



Kunming-Montreal
Global Biodiversity Framework
Target 6 on invasive alien species

INVASIVE ALIEN SPECIES TOOLKIT

**for Target 6 of the
Kunming-Montreal Global
Biodiversity Framework**





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Cover photo

Green iguana, *Iguana iguana*, a popular pet has become an invasive alien species across some of the islands of the Caribbean and Florida in the USA © Pedro Genaro Rodriguez CC BY NC



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Contents

Acknowledgements	iv
1. Introduction	1
1.1. Background	1
1.2. Purpose of the toolkit	1
1.3. How to use the toolkit	1
2. Toolkit	3
2.1. Invasive alien species	3
2.1.1. What are invasive alien species?	3
2.1.2. Why are invasive alien species a problem?	3
2.1.3. What can be done?	4
2.2. Invasive alien species under the CBD	4
2.2.1. CBD Article 8(h)	4
2.2.2. The Kunming-Montreal Global Biodiversity Framework	5
2.3. Implementation of actions at a national level towards Target 6	6
2.3.1. What do we need to know to meet Target 6?	6
2.3.2. What actions can be implemented?	7
2.4. Considerations for the implementation of Target 6	17
2.4.1. Whole-of-government and whole-of-society approach	17
2.4.2. Contribution and rights of indigenous peoples and local communities	17
2.4.3. National circumstances, priorities and capabilities	18
2.4.4. Interactions with other drivers of biodiversity loss	18
2.4.5. Consistency with international agreements or instruments	18
2.4.6. Biodiversity and health	19
2.5. Indicator for the implementation of Target 6	20
Annexes	21
Annex 1. IAS Toolkit Glossary	22
Annex 2. Resources to support the development and implementation of actions towards Target 6	27
Annex 3. Guidance for the development and implementation of a National Invasive Species Strategy and Action Plan (NISSAP)	34

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1. Introduction

1.1. Background

In response to a request made in decision XI/28¹ a toolkit to facilitate Parties to achieve Aichi Biodiversity Target 9 on invasive alien species (IAS) was produced by the Global Invasive Alien Species Information (GIASI) Partnership and the Secretariat of the Convention on Biological Diversity in 2014. The purpose of the toolkit was to provide information useful for Parties in the achievement of Aichi Biodiversity Target 9.

Following the adoption of the Kunming-Montreal Global Biodiversity Framework², in decision 15/27³ Parties requested the Executive Secretary to develop advice, in collaboration with the Inter-Agency Liaison Group on IAS, on the evaluation of existing capacity and needs for monitoring, preventing and controlling the introduction and spread of IAS and their harmful effects to biodiversity, taking into account relevant multilateral instruments, and thereafter as relevant, update the CBD online toolkit on invasive alien species. In response to this request, the CBD Secretariat and IUCN in cooperation with the Inter-Agency Liaison Group on IAS have produced this non-prescriptive toolkit which replaces the previous tool and provides new information in line with Target 6.

1.2. Purpose of the toolkit

The purpose of this toolkit is to provide information to assist Parties in the implementation of Target 6 of Kunming-Montreal Global Biodiversity Framework.

1.3. How to use the toolkit

This toolkit should be used on voluntary basis to assist Parties, and other actors, in the implementation of actions towards Target 6 of the Kunming-Montreal Global Biodiversity Framework. It provides a brief overview of IAS and Target 6 and presents the key actions that can be taken. The Annexes to the toolkit provide a glossary of key terms, a list of resources to support the development and implementation of the actions, and information on how to develop a National Invasive Species Strategy and Action Plan (NISSAP).

¹ [CBD/COP/DEC/XI/28](#)

² [CBD/COP/DEC/15/4](#)

³ [CBD/COP/DEC/15/27](#)



2. Toolkit

2.1. Invasive alien species

2.1.1. What are invasive alien species?

An **alien species** is a species, subspecies or lower taxon, introduced outside its natural past or present distribution; this includes any part, gametes, seeds, eggs, or propagules of such species that might survive and subsequently reproduce.⁴ An **invasive alien species** is an alien species whose introduction and/or spread threaten biological diversity.

Alien species are introduced to areas outside their natural range by human activities, and the mechanisms in which they are moved are termed **pathways**. These can be intentional, for example as pets or aquarium fish, or unintentional such as a stowaway in a shipping container. See Annex 1 for a glossary of key terms related to invasive alien species and this toolkit.

2.1.2. Why are invasive alien species a problem?

Invasive alien species are one of the major drivers of biodiversity loss, and cause dramatic, and in some cases irreversible changes to ecosystems. They have contributed solely or alongside other drivers to 60

per cent of recorded global extinctions and are the only driver in 16 per cent of documented global extinctions.⁵ Their impacts occur through different interactions, such as out-competing or predating upon native species, hybridisation, transmission of diseases, or biofouling.

Invasive alien species can also negatively affect economies and infrastructure across different sectors, food and water security, and human health and wellbeing. The impacts are often felt the most by communities with the greatest direct dependence upon nature, including indigenous peoples and local communities. The global economic costs of invasive alien species have quadrupled every decade since 1970, and in 2019 the annual costs of biological invasions were estimated to exceed US\$423 billion.

The number of invasive alien species and their impacts are increasing across all regions of the Earth.⁵ Demographic, economic, and land-use and sea-use changes and their interlinkages with climate change and other drivers of biodiversity loss will continue to increase the frequency and extent of biological invasions, and the magnitude of impacts from invasive alien species.

⁴ [CBD/COP/DEC/VII/23](#) Alien species that threaten ecosystems, habitats or species.

⁵ IPBES. (2023). Summary for Policymakers of the Thematic Assessment Report on Invasive Alien Species and their Control of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. Roy, H.E., et al. (eds.). IPBES secretariat, Bonn, Germany. <https://doi.org/10.5281/zenodo.7430692>



Pueraria montana © Eric Schmit CBO

2.1.3. What can be done?

There are effective actions that can be implemented to eliminate, minimize, reduce and or mitigate the impacts of invasive alien species on biodiversity and ecosystem services. **Pathway management and border security measures** can be used to prevent introductions. **Early detection and rapid response capacity and capability** can stop alien species that are introduced or at an early stage of invasion from becoming established and spreading. In addition,

eradication, containment, and long-term control of already established invasive alien species populations can be undertaken. Such measures are more effective when an integrated governance approach is taken, including cross-sector, multi-stakeholder, and regional and international engagement. This toolkit sets out these key actions in more detail in Section 2.3. below, and also provides information on resources to support their development and implementation at a national level in Annex 2.

2.2. Invasive alien species under the CBD

2.2.1. CBD Article 8(h)

The mandate for work on invasive alien species under the CBD comes from Article 8(h)⁶ of the convention text, which commits Parties to *“as far as possible and as appropriate, prevent the introduction of, control or eradicate those alien species which threaten*

ecosystems, habitats or species”. Additionally decision VI/23⁷ was adopted in 2002 and sets out the guiding principles for the implementation of Article 8(h). Since then, a number of COP decisions have been adopted⁸ on various topics including the provision of guidance, to support Parties in addressing invasive alien species.

⁶ [CBD Article 8](#). In-situ conservation

⁷ [CBD/COP/DEC/VI/23](#) Alien species that threaten ecosystems, habitats or species

⁸ [COP Decisions on Invasive alien species](#)

2.2.2. The Kunming-Montreal Global Biodiversity Framework

The Kunming-Montreal Global Biodiversity Framework (KMGBF) adopted by Parties to the Convention at COP 15 has 23 action-oriented global targets for urgent action over the decade to 2030. Target 6 is focused on IAS,⁹ and aims to *‘Eliminate, minimize, reduce and or mitigate the impacts of invasive alien species on biodiversity and ecosystem services by identifying and managing pathways of the introduction of alien species, preventing the introduction and establishment of priority invasive alien species, reducing the rates of introduction and establishment of other known or potential invasive alien species by at least 50 per cent, by 2030, eradicating or controlling invasive alien species especially in priority sites, such as islands’*.

Target 6 can be broken down into the overall aim, and three separate elements or actions (see Box 1). The first two elements aim at addressing impacts from new invasive alien species, through the management of pathways of introduction, and by preventing

the introduction and establishment of invasive alien species. The types of actions that will support these elements include border security, legislation, surveillance, and early detection and rapid response. The target requires that *priority* invasive alien species are prevented from introduction and establishment, but the species classed as a ‘priority’ is to be determined at a national level. This could include species that are likely to have the greatest impacts upon biodiversity if they were to become established. The only quantitative aspect of the target relates to the rates of introduction and establishment for *other* (i.e. non-priority) invasive alien species, which needs to reduce by 50% by 2030. To achieve these elements of the target, the pathways of introduction will need to be identified and prioritised so that resources are focused on addressing the pathways that are the most important. In addition, the quantitative aspect of the target will require an understanding of the existing or baseline rate of introductions and establishments within the country, and for surveillance and monitoring to be undertaken to identify and record new introductions and establishments.

Box 1. Kunming-Montreal Global Biodiversity Framework Target 6 on invasive alien species

The target text is presented below, broken down by colour into its **overall aim** and **elements (actions)**, one of which has a **quantitative** aspect.

Eliminate, minimize, reduce and or mitigate the impacts of invasive alien species on biodiversity and ecosystem services by:

- i. identifying and managing pathways of introduction of alien species,
- ii. preventing the introduction and establishment of priority invasive alien species, reducing the rates of introduction and establishment of other known or potential invasive alien species by at least 50 per cent, by 2030,
- iii. eradicating or controlling invasive alien species especially in priority sites, such as islands.

The third element of the target aims to address impacts from those invasive alien species that are already established within a territory. It requires the eradication or control of invasive alien species, especially in *priority* sites such as islands. Again, the identification of which sites are a priority is to be done at a national level but could include those that are important for biodiversity and ecosystem services and

vulnerable to, or are facing significant impacts from, invasive alien species. Those invasive alien species that are currently having the greatest impact or may do so in the near future (e.g. due to climate change or other drivers of change), should be prioritised for eradication. Where this is not feasible, their populations should be contained and controlled so that their impacts are mitigated.

9 Target 6 <https://www.cbd.int/gbif/targets/6>

Actions that can be implemented to meet the different elements of the target are outlined in Section 2.3 below, along with the baseline information and prioritisation on pathways of introduction, invasive alien species, and sites that is needed to inform these actions and track progress (see also Figure 1).

The KMGBF also has a set of considerations for its implementation, which are relevant when actions are taken towards the targets. Section 2.4 below provides information in the context of invasive alien species and Target 6, that can be considered when addressing these considerations of the KMGBF.

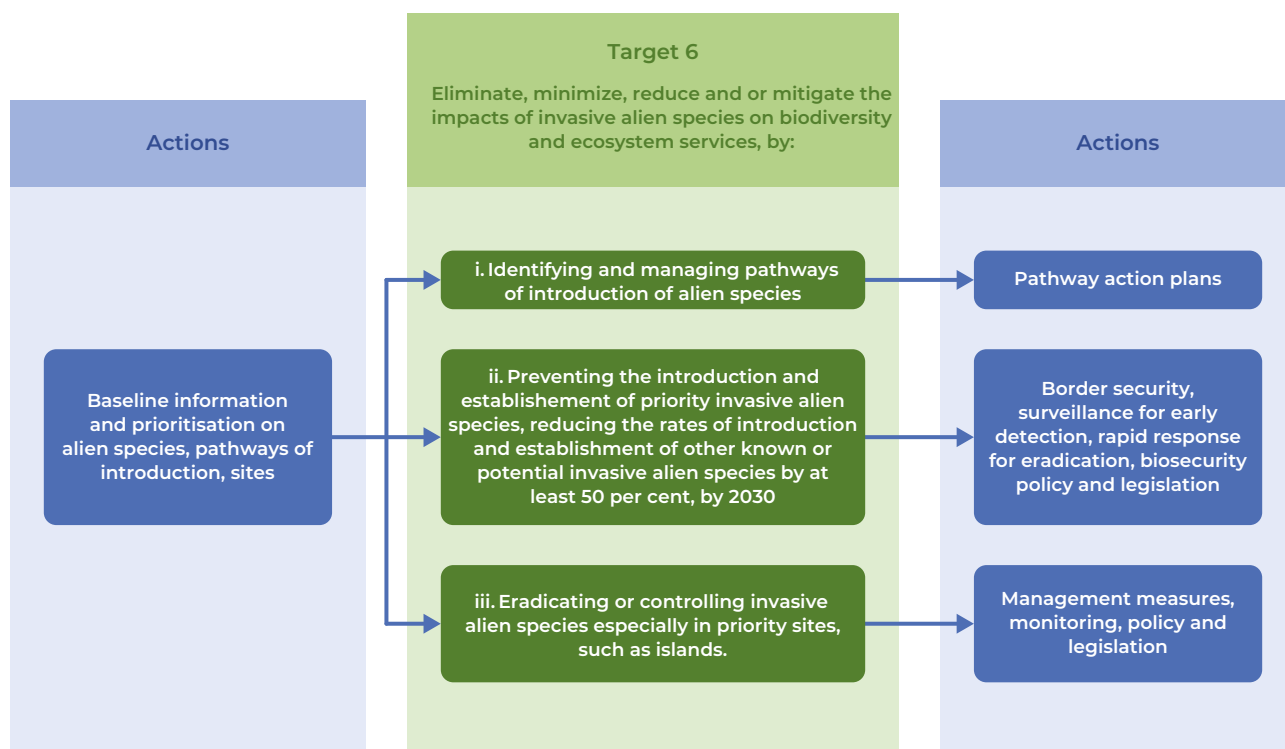


Figure 1. Overview of the actions that can be taken towards the different elements of Target 6.

2.3. Implementation of actions at a national level towards Target 6

This section provides information useful for the development and implementation of actions at a national level to address invasive alien species for Target 6.

2.3.1. What do we need to know to meet Target 6?

The series of guiding questions below can be used to help set out what essential pieces of information need to be known to produce the required baseline information in order to develop the actions needed for Target 6 (Figure 2).

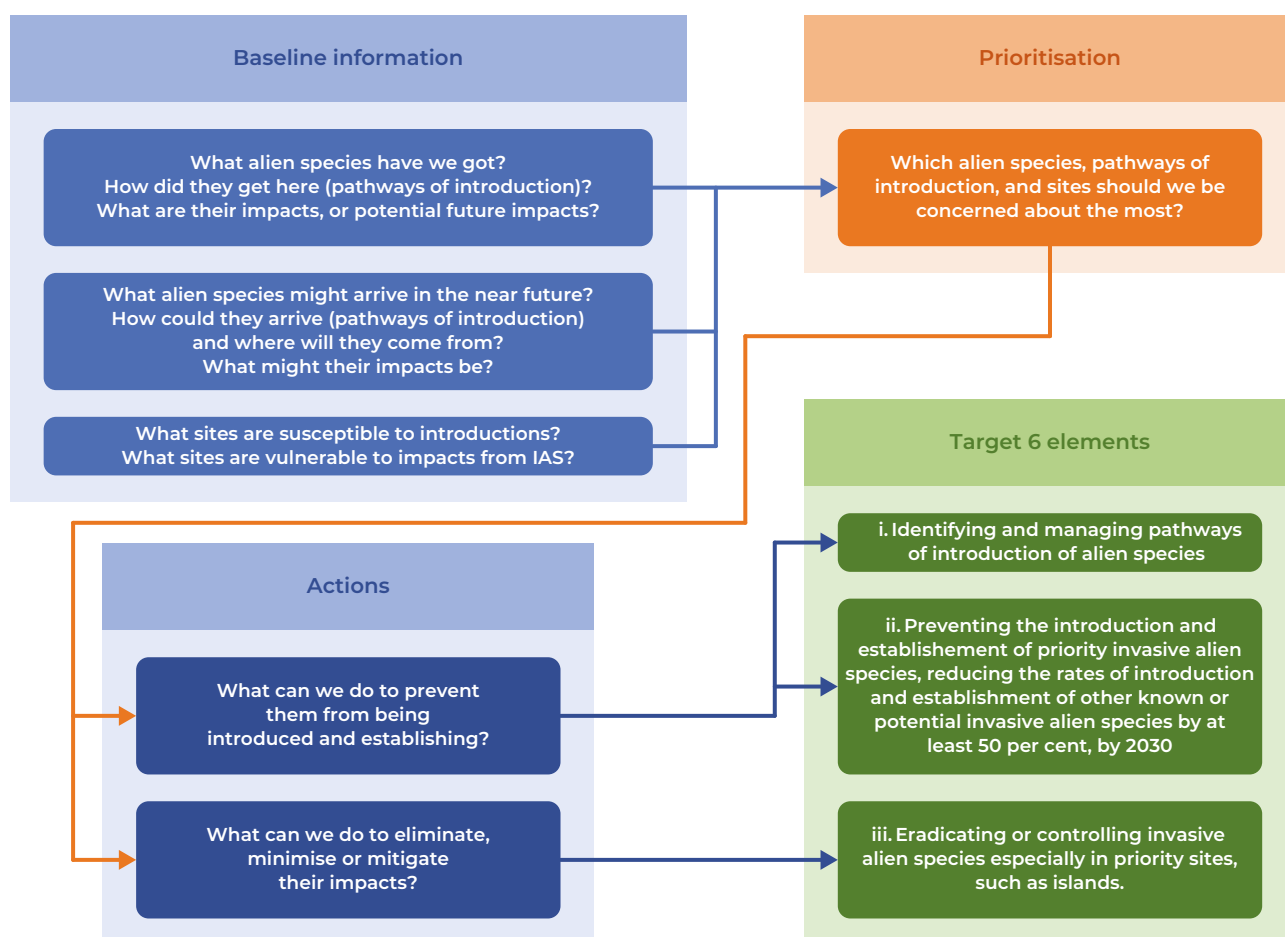


Figure 2. What do we need to know for Target 6? The questions (in blue) can guide and inform the development of actions to address the three elements of Target 6 (in green).

2.3.2. What actions can be implemented?

The actions discussed in this section will help answer the guiding questions and are deemed to be important for successfully addressing the different elements of Target 6. The actions are grouped into four broad categories, one for baseline information and prioritisation, and one for each of the three Target 6 elements. See Annex 2 which lists key resources that can support in the development and implementation of the actions discussed. Figure 3 also presents the different stages of an invasive alien species invasion over time, showing the corresponding elements of Target 6 and the actions that can be taken which are set out in this toolkit.

These actions are voluntary and need to be developed and implemented in accordance with national circumstances and priorities. It should be stressed that progress can be made with limited resources, and not all these actions need to be undertaken

in order to see positive outcomes. As stated in the Guiding Principles for the implementation of CBD Article 8(h), preventative measures are generally more cost-effective than measures taken following the introduction and establishment of an invasive alien species.

When developing and implementing these actions, it is important that a cross-sectoral approach is taken, that recognises the broad impacts many invasive alien species also have across agriculture and other economic sectors, and human health and wellbeing. It is likely that relevant measures are already being implemented through these sectors, for example biosecurity procedures to protect agriculture and aquaculture from pests and diseases, and they present opportunities for synergies and collaboration to ensure that threats to biodiversity are also addressed. See Section 2.4 below that sets out the broader considerations for implementing actions for Target 6.

While the actions set out in this toolkit can be implemented independently, it is recommended that they are developed as part of a formal national invasive species strategy that will improve the governance of invasive alien species management. Such an approach can be taken by explicitly including actions addressing Target 6 within the National Biodiversity Strategy and Action Plan (NBSAP), or by developing a more comprehensive and cross-sectoral **National Invasive Species Strategy and Action Plan (NISSAP)**.¹⁰ Addressing invasive alien species through the development and implementation of

a NISSAP will improve the likelihood that a strategic approach is taken, so that the correct priorities are being addressed in the most cost-effective way, that measures are sustainable and adaptable to reflect changing circumstances, and that a cross-sectoral integrated governance approach is taken.¹¹ **Annex 3 presents guidance on how to develop a NISSAP.** It takes the actions to meet Target 6 presented in the Toolkit and places them alongside other additional measures within a holistic strategic framework to develop and implement a NISSAP.

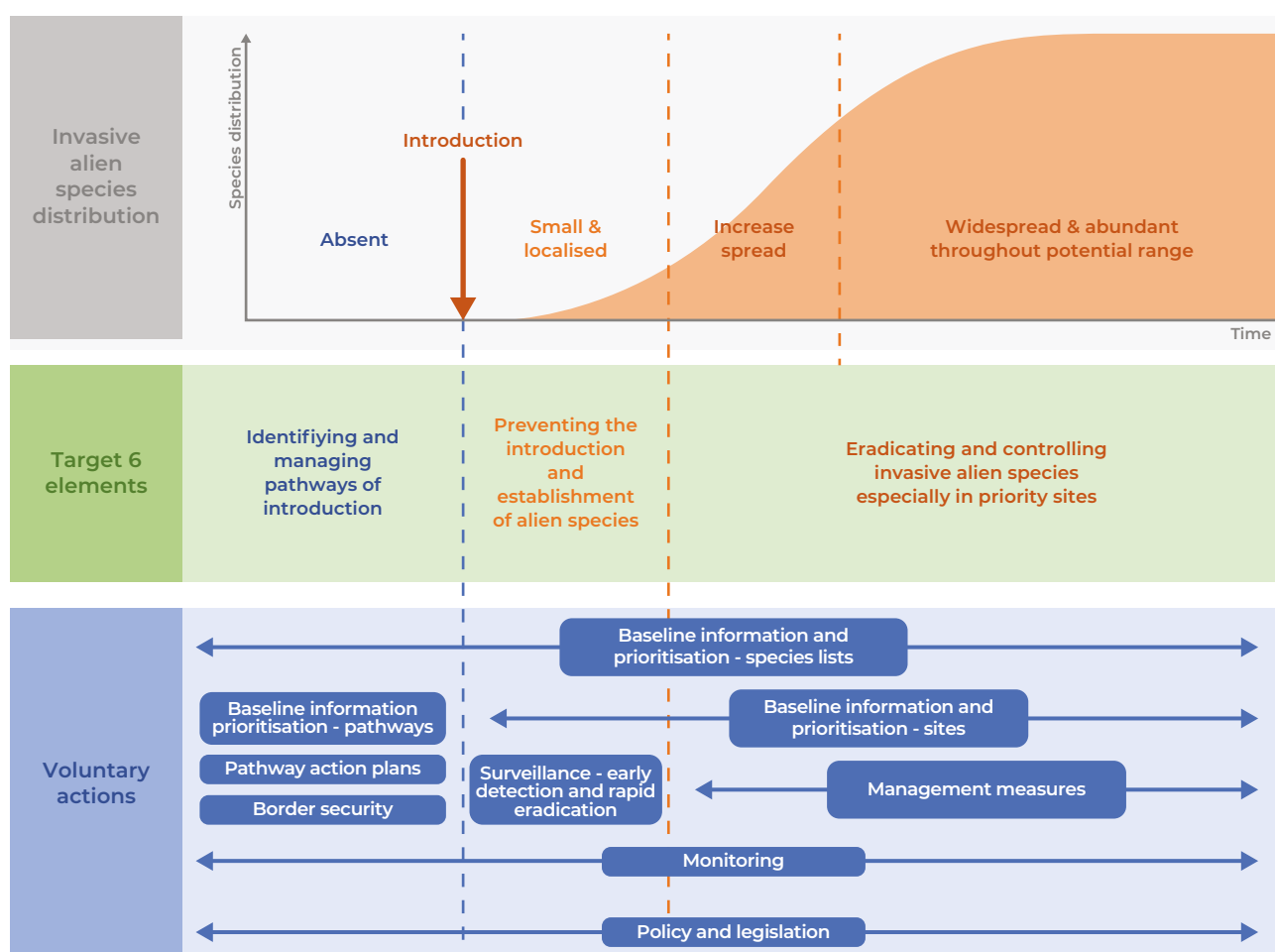


Figure 3. How the different actions (blue box) address different elements of Target 6 (green box), and the corresponding invasion stages.

¹⁰ [CBD COP Decision VI/23](#) reaffirms the importance of national and regional invasive alien species strategies and action plans to address the threats posed to biodiversity of invasive alien species.

¹¹ The IPBES thematic assessment on invasive alien species (2023) defines *integrated governance for biological invasions* as the establishment of relationships between the roles of actors, institutions and instruments, and involving as appropriate all those elements of the socio-ecological system that characterize biological invasion and its management, for the purpose of identifying the strategic interventions needed to improve invasive alien species prevention and control outcomes (definition originated from this assessment, from the thinking on integrated environmental governance).

i. **Actions for compiling baseline information and prioritising invasive alien species, pathways of introduction, and sites**

Compiling and analysing available baseline information on alien and invasive alien species, pathways of introductions, and sites will inform all actions towards Target 6. Having access to this information will mean that the actions taken to prevent the introduction and establishment, and management of invasive alien species will be built on the best available evidence and therefore more likely to be effective. It is important to stress that knowledge gaps will always exist, and these should not stop action being taken.

Guiding questions that will be answered:

- What alien species have we got, how and when did they get here (pathways of introduction), and what are their impacts?
- What alien species might arrive in the near future, how could they arrive (pathways of introduction), and what might their impacts be?
- What sites are susceptible to introductions and establishments, or vulnerable to impacts from invasive alien species?
- Which alien species, pathways of introduction, and sites should we be concerned about the most?

Before starting to compile baseline information, it is important to note that it is likely that other actors possess relevant information and should be engaged with, if possible. This includes for instance, national and sub-national government agencies, such as those responsible for protected areas or inland waters, agriculture, forestry, and fisheries. In

addition, indigenous peoples and local communities, academic institutions, and civil society organisations, especially those with responsibility for land management, may be able to provide useful information. Identifying who has relevant information will require an integrated governance approach to ensure that the baseline information is as comprehensive as possible.

- Species lists

A list incorporating current and future alien species is the fundamental building block to support the prioritisation needed for developing many of the actions towards meeting Target 6.

Information on the invasive alien species that are currently known or suspected to have the greatest impacts upon nature in the country is usually the most accessible, and a good place to start. This can be extended to include a longer list of alien species known to have been recorded in the country. As a starting point, there are freely available global and regional databases including the Global Register of Introduced and Invasive Species - GRIIS¹² which provides validated national checklists of alien species. Additionally, the Alien Species First Record Database¹³ can also provide information on first records, if available. To help in the prioritisation process, additional information such as evidence of environmental and socio-economic impacts,¹⁴ and the plausible pathways of introduction, will be useful to collate if available. Alien species lists do not need to be complete to be useful, partial lists can provide a good starting point for informing actions. If feasible, the establishment of a national database of alien species, using commonly accepted standardised terminology, will support efforts to meet Target 6, including in prioritisation, monitoring, and management.

To generate a list of alien species not yet present, but likely to be introduced in the near future, a horizon

¹² The Global Register of Introduced and Invasive Species - GRIIS. Produced by the IUCN SSC Invasive Species Specialist Group (ISSG) within the framework of activities of the Global Invasive Alien Species Information Partnership (GIASIP) <https://griis.org/> (also available via GBIF <https://doi.org/10.15468/puy8bx>)

¹³ Seebens, H., Blackburn, T.M., Dyer, E.E., (2017). No saturation in the accumulation of alien species worldwide. *Nature Communications*, Vol. 8 (February) <https://doi.org/10.1038/ncomms14435>. The Global Alien Species First Record Database resulting from this paper can be found here: <https://dataportal.senckenberg.de/dataset/global-alien-species-first-record-database>

¹⁴ Classifying alien species in terms of the magnitude of their environmental impacts can be done by applying the IUCN Environmental Impact Classification for Alien Taxa - EICAT Categories and Criteria <https://doi.org/10.2305/IUCN.CH.2020.05.en>. Note that all global EICAT assessments are made available on the IUCN Global Invasive Species Database. <https://www.iucngisd.org/gisd/>



scanning approach can be used.¹⁵ This usually adopts a structured process involving expert elicitation and consensus building and does not need to be comprehensive to be informative, as it can focus on specific taxonomic groups, realms or pathways that are of most concern. There are a number of global and regional databases that can assist in identification of the alien species not yet introduced or established, their pathways of introduction, likelihood of introduction and establishment, and potential impacts (see Annex 2 resources).

This information can be used to support the prioritisation of high-risk species that may require regulation or contingency planning to prevent introduction and establishment, and of species for eradication or control to eliminate or reduce their impacts. For species that are not yet established, a formal risk assessment can be undertaken. This is a systematic and evidence-based process that considers the separate steps within the biological

invasion process and potential impacts of species, evaluating each step and determining the overall risk. The level of detail of information included in the risk assessment will depend on the intended use, for example those used to support legislation (e.g. banning trade) will usually need to be more detailed. There are several existing risk assessment templates and processes that can be adopted.¹⁶ In addition, a risk management approach can be taken to assess the feasibility of management options if the species are introduced. This allows efforts and resources to be focused on those invasive alien species that have both a high risk of introduction, establishment and impact, and that can be eradicated or controlled if they arrive. A risk management approach can also be used alongside evidence of impacts, to help prioritise those invasive alien species that are already established in a territory. This will identify those invasive alien species where eradication, containment or control is a feasible management option, particularly within priority sites.

¹⁵ See for example: Roy, H.E., Peyton, J., Aldridge, D.C., et al. (2014). Horizon scanning for invasive alien species with the potential to threaten biodiversity in Great Britain. *Global Change Biology*, Vol. 20, Issue 12 (December) <https://doi.org/10.1111/gcb.12603>; Roy, H.E., Bacher, S., Essl, F., et al. (2019). Developing a list of invasive alien species likely to threaten biodiversity and ecosystems in the European Union. *Global Change Biology*, Vol. 25, Issue 3 (March) <https://doi.org/10.1111/gcb.14527>

¹⁶ For example: The EU invasive alien species Risk Assessment process and framework, see Commission Delegated Regulation (EU) 2018/968 http://data.europa.eu/eli/reg_del/2018/968/oj; Roy, H.E., Rabitsch, W., Scalera, R., et al. (2017). Developing a framework of minimum standards for the risk assessment of alien species. *Journal of Applied Ecology*, Vol. 55, Issue 2 (March) <https://doi.org/10.1111/1365-2664.13025>; ISPM 11, *Pest Risk Analysis for quarantine pests* is an international standard to assess the risk of pests or alien plants becoming invasive; *WOAH import risk analysis* for assessing the disease risks associated with the importation of animals, animal products etc.; the Great Britain Non-Native Species Secretariat – GB NNSS. [Risk assessment templates and species assessments](#); and Kumschick, S., Wilson, J.R.U. and Foxcroft, L.C. (2020). A framework to support alien species regulation: the Risk Analysis for Alien Taxa (RAAT). *NeoBiota*, Vol 62 (October) <https://doi.org/10.3897/neobiota.62.51031>

This list of established alien species, updated via monitoring and survey effort to identify new introductions and establishments, will also allow for monitoring changes in the rates of establishment, which is the headline indicator for Target 6 (see section 2.5).

- Pathways of introduction

Identifying the pathways of introduction of past and future alien species introductions into the territory is the first step towards developing pathway action plans. Ideally this information will be collated during the generation of the species lists and will use the standardised pathway terminology and classification produced under the Convention.¹⁷ It is likely that evidence for the pathways responsible for most of the alien species introductions does not exist, however, this information can be deduced by expert opinion and by pathways allocated to the introduction of the species from other countries or in global datasets (see Annex 2 Resources). In addition, choosing the relevant pathways to assign can sometimes be challenging, therefore additional guidance¹⁸ has been produced to support this process.

This information will allow the priority intentional and unintentional pathways of introduction to be identified. Depending on data availability, this can be achieved by identifying those pathways with the highest number of species introductions, highest volume of traffic, and/or responsible for invasive species leading to the highest magnitude of impacts.¹⁹

- Sites

Target 6 requires that invasive alien species are eradicated or controlled in priority sites, such as islands. In order to identify those priority sites, it is important to understand which sites are more susceptible to introductions, and which are sensitive (or vulnerable) to impacts from invasive alien species.²⁰ *Sensitive sites* or areas are those where the greatest impacts upon nature will be realised if invasive alien species are able to establish. These sites need to be identified at a national level, but could include protected areas,

natural World Heritage Sites, Key Biodiversity Areas, islands, and isolated freshwater systems. *Susceptible sites* are those areas that are at high risk to the introduction and establishments of alien species. These are often areas that are already degraded and close to areas of high levels of human activity, e.g. ports and harbours, large urban areas, tourist sites, or major traffic routes. These sites should be prioritised for biosecurity efforts to prevent species being introduced, for surveillance so that early detection and rapid eradication can prevent new invasive alien species establishing, and be the focus of management actions to remove, minimize and mitigate impacts from existing invasive alien species.

ii. **Actions for managing pathways of introduction**

Prevention is the most cost-effective way to mitigate impacts from invasive alien species. By managing the priority pathways of introduction, the risk of a species being transported and introduced into a country can be reduced.

Guiding questions that will be answered:

- What can we do to prevent invasive alien species from being introduced?

- Pathway action plans

Building on the pathway identification and prioritisation covered in the above section on baseline information, the pathways that will be the target of action plans need to be chosen. The final selection should also consider the feasibility of managing the pathways, so that pathways are not chosen where it is unlikely that any measures taken would prevent introductions.

Pathway action plans set out the strategic actions that need to be undertaken and can target an

¹⁷ See [CBD SBSTTA/18/9/Add.1](#). Pathways of introduction of invasive species, their prioritization and management.

¹⁸ European Commission, Directorate-General for Environment, Harrower, C., Scalera, R., Pagad, S. et al., *Guidance for interpretation of the CBD categories of pathways for the introduction of invasive alien species*, Publications Office, 2020. <https://data.europa.eu/doi/10.2779/6172>

¹⁹ Examples of pathway analysis: NOBANIS. 2015. Invasive alien species pathway analysis and horizon scanning for countries in Northern Europe. Nordic Council of Ministers, Copenhagen. [doi:10.6027/TN2015-517](https://doi.org/10.6027/TN2015-517); Rabitsch et al. 2018. Analysis and prioritisation of pathways of unintentional introduction and spread of invasive alien species in Germany in accordance with Regulation (EU) 1143/2014. <https://www.bfn.de/en/publications/bfn-schriften/bfn-schriften-490-analysis-and-prioritisation-pathways-unintentional>

²⁰ McGeogh, M.A., Genovesi, P., Bellingham, P.J., et al. (2016). Prioritising species, pathways, and sites to achieve conservation targets for biological invasion. *Biological Invasions*, Vol. 18 (November) <https://doi.org/10.1007/s10530-015-1013-1>



individual pathway, or a group of related pathways. If targeting a group of pathways, it is important to ensure that actions are proposed for each individual pathway, or that it is clearly indicated to which pathway they refer to. Ideally, pathway action plans will be developed in consultation with the key stakeholders that will be needed to implement actions or will be affected by them. Given the diverse nature of different pathways, action plans can include a range of activities including raising public awareness, policy development, improving the effectiveness of border checks for specific goods, or applying best practices to reduce contamination of commodities, equipment or vehicles. They can also target both pathways of introduction into a country, and pathways of spread for species that are already introduced. Pathway action plans often target unintentional introductions, as often legislation can be used to regulate the import, trading, keeping and breeding of invasive alien species that are intentionally introduced. Guidance has been developed through the Council of Europe to support countries in the development of pathway action plans²¹ and, while these guidelines are for European countries, they are still relevant

globally. In addition, there are existing guidance documents, or codes of conduct, that can be used to inform the development of actions for specific pathways, see the resources section for this.

Due to the international nature of pathways, collaboration at the regional or international level will support their management. In addition, some pathways are already addressed by existing international agreements²² and the relevant national authorities need to be engaged with to develop any additional actions that may be needed.

iii. **Actions for preventing the introduction and establishment of alien species**

Pathway management will not prevent all introductions of alien species, therefore additional actions are needed to prevent their introduction and establishment. Implementing biosecurity procedures, including border security measures along with early detection and rapid response capability, is more cost-effective at preventing impacts from invasive

²¹ Council of Europe. (2016). Guidance for governments concerning invasive alien species pathways action plans. Convention on the Conservation of European Wildlife and Natural Habitats, Standing Committee. <https://rm.coe.int/1680746339>

²² Examples of existing international agreements relevant to invasive alien species pathways of introduction: World Trade Organization Agreement on the Application of Sanitary and Phytosanitary Measures ([WTO-SPS Agreement](#)), World Organisation for Animal Health ([WOAH](#)), International Plant Protection Convention ([IPPC](#)), International Convention for the Control and Management of Ships' Ballast Water and Sediments ([the Ballast Water Management Convention, BWMC](#))

alien species than managing them once they become established. Some of the actions described here may have been included within the pathway action plans discussed above.

Guiding questions that will be answered:

- What can we do to prevent alien species from being introduced and establishing?

- Border security

Effective border security measures (often termed 'biosecurity') will reduce the risk of introductions and spread of alien species across many pathways of introduction, and can be applied pre-border, at-border, and post-border. As invasive alien species have broad scale impacts across sectors, it would be beneficial to take a 'one-biosecurity' approach²³ if feasible, where relevant national authorities responsible for identifying and managing risks to the environment and biodiversity, agriculture, and human health are working together.

Pre-border – These are actions taken outside of the country or region to reduce the risk of alien species being transported in the first place. This could range from preventing exports from certain high-risk places or along certain pathways, working with trading partners to raise awareness and improving inspection and treatment procedures prior to export, or the application of compliance systems such as 'passports' to verify that biosecurity standards have been met.

At border – The most fundamental elements of border security are the physical inspections and checks of goods, equipment, and people entering a country. These can ensure that regulated species are not imported deliberately, or as contaminants on other goods. Existing capacity will likely exist to cover requirements for plant and animal health, and it may be feasible to expand their mandates and expertise to also cover invasive alien species that threaten biodiversity. For most countries all goods

and consignments cannot be checked due to the high volume of imports, therefore the focus of inspections should be 'risk based' and focused on the relevant alien species and pathways that have been prioritised. It is also important to have suitable facilities and infrastructure to allow for inspections and quarantine to be undertaken.

Post-border - It is not always possible to detect and stop regulated species at the border, and so it is important to carry out post-border inspections to check for regulated species within the country. These could include visiting premises that may keep, trade or transport regulated species to ensure they are complying with national laws.

- Surveillance for early detection

Surveillance to rapidly detect new alien species is important to ensure the effectiveness of rapid response and eradication. Surveillance systems can be designed to detect many different invasive alien species or can be specific to one or a few invasive alien species selected through horizon scanning and risk assessment.

Surveillance can be implemented for priority invasive alien species and/or at susceptible and vulnerable sites. The design of surveillance programmes, including the methods used and effort required, will be determined by the detectability of the species being targeted, and its habitats. Cryptic and harder to detect species at a low density will require a greater level of surveillance. 'Sentinel' sites or networks can also be established, where heightened levels of surveillance are undertaken at selected areas (e.g. at susceptible sites) in order to enhance detection and improve cost-effectiveness. To be effective, surveillance programmes need to have access to species identification capacity. 'Citizen-science' programmes can be a cost-effective tool for helping collate useful information on invasive alien species, especially for early detection and species distribution mapping.²⁴ Reporting by the public can be realised through a dedicated email account, social media or smart phone apps, however it is critical that someone has the responsibility to check the reports, and also ensure the information is validated and sent to

²³ Hulme, P.E. (2020). One Biosecurity: A unified concept to integrate human, animal, plant, and environmental health. *Emerging Topics in Life Sciences*, Vol 4, Issue 5 (December).

²⁴ Pocock, M.J.O., Adriaens, T., Bertolino, S., et al. (2024). Citizen science is a vital partnership for invasive alien species management and research. *iScience*, Vo. 27, Issue 1 (January) <https://doi.org/10.1016/j.isci.2023.108623>



the relevant authority, so that action is taken. In addition, there are many innovative technologies such as smart traps, sensor networks and eDNA that can also be used to support surveillance efforts for early detection.²⁵

- Rapid response capacity to eradicate new incursions

In general, the likelihood of eradication being feasible declines following the dispersal of the invasive alien species. As different species establish and spread at different rates (e.g. hornets versus trees), the time frame between introduction and when eradication is no longer feasible will differ. It is therefore useful to prepare rapid response plans for priority species that set out the institutional responsibilities, response processes, and access to resources and capacity, so that an invasive alien species incursion can be cost-effectively, and as soon as possible, eradicated or contained following on from an early detection. These plans can be generic, for example targeting broad species groups, such as terrestrial vertebrates,²⁶ or be species specific.

- Biosecurity legislation and policy

Having robust and effective legislation and policies will underpin actions to prevent the introduction and establishment of alien species and will provide the required mandates for institutions, including for collaboration across sectors. Such legislation may also regulate the keeping, releasing, importing and trading of priority invasive alien species. There may already exist relevant legislation that covers other sectors, such as for plant and animal health, and it may be more feasible to amend these to cover invasive alien species that impact biodiversity, than to create new specific legislation. Examples of the elements that can be covered by biosecurity legislation include the provision of powers to undertake inspections and quarantine goods, seizure of regulated species or contaminated goods, establishing financial penalties, and entry to private land or vessels to undertake inspections, surveillance or eradication measures.²⁷

²⁵ Martinez, B., Reaser, J.K., Dehgan, A., et al. (2020). Technology innovation: advancing capacities for the early detection of and rapid response to invasive species. *Biological Invasions*, Vol. 22 (December) <https://doi.org/10.1007/s10530-019-02146-y>

²⁶ For example, the GB Non-Native Species Secretariat (GB NNSS) have [produced five generic rapid response plans](#) ('contingency plans') for Great Britain to address incursions for terrestrial vertebrates, terrestrial plants, freshwater plants, aquatic animals, and marine species.

²⁷ To support the UK Overseas Territories develop biosecurity capacity, the GB NNSS have [produced model biosecurity legislation along with a legal checklist](#) which is intended to provide a comprehensive list of elements which together comprise effective biosecurity legislation.

iv. Actions for the eradication and control of invasive alien species

Undertaking actions that aim to eradicate, contain, or control established invasive alien species populations are the main means of eliminating, minimising or reducing their impacts. Target 6 calls for these actions to be applied especially in priority sites and should therefore be informed by the prioritisation process discussed above. Ongoing monitoring and evaluation will provide updates on the status of biological invasions and progress of any interventions to allow review of priorities, resource allocation and adaptation of management methods.

Guiding questions that will be answered:

- What can we do to eliminate, minimize or mitigate impacts from invasive alien species?

- Management measures

In order to eliminate, minimise, or mitigate the impacts of currently established invasive alien species, especially within priority vulnerable sites, management measures need to be undertaken. When planning and undertaking these management measures, there are three broad objectives that should be considered:

Eradication - Remove the entire population of an invasive alien species from a defined geographic area, with no immediate risk of re-invasion.

Containment - Prevent the spread of a population of an invasive alien species from a defined area. Containment may also apply in the context of keeping an invasive alien species out of a defined geographic region within a broader landscape (also known as 'exclusion').

Control - Reduce the abundance, distribution, or spread and impacts of a population of an invasive

alien species from a defined geographic area of interest.

Eradication of the invasive alien species population should be considered as the first option. This is because eradication, if successful, will eliminate the impacts from the invasive alien species rather than reducing them, and the measures being implemented will be time bound, meaning that costs, side effects and any welfare impacts will be less than if the invasive alien species population is controlled in the long term. Where eradication is not deemed to be feasible, either for costs, effectiveness or other reasons such as political or community support, then *containment* or *control* should be considered. In terrestrial environments increasingly larger scale eradication programmes have been successful, especially those that target mammal invasive alien species on islands,²⁸ resulting in significant conservation outcomes. In freshwater systems, eradication is more challenging, but has been achieved primarily in smaller isolated water bodies. However, eradications in the marine environment are largely unfeasible, highlighting the importance of pathway management to prevent introductions in the first place.

There are many management measures available that can be used to eradicate, contain or control invasive alien species²⁹ and their effectiveness depends upon many factors, including the species being targeted and the habitats it is found, the size of area being managed, available resources and capacity, legal frameworks, and political and community support. The involvement of stakeholders and communities in the planning and decision-making processes is fundamental, as it usually leads to an increase in the likelihood of success.

In addition, taking an adaptive integrated approach, where more than one option is used either in parallel or sequence (e.g. mechanical removal followed by herbicide application), can achieve greater success than the application of either option on their own. This approach can also include the use of ecosystem management approaches (e.g. restoring connectivity or flow regimes in a river) alongside actions that directly target the invasive alien species.

28 Spatz et al. 2022. The global contribution of invasive vertebrate eradication as a key island restoration tool. *Scientific Reports*. <https://doi.org/10.1038/s41598-022-14982-5>

29 For example see: Sankaran, K., Schwindt, E., Sheppard, A.W., et al. (2023). Chapter 5: Management; challenges, opportunities and lessons learned. In: Thematic Assessment Report on Invasive Alien Species and their Control of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. Roy, H. E., Pauchard, A., Stoett, P., and Renard Truong, T. (eds.). IPBES secretariat, Bonn, Germany. <https://doi.org/10.5281/zenodo.7430733>



- Monitoring

The integration of new data on the introduction and establishment of new alien species, and the distribution, spread and impacts of existing invasive alien species, especially within priority sites, into baseline datasets is essential to provide up-to-date lists of species and their impacts and on the effectiveness of prevention and management measures. Standardised monitoring should be implemented for:

Invasive alien species and sites – To track introduction and establishment of new species, established species spread and impacts.

Pathways – To track success of prevention measures such as biosecurity inspections, regulations and compliance.

Management actions - All management interventions (prevention, eradications and control) should be monitored for cost and effectiveness.

These data will allow for tracking of progress towards Target 6, and to inform decision making and resource allocation to adapt any actions being taken.

- Policy and legislation for management of invasive alien species

Legislation at a national level may already exist that deals with aspects of the management of biological invasions, directly or indirectly. These are likely to be primarily targeting different sectors such as plant and animal health, shipping, aquaculture, forestry, and trade and transport. It is important to understand the current legal framework and what gaps exist, as new invasive alien species specific legislation that covers both prevention and management may be needed. It is also important to ensure alignment and coordination across sectors and regulatory instruments, in order to support the management of invasive alien species. As discussed above in relation to biosecurity, such legislation or policies should identify which institutions have the mandate to act, and can provide powers to access private land, for cost recovery, and to regulate what management methods can be used.

2.4. Considerations for the implementation of Target 6

Considering the cross-cutting nature of the challenges posed by invasive alien species, for actions towards Target 6 to be effective they need to consider additional considerations beyond the specific actions focused on the Target. Many of these are set out in Section C of the KMGBF.³⁰ This section presents some examples on how some of the actions from section C could be applied to support the achievement of Target 6.

2.4.1. Whole-of-government and whole-of-society approach

In order to meet Target 6 a whole-of-government and whole-of-society approach needs to be taken. This is especially important due to the cross-sectoral and cross-border nature of invasive alien species and the many different institutions that undertake measures that aim to prevent or address their impacts. In addition, there are instances where there will be conflicting perceptions of the value of invasive alien species, and the ethics associated with their management. It is critical that relevant actors and institutions across different sectors co-ordinate, collaborate and build partnerships with each other to strategically manage invasive alien species.

Addressing the challenges posed by invasive alien species will require engagement, coordination and joint policy development across multiple sectors (e.g., environment, agriculture, plant and animal health, transport, trade, customs, tourism, science and research, and human health departments), at both national and sub-national levels. Taking a whole-of-government approach, potentially supported by a single cross-sector coordination body, will strengthen the understanding of invasive alien species and their cross-sectoral impacts and facilitate the development and implementation of coherent policies and legislation, national strategies

and action plans, and funding mechanisms to strengthen measures that prevent the introduction and spread of invasive alien species and eliminate or mitigate their impacts.

This approach includes the involvement of the private sector and civil society. Many intentional and unintentional pathways of introduction are related to key sectors. The development and effective implementation of best practices and voluntary codes of conduct, implementing biosecurity measures across the supply chain, and the adherence to national legislation and regional and international policy instruments can play a major role in preventing future impacts from invasive alien species. Civil society organisations can help change the perception of invasive alien species and build support for management actions.

2.4.2. Contribution and rights of indigenous peoples and local communities

The Framework acknowledges the important roles and contributions of indigenous peoples and local communities as custodians of biodiversity and as partners in its conservation, restoration and sustainable use.³¹ Indigenous peoples and local communities own or govern 32 per cent of the world's land which supports a third of the world's Key Biodiversity Areas.³² However, more than 2,300 invasive alien species are found on lands managed, used and/or owned by indigenous peoples, threatening their quality of life.³³ It is therefore essential to ensure that the rights, knowledge, including traditional knowledge associated with biodiversity, innovations, worldviews, values and practices of indigenous peoples and local communities are respected, and documented and preserved with their free, prior and informed consent, including through their full and effective participation in decision-making.

³⁰ Introduction to the KMGBF <https://www.cbd.int/gbf/introduction>

³¹ [CBD COP Decision 15/4 Kunming-Montreal Global Biodiversity Framework](#) – Section C. Considerations for the implementation of the Kunming-Montreal Global Biodiversity Framework

³² WWF, UNEP-WCMC, SGP/ICCA-GSI, LM, TNC, CI, WCS, EP, ILC-S, CM, IUCN. (2021). The State of Indigenous Peoples' and Local Communities' Lands and Territories: A technical review of the state of Indigenous Peoples' and Local Communities' lands, their contributions to global biodiversity conservation and ecosystem services, the pressures they face, and recommendations for actions Gland, Switzerland. https://www.flac.awsassets.panda.org/downloads/report_the_state_of_the_indigenous_peoples_and_local_communities_lands_and_territories_1.pdf

³³ IPBES. (2023). Summary for Policymakers of the Thematic Assessment Report on Invasive Alien Species and their Control of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. Roy, H.E., et al. (eds.). IPBES secretariat, Bonn, Germany. <https://doi.org/10.5281/zenodo.7430692>

2.4.3. National circumstances, priorities and capabilities

Actions towards addressing invasive alien species should be implemented according to each Parties national circumstances, priorities and capabilities. For example, the identification of priority invasive alien species that may arrive in the near future will differ based on many factors such as trade relations, the prioritisation of sites will depend upon national conservation objectives, and measures put in place to prevent introduction and establishment, and the eradication and control of invasive alien species will depend upon access to resources and expertise, and existing legislation and policy frameworks.

2.4.4. Interactions with other drivers of biodiversity loss

The interactions between invasive alien species and other direct drivers of biodiversity loss such as climate change, pollution, habitat loss, and exploitation need to be acknowledged and understood as they are known to facilitate the establishment and spread of invasive alien species.³⁴ For example, a changing climate can create new opportunities for alien species to become invasive, including via floods and fires that are becoming more frequent and severe in many parts of the world. Conversely, the impacts from invasive alien species can reduce the resilience of natural habitats, agricultural systems, and urban areas to climate change. Understanding these links is critical so that a coherent and integrated response can be undertaken, and also that policies and actions that aim to address one driver do not exacerbate the impacts of another, for example by planting of potentially invasive alien tree species in order to increase carbon capture and sequestration.

2.4.5. Consistency with international agreements or instruments

Taking action to address invasive alien species needs to be implemented in accordance with relevant international obligations. This includes:

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Under CITES the, the Conference of the Parties have adopted Resolution Conf. 13.10 (Rev. CoP14) on Trade in alien invasive species.³⁵ In this Resolution, the CoP is recommending that countries consider the problems of invasive alien species when developing national legislation and regulations that deal with the trade in live animals or plants. Further, when possible and applicable, the designated Management Authority of the country of export should consult with the Management Authority of a proposed country of import, when considering issuing an export permit to authorize the export of potentially invasive species, for the importing country to be able to determine whether there are domestic measures regulating such imports.

The International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (BWM Convention). The aim of the BWM Convention,³⁶ which has been in force since September 2017, is to prevent the transfer of invasive aquatic species by shipping, specifically through ballast water, by establishing standards and procedures for the management and control of ships' ballast water and sediments. Under the Convention, all ships in international traffic are required to manage their ballast water and sediments to a certain standard, according to a ship-specific ballast water management plan. Ships cannot discharge ballast water into the sea unless it has been managed in accordance with the provisions of the BWM Convention; ultimately this entails complying with a strict quantitative discharge standard.

The WTO Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement). The SPS agreement³⁷ sets out the basic rules on food safety and animal and plant health standards that governments are required to follow. These standards must be based on science, applied only to the extent necessary to protect human, animal or plant life or health, and not arbitrarily or unjustifiably discriminate between countries. The SPS Agreement encourages members to base their sanitary and phytosanitary measures on international standards,

34 IPBES. (2023). Summary for Policymakers of the Thematic Assessment Report on Invasive Alien Species and their Control of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. Roy, H.E., et al. (eds.). IPBES secretariat, Bonn, Germany. <https://doi.org/10.5281/zenodo.7430692>

35 CITES Resolution Conf. 13.10 (Rev. CoP14) on Trade in alien invasive species <https://cites.org/sites/default/files/documents/COP/19/resolution/E-Res-13-10-R14.pdf>

36 IMO Ballast Water Management Convention <https://www.imo.org/en/OurWork/Environment/Pages/BallastWaterManagement.aspx>

37 WTO Sanitary and Phytosanitary measures https://www.wto.org/english/tratop_e/sps_e/sps_e.htm

and recognises the IPPC and WOAHA as the relevant standard setting organisations for plant and animal health respectively. If no relevant international standard exists, or when a WTO member wishes to deviate from an existing international standard, measures have to be based on a risk assessment that evaluates the likelihood of entry, establishment or spread within the territory of an importing member, and of the potential impacts on biological diversity and socioeconomic values.

The World Organisation for Animal Health (WOAH). WOAH develops normative documents relating to rules that Member Countries can use to protect themselves from the introduction of diseases and pathogens, without setting up unjustified sanitary barriers. The main normative works produced by WOAH are the following standards:³⁸ the Terrestrial Animal Health Code, the Manual of Diagnostic Tests and Vaccines for Terrestrial Animals, the Aquatic Animal Health Code and the Manual of Diagnostic Tests for Aquatic Animals. They are prepared by elected Specialist Commissions and by Working Groups bringing together internationally renowned scientists, most of whom are experts within the network of about 246 Collaborating Centres and Reference Laboratories that also contribute towards the scientific objectives of WOAH. These standards are adopted by the World Assembly of Delegates. WOAH standards, guidelines and recommendations are recognised by the World Trade Organization (SPS agreement) as the reference documents for Countries to base their sanitary measures necessary to protect animal life or health.

The International Plant Protection Convention (IPPC). The IPPC promotes action to protect plants

and plant products from the spread of pests and sets out measures to control plant pests. To protect the world's cultivated and natural plant resources from the spread and introduction of plant pests while minimizing interference with the international movement of goods and people, the International Plant Protection Convention provides an international framework for plant protection that includes International Standards for Phytosanitary Measures (ISPMs).³⁹ ISPMs provide guidance on phytosanitary principles for the protection of plants, and the application of phytosanitary measures in international trade, with specific standards covering: pest risk analysis, import and export systems, post-border controls, and surveillance and reporting on pests and diseases.

2.4.6. Biodiversity and health

Invasive alien species can be vectors of pathogens, or in some cases be pathogens, that impact wildlife and can also affect human, and domesticated animal and plant health. In addition, their impacts upon the quality and quantity of ecosystem services can affect livelihoods and food and water security. Understanding the interlinkages between health and invasive alien species and their management will strengthen the development of interdisciplinary actions such as a 'One Biosecurity' approach,⁴⁰ which addresses risks that cut across human health, agriculture, and the environment. The Global Action Plan on Biodiversity and Health adopted at COP 16 aims to support Parties in mainstreaming biodiversity and health interlinkages into the implementation of the Kunming-Montreal Global Biodiversity Framework, including for Target 6 on invasive alien species.

38 WOAH standards <https://www.woah.org/en/what-we-do/standards/>

39 IPPC international Standards for Phytosanitary Measures (ISPMs) <https://www.ippc.int/en/core-activities/standards-setting/ispm/>

40 Hulme, P.E. (2020). One Biosecurity: A unified concept to integrate human, animal, plant, and environmental health. *Emerging Topics in Life Sciences*, Vol 4, Issue 5 (December).

2.5. Indicator for the implementation of Target 6

While it is critical to establish national or regional indicators to implement this Target, it is important to consider that, at an international level, the headline indicator for Target 6 refers to the rate of invasive alien species establishment,⁴¹ which quantifies the number of invasive alien species that are expected to have established in a new region or country over the reference period. The unit of measurement is the rate of invasive alien species establishments per unit period (e.g. year). The indicator can be disaggregated by taxon, subnational unit (e.g. islands), priority conservation areas, pathways, or type of impact.

A critical source of information for this indicator is the IUCN Global Register of Introduced and Invasive Species as well as the Alien Species First Record Database (Seebens *et al.* 2017) which can be used as baseline. Based on national monitoring processes, research, citizen science, etc. Parties can also contribute to enrich these international tools by providing them with information on newly detected species.

Country actions towards Target 6, should consider the use of this indicator to monitor their progress.

⁴¹ [CBD/COP/DEC/15/5](#)

Annex 1. Glossary



Annex 1. IAS Toolkit Glossary

This Annex presents a list of some key invasive alien species related terms used in this toolkit. These terms and their definitions are taken from the CBD COP decisions and the IAS glossary¹ on the CBD website and the glossary section of the *Thematic Assessment Report on Invasive Alien Species and their Control of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*² (IPBES 2023). Please see these resources for additional IAS related terms and definitions.

Term	Definition	Source
Alien species	A species, subspecies or lower taxon, introduced outside its natural past or present distribution; includes any part, gametes, seeds, eggs, or propagules of such species that might survive and subsequently reproduce.	CBD COP Decision VI/23 ³
Invasive alien species	An alien species whose introduction and/or spread threaten biological diversity.	CBD COP Decision VI/23
Introduction	The movement by human agency, indirect or direct, of an alien species outside of its natural range (past or present). This movement can be either within a country or between countries or areas beyond national jurisdiction.	CBD COP Decision VI/23
Intentional introduction	The deliberate movement and/or release by humans of an alien species outside its natural range.	CBD COP Decision VI/23
Unintentional introduction	All other introductions which are not intentional.	CBD COP Decision VI/23
Pathway of introduction	A suite of processes that result in the introduction of a species from one geographical location to another. It means: 1) geographic routes by which a species is moved outside its natural range (past or present); 2) corridors of introduction (e.g., road, canal, tunnel); and/or 3) human activity that gives rise to an intentional or unintentional introduction. More than one vector within a pathway may be involved in a transfer of species.	IPBES 2023

¹ <https://www.cbd.int/invasive/terms.shtml>

² <https://www.ipbes.net/ias>

³ [CBD/COP/DEC/VI/6](#)

Term	Definition	Source
Biological invasion (or invasion process)	A process involving the transport of a native species outside of its natural range, intentionally or unintentionally, by human activities to new regions where it may become established, spread and ultimately adversely impact nature, nature's contributions to people, and good quality of life (Blackburn et al., 2011; Figure 1.6).	IPBES 2023
Surveillance	Actions, including extended programme of surveys and general surveillance (capturing unstructured and untargeted surveillance data and information from a wide range of sources), undertaken in order to directly or indirectly detect the presence of one or many invasive alien species over time (CEPM, 1996; Clift, 2008; CPM, 2015).	IPBES 2023
Monitoring	The continued or regular observation of an ecosystem to detect invasion/reinvasion by invasive alien species and/or their impacts.	IPBES 2023
Adaptive management	A philosophy that accepts that management must proceed even without complete information. It views management not only as a way to achieve objectives, but also as a process for probing to learn more about the resource or system being managed. Learning is an inherent objective of adaptive management. Adaptive management is a process where policies and activities can adapt to future conditions to improve management success (CCBA, 2008).	IPBES 2023
Biosecurity	A strategic and integrated approach that encompasses the policy and regulatory frameworks (including instruments and activities) for identifying, analysing and managing risks, including invasive alien species, to human, animal and plant life and health, and associated risks to the economy and the environment (FAO, 2007).	IPBES 2023
Containment	The application of measures in and around an infested area to prevent spread of invasive alien species. Containment may also apply in the context of keeping an invasive alien species out of a defined geographic region within a broader infestation (in pest management this is also termed "area-wide management") (FAO, 2019). Any action taken to delimit the distribution of an invasive alien species through whatever means possible.	IPBES 2023

Term	Definition	Source
Control	Direct action(s) taken to reduce or suppress the distribution, abundance, spread and impacts of invasive alien species within a defined geographic area (FAO, 1995) (see management).	IPBES 2023
Eradication	Elimination/extirpation of an invasive alien species from a defined geographic area even in the absence of all preventive measures obviating the necessity for further control measures (Dowdle, 1998). The time period after which an invasive alien species can be considered eradicated depends on the species and location.	IPBES 2023
Establishment / established alien species	The process of an alien species in a new habitat successfully producing viable offspring with the likelihood of continued survival.	CBD COP Decision VI/23
Integrated governance for biological invasions	Establishment of relationships between the roles of actors, institutions and instruments, and involving as appropriate all those elements of the socio-ecological system that characterize biological invasion and its management, for the purpose of identifying the strategic interventions needed to improve invasive alien species prevention and control outcomes (definition originated from this assessment, from the thinking on integrated environmental governance).	IPBES 2023
Invasion stages	Stages (transport, introduction, establishment, and spread) that a species must pass through on the invasion continuum from native to (invasive) alien species, recognising the need for a species to overcome the barriers (geography, captivity or cultivation, survival, reproduction, dispersal and environmental) that obstruct transition between each stage (Blackburn et al., 2011).	IPBES 2023
Management	Any action taken to address the threats, risks, distribution, abundance and impacts of an invasive alien species within a defined geographic area (Hulme, 2006; Pyšek et al., 2020). Management includes prevention, preparedness, eradication, containment, and control (Robertson et al., 2020).	IPBES 2023
Pathway management	Any action taken (single or via systems approach) towards a particular anthropogenic invasive alien species arrival pathway (e.g., trade) to prevent or address the threats and risks of an invasive alien species arriving and establishing via that pathway either between or within jurisdictions (Robertson et al., 2020).	IPBES 2023

Term	Definition	Source
Prevention	Any policy and/or action/response undertaken to prevent the arrival and/or introduction of alien and invasive alien species, between and within countries and regions. Prevention is generally far more cost-effective and environmentally beneficial than measures taken following introduction and establishment of an invasive alien species (CBD, 2002).	IPBES 2023
Risk analysis (assessment / management)	(1) the assessment of the consequences of the introduction and of the likelihood of establishment of an alien species using science-based information (i.e., risk assessment), and (2) to the identification of measures that can be implemented to reduce or manage these risks (i.e., risk management), taking into account socio-economic and cultural considerations.	CBD COP Decision VI/23
Citizen science/ community science	Citizen science refers to research collaborations in which volunteers and scientists partner to answer real-world questions.	IPBES 2023



Annex 2. Resources

Annex 2. Resources to support the development and implementation of actions towards Target 6

This annex presents a list of resources that can support Parties and other stakeholders with the development and implementation of actions towards the Kunming-Montreal Global Biodiversity Framework target 6 on invasive alien species.

The resources are grouped into four categories, one on baseline information and the others on the different elements of target 6:

1. Non-exhaustive list of resources for compiling baseline information and prioritising invasive alien species, pathways of introduction, and sites 26
2. Non-exhaustive list of resources for managing pathways of introduction 28
3. Non-exhaustive list of resources for preventing the introduction and establishment of alien species 29
4. Non-exhaustive list of resources for the eradication and control of invasive alien species 30

Non-exhaustive list of resources for compiling baseline information and prioritising invasive alien species, pathways of introduction, and sites

Data sources on invasive alien species, their impacts and pathways of introduction

- CABI Horizon Scanning Tool. A decision support aid that helps identify and categorize species that might enter a particular geographic area from another geographic area. <https://www.cabi.org/HorizonScanningTool/>
- CABI Invasive Species Compendium. Provides detailed coverage of invasive pests, plants, fungi and animal diseases to help support decision-making in invasive species management worldwide. <https://www.cabidigitallibrary.org/product/QI>
- CABI Pest Risk Analysis tool. A decision-support tool that presents scientific information from the CABI Compendium to aid the selection of appropriate measures for reducing risk of pest introduction and facilitating the safe movement of plants and plant products. <https://www.cabi.org/PRA-Tool/signin?returnUrl=%2Fpra-tool%2F>
- Costello, M.J., Ah Yong, S., Bieler, R., et al. (2015). World Register of Introduced Marine Species (WRIMS). <http://www.marinespecies.org/introduced>
- FAO Invasive and introduced tree species database. The database provides summarized information about those forest tree species that have been reported naturalized or invasive in at least one country or territory. <https://www.fao.org/forestry-fao/24107/en/>
- Global Biodiversity Information Facility – GBIF. An international network and data infrastructure that enables data-holding institutions to share information about where and when species have been recorded. <https://www.gbif.org/>
- Global Register of Introduced and Invasive Species – GRIIS. Validated country checklists of alien and invasive alien species. <https://griis.org/>
- Invacost – Project that has produced a database with estimated the economic costs associated with biological invasions worldwide. <https://invacost.fr/en/accueil/>
- IUCN Global Invasive Species Database – GISD. A source of information about alien and invasive alien species that negatively impact biodiversity, including on their impacts, distribution, pathway of introduction, and management. GISD also includes EICAT assessments made at the global scale. <https://www.iucngisd.org/gisd/>
- IUCN Red List of Threatened Species™. Comprehensive information source on the global extinction risk status of animal, fungus and plant species. It currently lists over 160,000 species, with information on the distribution, habitat and ecology, and threats, including from invasive alien species. <https://www.iucnredlist.org/>
- Plants of the World Online. Provides information on the taxonomy, identification, images, distribution, traits, threat status, molecular phylogenies and uses of vascular plants worldwide. <https://powo.science.kew.org/>

Non-exhaustive list of data sources on potential sensitive sites for biodiversity

- Protected planet. A source of data on protected areas and other effective area-based conservation measures (OECMs). <https://www.protectedplanet.net/en>
- World database on Key Biodiversity Areas. Provides access to information on the world's Key Biodiversity Areas, which are sites that support critical populations of the world's threatened species. <https://www.keybiodiversityareas.org/>

Non-exhaustive list of resources for identifying and prioritising pathways of introduction

- CBD SBSTTA/18/9/Add.1. Pathways of introduction of invasive species, their prioritization and management. <https://www.cbd.int/doc/meetings/sbstta/sbstta-18/official/sbstta-18-09-add1-en.pdf>
- Dawson, J., Oppel, S., Cuthbert, R.J., et al. (2014). Prioritizing islands for the eradication of invasive vertebrates in the United Kingdom overseas territories. *Conservation Biology*, Vol. 29, Issue 1 (August) <https://doi.org/10.1111/cobi.12347>
- European Commission, Directorate-General for Environment, Harrower, Scalera, Pagad et al. 2020. Guidance for interpretation of the CBD categories of pathways for the introduction of invasive alien species. *Publications Office*. <https://data.europa.eu/doi/10.2779/6172>
- NOBANIS. (2015). Invasive alien species pathway analysis and horizon scanning for countries in Northern Europe. *Nordic Council of Ministers, Copenhagen*. [doi:10.6027/TN2015-517](https://doi.org/10.6027/TN2015-517)
- Rabitsch, W., Heger, T., Jeschke, J., et al. (2018). Analysis and prioritisation of pathways of unintentional introduction and spread of invasive alien species in Germany in accordance with Regulation (EU) 1143/2014. <https://www.bfn.de/en/publications/bfn-schriften/bfn-schriften-490-analysis-and-prioritisation-pathways-unintentional>

Non-Exhaustive list of additional resources to support prioritisation of invasive alien species (incl. risk assessment and risk management)

- Bacher, S., Blackburn, T.M., Essl, F., et al. (2017). Socio-Economic Impact Classification of Alien Taxa - SEICAT. *Methods in Ecology and Evolution*, Vol.9, Issue 1 (July). A standardised method for classifying alien taxa in terms of the magnitude of their impacts on human well-being, and is designed to align closely with EICAT. <https://doi.org/10.1111/2041-210X.12844>
- Booy, O., Mill, A.C., Roy, H.E., et al. (2017). Risk management to prioritise the eradication of new and emerging invasive non-native species. *Biological Invasions*, Vol. 19 (May). <https://doi.org/10.1007/s10530-017-1451-z>
- ISPM 11. (2019). Pest Risk Analysis for quarantine pests. This is an international standard to assess the risk of pests or alien plants becoming invasive. <https://www.ippc.int/en/publications/639/>
- IUCN (2020). IUCN EICAT Categories and Criteria. The Environmental Impact Classification for Alien Taxa First edition. Gland, Switzerland and Cambridge, UK: IUCN. The IUCN global standard for measuring the magnitude of environmental impacts caused by alien species. This can be applied at global, regional or national scale to support prioritisation of invasive alien species. <https://www.iucn.org/resources/conservation-tool/environmental-impact-classification-alien-taxa>
- Kenis, M., Agboyi, L.K., Adu-Acheampong, R., et al. (2022). Horizon scanning for prioritising invasive alien species with potential to threaten agriculture and biodiversity in Ghana. *NeoBiota*, Vol. 71 (February) <https://doi.org/10.3897/neobiota.71.72577>
- Kumschick, S., Wilson, J.R.U., and Foxcroft, L.C.. (2020). A framework to support alien species regulation: the Risk Analysis for Alien Taxa (RAAT). *NeoBiota*, Vol. 62 (October). <https://doi.org/10.3897/neobiota.62.51031>
- McGeogh, M.A., Genovesi, P., Bellingham, P.J., et al. (2016). Prioritising species, pathways, and sites to achieve conservation targets for biological invasion. *Biological Invasions*, Vol. 18 (November) <https://doi.org/10.1007/s10530-015-1013-1>
- Roy, H.E., Rabitsch, W., Scalera, R., et al. (2017). Developing a framework of minimum standards for the risk assessment of alien species. *Journal of Applied Ecology*, Vol. 55, Issue 2 (March) <https://doi.org/10.1111/1365-2664.13025>
- USFWS – Ecological Risk Screening Summaries. <https://www.fws.gov/story/ecological-risk-screening-summaries>
- WOA – Import Risk Analysis for assessing the disease risks associated with the importation of animals, animal products, etc. https://www.woah.org/fileadmin/Home/eng/Health_standards/tahc/2018/en_chapitre_import_risk_analysis.htm#:~:text=The%20process%20of%20import%20risk,health%20in%20the%20exporting%20country.

Examples of regional and global networks with resources

- Caribbean Invasive Alien Species Network is a collaboration of national, regional and international organisations engaged in the field of invasive alien species control, whose objective is to reduce the potential threat posed by IAS to health and livelihoods; to intra-regional and international trade; and to the Caribbean's endemic biodiversity and priceless ecosystems. <https://caribbeaninvasives.org/>
- European Alien Species Information Network (EASIN). EASIN facilitates the exploration of existing alien species information from a variety of distributed information sources through web tools and interoperable web services, compliant with internationally recognized standards. <https://easin.jrc.ec.europa.eu/easin#>
- European Network on Invasive Alien Species (NOBANIS). NOBANIS is a gateway to information on alien and invasive species in North and Central Europe. <https://www.nobanis.org/>
- INVASIVESNET International Association for Open Knowledge on Invasive Alien Species (INVASIVESNET) is a non-profit, non-governmental organization open to individuals and organizations involved in research, management and exchange of knowledge on invasive species. <https://www.invasivesnet.org/>
- IUCN SSC Invasive Species Specialist Group (ISSG). The ISSG promotes and facilitates the exchange of invasive species information and knowledge across the globe and ensures the linkage between knowledge, practice and policy so that decision making is informed. The two core activity areas of the ISSG are policy and technical advice, and information exchange through our online resources and tools and through networking. <https://www.iucn.org/our-union/commissions/group/iucn-ssc-invasive-species-specialist-group> & <https://www.iucn.org/our-work/topic/invasive-alien-species>
- NEOBIOTA European Group on Biological Invasions. NEOBIOTA is the European Group on Biological Invasions. It is a consortium of scientists and environmental managers aiming to enhance integration of invasion research and strengthen approaches to counteract negative effects of introduced organisms on biodiversity, ecosystem services and human health. NEOBIOTA addresses theoretical and applied aspects of biological invasions, but also aims at educating the public and consulting with policy makers. <https://www.neobiota.eu/>
- North American Invasive Species Network (NAISN). NAISN is a consortium that uses a coordinated network to advance science-based understanding and enhance management of non-native invasive species. <https://www.naisn.org/>
- Pacific Invasive Learning Network (PILN). PILN connects Pacific professionals and practitioners to share knowledge, expertise, tools, and ideas that are vital to managing invasive species effectively. <https://www.sprep.org/invasive-species-management-in-the-pacific/piln>

Non-exhaustive list of resources for managing pathways of introduction

- Barros, A., Shackleton, R., Rew, L., et al. (2022). Tourism, recreation and biological invasions. *CABI*. Includes information on how tourism-related infrastructure and activities promote biological invasions, including key pathways for non-native invasive species introductions. <https://www.cabidigitallibrary.org/doi/book/10.1079/9781800620544.0000>
- CBD COP Decision XII/16. Guidance on devising and implementing measures to address the risks associated with the introduction of alien species as pets, aquarium and terrarium species, and as live bait and live food. <https://www.cbd.int/doc/decisions/cop-12/cop-12-dec-16-en.pdf>
- ICAO. (2007). Air transport remains a major pathway for invasive alien species. Document highlighting the role of air transportation as a pathway for invasive alien species. https://www.icao.int/publications/journalsreports/2007/6201_en.pdf
- IMO. (2023). Guidelines for the control and management of ships' biofouling to minimize the transfer of invasive aquatic species. Intended to provide a globally consistent approach to the management of biofouling, which is the accumulation of various aquatic organisms on hulls of ship. <https://www.imo.org/en/OurWork/Environment/Pages/Biofouling.aspx>

- IMO. Guidance documents on ballast water management. Series of guidelines to support governments and stakeholders on uniform and effective implementation of BWM Convention. <https://www.imo.org/en/OurWork/Environment/Pages/BWMConventionandGuidelines.aspx>
- IMO/ILO/UNECE Code of Practice for Packing of Cargo Transport Units. The CTU Code, inter alia, introduces a duty to ensure that cargo transport units, including shipping containers, are not infested with plants, plant products, insects or other animals. <https://www.imo.org/en/OurWork/Safety/Pages/CTU-Code.aspx>
- IPPC E-commerce Portal. A guide to managing the pest risk posed by goods ordered online and distributed through postal and courier pathways. <https://www.ippc.int/en/core-activities/capacity-development/e-commerce/>
- IPPC International Standards for Phytosanitary Measures (ISPMs). As of April 2024, there are 46 ISPMs, 33 diagnostic protocols, and 46 phytosanitary treatments that aim to protect agriculture and food security, and the environment and biodiversity from plant pests and diseases. These include on the intentional movement of: seeds; wood; growing media in association with plants for planting; and used vehicles, machinery and equipment. [https://www.ippc.int/en/core-activities/standards-setting/ispms/#:~:text=International%20Standards%20for%20Phytosanitary%20Measures,ISPM\)%20was%20adopted%20in%201993.](https://www.ippc.int/en/core-activities/standards-setting/ispms/#:~:text=International%20Standards%20for%20Phytosanitary%20Measures,ISPM)%20was%20adopted%20in%201993.)
- IPPC Sea container supply chains and cleanliness. This guidance identifies the key parties involved in the international container supply chains and describes their roles and responsibilities for minimizing visible pest contamination of sea containers and their cargoes, and best practices they may follow to meet that objective. <https://www.ippc.int/en/core-activities/capacity-development/sea-containers/>
- Secretariat of the Convention on Biological Diversity. 2010. Pets, Aquarium, and Terrarium Species: Best Practices for Addressing Risks to Biodiversity. Montreal, SCBD, Technical Series No. 48. <https://www.cbd.int/doc/publications/cbd-ts-48-en.pdf>
- WOAHS Standards, Guidelines, and Recommendations. Includes the Terrestrial and Aquatic Animal Health codes that provide standards for the improvement of animal health and welfare and veterinary public health worldwide, including through standards for safe international trade. <https://www.woah.org/en/what-we-do/publications/>

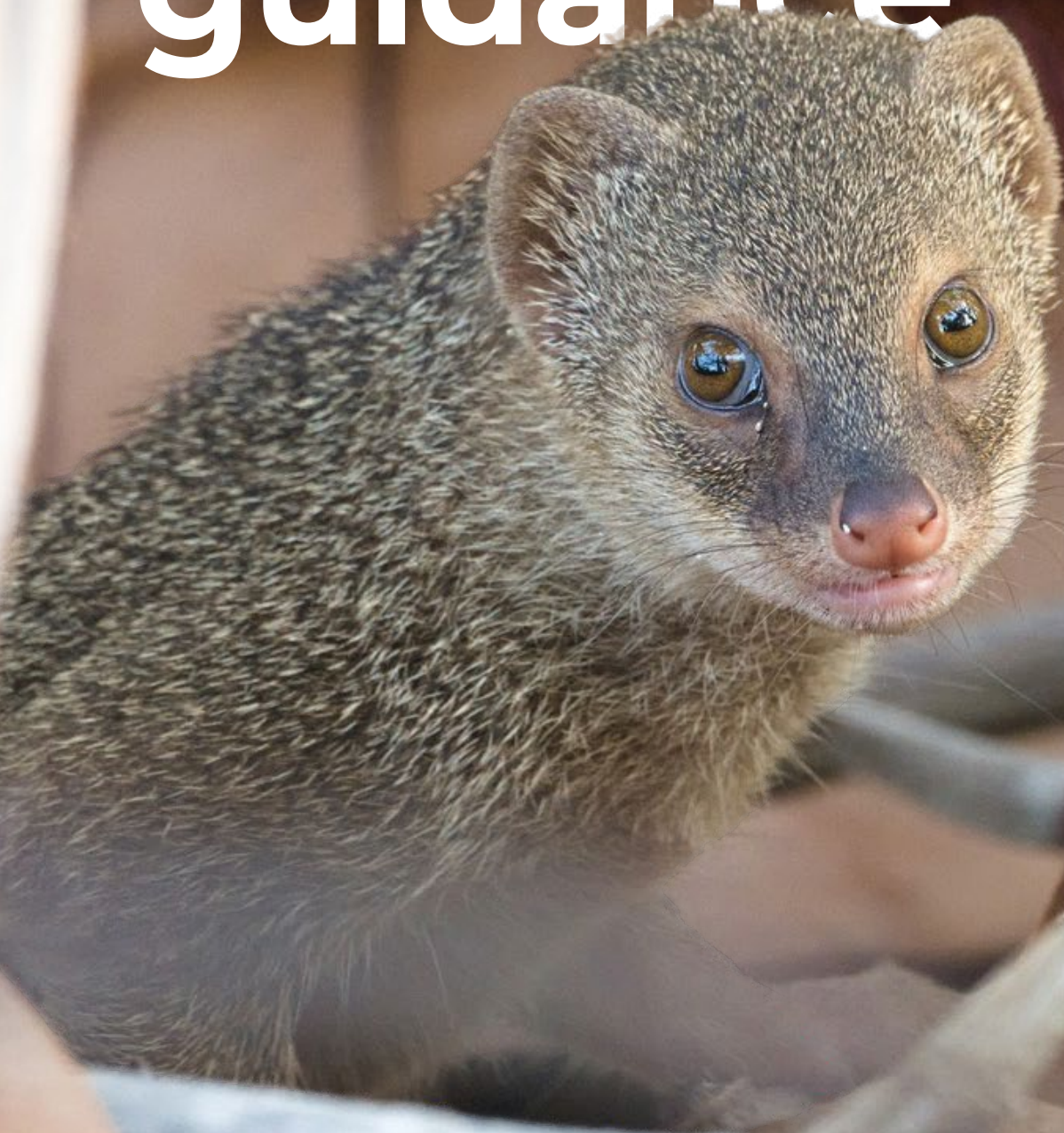
Non-exhaustive list of resources for preventing the introduction and establishment of alien species

- FAO. (2018). International Standard for Phytosanitary Measures 6. Surveillance. *Food and Agriculture Organization of the United Nations*. <http://www.fao.org/documents/card/en/c/7985f320-a606-47f9-9f0b-9dfa5a2e1622>
- IUCN. (2018). Guidelines for invasive species planning and management on islands. Cambridge, UK and Gland, Switzerland. *IUCN*. These guidelines are designed to assist anyone planning and programming the management of invasive species on islands. <https://doi.org/10.2305/IUCN.CH.2018.15.en>
- Sankaran, K., Schwindt, E., Sheppard, A.W., et al. (2023). Chapter 5: Management; challenges, opportunities and lessons learned. In: Thematic Assessment Report on Invasive Alien Species and their Control of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. Roy, H. E., Pauchard, A., Stoett, P., and Renard Truong, T. (eds.). IPBES secretariat, Bonn, Germany. <https://doi.org/10.5281/zenodo.7430733>

Non-exhaustive list of resources for the eradication and control of invasive alien species

- FAO. (2011). Sustainable Forest Management (SFM) Toolbox. Includes decision-making guide for invasive species program managers or the document alien invasive species: impacts on forests and forestry (Moore, B. 2005). <https://www.fao.org/sustainable-forest-management/toolbox/tools/tool-detail/en/c/230818/> and <https://www.fao.org/4/j6854e/j6854e00.htm>
- Island Conservation. Database of Island Invasive Species Eradications (DIISE). Attempts to compile all historical and current invasive vertebrate eradication projects on islands. <http://diise.islandconservation.org/>
- Katsanevakis, S. (2022). Management Options for Marine IAS. Technical note prepared by IUCN for the European Commission. The report provides a global review of the scientific literature on the effectiveness of management of marine IAS, analyses globally applied management options for marine invasive species, identifies best practices and success stories, and reviews constraints to managing marine IAS. <https://circabc.europa.eu/ui/group/4cd6cb36-b0f1-4db4-915e-65cd29067f49/library/1e85f0e4-9df0-4008-915b-39315a21dd37/details>
- Sankaran, K., Schwindt, E., Sheppard, A.W., et al. (2023). Chapter 5: Management; challenges, opportunities and lessons learned. In: Thematic Assessment Report on Invasive Alien Species and their Control of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. Roy, H. E., Pauchard, A., Stoett, P., and Renard Truong, T. (eds.). IPBES secretariat, Bonn, Germany. <https://doi.org/10.5281/zenodo.7430733>
- Shackleton, R.T., Adriaens, T., Brundu, G., et al. (2019). Stakeholder engagement in the study and management of invasive alien species. *Journal of Environmental Management*, Vol. 229 (January) <https://doi.org/10.1016/j.jenvman.2018.04.044>
- Sheppard, A.W., Paynter, Q., Mason, P., et al. (2019). IUCN SSC Invasive Species Specialist Group. The Application of Biological Control for the Management of Established Invasive Alien Species Causing Environmental Impacts. The Secretariat of the Convention on Biological Diversity Technical Series No. 91. Montreal, Canada 88 pages. The document provides detailed technical information on the application of classical biological control, as well as the track record and case studies of past successful applications, including evidence of non-target impacts. <https://www.cbd.int/doc/publications/cbd-ts-91-en.pdf>
- University of Cambridge. Conservation evidence. A free information resource designed to support decisions about how to maintain and restore global biodiversity. Presents Summarise evidence from the scientific literature (studies) about the effects of conservation actions such as methods of habitat or species management. <https://www.conservationevidence.com/>

Annex 3. NISSAP guidance



Annex 3. Guidance for the development and implementation of a National Invasive Species Strategy and Action Plan (NISSAP)

Contents

1. Introduction	36
2. The NISSAP process	37
Step 1.1. Situation analysis	38
i. Legislation and policy	39
ii. Institutions and capacity	39
iii. Data availability	40
iv. Stakeholder identification	40
v. Regional / international engagement	40
Step 1.2. Baseline information	41
i. Species list of current alien species	42
ii. Future IAS/horizon scan	42
iii. Pathways of introduction	43
iv. Sites	43
Step 2. Analysis and prioritisation	44
i. Risk assessment	44
ii. Risk Management	45
iii. Risk Communication	45
iv. Pathway Analysis	45
v. Prioritisation	46

Step 3. Action planning and implementation	47
i. Joint strategic planning to produce a NISSAP	48
ii. Actions - Pathway management	48
iii. Border security	49
iv. Early detection and rapid response	49
v. Site-based management actions	50
Step 4. Monitoring and evaluation	51
i. Monitoring	52
ii. Evaluate	52
iii. Adapt	52
Step 5. Cross-cutting actions and enablers	53
i. Legislation and policy	53
ii. Research and innovation	54
iii. Stakeholder engagement	54
iv. Awareness raising	54
v. Capacity building	54
vi. Resources	54
vii. Political will	55
viii. Expertise and data	55

1. Introduction

The Convention on Biological Diversity through Article 6¹ on general measures for conservation and sustainable use indicates that each contracting Party shall, in accordance with its particular conditions and capabilities:

(a) Develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity or adapt for this purpose existing strategies, plans or programmes which shall reflect, inter alia, the measures set out in this Convention relevant to the Contracting Party concerned

(b) Integrate, as far as possible and as appropriate, the conservation and sustainable use of biological diversity into relevant sectoral or cross-sectoral plans, programmes and policies.

Article 6 creates an obligation for national biodiversity planning. A national strategy will reflect how the country intends to fulfil the objectives of the Convention in light of specific national circumstances, and the related action plans will constitute the sequence of steps to be taken to meet these goals. Countries response to Article 6 are National Biodiversity Strategies and Action Plans (NBSAPs).

The Kunming-Montreal Global Biodiversity Framework is action- and results-oriented and aims to guide and promote, at all levels, the revision, development, updating, and implementation of policies, goals, targets, and national biodiversity strategies and actions plans, and to facilitate the monitoring and review of progress at all levels in a more transparent and responsible manner.

Based on the above, a National Invasive Species Strategy and Action Plan (NISSAP), can complement the objectives set on an NBSAP, and provide more detailed information to guide national and/or regional actions towards mitigating the threats of invasive Alien Species (IAS) and reducing their pressure on biological diversity. These actions can also generate co-benefits for the implementation of other targets of the Kunming-Montreal Global Biodiversity Framework.

This document presents guidance for the development and implementation of a NISSAP. It builds on the Toolkit for the implementation of Target 6 but can be used as a standalone document.

¹ <https://www.cbd.int/convention/articles/default.shtml?a=cbd-06>

2. The NISSAP process

A NISSAP is a formal strategic document that sets out the priority actions, along with timelines, responsibilities and budgetary needs, that need to be taken to address threats posed by IAS. However, the process of developing a NISSAP is as important as ensuring that the priority actions are contained within it. To ensure that the actions and policies are given the greatest chance of success, a cross-sectoral collaborative approach needs to be taken from the outset, and the decision on what to include needs to be informed by the best available evidence. In addition, the implementation of actions included within a NISSAP need to adapt to changing circumstances and new evidence.

This document aims to address these important aspects by setting out a strategic framework on how to develop a NISSAP, what actions can be included within it, and how to adapt implementation. See Figure 1 that presents the NISSAP development

and implementation framework which consists of four interconnected steps supported by additional cross-cutting actions and enablers. Figure 2 details the elements that can be considered under each step, which are discussed individually in this document. While this guidance identifies and describes the key elements of a NISSAP and its development, i.e. what can be done, it does not go into detail on how the actions can be implemented. More information on the 'how to' can be found in the citations and links provided in the footnotes.

It is important to stress that not all the elements presented in the framework need to be developed or implemented for an effective NISSAP. The levels of engagement, data mobilisation and actions taken need to reflect national circumstances. Any action taken, no matter how small can result in significant benefits.

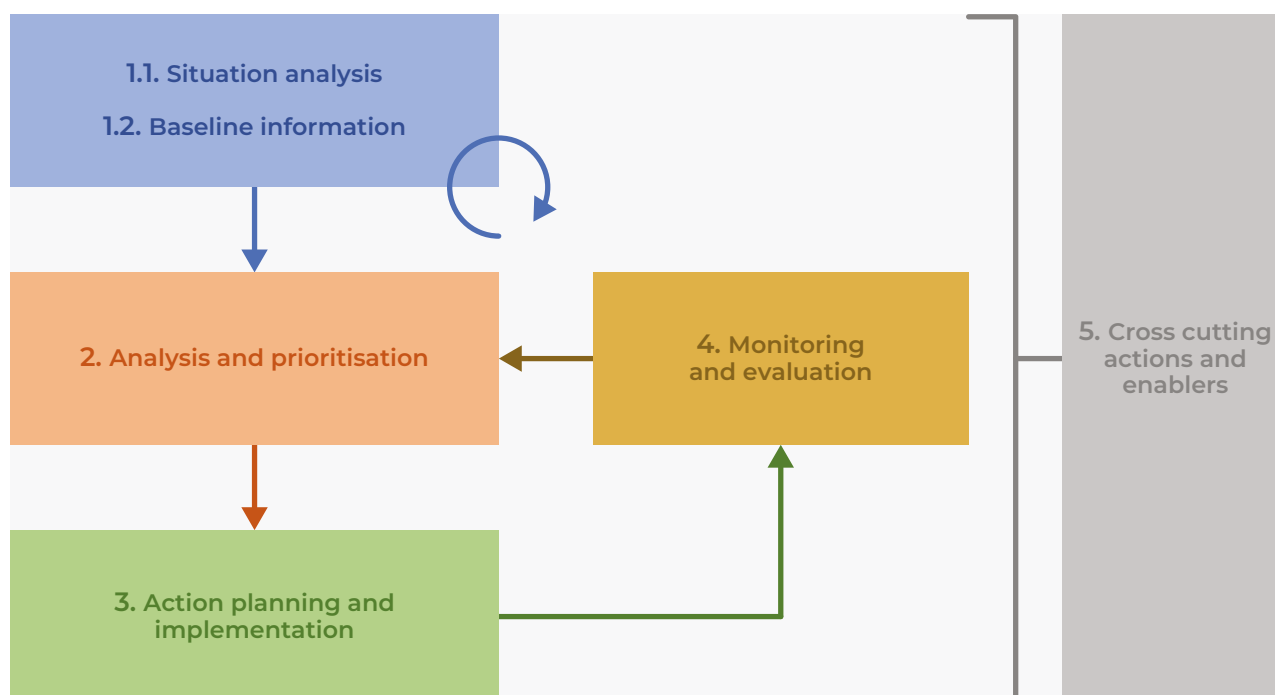


Figure 1. NISSAP development and implementation framework which consists of four interconnected steps supported by additional cross-cutting actions and enablers.

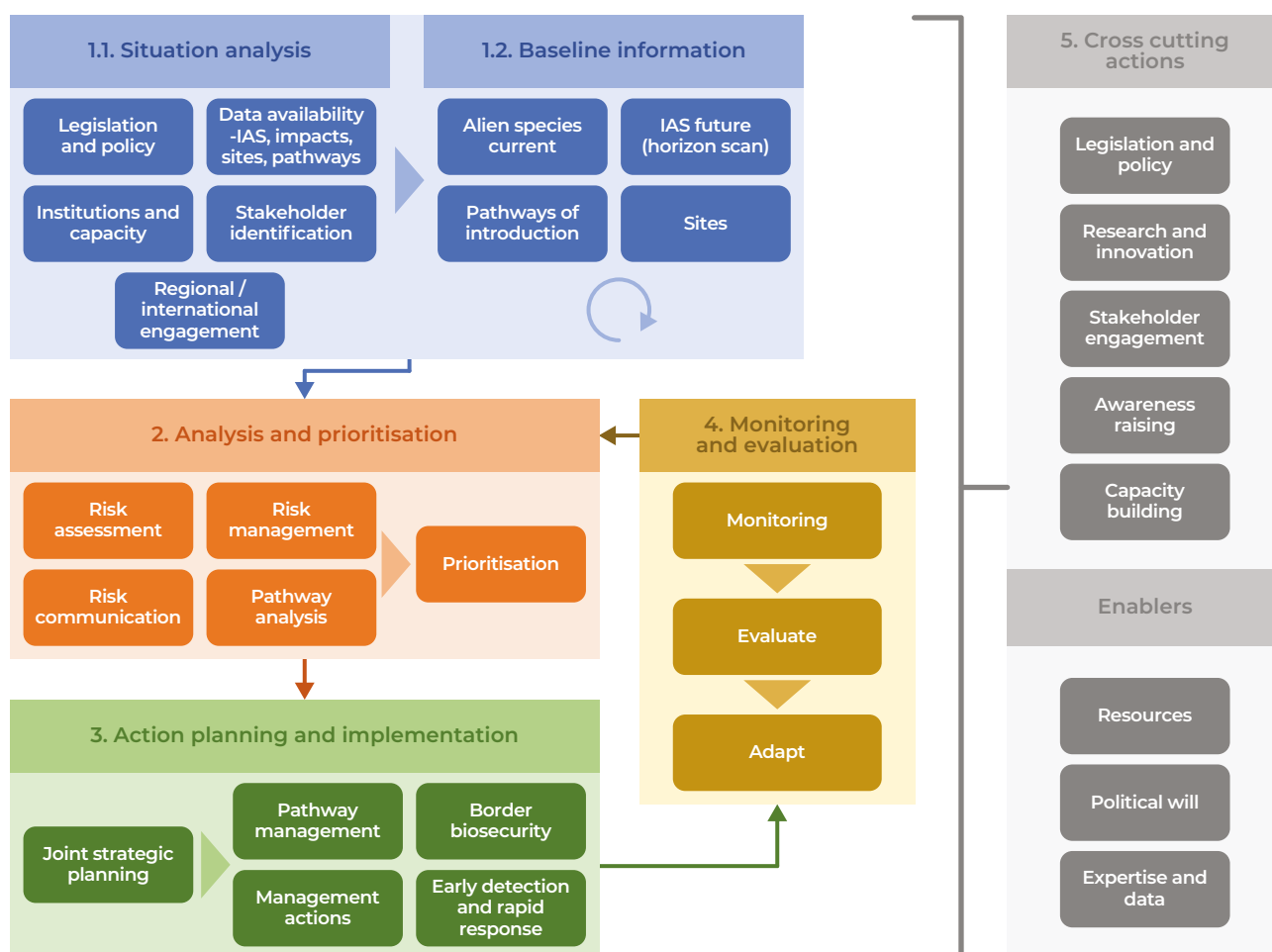


Figure 2. NISSAP framework with the individual elements that can be considered under each step. Each element is discussed separately within this guidance.

Step 1.1. Situation analysis

Before developing a NISSAP it is important to understand the current situation of actions taken to address IAS at a national level. A situation analysis will support the identification of existing capacity and actions, but also the gaps and needs. Engagement

across government ministries (e.g. fisheries, forestry, agriculture, environment, trade, customs and transport) may be needed in order to undertake a situation analysis.

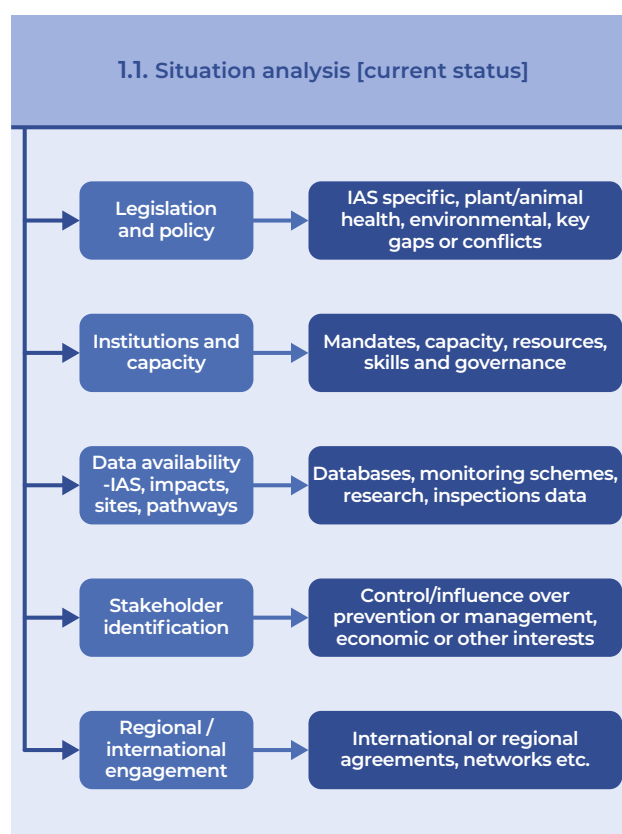


Figure 3. Step 1.1 elements for undertaking a situation analysis to identify the current status of IAS related measures.

i. Legislation and policy

Reviewing the current status of laws and policies related to IAS will help identify gaps and conflicts between related policies and facilitate discussion among relevant ministries.

Relevant existing laws and policies may not necessarily be specific to IAS, but may focus on broader environmental protection, wildlife management, plant/animal health, or other agriculture or aquaculture

issues. In some cases, voluntary codes of conduct may have been adopted and these can also provide a useful reference for informing understanding of the current situation.

Once legislations and policies are identified, key gaps and conflicts between these policies can be identified and then addressed in the action plan.

ii. Institutions and capacity

Mapping the relevant government institutions, including ministries, agencies and competent authorities, that are or could be relevant to IAS, will help understand existing capacity, responsibility and gaps. The scope should not be limited to government institutions that have jurisdiction over existing IAS related policies but should also include those that could in the future play a role in the prevention of

the introduction and establishment of alien species, or the management of IAS.

Mapping of institutional mandates, capacity, resources, skills and governance will facilitate the identification of gaps and potential synergies between the institutions in implementing actions within the NISSAP.

iii. Data availability

Before undertaking work to develop baseline information (see Step 1.2) it is important to understand what data and other resources are already available. Data are fundamental for identifying and prioritising IAS, pathways of introduction, sites and management actions as required for meeting Target 6. It also enables the establishment of baselines so that progress towards targets and goals, or the effectiveness of management interventions can be monitored.

Collating an inventory of available data and resources could include checklists on alien species presence, databases on threatened native species and impacts from IAS, field guides, biodiversity reports, monitoring schemes, research, and inspections data on IAS. An inventory of data and resources will help identify gaps in knowledge that can be addressed in Step 1.2 Baseline information.

iv. Stakeholder identification

Effective management of IAS not only requires a whole-of-government (see institutional capacity above) but also a whole-of-society approach. Engagement and collaboration with non-government stakeholders and indigenous peoples and local communities will improve outcomes of management actions. Identification of stakeholders and rightsholders can be achieved by listing those groups who may be positively or negatively affected

by IAS, or who may be able to play a role in their prevention and management.

The perception of some IAS may differ across stakeholder groups. These can be 'conflict' species that have both negative and positive impacts, such as cultural or economic value, and are therefore challenging to manage. Identifying potential conflicts at this early stage can facilitate engagement and improve the likelihood of management success.

v. Regional / international engagement

Regional and international cooperation helps strengthen action to address IAS, and especially for the prevention of introduction through collaborative actions.

Knowing which regional and international agreements relevant for IAS are ratified, and which networks are engaged with will help in the development

of actions that may be best addressed at a bilateral, regional or global level.

The Convention on Biological Diversity for instance, works with several other international and standard setting organizations through the Inter-agency Liaison Group on IAS.

Step 1.2. Baseline information

Compiling available baseline information, on alien and IAS, pathways of introductions, and sites, will support the decision-making process to develop a NISSAP. Any information relating to which species are present, where they are, if they are spreading and the impacts they are having, will be useful for prioritising (Step 2) and guiding actions (Step 3), and for reporting and evaluating progress (Step 4)

towards Target 6. Recognising knowledge gaps in the baseline data is important but shouldn't stop action being taken. Horizon scanning can provide a useful assessment of what future threats to be aware of and knowledge of sites that are susceptible or vulnerable to invasion may help guide actions. Baseline information should be maintained and updated on a regular basis if possible.

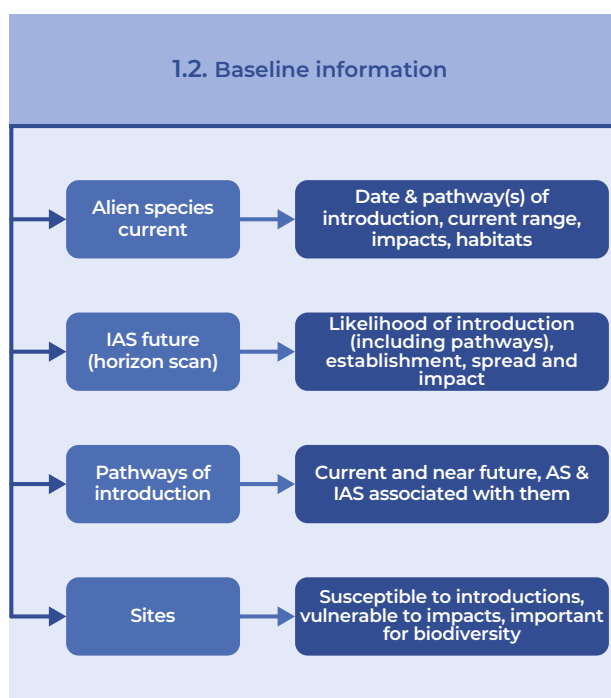


Figure 4. Elements for baseline information considered in Step 1.2 that can be used for analysis and prioritisation in Step 2, and to inform action planning and implementation (Step 3).

i. Species list of current alien species

A list of currently established alien species is the foundation of the baseline information. Species lists can be collated through a variety of approaches including through access to existing open online information systems. Information can be added over time and does not need to be 'complete' to be useful for further work.

A list of IAS that are currently known or suspected to have impacts upon nature in the country is usually the most accessible information with which to start.

This can be extended to include a longer list of alien species known to have been recorded in the country. As a starting point there are freely available global and regional databases including the Global Register of Introduced and Invasive Species - GRIIS² which provides national checklists of alien species. These can be supplemented by additional information from a variety of sources, including reports, surveys and consultation with local experts. See Box 1 for suggested key information to be included.

2 The Global Register of Introduced and Invasive Species - GRIIS. Produced by the IUCN SSC Invasive Species Specialist Group (ISSG) within the framework of activities of the Global Invasive Alien Species Information Partnership (GIASIP) <https://griis.org/> (also available via GBIF <https://doi.org/10.15468/puy8bx>)

Adding other information on alien species, such as evidence of impacts,³ can help with the prioritisation

of alien species, pathways of introduction and management actions (Step 2).

Box 1. Invasive alien species lists should include:

- Scientific names to facilitate access to information in other data systems, which may include species identification, impacts and management.
- Common names, where available, including those used locally, to improve access to information and ease of communication.
- Higher taxonomy or 'groups' of species (e.g. flowering plants) to categorize species. There are global datasets to support this process, e.g. GBIF, and Plants of the World.

ii. Future IAS/horizon scan

A horizon scanning approach can be used to identify and prioritise alien species that are likely to arrive in the near future. This information will support the development of measures to prevent their introduction. A horizon scan is usually undertaken using a structured process involving expert elicitation and consensus-building and can still be applied where there is a lack of evidence.

A horizon scan does not need comprehensive evidence and data, nor access to lots of expertise to undertake. The fundamentals, which are taken from the approach developed by Roy *et al.* (2014) and Roy *et al.* (2018)⁴ are:

- Compile a list of species not yet established in the territory of interest which have the potential to arrive within the foreseeable future.

- Assigning plausible pathways of introduction for the species included on the list.
- Score the species according to likelihood of arrival, establishment, and spread, and the potential impact upon biodiversity and ecosystem services.
- Ranking the species.
- Consideration of management actions

Horizon scanning may be undertaken for all IAS or for groups of species based on taxonomy or environment. When scoring it is useful to consider the previous invasion history, especially of neighbouring or geographically/ climatically similar regions. Tools can help categorise impacts such as EICAT⁵ for Environmental and SEICAT⁶ for Socio-economic and human health impacts.

3 Classifying alien species in terms of the magnitude of their environmental impacts can be done by applying the IUCN Environmental Impact Classification for Alien Taxa - EICAT Categories and Criteria <https://doi.org/10.2305/IUCN.CH.2020.05.en>. Note that all global EICAT assessments are made available on the IUCN Global Invasive Species Database. <https://www.iucngisd.org/gisd/>

4 Roy, H.E., Peyton, J., Aldridge, D.C., et al. (2014). Horizon scanning for invasive alien species with the potential to threaten biodiversity in Great Britain. *Global Change Biology*; Vol. 20, Issue 12 (December) <https://doi.org/10.1111/gcb.12603>; Roy, H.E., Bacher, S., Essl, F., et al. (2019). Developing a list of invasive alien species likely to threaten biodiversity and ecosystems in the European Union. *Global Change Biology*; Vol 25, Issue 3 (March) <https://doi.org/10.1111/gcb.14527>

5 Classifying alien species in terms of the magnitude of their environmental impacts can be done by applying the IUCN Environmental Impact Classification for Alien Taxa - EICAT Categories and Criteria <https://doi.org/10.2305/IUCN.CH.2020.05.en>.

6 Bacher, S., Blackburn, T.M., Essl, F., et al. (2017). Socio-economic impact classification of alien taxa (SEICAT). *Methods in Ecol and Evol.*, Vol. 9, Issue 1 (January) <https://doi.org/10.1111/2041-210X.12844>

iii. Pathways of introduction

Identifying the pathways of introduction of past and future alien species introductions into the territory is the first step towards developing pathway action plans. Ideally this information will be collated during the generation of the species lists and will use the standardised pathway terminology and classification produced under the CBD.⁷ Using this framework will support integration with work that has been done by other countries, regions and globally to identify, prioritise and manage specific pathways.

The pathways of introduction should be assigned to as many species as possible in the list of currently established alien species and the horizon scan list. It is likely that the pathway of introduction for many species is not known for certain. In addition, more than one pathway can be assigned to a species, therefore choosing the relevant pathways to assign can be challenging, however additional guidance⁸ has been

produced to support this process which includes decision tree flow charts, and species examples for each pathway.

Once the pathways have been allocated to the species within the list, it will be possible to assess patterns and trends in pathways of introduction. This will allow for the identification of those pathways that have led to the introduction of alien species in the past, and those that are relevant for future introductions, as they may be different.

Consideration of pathways of introduction into a territory could be extended to include the pathways of spread, as many alien species may be introduced by one pathway (e.g. aquarium trade) but then spread via another (e.g. biofouling on boats). Pathway of spread information is useful for prioritisation of management actions that aim to contain the spread of IAS.

iv. Sites

Site-based management is an important approach to eliminate or reduce impacts from IAS and requires identifying where the important or priority sites are within the territory and what actions are applicable. In general, there are two categories of sites that require different actions;⁹ i) *susceptible* sites that are at high risk to introductions and establishments of alien species, and ii) *sensitive* sites that are vulnerable to the greatest impacts from IAS.

This site-based approach could be broadened out to cover a wider range of 'values'. For example,

priority sites could be areas important for ecosystem services, food security, cultural importance or tourism. Consideration of site-based management (e.g. removal of IAS populations) and ecosystem-based management (e.g. restoration of river flow regimes) can also help inform the selection of sensitive sites. There may also be sites already prioritised for management by rightsholders or stakeholders, e.g. by Indigenous Peoples. These sites may have existing capacity to deploy management actions and can be identified within the site-based approach.

⁷ CBD SBSTTA/18/9/Add.1. Pathways of introduction of invasive species, their prioritization and management. <https://www.cbd.int/doc/meetings/sbstta/sbstta-18/official/sbstta-18-09-add1-en.pdf>

⁸ European Commission, Directorate-General for Environment, Harrower, C., Scalera, R., Pagad, S. et al. (2020). *Guidance for interpretation of the CBD categories of pathways for the introduction of invasive alien species*, Publications Office, 2020. <https://data.europa.eu/doi/10.2779/6172>

⁹ McGeogh, M.A., Genovesi, P., Bellingham, P.J., et al. (2016). Prioritising species, pathways, and sites to achieve conservation targets for biological invasion. *Biological Invasions*, Vol. 18 (November) <https://doi.org/10.1007/s10530-015-1013-1>

Step 2. Analysis and prioritisation

To inform decisions on effective resource allocation and actions, there are a number of elements that need to be considered and prioritised (Figure 5). Building on the baseline information gathered in

Step 1.2, analysis of the risks that species pose (establishment, spread, impact) and identification of the most important pathways of introduction and priority sites should be done in a structured way.

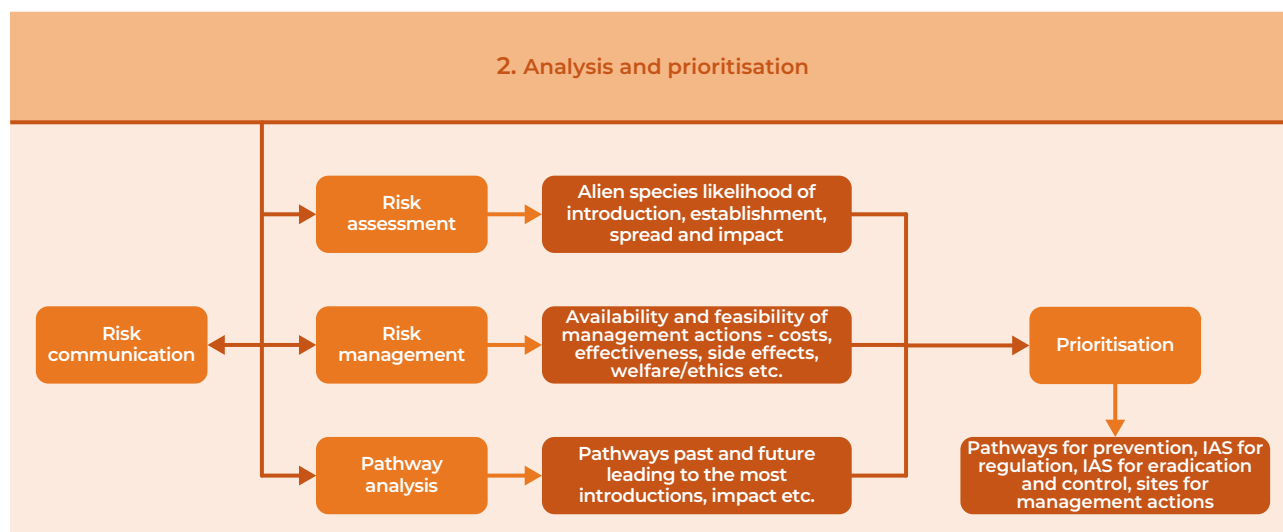


Figure 5. Step 2 describes the process of analysis and prioritisation based on the data collected in Step 1, to support decision making and implementation as described in Step 3. This process includes risk analysis of species, which is a combination of risk assessment and risk management, associated with risk communication, and analysis of pathways, which enables prioritisation.

i. Risk assessment

Risk assessment is a systematic process used to evaluate the potential for an alien species to be introduced, establish, spread and cause negative impacts in a defined area. They provide an important evidence-base for underpinning policy and legislation and specifically provide crucial evidence to effectively allocate resources for conservation and, with effective communication, increased support from stakeholders and the public.

At its simplest, risk assessment involves considering the separate steps within the biological invasion process:

- Likelihood of entry / introduction
- Likelihood of establishment

- Rate of spread
- Magnitude of impact

Species are typically scored for each step and then an overall risk is determined based on this evaluation. Scoring can be done in a semi-quantitative way using guidance criteria and the best available evidence or expert judgements.

Species lists can be screened for known IAS and databases such as the GRIIS¹⁰ and CABI compendium¹¹ can be used to check if there is an invasion history in a situation comparable to the target area (e.g. similar climate and habitat), which can be used to help evaluation. The evidence base for evaluation of risk can be formally assessed using existing impact

¹⁰ The Global Register of Introduced and Invasive Species - GRIIS. Produced by the IUCN SSC Invasive Species Specialist Group (ISSG) within the framework of activities of the Global Invasive Alien Species Information Partnership (GIASIP) <https://griis.org/> (also available via GBIF <https://doi.org/10.15468/puy8bx>)

¹¹ CABI compendium on invasive species <https://www.cabidigitallibrary.org/product/qi>

scoring schemes such as the environmental impact categories set out by the EICAT¹² or use climate matching/habitat suitability systems and models to

identify risk of future establishment and spread.¹³ Additional criteria could also be included, for example socio-economic,¹⁴ and human health impacts.

ii. Risk Management

Risk management involves making a structured assessment on the availability and feasibility of management actions - costs, effectiveness, side effects, welfare/ethics etc. to eliminate, minimise or mitigate the impacts of IAS. Evaluation of risk management for established species will consider the feasibility of eradication, containment, control etc. while species not yet arrived (horizon scan species) can be

evaluated for prevention and contingency planning. Assessment of management feasibility is important to inform decision making on priority species as some high-risk species (determined by risk assessment) may not have a feasible management option. In some cases, it may be obvious when a specific management approach is feasible or not, but decision making should be evidence based.

iii. Risk Communication

Risk communication is an interactive process that involves communicating evidence about the risk posed by a species or pathway, proposed mitigation measures and uncertainties. Ideally, it is not a one-way provision of information, but instead an interactive process that helps gather and reconcile the views of scientists, stakeholders and politicians. In this way, good risk communication can help improve assessment, build trust in management efforts and address misconceptions.

Uncertainty is an inherent part of alien species risk assessment and the scientific process in general. Communication of uncertainty or confidence in the outcomes of risk assessment is a particular focus of communicating the risk to stakeholders and the public. The understanding and extent of uncertainty is critical to open and transparent communication.

iv. Pathway Analysis

By analysing pathways of introduction identified in Step 1.2, pathway analysis clarifies which human activities have caused the introduction of alien species. This is achieved through systematic examination of the various routes through which alien and IAS are introduced or spread. The analysis can focus on pre-border (pre-invasion) or post-border pathways

of introduction or spread. The analysis can evaluate factors such as the volume of traffic along the pathway, the likelihood of known invasive species being transported along the pathway, the vulnerability of the receiving ecosystems and the potential impact of the alien species if introduced.¹⁵

12 Classifying alien species in terms of the magnitude of their environmental impacts can be done by applying the IUCN Environmental Impact Classification for Alien Taxa - EICAT Categories and Criteria <https://doi.org/10.2305/IUCN.CH.2020.05.en>.

13 For example, Chai, S-L., Zhang, J., Nixon, A., and Neilson, S. (2016). Using Risk Assessment and Habitat Suitability Models to Prioritise Invasive Species for Management in a Changing Climate. PLoS ONE, Vol. 11, Issue 10 (October) <https://doi.org/10.1371/journal.pone.0165292>

14 Bacher, S., Blackburn, T.M., Essi, F., et al. (2017). Socio-economic impact classification of alien taxa (SEICAT). *Methods in Ecol and Evol.*, Vol. 9, Issue 1 (January) <https://doi.org/10.1111/2041-210X.12844>

15 Examples of pathway analysis: NOBANIS. 2015. Invasive alien species pathway analysis and horizon scanning for countries in Northern Europe. Nordic Council of Ministers, Copenhagen. [doi:10.6027/TN2015-517](https://doi.org/10.6027/TN2015-517); Rabitsch et al. 2018. Analysis and prioritisation of pathways of unintentional introduction and spread of invasive alien species in Germany in accordance with Regulation (EU) 1143/2014. <https://www.bfn.de/en/publications/bfn-schriften/bfn-schriften-490-analysis-and-prioritisation-pathways-unintentional>

V. Prioritisation

Prioritisation processes are a transparent, evidence-based evaluation of multiple species, pathways or sites that provide a basis for decision making. Where resources are limited and uncertainty is high, a systematic approach is needed to target action to the areas of greatest need and where the greatest benefits can be achieved.

Prioritisation should follow the CBD hierarchy (decision 6/23¹⁶) where prevention is most cost-effective

followed by early detection and rapid response, followed by eradication, containment and long-term control measures.

Effective prioritisation should be straightforward, in some cases, simple ranking or obvious prioritisation may be sufficient and further assessment is not needed but the process should be evidence based to demonstrate that high impact species or pathways are indeed high management priorities.

¹⁶ [CBD/COP/DEC/6/23](#)

Step 3. Action planning and implementation

When all the relevant information has been collated (Step 1.1 and 1.2), analysed and prioritised (Step 2) the appropriate actions can be identified through a consultative process involving relevant stakeholders and formalised in an achievable action plan, i.e. drafting of the NISSAP.

Here we describe the **joint strategic planning** process to develop a NISSAP and outline four elements

to consider when planning actions to **prevent the introduction and establishment of new alien species** or to **remove, minimise, or mitigate the impacts from already established IAS** (Figure 6). The NISSAP should be a dynamic document that enables adaptive management approaches, a regular review process will allow monitoring of action actions and evaluation of progress to inform updates to actions through time (see Step 4).

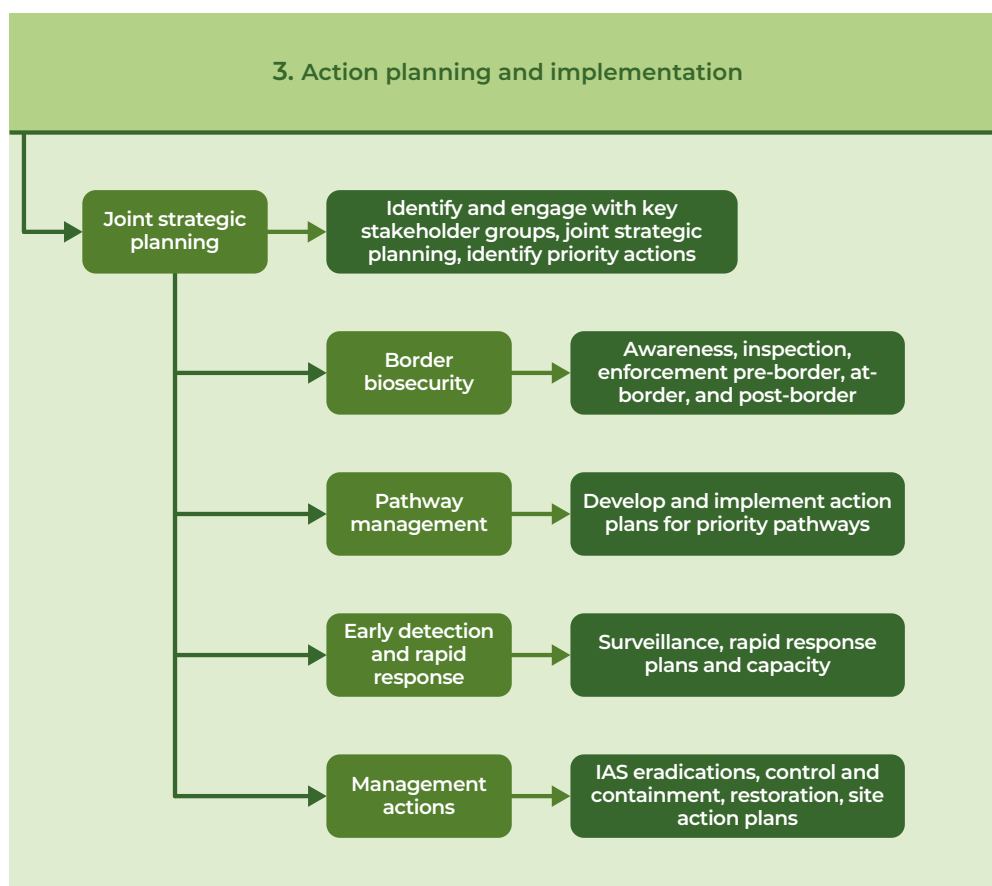


Figure 6. Elements included in Step 3. Action planning and implementation

i. Joint strategic planning to produce a NISSAP

A joint strategic planning approach is a multi-stakeholder process that aims to develop an integrated, coordinated and achievable plan of action.

It is important that **key institutions with responsibility for implementing actions targeting impacts from IAS are engaged with at the start of the action planning process.** Stakeholders that have influence over the implementation of possible actions, and those that may be positively or negatively impacted by the should be included. These stakeholders should have been identified in Step 1.1. situation analysis.

How the engagement is undertaken, and the actions are agreed can depend upon many different factors, including availability of resources and time, cultural practices, or existing planning processes.¹⁷ A relatively simple approach involves the running of one or more stakeholder engagement workshops to agree priority actions, responsibilities, time frames and budget needs.

A *strategy* document will set out the overarching goals that need to be achieved, each with one or more objectives that detail what needs to happen to meet that goal. The *action plan* should define the specific actions that need to be implemented in order to attain the objective. Each action should be 'SMART' (Specific, Measurable, Assigned to someone, Resourced, and Time-limited).

A committee can be created to include experts from across different government authorities and key stakeholder groups, with an individual or institution taking the coordination responsibility. It should have access to technical and scientific support, and effective communication channels to relevant decision makers.

Finally, it may be useful to support political decision-making processes to incorporate economic principles, so that the benefits from actions taken on IAS are not just presented in biodiversity gains but also economic, and public health.

ii. Actions - Pathway management

Pathway management aims to prevent the invasion of alien species by managing the pathway(s) prioritised (see Step 2). These measures can be captured under the NISSAP, or if deemed necessary can be expanded into more detail and take the form of a specific Pathway Action Plan (PAP). When developing PAPs, the following should be considered:¹⁸

- Understanding the pathway. Consider origins and transit routes, any vectors associated with it (e.g. vehicles, goods, containers, luggage), points of entry (e.g. airports, seaports, post-border destination points) and, if relevant, points of release or escape (e.g. from gardens, wildlife collections, deliberate planting).
- Identify relevant stakeholders and key actors. For example, importers, transport companies, trade associations, hobbyists, government stakeholders (border officials, etc), general public, etc.
- Working with relevant stakeholders:

- Identify the aim and objectives of the pathway action plan in order to reduce risk of invasion.
- Determine the key actions that need to be taken to achieve these aims, who will deliver them and by when.
- Consider aims and actions that include:
 - Awareness raising and behaviour change.
 - Methods to minimise contamination of goods, vehicles, equipment, etc.
 - Appropriate checks at the border and / or at other points along the pathway
 - Codes of practice and or regulation.

Due to the international nature of pathways of introduction, collaboration at a regional or global level will support their management. There are existing international agreements that address some of the pathways (e.g. The World Trade Organisation

¹⁷ For example, FAO Facilitating effective multi-stakeholder processes <https://www.fao.org/capacity-development/resources/practical-tools/multi-stakeholder-processes/en/>

¹⁸ Scalera, R. and Genovesi, P. (2016). Guidance for governments concerning invasive alien species pathways action plans. T-PVS/Inf (2016) 10 <https://rm.coe.int/1680746339>

SPS agreement,¹⁹ World Organisation for Animal Health (WOAH)²⁰ and International Plant Protection Convention (IPPC)²¹ standards, the Ballast Water Management Convention and IMO guidelines²², and the national authorities with the mandates apply the standards they set should be engaged with in the development of pathway management actions. This includes plant and animal health authorities, marine shipping and ports, and trade.

iii. Border security

Effective border security measures (often termed 'biosecurity') are important for preventing the arrival of new species across many pathways of introduction, and can be applied pre-border, at-border, and post-border.

Consideration should also be given to monitoring online commerce, for example for the sale or import

of regulated species. In addition to commerce, the exchange of species via peer-to-peer trading platform, forums and social media can be common. Monitoring and intervening online can be challenging and national and international rules must be followed.

iv. Early detection and rapid response

When prevention fails or is not possible, early detection and rapid response actions can contain and remove alien species at an early stage of biological invasion.

Surveillance to rapidly detect new IAS is important to ensure the effectiveness of rapid response and eradication and should be implemented for priority susceptible and vulnerable sites. Surveillance systems can be designed to detect many different IAS or can be specific to one or a few IAS selected through horizon scanning and risk assessment (see Steps 1 and 2).

Surveillance can be achieved through repeatable survey methods or can rely on opportunistic reporting by stakeholders including members of the public. Engagement of stakeholders in surveillance requires effective communication to raise awareness and ensure that methods for reporting any species

of concern are clear. Reporting can be achieved through a dedicated e-mail account or using social media such as WhatsApp. 'Citizen-science' programmes can be a cost-effective tool for helping collate useful information on IAS, especially for early detection and species distribution mapping.²³ However, it is critical that someone has the responsibility to check the account and provide feedback as necessary while also ensuring that the information is provided to those who can implement action. Online data systems can also be relatively easily established and provide a more efficient and secure way to capture and share relevant information.

In addition, there are many innovative technologies such as smart traps, sensor networks and eDNA that can also be used to support surveillance efforts for early detection.²⁴ Trained detector dogs have been effectively used to detect IAS in many contexts including at ports of entry or sensitive sites. Earth

19 WTO Sanitary and Phytosanitary measures https://www.wto.org/english/tratop_e/sps_e/sps_e.htm

20 WOAH standards <https://www.woah.org/en/what-we-do/standards/>

21 IPPC international Standards for Phytosanitary Measures (ISPMs) <https://www.ippc.int/en/core-activities/standards-setting/ispm/>

22 IMO Ballast Water Management Convention <https://www.imo.org/en/OurWork/Environment/Pages/BallastWaterManagement.aspx>

23 Pocock, M.J., Adriaens, T., Bertolino, S., et al. (2024). Citizen science is a vital partnership for invasive alien species management and research. *iScience*, Vol. 27, Issue 1 (January) <https://doi.org/10.1016/j.isci.2023.108623>

24 Martinez, B., Reaser, J.K., Dehgan, A., et al. (2020). Technology innovation: advancing capacities for the early detection of and rapid response to invasive species. *Biological Invasions*, Vol. 22 (December). <https://doi.org/10.1007/s10530-019-02146-y>

observation data from satellites and aerial systems, including drones and under water remote vehicles, can be used for rapid and repeatable large-scale

assessment of areas which in some cases maybe inaccessible for other survey approaches

V. Site-based management actions

Undertaking actions that aim to eradicate, contain, or control established IAS populations are the main means of eliminating, minimising or reducing their impacts upon biodiversity and ecosystem services. When planning and undertaking these management measures, there are three broad objectives that should be considered: eradication, containment, or control.

When considering management actions for established IAS populations, **eradication should be considered as the first option**. Where eradication is not deemed to be feasible then other management objectives such as **containment or control** to reduce the distribution, spread or impacts should be considered.

When planning management actions, it is important to consider possible non-target effects, and

aim to mitigate these where possible and to adapt or change approaches accordingly. For example, this could include damage to native species or habitats due to chemical application, or the increase in other IAS once the targeted IAS has been removed. It is recommended that the potential animal welfare impacts of any management measure are also taken into consideration when choosing which approach to use and through its application.²⁵

In addition, taking an adaptive integrated approach where more than one option is used either in parallel or sequence (e.g. mechanical removal followed by herbicide application), can achieve greater success than the application of either option on their own. This approach can also include the use of ecosystem management approaches (e.g. restoring connectivity or flow regimes in a river) alongside actions that directly target the IAS.

²⁵ Smith, K.G., Nunes, A.L., Aegerter, J., et al. (2022). A manual for the management of vertebrate invasive alien species of Union concern, incorporating animal welfare. 1st Edition. Technical report prepared for the European Commission within the framework of the contract no. 07.027746/2019/812504/SER/ENV.D.2 <https://easin.jrc.ec.europa.eu/easin/documentation/Codesofconduct>

Step 4. Monitoring and evaluation

When developing a NISSAP, it is important to consider that Global Biodiversity Framework has a monitoring framework with an indicator for Target 6, “the rate of invasive alien species establishment”,²⁶ which is the number of IAS that are expected to have established in a new region or country compared with the reference period, based on modelled trends in IAS observations. National targets should be established considering the information required to report on this, such as species lists, new introductions and pathway management strategies and results.

Implementation of the NISSAP should allow for adaptive management through integration of new evidence to update decision making and actions (Figure 7). Ongoing monitoring and evaluation will provide updates on the status of biological invasions (e.g. are new species arriving?) and success of any interventions (e.g. which species have been prevented from establishing?) to allow a review of priorities, resource allocation, and adaptation of management methods. Analysis of data from monitoring will also provide trends for indicators on targets and can be used in models to make predictions and can inform future action planning.

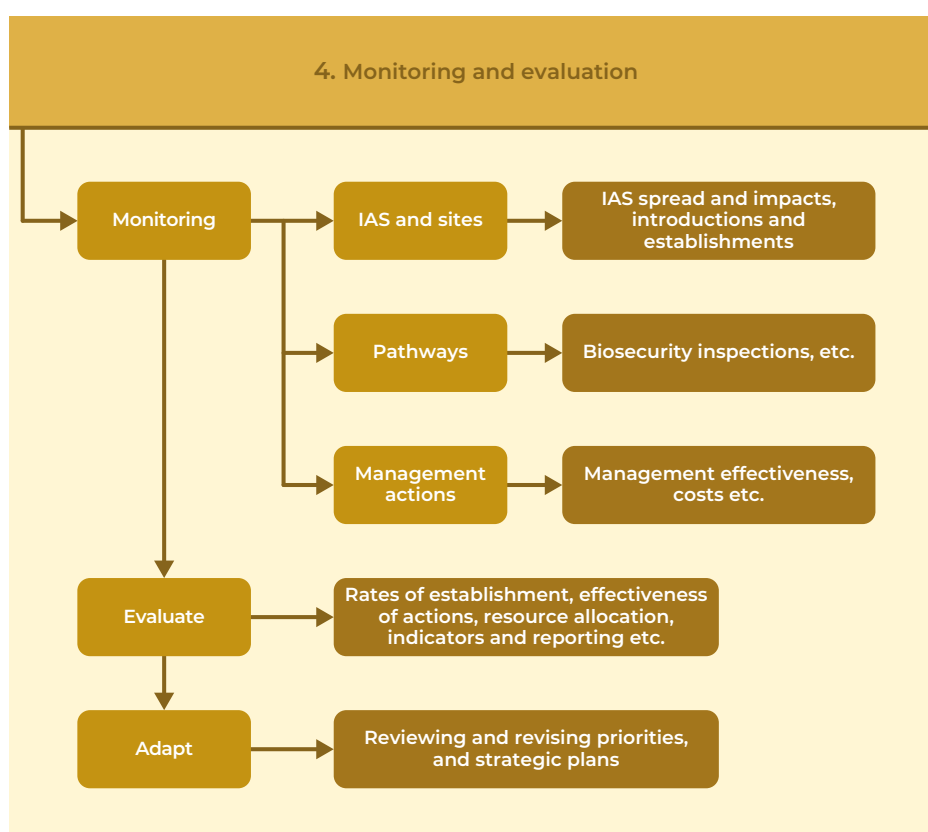


Figure 7. Step 4 describes the process of reviewing and updating data and information on IAS, including evaluating outcomes of management actions. This step will require prioritised lists of species and pathways (step 2) and management actions (step 3).

²⁶ CBD/SBSTTA/26/INF/14

i. Monitoring

Integration of new data into baseline datasets of species occurrence (Step 1) and management (Step 3) is essential to provide up-to-date lists of species and their impacts.

Monitoring of IAS should capture any changes to baseline information that can be attributed to the causes (or drivers) of the biological invasions,

resource allocation or management actions, it may also be possible to monitor the benefits through tracking of the conservation status of species and habitats that are threatened by IAS. It is important to keep in mind that the indicator from the monitoring framework of the Kunming-Montreal Global Biodiversity Framework should be used for reporting progress for Target 6.

ii. Evaluate

Analysis and evaluation of available data will allow tracking of IAS and assessment of the effectiveness of management actions to reduce the magnitude of their impacts. Regular updating of species lists will facilitate evaluation of trends in numbers of species arriving and establishing, including information on likely or known pathway of introduction, and magnitude of impact. Sources of uncertainty, bias and gaps in knowledge should be identified and documented.

The range of **indicators and trends** used to track biological invasions will depend on the quality of data being collected. Indicators do not need to be complex but should consider bias and uncertainty in data availability. **Simple metrics can be determined for species entering, establishing, by pathway and impact severity.** However, the usefulness of these metrics will be dependent greatly on the level of surveillance or monitoring effort and the detectability of the species so ideally these metrics should be standardised when presenting trends through time.²⁷

iii. Adapt

A NISSAP should be a dynamic document where evidence, decision-making and actions are updated regularly to reflect the latest situation and information. Adaptive management allows interventions and actions to be implemented based on the best available evidence, which can be reviewed and refined or updated as new information becomes available, with the aim to reduce uncertainties and

improve efficiency. Sharing of management information including both successes and failures is important to continually improve best practise. Regular reviewing of the NISSAP, following acquisition of new information and assessment of data gaps through monitoring and evaluation, can re-align priorities and management actions to ensure continued appropriate resource allocation.

27 McGeoch, M.A., Buba, Y., Arle, E., et. al. (2023). Invasion trends: An interpretable measure of change is needed to support policy targets. *Conservation Letters*, Vol. 16, Issue 6 (October) <https://doi.org/10.1111/cons.12981>

Step 5. Cross-cutting actions and enablers

To achieve an effective NISSAP a whole-of-government and whole-of-society approach is required to implement actions across sectors and stakeholder groups. Coordination and collaboration are core pillars to enable this, supported by a number of interconnected cross-cutting elements that link to each NISSAP development step. The cross-cutting

actions to consider include legislation and policy; research and innovation; stakeholder engagement; awareness raising; and capacity building (Figure 8) which are underpinned by enabling factors including resources, political will and access to expertise and data.

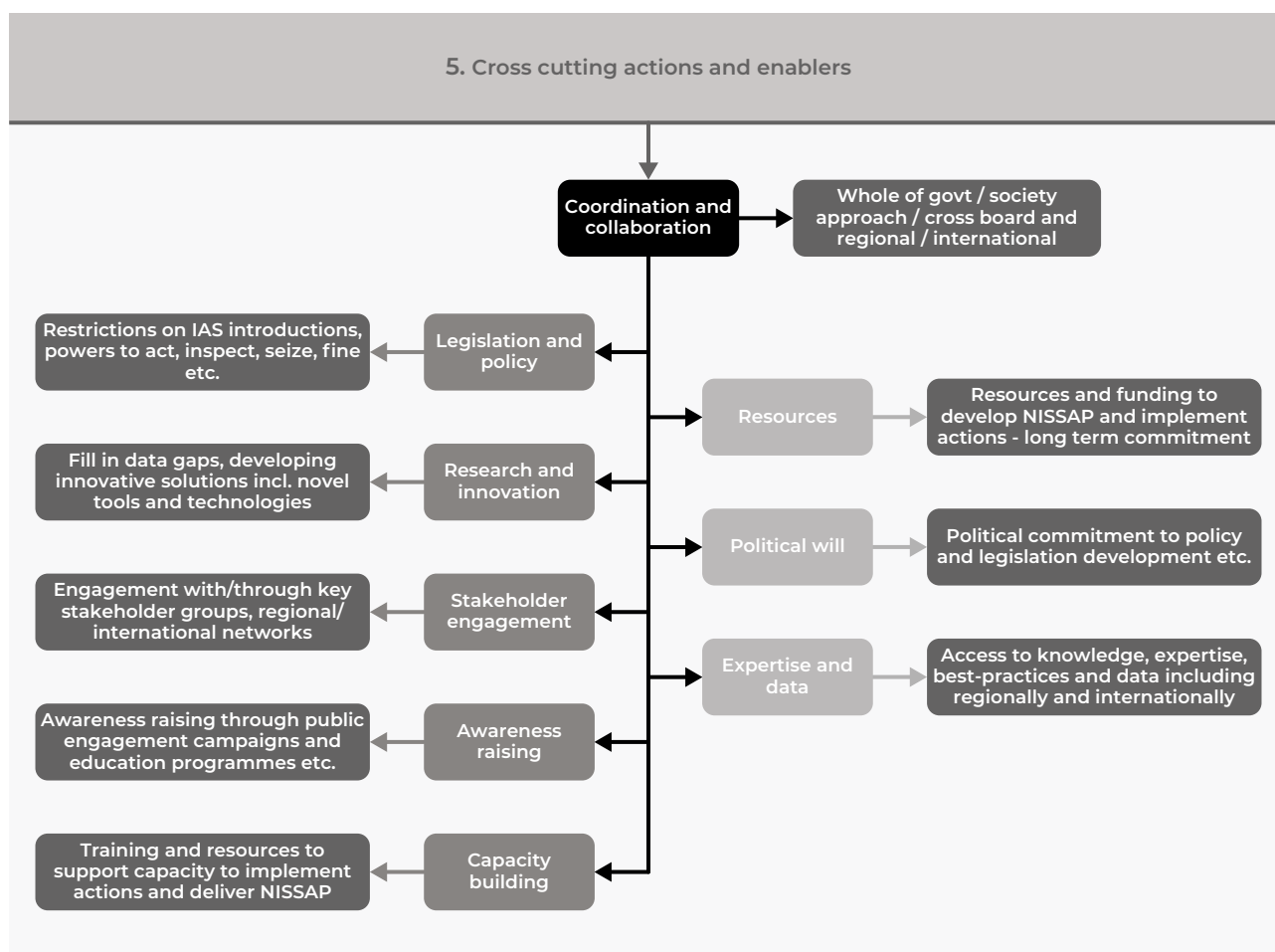


Figure 8. Step 5 describes the cross-cutting actions (left hand side) and enablers (right hand side) that support the implementation of actions across all of the steps.

i. Legislation and policy

Having robust and effective legislation and policies will underpin actions to prevent the introduction and establishment of alien species and will provide the required mandates for institutions, including for collaboration across sectors.

Enacting legislation takes time and is a complex process, but it can strongly support long-term commitment and resourcing from governments and institutions, which in turn will help guarantee the implementation of the various actions envisaged in the NISSAPs.

Due to the transboundary nature of IAS, pathways and impacts, it can be more efficient to jointly develop regional policy instruments, which require shared

objectives and cross-national actions. Collaborative approaches are often more strategic and cost-effective but can be challenging and complex to develop.

ii. Research and innovation

Enhanced technical and scientific cooperation and technology transfer for state-of-the-art research, innovative management techniques, and environmentally sound technologies will support effective implementation of management actions. A holistic

approach through promoting transdisciplinary research and innovation by exploring links with fields such as social sciences, human health, animal welfare and informatics would greatly benefit the advancement of management of IAS.

iii. Stakeholder engagement

Response to IAS requires a whole-of-government and whole-of-society approach. Governments will need to coordinate actions across multiple departments to develop and implement coherent policies

and legislation. Governments can engage in regional and international mechanisms to facilitate joint action and information exchange.

iv. Awareness raising

Public understanding of the risks associated with IAS, complemented by their informed cooperation, is critical to preventing new introductions. Awareness raising and education can target a range

of audiences and can be undertaken in various places, including schools, community groups or through targeted events.

v. Capacity building

It is recognised that the capacity to respond to IAS varies widely across regions, with nearly half of all countries not investing in management of IAS.²⁸ Identification of where training and support are needed to enable the development and implementation of NISSAPs will increase the capacity to

respond. Areas that may require capacity building include species taxonomy and identification, improving data management systems, implementing biosecurity approaches and sharing of best practice methodologies for prioritisation and practical management.

vi. Resources

The number of IAS and the magnitude of their impacts will outstrip the resources available for their management. Allocation of sufficient resources to support the development and implementation of a NISSAP should prioritise actions that contribute to

prevention and preparedness as these are the most cost-effective options.

Accessing global funding mechanisms can support the resourcing of developing and implementing a NISSAP, such as through the Global Environment

28 IPBES. 2023. Summary for Policymakers of the Thematic Assessment Report on Invasive Alien Species and their Control of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. Roy, H.E. et al. (eds.). IPBES secretariat, Bonn, Germany. <https://doi.org/10.5281/zenodo.7430692>

Facility²⁹ which enables developing countries to address complex challenges and work towards international environmental goals, including on IAS. In addition, tax incentives, international standards and cost-sharing mechanisms can be used to encourage stakeholders across different sectors to engage

in IAS prevention and management. Under certain conditions, methods such as economic penalties or tariff related regulations, tax relief or subsidies, voluntary codes of conduct, or direct regulatory intervention may also be useful.

vii. Political will

At the global level, the inclusion of target 6 in the Kunming-Montreal Global Biodiversity Framework demonstrates the global understanding of the negative impacts of IAS and the political will to prevent the damage caused by these species.

Political will, alongside sufficient resources and long-term commitment, is critical to making IAS prevention and control an achievable goal.³⁰

viii. Expertise and data

National, regional and international networks and fora of expertise on invasive species and their management can provide support and advise across all levels of IAS management. Information sharing on taxonomy, risks and impacts and management best practise is aided by a range of freely available online resources and databases. Data sharing (using standardised and harmonised datasets) on invasions improves the knowledge base to inform effective

action. There are also global and regional networks of experts on IAS that can be engaged with, for example the IUCN Species Survival Commission Invasive Species Specialist group (ISSG).³¹ In addition, the recent 2023 *IPBES the Thematic Assessment Report on Invasive Alien Species and their Control*³² provides up-to-date information to support management of IAS but also to help raise awareness with decision makers.

29 Global Environment Facility <https://www.thegef.org/>

30 IPBES. (2023). Summary for Policymakers of the Thematic Assessment Report on Invasive Alien Species and their Control of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. Roy, H.E., et al. (eds.). IPBES secretariat, Bonn, Germany. <https://doi.org/10.5281/zenodo.7430692>

31 IUCN SSC ISSG <https://www.iucn.org/our-union/commissions/group/iucn-ssc-invasive-species-specialist-group>

32 IPBES. (2023). Thematic Assessment Report on Invasive Alien Species and their Control of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. Roy, H.E., Pauchard, A., Stoett, P., and Renard Truong, T. (eds.). IPBES secretariat, Bonn, Germany. <https://doi.org/10.5281/zenodo.7430682>



Convention on
Biological Diversity

