. The resulting absence of groundcover in acacia thickets may lead to increased soil erosion. Acacias also heighten the risk and intensity of fire by increasing the fuel load, and these very hot fires destroy the seeds of native species. Furthermore, they are ‘thirsty’ plants with high water needs, so they reduce runoff and hence river flow, impacting aquatic ecosystems.

Figure 4, based on the Millennium Ecosystem Assessment, shows how human livelihoods, particularly in countries and communities directly dependent on natural resources, may be harmed by environmental impacts of invasive alien species.

**Figure 4: invasions, ecosystem services and human wellbeing**
Module 1  what decision-makers need to know about invasive species

Invasions impact on the provision of which results in changes in understanding, assessing and acting on invasives in the light of the changes in ecosystem services and human wellbeing they give rise to economic analysis

Economic impacts
As noted, many introduced species underpin national production systems (agriculture, fisheries, aquaculture, forestry) and have very considerable benefits for local and national economies. Others are highly appreciated sources of wellbeing for society (e.g. ornamental plants, aquarium fish and pets).

However, the subset of introduced species that do become established and proliferate may cause major economic losses to society, as a consequence of reduced productivity as well as costs incurred for the prevention and management of invasive species. The best-known study is the assessment of known environmental and economic costs of invasive alien species in the United States, United Kingdom, Australia, South Africa, India and Brazil carried out in 2001 and updated in 2005 (Pimentel et al. 2001, Pimentel et al. 2005). This study estimated that invasions of non-native species in the six countries concerned cause over US$ 314 billion in damage per year. This sum translates into US$ 240 annual cost per capita in these six countries. Assuming similar costs worldwide, Pimentel estimated that damage from invasive species would be more than US$1.4 trillion per year, representing nearly 5 per cent of the world GDP.

Damage to the ecosystem services upon which humans depend (see previous section) often triggers economic impacts, although these losses may be hard to quantify and are often excluded from the analysis of costs associated with invasive alien species. Economically valuable ecosystem services include provisioning services such as food, shelter, water, timber, and fibre; regulating services that affect climate, floods, disease, wastes, and water quality; supporting services such as soil formation, photosynthesis, and nutrient cycling; and cultural services that provide recreational, aesthetic, and
what decision-makers need to know about invasive species

Module 1

spiritual benefits. Damage to these services may have a disproportionate impact on poor and vulnerable communities (Wise et al. 2007)

**Direct costs:**
- Direct loss of crops to introduced crop pests
- Spoiling of produce, rendering products unsuitable for consumption, such as fruit-fly infestations destroying fruit crops or weevils infesting stored grain
- Loss of export earnings due to prohibitions on exporting products infected by IAS, such as bans on meat exports due to foot-and-mouth disease
- Reductions in agricultural production due to displacement of pasture by unpalatable grasses and woody species, or through environmental changes caused by the invading species
- Impacts on fisheries and aquaculture through, for example, the introduction of phytoplankton species that cause harmful algal blooms, of smothering plants like salvinia or of predatory species such as Nile perch
- Secondary economic impacts from human health issues associated with introduced pathogens and toxic species, including increased monitoring, testing, diagnostic and treatment costs, and loss of social productivity due to illness and death in affected people
- Loss of tourism revenue due to epidemics (e.g. SARS outbreak, see below);
- Costs of producing and using chemicals and machines to deal with IAS.

**Indirect costs:**
- Degradation of ecosystem services, such as reduced water supplies due to invasive alien trees growing in catchments and along rivers, or siltation of dams and rivers due to increased soil erosion;
- Lost human productivity due to time and resources allocated to dealing with IAS, such as clearing weeds or spraying pesticides
- Damage to infrastructure due to ecosystem changes, such as increased intensity and/or frequency of fires, floods or landslides
- The costs of responding to the problem, including research and development, monitoring, education, communication, regulation, compliance, management, mitigation and control costs and restoration activities.
Module 1  what decision-makers need to know about invasive species

Box 6: examples of economic impacts

The North American comb jelly, *Mnemiopsis leidyi*, was introduced to the Black Sea via ballast water, probably in the early 1980s. In 1988 the population began expanding rapidly, and by the following year its total biomass had reached a billion tons for the entire Black Sea. By competing with pelagic fish for zooplankton food, and preying on their eggs and larvae, the comb jelly caused the collapse of commercial fisheries worth approximately $500 million per year. Landings of anchovy dropped to a third of their previous levels, and many fishermen abandoned fishing, resulting in severe socio-economic hardship in the region.

The larger grain borer *Prostephanus truncatus* is a destructive pest of farm-stored maize and dried cassava in sub-Saharan Africa. Native to South and Central America, it was first detected in Africa in the late 1970s in Tanzania. In 1984 the first outbreak in West Africa occurred in Togo. The pest subsequently spread throughout East and West Africa and also began invading southward, reaching South Africa at the tip of the African continent in 1999. In Tanzania the pest causes more than US$90 million in maize losses annually, and in West Africa it is responsible for cassava losses of approximately US$800 million per year. The pest also attacks cereals, legumes, dried roots, tubers, peanuts, cocoa and coffee beans.

Health impacts

Invasive alien species can also have severe impacts on human health. These may be direct e.g. by causing disease, allergic respiratory or skin reactions or due to injuries from stinging and biting.

Impacts may also be indirect, when a species acts as a vector for the introduction of disease. Zoonosis is the term for a disease of animals that becomes a disease of humans after introduction to the human population as a pathogen (as happened with Ebola, SARS and, to a certain extent, HIV/AIDS).

Diseases may affect the movement of people and seriously compromise business travel and tourism, resulting in secondary economic impacts. This was demonstrated by the Severe Acute Respiratory Syndrome (SARS) outbreak in 2003, which cost China’s tourism industry an estimated $17 billion on top of the cost of lost exports and foreign investment. The appearance and spread of the H5N1 strain of avian influenza that has been spread around the world (by poultry infecting migratory birds) and the impacts on human health and the poultry industry in many countries of Asia, Africa and Europe.

In the marine environment, ballast water can transfer bacteria and viruses, as well as planktonic species that may form harmful algal blooms (HABs) such as ‘red tides’. Some HAB-forming species produce toxins that are potentially dangerous to humans. Eating contaminated shellfish can result in various types of shellfish poisoning that can cause severe illness and even death in humans, while some HAB species release an aerosol toxin that causes skin and respiratory irritations. The threat of shellfish poisoning often forces the closure of fisheries and mariculture facilities for filter-feeding shellfish species, which tend to accumulate the HAB toxins in their tissues.

Box 7: examples of health-related impacts

*Parthenium weed* (*Parthenium hysterophorus*) is native to Mexico but was been accidentally introduced to many countries in Africa, Asia and the Pacific, where it has become an aggressive invader of disturbed areas, including pasture land and crop fields. It is unpalatable to livestock, and if mixed with fodder can cause severe skin and gastrointestinal irritations in cattle, buffalo and sheep. The weed is also a health hazard for humans, because contact with the plant or pollen can cause allergic reactions such as dermatitis, asthma and hayfever.

In the United States, the introduction and spread of West Nile Virus has also had a dramatic impact on public health. The virus had not been recorded in the Western Hemisphere until it caused an outbreak in New York in 1999, and it has since spread throughout the United States. Between 1999 and 2006, the virus was responsible for 24005 medical cases and 962 fatalities. The estimated cost of the epidemic in Louisiana in 2002, when 329 cases were reported in the state, was $20.1 million, comprising a $10.9 million cost of illness and a $9.2 million cost of public health response.

Invasive alien species with multiple impacts

As noted, some species affect multiple sectors and interests and effective management efforts will require coordination across administrative and often national boundaries. The importance of transboundary and regional coordination and information sharing e.g. on biocontrol and other control techniques, is discussed in detail in Module 6.
Box 8: examples of species with multiple impacts

Water hyacinth, a floating water plant from Central America, has invaded water systems in Asia, Africa and parts of tropical America and is now spreading in parts of Europe. Its impacts include: increasing evaporative water loss by as much as six times normal evaporation from open water, so that infested water bodies lose water very quickly; blocking water flow in streams, irrigation canals and drains causing serious problems of water supply and requiring frequent clearing, infiltrating hydropower generation dams and turbines, requiring expensive clearance and disposal; forming vast floating mats, preventing people and boats from accessing open water and ferries and freighters from reaching their harbours; providing sanctuary for snakes, crocodiles and other problem animals; preventing access to fish/fisheries; encouraging the growth of the vectors (intermediate hosts) of malaria and bilharzias; suppressing the growth of other aquatic plants that provide shelter and breeding grounds for fish.

The Louisiana Crayfish, *Procambarus clarkii*, a native of the southern United States, was introduced to many countries as an aquaculture species for specialist food and as a predator for the snail intermediate hosts of bilharzias. In Asia, Africa, Europe and some South American and Caribbean countries, it has escaped from aquaculture and invaded inland water systems such as lakes, dams, ponds and slow rivers where it consumes aquatic vegetation, aquatic molluscs and crustaceans and other species, resulting in serious aquatic ecosystem changes and reduced fisheries. The species also burrows into riverbanks and dams causing serious erosion and leakage of storage waters. The small benefits that it provides as a (often only specialist) food source are far outweighed by its destruction of many aquatic systems and their (often endemic) fauna, fisheries and water holding capacity.

1F Prediction and linkages to other environmental pressures

The ability to predict invasions would obviously have major advantages in terms of their prevention and management. Considerable effort has therefore been put into trying to get a better understanding of the factors that increase the likelihood of an alien species becoming invasive. These factors include the characteristics of the species itself and also the state of the receiving environment.

Species characteristics

Invasion biologists have identified various traits and characteristics that may facilitate invasion by an introduced species, and could be useful in predicting invasive potential. These include:

- invasive elsewhere in the world (often though not always the best indicator);
- widespread distribution and abundance in the native range;
- high adaptability to, and tolerance of, a variety of environmental conditions;
- ability to grow and mature rapidly, i.e. reach reproductive age quickly;
- high reproductive output, i.e. able to build populations quickly, increasing the chance for establishment in the new range (either by producing many offspring/propagules or by nurturing fewer progeny but with great efficiency);
- ability to colonise from a single pregnant female;
- effective dispersal mechanisms, enabling rapid spread once established;
- broad diet (animals) or tolerance of various soil types (plants);
- aggressive behaviour and competitive ability with local species for food, space, light, water, resting and nesting areas and so on;
- association with humans;
- small size, making both detection and control difficult.

Characteristics of invaded environments

Factors that may predispose certain areas to becoming invaded include:

- the degree of similarity between the climate and habitats of the receiving region and those colonised by the species of interest in its natural and other introduced ranges;
- the ‘invader friendliness’ of the area where the invasions occur e.g. the number of recently established invasive species; the percentage of artificial, heavily modified or disturbed habitats that offer vacant niches due to absence or immaturity of native species populations; lowered biodiversity
Module 1 what decision-makers need to know about invasive species

in native communities owing to overgrazing, frequent burning, deforestation, pollution, overfishing, dams or other disruptive processes

• the range of secondary pathways available (i.e. number and frequency of local vectors and their routes that can assist regional spread)
• the presence of biogeographically isolated communities containing a high percentage of endemic species and/or offering naturally vacant niche space owing to relatively low biodiversity.

Other factors that may help alien species to establish in new ranges, include:

• propagule pressure: the likelihood of the establishment of an alien species increases with the number of individuals (including seeds, roots, rhizomes for plants, and eggs, larvae and pupae for animals) introduced and the frequency of introductions;
• lack of natural enemies e.g. pathogens, diseases, predators or competitors. When a species is transferred to a new location outside its native range the predators, diseases or other species that help control it may be left behind.

However, there is insufficient evidence to quantify these trends adequately. There are also mechanisms that influence invasiveness on a more case-by-case basis which are difficult to predict. For these reasons there remains no substitute for careful biological research on any species of concern, both in its natural and invaded habitats.

Linking invasions to other environmental pressures

The Millennium Ecosystem Assessment (MEA 2005) looked at hundreds of ecosystems around the world and found that invasive species could exacerbate their role in ecosystem degradation when combined with other environmental pressures: habitat loss/destruction, climate change, over-exploitation of ecosystem resources and possibly pollution. In other words, other human-induced change can make receiving environments even more vulnerable to invasion.

It is important for decision-makers to understand these linkages in order to ensure consistency between invasive alien species policies and broader sectoral policies for environment and resource management.

Land-use change

The alteration of the natural environment for human ends is nothing new but the rate of transformation has increased dramatically. As globalisation opens up world markets and economies are increasingly reliant on exports, the economic incentives for industrial growth and agricultural expansion have led to large-scale urbanisation and deforestation across the globe.

Invasive species can often enter and establish in a disturbed habitat more easily than in a stable and resistant system. This is why more invasive species are found in newly changed habitats (such as land cleared for agriculture or urban development and along roadsides and construction sites). A current example of this phenomenon is appearing in areas where biofuels are being prepared from new plantations of plants that will yield biofuels – often in areas cleared of native vegetation.

Deforestation increases the amount of sunlight reaching the forest understorey and results in warmer soil temperatures, creating areas that are conducive to invasion by weedy, fast-growing plants. Alien plants and animals introduced for agricultural purposes are typically selected for their rapid growth, short maturation period, high reproductive capacity and wide environmental tolerance - the very same characteristics that contribute to their invasive potential.

Urban and agricultural expansion also have a number of secondary environmental impacts associated with nitrogen deposition. Fertilisation of agricultural fields involves direct application of nitrogen to soils, while urban and industrial activities release nitrogen-based pollutants into the air that ultimately return to the surface via precipitation and dry deposition. The resulting soil enrichment disadvantages slow-growing native plants that are adapted to nutrient-poor conditions, but increases the potential for invasion by fast-growing species, such as alien grasses.

Urban and agricultural expansion has also given rise to a massive network of roads and railways, which serve as secondary pathways for the spread of invasive species.
In the aquatic environment, runoff from farmlands and discharge of sewage and industrial effluent causes nutrient enrichment – or eutrophication - of flowing and standing waterbodies. This typically results in algal blooms and excessive growth of nuisance weeds, such as invasive water hyacinth and salvinia, which have a variety of economic and ecological impacts.

**Climate change**

Climate change is already affecting native biodiversity, which is often dependent upon a stable climate. When the temperature increases (even only slightly) and/or rainfall patterns change, most native species are slow to adapt to the new conditions – whereas invading species, by their very nature, are better able to adapt to the same changes and so will (and are already) spreading into areas where native biodiversity is affected.

It is also anticipated that the incidence of extreme events such as drought, major storms and wildfires will become more frequent, and coastal towns will increasingly be threatened by flooding resulting from sea level rise. The resulting ecological disturbance is likely to provide more opportunities for invasion by alien species that may be better adapted to take advantage of changing conditions than indigenous species.

For example, Hurricane Katrina (Mississippi, USA: August 2005) caused widespread damage to swamplands and forests. Land managers have subsequently noted a dramatic spread of invasive alien plants, particularly cogon grass and Chinese tallow tree, attributed to fallen trees creating openings in the forest canopy, giving weeds more access to sunlight and also increasing soil temperature, and to wind- and water-dispersal of seeds and rhizomes. In addition, increased traffic of humans and logging equipment during rehabilitation work probably transported the weeds to new, previously unaffected locations.

Rising levels of atmospheric CO₂ (used by plants for photosynthesis) are also expected to have a ‘fertilisation’ effect, and lead to accelerated plant growth, which would be particularly advantageous to
fast-growing invasive grasses and woody plants. Most plants increase their water-use efficiency when grown under CO₂ enriched conditions, while nitrogen fixation is stimulated in leguminous plants. As a result, annual grasses might be able to expand their ranges further into more arid regions, while woody plants have the potential to increase growth and seed output through more efficient use of water and nitrogen resources.

1G Compiling baseline information: useful resources

Why technical information matters to decision-makers

Up-to-date scientific and technical knowledge is essential to inform planning and decision-making with respect to invasive alien species and to shape the design of detailed regulatory controls and procedures. Relevant authorities need accurate information to determine permit applications, set priorities for pathway management and allocate resources for control. Legal measures that potentially affect international trade (e.g. by restricting imports) must have a scientific basis to comply with international trade rules (see Module 6).

From a pragmatic point of view, reasonably comprehensive information about the nature and extent of invasive threats facing your country may make it easier to build political will for new or improved legislation and promote consistent decision-making across sectors. The development or expansion of a national inventory and database is therefore a key consideration in the process of developing national institutional and regulatory frameworks.

Many countries already have some kind of inventory for species affecting agriculture, forestry and fisheries production, but in most cases these will need to be enlarged to identify and cover species affecting biodiversity and ecological services. In Mexico in 2007, the expanded National Information System provided data, information and analysis to assist determination of fourteen requests from different sectors in relation to import permits and reforestation programs (March et al, 2008).

High-quality information is also needed to support education and public awareness initiatives, in particular when it comes to potentially controversial policies such as eradication initiatives or import restrictions for certain species.

What kind of information is needed for legislation and management?

Information that should be collected and shared includes that on invasive species themselves, as well as on best practices for their management. This should include:

- development of inventories and databases including species distribution data;
- incident lists and case studies;
- potential threats to neighbouring countries;
- information on taxonomy, ecology and genetics of IAS;
- prevention and control methods where available;
- national and regional guidelines;
- national requirements and regulations regarding intentional introductions, such as imported species;
- national requirements and regulations regarding unintentional vectors, such as ballast water controls.

What information resources are already available?

The good news for countries that lack adequate information resources is that over the last five years, there has been a very significant increase in international, regional and national databases that can be consulted electronically and are interlinked (for a range of examples, see Box 8). For example, countries that lack fast or reliable internet links, data may usually be procured via CD-Rom though this is inevitably slower.
Box 9: examples of invasive alien species databases

<table>
<thead>
<tr>
<th>Database</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global Invasive Species Information Network</td>
<td>URL: <a href="http://www.gisinetwork.org/">http://www.gisinetwork.org/</a></td>
</tr>
<tr>
<td>Invasive Alien Species Information Network</td>
<td>URL: <a href="http://www.iabin.net/">http://www.iabin.net/</a></td>
</tr>
<tr>
<td>Delivering Alien Invasive Species In Europe</td>
<td>URL: <a href="http://www.europe-aliens.org/">http://www.europe-aliens.org/</a></td>
</tr>
<tr>
<td>Asia-Pacific Forest Invasive Species Network (APFISN)</td>
<td>URL: <a href="http://apfisn.net/">http://apfisn.net/</a></td>
</tr>
<tr>
<td>Invasives Information Network (Inter-American Biodiversity Information Network)</td>
<td>URL: <a href="http://www.iabin.net/">http://www.iabin.net/</a></td>
</tr>
<tr>
<td>Invasives Network (Inter-American Biodiversity Information Network)</td>
<td>URL: <a href="http://www.iabin.net/">http://www.iabin.net/</a></td>
</tr>
<tr>
<td>Invasive alien species of Mexico</td>
<td>URL: <a href="http://www.conabio.gob.mx/invasoras/index.php/Portada">http://www.conabio.gob.mx/invasoras/index.php/Portada</a></td>
</tr>
</tbody>
</table>

Another key set of information resources relates to taxonomy. Through BioNet International (http://www.bionet-intl.org/), a global network for taxonomy has been developed through coordinating institutes. Each of the following regional sites can be accessed from the central Bionet site:

- **ANDINET** the Andean Countries
- **ASEANET** South East Asia
Module 1  what decision-makers need to know about invasive species

- CARINET Caribbean
- EA FRINET East Africa
- EASIANET East Asia
- NA FRINET Northern Africa
- PACINET South Pacific
- SACNET South Asia
- SA FRINET Southern Africa
- WA FRINET Western Africa
- LATINET South America, S. cone (under development)
- MESOAMERINET Mesoamerica (under development).

In conclusion, many countries already have some kind of inventory for species affecting agriculture, forestry and fisheries production, but in most cases these will need to be enlarged to identify and cover species affecting biodiversity and ecological services (March et al, 2008).

Regional cooperation can play an extremely important catalyst role in improving information resources. In South America, for example, very little information on invasive alien species was available in most countries in 2005: by 2008, ten of the 13 countries had established national databases after receiving technical training through I3N and TNC initiatives on biological invasion science and database management (Ziller, 2008).

1H Key readings for further information

CBD Guiding Principles, 2002. Annexed to Decision VI/23 (Alien species that threaten ecosystems, habitats or species) of the Conference of the Parties to the Convention on Biological Diversity


what decision-makers need to know about invasive species

Module 1

Invasive Species Programme
Module 2
laying the foundations for effective national frameworks
2A What this module covers

This module explains the need for workable legal frameworks to equip countries with a solid basis to implement prevention and management measures for invasive alien species. It describes common constraints faced by nearly all countries and recognises that the approach selected will vary according to each country’s legal system, traditions, existing laws and capacity. It emphasises the need to implement key international commitments and building real cross-sectoral coordination at national level.

By the end of this module, the reader will understand how to carry out a legal review process for invasive alien species and have an overview of different options for improving institutional coordination and capacity, the different types of laws that can be used and the basic components that should be included in all legal frameworks.

2B Key points to address

If a country is to manage invasive alien species effectively, it needs a supportive policy environment underpinned by scientific and technical baseline information (see 1G).

National legal frameworks define agreed objectives and provide the basis for establishing principles, standards and procedures to achieve them. They assign responsibility to particular government authorities and give them the authority to carry out their mandates. They also establish the institutional mechanisms needed to develop and implement detailed regulations, ensure compliance, monitor success and failure, and promote policies for improved implementation. Establishing effective institutions is one of the most important roles of legislation, although this is often underestimated.

Some key points should be borne in mind when embarking on the complex process of reviewing and strengthening your policy, legal and institutional frameworks.

Communication and consultation with stakeholders

As Module 1 showed, many stakeholders are involved in or affected by invasive alien species. Building lasting cooperation between responsible agencies and stakeholders is one of the most important challenges the legal team faces.

This may seem unnecessarily time-consuming. However, to be successful, invasive management actions and strategies rely upon the awareness and cooperation of many stakeholders, not just in government but also including commodity industries, traders (garden and pet shops, angling suppliers etc.), natural resource and conservation interest groups and private individuals. Because public programmes and private actions interact to influence the entry, spread and damage of invasive species, consultations throughout the process are essential to ensure buy-in and promote voluntary compliance to the extent possible (Hachileka 2006). Exactly who should be involved will vary from one country to another, depending on local circumstances and in some cases, the species involved.

<table>
<thead>
<tr>
<th>Box 10: checklist of main stakeholders who should be involved</th>
</tr>
</thead>
<tbody>
<tr>
<td>environmental administrations</td>
</tr>
<tr>
<td>quarantine, border and port authorities</td>
</tr>
<tr>
<td>Customs</td>
</tr>
<tr>
<td>health and safety administrations</td>
</tr>
<tr>
<td>authorities responsible for plant and animal health</td>
</tr>
<tr>
<td>trade, transport and tourism authorities</td>
</tr>
</tbody>
</table>

Common constraints

All countries have relevant legislation, often more than individuals in government agencies realise. However, these laws span many sectors (quarantine and border control, production sectors, nature conservation, water resource management, hunting and possibly genetically modified organisms).
Module 2  laying the foundations for effective national frameworks

This leads, almost everywhere in the world, to fragmented legal and institutional frameworks that tend to result in inefficiencies and ineffective responses. Constraints include poor administrative coordination, gaps and inconsistencies in existing legal provisions, a reactive approach to invasives management and weak compliance and enforcement mechanisms and remedies. Box 10 summarises problems identified by countries across Europe when developing the European Strategy on Invasive Alien Species (Genovesi and Shine, 2004).

**Box 11: challenges identified in the European Strategy on Invasive Alien Species**

<table>
<thead>
<tr>
<th>Issue</th>
</tr>
</thead>
<tbody>
<tr>
<td>low public awareness and opposition to government intervention</td>
</tr>
<tr>
<td>shortage and inaccessibility of scientific information (for species identification, risk analysis, detection and mitigation techniques)</td>
</tr>
<tr>
<td>absence of clear and agreed priorities for action</td>
</tr>
<tr>
<td>ease of introduction and movement (e.g. through the post), inadequate inspection and quarantine</td>
</tr>
<tr>
<td>inadequate monitoring capacity</td>
</tr>
<tr>
<td>lack of effective emergency response measures</td>
</tr>
<tr>
<td>outdated or inadequate legislation</td>
</tr>
<tr>
<td>poor coordination between government agencies, States and other stakeholders</td>
</tr>
</tbody>
</table>

**Political will and defining the policy vision**

This is a delicate but critical issue. The first step to enable the development of a stronger national legal and institutional framework is for national government to recognise the existence of invasive alien species challenges and to make a political decision to take steps to meet those challenges.

Once that decision is taken, the policy and legal development process can be designed within a set timeframe with milestones for consultation along the way. It is helpful to develop a draft policy vision or discussion document that gives background information on invasives challenges faced by a country and identifies potential policy choices.

**Who should be involved?**

The answer will vary depending on practice in your country and possibly at different stages of the process. The policy development process may be quite inclusive and can give prominent roles to non-governmental organisations and private sector representatives (e.g. through working groups on specific issues). In contrast, the legal review and drafting team is likely to be government-focused.

The question ‘Who does the drafting?’ varies greatly from country to country and will also depend on the nature of the legislation to be developed. Laws that focus on purely legal matters (defining legal rights, governance of contracts, creation of legal agencies, oversight of government officers, etc.) are usually drafted by a special government office within the Ministry of Justice, Attorney General’s office or equivalent.

However, this process usually needs to be adjusted for laws that address highly technical and scientific issues because a legal officer cannot be expected to have sufficient understanding of such issues across all sectors of government. For invasives legislation, it will be necessary to include significant scientific/technical input as well as cross-sectoral input. Options include:

- forming a review and drafting team that includes scientific/technical experts (within the responsible ministry, for example) or
- selecting a legislative draftsman who will be responsible to obtain input from the technical and other sectors.

Technical laws may often be improved by obtaining input from the regulated sectors or industries, other affected groups and the wider community at an early stage in the drafting process, to ensure that their contributions can guide the overall design of legislation. It is obviously important that policy-makers hear a balance of perspectives, rather than only focusing on a particular interest group.
2C Getting started: identifying your country’s international commitments

Overview of international instruments

Because of the global and cross-sectoral nature of invasive species impacts, some international organisations have been addressing aspects of this problem for years (e.g. in the field of plant health). Other bodies have turned their attention to the problem more recently, with concern about risks to the natural environment and human health acting as a catalyst.

The common theme that links the work of these organisations is the understanding that unilateral action by a few States can never be enough to prevent unwanted introductions and contain the spread of established invasive species.

Your country will have accepted legal commitments at the international and regional levels, though you may not be aware of them all. National frameworks need to be consistent with and provide for the domestic implementation of such commitments.

There are two main sources of international law: customary international law and treaties.

Customary international law consists of a body of rules that States generally accept as being legally binding. Particularly relevant is the long-established principle that States have a general responsibility to ensure that activities under their jurisdiction or control do not cause harm to the environment of other States or to areas beyond the limits of national jurisdiction (see Module 6).

Treaties are agreements between States or groups of States (such as the European Union). Unlike customary international law, the rules and obligations contained in a treaty are only binding on the parties to that treaty. The level of detail varies depending on the level and type of treaty. For example, international instruments are often fairly general in character, whereas bilateral agreements may be more detailed. Treaty provisions are usually not ‘self-executing’, which means that national legislation and regulations are necessary to make them operational in domestic legal systems.

For invasive alien species, the existing international framework is complex. Over fifty instruments deal with some aspect of the introduction, control and eradication of alien species. These can be loosely divided into the following categories: phytosanitary and zoosanitary instruments (protection of plant and animal health); biodiversity conservation, including conservation of freshwater and marine ecosystems; and instruments and guidelines targeted at specific sectoral pathways (e.g. ballast water management, control of introductions for aquaculture). Some measures are binding, others voluntary.

The following section provides practical guidance and a checklist of key instruments to help you identify relevant requirements to be addressed at the national level. Specific rules for international and regional cooperation are discussed in Module 6.
Module 2  laying the foundations for effective national frameworks

Where to find the information
The first step is to identify and collect relevant instruments. These are not limited to binding treaties but also include non-binding instruments e.g. ‘soft law’ recommendations, guidelines, programmes of action and declarations of principles.

An excellent reference source is ECOLEX (www.ecolex.org), an international database of environmental law that contains a comprehensive and constantly updated collection of all international environmental treaties at the global and regional levels, including all protocols and amendments, and the status of each country under each instrument.

As ECOLEX does not cover everything (e.g. trade-related instruments), it will be necessary to contact the focal points for implementation in relevant ministries (especially agriculture, trade and foreign affairs). This is also important to identify regional and bilateral agreements that your country may have signed and which do not appear in international databases. Many key invasives issues are addressed under such localised instruments e.g. specific commodities moving in commerce, migratory species, cross-border ecosystems and shared waterways.

Another very helpful one-stop source of reference on treaty provisions and synergies between international organisations is now available on the internet (see Box 11).

<table>
<thead>
<tr>
<th>Box 12: TEMATEA: interactive information on relevant treaty commitments</th>
</tr>
</thead>
<tbody>
<tr>
<td>The TEMATEA Project on Issue-Based Modules structures the commitments and obligations from regional and global biodiversity-related agreements in a logical, issue-based framework. The issue-based module for invasive alien species regroups obligations related to Assessment, Legislative measures and national policies, Management, Economic Instruments, Provision of Resources, Communication, Education and Public Awareness, and Cooperation (<a href="http://www.tematea.org/?q=node/14">http://www.tematea.org/?q=node/14</a>). The issue-based modules are interlinked which means that synergies with other environmental policy areas (e.g. inland water systems) are immediately visible.</td>
</tr>
</tbody>
</table>

A non-exhaustive checklist of key instruments that can form the starting point for your analysis includes:

- the Convention on Biological Diversity (CBD, 1992). This calls on States to “prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species” (Article 8(h)). Parties to this Convention have identified invasive alien species as a cross-cutting theme across different work programmes (e.g. inland water systems, forests, coastal and marine management). In 2002, they approved a set of 15 Guiding Principles for invasive alien species prevention and management which provide an essential checklist for the development and strengthening of national frameworks (see http://www.cbd.int);

- other biodiversity-related instruments that specifically address invasive alien species issues (Ramsar Convention on Wetlands 1971; Convention on International Trade in Endangered Species of Wild Fauna and Flora 1972; Convention on Migratory Species of Wild Animals 1979 and subsidiary agreements such as the African-Eurasian Agreement on Migratory Waterbirds 1995);

- regional environmental instruments and protocols (see further Module 6);

- the United Nations Law of the Sea Convention (1982), regional seas conventions concluded under the United Nations Environment Programme (several of which contain general provisions on invasive alien species in the marine environment) and regional and bilateral instruments for shared rivers and lakes;

- the International Convention for the Control and Management of Ships’ Ballast Water and Sediments (2004, adopted under the auspices of the International Maritime Organisation);

- treaties and standards focused on protecting plant health against the introduction and spread of plant pests (International Plant Protection Convention 1951, revised 1957, and its global network of nine regional plant protection organisations; International Standards for Phytosanitary Measures formally adopted within the IPPC framework). These are discussed further in Module 6E;
Laying the foundations for effective national frameworks

- international codes and procedures focused on protection of animal health, developed by the World Organisation for Animal Health (OIE);
- International Health Regulations of the World Health Organisation (1969, amended 2005) that aim to prevent, control and provide a public health response to the international spread of disease in ways that avoid unnecessary interference with international traffic and trade.

How to analyse the information collected

Once the team has identified applicable instruments, the next step is to extract relevant obligations and recommendations. Texts, standards and decisions adopted by the respective Conferences of the Parties or other organisations are usually well-catalogued and easily accessible from relevant websites. As mentioned, such obligations vary greatly in terms of their level of detail and whether they bind or simply encourage Parties to carry out certain actions.

For each instrument, the review team needs to:

- record the country’s status with respect to the instrument (i.e. Party, signatory or non-Party);
- identify the department or agency responsible for liaising with the relevant international organisation and overseeing implementation;
- identify the national law(s) used to implement each instrument;
- assess whether the obligations and recommendations under each instrument have been adequately transposed into the domestic legal system.

Checklist of priorities and principles backed by international instruments

A prioritised approach for tackling invasive alien species has been widely accepted at international level and should be reflected in the development of national policies.

As expressed in the CBD Guiding Principles, this three-stage approach ranks the ways in which invasive species should be addressed as (1) prevention of their introduction; (2) early detection and rapid response to eradicate an incipient or new invasion where feasible; and (3) containment of a newly established invasion to prevent spread or, if this fails, long-term control to manage the impacts of an established invasion.

As noted in 1C, prevention is recognised as both the cheapest and most effective policy intervention in stemming the rise of invasions and their consequences. Long-term control (the last resort) is by far the most expensive and long-lasting approach and is not always effective in halting the effects of invasion.

In addition, a series of cross-cutting principles or approaches have been recognised at international level and incorporated into relevant decisions and work programmes. These include:

- prevention (see 3B);
- the precautionary principle (see 2I);
- the ecosystem approach (see 2I);
- information sharing (see 1G and Module 6);
- cross-sectoral management (see 2E);
- regional and international cooperation (see Module 6);
- the polluter/user-pays principle (see 21).

2D Reviewing national laws, policies and regulations

Collecting information

Sources of law to be investigated may include the constitution, parliamentary enactments which may be consolidated into legal codes, subsidiary legislation and (depending on the legal system) the common law and/or customary laws (e.g. on land tenure). In federalised states that have a two-tier system of governance and legislation, both national (federal) laws and subnational (state/province) laws will contain relevant provisions.
Module 2  
laying the foundations for effective national frameworks

Few if any of your laws probably refer to ‘invasive alien species’. You will need to track down a range of sectoral laws and regulations, including institutional laws (i.e. agencies and institutions that regulate invasive species issues), environmental laws (i.e. species introduction, protected areas, environmental impact assessment and risk assessment), natural resources legislation (i.e. forest laws managing forest resources, agricultural laws including those that address non-native species and genetically modified organisms, fisheries laws including those that govern aquaculture and biological agents, and water resource laws), trade and customs laws on biological materials, transport law (i.e. addressing navigation and practices of vessels and vehicles), and commercial laws. On rare occasions, alien species may also be considered ‘hazardous substances’, ‘pollution’ or ‘dangerous material’.

Box 13: examples of legislation relevant to the review process

In Mexico, a legal review supported by The Nature Conservancy identified the following laws and regulations as relevant: Federal Phytosanitary Law and implementing regulations; Federal Animal Health Regulations; Environmental Law; Environmental impact assessment regulations; Regulations on Protected Natural Areas; General Law on Sustainable Forest Development; General Law on Wildlife; Fisheries Law and Regulations; as well as twelve Official Standards (Norms) related to implementation of phytosanitary and zoosanitary controls (Cornett 2008).

Botswana has a number of different laws dealing with aspects of invasive species. Its Aquatic Weeds Act declares infested areas and regulates boat traffic to prevent the spread of aquatic weeds. Its Noxious Weeds Act provides for the eradication and destruction of noxious weeds, while the Plant Diseases and Pests Act provides for the prevention of the introduction into and the spread within Botswana of plant diseases and plant pests.

Policies collected should include overarching social and economic policies that shape your government’s action. In Uganda, for example, the focus of government policies is poverty eradication. The draft National Invasive Species Strategy, Action Plan and Policy Guidelines for Uganda (NISSAP 2008) is directly relevant to the Poverty Eradication Action Plan (2004-2008) because it is recognised that invasive alien species pose a threat to sustainable development at the local level and ultimately at the national level.

Identify current institutional roles and responsibilities

Understanding who does what – and what gets missed out – is another important part of the review process.

The checklist in Box 9 above lists the main institutions that will have responsibility for some aspect of invasive alien species prevention and management or for activities that impinge on the subject. Other relevant ministries/departments could include Interior, Justice and Immigration.

Analyse the laws, policies and regulations collected

The next step is to carry out an in-depth analysis of the documents collected to see whether they address the subject of invasive alien species, directly or indirectly. Where the legislation is captured in electronic form such as CD-Rom, searching with key words will facilitate research.

Table 3 contains an indicative guide (but not a comprehensive checklist) to the types of questions that should be asked in assessing existing national frameworks on IAS. These questions have been developed in the light of the provisions of key international instruments but the review team will still need to check in more detail that national legislation complies with internationally-agreed rules. The dedicated TEMATEA website (see Box 11) can be used as a starting point because it itemises actions for domestic implementation. Sarpong 2004 also provides very helpful advice on methodology.

Table 3: questions for assessing legal and institutional frameworks

A. SCOPE OF THE REGULATORY FRAMEWORK (see Module 2)

1. What international instruments has your country ratified and what actions have been taken to implement those instruments in domestic legislation?
2. What policies dealing directly or indirectly with invasive alien species and how do they approach the issue (integrated perspective e.g. deal with all IAS concerns regardless of the pathway, vector, commodity or economic sector concerned? or sectoral perspective e.g. dealing only with threats to agricultural crops and livestock)?

Intentional introductions and transfers (see Module 3)

3. Does the law establish procedures (e.g. permitting requirements) to control the intentional introduction of alien species? (Consider this in relation to each pathway of concern and in relation to different taxonomic groups).
4. Does the law restrict the introduction of alien species, particularly potentially invasive alien species, into protected areas and other environmentally sensitive areas? (Note: it is important to consider controls on movements within a country as well as movements between countries).
### Table 3: questions for assessing legal and institutional frameworks

<table>
<thead>
<tr>
<th><strong>Unintentional introductions and transfers (see Module 3)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Have the pathways and vectors that pose the highest risk of introducing invasive alien species into and within the country been identified?</td>
</tr>
<tr>
<td>6. What if any legal measures exist to minimise risks associated with such pathways?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Post-introduction measures (see Module 4)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>7. What legal measures exist to support early warning, rapid response and control of IAS?</td>
</tr>
<tr>
<td>8. Have IAS already established in the country been given an appropriate legal status (e.g. classification as “weeds”, “plant pests”, “notifiable diseases” etc.) to facilitate control and eradication programmes and are these classifications regularly reviewed and updated?</td>
</tr>
<tr>
<td>9. Are there any provisions in law that create incentives or impose duties (e.g. on landowners) to take measures to report, contain, eradicate or mitigate the adverse impacts of IAS?</td>
</tr>
<tr>
<td>10. Are there any provisions in law that create incentives or impose duties (e.g. on landowners) to take measures to restore ecosystems damaged by IAS?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>B. INSTITUTIONS (see Module 2)</strong></th>
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<tbody>
<tr>
<td>11. Are there institutions with a clear legal mandate and the necessary powers:</td>
</tr>
<tr>
<td>11.1. to develop national plans and policies in relation to IAS;</td>
</tr>
<tr>
<td>11.2. to undertake risk analyses of potentially invasive species;</td>
</tr>
<tr>
<td>11.3. to undertake risk analyses of pathways for potentially invasive species;</td>
</tr>
<tr>
<td>11.4. to prevent the intentional introduction of species assessed as potentially invasive (including importation for the purposes of agriculture, aquaculture, the nursery trade, farming and animal breeding, the pet trade etc.);</td>
</tr>
<tr>
<td>11.5. to minimise the unintentional introduction of alien species;</td>
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<tr>
<td>11.6. to promote public awareness of IAS issues;</td>
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<tr>
<td>11.7. to monitor and conduct surveillance programmes to detect founder populations of IAS at an early stage;</td>
</tr>
<tr>
<td>11.8. to contain and eradicate populations of invasive alien species within the country;</td>
</tr>
<tr>
<td>11.9. to record and maintain information on IAS;</td>
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<tr>
<td>11.10. to enforce the relevant legal provisions regarding the control of IAS?</td>
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<thead>
<tr>
<th><strong>C. DECISION-MAKING (see Modules 3 and 4)</strong></th>
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<tbody>
<tr>
<td>(It is important to assess the extent to which the legal and institutional framework facilitates or inhibits the making of consistent, high-quality decisions in relation to IAS).</td>
</tr>
<tr>
<td>14. Do technical staff and decision-makers have access to relevant and up-to-date information necessary for planning prevention and management interventions?</td>
</tr>
<tr>
<td>15. Are there legal measures that require the invasive potential of an alien species to be assessed before a decision is made as to whether or not to permit its introduction into the country?</td>
</tr>
<tr>
<td>16. Is there guidance to help decision-makers exercise their discretionary powers on applications regarding potentially invasive alien species e.g. on application of the precautionary principle?</td>
</tr>
<tr>
<td>17. Are there provisions for interested and affected parties (which may include other government departments, private and civil society organisations etc) to participate in planning and decision-making in relation to IAS?</td>
</tr>
<tr>
<td>18. Does the law make provision for appeals by both applicants and aggrieved parties, in relation to decisions by authorities to permit or refuse the introduction of alien species?</td>
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<tr>
<th><strong>D. INTEGRATION OF IAS CONCERNS INTO DEVELOPMENT PLANNING AND CONTROL</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>19. Do key sectoral policies (e.g. national policies on agriculture, horticulture, aquaculture, genetically modified organisms, and trade) address IAS concerns?</td>
</tr>
<tr>
<td>20. Is the potential threat of IAS as assessed during environmental impact assessment studies where appropriate?</td>
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<tr>
<th><strong>E. RELATIONS WITH OTHER COUNTRIES (see Module 6)</strong></th>
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</thead>
<tbody>
<tr>
<td>21. Does the law require prior notification of other affected countries before a decision is made as to whether or not to permit the introduction of an alien species into a shared ecosystem?</td>
</tr>
<tr>
<td>22. Are there any legal requirements or institutional arrangements regarding information exchange and co-operation with other countries in relation to the prevention and control of IAS?</td>
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</table>

<table>
<thead>
<tr>
<th><strong>F. LIABILITY AND ENFORCEMENT</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>23. Are there any provisions in law that impose liability on parties responsible for the unlawful introduction or spreading of IAS?</td>
</tr>
<tr>
<td>24. Are the criminal sanctions (fines, imprisonment, confiscation of property etc) sufficient to deter unlawful behaviour in relation to IAS?</td>
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<tr>
<th><strong>G. FLEXIBILITY AND ADAPTABILITY</strong></th>
</tr>
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<tbody>
<tr>
<td>25. Is the legal framework sufficiently flexible to adapt rapidly to new information or changed circumstances (e.g. can standards and permit conditions be easily changed)?</td>
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</table>
Using the information generated by the legal and institutional review

Table 3 above provides a structured tool to help the review team work through the different aspects of the subject and identify the gaps and weaknesses in national frameworks at each stage. These findings will help the team to prioritise key needs and entry points for designing legislative measures and develop proposals to strengthen the national framework.

Box 13 gives an example of how specific issues can be addressed through the legal review process.

**Box 14: addressing specific issues through a legal review process**

| During the process of developing Uganda’s invasive alien species strategy, a review was conducted of national laws including the Local Government Act; the National Environment Act (1995) and its subsidiary regulations (National Environment (Mountains and Hilly Areas) Management Regulations (2000); National Environment Wetlands, Riverbanks and Lakeshores Management Regulations (2000)); the Forestry and Tree Planting Act (2003); the Wildlife Act (1996); and the Plant Protection Act (1962). One of the specific issues addressed was how far existing phytosanitary instruments addressed invasive alien species beyond agricultural pests and diseases. |

2E Mainstreaming invasives: the importance of institutional coordination

Unless institutions work well, and work well together, no amount of sophisticated legislation will deliver the necessary benefits for invasive alien species prevention and management.

Inter-agency rivalry or non-communication can block progress, sometimes for years. A culture of shared responsibility, shared information and accountability for cross-sectoral invasives problems should be prioritised.

One of the most important ‘relationships’ to address is between environment and agriculture (taken to include plant and animal health protection). The latter sector usually has relatively high capacity for addressing invasive alien species risks but its mandate and available resources are often focused on production sectors and ‘environmental’ weeds have not traditionally been seen as its responsibility. In contrast, environmental agencies typically have low capacity and may struggle to address risks to the natural environment, at least outside protected areas.

Another priority issue is vertical coordination in federal states. The division of powers between the national government and the states/provinces/autonomous regions can make it harder to develop a consistent national approach to invasive species prevention and control (e.g. where different provinces develop different lists of species whose sale is regulated and/or which are subject to management measures). Similar challenges can arise in regional economic integration organisations.

It is strongly recommended that the review team and decision-makers prioritise discussions on respective roles and responsibilities in order to decide on the most appropriate form of coordination for the country concerned. This depends on what bodies are already in place, how effective they are, what capacity they have at their disposal and whether any new tasks would overstretch them.

Decisions on respective roles and coordination will affect the design of new or amended legislation. One cannot write regulations without first establishing who is going to administer them.

Decisions adopted under the CBD strongly support not only the development of national strategies but also structures to facilitate cross-sectoral coordination (at the international level, the CBD and the International Plant Protection Convention cooperate through a joint work programme). Several countries from different regions have taken steps to establish a ‘one-stop’ body at national level to facilitate coordination and information-sharing:

- since 2005, Chile and Uruguay have established national bodies to coordinate work on invasive alien species and other South American countries developing national strategies envisage doing the same in the near future;
- Great Britain has set up the Non-Native Species Forum (England, Wales and Scotland) whilst the Republic of Ireland and Northern Ireland (UK) have jointly created the Invasive Species Ireland
laying the foundations for effective national frameworks

Project with a common information gateway straddling the international border (http://www.invasivespeciesireland.com/).

Options that may be considered include:

- designating a lead ministry or agency, provided it has capacity and this does not overstretch the workforce or budget: the mandate of the relevant minister may need to be adjusted to confer specific responsibility for this area of policy;

- establishing a Technical Advisory Committee on Invasive Species with a secretariat in e.g. the national environment ministry or agency, that can provide streamlined advice on invasive alien species issues to concerned ministries. This is usually quick and cheaper to put in place and can incorporate expertise from universities and research institutions, but it will not usually have authority to implement its decisions. Some countries may already have a Biosafety Committee along these lines;

- creating a separate statutory body with cross-sectoral representation to ensure coordination and representation of relevant concerns and viewpoints;

- a progressive approach that starts with an informal coordination committee and works towards a statutory body in the longer term.

Consideration must also be given to funding. The host institution for a technical committee may be able to provide core funding while a more sustainable funding mechanism is developed.

2F Deciding what kind of policy framework is needed

When preparing for the development of a national policy, the potential policy choices faced by the country should be reflected upon. Issues to be considered include acceptable risk levels and distribution of responsibility for risks, both of which will inform decisions taken regarding the country’s approach to management of invasive alien species.

Acceptable risk levels

The acceptable balance between avoiding risks and reacting to damage where risks are not avoided needs to be determined, and will inform how components of the legal and institutional framework will function. The level of risk that is considered acceptable by a country depends upon a variety of factors, including the country’s financial and other abilities to take remedial measures where risks have not been avoided, weighed against the social, economic or other reasons for the introduction of alien species.

For developing countries, determination of acceptable risk levels with respect to IAS is particularly complex. The risks of introductions may be especially significant given the importance of biodiversity in such countries and the lack of resources to undertake remedial action, but must be balanced against social and economic needs including poverty alleviation and food security.

Distribution of responsibility for risks

Another policy element to be decided upon is how responsibility for the acceptable risks will be distributed. In particular, it is necessary to consider who will bear the responsibility to compensate for harm and remedy harmful conditions which result where a government decision has facilitated the causing of such harm, for example through permitting a species to be introduced. In general, this policy decision involves a balance between government responsibility and the responsibility of the introducer or other relevant parties (see further Module 5).

Purpose of the national policy

The national policy provides guidance to planners, decision-makers and law-makers. It should contain clear long-term goals and objectives of invasive alien species management, which are grounded in the country’s primary approach and other policy choices, and should address broadly how such goals and objectives are to be met.
The policy document may include a strategy and action plan indicating how the policy will be implemented, or these may be prepared separately. A realistic and simple action plan provides a helpful short term road map for a defined period of time (often five years). It can define intermediate goals and specify actions for detection, prevention, control, eradication, surveillance, restoration or rehabilitation to be carried out by each institution to meet these targets.

National policy documents, strategies and action plans should address:

- the vision, goals and objectives for the invasive species strategy;
- the status and trends of IAS in the country and identification of priorities for management and control;
- the main sectors, pathways, vectors and particular risks associated with alien species introduction and use;
- the identification of government departments or agencies at all levels that have a mandate relating to IAS, and their roles and responsibilities under the policy;
- procedures and systems for co-operation within and between relevant agencies, sectors and institutions;
- procedures and systems for stakeholder participation;
- criteria for risk analysis, management planning and mitigation;
- requirements related to monitoring;
- requirements and systems for training and capacity building;
- where appropriate, specific measures or policies for isolated and biodiversity-rich ecosystems (e.g. islands and archipelagos, protected areas);
- requirements for recovery of species or ecosystems affected by IAS;
- ways to promote sustainable use of native species rather than imported species;
- requirements for public awareness efforts;
- details regarding research requirements and funding.

The Global Invasive Species Programme (GISP) has published a Global Strategy on Invasive Alien Species and a Toolkit of Best Prevention and Management Practices which can help countries to decide which components and activities should be dealt with as priority issues (McNeely et al, 2001: see http://www.gisp.org).

Many countries and some regions have developed or are finalising invasive alien species strategies that are easily accessible via the internet and can provide ideas and examples for countries developing their own policies in this field. As a general rule, existing strategies in this area are all consistent with the three-stage hierarchy of prevention, detection/surveillance and control/eradication endorsed by the CBD Guiding Principles (see 2C). Despite geographical differences between countries and continents, this three-stage hierarchy is fully applicable to all regions, including Africa.

The following list provides some examples of easily-accessible strategy documents:

- in South America, national strategies are being developed in Chile, Peru, Uruguay, Brazil, and Colombia, and in initial stages of development in Paraguay and Venezuela. (Ziller 2008);

- in the Caribbean, the Bahamas have developed a comprehensive strategy (2003) and voluntary codes of conduct for different target audiences, including government agencies (www.best.bs/Documents/bahamas_nationalstrategy.doc, see 5E);

- the South Pacific is finalising its Regional Invasive Species Strategy (www.sprep.org);

- Canada has established a National Invasive Alien Species Strategy and created an Invasive Alien Species Partnership Programme to provide targeted funding (http://www.ec.gc.ca/eee-ias/);

- in Europe, three countries will launch national strategies during summer 2008 (Denmark, Sweden, United Kingdom) and the European Union has begun work on an invasive alien species strategy in collaboration with its 27 Member States (http://ec.europa.eu/environment/);

- at the pan-European level, the European Strategy on Invasive Alien Species was formally approved in 2003 (see Genovesi and Shine, 2004).
2G Deciding what type of legislation is most suitable

Once the policy informing the national legal and institutional framework has been determined, it needs to be implemented through legal and institutional reform, which may involve the drafting of new legislation, the repeal or amendment of existing legislation and the establishment or re-structuring of institutions. The end result should be legislation that is clear, workable and suited to national practice and capacity.

Capacity requirements for implementing legislation include:

- legal authority: one or more ministries or agencies with clearly defined powers and functions (e.g. to issue specific prohibitions, restrictions and permits);
- organised inspection services and facilities;
- effective and efficient quarantine measures and procedures including emergency response measures;
- powers for direct implementation of management plans and measures;
- training and development of staff (capacity building);
- monitoring and evaluation to assess the extent to which legislation is actually meeting policy objectives;
- protocols and procedures for enforcement.

Figure 7 (adapted from the GISP Economic Toolkit) summarises the range of interventions that should be supported by legal frameworks. As indicated in Module 1, the cost implications are very different depending on whether measures are implemented before a species is introduced (prevention, see Module 3) or after the species has become invasive (eradication, containment, management and restoration: see Module 4).

<table>
<thead>
<tr>
<th>Interventions targeting the steps to invasion</th>
<th>Type of intervention</th>
<th>Aim of the intervention</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>Prevention</td>
<td>stopping introductions</td>
<td>quarantine, blacklists, inoculation, trade or import bans, land use restrictions</td>
</tr>
<tr>
<td>Establishment</td>
<td>Eradication</td>
<td>destroying or removing a new invasion</td>
<td>physical removal, chemical eradication, biocontrol measures</td>
</tr>
<tr>
<td>Naturalisation/Spread</td>
<td>Containment</td>
<td>stopping a new invasion from further spreading</td>
<td>confinement of the species, phytosanitary controls, border checks</td>
</tr>
<tr>
<td>Invasion</td>
<td>Management</td>
<td>of established invasions of affected ecosystems</td>
<td>periodic clearance, revegetation/repopulation with native species, landscape restoration</td>
</tr>
<tr>
<td></td>
<td>Restoration</td>
<td></td>
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</tbody>
</table>

From Emerton and Howard 2008

The drafting team will need to consider a number of key issues including the nature and level of the legal instrument, the ambit of the legal instrument and authorised institutions and co-ordinating mechanisms.

Nature of legislation

The key decision to be taken is whether existing laws should be maintained, with appropriate gap filling and improved coordination, or whether new consolidated legislation should be enacted.

The answer will depend on the review findings. Where existing legislation on a particular subject has been found broadly adequate, it may be possible to improve its effectiveness by adjusting the implementing regulations. Where, on the other hand, comparison with international requirements reveals major gaps, more radical change may be needed. For example, older legislation on noxious weeds or on control of pests and diseases is often not broad enough to cover all implementation requirements under the International Plant Protection Convention (Sarpong, 2004).

Where there is no existing legislation on a particular subject, countries can learn from experiences from other states, especially those with similar situations or circumstances. Some indicators are given below: for more detailed information, counties can consult the Experiences, case studies and assessments section on the CBD website (http://www.cbd.int/invasive/assessments.shtml?reg=eu#eu).
The most ambitious approach is an integrated one, under which existing measures are consolidated into a unitary legislative framework that covers all categories of species, sectors, ecosystems and the full range of actions to be taken, with the goal of ensuring consistent national practice with respect to invasive alien species. The term ‘biosecurity’ is often used to refer to this type of comprehensive approach.

This option requires high political commitment to major legislative change and is best suited to countries that have high public awareness and support for biosecurity goals e.g. island states badly affected by past and ongoing invasions. It is easier to implement in countries that do not have the additional complexity of a federal system of government, which involves different tiers of authority.

Even where a special regulatory authority is created, other agencies will retain responsibilities, especially for planning and enforcement purposes e.g. Customs authorities will always play an important role in the application and enforcement of border controls.

**example:** New Zealand’s legal framework is based upon two main items of legislation: the Biosecurity Act 1993, which deals with unwanted organisms and accidental releases; and the Hazardous Substances and New Organisms Act 1996, which deals with licensing intentional imports of new organisms. Administration of these Acts is principally the responsibility of the Ministry of the Environment, the Ministry of Agriculture and Forestry and the specially created Environmental Risk Management Authority (ERMA). Alien species issues have cabinet representation through the Minister of Food, Fibre, Biosecurity and Border Control.

A simpler variation of this approach is to retain multiple sectoral laws and harmonise them to remove conflicting provisions and promote more consistent national practice. For this type of integration to work, however, existing sectoral agencies need to be functioning well, be willing to co-operate and collaborate with other agencies and which have sufficient individual capacity.

**example:** in French Polynesia, a decision was taken during the Strategic Action Planning process to harmonise species lists under the two key texts (Délibération n° 96-42 AT sur la protection des végétaux which covers prevention and control of plant pests; Code de l’Environnement which devotes a chapter to ‘species threatening biodiversity’ and distinguishes between species already present and potentially invasive species that are not yet present on national territory). The environmental lists will be taken into account in developing phytosanitary and zoosanitary regulations and will be referenced on the website of the Plant Protection Agency (Shine 2008).

A third option is to enact an umbrella legal instrument to promote a more unified and consistent approach across multiple instruments and agencies and to strengthen institutional coordination and planning. This does not get round sectoral complexity but can improve streamlining, information-sharing, priority setting and cooperative management planning.

**example:** the United States has a highly complex framework but since the enactment of the presidential Executive Order 13112 of 1999, there have been significant advances in terms of streamlining, increased funding and increased powers of enforcement. National Invasive Species Council has been established to oversee the activities of eight key federal agencies involved and is empowered to develop and publish the National Invasive Species Management Plan (currently under revision, see http://www.invasivespeciesinfo.gov/council/ for progress reports and budgetary information).

The fourth and very common approach consists of gradual incremental change to existing sectoral legislation without radical alteration (an approach used in many European countries). This minimises disruption to a country’s legal system and can be less burdensome and more acceptable from an institutional and administrative point of view. However, the resulting frameworks can be complex and give very low legal ‘visibility’ to the problem of invasive alien species. Without effective communication and awareness-building, this may complicate compliance and enforcement.

To conclude, Brazil provides an interesting example of steady progression from information-gathering to integrated legislative development. Two aspects are of particular interest: the attention paid to invasive species impacts on public health and the integration of water management into the policy framework.
Level of legislation

At the outset, a decision must be taken regarding whether primary legislation (e.g. a Parliamentary Act) or subordinate legislation (e.g. statutory instrument, regulations) is appropriate. Factors that will guide the selection of the appropriate level include:

- fundamental requirements of a country’s constitution;
- existence of enabling primary legislation;
- the technical level of the proposed legislation;
- whether the provisions will need to be regularly adjusted.

Primary laws are usually focused on the overall system – what the law is about, what mechanism it creates, what activities are prohibited and what are required. In some cases, this may be covered by the constitution e.g. it may stipulate that penalties must be contained in laws and not subordinate instruments.

The amendment process for primary legislation is comparatively cumbersome and time-consuming. It is therefore ineffective in coping with desired changes in legislation demanded by changing times or circumstances, including the emergence of new technology or scientific data.

For these reasons, technical norms, procedures and use of terms are usually addressed through secondary instruments, which provide the necessary level of detail to fully implement primary legislation.

At the non-legislative level, codes of practice can also be issued to guide relevant actors in the performance of their functions. Although these are not legally binding per se, it is possible to provide for official recognition of approved codes and to give them persuasive force in legal enforcement proceedings (see Box 15 and also Module 5D).

Box 16: the legal status of codes of conduct in the United Kingdom

The Wildlife and Countryside Act (amended through the Nature Conservation (Scotland) Act 2004 and Natural Environment and Rural Communities Act 2006 in England and Wales) makes it possible for Codes of Practice approved by the Secretary of State for the Environment to be used as evidence in court proceedings when applicable. Codes have so far been published by the Department for Environment, Food and Rural Affairs and by the Environment Agency for the horticulture trade and for managing Japanese knotweed on development sites respectively (www.parliament.uk/parliamentary_offices/post.cfm).

2H Getting down to detail: objectives, scope and definitions

As lawmakers attempt to move beyond piecemeal approaches to IAS control and management, they should consider the overall purpose and scope of the laws they wish to amend or adopt, consistent with their country’s IAS policy.
Objectives
Clear objectives provide a conceptual framework to develop subordinate legislation, guide implementation, set priorities and build awareness. The reasons for addressing invasive alien species need to be easily understood by all categories of stakeholders, including other branches of government.

Ideally, objectives should focus on desired outcomes (the benefits of action) rather than the invasive alien species per se. Measures supported by legislation could for example be designed to:

- prevent or minimise the impacts of invasive species to ecosystems, economies or public health and welfare;
- conserve and protect living resources and associated industries;
- conserve indigenous biodiversity;
- promote international and regional cooperation and harmonisation of management practices pertaining to invasive species.

Scope
Decisions need to be taken regarding the taxonomic and geographical scope of regulatory frameworks, based on assessed needs, capacity, commitments, ease of implementation and scope of existing instruments. Legislation should clearly indicate the coverage of its provisions to provide legal certainty for administrative agencies and all other parties involved in the introduction and use of alien species.

Because invasions can be generated by organisms throughout the taxonomic scale and alien species that become invasive can come from any taxonomic group, legislation on IAS should be broad enough to cover all groups of species, subspecies, or variety, as appropriate. Often, one variety is native in an area and well integrated into its ecosystems, but another variety of the same species may become invasive if introduced into that same ecosystem.

Legislation must be clearly stated to apply to micro-organisms: for example, pathogens carried on invasive animals are considered to be a major emerging threat to human health.

During the drafting process, a decision should be made on whether the legislation is linked to or completely separate from your country’s laws governing genetically modified organisms (GMOs). GMOs are alien under virtually any definition since they are newly created and are not native in any natural ecosystem. At international level, certain aspects of GMO licensing are addressed under the Cartagena Protocol on Biosafety but this does not specifically consider invasiveness.

From the geographic perspective, invasion processes may affect all types of ecosystems, although some are more vulnerable than others (e.g. geographically or evolutionarily isolated islands). All parts of national territory may be affected if an invasion takes place. Legal frameworks therefore need to provide a basis for regulating introductions of alien species to any type of ecosystem and for monitoring and managing their use wherever it takes place.

Definitions and use of terms
Definitions are used in law to provide greater certainty about the meaning of key terms. They make implementation of laws easier and facilitate effective enforcement by, preventing confusion around vague, ambiguous provisions.

Terms should only be defined when their meaning is unclear, highly technical or where the intended meaning differs from that in normal usage (for example where the usual meaning of the term is being expanded or limited in some way) or to avoid the repetition of long phrases. Where possible, internationally agreed terminology and standards should be used to promote consistency and certainty.

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3 The following discussion is based on preparatory work carried out by Tomme Rosanne Young on behalf of the Global Invasive Species Programme, whose contribution is gratefully acknowledged.
As a minimum, it will be necessary to consider definitions for *alien*, *native*, *invasive* and *introduction* or equivalent terms. This is a complicated subject (for more guidance, see 1B for terminology resources available through the internet and the key readings annexed to this Toolkit, including Shine et al, 2000).

Where a country has several existing laws, the drafting team will need to examine how equivalent terms are used and whether there is already established practice at national level. No one term is better than another. The important thing is to promote consistency in use of terms and ensure that stakeholders can understand what the legislation actually means in concrete terms.

*Introduction and the question of intention*

Because legislation is concerned with human actions that provide pathways for introduction, the definition should clearly reference human action (c.f. species that become established without human help. This can be done by:

- the description approach: ‘introduction’ of a species is any human action by which a species that came to be located and/or established within an ecosystem; or

- the itemisation approach: *In this law,... ‘introduction’ of a species is “any of the following actions, when they lead to the location and/or establishment of a species within an ecosystem: [followed by a list of actions such as planting, releasing, husbandry, aquaculture, etc. “undertaken for any purpose.”]*

A companion definition for ‘introduced species’ may be used: *In this law,... an ‘introduced species’ is any species that came to be located or established in an ecosystem by introduction [or “by human action.”]*

Examples of existing definitions include:

- the CBD Guiding Principles, which define an introduction/translocation as the ‘human-assisted movement of an organism to an area outside its natural range’;

- the US Executive Order 13112 (1999) which define an introduction as ‘the intentional or unintentional escape, release, dissemination, or placement of a species into an ecosystem as a result of human activity’.

It may be necessary for the government (or someone else) to prove that such a human action has taken place e.g. in order to assess liability for damage caused by an invasion. The drafting team will need to consider whether the term “introduction” includes all human actions that lead to introduction or only those that are “intentional” or “reckless.” In some countries, “introduction” includes only human actions that intentionally bring alien species into the country or ecosystem (whether or not the person knew that the species was invasive or knew that introduction was against the law). In other countries, “introduction” includes actions that indirectly cause a species to enter the ecosystem irrespective of intention. In some cases, these actions may be “reckless” and in others “negligent.” In some cases, there may be no “fault” at all.

*Terminology of Origin (alien/native)*

There are many terms focused on species’ origin, including (for native) *indigenous*, *endemic*, *domestic* and naturally occurring and (for alien) *exotic*, *non-native*, *non-indigenous*, and *foreign*. These terms are often used with different meanings (political, historical, biological). For example:

- controls at national border crossings usually use political definitions;

- agricultural and other sectoral permits and controls generally look at the historical issues and fix a baseline date, allowing the unrestricted use of “species that have been in use in the country (or ecosystem) for at least XXXX years.”

- controls focused on ecosystem harm are often based on the biological definition (a species from the same country may be “alien” if from a different ecosystem).

These differing approaches are sometimes unavoidable: a customs official cannot look at historical data on seeds crossing the border, but must act on the basis that they are coming from outside the country.
Module 2  laying the foundations for effective national frameworks

However, the need for a biological definition is increasingly accepted: how could a large country (Australia, China, India, Brazil, United States) tackle invasiveness if it automatically permitted all introductions of any species already present within the country’s political boundaries?

Given the problems posed by these three very different approaches, it may be advisable to use a term that is less likely to be misunderstood. For example, rather than defining a specific term “alien”, it might be better to use a descriptive phrase such as “a species that is not already present in the ecosystem in question,” rather than an “alien species.”

Terminology of invasiveness/threat

As noted (1B), several terms are used to convey invasiveness including “harmful,” pest” and “weed.” These have clearly understood meanings that are usually much narrower than the comprehensive interpretation of invasive alien species used for example under the Convention on Biological Diversity.

There are three primary ways of drafting a definition of “invasive” or “invasive species”:

• a descriptive definition focused on the consequences of invasiveness: “In this law,... an ‘invasive species’ is any species that, upon being present within an ecosystem, causes or might cause any of the following [here describe the kinds of harms caused by invasive species].” The list could include the five agreed ways in which an invasive species causes harm to ecosystems, habitats or species (direct destruction; competition/displacement of existing species within the ecosystem; interbreeding with existing species; destruction or alteration of other components of the ecosystem; and/or introduction of diseases and parasites).

• a decision-based definition that tries to identify invasive species in advance: In this law,... an ‘invasive species’ is any species that, has not been identified as “non-invasive” by [designated agency], pursuant to section XXX.

• a list-based definition to simplify implementation: this might refer to classifications such as “known invasive,” “potential invasive,” (i.e. whose characteristics in the ecosystem are not yet proven) and “non-invasive” which could include established alien species that provide important socio-economic benefits (see further Module 3).

Box 17: example of definitions in national legislation

According to South Africa’s National Environmental Management: Biodiversity Act (2004) an “alien species” is defined as:

a) a species that is not an indigenous species; or
b) an indigenous species translocated or intended to be translocated to a place outside its natural distribution range in nature, but not an indigenous species that has extended its natural distribution range by natural means of migration or dispersal without human intervention;

while an “invasive species” is any species whose establishment and spread outside of its natural distribution range:

a) threatens ecosystems, habitats or other species or has demonstrable potential to threaten ecosystems, habitats or other species; and
b) may result in economic or environmental harm or harm to human health.

2I  Cross-cutting principles that should underpin legislation

Precautionary principle

One of the most important environmental concepts relevant to the management of potentially invasive species is what a number of countries refer to as the ‘precautionary principle’ or ‘precautionary approach’ (see generally Cooney, 2004). The most commonly-used expression of this principle states that ‘where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation’ (Rio Declaration on Environment and Development, 1992).

The precautionary principle is frequently misunderstood. It does not of itself prohibit an activity or development but is applied during the decision-making process on proposed activities or developments to protect against harm to the environment. Measures selected as a result of this process (authorisation,
conditional authorisation, refusal of authorisation etc.) are required to be ‘precautionary’ in the sense that they seek to protect against environmental harm where the scientific evidence is not sufficiently clear.

The principle is central to invasive alien species policies because (a) an uncontrolled introduction can have irreversible or serious impacts (destroy ecosystems, cause species extinctions) and (b) scientific uncertainty associated with predicting species invasiveness and the potential impact is a fundamental challenge in this area (see 1C above and 3D below).

Legal systems and tools therefore need to integrate precaution at each step of the management hierarchy (prevention, early detection and rapid response, long-term control or containment). This applies to:

- decision-making on intentional introductions of new alien species;
- prioritisation of pathway management measures;
- length of monitoring and oversight following a first-time introduction;
- design of control measures.

Ecosystem approach

The ecosystem approach can be defined as a strategy for the integrated management of land, water and living resources that promotes conservation and equitable use in a sustainable way by considering all aspects of a functioning ecosystem and developing actions with well-defined objectives that consider the whole ecosystem and its users4.

CBD Guiding Principle 3 recommends that measures to deal with invasive alien species should, as appropriate, be based on this approach i.e. addressed at the ecosystem level.

As noted, invasive alien species are a serious threat to all types of ecosystems and the severity of their impacts may increase when combined with climate change and continuing habitat change (Millennium Ecosystem Assessment, 2005). For this reason, policies and management programmes need to go beyond a species-by-species approach to promote the broader goal of maintaining functioning ecosystems with reasonably intact biodiversity. This is a livelihood issue as well as an economic one. It brings us back to the critical importance of mainstreaming invasive alien species in the work of key sectors, including water resource and wetland management; agriculture, forestry, fisheries and other production sectors; land planning; transport and trade development (see 2E above).

Where legislation link regulatory requirements to ecosystems, it will clearly be necessary to define the ‘ecosystem’ with sufficient precision, based where possible on existing national practice.

Polluter/User-Pays Principle

Under this principle, the person/entity that takes advantage of the environment or natural resources for his own purposes should pay the costs and damages that result from his actions. In the context of natural resource use, this principle is often called the user pays principle on the basis that actions may impact on natural resources even if they are not ‘polluting’ in the common meaning of the word.

The polluter pays principle in its conventional form may need to be adapted to the invasives context because it is often not clear who the “polluter” is (see 5F for alternative approaches to cost-recovery and financial mechanisms).

When applied to invasive alien species, the principle suggests that persons/entities who conduct and benefit from activities that may result in unwanted introductions should bear the costs associated with regulatory oversight and management as well as the burden of proof for demonstrating compliance with regulations. They should also bear the cost of remedying environmental harm caused by their activities.

In concrete terms, this means that permit applications for intentional introductions should involve a fee structure that covers administration costs of management, including risk analysis. Legal frameworks also need to address the issue of liability, should the species in question become invasive. Financial penalties should apply to non-compliance with regulatory requirements in the case of both intentional and unintentional introductions.

4 See CBD guidance for application (http://www.cbd.int/programmes/cross-cutting/ecosystems/).
Module 2  
laying the foundations for effective national frameworks

Mechanisms based on this principle can make it possible to require operators and users of known pathways for introduction (shipping, cargo handling, international aviation etc.) to contribute in various ways to the cost of future management and control activities (see Module 5F).

2J References


Cornett, V. 2008. Marco Legal Aplicable a la Introducción de Especies Exóticas en México (Existing legal framework with incidence on IAS in Mexico). Legal review carried out on behalf of The Nature Conservancy, Mexico (http://www.nature.org/contact person: Ignacio March)


Module 3
preventing biological invasions

Legal and Institutional Frameworks for Invasive Alien Species
3A What this module covers

This module returns to the importance of prevention and examines the ways in which we can try to prevent biological invasions resulting from both intentional and unintentional introductions as well as illegal conduct. It explains where legal measures for prevention are applied and how legal frameworks and tools can address risk and uncertainty associated with invasive alien species.

By the end of the module, the reader will have an overview of how prevention tools are used to regulate or manage intentional and unintentional introductions and understand the need for in-country prevention as well as measures related to international pathways. The module also highlights the role of education and awareness programmes and explains the limitations of prevention.

3B Why is prevention so important?

What do we mean by prevention in invasives management?

Prevention is the application of measures aimed at reducing or eliminating species introductions, or at preventing their establishment. These measures can be applied to intentional or unintentional introductions, and may be contained in national regulatory frameworks or be developed by industry sectors on a voluntary basis. Examples include permitting procedures for imported species and shipboard treatment systems for preventing introductions via ballast water.

Prevention is therefore the first step in the management hierarchy. The aim is to halt the process of introduction of an alien species (that may become invasive) before it enters a new ecosystem, area, country or region. This can occur before it arrives at the place of entry, while it is in the process of moving along a pathway from its origin to the new ecosystem. If this fails, the second opportunity for prevention is to stop the introduction as it arrives and prevent it from entering the new area.

Policy justification for prevention

All pest reduction and management strategies recognise the maxim “prevention is better than cure”. In other words, the most efficient and cost-effective way of dealing with invasive alien species is to stop them being introduced in the first place. Once an introduced species has established in a new location, it can be very difficult, expensive and environmentally damaging to remove.

For decision-makers, the policy justification for prevention is based on the need to protect the country and region from the impacts described in Module 1. Such costs, as seen, are potentially very far-reaching. While direct economic impacts mainly consist of on-site production impacts on the host habitat or ecosystem, indirect impacts are non host-specific and may cause much wider effects on markets, prices, health, nutrition, trade, the environment and public and private spending.

Many countries have instituted prevention-based strategies to regulate intentional introductions (see 3E) and minimise unintentional introductions through the identification and elimination of known and potential high-risk species and pathways (see 3F).

The checklist in Table 4 provides guidance for communicating the importance of prevention and for designing policies to prevent unwanted introductions.

<table>
<thead>
<tr>
<th>Table 4: checklist of prevention elements</th>
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</thead>
<tbody>
<tr>
<td>1: Prevention is more cost-effective and environmentally less damaging than measures taken following the introduction, establishment and spread of an alien species.</td>
</tr>
<tr>
<td>2: The concept of ‘zero risk’ of unwanted introductions is unrealistic – this could only be achieved if trade, transport and travel were halted - but countries should make every effort to minimise the risk.</td>
</tr>
<tr>
<td>3: Every country in the world is a potential source and recipient of invasive alien species so it is in everybody’s interest to cooperate to control their movement and spread, particularly for known invasive species.</td>
</tr>
<tr>
<td>4: The public should be made aware of the threats posed by invasive alien species and their role in introducing them and should be encouraged to become a part of the solution.</td>
</tr>
<tr>
<td>5: Prevention strategies should be based on the precautionary principle and supported by suitable legislation, policy and resources</td>
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</tbody>
</table>
Module 3  preventing biological invasions

### Table 4: checklist of prevention elements

<table>
<thead>
<tr>
<th>Including people, infrastructure and funding.</th>
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</thead>
<tbody>
<tr>
<td><strong>6:</strong> The intentional introduction of any alien species should be subject to strict regulatory oversight through a permit system. The process for granting or denying approval should be based on risk analysis and if adequate risk assessments are not feasible, consideration should be given to prohibition of introductions.</td>
</tr>
<tr>
<td><strong>7:</strong> Unintentional and unauthorised introductions of alien species should be minimised through the identification of common high-risk pathways and the application of appropriate measures.</td>
</tr>
<tr>
<td><strong>8:</strong> The intentional and unintentional movement of invasive alien species should be controlled between and within countries.</td>
</tr>
<tr>
<td><strong>9:</strong> No potentially invasive species should be introduced into protected or vulnerable areas.</td>
</tr>
</tbody>
</table>

### 3C Where are prevention measures applied?

As noted above, prevention can be applied at different stages of an introduction pathway. Depending on the context, the approach usually consists of a combination of several tools, of which the following are the most important:

- Risk analysis
- Authorisation procedures
- Species lists
- Quarantine and Border control
- Treatment
- Vector/pathway management
- Education and awareness

These tools can be applied pre-border (before an organism, consignment or transport vessel leaves the country of origin, or en route to the destination), at the border (on arrival, before it enters a country), or post-border (once within a country). Post-border measures are primarily aimed at early detection and rapid response in order to prevent establishment of new potentially invasive alien species. These straddle the boundary between prevention and response and are discussed further in Module 4.

Effective implementation of all these measures depends on information exchange and cooperation between countries (see Module 6).

[Figure 8: summary of pre-border, border and post-border prevention tools]

#### Pre-border legal obligations

To the extent possible, countries of export should put in place procedures in their regulatory frameworks to minimise the risk of transferring alien species to countries or ecosystems in which they may become
invasive. Regulatory frameworks should stipulate that information regarding the potential invasiveness of species should be supplied to the receiving State, and that internationally agreed standards and procedures contained in international legal instruments with respect to export of potentially invasive species should be complied with.

Under existing international law, binding export-related measures mainly consist of phytosanitary and zoosanitary standards and procedures with which countries of export must comply in order to be able to trade their goods and commodities. The principle of prevention and risk containment at source is well integrated into standards adopted under the International Plant Protection Convention and the codes developed by the World Organisation for Animal Health.

In contrast, there are no concrete export-related provisions under biodiversity-related treaties and few if any countries address the risks of exporting organisms that damage the biodiversity of the receiving country. However, CBD Guiding Principle 4 provides that

‘in the context of invasive alien species, 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 minimize that risk, including the provision of any available information on invasive behaviour or invasive potential of a species. Examples of such activities include: the intentional transfer of an invasive alien species to another State (even if it is harmless in the State of origin)… and activities that may lead to unintentional introductions, even where the introduced species is harmless in the state of origin’.

This is discussed further in Module 6.

**Border and Post-Border legal considerations**

The regulatory frameworks of all countries should contain a basis for restricting imports and internal movements of alien species that might threaten native biodiversity as well as health and economic production sectors.

For introductions into a country, the point at which prevention is applied should ideally be an airport, land border crossing or marine5 port. Depending on the state of the country’s biosecurity framework, these entry points should be furnished with quarantine facilities and risk assessment procedures for evaluating arriving organisms (see below). In the real world, however, many unintentional introductions and those that occur at non-entry point localities are unlikely to be subject to such controls, especially in countries in regions with many shared and porous land boundaries. The same goes for introductions into countries with limited biosecurity systems and insufficient technical capacity.

It is important to note that alien species present on national territory may become invasive for the first time when moved to a new part of the country where not already present. Legal frameworks need to provide a basis for controls on domestic movement, possession and trade, as appropriate, in particular as regards movements between the mainland and islands, between islands and into the vicinity of vulnerable ecosystems, including but not limited to lakes, wetlands and protected areas.

**Responsibility and capacity for applying border control measures**

Three services play a key role in the application of border-related prevention measures (Hachileka 2006).

**Customs services** have responsibilities relating to border control of imports and, to a lesser extent, exports with a strong focus on revenue collection. Border control of imported goods covers the clearance of goods, which may involve ensuring that no prohibited goods are imported as well as collecting necessary revenues.

**Quarantine services** provide border control activities in respect of imported and exported goods and incoming passengers. They are critical to trade facilitation and food security as regards minimising the importation of unwanted pests and diseases. They may operate as stand-alone units or be integrated with other relevant functions of the Department of Agriculture (there are important linkages between

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5 In this situation, “marine” applies to freshwater as much as oceans and seas because the practices of inland water transport are similar (though not identical) to those of marine shipping
Module 3 preventing biological invasions

quarantine and plant and animal health areas and agricultural research and extension functions). Other functions may include submission of information to another country to enable that country to conduct an import risk analysis and/or undertaking import risk analysis on products that other countries are seeking to export to them.

Sanitary and phytosanitary services develop regulations to mitigate risks to human, animal and plant health arising from imports. Different protocols are established for imports that vary by source and product type: these set required process and product standards that exporters must meet in order to get permission for their goods to be imported. The principles and scope of such regulations are directly linked to internationally-developed standards (see 6E on compliance with international trade rules).

The ability of border control services to implement biosecurity measures is directly linked to capacity in terms of physical infrastructure, screening equipment and laboratories, quarantine facilities, telecommunication (internet) and manpower. However, their effectiveness also depends on close institutional coordination and communication. Several countries have now integrated their border control operations to provide a streamlined ‘one-stop’ service with relevant officials from different departments all located in the same premises.

3D Dealing with risk and uncertainty

In our daily lives we often do things that pose a certain amount of risk, such as driving a car. We do so on the basis that the benefits of such ‘risky activities’ outweigh the potential negative outcomes. We weigh up each risk by considering two variables - the probability of a negative outcome occurring, and the magnitude or severity of the outcome should it occur.

Similarly, the risks of negative impacts associated with introducing IAS need to be weighed and considered against the positive economic benefits associated with them, or the activities that introduce them. This assessment of trade-offs can be done from various perspectives. Detailed guidance on techniques for cost-benefit analysis is provided in the GISP Toolkit for the economic analysis of invasive alien species (Emerton and Howard, 2008) and will not be repeated here.

Risk analysis should be a means to an end: its goal is to provide a science-based tool to support better and more informed decision-making. Legally-backed procedures for risk analysis need to be practical and capable of application in the real world, including in countries with limited capacity.

How is risk analysis applied to invasive alien species?

Risk analysis has traditionally focused on certain types of impacts (e.g. competition with commercially valuable species), and certain taxa or types of potential invasive alien species. Increasingly, it is being recognised that risk analysis should apply to all taxa and pathways and to the full range of impacts that can potentially be caused.

In invasive alien species prevention, risk analysis is usually applied to:

- a particular species. The analysis seeks to determines the risk that once that species has been introduced, it could establish, spread and have negative impacts: this is largely based on the characteristics and history of the organism under consideration and is prepared by reviewing literature and consulting with stakeholders and technical experts; or

- a particular pathway, in which case the analysis focuses more on determining the risk of unintentionally introducing multiple alien species in the course of a certain activity.

Table 5 below contains the list of potential pathways developed by the United States’ Aquatic Nuisance Species Task Force and National Invasive Species Council Prevention Committee for a ‘first-cut’ or general analysis of invasion pathways. This is the first step in a ‘triage’ approach and is used to decide

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54 Legal and Institutional Frameworks for Invasive Alien Species
what pathways are relevant to an agency’s mission, what the traditional characteristics of the pathway(s) are; what invasive alien species are traditionally transmitted via these pathways; and the level of threat that invasive alien species transmitted via those pathways represent. Based on this ‘first-cut’ analysis, a roughly prioritised list of pathways is drawn up for the second-cut analysis, involving more detailed analysis of individual, single pathways.

| Table 5: risk analysis of pathways as a basis for prioritising management measures |
|-------------------------------------|-------------------|-----------------|
| **Transportation**                  | **Living industry** | **Miscellaneous** |
| **Modes of Transportation**         | **Plant Pathways** | **Biocontrol** |
| Air                                 | Importation of plants for research | Other Aquatic Pathways |
| Water/Aquatic                       | Potting soils, growing mediums, sods and other materials | Interconnected waterways |
| Ship ballast water                  | Plant trade (agricultural nursery, landscape, floral, raw logs) | Freshwater canals |
| Hull/surface fouling (i.e., recreational boats, other) | Plant parts (above ground, below ground, seeds and the seed trade, aquatic propagules) | Marine/estuarine canals |
| Stowaways in holds                  | Whole plants | Domestic waste streams |
| Superstructures/structures above water line | Food Pathways | Interbasin transfers |
| Transportation/relocation of dredge spoil material | Live seafood | Natural Spread of Established Populations |
| Land Terrestrial                    | Other live food animals | Ecosystem Disturbance |
| Cars, buses, trucks                 | Plants and plant parts as food | Long-term (highway and utility rights-of-way, clearing, logging) |
| Trailers for boats                  | Non-Food Animal Pathways | Short-term (habitat restoration, enhancement, prescribed burning) |
| Trains, subways, metros, Construction/ firefighting vehicles | Bail | Garbage |
| Hikers, horses, pets                | Pet/aquarium trade | Garbage transport |
| Military Travel & Transportation of Military Vehicles | Aquaculture | Garbage landfill |
| Baggage/gear                        | Non-pet animals | Miscellaneous |
| Equipment                           | Release of organisms for religious cultural or other reasons | |
| **Items used in Shipping**          | Non-living Animal and Plant Related Pathways | Biocontrol |
| Containers                          | Processed and partially processed meat and meat processing waste | Other Aquatic Pathways |
| Packing materials                   | Frozen seafood | Interconnected waterways |
| Wood packing materials              | Minimally processed animal products | Freshwater canals |
| Seaweed                             | Minimally processed plant products | Marine/estuarine canals |
| Other plant materials               | | Domestic waste streams |
| Sand/earth                          | | Interbasin transfers |
| **Mail/Internet Overnight Shipping** | | Natural Spread of Established Populations |
| **Travel Tourism/Relocation**       | | Ecosystem Disturbance |
| Travellers themselves               | | Long-term (highway and utility rights-of-way, clearing, logging) |
| Baggage/gear                        | | Short-term (habitat restoration, enhancement, prescribed burning) |
| Pets/plants and animals             | | Garbage |
| Travel consumables                  | | Garbage transport |
| Service industries                  | | Garbage landfill |

For further information, see http://www.invasivespeciesinfo.gov/docs/toolkit/pathwaysguide.pdf.

Risk analyses should be science-based, politically independent, transparent, and consistent with government policy and the country’s international obligations and rights. The results of a risk analysis are used to help decision-makers decide on the best course of action e.g. whether to allow the intentional import of an alien species not present on national territory and if so, what conditions should apply to minimise identified risks (treatment, health standards, etc.). An example of the practical application of risk analysis is given in Box 22 below.

**Box 18: risk analysis for the intentional introduction of blue shrimp to Fiji**

The hazard identification process undertaken as part of a risk analysis on the importation of blue shrimp *Litopenaeus stylirostris* from Brunei Darussalam to Fiji recognised six viruses and two bacterial pathogens as potentially serious hazards that could be associated with such an introduction. The pathogen risk analysis concluded, however, that the importation could be accomplished within the appropriate level of protection recommended for Fiji, provided specified mitigation measures to reduce the risks associated with these hazards were adopted. The ecological risk assessment suggested that, despite the lack of country-specific and species-specific information, the benefits of introduction would outweigh any potential negative effects.

Bondad-Reantaso, Melba G. et al. Pathogen and Ecological Risk Analysis for the Introduction of Blue Shrimp *Litopenaeus stylirostris* from Brunei Darussalam to Fiji. Consultancy report for the Secretariat of the Pacific Community
Components of risk analysis

Risk analysis has three distinct but interactive components (see Figure 9):

- Risk assessment
- Risk management
- Risk communication.

**Figure 9: components of risk analysis**

<table>
<thead>
<tr>
<th>Risk Assessment</th>
<th>Risk Management</th>
<th>Risk Communication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identifying and evaluating the risks from a particular species or the risks associated with a particular pathway</td>
<td>Identifying what needs to be done to eliminate or reduce the risks</td>
<td>Informing stakeholders about the risks and measures to be taken to manage those risks</td>
</tr>
</tbody>
</table>

Risk assessment

The risk assessment process needs to begin with the correct identification of candidate species or definition of a pathway for introduction. The likelihood of successful introduction is assessed through review of scientific and other literature, expert opinion, and qualitative and/or quantitative analysis.

Factors to be considered (see 1F) include known invasiveness elsewhere, likelihood of entry, likelihood of establishment, rate of spread, environmental conditions of the area intended for import and likely impacts on the receiving ecosystem if the species were to go on to become invasive. This is technically very complex: even after an invasive species is established, and when invasion occurs, the path it will follow and the impacts it will cause depend on a complex series of natural and management factors, and are rarely the same at two different times or in two different sites.

During the risk assessment component, the significance of a risk is evaluated. The result is usually some ranking of relative risk, ranging from a simple qualitative rating of "high," "medium" or "low" to a numeric score. Ecological and economic models can also be used to estimate the rate and extent of spread and the potential biological and economic consequences of establishment of a pest or group of pests.

A decision must then be made as to whether the risk is acceptable as it stands, whether it should be modified, or whether it is unacceptable for the country or ecosystem concerned. This process is undertaken during the risk management component (see below). However, as noted earlier, invasions are typically subject to high levels of uncertainty and involve complex interactions with other species, populations and natural communities, the natural environment and human systems. Some level of scientific uncertainty is unavoidable, and it is inevitable that certain assumptions will have to be made (and should be made explicit) during the course of the risk assessment. For these reasons, risk management strategies should be considered regardless of the apparent level of risk.

Risk management

The conclusions from the risk assessment are used to decide whether risk management is required. Risk management involves considering the various options available to manage an identified risk, evaluating
the effectiveness of such options and deciding on the most appropriate option for the species or pathway concerned. Management options including monitoring measures and emergency responses in case a species escapes or a new species is found during routine surveillance.

Risk communication
The findings of the above two components are communicated to stakeholders under this component. Communication with stakeholders, including the general public, needs to be an iterative and collaborative process involving a two-way dialogue throughout the risk analysis process.

At the outset, the reason for using risk analysis at all should be clearly communicated. Subsequently, information on the results of the risk assessment and identified management options should be made available to stakeholders. Open and transparent information exchange will not only lead to better understanding and decision-making on the part of the risk analysis team, but will also help ensure stakeholders’ engagement and support for any actions that may need to be taken.

In accordance with national legislation, communication procedures can be adjusted to withhold commercially sensitive information provided that this does not compromise the risk analysis process.

In summary, risk analysis evaluates the likelihood of an alien species entering and establishing in a particular area as well as the potential environmental and socio-economic impacts; assesses and recommends mitigation measures to manage such risks, and communicates the reasons for and findings of the risk analysis process to stakeholders.

3E Regulating intentional introductions
It is often stated that only a small percentage of invasives are introduced through intentional introductions. However, the impact and the volume of these introductions are very large and hence they must be closely overseen and controlled.

For most countries, laws controlling intentional introductions comprise a large portion of the overall regime on species introduction. This is understandable because the law has something it can ‘attach’ to (imports, holding of known invasive species in contained facilities, retail activities involving known invasive species, release of alien species into the wild and so on). Penalties can be applied to unauthorised introductions (e.g. smuggling of plants, animals, curios, seeds and foodstuffs) even though enforcement raises serious practical difficulties (see Module 5).

The authorisation regime for intentional introductions into a new country or ecosystem can be based on a combination of legal tools and approaches. Whatever measures are used, the basic objective should be to ensure that introductions are only authorised for species that present no or low risk of becoming invasive. When designing measures, a distinction may be made between:

• species that are directly introduced into the wild (e.g. crops, domestic animals, game species, biological control agents, plants intended to improve soil condition, provide fuelwood or pasture, prevent erosion or for use in biofuel production: see 1D above). Prior screening and risk assessment are particularly important in this situation together with follow-up monitoring to detect early signs of invasiveness; and

• species that are introduced into captivity or containment (e.g. pets or species kept in zoos, ornamental plants in botanical gardens and private homes, aquaculture facilities, fur farms, game breeding facilities, scientific research establishments). An extra tier of regulatory controls can be applied to such introductions in the form of licensing/permit requirements for the holding facility.

Measures to regulate and manage intentional introductions should be based on risk analysis and may include authorisation procedures (e.g. permitting systems), species lists, quarantine and border control procedures, systems for phytosanitary treatment of species and, for species to be kept in contained facilities, operating conditions to reduce risk of escapes. Figure 10 gives one example of how measures can be combined under national legislation to ensure ongoing oversight of a species authorised for introduction.
### Applying risk analysis and environmental impact assessment to intentional introductions

Measures to regulate intentional introductions should be based on risk analysis (see 3D) in line with applicable international instruments and standards (see 6E).

The CBD Guiding Principles and the regulatory frameworks of some countries support the preparation of an environmental impact assessment (EIA) before a decision is taken on whether to authorise an introduction. The EIA process was originally developed as a tool to help sectoral agencies obtain expert input on possible environmental impacts of their plans and projects to inform decision-making. In the context of invasive alien species, an EIA can incorporate the findings of the risk analysis, but also consider a broader range of potential environmental and socio-economic impacts of the introduction (i.e. beyond invasion risks). This could include, for example, possible impacts of invasive plants on a water catchment area in terms of biodiversity impacts, reduced ecosystem function and direct economic costs linked to lost production, reduced water yield and infrastructure maintenance.

Authorising authorities will use the risk analysis and EIA to help decide whether to allow an introduction and what conditions, if any, should be attached to permits.

When developing legislation, countries will need to decide whether requirements apply to first-time introductions only or include ‘repeat introductions’ of the same species. As noted, invasiveness is often not apparent in the initial years following an introduction although systematic monitoring should help to detect this as early as feasible. The law may either impose the same regulatory standard for subsequent introductions of the same species or limit this intensive scrutiny to first-time introductions.

### Standards and criteria for decision-making

Although the application of risk analysis and EIA will provide authorities with an objective, technical basis on which to make decisions, legal frameworks should contain standards and criteria to guide the exercise of decision-making powers and to promote consistency and transparency.

International instruments provide some guidance in this regard. For example, the IUCN Guidelines for the Prevention of Biodiversity Loss due to Biological Invasions (2000) provide that anticipated benefits of an introduction should strongly outweigh any actual and potential adverse effects and related cost.

The inherent difficulties in assigning economic values to losses of biodiversity and ecological damage, and in estimating the future costs of controlling IAS, mean that it is easy to underestimate the potential costs of a decision to introduce an alien species that becomes invasive. Useful guidance on when and how to use cost-benefit analysis or equivalent techniques is provided in the GISP Toolkit for Economic...
Analysis of Invasive Alien Species (Emerton and Howard, 2008) which provides concrete case studies of costed impacts that can be generated by biological invasions.

**Authorisation procedures**

Authorisation procedures (permitting/licensing systems) are familiar legal tools that can be adapted at national level to regulate the introduction, movement, transport, trade, containment and/or possession of particular species.

Their flexibility means they can be applied at the point of import and/or in-country. It is important that procedures cover the full range of activities that can lead to introductions. For example, it may be ineffective to prohibit release of a species into the wild without also addressing trade and possession of species known to present high escape risks.

The authorisation procedure provides an opportunity to screen applications for proposed imports and/or in-country introductions. This can be done by requiring a risk analysis and/or EIA, and where appropriate a cost-benefit analysis or equivalent, to be submitted as part of the application before any decision is made.

To keep things manageable and proportionate, countries should avoid a ‘one-size-fits-all’ approach where a single generic standard is applied identically. It is more practical to prioritise the kinds of introductions that are of greatest concern and adjust the level of regulatory scrutiny accordingly. In each category of intentional introduction, there are likely to be some kinds of actions that raise serious invasive species concerns (requiring prohibitions and other strict measures), and others that can be addressed by less burdensome provisions or even a list of recommended best practices. The following sub-sections describe how such categories can be designed.

**Prohibitions on introductions without authorisation**

Provisions of this kind have the effect of treating species proposed for introduction as potentially invasive unless risk analysis and possibly other types of assessment indicate otherwise.

Such prohibitions can be drafted to be ‘absolute’ (e.g. ‘no introductions of non-native plants are allowed…’) or ‘qualified’ (e.g. ‘no introductions of species x are allowed during certain months of the year’).

When drafting provisions containing such prohibitions, lawmakers should be conscious that cross-sectoral consultation is essential to ensure consistency e.g. to avoid species being prohibited in some laws and not others.

In-country prohibitions may be designed to protect areas when an invasive alien species is not yet present, vulnerable areas such as off-shore islands, legally protected areas or specific habitat types (e.g. wetlands). Defining terms such as ‘ecosystem’ or ‘habitat’ with sufficient precision in regulations is complicated and there is no blueprint readily available. The most practical approach is probably to identify terminology already in use in your country and use that if it is workable.

**Box 19: examples of regulatory controls on introductions**

- **Venezuela:** Recent national regulations specifically address introduction of non-native species (e.g. the Fisheries and Aquaculture Act of 14 March 2008. The Organic Law for the Environment of 22 December, 2006 defines the introduction of non-native species declared as harmful as an ‘environmentally damaging activity’ and requires them to be subjected to control and eradication programmes to protect native biodiversity. The draft Biological Diversity law will include a chapter on the introduction, breeding and cultivation of non-native species.

- **Poland:** The recently amended Fishery Act (2004) requires authorisation from the Ministry of Agriculture to carry out breeding, fish farming and fish hatchery in Polish marine areas. This may not be given if the planned investment would be dangerous for the marine environment. Threats listed under the Act include the possibility of fish escaping from the farm. The permit may be cancelled if the activity is carried out against the rules stated in the permit or the enterprise causes harm to the marine environment.

- **Polish forestry legislation regulates the use of alien species in forestry and bans using the highly invasive Prunus serotina (American black cherry) in undergrowth. Wider use of alien species is accepted in post-industrial areas or buffer zones where they constitute a forecrop preparing the soil for indigenous species.**

- **Netherlands:** The Flora and Fauna Act 1998 (Article 14) prohibits releasing any animal species into the wild and prohibits planting or sowing of listed alien plant species without prior authorisation. Two species are currently restricted in terms of possession, trade and import and/or export: Hydrocotyle ranunculoides (Floating Pennywort) and Muntiacus reevesi (Reeve’s Muntjac).
Adapting specific and general permits to particular cases

Taking account of the findings of risk analysis, the competent authority may refuse an application for import/introduction, issue it outright or issue it subject to conditions.

Where granted, permits may be limited to a one-off introduction or take the form of a general permit for introductions that happen consistently or in a particular ecosystem and are always subject to similar controls. ‘Blanket’ or general permits should have a limited validity and be reviewed in detail if an application is made for renewal.

As in other areas of public policy, the information requirements, conditions, appeal and enforcement procedures applicable to alien species permits should be clearly set out in relevant regulations and easily accessible to concerned stakeholders. Regulations should identify the authority or agency responsible for inspecting containment facilities or introduction sites (not necessarily the permit-issuing authority: for example, local authorities may be involved in monitoring/inspection on the ground).

Specific information that will be needed includes a description of involved parties (e.g. introducer, supplier), the characteristics of the specimens being introduced, including the history of its use and any associated risks, the target area/ecosystem into which the specimens will be introduced and a description of permitted activities.

**Table 6: checklist of basic components for a permit system**

- A clear statement of what species are subject to the permit requirement
- A clear statement of information to be supplied by the applicant
- Public access to information on applications, criteria, hearings and decisions
- Risk analysis and environmental impact assessment, based on scientific principles and evidence
- Requirements for provision of objective and technically sound information to guide decision-makers in determining permit applications
- Provision for permit conditions (reporting and record-keeping, monitoring, emergency plans, containment procedures)
- Provision for allocating the cost of permit procedures to the applicant
- Sanctions for non-compliance.


Permit conditions adapted to the particular characteristics of the species concerned may include details on the pre- and post-border treatment required, inspection of facilities and operations, measures to prevent the potential escape of species from facilities, and the development of plans to take rapid action if a species has escaped.

**Species listing**

Species lists can streamline decision-making on intentional introductions by differentiating between alien species on the basis of risk. They can be referenced by border control services, permit authorities and stakeholders. Lists can also be used as a basis for prioritising species-based border checks and post-border surveillance.

Existing listing systems generally include one or more types of list, often referred to as ‘black’, ‘white’ and ‘grey’. Whatever type of listing system is used, it is most important for all species lists to be regularly reviewed and updated to remain effective and accurate. For this reason, lists should be issued by regulations or statutory instrument to simplify the amendment process.

**Black lists**

Black lists contain species banned from import/introduction/domestic trade and transport because of the damage they may cause to human, animal or plant health, including the natural environment. They are the most common listing mechanism used at national level\(^7\), but their content varies widely.

Regionally coordinated black lists are almost exclusively limited to plant pests/animal diseases. However, an initiative that also encompasses the natural environment has recently been developed by the

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\(^7\) Including some European Union Member States, South Africa, United States, Australia and New Zealand.
European and Mediterranean Plant Protection Organisation. The EPPO Priority List of Invasive Alien Plants, updated annually, recommends that member countries endangered by listed species take measures to prevent their further introduction/spread or manage unwanted populations (publicity, restriction on sale and planting, control) (see www.eppo.org).

Developers of black lists should consider the scope of listing (e.g., designation of an entire genus vs. identification of particular species within a genus) as well as species identification (e.g., if species look alike but have different potentials for invasiveness).

Drawbacks include the fact that black lists are usually reactive (a species is most often listed after it has become invasive within the country or region) and tend not to be regularly updated, particularly where there is resistance from trade interests.

Blacklisting a species obviously has economic consequences for affected production or retail sectors (e.g., in the horticulture and pet trade) and should be accompanied by consultation, including on non-regulatory alternatives if feasible and/or selection of native alternatives to meet demand.

To minimise the risk of a national measure being challenged under international trade law (see 6E), inclusion of a species on a black list should:

- be based on risk assessment to determine the potential invasiveness and impacts of the species;
- be periodically reviewed to re-assess whether trade restrictions are still justifiable.

**White lists**

White lists cover organisms that are considered low risk and approved for introduction. Listing is based on prior risk assessment, which has determined the species to be safe, or on long experience e.g. of already established species that can no longer be controlled.

Introduction or further importation of white-listed species may be authorised without restriction, or under conditions restricting their use to specific purposes (e.g. research or public education). This means there should be a high degree of certainty that a species will not cause harm before it is placed on a White List.

White lists are most commonly associated with agricultural and animal crops. They can be used independently or in conjunction with black lists to increase transparency and legal certainty for potential importers and to streamline import control procedures.

**Grey lists**

Where black or white listing is not appropriate because risk cannot be adequately determined, grey or ‘holding’ lists can provide for a temporary ban on proposed imports pending further assessment to determine whether a species is safe or potentially invasive. They function as provisional black lists to the extent that they prevent import until the competent agency can make a scientifically-based determination.

Grey lists are clearly precautionary. They may be consistent with the international trade rules (SPS Agreement provisions on provisional measures, see 6E) provided that the necessary further information is sought and a decision eventually taken. The import regulatory authority can request the exporter to provide scientific evidence and analysis to facilitate this assessment and/or charge an administrative fee to cover costs of evaluation. This is likely to be in the exporter’s commercial interest to speed up determination of its import application. If there is still insufficient evidence to make an adequate assessment of risk, the species can be left on the grey list pending the collection of additional information and a subsequent re-assessment.

**Combined use of species lists**

The most precautionary approach – which if properly operated, may also fit best with international trade rules - is to combine these three types of list within an integrated framework.

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8 E.g. the U.S. Government’s list of ‘noxious weeds’ banned from import contained about 93 taxa in 1993: ten years later, there were only about 96 (two removed and five added), despite a number of new IAS introductions and a backlog of data on other potentially harmful noxious weeds that were candidates for listing (Burgiel et al, 2006).
Module 3  preventing biological invasions

Consultation of white and black lists enables a government or exporter to determine whether a species is already allowed for or banned from import into a particular country. Species proposed for import that are not already listed can be placed on a grey list pending risk assessment and then moved to the white list (if safe) or the black list (if potentially harmful). Flexibility is important, particularly with regard to processing new submissions and proposals for movement from one list to another. Lists that are not well or frequently maintained are more likely to run afoul of trade rules than those which have prompt, transparent timelines and procedures (Burgiel et al 2006).

A word of caution

In federal countries where subnational states or provinces have the power to adopt their own species lists (e.g. to regulate domestic trade, movement or release), the risk of inconsistency between adjacent territories is obviously higher. Provinces that want to make quicker progress are free to do so: on the other hand, investment in prevention and management can be undermined if a neighbouring province or state ignores the problem.

There is also a risk of conflict with overarching national legislation. In Australia, for example, the invasive plant *Lantana camara* is legally classified as a Weed of National Significance but it took a further six years before its sale was banned in the state of Western Australia.

Quarantine and border control

For intentional introductions that have been authorised, the primary role of border controls is to ensure that permit requirements have been, or will be, met. This includes verifying that the species presented at the border correspond to the species for which the permit was issued and/or checking the species against black/white lists where relevant; inspecting and verifying any pre-border certification which may have been required; and ensuring that quarantine requirements at the border are met.

This has significant capacity implications, including the need for more taxonomic expertise. In addition, paperwork associated with plant and animal imports can be incomplete or incorrect e.g. with regard to country of origin.

3F Managing pathways to minimise unintentional introductions

The actual prevention of unintentional introductions depends upon prevention procedures in and on pathways as well as proactive measures to increase public awareness and encourage voluntary prevention efforts. In virtually all countries, legal measures to address pathways are less developed than for intentional introductions.

Managing pathways and vectors

A species-specific approach is quite impossible for major trade and transport pathways through which enormous volumes of goods, people and vehicles pass. An integrated approach to pathway and vector management is best suited to preventing unintentional introductions and to address movement along such routes.

Some examples of legal options for pathway management are listed below (see also Emerton and Howard, 2008). What stands out is the number of approaches that depend on bilateral or wider cooperation to be effective:

**Land-based pathways**: roads, tracks, paths, railways, stock routes, migration routes.

**Vectors**: vehicles, rolling stock, freight, travellers, strollers, domestic animals, wild animals, winds.

**Solutions**: existing and new trade agreements, regional biosecurity agreements, industry best practices, responsible export practices.

**Freshwater pathways**: lakes, reservoirs, dams, canals, rivers, deltas, large wetlands.

**Vectors**: ships, boats, other vessels, travellers, freight, currents, winds.

**Solutions**: International Ballast Water Convention, draft biofouling agreement (International Maritime Organisation), trade agreements, industry best practices, regional biosecurity...
agreements, Ramsar Convention on Wetlands, bilateral and regional lake and river basin commissions.

**Marine pathways**: shipping, oceans, seas, estuaries, inter-ocean canals, storms.
- **Vectors**: all marine vessels (freight, passengers, fishing, exploration, sport, etc.), marine organisms, marine migration, winds, currents.
- **Solutions**: Ballast Water Convention, draft biofouling agreement (International Maritime Organisation), international and regional trade agreements, regional biosecurity agreements, regional seas conventions under the UNEP Regional Seas Programme, industry best practices.

**Aerial pathways**: all air transport (local, national, international), bird and other flying animal migration, release of organisms into the atmosphere, aerosols, winds, storms.
- **Vectors**: aircraft, freight, passengers, luggage, flying animals.
- **Suggest**: Civil aviation agreements (under the International Civil Aviation Organisation), airline and travel industry best practice, trade and biosecurity agreements.

National legal frameworks need to provide for the identification of common pathways through risk analysis, with reference to international guidance. Wherever possible, pathway control measures should be integrated into existing sectoral frameworks as part of a general policy of mainstreaming invasives issues. This will require cooperation and collaboration between the relevant agencies. Consideration must be given to capacity and funding needs, and authority of the agencies, to make integration possible.

Although major pathways may be relatively easy to analyse for the purpose of developing control measures, regulatory controls should not be limited to already-identified pathways. Legal frameworks need to be sufficiently flexible to respond to new and emerging pathways. Within a single pathway, it may be necessary to develop many individual control systems to deal with sub-pathways. For example, the risks associated with packaging material in transportation vary depending upon the kind of packaging materials used and the country from which the packaged material originates (see Box 18).

### Box 20: example of regulatory controls on a packaging pathway

Because wood packaging material is often reused, recycled or remanufactured, its true origin - and hence the risks associated with each importation - is difficult to determine. International standards to address these risks were developed after it was realised that, worldwide, the movement of wood packaging material made of unprocessed raw wood provided a pathway for the introduction and spread of a variety of pests (e.g. in the United States, this facilitated the introduction of the pine shoot beetle and the Asian longhorned beetle). The IPPC Guidelines for regulating wood packaging material in international trade (ISPM No.15, adopted 2002) call for all wood packaging material thicker than 6mm to be either heat treated or fumigated with methyl bromide and marked with an approved international mark certifying treatment. Exempted products are made from alternative material, like paper, plastic or manufactured wood products (e.g. plywood). New treatments are being evaluated for inclusion in ISPM 15.

The creation of accepted regulations and standards for the control of a particular pathway can be time-consuming and expensive. Implementation may also be a lengthy process. Consequently, for purposes of regulation, countries need to prioritise pathways of greatest concern. For large-scale pathways, information-sharing and international cooperation can make it easier for countries to identify risks and collaborate on possible solutions.

**Pre-border prevention for unintentional introductions**

As noted earlier, intentionally introduced species can be vectors for unwanted pathogens and disease organisms.

Ideally, pre-border checks should be carried out before goods are transported to reduce the likelihood of the product being infested or contaminated, and/or to reduce the survival of organisms associated with the product. Measures may include:

- Pest control in production fields
- Quality control measures in packhouses
- Inspection during production, packing and prior to shipment
- Pest-proof packaging
- Treatment of goods and packaging
- Timing of shipment in accordance with seasonal cycles of insect pests
- Pre-shipment quarantine for live plants/animals
Module 3 preventing biological invasions

- Veterinary inspections and issuing of clearance certificates.

**Box 21: example of pre-entry treatment for a transport pathway**

The *International Convention for the Control and Management of Ships’ Ballast Water and Sediments* (International Maritime Organisation, 2004) provides for binding and consistent international arrangements to ensure that ships’ ballast water is handled and managed in a manner that will minimize the transfer of harmful aquatic organisms and pathogens to new territories.

The Convention advocates the use of open-ocean exchange of ballast water as an interim measure for controlling species transfers, but acknowledges the limitations of ballast water exchange and the need for ongoing research and development in the field of ballast water treatment technologies. It sets standards for achieving adequate treatment of ballast water in the years to come. The effective shipboard or quayside treatment of ballast water, to eliminate any organisms contained in it, will increasingly be the main goal of most ballast water management regimes.

In specific areas where conditions are appropriate, research is also investigating the possibility of developing shore-based reception facilities for handling ballast water. Similar systems are already operational for separating oil from ballast water when discharged from large tankers. The challenge of effective elimination of all species, while maintaining adequate flow rates for normal vessel operation, make such treatment options very difficult to engineer.

**Quarantine and border control**

Countries need robust procedures in place to detect infested or contaminated items and unwanted organisms at the border and prevent their establishment and spread within the country or ecosystem. Such systems are fairly widespread when there is a risk of disease epidemic (e.g. movement restrictions, mandatory disinfection of footwear, spraying within aeroplanes etc.) but capacity and resources tend to be much more limited for detecting organisms that are mainly of concern to the natural environment and native biodiversity.

Port of entry inspection works in two ways:

- Direct examination of vectors for the presence of alien species: examination methods include physical searches, immunisation certificates, X-ray machines, sniffer dogs, cameras and probes.

- Monitoring of imports and accompanying certificates to ensure that treatment requirements for reducing the risk of introduction have been met (e.g. phytosanitary treatment of imported fruit and vegetables to detect and destroy regulated pests: such treatments are mainly regulated under international or regional phytosanitary standards).

Facilities should be available at each point of entry for quarantining goods that are themselves alien species or that might contain alien species.

**Box 22: example of risk analysis to assess disease risk in an imported commodity**

Biosecurity New Zealand conducted a risk analysis for the import of hatching eggs of birds in the order Passeriformes from the European Union (song birds or perching birds, including house sparrows, starlings, thrushes, magpies, crows, swallows and finches). Zoological gardens and aviary owners wished to import passerine eggs to hatch birds for inclusion in their collections.

From a preliminary hazard list of organisms, those that were considered to be potential hazards in the commodity were subjected to individual risk assessments. It was concluded that the risk in the commodity (eggs) was non-negligible for avian influenza viruses and avian paramyxo-viruses types 1, 2 and 3.

Sanitary measures were recommended to manage their risks to an acceptable level:

- layer flocks of origin will be tested for the presence of these organisms prior to collection of the hatching eggs, and eggs will be collected only from test-negative flocks
- the imported eggs will be hatched in a post-arrival quarantine facility in New Zealand
- hatchlings from the imported eggs will be tested for the presence of these organisms
- a biosecurity clearance will be issued for the birds hatched from the imported eggs only if all laboratory tests for these organisms are negative.


In countries operating strong biosecurity frameworks (usually islands with only a few major entry points, such as Australia and New Zealand), arriving passengers are warned to dispose of or declare any banned goods as they pass through customs. There are serious consequences for those caught violating quarantine laws.

Such countries also have strong systems to detect unauthorised (illegal) introductions. For example, New Zealand has an elaborate but efficient system for checking all mail that enters the country and screening out any illegal imports of seeds, eggs, and pupae.
Infrastructure of this kind is not feasible for most countries, especially those with porous land borders and limitless points of entry. However, detection techniques are evolving (see Boxes 20-21 below).

**Box 23: DNA Barcoding – a breakthrough for species detection?**

During inspection procedures, Border Control officials frequently discover organisms hitchhiking as eggs or larvae on imported goods. These may be impossible to identify on the basis of their appearance, so various molecular techniques may be employed for species identification. A recent development, known as DNA barcoding, is now being widely promoted as a global standard for rapid species identification. The technique is based on a short gene region that can serve as an identification marker for nearly all animal groups. A public archive of barcode records for known voucher species, identified through traditional taxonomy, is being developed so that unidentified specimens can be matched against them. While it is already possible for border inspectors to send intercepted material to a lab overnight by overnight mail, and have an identification back the next day, the technique’s proponents hope to develop a portable DNA sequencing device with Internet connectivity, which would allow instant identification.

**Box 24: vigilance pays off**

Alert Customs and Border Protection officials at Los Angeles International Airport prevented the introduction of three dangerous pests never previously seen on the United States mainland, on the same day.

On July 19 2007, a CBP agriculture specialist examined a shipment of 242 pounds of plantain leaves and fernaldina from Guatemala. Plantain is a type of banana generally used in cooking, while fernaldina - commonly named loroco - is a species of flower used in Central American cooking. During inspection the agriculture specialist discovered an insect pest on the loroco leaves.

The importer, a Californian food distributor, was given the choice of destroying the shipment or exporting it back to Guatemala. Opting for destruction, the shipment was destroyed under CBP supervision on July 25. On August 1, an entomologist confirmed to CBP that the insect was a mealy bug, discovered for the first time in the Continental US. The mealy bug attacks plants, especially citrus trees.

Also on July 19, LAX CBP agriculture specialists intercepted two more pests: the *Pseudococcus eucalypticus*, an insect that attacks a wide variety of plants, such as myrtles, and a gall midge belonging to the genus *Contarinia*, which can cause widespread damage on young crop plants. Both pests were found in shipments of fresh cut flowers arriving from Australia.


**3G Education and public awareness**

Increasing the general public’s awareness and understanding of the IAS issue can go a long way towards preventing unintentional and illegal introductions. Rules and regulations prohibiting the importation of curios, foodstuffs, seeds and pets are often dismissed as bureaucratic red tape by the uninformed public. Educating people will encourage them to co-operate with efforts to prevent the further introduction of invasive species.

Effective tools for awareness-raising include simple descriptions of the relevant issues and the use of film and advertising in the media. For example, the Weedbusters programme was launched in Australia with the support of the federal government and all Australian states and territories. Similar initiatives have now been launched in South Africa and New Zealand (http://www.weedbusters.info/about.htm).

Such initiatives may come directly from concerned industries: for example, the Ornamental Aquatic Trade Association uses messages on its carrier bags to warn of the dangers of releasing fish or plants into the wild.

Legal frameworks may contain provisions authorising or encouraging agencies to engage in awareness-raising programmes.

**Figure 11: Australian quarantine practices**
In conclusion, no prevention system can guarantee complete exclusion of potentially invasive species. In any event, most countries already have a large number of alien species present within their borders. Legal frameworks must therefore include post-border controls to detect and eradicate new entrants early on, or for those that cannot be eradicated, to contain/slow the rate of spread, and to protect sensitive areas. These concepts are covered in the next module.

3H References


Module 4
responding to biological invasions

Legal and Institutional Frameworks for Invasive Alien Species
4A What this module covers

This module describes the policy context for response measures to biological invasions and discusses the technical and legal aspects of early detection and rapid response as well as eradication, control and mitigation. It considers ways in which to address conflicts of interest surrounding established invasive alien species and looks at opportunities to provide incentives for their control and subsequent ecosystem restoration.

By the end of the module, the reader will have a clearer understanding of the legal requirements for effective response systems and be able to identify and address some common obstacles in legal systems to eradication and control.

4B Policy context for response measures

As discussed, the internationally and nationally accepted sequence of management options for dealing with invasive alien species is as follows:

- Prevention
- Early detection and rapid response
- Eradication
- Control and mitigation.

The policy justification for prevention (see 3B) is also applicable to response measures. Where prevention efforts have failed, the next best option in terms of technical feasibility and cost-effectiveness is early detection, allowing for a rapid response, such as eradication while its numbers are still small or confined to a limited area. This is also the best way to reduce foreseeable impacts on human livelihoods, ecosystem services and economic productivity.

In contrast, if the introduced species is only detected at a later stage after it has established and spread, eradication may no longer be feasible. In such cases, control and mitigation remain the only viable management options even assuming that technical solutions are available.

The costs associated with long-term control efforts can be enormous. They entail a high ongoing cost which, in the production sector, gets passed on to the consumer: for example, in 2004 agricultural weeds alone cost Australia over Aus $2.8 billion and 17% of the cost of fruit and vegetables in Australia were linked to weed management practices (source: National Weeds Facilitator). Outside commercially important sectors, such costs may be prohibitive which means in practice that the species concerned will have to be left to spread unchecked.

The CBD Guiding Principles recommend that measures contained in legal frameworks for eradication and control should be cost-effective, safe for the environment and human, animal and plant health or life, and socially, culturally and ethnically acceptable. Many of the principles and tools already discussed in this toolkit - the precautionary principle, use of risk analysis and EIA, stakeholder consultation, cross-sectoral cooperation – are just as applicable to the design of eradication and control measures as they are to prevention (see also IUCN Guidelines 2000).

In addition, some specific issues need to be addressed through policy and legal frameworks when looking at response measures. These include dealing with conflicts of interest and implications of control measures for private property rights.

The importance of high quality information for all aspects of invasive alien species management was highlighted in 1G. Up-to-date scientific and technical knowledge is crucial to prioritise response measures and help authorities to allocate resources for control.

4C Early detection and rapid response

When an alien species first arrives in a country, for a while its chances of establishment and spread hang in the balance. The likelihood of successful eradication is greatest during this period, but the window of opportunity closes in time. It is therefore of utmost importance to detect the arrival of known or potential invasive alien species as soon as possible, and to act rapidly to try to eradicate them.
Module 4 responding to biological invasions

Post-border control measures – which can also be seen as an extension of prevention efforts - are specifically aimed at preventing the spread of potentially invasive species that have slipped past the pre-border and border controls and are in the country. Early detection is also crucial in detecting the development of unforeseen invasive characteristics where a species was mistakenly judged to be “harmless” and cleared for introduction.

There are three main components to the process of Early Detection and Rapid Response:

![Early Detection & Rapid Assessment & Rapid Response](image)

**Early detection**

Early detection should not depend on chance encounters with new species. Legal and management systems should support a structured approach that incorporates:

- Surveillance (surveys & monitoring)
- Identification (taxonomy)
- Reporting.

**Monitoring and surveillance** increases the chance of detecting potential invasive alien species before the founder population attains a size or distribution that prevents practical eradication, containment or other control options. Surveillance programmes for early detection need to be carefully designed and targeted to answer specific questions as economically as possibly. Some invasive alien species are easily seen, while others require special efforts to locate or identify them, particularly when they are in low numbers. Surveillance programmes should therefore include both active surveillance through surveys and monitoring, as well as passive surveillance through increased public awareness.

Site-specific surveys for early detection are generally focused on high-risk areas such as those close to entry points (e.g. airports, harbours, military bases); on high-risk pathways (e.g. adjacent to aquaculture or horticulture facilities); and/or in high-value areas (e.g. protected areas or commercial forests). Species-specific surveys are conducted to determine if, and to what extent, a particular species is present in an area. Monitoring involves regular surveys or ongoing sampling using replicable techniques in the same place.

Many countries currently lack systematic surveys of this kind. Returning to the importance of mainstreaming, one efficient option can be to incorporate invasive alien species criteria into existing survey programmes set up for other purposes.

Another relatively low-cost option is to develop public awareness initiatives and encourage the public and interested stakeholders to provide information to the relevant government department (where possible, over forms accessible from an internet site). This type of approach usually works best with established interest groups such as bird watchers, anglers and plant lovers and can be developed in collaboration with appropriate NGOs. Another way to stimulate public interest is to use catchy visual materials for priority species.

**Box 25: the 100th Meridian Initiative**

The 100th Meridian Initiative is a cooperative effort between subnational and federal agencies to prevent the westward spread of zebra mussels and other aquatic nuisance species in North America.

http://100thmeridian.org/
Accurate **identification** is vital in order to be able to detect new species collected during surveillance programmes. The need to invest in taxonomic capacity has already been highlighted in this Toolkit. Countries can use regional taxonomy information resources (see 1G and Module 6) to facilitate the work of personnel in the field.

Early detection also requires an effective **reporting** system when potential invasive alien species are detected. Regulatory frameworks should equip competent agencies with responsibility and duties for receiving, coordinating and responding to reports, as well as for data archival and management and communication of findings (for an example, see Box 26).

Regional collaboration and cooperation are of particular importance with respect to early detection and reporting. The IUCN Guidelines 2000 recommend that neighbouring countries consider the desirability of cooperative action to prevent potential IAS from migrating across borders. Cooperation may take the form of agreements to share information and warnings, and to consult and develop rapid responses.

**Box 26: developing a centralised information point for recording invasives**

At the national level, the Non-Native Species Programme Board (Great Britain) is reviewing options for a centralised information point on the internet for recording the presence of specified alien species in Britain. This portal would provide the country with an “alert” system and allow prioritisation of those species on which to complete risk assessments or develop actions.

At the regional level, the European Environment Agency is working on the development of a European-wide early warning network system to enable member states to take action against newly arrived invasive non-native species.

**Rapid assessment**

Once a potentially invasive species has been detected, a decision needs to be made as to whether a response should be initiated, based on the level of risk it poses. In order to determine this, a rapid risk assessment should be carried out.

Unless a contingency plan is already in place for the species, the rapid assessment will determine not only whether response action is necessary, but also what type of action should be considered. If the risk assessment indicates that the consequences of the incursion will be significant, then eradication is invariably the preferred option. However, the decision will depend on the resources available, the practicality of the proposed action and the outcome of a cost-benefit assessment. In general, eradication should only be attempted if there is a good chance of success.

Pest reporting and alert services maintained by regional phytosanitary organisations provide an up-to-date and accessible source of technical information for national officials. One example is the Pest Alert List operated by the European and Mediterranean Plant Protection Organisation which includes reports on pests that are new to science, new outbreaks and spread ([http://www.eppo.org/QUARANTINE/Alert_List](http://www.eppo.org/QUARANTINE/Alert_List)).

**Rapid response: the importance of contingency planning**

The rapid assessment should lead to a decision on the most appropriate action to take. The level of response may range from simply collecting further information to commencing a full-scale containment, eradication or control programme. Eradication is almost always the preferred option, providing it is considered feasible and cost-effective.

It is therefore essential for legal frameworks to provide a formal basis for early detection and rapid response systems, dealing with the three primary components discussed in above. A key aspect of rapid response planning is to have clearly defined institutional roles and responsibilities: there should be no confusion about which agency leads.

Confusion over institutional lines of responsibility is most likely to arise where a newly-discovered species has multiple impacts across different sectors (see example in Box 27).
Contingency planning is necessary to enable authorities to implement rapid response measures as soon as an invasion is suspected or detected. Regulatory frameworks should support such planning in consultation with relevant agencies and affected communities and individuals. The agency will obviously need to equip itself in advance with appropriate equipment (mechanical, chemical) as well as contingency funding.

Specific measures that should be available to competent authorities include:

- Authority to inspect and confiscate
- Powers to disinfect equipment and destroy infested material
- Authority to direct chemical or other control of invasive organisms and to close contaminated areas and declare quarantine zones (see example in Box 28)
- Authority to prohibit transfer of living material from contaminated to clean areas.

Contingency planning is particularly important with respect to transboundary and regional invasives management. Mechanisms to promote inter-state consultation and co-ordination should be put in place well in advance of actual emergencies.

4D Eradication, control and mitigation

The rapid response techniques and powers presented in the previous section apply to the eradication of relatively small founder populations, detected early on in the invasion process. Management of established populations is generally more complicated, involving a greater range of options and therefore rendering the decision-making process more difficult.

The general strategies available for invasive species management programmes are:

- Eradication – the complete elimination of the targeted IAS population by the end of the programme
- Control - individuals will still be present, but at lower densities and/or limited to certain areas than before the programme
- Impact mitigation – the aim is to reduce the severity of impacts the IAS is causing, rather than managing the population itself
responding to biological invasions  Module 4

- Do nothing – apart from monitoring the situation until it becomes necessary and feasible to consider new technologies.

Methods usually involve one or a combination of physical, chemical, biological and habitat manipulation methods.

- Physical (mechanical) control involves the removal of invasive species by hand or with tools and machines. Control methods for invasive animal populations include trapping, shooting and hand removal, while those for invasive plant populations include uprooting, felling, slashing, mowing, burning, ring-barking and bark-stripping, or in the case of aquatic plants, hauling them out of the water.

- Chemical control involves using registered pesticides, herbicides or poison bait.

- Biological control, or biocontrol, is the reduction of pest populations by using another organism, a biological product (e.g. hormone), or genetic manipulation.

- Habitat manipulation is used to control invasive alien species by making the habitat less suitable for them, or by changing ecological processes in order to discourage re-infestation.

Some of these methods involve techniques that may require special authorisation. This is particularly true for biological control, which in general involves the introduction of another alien organism intended to attack the original invader. Proposed biocontrol agents should always be subject to risk analysis unless there is adequate experience from elsewhere in the region of their suitability for the project. At the international level, a Code of conduct for the import and release of exotic biological control agents has been adopted under the auspices of the IPPC (International Standard for Phytosanitary Measures No.3).

Most success stories for invasives control have been achieved using an integrated approach, relying on a combination of different techniques, depending upon the circumstances.

**Box 29: example of an integrated approach to control**

Chromolaena odorata – commonly called chromolaena, trifid weed or Siam weed – is a widespread invasive plant in Africa. It is best controlled through an integrated approach, the methods used being dependent on the size of the plant and the type of vegetation infested. Repeated follow-up work is necessary, as the plant is capable of rigorous growth from stem coppice, root suckers and seed.

Seedlings and young plants can be removed by handpulling, while herbicides are available for cut-stump treatment and for foliar application to seedlings and coppice growth. An annual burning regime effectively controls invasions in grasslands by killing mature plants and preventing new seedlings from establishing.

Biocontrol agents, such as the leaf-feeding moths Pareuchaetes pseudoinsulata and the stem-galling fly Cecidochares connexa, have been released in different parts of the world. A number of other biocontrol agents have been released or are still being investigated.

**Eradication**

Eradication programmes are usually designed for biodiversity conservation or ecosystem restoration. They involve the destruction of the population of establishing species – including all living organisms and all development stages (adults, sub-adults, immatures, eggs, seeds, other vegetative propagules, etc.). This is sometimes possible under special conditions but it is mostly quite difficult to ensure that complete eradication has been achieved – especially with flowering plants that may set down a seed bank that is hard to destroy.

Eradication is most likely to be feasible where the detected species is still restricted to small areas i.e. before the population has the chance to expand and disperse into new areas via reproduction and secondary pathways. Eradication success stories are most numerous for islands (see in particular the IUCN-led Cooperative Initiative on Invasive Alien Species on Islands, http://www.issg.org/cii).

The objectives of eradication programmes, which should be clearly defined, may be to:

- to restore the managed area to the condition it was in before the introduction of the alien species;
- to accomplish the above by removing all evidence of the introduced species;
- to maintain the managed area free of the introduced species following the eradication programme.
While successful eradictions can lead to significant benefits for native species, without a comprehensive assessment of risks they may have unexpected and unwanted impacts. Undesired effects can result from eradications of well-established invasive populations, because ecosystems are complex and multiple invasive species in a single system can interact in unpredictable ways. When one species is removed, the effect of the remaining invasive alien species may actually be amplified.

Control

Controlling invasive alien species is the next preferred option when eradication is not appropriate or feasible. It involves the application of measures to contain the distribution of and/or reduce the abundance of a species according to prescribed standards and for defined periods, with a view to limiting its impacts to acceptable levels.

The reason for controlling selected invasive alien species is to achieve outcomes such as habitat conservation, increased fisheries productivity or enhanced recreational experiences. Provided appropriate control targets have been set, the impacts of the invasive alien species on the resources to be protected should be kept within acceptable levels.

Control typically offers more practical and less damaging options than eradication and, at least in the short term, may also seem more affordable. However, control is only achieved for as long as the management regimes are applied. The invasive alien species populations may “bounce back” – sometimes to higher densities than before – if control measures cease. All control programmes therefore require long-term funding and commitment. In the long run, this means that an effective control programme is likely to be more expensive than a successful eradication campaign.

Two main approaches to control involve containing distribution (e.g. through physical barriers like fences or even electrical or salinity barriers across waterways and sea canals) and limiting density (manual or chemical thinning or culling). In practice, most control programmes incorporate both approaches - keeping the numbers of the species low within a defined area, while striving to prevent its spread to other areas.

Containment techniques are often used to contain epidemics and epizootics of (human and animal) pathogens and parasites by the use of quarantine and restriction of movement of the hosts.

Impact mitigation

This aims to reduce the severity of impacts the invasive species has on other species or on places with high biodiversity, cultural or economic value, rather than managing the population itself. Some invasive alien species are so widespread and have achieved such high densities that controlling them is not considered feasible or cost-effective. In other cases, no reliable control method is available, or an interim solution to minimise damage inflicted by the species is needed while control is being conducted.

One example concerns the world’s worst urban bird pest, the feral pigeon Columba livia, descended from the domesticated European rock dove. It is found throughout the world, but is concentrated in cities and towns, where it causes considerable damage to buildings and monuments because of its corrosive droppings. It also poses a health hazard, since it is capable of transmitting a variety of diseases to humans, as well as to domestic poultry and wildlife. Worldwide, little effort is made to control pigeon populations in urban areas, the focus instead being to mitigate the problems they cause. For example, buildings are often ‘pigeon-proofed’ with metal spikes or regularly spaced nylon line, which will prevent the birds from landing.

4E Strengthening the legal basis for response measures

Existing national institutional and regulatory frameworks tend to be stronger on preventing introductions than on management measures for established invasive species populations. There is often no basis for taking legal measures to tackle accumulated problems relating to invasions and where legislation does provide for eradication and control measures, these are often implemented in a piecemeal way.
In drafting provisions of relevance to eradication and control in a national framework, lawmakers should therefore consider:

- how to tackle legal obstacles to eradication and control measures;
- how to improve institutional capacity and coordination;
- how to plan for sustainable control programmes;
- what kinds of obligations and incentives should attach to communities and landowners with regard to control of invasive alien species.

Removing legal obstacles to eradication and control

By definition, response measures used against an unwanted species are designed to kill it or at least stop it from reproducing. It follows that the legal status of the species to be eradicated or controlled must be compatible with such actions. More broadly, alien species in general should have a legal status that does not impede rapid response measures should they become invasive.

This is not as straightforward as it might sound. In many countries that confer legal protection on biodiversity, all wild species (irrespective of their origin) may be automatically protected unless they are specifically designated within a legal category for which control measures are authorised (e.g. ‘pest’ or ‘nuisance’ species). In addition or alternatively, national legislation may protect any species occurring in legally protected areas.

A similar problem can arise where international legal instruments confer protection on large taxonomic groups, making it technically impossible for a Party to that instrument to implement measures against a species in that group that is invasive within national territory (see example in Box 30).

### Box 30: inadvertent protection of invasive alien species under treaties

In France (Loire-Atlantique), a Prefectoral Order dated 4 December 2006 authorises the destruction of specimens of the sacred ibis (*Threskiornis aethiopicus*), a species which is automatically protected because the whole family of Threskiornithides is listed under Annex II of the Bern Convention on the Conservation of European Wildlife and Habitats. The Order provides that this listing should only apply to the species’ natural area of reproduction and migration and not apply to introduced populations, and notes that the species is not legally protected under the Birds Directive applicable in the European Union. The Order provides for population control measures to be undertaken by officials of the departmental branch of the National Hunting and Forestry Service. These measures must be accompanied by additional research under the auspices of the Regional Scientific Council for Natural Heritage.


Legislative techniques to confer status on species compatible with eradication and control include individually listing all protected species which qualify for legal protection (“positive listing”) or declaring all alien species which do not qualify for protection (“negative listing”). Such systems are administratively cumbersome, however, and lists are seldom fully accurate or up-to-date.

It is therefore preferable to decide upon a legal status for alien species that is compatible with eradication and control and find a way to reflect that status consistently across legal frameworks (see discussion of definitions in 2H).

Equipping competent authorities with necessary powers and duties

Control measures may only be undertaken if the agencies wishing to undertake the actions have the authority to do so.

It is therefore important to decide on the type and scope of powers to be conferred upon named agencies, other organisations and possibly individuals to enable them to take measures for eradication and control, both in emergency situations (see 4B) and in the longer term.

Statutory powers to facilitate eradication and control policies should include:

- strict prohibition of further intentional or negligent introductions of invasive alien species into the natural environment;
- powers for authorities to regulate the containment, possession, transport and trade in introduced species;
Module 4 responding to biological invasions

- a notification requirement for land owners and occupiers to inform authorities of the presence of listed alien plants on their land
- powers for competent authorities to gain compulsory access to private land where landowners and occupiers do not comply with reporting or control requirements
- authority for competent officials to notify, co-operate and consult with neighbouring officials on possible invasions and harmonised programs for eradication and control
- authority for officials to use cost-recovery mechanisms or other revenues to finance eradication and control programmes.

Box 31: example of regulations mandating invasives control by landowners

In South Africa, legislation on weeds and invasive plants forms part of the Conservation of Agricultural Resources Act (Act No 43 of 1983). Regulations 15 and 16 under the Act were amended in March 2001. In terms of these regulations, landowners are legally responsible for controlling invasive vegetation on their property. Some 200 alien plant species listed as weeds and invaders have been divided into three categories:

- Category 1 – those that be removed and destroyed immediately, unless measures are being taken to control them and prevent their spread
- Category 2 - those that may only be grown under controlled conditions that prevent them from spreading
- Category 3 - those that may no longer be planted.

Subsidies and grants are also available under the Act for controlling weeds or invader plants. Landowners and users must comply with the specifications for the incentive scheme to qualify for subsidies and must refund payments if they fail to comply.

Long-term control

Long-term control needs to be addressed by countries or subnational authorities in a holistic way based on the ecosystem approach, as far as possible. For financial and technical reasons, it will be necessary to set priorities. Routine control operations are often focused on legally protected areas where the biodiversity under threat may be of national or global importance.

Before deciding on an appropriate management strategy for a country, region, species or invasion site, a feasibility assessment should be conducted to determine the likelihood of success of a particular management strategy, and the methods to be used. This involves a thorough analysis of available information, including:

- background information on the species in question, such as biological, ecological and biogeographic information
- the invasion history of the species and its pathways/vectors of introduction
- extent of the invasion, including size/density of the population and geographic area
- available physical, chemical and/or biological control management methods
- case studies of other attempts at managing invasions with similar characteristics
- resources available, including manpower, equipment and budget
- cost-benefit and risk analyses.

Cost-benefit analysis remains the most commonly used decision-making framework for assessing and comparing economic and financial trade-offs. It is a standard tool for appraising and evaluating programmes, projects and policies and one that is a required part of many government and donor decision-making procedures. It is also a framework into which invasives values can easily be integrated (see Emerton and Howard, 2008).

Another aid to decision analysis on management options is shown in Box 32.

Box 32: decision analysis to evaluate alternative management strategies for controlling invasive weeds in Australia

When a weed invasion is first discovered a decision has to be made on whether to attempt to eradicate it, contain it or do nothing. Ideally, these decisions should be based on a complete benefit-cost analysis, but this is often not possible. A partial analysis, combining knowledge of the rate of spread, seedbank longevity, costs of control and techniques of economic analysis, can assist in making a good decision.

In this example, a decision model was used to determine when immediate eradication of a weed should be attempted, or more generally whether weed control should be attempted at all. The model was designed as a first step in developing rapid-assessment tools to evaluate alternative management strategies when invasions are first discovered. The control measure considered consisted of establishing a barrier zone along the perimeter of the invasion and, if appropriate, eliminating the established weed population. For any given invasion size the most desirable course of action is determined by selecting the strategy that maximizes net benefits,
4F Addressing conflicts of interest

Conflicts of interest can begin within government. Sectoral departments and agencies have their own mandates and priorities and are subject to a range of external pressures. The effectiveness of invasive alien species policies is likely to be much higher if support is actively sought from responsible agencies and stakeholders and supported by two-way communication.

Outside government, every country will be faced with resistance to invasives prevention and control measures at some point in time. Opposition may be focused on specific control programmes or take the form of hostility at the mere idea of restricting freedom to choose plants and pets or of destroying a healthy living plant or animal.

In the United Kingdom, for example, the eradication of mink from the Hebridean Islands had high levels of public support due to their impact on economic activities such as bird watching, game shooting and fisheries by predating fish and the chicks or eggs of ground nesting birds. However, ethical objections to certain eradication programmes have been raised especially when the species are present due to humans and the ruddy duck (Oxyura jamaicensis) eradication programme has met a mixed response.

Some types of opposition can be addressed through well-designed communication campaigns and information materials. The position is very different where established alien species have economic and/or socio-cultural benefits for various sectors of society (for fuel, food, housing materials, recreation). A critical concern should be to ensure that the poor are not negatively impacted either by the introduction of an invasive species or by the management intervention that is employed to address it.

By way of example, analysis of the role of alien invasive species in rural livelihoods in the Eastern Cape, South Africa found that poor local households make widespread consumptive use of invasives for food, fodder and building materials, as well as trading them for income – even though the same species plays havoc on commercial farmland nearby (Shackleton et al. 2007).

As in other areas of environmental policy, the principles of public participation and information sharing should precede and underpin development of strategic control programmes. Where livelihoods or long-established cultural traditions are perceived to be threatened, strenuous efforts should be devoted to negotiation and bridge-building between different groups (see example in Box 33).

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**Box 32: decision analysis to evaluate alternative management strategies for controlling invasive weeds in Australia**

measured in present value terms. Net benefits are measured relative to the do-nothing option. The technique is based on identifying two ‘switching points’: the invasion size at which it is no longer optimal to attempt eradication but where containment may be an option; and the invasion size at which it becomes optimal to apply no form of control at all. The model is applied to a woody perennial weed in a natural environment.

The results show that seedbank longevity is the main constraint on the maximum eradicable area and spread rate is the main constraint on the maximum containment area. Stochastic simulations were undertaken to derive probability distributions of costs which were then used to evaluate the effect of budget constraints on areas that can be eradicated. The study found that, in the absence of a budget constraint, it may be desirable to eradicate invasions from areas as large as 8,000 ha, but when budget constraints typical of those faced by agencies in Australia are introduced, feasible eradicable areas are less than 1,000 ha.


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Legal and Institutional Frameworks for Invasive Alien Species
4G Providing incentives for control and restoration

Eradication and control measures in national regulatory frameworks should ideally combine regulatory and voluntary measures for heightened effectiveness. Indigenous and local communities and landowners are often best placed to monitor the impacts of alien species on local ecosystems, to identify when species become invasive and to participate actively in mitigation measures.

Legal frameworks may create incentives for the involvement of affected individuals and groups. These can take the form of payments to individuals who carry out IAS control and be calculated per animal killed or collected or by volume of plant material cleared. In Venezuela, for example, the Ministry of Environment introduced an incentive scheme in 2003 to control the invasive bullfrog *Rana catesbeiana* which became established in 1998 following illegal releases into Andean waterbodies. The scheme pays licensed hunters a ‘bounty’ payment of 1000 bolivars – equivalent to about US 50 cents – per dead female frog, 500 bolivars for males, and about 15 cents per kilogram of tadpoles. By the end of 2003, more than US$1 640 had been paid for some 4,700 bullfrogs.

When designing incentive schemes, great care must be taken to avoid unintentionally creating perverse incentives that can lead to greater environmental harm (e.g. encouraging clandestine breeding of an invasive animal to increase opportunities for bounty collection).

With respect to alien plants, sustainable management practices and restoration of native vegetation can be promoted through incentives including direct payments or tax breaks.

Countries with low labour costs may consider using labour-intensive approaches within an integrated approach (i.e., including bio-control, fire, chemical and other controls), whereas this is harder or prohibitively expensive for countries with higher labour costs. These employment opportunities can be a way to link social welfare goals to invasive alien species policies. By far the best known example of this approach is South Africa’s Working for Water programme (www.dwaf.gov.za/wfw/), outlined in Box 34.

<table>
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<tr>
<th>Box 34: Working for Water programme, South Africa</th>
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<td>The Programme, established in 1995, trains and employs people from poor communities to clear invasive alien plants and thus has the twin benefits of conservation and job creation. During 2006/07, the government programme treated 790,000 hectares of invasive alien plants and employed more than 29 000 people. Its budget for the 2007/08 financial year is R387 million. The Programme has developed additional incentives by creating opportunities to provide added value by reutilising harvested biological material e.g. for furniture. It is now complemented by sibling programmes like Working on Fire and Working for Wetlands.</td>
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Where possible, legal frameworks should also include positive measures to conserve and enhance native biodiversity. Tools for this purpose may include:

- measures to re-introduce or re-establish populations of native species formerly present in the national territory
- measures to restore native habitats and ecosystems that have been degraded as a result of invasion by alien species.

Legal frameworks should establish procedures and conditions for the assessment and control of re-introduction or re-establishment programmes. For example, provisions should govern permitting requirements for introductions and should recommend cross-boundary co-operation and collaboration where appropriate.

4H References


responding to biological invasions

Module 4


Module 5
getting results:
compliance, enforcement and liability

Legal and Institutional Frameworks for Invasive Alien Species
5A What this module covers

This module explains why oversight, compliance and enforcement mechanisms are essential components of national frameworks. It describes the components and legal authority necessary to operate effective monitoring systems and discusses the importance and limitations of conventional approaches to enforcement and liability in the context of invasive alien species. The module considers the need to foster a positive approach to compliance, building on the education and public awareness programmes discussed earlier in the Toolkit. It gives a brief introduction to the design of economic and financial instruments to tackle invasive alien species.

It is important to remember that legislation is not an end in itself, but a means to an end – better and more informed decision-making leading to results on the ground. However impressive legal texts may look on paper, the real test is whether they meet their objectives out in the real world. This depends on many factors, including administrative capacity, administrative will and proper communication. People, from government agencies to large companies to individuals, know what is allowed or not, understand why and know what may happen if they disregard applicable measures.

By the end of this module, the reader will have an understanding of the strengths and weaknesses of conventional legal procedures for enforcement and liability and why voluntary approaches and economic instruments may play a useful complementary role in improved prevention and remediation.

5B First things first: oversight and monitoring

As discussed in previous Modules, more than one agency will be involved in some aspect of invasive alien species oversight and monitoring. It is absolutely critical that each agency has a clearly defined role and that there is a common understanding across national and local government as to which agency or department is responsible for enforcing which law. These separate and respective roles should be properly coordinated and supported through information-sharing.

Legal frameworks must confer extensive oversight and monitoring powers on the responsible agency or agencies to enable effective enforcement. A checklist of these powers includes measures to:

- confirm statements, reports and the contents of applications, both at the time of application and at later points following any introduction
- oversee compliance with permits, through inspection and other processes
- remain aware of scientific developments and internal conditions, and take additional actions where new information suggests that they are necessary
- require persons or companies to provide specific or periodic reports and other information based on the facts and conditions under their knowledge
- carry out inspection where the agency suspects that a report contains false information
- conduct any necessary tests and analyses of specimens and processes obtained by inspection or in other ways
- manage and collate the data received, using it for a variety of purposes.

Confirmation, testing and analysis

Confirmation is a key component of any enforcement process. Oversight and inspection are only effective if the agency is able to confirm that statements made are correct, that the permit holder is complying with his permit, and generally, that substances and specimens are correctly identified and evaluated. The need for confirmation applies at the time of the original application and at every stage at which an individual or company makes statements or provides reports concerning biological material or specimens being introduced.

The legal framework should therefore provide authority to review and verify information. Capacity requirements linked to this activity include skilled staff members and infrastructure such as quarantine and culturing facilities, testing laboratories and biological storage facilities.
Inspection and monitoring

These components are likely to be very familiar because most if not all legal systems already have well-established inspection procedures for other policy areas (e.g. pollution control, health and safety regulations, storage of hazardous substances). Basic powers should include:

- detailed powers for different aspects of inspections. In addition to general powers to enter and inspect premises and facilities of persons with permits, there may need to be a broader power for invasive alien species (a) to enter and inspect property on which unauthorised introductions are suspected to be occurring and (b) to monitor other properties to see whether invasive species have spread onto them;
- clear requirements and procedures for inspectors to follow in circumstances when a violation is discovered or when the spread of an invasive species is found;
- provision for the development of standards and capacity for inspection staff.

Powers of entry, inspection and monitoring

How these powers are drafted will vary greatly from country to country, depending on the practice already used in your legal system (these may be directly shaped by generic instruments such as the Criminal Code). A checklist of questions to be addressed when drafting provisions includes:

- Which agencies and officials should have the power to enter and inspect?
- Are there different levels of authority for inspectors? In particular, if these powers are held by agency officials rather than the police, do some or all inspectors have the power to collect evidence, issue citations, arrest violators etc.?
- What rights and procedures apply to the collection of samples? For example, does the inspected landowner or a facility have any right to receive duplicate samples?
- Are there different entry/inspection powers for different purposes? Specifically:
  - is advance notice required before normal inspections?
  - when is a warrant or court order required?
  - are there some kinds of inspections that may be done without advance notice ("surprise inspections"), for example, where illegal activity is suspected?
  - are there additional rights/protections for landowners who do not have permits for species introduction?
- What procedures must be followed when inspecting:
  - land/activities that are subject to a permit (to confirm compliance with permit, or to verify information submitted in a report)?
  - lands/activities for which a permit is required, but for where the landholder or actor does not possess the requisite permit?
  - premises and property where the government suspects that an infestation or uncontrolled spread of alien species is occurring?

Box 35: Inspection powers linked to import control

The Smuggling Interdiction and Trade Compliance (SITC) unit of the USDA-Animal Plant Health Inspection Service (APHIS) is tasked with preventing the unlawful entry of prohibited products that may harbour exotic plant and animal pests, diseases, or invasive species. SITC officers are authorized to request documents and records of products in question; seize and/or destroy plant and animal products that have entered the country illegally or are not legal to sell in the USA, and order the products destroyed at the owner’s expense.

In one case, an intercepted mail package declared to be chocolates was found to contain citrus cuttings, which tested positive for citrus canker. A link between the addressee and a commercial nursery in Southern California was established, and a site visit by SITC revealed 5000 citrus trees, all smuggled from Japan.

Actions to be taken on the basis of inspection results

Inspection may reveal that a permit holder has breached the terms and conditions of his permit or that a land owner/occupier (public or private) has not taken action as required by law to control an invasive alien species on the land concerned.
In such circumstances, the legal framework should provide for the quickest and most effective response to the conditions observed. Ideally, this means that the permit holder or land owner/occupier should return to full compliance and/or take whatever action is needed to prevent further infestation or invasion.

Allowing for differences in legal systems, there are two basic steps in moving from inspection to remedy:

1. The competent agency issues a notice or order, informing the responsible person or entity that a condition requiring action has been discovered. The notice must:
   - order the responsible person to take action (e.g. to fully comply with the terms and conditions of their permit or to take specified action to eliminate a listed invasive alien species on land under his control)
   - give a time limit for compliance
   - state the actions that will be taken if the responsible person does not comply with the order
   - inform the responsible person of any right which they may have to appeal against or contest the notice or order.

2. If the responsible person does not comply with the order, various actions may be authorised, including:
   - necessary emergency or temporary measures
   - if the responsible person is a permit holder, suspension of the permit and where necessary, cancellation of the permit after a specified further period
   - imposition of penalties, similar to those used for persons who conduct activities without obtaining the required permit.

Capacity for inspection and monitoring

Inspection can be useful only where the responsible agency has (or can develop) a team of trained inspectors, who are qualified to identify critical species and activities, perform necessary sampling techniques and properly document all sample collection.

The number of field inspection teams that are appropriately trained and equipped must be sufficient to cover:

- primary areas and activities in which introductions are expected (agriculture/horticulture/aquaculture zones, etc.), to confirm that the permit holder is in compliance with law and permit requirements
- random sampling of areas which are covered by self-inspection processes, to confirm that inspections are done properly and results are accurately reported
- other areas, as a preventive measure against unreported spread of species that are thought to be confined or non-invasive, or the appearance of unexpected invasives.

New discoveries and changed conditions

Scientific knowledge regarding invasive species is continually evolving and it must be possible to review and update the content and conditions of permits where necessary to prevent or control invasion risks. Specifically, governments may find it necessary to issue new or revised controls where:

- a previously unknown invasive species infestation is discovered
- a species formerly thought to be non-invasive or acclimatised displays invasive characteristics or is found invading other ecosystems
- scientific experts identify some specific measures or approaches that can control certain species or invasiveness characteristics
- scientific analysis or other data invalidates or calls into question the assumptions on which a permit was granted
- an ecosystem into which the species is introduced (or an ecosystem nearby) is shown to be more vulnerable or more valuable than previously thought
- actions are being taken in other sectors (clearing, development, etc.) that render the site covered by
Module 5  getting results: compliance, enforcement and liability

the permit more vulnerable to invasion.

The legal framework must be sufficiently flexible to allow:

- changes to existing permits
- revision of standards for permit approval (including permanent or temporary bans on introductions of certain species or in certain areas)
- additional administrative measures or controls (including controls on domestic or international shipments)
- additional limitations on actions that do not require permits
- additional inspection and/or remedial action by government
- notification to landowners/occupiers and other persons/entities requiring them to take remedial or other actions.

Several of these powers raise legal issues. First, the agency’s remit needs to extend to management actions with regard to incursions of species that were lawfully introduced but have since become invasive as well as to invasions of lands and waters where no human action caused the problem (i.e. lands that the species has spread onto). Second, because the best time to address invasiveness problems is straight away, the powers described in these laws must be fairly strong. The agency must be able to take some actions quickly, without unnecessary interference.

It is of course essential to recognise and address the legitimate expectations of landowners, permit-holders or other entities who may be affected by these decisions. The approach will depend on existing legal practice in your country regarding prior notification, consultation, compensation and appeals.

Reporting and self-inspection

Reporting and self-inspection requirements are an important component of oversight. They enable a country to obtain data concerning the use and dispersion of alien species and the effectiveness and coverage of oversight and control measures.

The basic approach is to require the holder of an introduction permit, for a specified number of years following the introduction, to keep records of population size and stability, and to conduct surveillance of both the introduction area and nearby areas and conditions. These requirements need to be tailored to the nature of the particular introduction and the nature and level of concerns relating to the ecosystem involved and nearby ecosystems. Findings are submitted in the approved format to the competent agency.

Managing and controlling data

Information on species (both domestic and newly introduced), ecosystems, and habitats and other relevant materials need to be systematically recorded and catalogued to provide decision-making support, including for risk analysis. The legal framework should address record-keeping, mandate the relevant agency to maintain data in accessible form and specify who may access that information.

If possible, data from all governmental sources relevant to invasive alien species and other relevant data (e.g. scientific institution surveys and inventories) should be collected and organised into researcetable form. Collected data needs to be regularly maintained, especially where actions are being permitted on the basis of risk analysis. New information may, for instance, change the risk analysis, or indicate that a particular ecosystem or region needs special assistance.

Consideration must be given to the confidentiality of certain information. Where a law requires applicants to disclose a trade secret (e.g. information on the parent, donor and recipient species, genetic modification processes, processes for which the species may be used), applicants often want to keep this information confidential from competitors and other non-governmental sources. At the same time, governments have an interest in having complete information about species being introduced, and where they are introduced into the environment. Civil society and other stakeholders also have an interest in obtaining information concerning species introduced.
To address these objectives, countries may adopt trade secret or confidentiality provisions in legislative frameworks to protect certain information provided in government reports and applications.

5C Enforcement and its limitations

Many invasive-related problems result from actions that are prohibited or restricted. In the case of intentional introductions, there may be a breach of quarantine regulations. For unintentional introductions, there may be non-compliance with operating regulations such as controls on discharges of ballast water. Recklessness and negligence may also underlie damaging actions. Regulatory frameworks should provide for the full suite of enforcement and penalty mechanisms to reinforce policy on alien species control.

Communicating what is allowed and what is not – and clearly explaining why – is essential to get desired results from legislation. Information campaigns have, for example, made travellers familiar with controls on trade in protected species under the Convention on International Trade in Endangered Species of Wild Flora and Fauna, or CITES (see Figure 12 for a similar approach to invasives control information).

**Figure 12: quarantine posters to improve law enforcement**

arriving passengers commit an offence when they fail to declare food, plant cuttings, seeds, nuts or anything made from wood, plant or animal material to customs officials

Capacity for enforcement

When formulating a legal framework that includes enforcement measures, sufficient capacity must exist to implement enforcement provisions. For example, officials must be sufficiently skilled and authorised to effectively enforce laws.

Enforcement provisions

In drafting enforcement provisions, it is helpful to consider the motivations and objectives of the people and companies that are subject to regulatory control. For example, many individuals and businesses transporting viable biological materials often violate species transport restrictions by not declaring what they are carrying. These violations are often motivated by a relatively innocent desire to avoid delays in customs and agricultural inspections, or to save the time and cost of getting a permit. Often the violator sees no harm in skipping these steps, which he/she sees as “mere formalities.” Therefore, the challenge of enforcement is to find a way to encourage higher levels of compliance, not only by traditional mechanisms but also by considering and adjusting underlying motivation factors.

Mandatory measures

Mandatory measures comprise three elements:
Module 5  getting results: compliance, enforcement and liability

- The mandatory requirement
- Enforcement practices and powers (including entry, arrest, seizure) with respect to the mandatory requirement
- Penalties and other consequences linked to the mandatory requirement.

**Mandatory requirement**

Mandatory requirements specify the action that constitutes an offence and use terms such as “shall”, “must” or “may not” e.g. “no person may plant or otherwise introduce species X into land or water under his ownership or control or allow it to remain on such land”.

The requirement needs to be phrased to ensure that it helps, not hinders, enforcement. For example, if a law says “No person may plant or otherwise introduce species X in land under his ownership or control,” it may be unlikely that an official will be watching at the moment that the person plants or releases the species. To make that provision easier to apply, the provision could say: “No person may plant or otherwise introduce species X in land under his ownership or control, or allow it to remain on such land.” In the first version, the government would have to prove that a particular person “planted or otherwise introduced” the specimens whereas in the second, action could be taken wherever the specimens are recorded as present on private land.

**Enforcement practices and powers**

A minimum set of powers to investigate and enforce invasive alien species-related offences could include powers to:

- Enter premises
- Request oral or written information
- Take samples and collect evidence
- Seize property
- Issue arrest warrants.

In the specific context of invasive alien species regulations, it is particularly important that officers and agencies should be given sufficient power to:

- enter lands where introductions have taken place and that are impacted by introductions
- board and inspect vehicles and vessels
- warn or arrest violators.

**Box 36: enforcement of invasive plant controls in South Africa**

Enforcement of the regulations under the South African Conservation of Agricultural Resources Act, 1983 is the responsibility of the national Department of Agriculture, which is empowered to issue a directive setting a date by when a property containing IAS must be cleared by a land-owner or occupier. Non-compliance with the directive is a criminal offence.

- The directive is binding on anyone who subsequently buys the land.
- If the directive is ignored and the land is not cleared, the Department of Agriculture can clear the land or engage someone else to do so.
- The costs of clearing are recovered from the land user.

**Penalties and other consequences**

**Levels of penalty**

Decisions regarding the type of penalty to be imposed (e.g. fine or imprisonment) and the measure of any monetary penalty should be taken with reference to:

- the level of risk posed by the species (e.g. known invasive or potential invasive)
- the level of harm caused
- whether the violation was intentional, reckless or negligent
- the potential for deterrence (i.e. the potential that the violator will be deterred from violating in the same way again or that others will be deterred from committing the same offence).
Penalties specified in law are frequently devalued. Even normal levels of inflation slowly convert a penalty from being sizeable deterrent to becoming an “additional cost of doing business.” In some cases, especially where some other factor has caused a broader crash of the national economy, the penalty amounts can become negligible, especially to external people and entities who will calculate the cost based on more stable currency.

To help address this, legislation can create a sliding scale of penalties but specific fines/length of imprisonment for each level of that scale can be periodically adjusted by secondary regulations (see below).

Penalty levels tend to be highest in countries that have suffered the most from invasive species e.g. the South African Mpumulanga Nature Conservation Act, 1998, provides for the imposition of unlimited fines and/or four year terms of imprisonment. Stakeholder organisations can also play a very positive partnership role in publicising offences and applicable penalties (see Box 37).

**Box 37: stakeholder contribution to building awareness of penalties**

In the United States, a voluntary organisation (North Texas Water Garden Society) has the following information on its website ([http://www.ntwgs.org/articles/illegalAquatics.html](http://www.ntwgs.org/articles/illegalAquatics.html)):

> "The spread of exotic plants is an extreme threat to the native aquatic environment and a potentially dangerous situation."

The State of Texas doesn't just frown on the possession of harmful or potentially harmful exotic plants. It is illegal to posses these plants in Texas. Possession of any prohibited plant species is a Class B Parks and Wildlife Code Misdemeanour punishable by a fine of not less than $200 nor more than $2000, a jail term not to exceed 180 days, or both a fine AND imprisonment.

Each individual plant of a prohibited species constitutes a separate violation. The law applies to everyone: aquatic plant producers and distributors, garden centres, pond supply stores, pet stores, and individual pond keepers. So if Joe Ponder is caught with 10 water hyacinth in his backyard pond, that would be 10 separate violations, with potential fines totalling $20,000.

For the complete list of prohibited and restricted plants and fish, you can download the official Revised Exotic Species Rules published by the Texas Department of Fisheries."

**Penalties for permit violations**

Non-compliance with permit conditions is usually seen as less serious than failure to obtain a permit because the law assumes that a permit-holder is basically committed to complying with the law. Legal frameworks generally enable authorities to issue a notice to the permit-holder requesting him/her to take action within a specified timeframe. Failure to take the requested action could result in a penalty.

For invasive alien species, however, failure to comply with permit requirements may need to be dealt with more stringently. The issue of a permit for the introduction of a potentially invasive species will be generally have been done for a particular, defined reason and the permit conditions are likely to be important. In such a case, the penalty for failing to comply with permit conditions may be as stringent as penalties for failure to obtain a permit.

**Restrictions on penalties**

The country’s legal framework, including its primary laws and/or the Constitution, may set limits on penalty provisions. In many countries, for example, penalties may only be created by law, while in others the power to set penalties is also available at the level of secondary instrument. In some cases, this power is divided: a penalty may only be created by law but its amount of the penalty (or a penalty scale) may be created or revised by a subsidiary instrument.

**Other consequences**

Other important penalties include temporary seizure and permanent confiscation, for example of samples of IAS. For maximum effect, such provisions should include all equipment, tools and other movable property related to or used in the commission of the violation as well as any related profits made from the invasive alien species in question.
Module 5  getting results: compliance, enforcement and liability

However well the above mechanisms are applied, they cannot by themselves be enough to deliver compliance with the full range of invasive alien species-related activities. Reasons include low levels of public awareness of invasives issues and insufficient institutional commitment or capacity in many countries. More fundamentally, from a legal point of view, traditional standards of knowledge, intent and causality are often hard to apply to many cases of biological invasion. In the case of an unintentional introduction, it may be impossible to ascribe any form of intent to a party unless the law covers negligent conduct. These issues are discussed in the next section.

5D Liability and its limitations

In the general legal sense, ‘liability’ refers to the civil or criminal responsibility of a party for a particular action. In the context of invasive alien species regulation, actions of responsible parties may be linked to harm to persons, property and/or the environment.

Governments and individuals who are required to bear the economic burden of preventing and redressing such harm may wish to put mechanisms in place in a regulatory framework to obtain compensation from those responsible for damage and associated costs. The content of liability provisions related to invasive alien species will be shaped by answers to the following questions:

- who has duties to take action to prevent harm and to compensate for harm?
- how is causation determined?
- how will liability will be allocated when more than one party is responsible for harm?
- how does the application and allocation of liability work in transboundary contexts?

Duties to take action and compensate for harm

Duties to take action may include reporting the presence of listed invasive alien species, taking steps to halt spread, repairing damage or restoring ecosystems. Where action to eradicate, repair or restore is not possible, or is insufficient, there may also be a duty to compensate for personal, financial or other injury.

In many countries, parties that take ‘reasonable measures’ to prevent harm may be protected against liability, in full or part, should harm occur. Such reasonable measures would include, as a starting point, complying with all legally-mandated control measures and permit conditions.

Determining causation

In general, it is necessary to prove a causal link between an action and the resulting harm in order for the judge to make the person or entity responsible for the action liable.

Proving causation is notoriously difficult in the context of invasive alien species because harms may arise from various sources and often build up slowly over time. In many cases, the invasion may have resulted from a category of activity carried out by numerous companies, facilities or individuals but it is difficult to establish whose actions or omissions actually lead to the introduction. Very frequently, the activities that led to introductions were – and probably still are - perfectly legal, either because they are simply not regulated or because they are carried out under permit.

In drafting legal provisions on causation regarding invasive alien species, lawmakers will therefore need to consider various standards of proof for liability, applicable in different circumstances. In criminal law, it is usually necessary to prove that a person intentionally or negligently committed a wrongful act in order to convict them of a crime: in contrast, it may be virtually impossible to prove intention or negligence in relation to offences involving invasive alien species.

In some cases, it may be appropriate to provide for a strict liability regime, which allows proceedings to be brought without having to prove intention or negligence. The prosecution has to demonstrate objective facts (e.g. the presence of invasive alien species on land) after which the burden of proof shifts to the defendant. Depending on the law, the defendant may be able to escape liability if s/he can prove that s/he did not act negligently.
Allocation of harm among multiple parties

One of the most complicated aspects of invasive alien species when it comes to civil liability claims for damages is that harm is often caused by more than one party (e.g. where multiple introductions have lead to cumulative economic impacts, possibly affecting a wide range of interests).

In the case of an introduction of a highly invasive species that causes harm to numerous parties and industries, one option is to hold all parties that received some form of financial benefit from the transport, sale and/or introduction of the species liable for some part of the harm. Provisions in legislation will then need to determine how such cases of multiple defendants should be dealt with.

A system of proportional allocation is sometimes utilised by courts or officials, under which total liability is divided up among parties with reference to the extent of their liability. With respect to environmental harm, however, determining each party’s liability is notoriously complex. To make it easier for claimants to obtain compensation where liability needs to be allocated between multiple parties, legislation could contain a provision in terms of which ‘joint and several liability’ applies. Under this approach, listed defendants are liable to compensate for total harm and the claimant is not prejudiced by the need to calculate proportional allocation.

Liability in transboundary contexts

The issue of liability where actions in one country impact parties, property or natural resources in another country is particularly relevant to invasive alien species because of the international nature of the issue. Consistent with the obligation under international law for states to avoid transboundary harm, provisions in national legal frameworks must reflect the country’s obligations under international law and place emphasis upon transboundary cooperation and collaboration with respect to IAS management, including liability for harm. More detailed requirements are discussed in Module 6.

5E Fostering voluntary compliance

In view of the difficulties with conventional enforcement and liability tools mentioned above, policy and legal frameworks need to promote a culture of accountability and responsibility to encourage voluntary compliance and best practices.

Complementary approaches of this kind are directly linked to communication and education activities as well as to cross-sectoral coordination and mainstreaming invasive alien species in all policy areas. They may be associated with initiatives to address conflicts of interests (see 4F).

Compliance in the broad sense starts with government: the activities of public agencies and/or publicly funded programmes routinely provide opportunities for alien species introductions which may not be subjected to adequate risk analysis or follow-up monitoring. For example, older laws restricting releases of alien species to the wild often make open-ended exemptions for species used in forestry or other production sectors, though some countries have now tightened up this type of provision.

Making all branches of government aware of the issue is an important step towards building a culture of responsibility across different sectors. The Bahamas National Invasive Species Strategy (2003) establishes a Code of Conduct for Government that promotes best practice across all policies and activities conducted on public land and/or by all categories of public servants (see BEST 2003).

<table>
<thead>
<tr>
<th>Box 38: the Bahamas Code of Conduct for Government</th>
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</thead>
<tbody>
<tr>
<td>- Require risk assessment for Government-led or financed plant and animal introductions to ensure that no new harmful species are introduced, intentionally or unintentionally.</td>
</tr>
<tr>
<td>- Do not distribute existing holdings of invasive plant and animal species to areas where they can potentially do harm.</td>
</tr>
<tr>
<td>- Coordinate and facilitate collaboration in databases, early warning systems, monitoring and other means of preventing invasive plant species problems.</td>
</tr>
<tr>
<td>- Lead and fund the development of environmentally sound methods to control harmful invasive plant species, seek control of such species on Crown and other public lands and promote their control on adjacent private lands.</td>
</tr>
<tr>
<td>- Develop and promote the use of non-invasive plant species within all Government agencies and to the public.</td>
</tr>
<tr>
<td>- Facilitate, lead, coordinate and evaluate public outreach and education on harmful invasive species.</td>
</tr>
<tr>
<td>- Encourage public servants and managers to participate in ongoing training programmes on invasive species.</td>
</tr>
<tr>
<td>- Foster international and regional cooperation to minimize the risk of import and export of potentially invasive species.</td>
</tr>
<tr>
<td>- Develop partnerships and incentive programmes to lessen the impact of invasive species and provide non-invasive restoration</td>
</tr>
</tbody>
</table>
Legislation can provide a basis for economic incentives to improve compliance or facilitate control. Some options were discussed in 4G, including payment per invasive animal collected or for manual clearance of invasive plants. Other options could include special benefits for communities that have the highest rates of invasives clearance or priority treatment of permit applications for applicants who demonstrate best practices.

Non-legislative measures to encourage collective responsibility of stakeholders outside government can take many forms.

Some industry groups and user federations around the world have already developed awareness campaigns of their own, using labelling schemes, messages on carrier bags, information at the point of retail or adoption of codes of conduct or similar guidelines. This type of measure is particularly developed in some areas of the horticulture and pet trade, less so for angling where release of exotic live bait is a major problem in many areas. One incentive for trade actors is to demonstrate to government that non-regulatory approaches can be effective and proportionate in order to forestall the adoption of what could be burdensome regulatory requirements.

Government can also sponsor development of Codes of Practice by sectoral application. It is now possible in Great Britain to use approved Codes of Practice as evidence in court proceedings linked to invasive alien species (see Box 16 above).

The Bahamas National Invasive Species Strategy annexes no less than nine voluntary codes of conduct for: botanical gardens; landscape architects; the gardening public; nursery professionals; zoos and aquaria; farms (agricultural and aquacultural); pet stores, breeders and dealers; pet owners; and veterinarians (BEST 2003).

5F Designing economic and financial instruments to tackle invasives

There is growing interest in the contribution that cost-recovery and financial mechanisms can play in generating more sustainable funding for regulatory and remediation programmes, mainly from stakeholders with primary responsibility for activities that lead to unwanted introductions (see e.g. Jenkins 2001, Jenkins 2002, Hachileka 2006, Emerton and Howard, 2008).

At present, markets cannot be relied upon to deal with the problems associated with invasive species because the total economic value of ecosystem services is not reflected in the prices that consumers, producers and traders face as they carry out their economic activities. Because introducers and end-users do not cover the cost of the damage to which their actions contribute, government intervention is almost inevitably required to tackle remediation – and funding is never sufficient.

The basic aim of environmental economic instruments is to encourage or discourage particular types of behaviour through appropriate incentives or disincentives. However, their application to invasive alien species presents specific challenges because invasions, once set in motion, are largely self-perpetuating and often their impacts also increase over time. These unique characteristics mean that many instruments that are commonly used to deal with environmental externalities only have limited applicability for the case of invasives (Jenkins 2002, Perrings 2002).

Figure 13 gives examples of economic and financial instruments that have potential application to invasives. Most are aligned with the polluter pays principle (see 2I), namely that the individual or company who is responsible for introducing or spreading invasive species should bear the costs of measures to prevent, eradicate, contain or manage that species and to mitigate and remediate the damage it gives rise to (Horan et al 2002, Jenkins 2002).
In practical terms, such instruments aim to confront producers, consumers and traders with the invasives-related cost of their actions (Perrings et al. 2005a) via the prices and markets they face. They also have the important task of generating sufficient revenues to cover the costs of a third party (usually government) to undertake the actions that are necessary to respond to the invasive species and any damage it causes, such as direct management, ecosystem restoration, provision of alternative technologies and products, and compensation.

In the invasives context, the proceeds raised by this kind of instrument should preferably be paid into a dedicated fund that can be used to provide easily-accessible financing for rapid response interventions, control measures and where necessary, restoration.

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
<th>Examples</th>
</tr>
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<tbody>
<tr>
<td>Charges and fees</td>
<td>Measures which rationalise prices and improve markets for the goods and services which utilise or depend on invasive species or to alternative products and technologies, or develop markets in quotas or permits which relate to invasive species</td>
<td>Ballast water fees, tradable permits</td>
</tr>
<tr>
<td>Creation of markets</td>
<td>Measures which create markets or prices for the land areas or ecosystem services which are impacted by invasive species</td>
<td>Payments for ecosystem services, biodiversity offsets</td>
</tr>
<tr>
<td>Fiscal instruments</td>
<td>Budgetary measures which apply taxes and subsidies to the goods and activities which utilise or depend on invasive species or to alternative products and technologies</td>
<td>Investment taxes, product taxes, preferential credit</td>
</tr>
<tr>
<td>Bonds and deposits</td>
<td>Measures which require the provision of monetary security when economic activities are carried out which involve invasive species, refundable against any damage occurring as a result of that activity</td>
<td>Performance bonds, damage bonds, import deposits, restoration deposits</td>
</tr>
<tr>
<td>Trade measures</td>
<td>Measures whose justification is primarily to guard against invasives but which take the form of trade instruments</td>
<td>Import tariffs and quotas, import duties, export taxes, trade bans, eco-duties, border tax adjustment</td>
</tr>
</tbody>
</table>

From Emerton and Howard 2008

There are few case studies available yet on using economic and financial instruments to address the problems associated with biological invasions – which makes it difficult to give specific examples where particular instruments have worked well or have been less successful. In general, most of the instruments referred to will work best where there are relatively well-developed markets and trading networks for invasive species, and where the capacity exists to enforce and regulate particular restrictions, requirements and fees (Emerton and Howard, 2008).

To conclude, Box 39 describes some of the specific economic and financial instruments that have been proposed by various authors to tackle invasives.

**Box 39: use of economic and financial instruments to tackle invasions**

- The use of payments for environmental services, made to landholders or others to restore invaded ecosystems that provide important services (such as water supply, carbon sequestration, and fire protection), by the beneficiaries of these services. An example is given of payments for hydrological services through the Working for Water programme in South Africa that contracts previously unemployed individuals to clear public or private mountain catchments and riparian zones of invasive alien plants in order to restore natural fire regimes, the productive potential of land, biodiversity, and hydrological functioning. Water utilities and municipalities have begun to contract Working for Water to restore catchments that affect their water supplies. (Turpie et al. 2008).
- The use of invasion risk tariffs to confront exporters with the costs of their actions. It is suggested that these should be embedded in trade agreements (Perrings et al. 2005a).
- The posting of bonds equal to the estimated cost of repairing any future damage that could occur in the worst-case scenario of intentional introductions (Thomas and Randall 2000).
- The use of environmental assurance bonds on importers of new species or those undertaking high risk activities, set at a rate equivalent to the conjectured damage if the species was to establish, naturalise, and become invasive (Perrings 2000).
- The levying of fees on activities which might cause invasions, which could in turn be used to create a fund to pay for preventive measures and rapid response to invasive problems. It is suggested that fees could be charged to those involved in global trade and travel, via levies on the import of any live animal or plant that is originally from another continent, on incoming passengers, cargo ships and airplanes (Jenkins 2001 and 2002).
- Using a package of insurance requirements and bonding requirements on activities which may potentially introduce or spread invasives, as well as applying civil and criminal fines and penalties (Jenkins 2001 and 2002). It should however be
Module 5  getting results: compliance, enforcement and liability

Box 39: use of economic and financial instruments to tackle invasions

- noted that many of these instruments suffer from a time lag problem, and that it is also often difficult to isolate the cause of an invasion (Jenkins 2002).
- Using tradable risk permits where permits are denominated in terms of the likelihood or probability of an invasive alien species introduction. The tradable permit market would work by providing each vessel with risk permits for potential invaders, and allow vessels to trade the permits among themselves. The only requirement is that the level of risk actually generated by each vessel must not exceed the vessel’s permit holdings (Horan and Lupi 2005).

From Emerton and Howard 2008

5G References


Jenkins, P., 2002, Paying for Protection from Invasive Species. Issues in Science and Technology, Fall 2002


Module 6
legal frameworks
for cooperation
beyond national borders
6A What this module covers

This module describes how international law mandates transboundary cooperation for invasive alien species and shows how the issue can be mainstreamed into existing regional processes. It identifies specific components and activity areas for regional and subregional cooperation before looking in more detail at the interface between national regulatory measures and the principles and rules established under the international trade regime.

By the end of this module, the reader will have an understanding of how national policy and legal frameworks fit into the bigger regional picture and the ways in which countries can play a mutually supportive role in preventing and managing biological invasions.

6B International mandate for transboundary cooperation on invasives

Obligation to avoid transboundary harm

Prevention and management of invasive alien species is inherently a transboundary issue. Invasive species do not respect political boundaries. As the causes and consequences of alien species introductions are often international, consistent approaches at the appropriate geographic level essential to address pathways and activities that lead to new invasions.

Management of already-established invasive alien species is also a transboundary concern. Problem species frequently spread beyond the boundaries of the country in which they were introduced and affect neighbouring countries or shared ecosystems such as international rivers and lakes.

The long-established principle of customary international law that States have a general responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or to areas beyond the limits of national jurisdiction was noted in 2C above. This duty to avoid transboundary harm has been fleshed out in different ways in international instruments applicable to invasive alien species, such as the Convention on Biological Diversity (see below).

The precise standard of conduct to which States must adhere regarding avoidance of transboundary harm is expressed differently in different instruments. It may be very general or translate into concrete obligations. Under the International Plant Protection Convention, for example, highly detailed technical standards have been developed to prevent the introduction of pests of plants and plant products between countries. This makes it easier to assess compliance in an objective and quantified way.

The core of the legal obligation is to exercise ‘due diligence’ in taking appropriate measures to prevent or minimise the risk of transboundary harm. This Toolkit has explained that zero risk does not apply to invasive alien species because of the very nature of human activities and global trade and transport systems. To show that it has acted with due diligence, a country must act reasonably and in good faith. Specifically, it must take steps to regulate and manage public and private activities over which it has jurisdiction and control that could lead to invasive species damage to other countries or to areas beyond national jurisdiction.

When drafting national legislation, it is critical to take account of this overarching duty to avoid transboundary harm. Regional instruments and programmes for invasive alien species prevention and management can provide helpful guidance to the drafting team when designing appropriate provisions.

Cooperation requirements under global instruments

The international commitment to tackling invasive alien species is reflected in steadily increasing calls for stronger cooperation and for improved synergies between different international organisations. Two examples of the approach taken by different international instruments are given below (see 2C for a checklist of other key instruments and for further reference sources).

The Convention on Biological Diversity (1992) requires Parties, as far as possible and as appropriate, to prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species’ (Article 8(h)). This specific obligation is framed by general obligations for States to:
Module 6  legal frameworks for cooperation beyond national borders

- ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction (Art.3);
- take cooperative action on areas in their mutual interest (Art.5);
- carry out EIAs for projects, programmes and policies likely to have a significant adverse impact on biodiversity and notification, exchange of information and consultation with neighbouring countries that may be affected by damaging processes and activities (Article 14).

Decisions adopted by the Conference of the Parties emphasise the need to build links between the CBD and organisations dealing with trade-related and transport pathways. Countries can contribute to this objective by promoting the mainstreaming approaches discussed in this Toolkit and ensuring regular liaison at national level between the different focal points to the various treaties or organisations.

Under the CBD, Decision VIII/27 (2006) specifically encourages governments and regional bodies to “develop procedures and/or controls to ensure that cross-border impacts of potentially invasive alien species are considered as part of national and regional decision-making processes.” It also urges them to be “proactive in preventing the introduction and spread of invasive alien species, within their territories, for example by offering to help neighbouring States to deal with particular alien species that may cross borders.”

The International Plant Protection Convention (1951, revised 1997) mandates international cooperation to prevent the introduction of pests of plants and plant products and to promote appropriate measures for their control. ‘Pest’ is defined to cover any species, strain or biotype of plant, animal or pathogenic agent injurious to plants or plant products, which covers fungi, bacteria, phytoplasmas, viruses and invasive plants. Although IPPC’s main practical focus is on preventing damage to plants of economic importance, it also covers invasive species that meet the definition of ‘pest’ and cause direct or indirect damage to wild plants and the natural environment.

The IPPC provides a framework for the development of International Standards for Phytosanitary Measures (ISPMs). Two ISPMs adopted in 2003 explicitly address the risk of pest impacts on unmanaged ecosystems as well as on agricultural systems (Supplement on Analysis of environmental risks9, Supplement on Guidelines on the understanding of potential economic importance and related terms including reference to environmental considerations10).

IPPC Parties are required to establish national plant protection organisations and to adopt legislative, technical and administrative procedures and standards to identify pests that threaten plant health, assess their risks and prevent their introduction and spread between and within countries by undertaking eradication or control. They may prohibit the introduction of certain plants or other commodities and prescribe restrictions on the import of plants and plant products.

The IPPC provides that national phytosanitary measures should only be used when necessary, should be the least trade restrictive and be harmonised or made consistent with international standards where possible (see 6E). Countries are required to use pest risk analysis to determine the need for and appropriateness of national measures. To ensure transparency and promote understanding of nationally developed measures, countries must make information available publicly, including information on the legislation and measures for non-compliance.

Implementation is facilitated by nine regional plant protection organisations (RPPOs), which may develop their own regional phytosanitary standards to facilitate harmonisation of plant protection measures. Practice varies widely between regions, with some RPPOs still focusing exclusively on pests affecting agricultural crops. However, at least two RPPOs have developed broader screening tools for environmental risks associated with invasive alien plants, which can provide a useful source of reference for your country (North American Plant Protection Organisation (NAPPO); European and Mediterranean Plant Protection Organisation (EPPO)).

9 Supplement to ISPM No. 11 (Pest risk analysis for quarantine pests, including analysis of environmental risks and living modified organisms).
10 Supplement to ISPM No.5 (Glossary of Phytosanitary Terms).
6C Addressing invasive alien species through existing regional processes

The added value of cooperation at the regional level is immense. From an invasive species perspective, regionally targeted approaches can be particularly helpful where:

- countries share a particular ecosystem within which species are likely to spread once introduced (e.g. a water basin approach is necessary to prevent the spread of freshwater aquatic invasive species);
- national capacity is limited: resources can be pooled and information and expertise shared in a manner that enhances the capacity of each country to control invasive alien species.

Most regions already have several agreements and organisations established for different purposes (general economic cooperation, closer economic integration, regional trade, regional phytosanitary protection organisations, management of shared rivers and lakes, forestry, fisheries, nature conservation, regional seas conservation etc.). Depending on the agreement, efficient cooperative arrangements may already be established and functioning between different authorities and national focal points. Quite often, however, regional agreements that look promising on paper have low visibility and institutional support from member countries, which reduces their scope to leverage national efforts.

The degree to which invasive alien species can be mainstreamed into existing regional processes depends on the nature of the agreement concerned as well as political will and available capacity. Regional agreements to promote a high degree of cooperation on a range of issues (e.g. linked to economic development) often provide a broad basis for addressing environmental threats and can therefore be used to address invasive alien species issues.

In Africa, for example, cooperation organisations already established in the continent’s different subregions have the potential to promote coordinated IAS policies: the pan-African NEPAD Environmental Action Plan already specifically addresses invasive alien species issues. To date, the Southern African Development Community (SADC) has gone furthest in terms of developing targeted invasive alien species measures as an integral part of regional cooperation (see Box 40).

Box 40: SADC and invasive alien species

The Southern African Development Community (www.sadc.int) has an extensive infrastructure to coordinate policy development and implementation in its 14 member countries. The Integrated Committee of Ministers ensures integration at policy level and coordination and harmonisation of cross-sectoral activity in e.g. the trade and industry sector and the food, agriculture and natural resources sector. It is supported by national committees composed of government, private sector and civil society stakeholders, whose functions include coordination and implementation of programmes at national level.

The Fisheries and Forestry Protocols adopted within the SADC legal framework specifically address invasive alien species prevention and control. In addition, the SADC Biodiversity Support Programme has been coordinating IAS guidelines for the regions. This has led to change at national level: for example, Swaziland’s national committee has supported the development of an invasive alien species database and the establishment of structures to address the problem.

In some parts of the world, regional institutional support for invasive alien species is much less developed. Nevertheless, there will nearly always be existing organisations that could make an effective contribution to regional cooperation if given appropriate support and back up by member countries. After all, it is national governments that ultimately decide on the priorities, work programmes and budgets of the regional organisations they choose to join.

National strategies and frameworks should therefore promote development of collaborative links to regional and international programmes relevant to invasive species.

Suitable organisations and programmes will vary depending on the region. By way of example, West African countries at a GISP training course in 2006 identified several regional structures that could address invasive alien species, including the agriculture and environment unit of Economic Community of West African States (ECOWAS), the Permanent Interstate Committee for Drought Control in the Sahel, the West and Central African Council for Agricultural Research and Development and the Inter-African Phyto-sanitary Council.

A single provision in a regional convention provides a sufficient legal basis for motivated countries to develop a work programme and activities on invasive alien species. At the pan-European level, the
Module 6  legal frameworks for cooperation beyond national borders

Convention on the Conservation of European Wildlife and Natural Resources (Bern Convention, 1979) requires Parties to strictly control the introduction of non-native species (Article 11.2.b). Since 1984, Parties have jointly agreed to a range of actions to implement this article, including:

- adoption of recommendations on general aspects (e.g. design of legal frameworks) and specific problems (e.g. multilateral efforts to eradicate the ruddy duck *Oxyura jamaicensis*);
- production of technical reports (control techniques, priority species lists);
- organisation of regional workshops as well as cross-sectoral national fora;
- establishment of an informal Invasive Alien Species Experts’ Group with technical representatives from across the region;
- adoption of the European Strategy on invasive alien species (Genovesi and Shine, 2004);
- regular national reporting, including on specific measures to implement the Strategy and strengthen national frameworks.

This kind of precedent can provide a useful starting point for other regions in which an existing convention explicitly covers invasive alien species. This applies on sea as well as on land: several biodiversity protocols to regional seas conventions mandate measures for invasive alien species prevention.

In the terrestrial context, the revised African Convention on the Conservation of Nature and Natural Resources (Maputo, 11 July 2003) requires Parties to take all necessary measures for the protection, conservation, sustainable use and rehabilitation of vegetation cover, including “concrete steps or measures to control fires, forest exploitation, land clearing for cultivation, grazing by domestic and wild animals, and invasive species” (Art. VIII.1(b)).

6D Components of regional cooperation and collaboration

Whether countries cooperate through existing or specially-established processes, they should promote the following types of activity through their joint efforts:

- sharing of information and expertise
- regional standard setting and harmonisation
- environmental impact assessment and prior notification
- regional strategy development
- institutional support for regional capacity-building
- consideration of export-related risks.

Sharing of information and expertise

As discussed in 1G, information and expertise on the ecology, impacts and management of invasive alien species needs to be collated and shared to improve the efficiency and effectiveness of management interventions. Within a region, sharing of information provides benefits for several reasons:

- countries within a region may share the same threatened biodiversity;
- common solutions may be found for similar problems;
- unsuccessful control and eradication efforts in one country may serve as a warning to neighbouring countries facing similar threats;
- duplication of effort in scientific studies may be avoided, allowing for research efforts and funding to be more productively targeted;
- high-risk species and pathways within areas and regions may be identified;
- knowledge of a species’ past invasiveness can be highlighted to facilitate early warning and risk analysis procedures.

Regional standard setting and harmonisation

Where countries are vulnerable to a species being introduced into one country and then spreading to neighbouring countries, regional agreements can play an important role in formalising the common commitment of all countries in the region to a high level of environmental protection. More specifically, they can promote the harmonisation of national controls by providing for the development of common
legal frameworks for cooperation beyond national borders  Module 6

standards (e.g. Regional Standards for Phytosanitary Measures) and/or technical guidance on common problems (see the example above of the Bern Convention in Europe).

Formal regional recommendations can provide valuable impetus for countries to improve their respective national frameworks and thus reduce the risk that one country's investment in prevention and management efforts are undermined by lax standards in a neighbouring country.

Environmental impact assessment and prior notification

Regional agreements can play a key role in ensuring that countries inform each other in advance concerning proposed projects that involve the introduction of alien species or may facilitate them spreading beyond their natural range. Specifically, they should encourage countries to introduce legally-backed procedures to prohibit such introductions unless the environmental impacts (including those on the environments of neighbouring countries) have first been independently assessed and found to be acceptable.

This type of provision corresponds to the CBD requirement for States to carry out of EIAs for projects, programmes and policies likely to have a significant adverse impact on biodiversity and to ensure notification, exchange of information and consultation with neighbouring countries that may be affected by damaging processes and activities (Article 14).

The SADC Fisheries Protocol (2001) provides that a State party must not introduce exotic species or genetically modified species to shared aquatic ecosystems, including the full extent of the river basin, unless the affected State parties agree to the introduction. State parties are also required to establish standard guidelines and regulations for the application of environmental impact assessments.

The African Convention on the Conservation of Nature and Natural Resources (Maputo, 2003) mandates cooperation between Parties and, where appropriate and possible, with other States:

- whenever a natural resource or an ecosystem is transboundary, the Parties concerned shall undertake to cooperate in the conservation, development and management of such resource or ecosystem and if the need arises, set up interstate commissions for their conservation and sustainable use (Art.XXII.2.e);
- the Parties shall, prior to the export of hazardous substances, or of alien or modified organisms, undertake to secure the prior informed consent of the importing, and where appropriate, transit States (Art.XXII.2.f).

Consistent with the CBD and this type of regional precedent, it is strongly recommended that national legislation establish procedures for prior consultation of potentially affected countries, along with other stakeholders, during the EIA process applicable to invasive alien species introductions.

Regional strategy development

Regional organisations can not only provide impetus for developing national strategies but also sponsor the production of dedicated regional strategies that focus on priority issues affecting the whole region. A holistic regional approach is very important to guide national efforts and allocate available resources effectively. For example, oceanic regions with many islands will include a focus on shipping-related pathways whereas a terrestrial region with many shared borders will have to address a far wider range of pathways, including infrastructure such as regional highways.

Several regions are currently developing or updating strategies (see also 2F). The first adopted in the world was the South Pacific Regional Environment Programme’s Regional Invasive Species Strategy (2000): this was updated in 2008 and is awaiting endorsement from member countries and territories. It will be accompanied by a five-year Action Plan detailing the major initiatives to be taken to manage invasive species in Pacific countries and across the region. In 2006, a Caribbean Regional Invasive Species Intervention Strategy (CRISIS) was developed and will be implemented through the Caribbean Invasive Species Surveillance and Information Programme (Waugh, 2008).
Institutional support for regional capacity-building

The need to increase national capacity to implement strategies and prevention policies has been emphasised throughout the Toolkit. Many countries, particularly developing countries, face major capacity constraints that restrict their ability to respond effectively to invasive alien species. They often lack the operational capacity or financial resources to implement, enforce and monitor comprehensive systems and are faced with insufficient staff numbers and expertise as well as lack of adequate equipment and facilities.

Regional organisations provide excellent opportunities for officials from different countries to exchange information and best practices and build relationships. Training and capacity-building can be geared to the needs of the region.

Consideration should be given to using regional mechanisms or structures to facilitate more cost-effective performance of tasks such as:

- developing regional lists of species of concern;
- conducting regional risk assessments of pathways and building regional capacity to conduct risk assessments;
- standardising taxonomy and terminology within the region;
- arranging training courses;
- regional awareness building and communication targeted at decision-makers and major economic stakeholders;
- tackling regional pathway risks associated with e.g. international development and assistance, humanitarian relief and smuggling.

Box 41: examples of regional capacity-building initiatives

The Commission for Environmental Cooperation for North America (CEC) covers Mexico, the United States and Canada. It has supported development of trilateral guidelines for assessing risk analysis of aquatic IAS to biodiversity; case studies on IAS socio-economic impacts; and guidelines for a standard on pathways-based risk assessment of quarantine and IAS introductions (in collaboration with the North American Plant Protection Organisation). CEC-backed guidance has helped to harmonise legal frameworks and has benefited Mexico’s efforts for IAS prevention and control (March 2008).

The Pacific Invasives Learning Network (http://www.sprep.org/PILN/index.htm) is currently developing specific capacity building activities in four main technical areas: marine invasive species, bio-security, weed management and rat management (Annual meeting, Moorea 2007).

The Secretariat of the Pacific Community (www.spc.int) operates the Pacific Act Prevention Programme, which promotes coordinated information sharing, cooperation, emergency surveillance, rapid response and political support to tackle incursions of the Red Imported Fire Ant from all sides of the Pacific Basin.

Consideration of export-related risks

Cooperation within and between regions can foster a more responsible attitude to export-related risks. Consistent with the obligation to avoid transboundary damage, and in accordance with CBD Guideline 4 (see 3C), the export of species known to present a high risk of invasiveness should be avoided without prior informed approval from the competent authority in the country of destination.

Countries and regions with similar ecological and biogeographical characteristics may build dialogue and share information to help this process. Brazil and South Africa already cooperate informally for this purpose. One area where inter-regional cooperation can work well is in developing reciprocal opportunities for biocontrol.

6E Interface between national regulations and the international trade regime

Overview of the international trade regime

Invasive alien species affect not only domestic interests but also a country’s trade partnerships and export markets. The design of national import regulations to minimise the risk of introducing unwanted organisms needs to take account of World Trade Organisation (WTO) rules and disciplines.
This is a complex area of law and the drafting team will need to involve specialists from the trade, plant protection and other key sectors in your country. Capacity-building and training materials are available from WTO (http://www.wto.org) together with a range of clearly written documents that will provide very helpful explanatory materials. In addition, guidance for development of import regulations for plant protection is available through the IPPC, whose secretariat is hosted by the United Nations Food and Agriculture Organisation (FAO).

WTO is the international body that establishes the overarching context for international trade and, through specific agreements, determines what measures member countries can take without creating unfair barriers to trade. For legal draftsmen, the basic challenge is to achieve the desired level of protection – against invasive threats from outside the country – without falling into the trap of protectionism and exposing the country to the risk of legal challenge.

The WTO system is supplemented by other multilateral trade agreements (between States/economic communities in the same region or in different geographic regions) and by bilateral agreements that regulate trade between two trading partners.

Key WTO agreements that cover trade in goods, services and intellectual property are listed in Table 7.

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<thead>
<tr>
<th>Umbrella</th>
<th>Agreement establishing WTO</th>
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</thead>
<tbody>
<tr>
<td>Basic principles</td>
<td>Goods</td>
</tr>
<tr>
<td></td>
<td>General Agreement on Tariffs and Trade (GATT)</td>
</tr>
<tr>
<td>Additional details</td>
<td>Other goods agreements and annexes</td>
</tr>
<tr>
<td>Market access commitments</td>
<td>Countries’ schedules of commitments</td>
</tr>
<tr>
<td>Dispute settlement</td>
<td>Dispute settlement</td>
</tr>
<tr>
<td>Transparency</td>
<td>Trade policy reviews</td>
</tr>
</tbody>
</table>

The General Agreement on Tariffs and Trade (GATT) establishes rules to prevent countries imposing barriers to trade. More specifically, it:

- prohibits national rules that constitute an arbitrary or unjustifiable distinction between countries;
- prohibits State parties from discriminating between similar or “like” products from different origins and requires importing countries to treat (1) imported products no less favourably than similar domestic products (the “national treatment” obligation) and (2) products imported from a particular country no less favourably than similar products imported from any other country (the “most favoured nation” obligation);
- provides that a free-trade area/customs union must not impose trade barriers against non-members that are higher than those in place before the free-trade area/customs union was created.

This framework is complemented by WTO agreements dealing with specific issues. The two most relevant to trade aspects of invasive species are described below.

**WTO Agreement on the Application of Sanitary and Phytosanitary Measures**

The SPS Agreement seeks to protect human, animal or plant health/life from risks arising from the entry, establishment or spread of pests, diseases, or disease-causing organisms where these may directly or indirectly affect international trade. At national level, plant protection and quarantine services will be familiar with the requirements and procedures of this Agreement because this governs many aspects of their day-to-day operations.
The Agreement provides that any SPS measure must be applied only to the extent necessary to protect human, animal or plant life or health, be based on scientific principles and not be maintained without sufficient scientific evidence (Art 2.2).

It encourages WTO members to use international standards, guidelines and recommendations when developing SPS measures. At present, it recognises three organisations for international standard-setting: the International Plant Protection Convention, the World Organisation for Animal Health and, for food safety standards, the Codex Alimentarius Commission. The SPS Committee may recognise other organisations for matters not covered by those three organisations but this has not happened to date.

Art.3 of the Agreement envisages three types of SPS measures:

- those that “conform to” international standards (Art.3.1)

This is where a national measure embodies an international standard completely. Such measures are presumed to be consistent with the SPS Agreement, are cheaper to develop and implement and contribute to greater harmonisation, thus reducing compliance costs.

However, experience to date shows that collective negotiation of standards generally reflects a lower common denominator of protectiveness with trade facilitation as the main objective. Developing countries may lack the resources, expertise or scientific information to participate effectively in standard development and ensure their concerns are taken into account (Burgiel et al, 2008).

- those that provide for higher levels of protection than international standards (Art.3.3).

A country has the right to determine the appropriate level of protection to protect human, animal or plant life of health within its territory. However, nationally-developed SPS measures must meet requirements concerning scientific justification, risk assessment, non-discrimination, consistency and least trade-restrictiveness.

- those that are “based on” international standards.

Here, countries tailor the relevant standard to their national circumstances (such measures do not benefit from an automatic presumption of consistency).

The Agreement on Technical Barriers to Trade

The TBT Agreement aims to prevent national regulations, standards, testing and certification procedures from being used to create unfair barriers to trade. It is relevant to broader IAS issues e.g. identification, documentation, labelling and traceability systems.

The consistency of a national import measure with the TBT Agreement depends on whether it is necessary to fulfil a ‘legitimate objective. Such objectives include “national security requirements, the prevention of deceptive practices, protection of human health or safety, animal or plant life or health, or the environment”. Scientific data may be considered in deciding whether a legitimate objective exists (Article 2.2).

National regulation needs to meet several criteria:

- imported products must be treated no less favourably than “like” domestic products, and “like” products from other countries;
- regulations must be no more trade restrictive than necessary to achieve their objectives;
- the regulations must be based on international standards, to the extent they exist or are imminent, unless they would not permit the achievement of the objectives sought;
- countries must recognise other members’ measures as technically equivalent, if those measures meet the stated objectives;
- members shall ensure that all technical regulations adopted are promptly published.
Designing national invasive alien species measures that may affect trade

When developing national measures, drafters must take the above principles and rules carefully into account.

Precaution and ‘provisional measures’

The main area in which legal uncertainty can arise concerns the application of the precautionary principle to trade-related measures as precaution is only implicitly referenced in international trade rules and the small amount of available case law is quite difficult to interpret in a consistent way.

The following indicators provide outline guidance but the drafting team will find more detailed support in easily available publications (see e.g. Burgiel et al, 2006; Perrault et al, 2003; Shine, 2006).

Under the SPS Agreement, measures must be based on an assessment of the risks to human, animal or plant life or health. Risk assessment must satisfy three requirements:

- identify the risks or threats to be prevented and the potential consequences;
- evaluate the likelihood of entry, establishment and spread of an species and the potential consequences (baseline risk);
- evaluate the likelihood of entry, establishment and spread of the species in the event that a chosen SPS measure is applied.

States should also consider: available scientific evidence; relevant process and production methods; inspection, sampling and testing methods; prevalence of specific diseases or pests; relevant ecological conditions; and quarantine and other treatments (Art.5, SPS Agreement).

States do not have to demonstrate a particular threshold of risk although past WTO rulings interpret these provisions quite strictly. The evaluation may include qualitative as well as quantitative considerations and should be specific to the product or pathway risk under consideration, not general or theoretical (Burgiel et al, 2006).

Importing countries may base national measures on risk assessment carried out by a relevant international or regional organisation (e.g. EPPO). This may be a helpful starting point, particularly for countries with limited capacity, but consideration still needs to be given to specific national conditions and risks.

Where relevant scientific information is insufficient, a provisional SPS measure may be adopted on the basis of available pertinent information. A member country must seek to obtain the additional information necessary for a more objective assessment of risk and review the measure within a reasonable period of time (Art.5.7).

This is the point at which precaution can be applied to trade-related decision-making. Its application requires some scientific evidence to be operational. The job of the competent authority is to review the risk analysis to decide whether potential risks associated with an import/pathway are acceptable and to select a measure authorising or prohibiting entry or imposing other restrictions. Restrictions imposed must not only be technically justified (clearly based on available and documented scientific evidence) but also be consistent with basic WTO principles (see below).

A robust approach to import regulation is potentially compatible with international trade rules. New Zealand’s adoption of comprehensive Import Health Standards and a multiple species listing approach show that countries do have scope to develop rigorous national frameworks (Miller et al, 2006).

Consistency

Once a country determines what level of risk it is willing to tolerate in the flow of goods across its borders, it should apply this consistently across a comparable range of threats. In particular, it should ensure…

\[\text{References}\]

\[11\] Preamble to the SPS Agreement; sections 3.3 and 5.7.


broadly consistent treatment of different pathways by which the same pest could be introduced to avoid the risk of measures being found arbitrary

Countries should also ensure consistency in regulating similar risks in domestic and international commerce. Where an invasive alien species has already become established in some part of the country, countries cannot impose import controls with also adopting domestic regulations for eradication, containment, and/or control.

Necessity/Least Trade-Restrictiveness

SPS measures that might affect trade must not be more trade-restrictive than required to achieve their appropriate level of sanitary or phytosanitary protection, taking into account technical and economic feasibility (Art.5.6). Here, scientific evidence is needed to support a reasoned explanation for how potential threats link to prevention measures.

Burden of proof

An importing country that adopts a prevention measure is presumed to have met its SPS obligations. This means that an exporting country that objects to the measure has to present a prima facie case of inconsistency. Only if it succeeds does the importing country have to submit evidence that it complied with the Agreement.

Transparency

WTO member countries must notify other countries of proposals to adopt new or changed measures, respond to requests for more information and provide the text of adopted measures.

6F References


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14 e.g. In Australia - Salmon, the WTO dispute settlement body found that restrictions to prevent disease in imports of frozen salmon were arbitrary because they were significantly tighter than measures governing imports of live ornamental fish and frozen herring for bait, which present a similar level of risk.
Key readings
on legal issues
relevant to invasives
key readings


CBD Guiding Principles, 2002. Annexed to Decision VI/23 (Alien species that threaten ecosystems, habitats or species) of the Conference of the Parties to the Convention on Biological Diversity


Cornett, V. 2008. Marco Legal Aplicable a la Introducción de Especies Exóticas en México (Existing legal framework with incidence on IAS in Mexico). Legal review carried out on behalf of The Nature Conservancy, Mexico (http://www.nature.org/ contact person: Ignacio March)


Jenkins, P., 2002, Paying for Protection from Invasive Species. Issues in Science and Technology, Fall 2002

key readings


