Assessment to support continued development of the EU Strategy to combat invasive alien species

Final Report

Service Contract ENV.B.2/SER/2009/0101r

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Abbreviations

AHR	EU animal health regime
ALARM	Assessing LArge-scale environmental Risks for biodiversity with tested Methods
AQR/aquaculture Regulation	Council Regulation (EC) No 708/2007 concerning use of alien and locally absent species in aquaculture
BAU	Business as Usual (policy scenario)
Bern Convention	Convention on the Conservation of European Wildlife and Habitats (1979)
BFIS	Belgian Forum on Invasive Species
BIPs	EU Border Inspection Posts
birds Directive	Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (codified version of Council Directive 79/409/EEC)
BWM Convention	IMO International Convention for the Control and Management of Ships Ballast Water and Sediments
CA	competent authority
CBD	Convention on Biological Diversity
COM	EC Communication 'Towards an EU Strategy on Invasive Species'. Brussels, 3.12.2008 (COM (2008) 789)
COM Option A	Business as Usual
COM Option B	Maximising existing approaches and voluntary measures
COM Option B+	Targeted amendment of existing legislation
COM Option C	Comprehensive dedicated legal framework
COP	Conference of the Parties
Council Conclusions	Council Conclusions on a mid-term assessment of implementing the EU Biodiversity Action Plan and Towards an EU Strategy on Invasive Alien Species (2953rd Environment Council meeting, Luxembourg, 25 June 2009)
DAISIE	Delivering Alien Invasive Species Inventories for Europe
EAFRD	European Agricultural Fund for Rural Development
ECDC	European Centre for Disease Control
EEA	European Environment Agency
EFSA	European Food Safety Authority
EIA	Environmental impact assessment
ELD	Environmental Liability Directive (Council Directive 2004/35/EC on environmental liability with regard to the prevention and remedying of environmental damage)
EMSA	European Maritime Safety Agency
EPBC	Environment Protection and Biodiversity Conservation Act (Australia)
EPPO	European and Mediterranean Plant Protection Organization
EU	European Union
EWRR	Early warning and rapid response
FAP	EU Forestry Action Plan
FCS	Favourable conservation status
FD	Directive on the assessment and management of flood risks (2007/60/EC)
FP	RTD Framework Programmes
FSC	Forest Stewardship Council
FTE	Full-time equivalent
FVO	DG SANCO Food and Veterinary Office
GABLIS	German-Austrian Black List for Invasive Species (Essl et al. 2008)
GAEC	Good Agricultural and Environmental Condition
GM	genetically modified
GPP	green public procurement
Guiding Principles	Guiding Principles for the prevention, introduction and mitigation of impacts of alien species that threaten ecosystems, habitats or species (annexed to Decision VI/23 adopted at CBD COP6 in 2002 (The Hague, Netherlands)).

habitats Directive ..... Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora
HACCP ..... Hazard Analysis and Critical Control Points
HO ..... Harmful organism (designation under plant health Directive 2000/29)
IAS ..... invasive alien species
ICAO ..... International Civil Aviation Organization
ICES ..... International Council for the Exploration of the Sea
IEWS ..... Information and early warning system (use of term does not prejudice future decision on architecture to support this system e.g. EU or Europe-wide)
IMO ..... International Maritime Organization
IOC ..... Intergovernmental Oceanographic Commission of UNESCO
IPPC ..... International Plant Protection Convention
ISPM ..... International Standards for Phytosanitary Measures (developed under the IPPC)
ISI ..... Invasive Species Ireland initiative
JKW ..... Japanese knotweed
JRC ..... Joint Research Centre
LIFE ..... EU Financial Instrument for the Environment
MSFD ..... marine strategy framework Directive (2008/56/EC)
MS ..... Member State(s)
NISC ..... US National Invasive Species Council
NOBANIS ..... European Network on Invasive Species (formerly North European and Baltic Network on Invasive Alien Species)
NPPO ..... National Plant Protection Organization (within IPPC/EPPO framework)
OCT ..... EU Overseas Countries and Territories
OIE ..... World Organisation for Animal Health
OR ..... EU Outermost Region
plant health Directive ..... Directive on protective measures against the introduction into the Community of organisms harmful to plants or plant products and against their spread in the Community (2000/29/EC) as amended
PHR ..... EU plant health regime
PHR Evaluation ..... Evaluation of the EU plant health regime (FCEC 2010)
PRA ..... Pest risk analysis
PRATIQUE ..... Enhancement of Pest Risk Analysis Techniques (RTD FP7 project)
PZ ..... Protected zone (established under the plant health Directive)
RA ..... Risk assessment
SBSTTA ..... CBD Subsidiary Body on Scientific, Technical and Technological Advice
SEA ..... Strategic environmental assessment
Strategy ..... future EU Strategy to combat Invasive Alien Species
TEEB ..... The Economics of Ecosystems and Biodiversity
Three-stage hierarchy ..... CBD-recommended sequence of IAS interventions (prevention; early detection and rapid response; long-term control and containment)
WFD ..... water framework Directive (2000/60/EC)
WTR ..... wildlife trade Regulation 338/97/EC
WTO-SPS Agreement ..... WTO Agreement on the Application of Sanitary and Phytosanitary Measures

Executive summary

Invasive alien species (IAS) are recognised as one of the five pressures directly driving biodiversity loss. The other four (habitat change, overexploitation, pollution and climate change) are already addressed by EU policies. Together with climate change, IAS are considered one of the most difficult biodiversity threats to reverse to normality. Some of Europe's most threatened species are affected by IAS: of the 174 European species listed as critically endangered by the IUCN Red List, 65 are in danger because of introduced species.

The IAS issue involves complex interactions between political, economic, social and technical factors. Trade pathways linked to globalisation are the key driver for the increasing rate of introductions into the EU across all taxonomic groups. In Europe as a whole, the rate of new introductions has risen steadily in recent decades and is still increasing for all taxonomic groups except mammals. The cumulative number of alien species is increasing for all groups including mammals, with one new alien mammal introduced per year. Similar patterns are observed in Europe's marine environment. Lost output due to IAS, health impacts and expenditure to repair IAS damage has already cost EU stakeholders at least 12 billion EUR / year over the past 20 years, of which costs identified for key economic sectors have been estimated at over 6 billion EUR / year (Kettunen et al. 2009).

An enabling policy framework is needed to protect the EU against exponentially-rising IAS impacts, aggravated by the effects of climate change, and to address the exceptional vulnerability to biological invasion of the EU's Outermost Regions and other isolated or vulnerable ecosystems.

This report presents a detailed analysis of the international, EU and Member State baseline and proposed priorities for action. It sets out a suggested outline for key components of the future EU Strategy on Invasive Alien Species, covering each stage of the risk management sequence and drawing on existing best practices where available. The development of an EU framework for IAS risk assessment and an EU / Europe-wide information and early warning system are seen as fundamental to effective action before biological invasions take hold, consistent with the precautionary principle and the EU's commitment to a high standard of environmental protection.

The report highlights the wide range of EU and MS policies, sectors and actors relevant to implementing the activities envisaged under the Strategy. In the study team's opinion, it is essential for the future visibility of IAS as an EU-wide concern to develop high-level coordination between key services responsible for implementing different Strategy components and to establish appropriate fora for stakeholder consultation.

The report also provides an initial assessment of the possible level / scale of costs associated with EU policy action on IAS. This assessment indicates that:

- even at the highest level of investment in policy development and implementation foreseen in this study, EU-level policy action (e.g. implementation of the EU IAS Strategy) is likely to bring more benefits (e.g. avoided costs) than it is estimated to cost;

- the cost of overall IAS measures (e.g. measures possibly required to implement the EU Strategy, both at MS and EU level) are foreseen to diminish over time (i.e. Strategy implementation is foreseen to become less expensive as time goes by);
- EU-level measures (e.g. in EWRR) can help to reduce costs for EU-27 as a whole.

The 2008 Communication 'Towards an EU Strategy on Invasive Species' (COM (2008) 789) proposed four policy options for consideration. These different levels of ambition are discussed in the context of each Strategy component.

Option A: Business as usual
Option A provides a reference point against which other Options can be assessed. But clearly, if no action is taken, new IAS will continue to become established in the EU with increased associated ecological, economic and social consequences and related costs.
Option B: Maximising use of existing approaches and voluntary measures
The formal legal requirements would remain as they are today but there would be a conscious decision to proactively address IAS problems under existing legislation. This would imply carrying out risk assessments using existing institutions and procedures such as the European Food Safety Authority. Member States would voluntarily make IAS issues part of their border control function. A Europe-wide Early Warning and Information System based on existing activities could also be set up. The DAISIE inventory of IAS could be maintained and updated regularly. Species eradication plans would be developed and supported by national funds. Cross-sectoral stakeholder groups could be set up at appropriate levels to foster exchange of best practice, to develop targeted guidance and to help resolve conflicts of interest. Voluntary codes of conduct could be drawn up to encourage responsible behaviour by retailers, users and consumers.
Option B+: Targeted amendment of existing legislation
Option B+ is similar to Option B in most respects, but would include amendments to the existing legislation on plant/animal health to cover a broader range of potentially invasive organisms and extension of the list of 'ecological threat species' for which import and internal movement are prohibited under the Wildlife Trade Regulation. If this approach were followed, additional resources would need to be dedicated to IAS in the assessment process and in the border control activities carried out by Member States.
Option C: Comprehensive, dedicated EU legal framework
Option C would involve the setting up of a comprehensive, dedicated legal framework for tackling IAS with independent procedures for assessment and intervention taking into account existing legislation. If it were considered desirable and cost effective, technical aspects of implementation could be centralised by a dedicated agency. Member States including the European Outermost Regions would be obliged to carry out controls at borders for IAS and to exchange information on IAS. Mandatory monitoring and reporting procedures and efficient rapid response mechanisms might also be established. While it is possible to envisage some EU funding being dedicated to support eradication and control actions, Member States could also fund these actions directly.

Based on the study's findings, **Option A (Business as Usual)** is not considered a viable option for the EU as environmental, social and economic costs associated with biological invasions would continue to escalate without any gains for issue visibility or policy coherence.

Option B (Maximising existing approaches and voluntary measures) is also not considered viable in isolation, as many suggested Strategy components require a legislative basis. However, voluntary codes, best practices and communication campaigns are foreseen to play a key role in delivery through a partnership-based approach. Industry federations, user groups and other stakeholders can pilot innovative approaches, supported by governments. Market-based instruments and green public procurement policies can help to shift the incentive culture and support IAS policies.

Option B+ (Targeted amendment of existing legislation) provides opportunities to address IAS within the ongoing modernisation of the EU animal and plant health regimes. This could be the start of a more integrated approach to EU environmental biosecurity, to the extent supported by relevant mandates. The recommendations of the recent Plant Health Regime Evaluation to address environmental and ecosystem risks associated with some alien plants (including those not yet introduced) and possibly their natural spread have been considered in this report. However, the extent to which this regime could deliver measures / activities envisaged under this Strategy will depend on political decisions taken at EU level by plant health administrations and on the priority level and resources allocated to protection of environmental public goods. These variables cannot be answered by this study. However, it is foreseen that seeking synergies with these existing regimes (in the context of both Options B+ and C) could bring forward significant cost savings.

Relying solely on adjustments to existing instruments, including expanded IAS coverage under the Wildlife Trade Regulation, would not address some overarching constraints identified in the baseline analysis. These include the lack of a strong EU driver and objectives for IAS prevention and management, which undermines issue leverage for environment departments in several Member States. Option B+ would not provide the critically needed tools to prioritise risks and manage IAS at the ecosystem or biogeographic scale or to address the needs of EU Outermost Regions and other isolated or vulnerable ecosystems.

The report therefore recommends that new legislation (along the lines of **Option C: comprehensive, dedicated EU legal framework**) is developed, taking account of synergies with ongoing animal and plant health regime modernisation. Based on the study team's analysis, a dedicated IAS Directive would be the recommended option. This would provide a flexible framework with minimum standards based on precaution and an IAS policy proofing tool to ensure coherence with upcoming instruments and emerging pathways. A Directive could establish common goals, terminology and principles, adaptable to appropriate scales of conservation, and provide clarity on the compatibility of IAS measures with the operation of the Single Market. By establishing a continuum of prevention and management measures with clearly allocated roles and duties of care, it would support development of more robust environmental liability tools aligned with the 'biological polluter pays' principle.

Under a Directive, annexes could be used to list specified categories of 'IAS of EU concern', triggering mandatory actions where the species concerned is found on Member State territory. The financing of key actions, in particular to enable early warning and rapid response before an invasion takes hold, will need specific attention in the context of the Strategy. Consideration of possible co-financing for mandatory actions and /or expanded cost recovery mechanisms could be informed by the parallel discussions within the animal and plant health sectors which are also committed to a progressive shift of incentive culture.

Lastly, it is envisaged that the Directive would need to be combined with a Regulation covering import and intra-EU movement / holding of 'IAS of EU concern' i.e. requiring mandatory uniform measures for the highest risks to the EU. The existing Wildlife Trade Regulation would require amendment and a targeted new focus for this purpose but as an existing instrument ,would have the strongest potential for synergy and cost-efficiency.

1 Introduction

1.1 Background to the Assessment

This report is the final output of a study for the European Commission, the *Assessment to support continued development of EU strategy to combat invasive species.*[1] It was commissioned in 2010 in the context of the EU's commitment to develop an EU strategy to substantially reduce the impacts of invasive alien species (IAS) and alien genotypes and to establish an early warning system (for details of the mandate from EU institutions, see 2.4).

In January 2008, the Commission mandated a first comprehensive study which combined a pan-European aggregated quantification of environmental and socio-economic impacts of IAS (Kettunen et al. 2009) with a preliminary analysis of costs, benefits and possible policy options (Shine et al. 2008, 2009a, 2009b).[2]

During this first study, in December 2008 the Commission published a Communication *Towards an EU Strategy on Invasive Species*[3] which outlined four policy options for further consideration (see
Table 1-1).

Table 1-1 Policy Options presented by the Commission in COM (2008) 789

Option A: Business as usual
Option A provides a reference point against which other Options can be assessed. But clearly, if no action is taken, new IAS will continue to become established in the EU with increased associated ecological, economic and social consequences and related costs.
Option B: Maximising use of existing approaches and voluntary measures
The formal legal requirements would remain as they are today but there would be a conscious decision to proactively address IAS problems under existing legislation. This would imply carrying out risk assessments using existing institutions and procedures such as the European Food Safety Authority. Member States would voluntarily make IAS issues part of their border control function. A Europe-wide Early Warning and Information System based on existing activities could also be set up. The DAISIE inventory of IAS could be maintained and updated regularly. Species eradication plans would be developed and supported by national funds. Cross-sectoral stakeholder groups could be set up at appropriate levels to foster exchange of best practice, to develop targeted guidance and to help resolve conflicts of interest. Voluntary codes of conduct could be drawn up to encourage responsible behaviour by retailers, users and consumers.
Option B+: Targeted amendment of existing legislation
Option B+ is similar to Option B in most respects, but would include amendments to the existing legislation on plant/animal health to cover a broader range of potentially invasive organisms and extension of the list of 'ecological threat species' for which import and internal movement are prohibited under the Wildlife Trade Regulation. If this approach were followed, additional resources would need to be dedicated to IAS in the assessment process and in the border control activities carried out by Member States.
Option C: Comprehensive, dedicated EU legal framework
Option C would involve the setting up of a comprehensive, dedicated legal framework for tackling IAS with independent procedures for assessment and intervention taking into account existing legislation. If it were

[1] Project reference: No 07-0307/2009/549757/SER/B2 - Service Contract ENV.B.2/SER/2009/0101r.

[2] Service Contract No 070307/2007/483544/MAR/B2. All background technical studies may be downloaded from http://ec.europa.eu/environment/nature/invasivealien/ .

[3] COM (2008) 789 final (Brussels 3.12.2008): http://ec.europa.eu/environment/nature/invasivealien/docs/1_EN_ACT_part1_v6.pdf.

considered desirable and cost effective, technical aspects of implementation could be centralised by a dedicated agency. Member States including the European Outermost Regions would be obliged to carry out controls at borders for IAS and to exchange information on IAS. Mandatory monitoring and reporting procedures and efficient rapid response mechanisms might also be established. While it is possible to envisage some EU funding being dedicated to support eradication and control actions, Member States could also fund these actions directly.

1.2 Objectives of the Assessment

The overall goal of this Assessment is to provide technical support to the Commission's internal impact assessment to underpin development of the future EU IAS Strategy. The Assessment consists of three main tasks:

(A) draw up a suggested outline for the components of the future Strategy:

- integrating elements for an early warning and information system;
- identifying strategy components that may require a legislative basis; and
- making concrete proposals for the design of each part of such Strategy (e.g. possible legislation), taking account of relevant existing EU legislation, financial instruments and ongoing policy development;

(B) identify and analyse costs of the suggested key components of a future Strategy that would involve early warning/rapid response and control/management, aiming to shed light on the costs of administrative systems needed to implement such mechanisms;

(C) provide some further insights regarding IAS impacts in the EU, with a particular focus on the implications of EU policy inaction versus foreseen benefits of the implementation of the EU IAS strategy.

This report combines the outputs of these three tasks. It aims to provide a clear summary of the complex policy picture surrounding IAS, identify priorities for action at EU level, present analysis and an evidence base to support comparison of the four COM policy options and make recommendations to the Commission.

1.3 Structure of the report

The report contains six substantive chapters, followed by conclusions and recommendations:

- **rationale for the EU Strategy** (chapter 2): this outlines the drivers, impacts and predicted trends associated with IAS, the need for an EU-level response, the socio-economic case for prioritising prevention and the mandate for Strategy development;
- **policy baseline** (chapter 3): this updates earlier analysis of instruments, policies, mechanisms and trends to assess how far the baseline meets the mandate from EU

institutions and identify gaps, constraints and suggested priorities to be addressed through the Strategy;

- **proposed conceptual framework for the future Strategy** (chapter 4): this covers generic issues related to the Strategy's scope, objectives and operational approach. It addresses the need for common approaches to terminology, risk assessment and possible categorisation of 'IAS of EU concern';
- **suggested outline for Strategy components** (chapter 5): this sets out components for IAS prevention, early warning and rapid response and control, management and ecological restoration, followed by cross-cutting components, with supporting analysis aligned with the four COM policy options;
- **costs of the suggested key components and foreseen benefits of implementing the EU Strategy** (chapter 6): this presents evidence collected on ten categories of activity to provide insights on related costs (e.g. administrative costs) and possible timescale and policy synergies related to these costs;
- **delivering the future EU Strategy** (chapter 7): this draws together the findings and analysis from chapters 4-6 to compare the feasibility and likely effectiveness of the four COM policy options for Strategy implementation and discuss different types of architecture to support the future EU /Europe-wide information and early warning system;
- **conclusions and recommendations** (chapter 8).

The four Annexes to the report provide examples of the range of different approaches used in selected third country jurisdictions and set out supporting data on administrative costs and benefits and on information and early warning systems.

1.4 Approach and methodology for the analysis

To avoid duplication, the report builds on recent work undertaken by team members, involving extensive stakeholder consultations. This includes:

- review and gap analysis of EU and MS instruments and policies, with preliminary consideration of the design and possible impacts of policy options (Miller et al. 2006; Shine et al. 2008, 2009a, 2009b);
- feasibility study for a European information and early warning system (Genovesi et al. 2010[4]);
- analysis of EU IAS-related expenditure on research and management through the RTD framework programmes and the LIFE programme (Scalera 2008, 2010).

Targeted complementary work involved desk-based research and direct contact with public and private institutions, including EC Directorates General, MS authorities, the Joint

[4] *Towards an early warning and information system for invasive alien species (IAS) threatening biodiversity in Europe*. This technical report for the European Environment Agency reviewed early warning and rapid response frameworks for IAS set up in other regions of the world, as well as early warning systems implemented in other European policy sectors, and provided an initial assessment of the possible options to establish an early warning system for IAS in Europe.

Research Centre (JRC), the European Environment Agency (EEA), the European Food Safety Authority (EFSA), the European and Mediterranean Plant Protection Organization (EPPO), the Council of Europe and other national and transnational organisations and authorities (see Annex 1 for contributor details).

Study team members also participated in the following meetings:

- EU Marine Strategy Framework Directive Task Group on Non-Indigenous Species (Bergen 24-25 May 2009 and Palma de Mallorca 2-6 November 2009);
- IMO Sub-Committee Bulk, Liquid and Gases (BLG) of the Ballast Water Working Group (London, 8-12 February 2010);
- DG SANCO Conference on modernising the Community plant health regime (Brussels, 23-24 February 2010);
- IUCN-ISSG Meeting on island eradications (New Zealand, February 2010);
- US National Invasive Species Council liaison meeting (Washington DC, March 2010);
- ICES/IOC/IMO Working Group on Ballast and Other Ship Vectors (Hamburg, Germany, 8-10 March 2010);
- ICES Working Group on Introductions of Marine Organisms (Hamburg, Germany, 10-12 March 2010) ;
- NOBANIS/EEA Workshop on developing an early warning system for invasive alien species based on the NOBANIS Database (Waterford, Ireland, 1-2 June 2010);
- EPPO/EEA 2nd International Workshop on invasive plants in the Mediterranean-type regions of the world (Trabzon, Turkey, 2-6 August 2010);
- 6th NEOBIOTA Conference (Copenhagen, Denmark, 14-17 September 2010);
- 10th Meeting of the CBD Conference of the Parties (Nagoya, Japan, 18-29 October 2010).

Work in progress on the draft Assessment was presented at EU Green Week (1-4 June 2010) and at the EU IAS Stakeholder Consultation (3 September 2010) which provided further opportunities for stakeholder input.

Policy baseline (chapter 3): This covers existing and upcoming instruments and policies, with a particular focus on ongoing regime changes. Three aspects are considered for each EU instrument: objectives, IAS coverage and mechanisms/infrastructure. A cross-cutting analysis of MS frameworks highlights trends and best practices of specific relevance to EU Strategy development. The analysis is used to develop a matrix of vertical and cross-cutting elements to identify strengths of the current framework and remaining gaps, constraints and priorities to be addressed through the Strategy.

Strategy framework and components (chapters 4 and 5): Information from the baseline and study evidence base - including lessons learnt from IAS systems in third countries and other policy sectors - was used to develop proposals for the overall conceptual framework and individual components. Each section sets out contextual information and suggested general

approach, followed by comparative analysis of measures aligned with the four COM policy options. Where appropriate to content, an indication is given of the measure that in the study team's opinion best responds to the suggested Strategy objectives.

Costs and benefits of implementing the EU Strategy (chapter 6): The study team first identified the key measures / actions required to implement the Strategy components outlined in chapter 5. The assessment of possible costs associated with implementation was then developed based on existing information on the costs of these IAS measures / actions, both within and outside the EU. In addition, the most applicable examples of costs from parallel policy areas (e.g. the EU frameworks for plant health and wildlife trade) were chosen in several cases to illustrate the possible costs of different IAS measures in the EU context. A suggestive range of costs has been provided to illustrate possible different levels of investment in implementing the identified measures. Finally, some consideration was given to the possible distribution of costs over time between the EU, MS and other possible stakeholders. More detailed information on the developed cost estimates can be found in chapter 6.

Different IAS measures can be taken within different timescales. Similarly, a varying level of investment / ambition can be used to implement these measures. Without a clearer indication of the timescale for and ambition of different measures it has not been possible to develop a comprehensive / very detailed overall aggregate estimate for the total (e.g. annual) costs of EU action on IAS, e.g. implementing the EU Strategy. However, an indicative assessment of the overall scale / level of costs for implementing the EU Strategy has been developed.

For the EU / Europe-wide information and early warning system (IEWS), evidence was based on the estimates calculated and published in the EEA report (Genovesi et al. 2010), integrated with additional data and information collected through a questionnaire circulated among national representatives of the NOBANIS network as well as Spain, UK and other countries participating in the EPPO/EEA workshop in August 2010 (see above). This questionnaire was aimed at developing a detailed breakdown of the estimated level and distribution of incremental costs of administrative measures required for IEWS implementation. The results of these questionnaires can be found in Annex 4.

Please note: the estimated costs of implementing the EU Strategy presented in chapter 6 do not correspond directly to the strategy components as outlined in chapter 5 but they are estimated for the key measures / actions required to implement the foreseen components.

In addition, a number of the outlined measures for IAS are already taking place at the Member State level. For this reason, the costs presented in this report are the foreseen overall costs of a comprehensive future policy on IAS in the EU, rather than the incremental costs of the adoption and implementation of a EU IAS Strategy.

With regard to the foreseen benefits associated with implementation of the EU Strategy, existing information on the benefits of IAS measures is relatively limited as this is a

comparatively new area of policy action. The consideration of benefits has therefore been carried out mainly based on insights on the costs of IAS impacts and the benefits of avoided impacts.

Delivery mechanisms (chapter 7): This chapter considers non-legislative and legislative options to deliver the suggested components of the future EU Strategy in the light of the suggested Strategy goals and operational objectives. It then compares four possible types of architecture to support the future EU / Europe-wide information and early warning system, building on the feasibility study conducted for the EEA (Genovesi et al. 2010).

2 Rationale for an EU Strategy on Invasive Alien Species

This chapter describes the drivers, impacts and predicted trends associated with IAS, including implications related to climate change (2.1), and the need for a coordinated response at EU level (2.2). It makes the socio-economic case for prioritising prevention (2.3) and outlines the backing from different European institutions for the development of an EU IAS Strategy (2.4).

2.1 Description of the problem

The importance of socio-economic factors as drivers of biological invasions is increasingly realised. A recent comprehensive study based on the DAISIE[5] dataset (Pyšek et al. 2010) has shown that only national wealth and human population density are statistically significant predictors in driving biological invasions in Europe when analysed jointly with climate, geography and land cover.

Our lifestyles thus lead to introductions of organisms beyond their natural range, both intentionally and by accident. Many of these 'alien' (non-native) species underpin the primary production systems so important to European economies. They provide a range of employment opportunities and are also highly appreciated in society (e.g. ornamental plants, pet animals, exotic birds, game, fish for angling and aquaculture). Many of these do not spread and of the ones that do, most remain in human-influenced habitat.

The term 'invasive alien species' (IAS) has a narrower scope. It covers the subset of non-native species whose introduction and/or spread threaten biological diversity (CBD Guiding Principles[6]) but is increasingly used more widely to include impacts to socio-economic interests[7] (see 4.2 for a discussion of key terms).

IAS are recognised as one of the five pressures directly driving biodiversity loss.[8] The other four (habitat change, overexploitation, pollution and climate change) are already addressed by EU policies. Together with climate change, IAS are considered one of the most difficult biodiversity threats to reverse to normality.[9]

IAS occur in all taxonomic groups, including animals, plants, fungi and micro-organisms, and affect all types of ecosystems. They can trigger wholesale ecosystem changes, disrupting ecosystem services crucial for livelihoods and impacting e.g. food security and access to water (Vilà et al. 2010). Inland water systems are particularly vulnerable while IAS

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[5] DAISIE (*Delivering Alien Species Inventories for Europe* (http://www.europe-aliens.org), supported under the Sixth EU Research Framework Programme.

[6] Guiding Principles for the prevention, introduction and mitigation of impacts of alien species that threaten ecosystems, habitats or species: Annex to CBD Decision VI/23, 2002 (http://www.cbd.int/decision/cop/?id=7197).

[7] e.g. DAISIE lists common ragweed, *Ambrosia artemisiifolia*, under the 100 worst IAS on the basis of health impacts without naming biodiversity effects.

[8] CBD (2001). Status, impacts and trends of alien species that threaten ecosystems, habitats and species. Available online at: http://www.cbd.int/doc/meetings/sbstta/sbstta-06/information/sbstta-06-inf-11-en.pdf .

[9] Millennium Ecosystem Assessment (2005). *Ecosystems and Human Well-being: Biodiversity Synthesis.* World Resources Institute, Washington, DC.

management in marine and coastal environments presents major challenges. On land, introductions of alien agricultural crops and trees can be an important factor in weakening the stability of agricultural and forestry habitats, making them even more vulnerable to outbreaks of pests. Horticultural plants that have become invasive in wetlands, fields and forests reduce the quality of wildlife habitat and forest regeneration.

At the global level, IAS have been identified as a key factor in 54% of all known species extinctions documented in the IUCN Red List database and the only factor in 20% of extinctions.[10] They are the second most important pressure on birds, impacting over half of species listed as critically endangered[11], the third most severe threat to mammals[12] and the fourth to amphibians.

At the European level, over the period 1970-2007 the number of IAS grew by 76% (Butchart et al. 2010) with no indication of any reduction in this dramatic rate of increase. Some recent extinctions have been caused by the introduction of alien species e.g. *Gasterosteus crenobiontus*, extinct since the 1960s.[13] Some of Europe's most threatened species – such as the European mink *Mustela lutreola* or the Ruddy duck *Oxjura leucocephala* – are affected by IAS. Of the 174 European species listed as critically endangered by the IUCN Red List, 65 are in danger because of introduced species.

According to a recent study focusing on changes of conservation status of endangered species included in the IUCN Red List (McGeoch et al. 2010), the overall impact of IAS pressure in driving declines in species diversity is apparently increasing. Although the policy response trend has been positive for the last several decades, this has not been sufficient and/or adequately implemented to reduce biodiversity impact. The same study documents how conservation measures (e.g. IAS control or eradication) can lead some endangered species to improve their status, showing that early warning is the key to implement concrete and effective conservation measures.

These risks and impacts are, in part, a cost of the way society has chosen to organise its trade. Globalisation – opening new trade routes, increasing trade with new partners and new commercial products, expanding tourism – increases opportunities for potential IAS to be moved between continents and into, within and from the EU. For example, more than 90% of world trade is carried by sea and by 2018, the world fleet could increase by nearly 25% with volumes nearly doubling compared to 2008. Subject to the current economic crisis, EU maritime transport is predicted to grow from 3.8 billion tonnes in 2006 to 5.3 billion tonnes in 2018. 40% of intra-European freight is already carried by short-sea shipping and over 400 million sea passengers pass through European ports each year.[14]

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[10] Clavero, M., & Garcia-Berthou, E. (2005). Invasive species are a leading cause of animal extinctions. Trends in Ecology and Evolution, 20, 110.

[11] BirdLife International 2008b. State of the world's birds. Cambridge: BirdLife International.

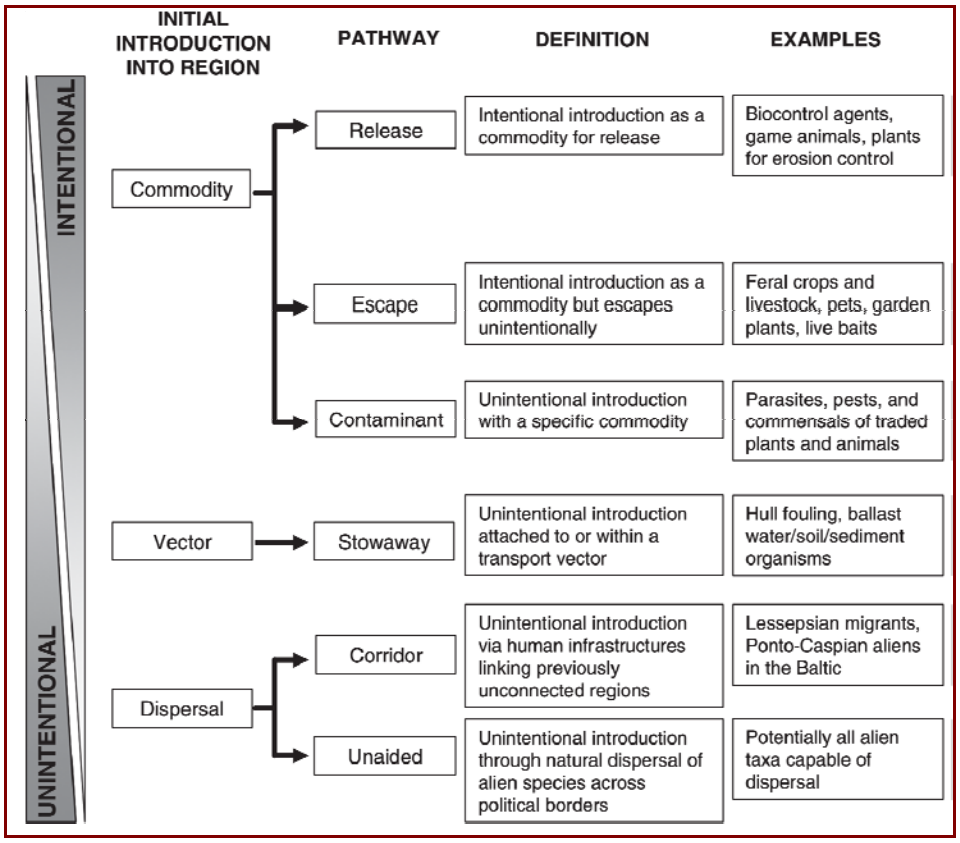
[12] Hilton-Taylor, C., Pollock, C., Chanson, J., Butchart, S. H. M., Oldfield, T. and Katariya, V. 2009. Status of the world's species. Pp 15–42 in: J.-C. Vié, C. Hilton-Taylor and S. N. Stuart (eds). The 2008 review of the IUCN Red List of Threatened Species. Gland, Switzerland: IUCN.

[13] Freyhof, J. & Kottelat, M. 2008. *Gasterosteus crenobiontus*. In: IUCN 2010. IUCN Red List of Threatened Species. Version 2010.3. <www.iucnredlist.org>. Downloaded on 13 October 2010.

[14] 100,000 vessels of 500 dwt and more compared to 77,500 vessels in 2008: total capacity is expected to reach more than 2,100 million dwt in 2018 (up from 1,156 million dwt in 2008). Source: OPTIMAR Study, LR Fairplay Research Ltd & Partners (September 2008).

Figure 2-1 provides a useful classification, developed through the EU-funded project ALARM (Assessing LArge-scale environmental Risks for biodiversity with tested Methods), to assess IAS risks associated with specific pathways.

Figure 2-1 Pathways for initial introduction of alien species into a region



Source: adapted from Hulme et al. 2008

The challenge is to identify which pathways and which species present the highest risks and to develop efficient and timely responses. There are many uncertainties in this field but we know that the likelihood of invasions is determined by:

- the invasiveness of species: this depends on organism properties (species or genotype traits), resource flows (trade, transport and travel) and measures to detect and intercept introduced species;
- the invasibility of habitats: this depends on climatic and environmental conditions in the host system but also on the degree of habitat disturbance and fragmentation and simplification; and
- the ease of introduction: factors that influence vulnerability include openness of an economy, composition of trade flows, the effectiveness of its regulatory regimes and the importance of agriculture, forestry or tourism (Perrings 2007; Perrings et al. 2010).

Environmental degradation caused by pollution, habitat loss and land use change already creates favourable conditions for some introduced species to establish and spread. Extreme weather events, eutrophication and abandonment of land use can further disrupt the local environment and increase opportunities for biological invasions.

In addition, climate change impacts such as warming temperatures and changes in CO_2 concentrations, whilst difficult to predict with certainty, are considered likely to alter species' distributions and provide unaided pathways for dispersal by making it easier for:

- species translocated to regions nearby their natural range to establish populations;
- alien species that are currently benign to become invasive for the first time;
- already-invasive alien species to increase their range further – or to become less of a threat (Capdevila-Argüelles and Zilletti 2008, Walther et al. 2009).

Climate change has been suggested as a primary driver of alien species range expansions into higher latitudes in Europe.[15] For example, as seawater gets warmer, alien species that were formerly unable to establish may now be able to do so (see Box 2-1).

Box 2-1 Implications of climate change for IAS: example of the Pacific oyster[16]

The Pacific oyster, *Crassostrea gigas,* established on natural shores in western Europe following its intentional introduction in the 1970s. It requires water temperatures of 18-23°C over a prolonged period to successfully recruit (Mann 1979; Utting and Spencer 1992). Recruitment first occurred near oyster farms in the UK after the unusually warm summers of 1989 and 1990 (Spencer et al. 1994). In the Wadden Sea, mean monthly sea temperatures showed increased deviations of 1-3°C from long-term means during the summers of 1994, 1997, 2001, 2002 and 2003 (Diederich et al. 2005), consistent with observed higher European shelf sea temperatures. Enhanced spatfall was observed in Schleswig-Holstein during these periods and may have contributed to an increased spread of feral populations of *C. gigas* in the Danish Wadden Sea (Nehls and Büttger 2007). Similar invasions of natural habitats have taken place along the Atlantic coastline of Europe up to Scandinavia as temperatures warmed sufficiently to enable successful recruitment (ICES 2009, Wrange et al. 2010).

The combined interaction of these two drivers of global biodiversity loss – climate change and IAS - poses challenges to policies for ecosystem-based adaptation (Burgiel and Muir 2010) and has direct implications for the economy and society. Climate change could increase the spread of serious infectious vector-borne diseases, including zoonoses (diseases transmitted from animals to humans), threaten animal wellbeing and impact plant health by favouring new or migrant harmful organisms which could adversely affect trade in

[15] Pederson, J., Mieszkowska, N., Carlton, J., Gollasch, S., Jelmert, A., Minchin, D., Occhipinti-Ambrogi, A. and Wallentinus, I. (2010 in prep.). Climate Change and Non-Native Species in the North Atlantic. Future ICES publication related to work of ICES WGITMO.

[16] Mann, R., 1979. Some biochemical and physiological aspects of growth and gametogenesis in *Crassostrea gigas* (Thunberg) and *Ostrea edulis* L. grown at sustained elevated temperatures. Journal of the Marine Biological Association of the U. K. 59, 95–110; Utting, S.D. and Spencer, B.E., 1992. Introductions of marine bivalve molluscs into the United Kingdom for commercial culture – case histories. ICES Marine Science Symposia, 194: 84-91; Spencer, B. E., Edwards, D.B., Kaiser, M. J., and Richardson, C. A. 1994. Spatfalls of the non-native Pacific oyster, *Crassostrea gigas*, in British waters. Aquatic Conservation and Freshwater Ecosystems, 4: 203-217; Diederich, S., Nehls, G., Beusekom, J. E. E., and Reise, K. 2005. Introduced Pacific oysters (*Crassostrea gigas*) in the northern Wadden Sea: Invasion accelerated by warm summers? Helgoländer Marine Research, 59: 97-106; Nehls, G., and Büttger, H. 2007. Spread of the Pacific Oyster *Crassostrea gigas* in the Wadden Sea: causes and consequences of a successful invasion. Husum, BioConsult SH on behalf of The Common Wadden Sea Secretariat, Wilhelmshaven, 55 pp.; ICES. 2009. Alien Species Alert: *Crassostrea gigas* (Pacific Oyster). *In*: ICES Cooperative Research Report 299: 1-42. Ed. by L. Miossec, R. M. LeDeuff, P. Goulletquer; Wrange, A-L., Valero, J., Harkestad, L. S., Strand, Ø., Lindgegarth, S., Christensen, H. T., Dolmer, P.,Kristensen, P. S., and Mortensen, S. 2010. Massive settlements of the Pacific oyster, *Crassostrea gigas*, in Scandinavia. Biological Invasions, 12: 1145-1152.

animals, plants and their products.[17] An FAO report on climate change and forestry-related studies indicates that the risk of outbreaks of harmful biotic agents has increased and is expected to increase further (Moore and Allard 2008).

A flexible approach based on best available scientific information is critical to identify risks and respond efficiently. The next section considers the need for action in the EU context.

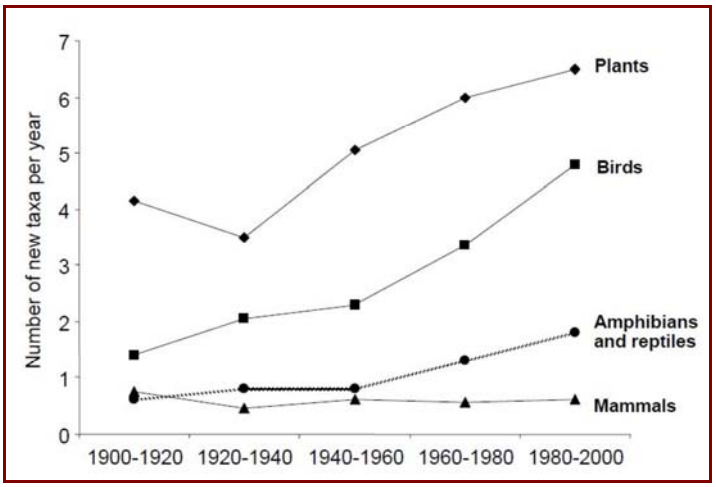
2.2 The need for a coordinated EU response

During the last decade international trade has been growing at around an average 12 per cent / year.[18] Over the same period, annual growth in GDP for EU-27 has been around 1.3 – 3.9 per cent.[19] EU-27 currently accounts for 19 per cent of world imports and exports[20] and with around 500 million inhabitants, is the world's largest free trade bloc.

DAISIE research indicates a **strong correlation between economies and the rate of introductions of new species** – both into the EU and between different parts of EU territory.

In Europe as a whole, the rate of new introductions has risen steadily in recent decades and is still increasing for all taxonomic groups except mammals. The cumulative number of alien species is increasing for all groups including mammals, with one new alien mammal introduced per year (see Figure 2-2). Similar patterns are observed in Europe's marine environment (see Figure 2-3).

Figure 2-2 Temporal trends in terrestrial aliens in Europe



Source: DAISIE data, presented in Hulme et al. 2010

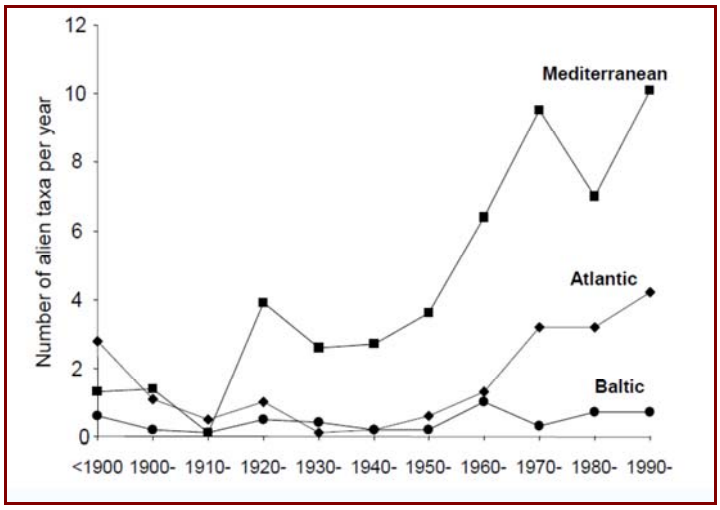
[17] See e.g. White Paper '*Adapting to climate change in Europe – options for EU action*' (COM (2009) 147 final, adopted by the European Commission on 1 April 2009).

[18] A conservative estimate based on the WTO 2009 trade statistics, excluding the impacts of the 2008 – 2010 financial crises http://www.wto.org/english/res_e/statis_e/its2009_e/its09_world_trade_dev_e.pdf.

[19] Eurostat - growth rate of GDP volume, excluding the impacts of the 2008 – 2010 financial crises: http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsieb020

[20] http://ec.europa.eu/trade/about/introduction-to-trade/ , accessed 26 July 2010.

Figure 2-3 Temporal trends in marine aliens in Europe



Source: DAISIE data, presented in Hulme et al. 2010

IAS impacts affect the EU's continental landmass, islands and seas at all scales. Specific characteristics that call for a coordinated EU response include:

- its open and expanding economy. The EU plays a central role on the global market. It has a high number of entry points, extensive porous borders and rapidly diversifying markets (e.g. for aquaculture, biofuels, bonsai plants) which increase demand for alien species. As trade and transport expands, newer MS and candidate countries may expect increasing inflow of IAS.[21] The EU is also a major exporter and is thus a source of potential IAS through commodity and other pathways to other parts of the world;
- its size and biogeographic variations. EU-27 encompasses very different biogeographic and climatic zones which need to be managed at the appropriate scale;
- its globally significant island biodiversity. Europe's islands, like islands elswhere in the world, have suffered disportionately from biological invasions. 11-12 per cent of globally threatened species occurring in the European region are already harmed by IAS, many native to isolated islands.[22] IAS have been found to threaten endemic and endangered species, particularly seabirds, and rare habitat types in the EU's seven Outermost Regions (ORs)[23] and 21 Overseas Countries and Territories (OCTs)[24] (RSPB 2007, Silva et al. 2008, Soubeyran 2008). These islands are also more vulnerable to

[21] e.g. the Cold War may have limited the introduction of exotic birds into formerly isolated countries of the Eastern European bloc, due to restrictions on movement and trade with other parts of the world (Chiron et al. 2009). The gradient found for e.g. invertebrates in the DAISIE data points to a similar conclusion (Roques 2010).

[22] Small island states are typically more dependent on imports as a share of GDP than continental countries: a study by Dalmazzone (2000) found an average of 43 per cent for islands as against 27 percent for continental countries.

[23] French Guiana, Guadeloupe, Martinique and Réunion Island (France); Azores, Madeira (Portugal); Canary Islands (Spain).

[24] Greenland (Denmark); French Polynesia, French Southern and Antarctic Lands, Mayotte, New Caledonia, Saint-Pierre and Miquelon, Wallis and Futuna (France); Aruba, Netherlands Antilles, (Netherlands); Ascension Island, British Antarctic Territory, British Indian Ocean Territory, British Virgin Islands, Cayman Islands, Falkland Islands, Montserrat, Pitcairn Islands, Saint Helena, Tristan da Cunha, South Georgia and the South Sandwich Islands, Turks and Caïcos Islands (UK).

introduced marine pests. The EU has recognised that effective action in these biodiversity-rich territories is vital to its credibility.[25]

2.3 The socio-economic case for prevention in the EU

In monetary terms, we know that lost output due to IAS, health impacts and expenditure to repair IAS damage has already cost EU stakeholders at least 12 billion EUR / year over the past 20 years, of which costs identified for key economic sectors have been estimated at over 6 billion EUR / year (Kettunen et al. 2009) (see chapter 6 for more information).

We also know that these figures are significant under-estimates. Information on ecological and economic impacts is only available for about 10 per cent of the nearly 11,000 alien species already present in Europe (Vilà et al. 2009). It is scarce for key sectors like fisheries and forests and almost non-existent for tourism (Kettunen et al. 2009).

In some cases IAS may have positive impacts, sometimes giving rise to conflicts of interest.[26] However, these are generally outweighed by documented negative impacts to:

- the economy and local livelihoods e.g. lost yield, reduced water availability, land degradation, erosion;
- public health and wellbeing e.g. allergies, skin problems, transmission of human diseases such as Chikungunya and salmonellosis, introduction of potentially dangerous animals such as poisonous snakes;
- biodiversity e.g. extinction or displacement of species at the species and the genetic level through competition, transmission of diseases or hybridization; and/or alteration and threats to habitats and ecosystems;
- ecosystem services e.g. water quality and retention, destabilisation of river banks, erosion, changed nutrient cycles leading to changed food chains and/or disruption of plant-pollinator interactions.

In a sectoral context, the EU has not yet suffered from EU-wide infestations of IAS in forest ecosystems (e.g. forest pests). However, as the recent efforts needed to contain pinewood nematode in Portugal show, with no comprehensive and effective EU-wide system in place it seems only a matter of time before such occurrences / infestations of IAS become a common phenomenon in Europe. The socio-economic costs of such invasions to the forestry sector can be significant. For example, Canada's annual timber losses due to IAS are estimated at 61 million m^3, which is equivalent to CND$ 720 million / year (~540 million EUR / year) in financial losses to stumpage, royalties and rent revenues.[27] The cost of the damage caused by IAS affecting forestry and agriculture in Canada has been estimated to be CND$7.5 billion annually (5.6 billion EUR).[28]

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[25] Communication on Biodiversity: Halting the Loss of Biodiversity by 2010 – and beyond (COM (2006) 216 Final).

[26] e.g. Pacific oysters act as an 'ecosystem engineer' to stabilise beaches but make them less attractive/accessible to tourists.

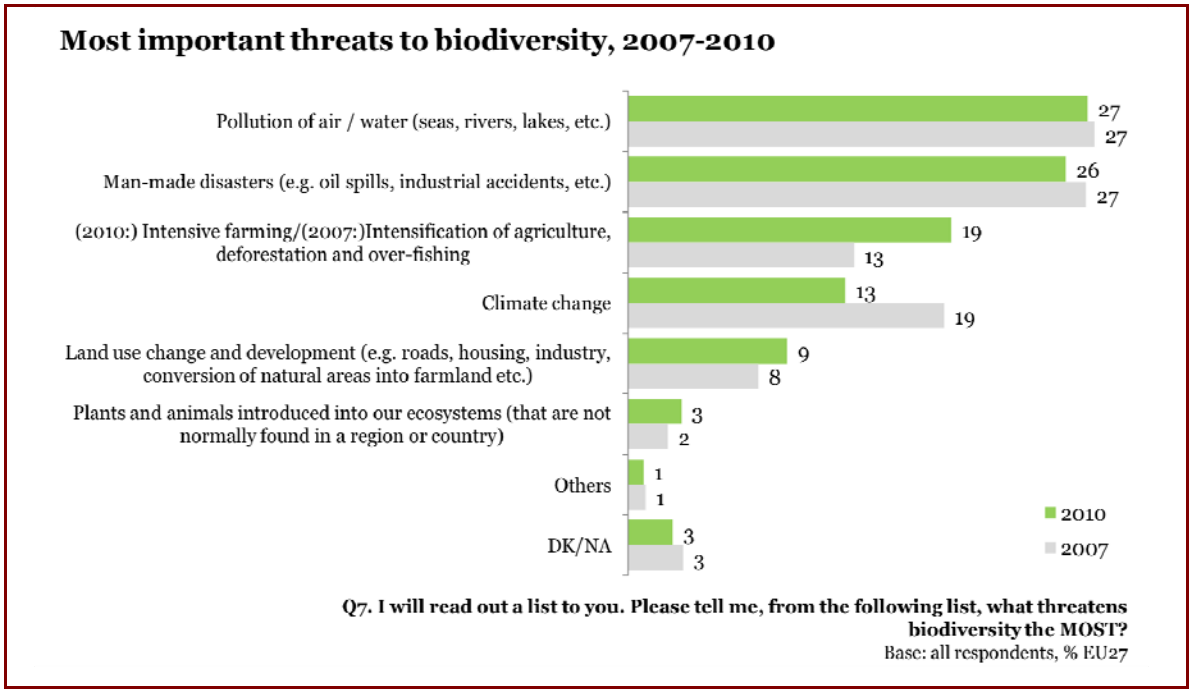
[27] Kremar-Nozic, E., Wilson, B. and Arthur, L. 2000. *The potential impacts of exotic forest pests in North America: a synthesis of research*. Canadian Forest Service Information Report BC-X-387. 35 pp.

[28] Marcel Dawson. 2002. *Plant Quarantine: Preventing the introduction and spread of alien species harmful to plants*, pages 243-252 in Alien Invaders in Canada's Waters, Wetlands, and Forests. Canadian Forest Service, Natural Resources Canada.

The case for preventive policy action at the EU level to tackle these future threats rests on strong foundations: the exponential growth in current and predicted introductions, the scale of IAS-related costs and damage and the technical constraints of taking effective control action once a species has become widespread. Existing evidence comparing the costs of policy action versus inaction (e.g. as discussed in Shine et al. 2009b and in chapter 6 below) shows that inaction or delayed action leads to more serious impacts, costs more to the EU economy and societies and damages function and resilience of Europe's ecosystems.

However, IAS have low visibility in the EU. In a 2010 survey commissioned by DG ENV on *Attitudes of Europeans towards the issue of biodiversity*, only 3 per cent of respondents selected IAS as the most important threat to biodiversity[29], a very small increase on the previous 2007 survey (see Figure 2-4). The range across individual MS went from 1 per cent (Portugal) to 5 per cent (Austria, Bulgaria, Czech Republic, Ireland and The Netherlands).

Figure 2-4 Survey results on attitudes of Europeans towards threats to biodiversity



Source: Flash Eurobarometer 290 (Gallup Organisation 2010)

2.4 The mandate from EU institutions

[29] Note that respondents were asked to select only one of the threats from a given list.

In 2006, EU institutions committed to develop an EU strategy to substantially reduce the impacts of IAS and alien genotypes and to establish an early warning system.[30] They supported alignment of the future Strategy with the CBD Guiding Principles, taking account of the European Strategy for Invasive Alien Species developed under the pan-European Bern Convention (Genovesi and Shine 2004).

In 2008, as noted in 1.1, the Commission issued a Communication outlining four policy options for further consideration. The Committee of the Regions and the European Economic and Social Council, in their responses, supported the development of dedicated legislation and emphasised the need for urgent and immediate action.[31]

In 2009, the Environment Council[32] called for an effective Strategy to fill existing gaps at EU level and establish a comprehensive EU IAS framework in a proportionate and cost-effective manner, based on strategic cooperation at EU and MS level. It should, in particular:

- cover i) prevention, including trade-related aspects, and information exchange, ii) early detection, warning and rapid response, including prevention of spread and eradication, iii) monitoring, control and long-term containment, and iv) restoration of biodiversity affected by IAS as far as feasible (§33);
- take into account the biogeographic approach and the specific circumstances of islands and ultra-peripheral regions (§34); and
- provide for the establishment and maintenance of a comprehensive inventory of IAS and common standards for risk assessment processes (§35).

The Council also stressed the need for the Commission and MS to:

- jointly develop an appropriate information system for early warning and rapid response and improve cooperation on biosecurity and control measures within and beyond the EU (§37);
- integrate IAS considerations into relevant EU and national policies, in particular trade, agricultural, forestry, aquaculture, transport and tourism policies, with a view to preventing the threats caused by IAS (§38);
- address unintentional introductions of IAS, particularly in marine ecosystems (§39); and
- note the importance of adequate financing for all aspects of IAS activities and increase public and sectoral awareness, responsibility and education, and ensuring public participation and involvement (§40).

[30] Communication on Halting the Loss of Biodiversity by 2010 and Beyond (COM(2006)216) and Action Plan (SEC(2006)621); Council Conclusions of 18 December 2006 and of 3 March 2008; European Parliament Committee on the Environment, Public Health and Food Safety (Report of 28 March 2007); Opinion of the Committee of the Regions of 6 December 2006; Opinion of the European Economic and Social Committee of 15 February 2007.

[31] Opinion of the Committee of the Regions on A New Impetus for Halting Biodiversity Loss (DEVE-IV-039, 80th Plenary Session, 17-18 June 2009); Opinion of the European Economic and Social Committee on the Communication – *Towards an EU strategy on invasive species* (NAT/433 Invasive Species dated 11 June 2009).

[32] Council Conclusions on a mid-term assessment of implementing the EU Biodiversity Action Plan and Towards an EU Strategy on Invasive Alien Species (2953rd Environment Council meeting, 25 June 2009).

In 2010[33], the Council identified the lack of additional efficiently-targeted instruments to tackle specific problems such as IAS as one of the reasons for not achieving the EU 2010 biodiversity target. It agreed:

- a long-term vision that by 2050 EU biodiversity and ecosystem services are protected, valued and appropriately restored for biodiversity's intrinsic value and for their essential contribution to human wellbeing and economic prosperity, and so that catastrophic changes caused by the loss of biodiversity are avoided;
- the EU headline target of halting the loss of biodiversity and the degradation of ecosystem services by 2020, and restoring them in so far as feasible, while stepping up the EU contribution to averting global biodiversity loss.

It is envisaged that the EU's **post-2010 Biodiversity Strategy** - to be submitted by the Commission after the tenth meeting of the CBD Conference of the Parties (Nagoya, October 2010) - will set sub-targets for different driving forces and pressures, including IAS. The expected aim is to ensure integration of these sub-targets into relevant internal and external EU sectoral policies and promote the use of best practices and the use of flexible approaches in line with existing legislation.

[33] Council Conclusions on Biodiversity: Post-2010 *EU and global vision and targets and international ABS regime* (15 March 2010), building on the Communication *Options for an EU vision and target for biodiversity beyond 2010* (COM(2010) 4 final, adopted 19 January 2010).

3 Evaluation of the policy baseline

This chapter provides an overview of the complex IAS policy framework to assess how far the baseline meets the mandate for action from EU institutions (see 2.4) and identify key issues and constraints to be addressed through the EU IAS Strategy. Further background information is available in an earlier study for the Commission.[34]

Specific sections cover:

- the most relevant trends in the international IAS policy framework (3.1);
- IAS coverage under key EU instruments and financial mechanisms (3.2);
- coherence with other EU objectives and policies (3.3);
- relevant rulings from the European Court of Justice (3.4);
- the current state of play and trends in MS frameworks (3.5);
- major voluntary initiatives (3.6);
- overall conclusions on the policy baseline (3.7).

3.1 International trends relevant to EU action on IAS

The CBD provides the overarching framework for action to prevent or minimise IAS impacts to EU biodiversity[35] and recognises IAS as a cross-cutting issue affecting all programme areas. The EU has endorsed the 'three stage hierarchy' in the CBD Guiding Principles that prevention of unwanted introductions is the most cost-effective, efficient and least environmentally damaging approach, followed by eradication where feasible or long-term containment/control.

In 2009, the G-8 Summit of Environment Ministers adopted the *Carta di Siracusa* on Biodiversity which called for:

- developing and strengthening actions to prevent and control IAS, taking into consideration the high costs of coping with existing invasions and their strong impact on biodiversity and ecosystem services;
- early warning and rapid response to be considered a priority action.[36]

In October 2010, CBD Parties approved the following IAS target under the CBD Strategic Plan 2011-2020: **'By 2020, invasive alien species and pathways are identified and prioritised,**

[34] Shine et al 2008 (updated 2009). Annexes 1-4 respectively cover the global and regional policy framework, EU instruments and policies, MS policy and technical frameworks and selected third countries with complex jurisdictions (see http://ec.europa.eu/environment/nature/invasivealien/docs/Shine2008_IAS%20Task%202_Annexes%201-5.pdf) .

[35] Article 8(h) mandates each Contracting Party, as far as possible and as appropriate, to prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species.

[36] Text available at http://www.cbd.int/doc/g8/g8-2009-04-23-chair-summary-en.pdf

priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment'. They also adopted a dedicated Decision on Invasive Alien Species and addressed IAS through a range of other decisions, notably on biofuels and on agricultural biodiversity.[37] Key elements are addressed in appropriate sections of this report.

The term 'IAS' is broad enough to encompass alien pests and diseases of plants and animals. In the field of animal and plant health, EU frameworks seek progressive convergence with international standards developed by the World Organization for Animal Health (OIE) and the International Plant Protection Convention (IPPC). OIE and IPPC are recognised as standard-setting bodies within the framework of the World Trade Organization Agreement on the Application of Sanitary and Phytosanitary Measures (WTO-SPS Agreement). No environmental organisation has equivalent WTO recognition for standard-setting.

The OIE maintains Animal Health Codes and early warning systems to prevent the spread of notifiable diseases pathogenic to animals and humans through international trade in animals and to promote animal welfare. Its primary focus is on livestock pathogens but some recent listings concern diseases affecting native wildlife. In 2008, two amphibian pathogens[38] - spread through international transportation of amphibians for food, biological supply, pets, zoos and conservation initiatives - were listed in the Aquatic Animal Health Code because of their severe impacts on the health of populations in the wild.

The OIE's current mandate does not address invasion risks to biodiversity associated with live animals moving in e.g. the pet and aquaria trade. In 2010, however, two issues of the OIE Scientific and Technical Review were devoted to invasive species.[39] In 2011, the OIE will host a Global Conference on Wildlife '*Animal Health and Biodiversity – Preparing for the Future*' to address coordinated management approaches to health risks at the wildlife/domestic animal and human ecosystems interface.[40]

The IPPC applies primarily to quarantine plant pests in international trade and aims to prevent spread and introduction of pests of plants and plant products through sanitary and phytosanitary measures. Pest is defined as 'any species, strain or biotype of plant, animal or pathogenic agent, injurious to plants or plant products': this is broad enough to cover IAS that pose a direct or indirect threat to plants in the unmanaged environment. The IPPC Commission on Phytosanitary Measures adopts International Standards for Phytosanitary Measures (ISPMs) to harmonise national measures but decision making is decentralised to country level. IPPC and CBD cooperate formally on IAS as they affect biodiversity. Recent IPPC activities have addressed e.g. consideration of environmental risks during pest risk analysis (PRA), explicit consideration of biodiversity when developing or revising standards and development of new standards to address a broader range of pathway and vector risks.

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[37] Advanced unedited versions of all decisions adopted at the tenth meeting of the CBD Conference of the Parties (Nagoya, Japan, 18-29 October 2010) available at http://www.cbd.int/nagoya/outcomes/

[38] *Batrachochytrium dendrobatidis*, a type of the chytrid fungus, and Ranavirus, a group of nucleocytoplasmic DNA-virus. In some regions it is estimated that 50% of amphibian species and 80% of individuals disappear within 6 months of disease introduction (Lips et al. 2006).

[39] Pastoret, P-P. and Moutou, F. (2010a and 2010b). Part 1 covers General aspects and biodiversity. Part 2 covers concrete examples, with specific article on 'Why own an exotic pet?', written from a veterinary perspective.

[40] 23-25 February 2011, Paris, France (http://www.oie.int/eng/A_WILDCONF/Intro.htm).

The European and Mediterranean Plant Protection Organization (EPPO) is an IPPC regional organisation and develops regional phytosanitary measures. The EU attends its meetings as an observer. EPPO has developed a dedicated work programme and expert panel for invasive alien plants.

On transport vectors for IAS, the International Maritime Organization (IMO) International Convention for the Control and Management of Ships' Ballast Water and Sediments 2004 (BWM Convention) is expected by the authors of this report to enter into force by 2013. By October 2010 four MS (France, The Netherlands, Spain and Sweden) and two neighbouring third countries (Croatia, Norway) had ratified the BWM Convention. The IMO has also established a working group to address bio-fouling (species transport on ships' hulls).

In contrast, there has been little progress on addressing aviation vectors. The International Civil Aviation Organization (ICAO) Secretariat drafted *Guidelines for preventing the transport and introduction of invasive alien species by air* in 2008 but has not had sufficient funds to test these in a field trial.

Despite this progress, existing international standards and regulatory frameworks still do not cover several key pathways for IAS spread.[41] In 2010, the CBD Secretariat convened the first meeting of the *Inter-agency Liaison Group on invasive alien species*[42] to discuss options to expand species coverage under relevant organisations and explore additional means to address IAS relevant to international trade in CITES-listed species and others.

At COP10, CBD Parties agreed to establish an Ad Hoc Technical Expert Group to suggest ways and means (including provision of scientific and technical information, advice and guidance) on the possible development of standards by appropriate bodies that can be used at an international level to:

- avoid spread of IAS that current international standards do not cover;
- address the identified gaps; and
- prevent the impacts and minimize the risks associated with the introduction of IAS as pets, aquarium and terrarium species, as live bait and live food.

The Government of Spain will provide financial assistance for the organisation of the Expert Group.[43]

[41] At global level, these gaps include conveyances; mariculture and aquaculture; marine bio-fouling; civil air transport; military activities; emergency relief, aid and response; international development assistance; scientific research; tourism; pets, aquarium species, live bait, live food and plant seeds; biocontrol agents; ex situ animal breeding; and inter-basin water transfer and navigational canals (list adapted from Report of Ad Hoc Technical Expert Group on Gaps and Inconsistencies in the International Regulatory Framework in Relation to Invasive Alien Species (UNEP/CBD/SBSTTA/11/INF/4).

[42] Building on CBD Decision IX/4 A§3 (2008). Meeting attended by OIE, IPPC, UN Food and Agriculture Organization Committee on Fisheries, CITES, IMO, WTO-SPS Committee, IUCN and the Global Invasive Species Programme (Paris, 17-18 June 2010).

[43] See 37.

3.2 Key EU instruments and ongoing developments

Three aspects are summarised for each instrument, taking account of ongoing changes:

- objectives;
- IAS coverage (definitions and key terms are discussed in detail in 4.2);
- mechanisms and supporting infrastructure.

3.2.1 Animal health regime

Objectives: The EU Animal Health Strategy and Action Plan[44] (EC 2007a) focuses on prevention and an integrated approach to animal health and welfare. It aims to establish a modernised single regulatory framework to replace the current interrelated policy actions[45], converge as far as possible with international recommendations, standards and guidelines[46] and adjust the incentive structure through a harmonised EU framework for responsibility- and cost-sharing. Its pillars of action support risk-based prioritisation of EU interventions; improved border and on-farm biosecurity; and improved science, innovation and research.

IAS coverage: The Strategy covers the health of all animals in the EU (food, farming, sport, pets, entertainment, zoos) and applies to wild animals and animals in research where there is a risk of them transmitting disease to other animals or to humans (zoonoses). Reflecting the OIE mandate (see 3.1), it does not address environmental risks associated with the import, release and/or escape of alien animals. However, the framework contributes to IAS prevention by providing a basis to regulate import and intra-EU movement of animals that are vectors of diseases that could affect native biodiversity. For example:

- the EU-wide ban on import of wild birds[47] was adopted to prevent transmission of avian flu, following evaluation of a risk assessment by the European Food Safety Authority (EFSA) and resulted in 2 million fewer birds being imported each year. It sets conditions for approved breeding facilities, certification, marking, transport, quarantine and monitoring. However, import restrictions do not apply to captive-bred species reared or kept in captivity for breeding or re-stocking supplies of game; birds imported for approved conservation programmes; pets accompanying their owner; or birds imported for zoos or experiments;
- in 2003, following a monkey pox infection in parts of the US linked to contamination of wild prairie dogs via contact with alien rodents imported from the African rain

[44] Communication laying down the Action Plan for the implementation of the EU Animal Health Strategy for 2007-2013 (COM(2008) 545 final adopted on 10 September 2008).

[45] Addressing e.g. intra-EU trade, imports, animal disease control, animal nutrition and animal welfare. Current instruments include both general legislation (Council Directive 92/65/EEC of 13 July 1992 laying down animal health requirements governing trade in and imports into the Community of animals, semen, ova and embryos not subject to animal health requirements laid down in specific Community rules referred to in Annex A (I) to Directive 90/425/EEC, as amended) and species-specific instruments (e.g. Commission Decision 2006/656/EC of 20 September 2006 laying down the animal health conditions and certification requirements for imports of fish for ornamental purposes).

[46] Adopted by OIE and by Codex Alimentarius, the international food safety organisation recognised for standard-setting purposes under the WTO-SPS Agreement.

[47] Commission Regulation (EC) No 318/2007 of 23 March 2007 laying down animal health conditions for imports of certain birds into the Community and the quarantine conditions thereof.

forest zone where the disease is endemic, the EU banned the import of prairie dogs from the US and the affected rodent species from sub-Saharan Africa.[48]

Mechanisms/infrastructure: Under veterinary legislative requirements for import into or transit through the EU[49], all live animals and specified products of animal origin must be presented at approved Border Inspection Posts (BIPs)[50] to undergo veterinary import controls prior to entry or transit. Prior notification is required prior to their arrival at the BIP. All consignments must undergo documentary and identity checks before clearance for animal and public health purposes, and be issued with a Common Veterinary Entry Document (CVED) to accompany them to place of destination. Details must be entered into the pan-European Trade Control and Expert System (TRACES) network which notifies, certifies and monitors animal imports, exports and intra-EU trade.

Harmonised EU rules are in place to facilitate non-commercial movement into and within the EU of certain pet animals (currently dogs, cats and ferrets), subject to proof of compliance with vaccination and other requirements.[51] This legislation applies without prejudice to the EU Wildlife Trade Regulation used to implement CITES (see 3.2.3).[52]

With regard to early warning and rapid response (see 5.3), the EU framework provides for reporting of detected listed diseases via the Animal Disease Notification System[53], diagnosis through a network of approved reference laboratories and disease control, eradication and monitoring.

EU co-financing to reduce cost of disease spread and minimise barriers to intra-EU trade is available for specific veterinary measures (e.g. emergency measures, contribution to national schemes for eradication of certain diseases, technical and scientific measures), inspection measures and programmes for disease eradication and monitoring.[54] An EU Veterinary Emergency Team was established in 2007[55] and includes experts in veterinary sciences, virology, wildlife, laboratory testing, risk management and other relevant areas. The Commission selects ad hoc team members when an MS or third country requests assistance during an animal health emergency.

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[48] Summary Record of the Standing Committee on the Food Chain and Animal Health (Section Animal Health and Welfare) (Brussels, 13 June 2003) (http://ec.europa.eu/food/committees/regulatory/scfcah/animal_health/summary21_en.pdf). Emerging infectious diseases transmissible to humans may be considered by the EU Committee of Experts on Rare Diseases, established under Commission Decision 2009/872/EC of 30 November 2009.

[49] For live animals, Council Directive 91/496/EEC of 15 July 1991 laying down the principles governing the organisation of veterinary checks on animals entering the Community from third countries and amending Directives 89/662/EEC, 90/425/EEC and 90/675/EEC (OJ L 268, 24.9.1991, p.56) ; for animal products, Council Directive 97/78/EC laying down principles governing the organisation of veterinary checks on products entering the Community from third countries, OJ L 24, 30.01.1998, p. 9.

[50] For the list of approved BIPs see http://ec.europa.eu/food/animal/bips/index_en.htm

[51] See http://ec.europa.eu/food/animal/liveanimals/pets/index_en.htm and Regulation (EC) No 998/2003 of 26 May 2003 on the animal health requirements applicable to the non-commercial movement of pet animals and amending Council Directive 92/65/EEC, currently under review (report available at http://eur-lex.europa.eu/LexUriServ/site/en/com/2007/com2007_0578en01.pdf .

[52] See General Guidance for CITES Entry Points and EU Border Inspection Posts (BIPs) on procedures applying to import/transit to the Community of live animals and their products (DG SANCO document D3/MG D(2009)430493.1 dated 7 August 2009: http://ec.europa.eu/food/animal/bips/docs/gen_guidance_CITES_EU_BIPS_en.pdf

[53] This is a management tool to ensure immediate access to information about contagious animal disease outbreaks and ensure that trade in live animals and products is not unncecessarily disrupted (see Council Directive 82/894/EEC as last amended by Commission Decision 2008/650/EC).

[54] See Council Decision 90/424/EEC of 26 June 1990 on expenditure in the veterinary field.

[55] Commission Decision 2007/142/EC.

The regulatory Standing Committee on the Food Chain and Animal Health assists the Commission with implementation and delivers its opinion on regulatory proposals.

3.2.2 Plant health regime

Objectives: the plant health regime (PHR), based on the plant health Directive[56] and complemented by control regulations for some pests, establishes protective measures against the introduction into the EU and the intra-EU spread of organisms harmful to plants or plant products. In 2009-2010, the regime was comprehensively evaluated to take account of emerging threats linked to globalisation and climate change, consistent with key international instruments, notably the IPPC (the PHR Evaluation (FCEC 2010)).[57]

IAS coverage: the current Directive defines HOs as '*pests of plants or of plant products, which belong to the animal or plant kingdoms, or which are viruses, mycoplasmas or other pathogens*'. Around 250 harmful organisms (HOs) are currently listed. The main focus is on agriculture and forestry although several plant pests with biodiversity impacts are listed.[58] The Directive has not been used to date to assess environmental risks associated with intentional introductions of e.g. fast-growing species for afforestation or biofuel cultivation (see 3.3).

The HO definition does not reference human health[59] or explicitly cover indirect impacts (e.g. wild plant biodiversity and non-agricultural ecosystems) although this environmental coverage is implicit in the existing regime and applied *de facto* in some MS. The PHR Evaluation notes that the Directive's current wording is not fully aligned with IPPC/EPPO and creates confusion and divergence in its application across MS. Several failures in EU plant pest prevention (e.g. pine wood nematode, red palm weevil) are attributed to the lack of a consistent approach on IAS, entailing large potential agricultural, amenity and/or environmental costs.

The PHR Evaluation has recommended clarifying and possibly expanding the regime's scope regarding HOs that affect environmental public goods (i.e. IAS). Any such enlargement would affect the range of implementation instruments available for suggested Strategy components (see 5.1.2 et seq.).

Mechanisms/infrastructure: The EU operates an open plant health system which allows all plants and plant products in unless specifically prohibited. Import bans and intra-EU

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[56] Directive on protective measures against the introduction into the Community of organisms harmful to plants or plant products and against their spread in the Community (2000/29/EC) as amended.

[57] See http://ec.europa.eu/food/plant/strategy/index_en.htm The PHR Evaluation terms of reference noted e.g. increased introduction potential for plant pests, greater variety of host/pest combinations, increased trade of high risk pathways.

[58] e.g. Pinewood nematode (*Bursaphelenchus xylophilus*), Asian Longhorned Beetle (*Anoplophora glabripennis*), Citrus Longhorned Beetle (*A. chinensis*), the fungus *Ceratocystis fagacearum* which causes North-American oak wilt or *Phytophthora ramorum* which threatens native shrubs and trees.

[59] Although e.g. an allergenic plant could be covered on condition that it also met the criteria for HO listing under the Directive. The IPPC also recognises other effects but notes (ISPM 11 §2.3.1) that '…the regulation of plants solely on the basis of their effects on other organisms or systems (e.g. on human or animal health) is outside the scope of this standard'.

movement/holding controls are imposed on listed HOs and/or HO-contaminated commodities:

- that are not known to occur in any part of the EU and are relevant for the entire EU;
- that are known to occur in the EU but are not endemic or established throughout the EU and are relevant for the entire EU;
- adapted lists are in place to regulate entry of HO into some EU Outermost Regions.

Upon entry into the EU, following verification of phytosanitary certificates, plant passports are issued which accompany the relevant commodities in intra-EU trade.

A derogation to the principle of free movement may be activated through a 'protected zone' (PZ) procedure at the request of a MS. The aim of a PZ is to prevent further spread through movement of HOs from areas where they are established into areas that are currently HO-free, but where favourable ecological conditions exist for the HO to establish. This is subject to strict conditions, including regular and systematic official surveys for HO presence and notifications of any findings to the Commission. PZ status must be withdrawn if the HO is found to occur there and either no official measures have been taken for its eradication or such measures have proved for at least two successive years to be ineffective.

In practice, use of PZ provisions has been variable. The PHR Evaluation reviewed this in detail and broadly recommended the maintenance of this system but with improvements to support improved verification e.g. to improve surveillance targets, involve stakeholders, harmonise eradication programmes and end status on time (FCEC 2010).

Listing in relevant annexes to the plant health Directive must be justified by pest risk analysis (PRA). The listing procedure is more flexible than under the centralised animal health regime. A designated MS competent authority (CA) may submit a proposal to the Commission which then consults the Standing Committee on Plant Health (SCPH). This regulatory committee meets monthly and delivers its opinion on regulatory proposals.

With regard to early warning and rapid response, the Commission's Food and Veterinary Office manages EUROPHYT, an electronic rapid alert system between the Commission and Member States. MS are required to conduct regular and systematic official surveys of the presence of HOs on their territory and to notify new occurrences to the Commission. The Directive provides an emergency procedure for non-listed HOs (fast track PRA conducted by an MS) but there is no EU-level emergency team (cf. animal health). MS may receive an EU financial contribution to co-finance the costs of eradicating or containing HOs that are spread through trade-related movement.[60]

There is currently no explicit basis to address natural spread of HOs not linked to movement e.g. including as a consequence of climate change. However, significant funding has been made available to address HOs with environmental impacts (e.g. pinewood nematode in Portugal).

[60] See in particular Articles 21 and 22.

If eradication does not achieve its objective, the current Directive does not provide a follow-up instrument once an HO is established or widespread i.e. it is no longer possible to apply coordinated measures to prevent further spread except in designated PZ. This continued expansion may damage EU environmental and socio-economic interests e.g. in cases where no action, delayed action or inappropriately targeted measures are taken or where potentially damaging control techniques (e.g. excessive use of pesticides, large-scale land clearance) are used without adequate assessment of environmental risk and consideration of lower-impact alternatives.

3.2.3 Wildlife Trade Regulation

Objectives: The WTR[61] is the EU's primary legislation regulating border, import and transit controls in relation to trade in protected species of wild fauna and flora and aims to ensure that trade will not have a negative impact on their conservation. Its main focus is CITES implementation but it also covers endangered EU species not threatened by international trade to ensure policy coherence e.g. with the birds and habitats Directives. The WTR also contains ancillary measures to ensure the legality of intra-EU trade and live animal welfare.

IAS coverage: The WTR provides a legal basis to suspend the import into the EU of '*live specimens of species for which it has been established that their introduction into the natural environment of the Community presents an ecological threat to wild species of fauna and flora indigenous to the Community*' ('ecological threat' species). Intra-EU movement and holding (e.g. for captive breeding and rearing) of import-banned species may also be regulated. There are no stand-alone provisions to address intra-EU movements of species native in some parts of the EU and alien and potentially invasive in others.

Since 1997, four animal species[62] have been banned for import but there is no restriction on their intra-EU movement/holding. For two of these species, Adrados and Briggs (2002) found evidence of market substitution with alternative species that also proved invasive. Listing is not differentiated by biogeographic region: the ruddy duck is actually native in two Outermost Regions (Guadeloupe and Martinique).

To date, these WTR provisions have not been used proactively and have proved ineffective as an IAS prevention tool (see e.g. Ó Críodáin 2007). However, they have potential for wider application consistent with CITES COP recommendations (see 5.1.2 and 5.1.3).

Mechanisms/infrastructure: MS Customs authorities[63] and police services handle border and internal trade controls whilst CITES management authorities handle administration (e.g. permit applications, certificates and marking procedures). WTR-listed species may only take

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[61] Council Regulation 338/97/EC, Commission Regulation (EC) No. 865/2006 laying down detailed rules for its implementation: see generally http://ec.europa.eu/environment/cites/legis_wildlife_en.htm

[62] Red eared slider (*Trachemys scripta elegans*); American bullfrog (*Lithobates catesbeianus*); painted turtle *(Chrysemys picta);* American ruddy duck *(Oxyura jamaicensis*).

[63] In accordance with Council Regulation (EEC) No 2913/92 establishing the Community Customs Code.

place at entry points designated by MS.[64] An EU-level framework is in place to strengthen wildlife trade controls through improved cooperation between MS.[65]

The EU Trade in Wildlife Information Exchange initiative (EU-TWIX) is an online database set up in 2005 to help enforcement personnel undertake risk analysis and coordinate joint investigations. By 2007, 300 officers had access to the system and 16,000 seizure cases were recorded. Good practices identified include strong in-country enforcement (e.g. checking pet shops, breeders, taxidermists and other facilities for illegal specimens), training and effective public information campaigns. Constraints include the lack of strong sanctions, wide variation in methods for calculating fines and few regular checks of internet sales (Milieu Limited & Orbiton Consulting 2006).

The EU Scientific Review Group (SRG)[66] conducts reviews of the conservation status of species listed in the annexes to determine whether imports of a species from a particular country should be suspended and advises the Commission accordingly. Proposals for listing may be made by the chair or MS. The WTR does not establish IAS-related criteria for assessment of proposals. Annexes are updated after every CITES COP or more frequently if needed. A large number of taxa are regularly added or removed.

The WTR has a targeted focus and does not cover IAS rapid response or control. However, EU information materials explicitly address welfare and escape risks associated with live specimens of exotic animals and the potential ecological threats posed to EU biodiversity.[67]

3.2.4 Aquaculture Regulation

Objectives: The aquaculture Regulation[68] establishes a dedicated framework to assess and minimise the possible impact of alien and locally absent species used in aquaculture on the aquatic environment and thus contribute to the sector's sustainable development. It is the only EU instrument to focus on the ecological risks associated with introductions by a specific sector. MS must ensure that all appropriate measures are taken to avoid adverse effects to biodiversity, including ecosystem functions, from such introductions / translocations and the spreading of these species in the wild.

IAS coverage: The Regulation has a dual focus: intentional introduction of **alien species** (species / subspecies of an aquatic organism occurring outside its known natural range and the area of its natural dispersal potential) and intentional movement of **locally absent species (**species / subspecies of an aquatic organism locally absent from a zone within its natural range of distribution for biogeographical reasons). It also covers environmentally

64 See http://ec.europa.eu/environment/cites/pdf/list_points_of_entry.pdf

65 EU Action Plan on CITES Enforcement, adopted 13 June 2007.

66 Consisting of representatives from each MS CITES Scientific Authority, chaired by a Commission representative. See generally General Guidance for CITES Entry Points and EU Border Inspection Posts (BIPs) on procedures applying to import/transit to the Community of live animals and their products (DG SANCO document D3/MG D(2009)430493.1 dated 7 August 2009 : http://ec.europa.eu/food/animal/bips/docs/gen_guidance_CITES_EU_BIPS_en.pdf

67 http://www.eu-wildlifetrade.org/pdf/en/4_welfare_en.pdf

68 Council Regulation concerning use of alien and locally absent species in aquaculture (No.708/2007 of 11 June 2007) (OJ L168/1 of 28.06.2007).

harmful non-target species moved with introduced or translocated organisms, excluding disease-causing organisms regulated under the AHR (see 4.2 on definitions). The Regulation does not cover translocations within MS except if there is a risk to the environment, nor to pet-shops, garden centres or aquaria where there is no contact with EU waters.

Mechanisms/infrastructure: Unlike the animal, plant and wildlife trade regimes, the Regulation establishes a decentralised and closed (white list) system. It gives MS primary responsibility for risk assessments (RA), decision making on permits and follow-up measures[69], based on a detailed procedure and mandatory criteria.

The basic principle is that for non-routine movements[70], only those species that meet the requirements of an environmental RA may be introduced or translocated. The burden of proof is on the introducer. The species-specific RA is designed to estimate the probability of the species becoming established and the consequences of that establishment and to assess any potential non-target species unintentionally moved with the species under consideration.[71] The precautionary principle is embedded through a risk-based distinction between open and closed facilities, provisions for pilot release, contingency planning, monitoring and rapid response should an introduced species or non-target organism become invasive.

Where the RA reveals that neighbouring MS may be affected by the potential or known environmental effects of a proposed movement, prior consultation is required. The Commission has override powers to confirm, amend or cancel the permit, following consultation with the Scientific, Technical and Economic Committee for Fisheries and the Advisory Committee for Fisheries and Aquaculture (i.e. EU-level corrective scrutiny).

However, the system is reversed for Annex IV species (used in aquaculture for a long time in certain parts of the EU) to facilitate aquaculture development without extra administrative burden. The current list (approved 6 June 2008) contains 28 species, mostly fishes. They include the ten most farmed species in the EU, some of which are highly invasive species damaging to EU biodiversity and socio-economic values (e.g. rainbow trout *Oncorhynchus mykiss;* Pacific or Japanese oyster, *Crassostrea gigas*). MS that wish to restrict the use of such species must justify this by environmental RA. Conditions for adding additional species to Annex IV are laid down in an implementing regulation.[72]

'Adverse effects' need to be demonstrated through scientific evidence. They are defined to cover situations where an aquatic species, after its introduction in an MS, may cause significant: habitat degradation; competition with native species for spawning habitat; hybridisation with native species threatening species integrity; predation on native species'

[69] The Preamble states that 'potential risks, which may in some cases be far reaching, are initially more evident locally. The characteristics of local aquatic environments throughout the Community are very diverse and MS have the appropriate knowledge and expertise to evaluate and manage the risks to the aquatic environments falling within their sovereignty or jurisdiction'.

[70] i.e. the movement of aquatic organisms from a source which has an elevated risk of transferring non-target species and which, on account of the characteristics of the aquatic organisms and/or the method of aquaculture, may give rise to adverse ecological effects.

[71] Procedure laid down in Annex II, aligned with the ICES Code of Practice on Transfers and Introductions of Marine Organisms (2005 version). Relevant ICES working groups were consulted during the preparation of the Regulation.

[72] Commission Regulation (EC) No 535/2008 of 13 June 2008 (also covers development of a permit information system).

population resulting in their decline; depletion of native food resources; or spread of disease and novel pathogens in wild aquatic organisms and ecosystems.

Climate change risks are not currently addressed, although warming of the oceans due to climate change may increase the risk of alien species becoming established in the wild after escapes from aquaculture farms.

Lessons learnt: Although the RA criteria and their evaluation were developed through best expert knowledge, all RA suffer to a certain extent from the subjectivity of the expert evaluating the risks. Species-specific RA may come to different conclusions regarding the risk level when addressing the same species for different MS (e.g. different climate conditions). Another area of uncertainty concerns some species that, when transported and released in a new environment, show greater (environmental) flexibility than anticipated and become established (i.e. the RA has underestimated the risks posed).

It is critical to note that eradication plans and contingency measures to manage aquatic alien species have rarely been successful. Monitoring programmes to discover unwanted impacts on non-target species are difficult to operate in waters, both marine and freshwater. Consequently, a new species is usually detected only after its establishment which makes it almost impossible to run a successful eradication programme (see Box 5-2). For this reason particular care should be applied when considering new species introductions.

3.2.5 Habitats and Birds Directives

Objectives: The habitats Directive[73] and birds Directive[74] underpin EU biodiversity policy through two pillars of activity: the Natura 2000 network of protected sites and a strict system of species protection. Implementation measures should be designed to maintain or restore, at favourable conservation status (FCS), natural habitats and species of wild fauna and flora of Community interest, taking account of economic, social and cultural requirements and regional and local characteristics.

IAS coverage: Both Directives contain an explicit IAS prevention obligation. The habitats Directive requires MS to '*ensure that the deliberate introduction into the wild of any species which is not native to their territory is regulated so as not to prejudice natural habitats within their natural range or the wild native fauna and flora and, if they consider it necessary, prohibit such introduction*' (Art.22b). The birds Directive more loosely requires MS to *'see that any introduction of species of bird which do not occur naturally in the wild state in the European territory of the Member States does not prejudice the local flora and fauna*' (Art.11). Neither instrument defines key terms ('native', 'naturally occurring': see 4.2).

[73] Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora.

[74] Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (codified version of Council Directive 79/409/EEC).

For Natura 2000 sites, the general assessment requirement[75] is broad enough to cover activities presenting a foreseeable risk of introduction, escape, release or human-mediated spread of IAS. IAS may also be included in monitoring and management obligations for protected species and Natura 2000 sites (surveillance of conservation status and maintaining or restoring them at FCS).

The above provisions, particularly Art.22b of the habitats Directive, provide a strong legal basis for MS to develop robust measures and could be compatible with a white list approach (i.e. presumption of 'no release' into the wild without permit: see 5.1.4). In practice, they have not been consistently applied across MS (see 3.5) and have proved ineffective in preventing the continued introduction and spread of IAS on European territory.

The Directives are not clearly applicable to species that are vectors for IAS threatening to EU biodiversity e.g. the Chytrid fungus killing native amphibians (see 3.1). They do not address the keeping of IAS in containment or captivity or explicitly provide for surveillance / rapid response. No guidance on the application of their IAS provisions has been developed.[76] The Directives do not apply to EU Outermost Regions which are mainly islands and whose globally-significant biodiversity is particularly vulnerable to IAS impacts.[77]

From a management perspective, a key constraint is that FCS is assessed only for very few Annex II and IV species under the habitats Directive, most of which – other than crayfish - are not affected by IAS. However, measures to maintain or restore FCS of Annex I habitats could provide a basis for integrating IAS prevention/control into biodiversity conservation in the field.

Certain measures under the Directives may have unintended consequences for IAS:

- some alien species are currently listed for strict protection and as priority species for co-financing;[78]
- certain species are protected in their whole current range although they are native only in part of the European range;[79]
- some bird species alien to the whole of Europe are listed in annexes II or III to the birds Directive.[80] They are accordingly subject to the same protection/management

[75] Article 6(3): 'any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives.'

[76] Commission guidance on sustainable hunting under the birds Directive briefly mentions Art.11 in terms of threats that introduced species may post to rare and more widespread species, including those subject to hunting. However, it does not address hunting as a pathway in its own right for introductions of alien species (e.g. stock replenishment) http://ec.europa.eu/environment/nature/conservation/wildbirds/hunting/docs/hunting_guide_en.pdf

[77] A voluntary Natura-2000 like initiative for ORs and OCTs is now under development, following Recommendations from the IUCN-EU conference on *The EU and its overseas entities: strategies to counter climate change and biodiversity loss* (La Réunion, 7-11 July 2008).

[78] e.g. Annex III of the habitats Directive lists the Sardinian and Corsican populations of Mouflon *Ovis ammon* (alien for the whole of Europe) and the subspecies *Cervus elaphus corsicanus* which is present only in Corsica and Sardinia whereas *Cervus elaphus* is alien in both cases. Both are highly invasive.

[79] e.g. under the habitats Directive, Hermann's tortoise (*Testudo graeca*) and marginated tortoise (*Testudo marginata*) (both alien/established in parts of Italy); under the birds Directive, *Anser anser* (alien/established in parts of Belgium and Germany: native in parts of Austria, but released and established as alien in other parts of Austria); *Anser fabalis* (alien/established in Finland); *Anas penelope* and *Anas strepera* (cryptogenic/established in Belgium, Estonia, Great Britain); *Columba livia* (alien/established in 12 MS). See DAISIE: http://www.europe-aliens.org/speciesFactsheet

and derogation provisions as naturally occurring species listed in these annexes, depending on MS implementation;

- for some habitat types, alien species are included in the EU Habitats Interpretation manual as characteristic species (e.g. 3150 includes Azolla, an introduced water fern that is subject to control in some places).

Mechanisms/infrastructure: Decision-making on introductions to the wild is fully decentralised. The habitats Directive implicitly envisages some kind of assessment to enable MS to ensure that damaging introductions do not take place and requires them to 'forward the results of the assessment undertaken' to the Habitats Committee for information. The birds Directive is less specific, requiring MS to 'consult the Commission' in connection with relevant introductions.

MS reporting under the habitats Directive does not systematically address IAS issues.[81] Under the birds Directive, several MS have reported issues with invasive birds.[82]

A significant number of IAS control and management programmes linked to the Directives have been supported by the LIFE and LIFE+ financial instruments (see 3.2.10).

3.2.6 Water Framework Directive

Objectives: The WFD[83] establishes a framework for national measures to achieve or maintain a good ecological status for European inland, transitional and coastal waters by 2015 and prevent their further deterioration. It provides for indicators to assess and monitor water status for this purpose.

IAS coverage: IAS are not mentioned in the WFD text but are included as a 'potential anthropogenic impact' in Annex V. Because IAS are a pressure that alters taxonomic composition and detracts from naturalness, MS should take their impacts into account as part of WFD implementation. In 2009, building on general EU guidance[84], a consultative process (ECOSTAT 2009) examined how alien species could be more consistently incorporated in WFD implementation. This identified major constraints, complicated by lack of adequate information tools:

- monitoring tends to be regionally focused, project-based or voluntary. Only a few national and long-term monitoring programmes exist. These tend to be driven by human health, livestock or economic needs rather than environmental needs;

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[80] e.g. the known IAS Canada goose *Branta canadensis* is listed in Annex II, giving MS the discretion to list it as a huntable species under national legislation; *Phasianus colchicus* (Annex III).

[81] In the Article 17 reports (2001-2006) filed in 2008, most MS (16/23 reports examined) did not report on implementation of Art.22b even though several of them are pursuing active IAS policies or management programmes. The MS that did report on this provision took different approaches (species/habitat-specific impacts cf. general information).

[82] e.g. Ruddy duck, monk parakeet, rose-ringed parakeet, Canadian goose, Egyptian goose.

[83] EU Water Framework Directive (2000/60/EC).

[84] Common Implementation Strategy for the WFD: Guidance document no. 3, Analysis of Pressures and Impacts. http://circa.europa.eu/Public/irc/env/wfd/library?l=/framework_directive/guidance_documents

- plants, invertebrates and fish are equally covered. Some countries also monitor reptiles and parasites. Rivers and lakes are covered better than coastal and transitional waters;
- MS procedures for using alien species data in ecological status classification vary widely, according to country, biological element and surface water type.[85] It will not be possible in the short to medium term to reach consensus on a single approach.

Mechanisms/infrastructure: Implementation is driven by MS, based on cooperative approaches at river basin/biogeographic level. The Commission provides technical support to harmonise approaches and oversees implementation at key milestones.

3.2.7 Marine Strategy Framework Directive

Objectives: The MSFD[86] delivers the environmental pillar of the EU's maritime policy. It requires each MS to develop a marine strategy, based on the ecosystem approach, with the aim of achieving or maintaining 'good environmental status' (GES) in the marine environment by the year 2021. Actions should be based on the principles of preventive action, rectification of environmental damage at source and the polluter pays principle. This is critical in the marine environment where IAS eradication and control present the greatest challenges.

IAS coverage: IAS are explicitly covered by one of the 11 GES descriptors: '*non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystems*'. MS initial assessment (by 2012) should include an IAS inventory and assess IAS as a biological disturbance (pressure).[87] Appropriate measures within the MSFD timeline and provisions to achieve GES could include IAS monitoring, control and/or eradication.

Mechanisms/infrastructure: Implementation is driven by MS, based on cooperation at the level of European Marine Regions between MS and third countries within the same region. Broader cooperation may be envisaged through existing regional seas bodies (e.g. OSPAR, HELCOM). The Commission provides technical support to harmonise approaches to implementation. A Non-Indigenous Species Task Group was established in 2009.[88]

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[85] Four different approaches are currently used at national or local level: (i) water body classified using pressure-based classification tools: classification then modified in an additional step based on IAS; (ii) water body classified, then modified depending on the abundance or percentage coverage of IAS; (iii) no additional assessment of IAS, on the assumption that impacts of IAS are detected in existing instruments; or (iv) separate risk assessment for IAS undertaken: biopollution indexes published alongside water classification, but not affecting classification (Josefsson 2010; ECOSTAT 2009).

[86] EU Marine Strategy Framework Directive (2008/56/EC).

[87] Annex III (indicative list of characteristics, impacts and pressures). Table 1 (biological characteristics) requires an inventory of 'the temporal occurrence, abundance and spatial distribution of non-indigenous, exotic species or, where relevant, genetically distinct forms of native species, which are present in the marine region or subregion. Table 2 (Biological Disturbance') includes Introduction of microbial pathogens, introduction of non-indigenous species and translocations.

[88] Its remit includes agreeing interpretation/definitions, reviewing methods for quantifying GES and identifying key elements of the GES descriptor (e.g. relevant temporal/spatial scales; possible links and overlaps with other descriptors on biodiversity, food webs, eutrophication and sea floor integrity; research needs and monitoring requirements)

3.2.8 Environmental Liability Directive

The environmental liability Directive (ELD)[89] establishes a common framework, based on the polluter pays principle, to prevent and remedy environmental damage. Its fundamental principle is that operators of occupational activities[90] causing such damage, or the imminent threat of such damage, should be held financially liable to encourage them to adopt measures and practices to minimise such risks and thus reduce their financial exposure.

'Environmental damage' is defined to cover three categories of direct or indirect damage:

- damage to protected species and natural habitats covered by the habitats or birds Directives as well as any additional habitats or species designated for protection under MS legislation. This includes any damage that has significant adverse effects on reaching or maintaining the FCS of such habitats or species.[91] Significance is assessed with reference to the baseline condition, taking into account factors such as the size of the population or habitat, its rarity value and its potential to recover naturally;
- water damage (any damage that significantly adversely affects the ecological or chemical quality or classification status of waters covered by the WFD);[92]
- land damage (any land contamination that creates a significant risk of human health being adversely affected as a result of the direct or indirect introduction, in, on or under land, of substances, preparations, organisms or micro-organisms).[93]

The ELD provides for two liability schemes. Operators of activities listed in Annex III are strictly liable for environmental damage (i.e. irrespective of fault). Operators of other activities are liable where damage to protected species or natural habitats has been caused by their fault or negligence[94] (see Table 3-1). This may be interpreted as a minimum standard. The ELD does not prejudice more stringent EU legislation regulating the operation of any of the activities falling within its scope.[95] MS may also adopt stricter national measures.[96]

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89 Council Directive 2004/35/EC on environmental liability with regard to the prevention and remedying of environmental damage.

90 Activity carried out in the course of an economic activity, a business or an undertaking, regardless of its private or public, profit or non-profit character (Art.2(7)).

91 The definition includes a 'permit defence' i.e. it excludes previously identified adverse effects resulting from an act by an operator expressly authorised by the relevant authorities pursuant to Article 6(3) and (4) or Article 16 of the habitats Directive or Article 9 of the birds Directive or, for non-EU habitats and species, under equivalent provisions of national nature conservation law.

92 With the exception of adverse effects to which Article 4(7) WFD applies i.e. where failure to achieve required status or prevent deterioration in status results from certain types of new modification or human activities and MS have complied with certain prescribed conditions.

93 Article 2(1)).

94 Article 1(b) ELD.

95 Art.3.2.

96 For an insurance industry overview of differences in MS implementation, see e.g. *New Environmental Liabilities for EU companies (*2009 briefing: http://global.marsh.com/documents/NewEnvironmentalliabilitiesforEUcompaniesv10.pdf .

Table 3-1 Categories of liability under the Environmental Liability Directive

Type of 'environmental damage'	Annex III activities	Other occupational activities
Damage to protected species and natural habitats	Strict liability	Fault or negligence
Water damage	Strict liability	ELD does not apply
Land damage	Strict liability	ELD does not apply

Annex III currently lists industrial or agricultural activities requiring a licence under the integrated pollution and prevention control Directive[97]; waste management operations, including landfills and incinerators; activities which discharge heavy metals into water or air; transport of defined dangerous or polluting goods; installations producing dangerous chemical substances; and activities involving the contained use, including transport, of genetically modified (GM) micro-organisms[98] or the deliberate release of genetically modified organisms.[99]

The ELD recognises[100] that not all forms of environmental damage can be remedied by means of the liability mechanism. For the latter to be effective, there need to be one or more identifiable polluters, the damage should be concrete and quantifiable, and a causal link should be established between the damage and the identified polluter(s). In the IAS context, liability is not a suitable instrument for dealing with pollution of a widespread, diffuse character where it is impossible to link the negative environmental effects with acts or failure to act of certain individual actors (see further 5.6.6).

3.2.9 EU support for risk assessment

The European Food Safety Authority (EFSA) was established to mobilise and coordinate scientific resources throughout the EU to provide high-quality and independent scientific advice and review RA carried out by other actors.[101] This review and oversight role provides risk managers (Commission, European Parliament, MS) with a sound foundation for policy in areas covered by EFSA's legislative remit. EFSA currently includes specific panels responsible for animal health and plant health. It also has a strong commitment to work with RA for genetically modified (GM) organisms which may be of some relevance to alien genotypes. In 2010 EFSA released studies on defining RA criteria for genetically modified fish[102] and arthropods.[103] Similar studies on mammals and birds are in preparation.

[97] Directive 2008/1/EC of the European Parliament and of the Council of 15 January 2008 concerning integrated pollution prevention and control (codified version of Directive 96/61/EC).

[98] As defined by Directive 90/219/EEC of 23 April 1990 on the contained use of genetically modified micro-organisms.

[99] Directive 2001/18/EC of the European Parliament and of the Council of 12 March 2001 on the deliberate release into the environment of genetically modified organisms.

[100] Preamble §11.

[101] As done for RAs of the invasive plants *Hydrocotyle, Lysichiton* and *Ambrosia* prepared by MS/EPPO.

[102] Defining environmental risk assessment criteria for genetically modified fishes to be placed on the EU Market (http://www.efsa.europa.eu/en/scdocs/doc/69e.pdf).

[103] Defining Environment Risk Assessment Criteria for Genetically Modified Insects to be placed on the EU Market (http://www.efsa.europa.eu/en/scdocs/doc/71e.pdf).

3.2.10 Contribution to IAS measures from EU financial instruments

Financial instruments for the programming period 2007–2013 provide several opportunities to support IAS interventions, separate to the dedicated mechanisms under the animal and health regimes discussed in 3.2.1 and 3.2.2.

Over the last 15 years the EC has contributed to financing almost 300 projects addressing IAS for a total budget exceeding 132 million EUR. These figures are based only on projects funded under the LIFE Programme and the Framework Programmes for Research and Technological Development (RTD) (Scalera 2010).

The LIFE and now LIFE+ Regulation (614/2007) have been used to co-finance numerous IAS projects eligible under the *Nature & Biodiversity* component, particularly on islands, and under the *Information & Communication* component. These include but are not limited to projects to implement the nature Directives. Between 1992–2006, the minimum yearly budget spent on IAS eradication, control and containment was 3 million EUR / year (total figure including EU and MS contributions), with a peak for one 3-year period of 14 million EUR / year (Scalera 2008, 2010). However, this should be considered a low-end estimate of LIFE's contribution to IAS as the analysis was limited by the lack of detail regarding different LIFE projects. Moreover, in the past LIFE was not designed to specifically address IAS which is likely to have limited the number of IAS projects supported under the fund.

Under successive RTD Framework Programmes (FPs), significant funds for IAS-related research have been leveraged to develop the knowledge base, improve assessment methodologies and control methods and to a lesser extent, measure IAS ecological and socio-economic impacts.[104] On average, in the period 1996–2006, the FPs financed seven IAS-related projects per year at an average cost of about 1 million EUR each. This amounted to a total yearly budget of 7 million EUR (i.e. including EU contribution and MS co-financing).

Large-scale IAS research contracts for the programming period 2007–2013 include the FP7 PRATIQUE project focused on developing more powerful and consistent PRA methods for plant health (see 4.3). In 2010, DG Environment issued two tenders with a budget of 1.5 million EUR for a comprehensive assessment of status, impact and management of ragweed (*Ambrosia artemisiifolia*) in Europe.[105]

The European Agricultural Fund for Rural Development (EAFRD) provides opportunities to support IAS control as part of Good Agricultural and Environmental Condition (GAEC) measures within cross-compliance. MS do not appear to use these measures in a systematic way for IAS but a few have done so (e.g. in the UK, to control populations of grey squirrel, rhododendron, Himalayan balsam, giant hogweed and Japanese knotweed). For pinewood nematode control, RD measure 126 under axis 1 on '*restoring agricultural production potential damaged by natural disasters and introducing appropriate prevention actions*' has

[104] e.g. DAISIE, ALARM, IMPASSE and EFFORTS: for a comprehensive list see Scalera 2008.

[105] http://ted.europa.eu/udl?uri=TED:NOTICE:210135-2010:TEXT:EN:HTML&src=0 and http://ec.europa.eu/environment/nature/invasivealien/index_en.htm .

been used in Madeira: programme modification is in the approval process to shift more money to this measure to support eradication.

However, the absence of 'IAS-proofing' in EU policy means that EAFRD funds may also be used to subsidise activities presenting known IAS risks e.g. invasive tree species in forestry or invasive plants for bioenergy. The Standing Forest Committee notes that it may be necessary to revise the eligibility conditions for prevention and corrective measures, considering drought and exceptional outbreaks of biotic agents as eligible basis for prevention and restoration actions (SFC 2009).

IAS interventions have also been funded under the structural, cohesion and development cooperation funds (see Shine et al. 2008). Examples include a 2 million EUR programme focused on IAS risks to selected Overseas Entities[106] and bi- or trilateral funding under INTERREG instruments for managing IAS at the level of biogeographic units.

3.3 Coherence with other relevant EU objectives and policies

Landscape connectivity and climate change adaptation

The White Paper on Adaptation to Climate Change (EC 2009c) recognised the need to establish a permeable landscape as part of the EU policy mix to reduce vulnerability to climate change impacts. In 2010, the Council emphasised the contribution of 'green infrastructure' to prevent habitat fragmentation and maintain species evolution processes and called on the Commission to further develop this concept.[107] The objectives to increase connectivity within landscapes (e.g. between Natura 2000 sites) and facilitate species migration in face of climate change will involve policy trade-offs by increasing dispersal opportunities for IAS, along with native and non-invasive alien species (see 5.2.4). This makes ex ante prevention at the EU level even more critical.

Forestry

Existing and upcoming instruments (Forest Action Plan (FAP), Green Paper on Forest Protection and Information, proposed EU Forest Strategy) highlight the new or aggravated challenges that climate change and biodiversity loss pose to EU forests. Global trade and climate change increase the potential vectors for HOs and IAS which, along with other stressors, have a sizeable influence on the ecological condition and productive capacity of EU forests. The FAP 2010–2011 work programme foresees a study on *Disturbances of EU forests caused by biotic agents* coordinated by DG Environment and a workshop to launch discussion on the future EU Forest Strategy.

[106] *Increase in the regional capacity to reduce the impacts of invasive species in the Overseas Territories of the United Kingdom in the South Atlantic* (EDF-9 2006-9).

[107] Council Conclusions on Biodiversity: Post-2010 *EU and global vision and targets and international ABS regime* (15 March 2010).

Renewable energy policies

The EU Renewable Energy Directive 2009[108] requires each MS to ensure that 20% of its energy consumption comes from renewable sources by 2020 and that renewables account for 10% of the energy used in the transport sector.

Cultivation and afforestation of fast-growing species or genotypes for biofuel/biogas production is already increasing within the context of climate change mitigation policies.[109] This can create a double pressure on ecosystems: land clearance for monoculture and selection of species with often favourable characteristics for invasiveness (Raghu et al. 2006). The Council has highlighted the risks of further IAS spread from such activities.[110]

Under the Directive, energy generated from biofuels and bioliquids may only count towards EU targets and be eligible for financial support if:

- raw materials are not obtained from specified categories of land of high biodiversity value, high carbon stock or peatland;
- agricultural raw materials cultivated in the EU and used for biofuel production respect cross-compliance rules i.e. meet the statutory management requirements of the nature Directives and respect GAEC.[111]

In June 2010, the Commission announced sustainability criteria with which biofuels must comply to count towards the 2020 target. These include:

- 'sustainable biofuel certificates': governments, industry and NGOs are encouraged to establish voluntary schemes which must be independently audited to be recognised by the Commission;
- 'protecting untouched nature': biofuels must not be made from raw materials from tropical forests or recently deforested areas, drained peatlands or wetlands;
- 'promote only biofuels with high greenhouse gas savings' (savings of at least 35% compared with fossil fuels, rising to 50% in 2017 and to 60% by 2018).

Sustainable transport

In 2009 the EU transport sector committed to mitigate negative environmental impacts and take all elements of sustainability into account, including provision of infrastructure (land occupancy, biodiversity), landscape fragmentation due to expanded transport infrastructure and the implications of climate change for increased vulnerability of coastal infrastructures, including ports.[112] These stressors can generally contribute to environmental degradation

[108] Directive 2009/28/EC of 23 April 2009 on the promotion of the use of energy from renewable sources.

[109] See e.g. Opinion of the Standing Forestry Committee on forestry measures in Rural Development of 22 July 2009.

[110] Council Conclusions 2009, §20 (general risks to biodiversity) and §38 (specific risks of favouring future IAS expansion).

[111] See Annex II, Regulation (EC) No 73/2009 of 19 January 2009 establishing common rules for direct support schemes for farmers under the CAP and establishing certain support schemes for farmers and in accordance with the minimum requirements for good agricultural and environmental condition defined pursuant to Article 6(1) of that Regulation.

[112] EC 2009a. *A sustainable future for transport: Towards an integrated, technology-led and user friendly system.* Communication from the Commission (COM(2009) 279 final dated 17.6.2009.

which can create favourable conditions for alien species to become established. Corridors opened up for transport infrastructure also provide opportunities for dispersal.

Maritime Transport Strategy for 2018 and European Ports Policy

This Strategy provides the policy basis for EU support to implementation of the IMO BWM Convention. The European Maritime Safety Agency (EMSA) provides technical and scientific assistance in the proper development and implementation of relevant EU legislation.

The Strategy's goal is to improve the framework for public maritime transport services that meet territorial continuity requirements. IAS-relevant aspects include measures to facilitate better connection of islands, establish a 'European maritime transport space without barriers' and a fast-track procedure for environmental assessments for port expansion (see 5.2.3).[113]

3.4 Relevant rulings from the European Court of Justice

National measures affecting free movement of goods may infringe the operation of the Single Market (quantitative restriction on imports, exports or goods in transit) unless scientifically justified on the grounds of protection of health and life of humans, animals or plants under Article 30 of the Treaty.

European Court of Justice (ECJ) case law relevant to IAS (see Table 3-2) is very limited and does not provide the level of legal certainty sought by individual MS seeking to develop national measures potentially affecting trade. On a case by case basis, it shows that IAS-related restrictions may indeed be justifiable to protect animal or plant health (interpreted widely to cover biodiversity) but not if the objective of the protection measure can be achieved as effectively by measures less restrictive of intra-EU trade. For example, in the 'German crayfish case', the ban on crayfish imports to protect native species was considered not meet the test of proportionality because the ban could be replaced by monitoring requirements.[114]

[113] COM(2007) 616, 18.10.2007 European Ports Policy.

[114] Commission v. Germany, C 131/93 ECR (1994-I) 3303.

Table 3-2 Examples of IAS-relevant caselaw from the European Court of Justice

CASE	SUMMARY	RELEVANCE TO IAS
Danish bees case (Case C-67/97)	The case concerned the ban on keeping alien species of bee on the island of Læsø. Danish law prohibited the keeping of nectar-gathering bees except the native brown bee of Læsø. An individual prosecuted for breaching the prohibition claimed that the law constituted a quantitative restriction on imports and was contrary to Article 28 of the EC Treaty. The ECJ found that the law was indeed a restriction, but that it was justified under Article 30 of the Treaty (protection of health and life of animals).	Directly concerns the threat that alien species may pose to natives. The ECJ referred to the existence of protected areas for biodiversity conservation under the Birds and Habitats Directives, and stated that the establishment by national legislation of a protection area within which the keeping of bees other than Læsø brown bees is prohibited, for the purpose of ensuring the survival of the latter, constituted an appropriate measure.
Belgian animal welfare case (Case C-219/07: judgment delivered on 19 June 2008)	The case concerned restrictions on holding of animals imposed under Belgian animal welfare legislation as amended in 1995, based on the EU WTR. The Belgian Decree prohibited the holding of any animals not included in a regulatory list (i.e. a white list), provided for certain derogations (zoos, laboratories etc.) and established a procedure for animal trading firms to apply to add new species to the authorised list subject to prior approval based on formal criteria. The Court found that the Decree was more stringent than the WTR Regulation and liable to restrict intra-Community trade for the purposes of Article 28 EC, but that it was justified under Article 30 of the Treaty, for the protection of the health and life of animals.	Not specifically, but the judgment provides generally applicable guidance on the criteria to be applied when assessing whether a national trade-restrictive measure is compatible with the Treaty. It is for the national court to determine whether: • the drawing up of a (positive) species list is based on objective and non-discriminatory criteria; • a procedure enabling interested parties to apply for species listing is provided for, readily accessible and can be completed within reasonable time; • relevant holding conditions are objectively justified and do not go beyond what is necessary to achieve the objective pursued by the national legislation as a whole. The CA may refuse applications only if the holding of the specimens of the species concerned poses a genuine risk to the protection of animal welfare and the environment. Its refusal must be based on a full assessment of the risk posed to such interests, established on the basis of the most reliable scientific data available and the most recent results of international research (§36-37). '*Where it proves impossible to determine with certainty the existence or extent of the risk envisaged because of the insufficiency, inconclusiveness or imprecision of the results of the studies conducted, but the likelihood of real harm to human or animal health or to the environment persists should the risk materialise, the precautionary principle justifies the adoption of restrictive measures*' (§38). Any refusal decision must be open to challenge before the courts. In the specific case, the National Council for Animal Welfare had established objective scientific criteria for dealing with applications to add new animal species to the list. These criteria precluded listing of species that, if they escaped into the wild, could continue to exist there and might constitute an ecological threat. The ECJ noted (§29) with regard to this criterion that '*the Court has consistently held that restrictions of the free movement of goods may be justified by imperative requirements such as the protection of the environment (see Case C-350-95 Bettati [1998] ECR I-4355 §62 and Case C-314-98 Snellers [2000] ECR I-8633 §55)*'. On proportionality, the ECJ noted (§30) that it was necessary when applying the principle to a case of this type, to 'take into account the specific nature of the species concerned' as well as the general requirements for protection of animal welfare and the environment. '*The fact that one Member State imposes less stringent rules than another Member State does not mean that the latter's rules are disproportionate and hence incompatible with Community law'* (§31).

		The ECJ also noted that '*a negative list system – which entails limiting the prohibition to the species of mammals included in that list – might not suffice to achieve the objective… Reliance on such a system could mean that, as long as a species of mammal is not included in the list, specimens of that species may be freely held even though there has been no scientific assessment capable of guaranteeing that that holding entails no risk to the protection of those interests and requirements*' (§32).
Netherlands mussels case (Case C-249/07: judgment delivered on 4 December 2008) **http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2009:019:0004:0004:EN:PDF**	The case brought by the Commission against the Kingdom of the Netherlands concerned a measure under domestic fisheries regulations. The ECJ declared that, by instituting a system of prior authorisation for the planting, in Netherlands coastal waters, of oysters and mussels coming lawfully from other Member States and being of species native to the Netherlands, the Kingdom of the Netherlands had failed to fulfil its obligations under Articles 28 EC and 30 EC.	The case is directly relevant to interpretation of Art 22, Habitats Directive. The Commission claimed that the prohibition on planting oysters and mussels in Dutch coastal waters without a permit amounted to a prior authorisation regime liable to restrict intra-Community trade and market access from other MS. Whereas a permit was always required to plant oysters/mussels sourced from other MS, even if those species were native to the Netherlands, a permit was not required in certain cases to plant oysters/mussels sourced within the Netherlands (planting in the Wadden Sea of stock originating from the Dutch part of that sea; planting in the western Escaut of stock originating from the western Escaut). The Commission also claimed that the derogation for planting mussels from the western Escaut in the Wadden Sea was discriminatory because it benefited a large part of domestic mussel production. ECJ case law made clear that measures having equivalent effect to quantitative restrictions (prohibited under Art.28 EC) applied to any domestic measures liable to obstruct intra-EU trade, directly or indirectly, now or in the future. The regime in question affected oysters and mussels from other MS differently to the majority of oysters and mussels in the Netherlands and could thus obstruct free trade by dissuading an importer to introduce or place products on the market in the State concerned. The Dutch government accepted that the permit regime could restrict free movement of goods but argued that such measures were justified for reasons of biodiversity protection and conservation of non-threatened fisheries species, basing its arguments, on the habitats Directive and on Art.30 EC: • the permit regime was designed to prevent introduction of alien organisms attached to the introduced shellfish, which could threaten native fish and plant species in the waters concerned. The ECJ rejected the argument that such a measure was consistent with Art.22 of the Habitats Directive because that article only covered intentional introductions linked to a specific project and did not cover possible accidental introductions arising from the translocation of other species. The ECJ did not consider that foreseeable risk was enough to constitute 'intention' under Art.22 (c.f. ECJ case law that accepts a more subjective interpretation of 'intention' for activities involving harm to protected species in breach of Art.12 of the Directive); • the ECJ rejected the argument that the measure was justified on the grounds of protection of the life of animals under Art.30. It noted that recourse to Art.30 was no longer possible once Community directives provided for harmonisation of measures to achieve the objective concerned (e.g. biodiversity protection on MS' European territory) but that the Dutch measure aimed to protect non-threatened fisheries species that fell outside the scope of the habitats Directive. Recourse to Art.30 was thus legally possible, provided that the Dutch government could show that the measure adopted was appropriate, necessary to achieve the desired objective and proportionate. On the facts, the ECJ found that the government had not demonstrated how its permit regime operated, the criteria used to grant or refuse permit applications, the objective and non-discriminatory nature of its system of derogations or detailed risk analysis which was a necessary precondition to invoking the precautionary principle.

Source: Shine et al. 2008

3.5 Member State frameworks and trends

Studies since 2006 have tracked the development of IAS measures and strategies in MS and other European countries.[115] The impetus for this has come partly from the Council of Europe which monitors implementation of the European Strategy on Invasive Alien Species (Genovesi and Shine 2004) and develops topic-specific guidance for Parties.[116] Table 3-3 provides an updated overview of MS frameworks as of 2010. This section highlights trends particularly relevant to the EU Strategy, illustrated with concrete examples.

Legislative definitions

MS legislative frameworks and associated terminology are often fragmented, complex and inconsistent. This constraint is widely recognised. Some modern instruments have shifted to clearer ecological definitions and provide an impact-based definition of 'invasive' which can create a clearer basis for identifying responsibilities and possible liability.

Examples: Spain's Natural Heritage and Biodiversity Act defines an 'invasive alien species' to cover '*a species that is introduced or established in a natural or semi-natural ecosystem or habitat and is an agent of change and threatens native biodiversity, either because of its invasive behaviour or because of the risk of genetic contamination*.'[117]

Scotland's draft legislation[118] defines:

- 'native range' of an animal, plant or type of animal or plant as '*the locality to which the animal or plant of that type is indigenous*' and excludes '*any locality to which that type of animal or plant has been imported (whether intentionally or otherwise) by any person*';
- 'invasive' as '*a reference to an animal or plant of a type which* ***if not under the control of any person****, would be likely to have a significant adverse impact on (a) biodiversity; (b) other environmental interests; or (c) social or economic interests*' (emphasis in bold added).

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[115] Miller at al 2006; Shine et al 2008.

[116] Most recently *Recommendation No. 142 (2009)* on IAS and climate change (see 4.2 below); *Recommendation No. 133 (2008) on* water hyacinth. For full list, see http://www.coe.int/t/dg4/cultureheritage/nature/WCD/InvasiveSpecies_en.asp# .

[117] '*la que se introduce o establece en un ecosistema o hábitat natural o seminatural y que es un agente de cambio y amenaza para la diversidad biológica nativa, ya sea por su comportamiento invasor, o por el riesgo de contaminación genética'* (Art.3.13, Law No. 42/2007).

[118] Sec.14, *Wildlife and Natural Environment (Scotland) Bill (SP Bill 52),* introduced in the Scottish Parliament on 9 June 2010: second reading begins on 22 December 2010; adoption scheduled for spring 2011. Consultation document on proposed IAS provisions available at http://www.scotland.gov.uk/Publications/2009/06/17133414/4

Table 3-3 Overview of existing MS legal and policy frameworks (as of June 2010). The overview is based on Shine et al. (2008) and updated according to the information provided by the Member States to the European Commission in the context of the review of the EU Biodiversity Action Plan in 2010.

COUNTRY	IMPORT/ EXPORT	POSSESSION/ TRADE	INTRODUCTION	CONTROL/ ERADICATION	NATIONAL IAS DATABASE / INVENTORY	INFORMATION AND EARLY WARNING SYSTEM FOR IAS	IAS STRATEGY
Austria	No	No	Yes	No	Yes	No[119]	IAS Action Plan
Belgium	Yes	No	Yes	Yes	Yes	Under development	IAS included in the Biodiversity Strategy
Bulgaria[120]	Yes	No	Yes	Yes	No information	No information	Under development
Cyprus	Being developed (fauna)	Yes	Yes	No	No	No	No
Czech Republic	Yes	No	Yes	Yes	Under development	No	IAS included in the Biodiversity Strategy and Action Plan
Denmark	No	No	Yes	Yes	Yes	No	IAS Action Plan
Estonia	Yes	No	Yes	Yes	Under development	No	No
Finland	Yes	No	Yes	Yes	Under development	Under development	Under development
France	Yes	Yes	Yes	Yes	Under development	Under development	Under development (inc. Outermost Regions)
Germany	No	Yes	Yes	Yes	Under development	Under development	Under development
Greece[120]	Yes	Yes	No	Yes	No information	No information	No
Hungary	No[121]	Yes	Yes	Yes	Under development	No	Under development
Ireland	Yes	Yes	Yes	Yes	Yes	Under development	Under development
Italy	Yes	Yes	Yes	Yes	Yes	No	No
Latvia	Yes	No	Yes	Yes	No	No	IAS included in the Biodiversity Strategy
Lithuania	Yes	Yes	Yes	Yes	No	No	IAS included in the Biodiversity Strategy and Action Plan
Luxembourg	Yes	Yes	Yes	Being developed	Yes	No	IAS included in the Biodiversity Strategy and Action Plan
Malta	Yes	Yes	Yes	Yes	Under development	No	IAS will be included in the currently developed Biodiversity Strategy

[119] Early warning and information system is seen as a priority to be developed at the EU level.

[120] The information for these Member States is based on Shine et al 2008.

[121] Were in place prior to EU membership.

The Netherlands	Yes	Yes	Yes	Yes	Yes	Yes	National IAS Policy
Poland	Yes	Adoption due Dec.2010	Yes	Yes	No information	No information	IAS included in the Biodiversity Strategy
Portugal	Yes[122]	Yes	Yes	Yes	Yes	No	IAS included in the Biodiversity Strategy
Romania	Yes	No	Yes	Yes	No information	No information	IAS will be included in the currently developed Biodiversity Strategy
Slovakia[120]	Yes	Yes	Yes	Yes	No information	No information	IAS included in the Biodiversity Strategy
Slovenia	No[123]	Yes	Yes	No	No	No	Under development
Spain	Yes	Yes	Yes	Yes	Under development	No	IAS Action Plan Also, IAS under development
Sweden	Yes	Yes	Yes	Yes	Yes	No	Yes, but yet to be adopted
UK	Yes	Yes	Yes	Yes	Under development	Under development	Yes

[122] Specific restrictions in relation to Madeira, under development for the Azores.

[123] Were in place prior to EU membership.

Approaches to IAS species listing

At pan-European level, countries have continued to invest in the development of IAS lists as a support to management and/or regulation. These tend to be based on different concepts of invasiveness e.g. based on either biogeographical or impact criteria; only consider environmental effects or also include impacts on economy or other non-biological parameters.

The effects of the inconsistency in the terms and concepts adopted in different contexts explains the large difference in the number of species listed as invasive within Europe (Genovesi et al. 2011 in press). For example, for the same geographic region, Vilà and co-authors (2009) reported 1094 alien species of Europe known to cause some impacts to biological diversity, and 1347 known to cause some economic impacts. On the other hand, preliminary black lists proposed for a Council of Europe study focused on species entering Europe through trade (Genovesi and Scalera 2007) and for an EEA feasibility study for a early warning and information system[124] included a number of listed species ranging from about 500 to over 1200.

A recent study (Solarz 2010: see Table 3-4) compared black and grey list approaches in NOBANIS countries and found wide scientific and policy-relevant variations, including:

- no lists (black or counterpart) in some countries;
- existing lists in very different stages of development (from early drafts to comprehensive inventories waiting to be updated);
- different names for existing lists in different countries;
- black lists are most common (12 countries) but not legally binding in most countries;
- grey lists are in place in six of these countries but only one (Belgium) has a formal alert list (see below);
- the scope and consistency of lists varies significantly between even neighbouring countries and between taxonomic groups;
- fact sheets on species invasiveness are lacking or incomplete for some of the most unwanted species.

Table 3-4 Comparison of black lists of IAS in NOBANIS countries

Country	legally binding?	non-environmental impacts?	invasion stage covered by list			
			absent	isolated	restricted	widespread
Belgium	N	N	Y	Y	Y	Y
Denmark	N	N	Y	Y	Y	Y
Estonia	Y	N	Y	Y	Y	Y
Finland	N					

[124] The full version of these black lists (cf. abridged version in Genovesi et al. 2010) was published in Genovesi P., Scalera R., Solarz, W and Roy, D. 2009. Towards an early warning and information system for invasive alien species (IAS) threatening biodiversity in Europe. European Environment Agency, Contract No. 3606/B2008/EEA.53386, ISPRA, Rome).

Germany	N	N	Y	Y	Y	Y
Iceland	Y		Y			
Ireland	N	Y				
Latvia	N	Y				
Netherlands	Y/N					
Norway	N					
Poland	Y	Y	Y	Y	Y	Y
Slovakia	Y	N		Y	Y	Y

Source: Solarz 2010

The 2010 NOBANIS study compared its findings to the above-mentioned Council of Europe 'metalist' study (Genovesi and Scalera 2007).[125] It found 126 species in common, 349 species listed only in the NOBANIS black lists and 381 species only in the Council of Europe metalist.

These findings highlight the need to develop a common approach and information platform to help individual countries developing or updating their national lists. This is also important to promote consistency between subnational units competent for developing species lists.[126]

Risk assessment to support IAS decision making

This is an area of significant investment in several MS to provide scientific justification for regulatory measures and/or to prioritise management interventions. At least two MS (UK and Belgium) have developed IAS-specific RA protocols that may be capable of scaling up to a broader level. Joint RA initiatives between neighbouring MS to facilitate a common biogeographical approach are in place for the island of Ireland[127] and Austria / Germany.[128]

Example of a unified RA mechanism: the Great Britain Non-Native Organism Risk Assessment Scheme, based on EPPO PRA methodology, can be used to assess the risks associated with alien species in any taxonomic group. Triggers for carrying out RA include interceptions of new non-native species and horizon scanning to detect invasive species. RAs are carried out by external experts using standardised methodology. A dedicated Non-Native Species Risk Analysis Panel, with expertise in entomology, plants, fish, animal diseases, marine and economics, meets at least four times per year to review RA results to ensure consistency and accuracy. Panel comments are sent back to the risk assessor, several times if necessary, until the Panel is satisfied that the RA is fit for the purpose prior to introduction of non-native species.[129]

Example of IAS regulation directly linked to risk status: Belgium's *Harmonia* database covers

[125] Metalist includes 517 species, developed from analysis of EPPO, EEA/SEBI, NOBANIS fact sheets, DAISIE and EU Wildlife Trade Regulation data.

[126] e.g. Germany's amended federal Nature Conservation Legislation makes it necessary to distinguish between invasive, potential invasive and non-invasive species. Federal black lists will be published for all taxonomic groups (starting with fish) but these do not bind individual Länder which may develop their own black lists (Stefan Nehring, pers.comm.).

[127] Invasive Species Ireland initiative: see http://www.invasivespeciesireland.com

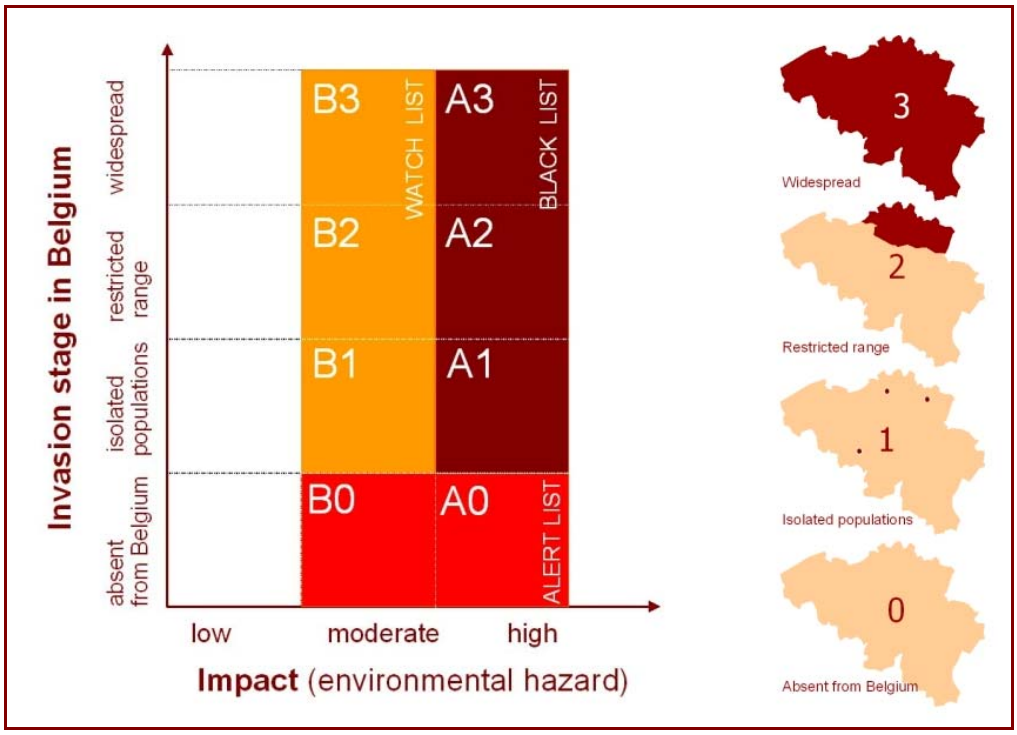
[128] GABLIS (German-Austrian Black List for Invasive Species) non-binding criteria-based system (Essl et al. 2008).

[129] https://secure.fera.defra.gov.uk/nonnativespecies/index.cfm?pageid=5 ; http://napra.eppo.org/index.php

alien species introduced by man on Belgian territory or in neighbouring areas after 1500. Listing depends on prior assessment by scientists using the ISEIA protocol[130] and is updated annually by a consultative expert committee (see Figure 3-1). It covers two categories:

- black and watch list: alien species naturalised in Belgium, with a focus on those that actively colonise semi-natural ecosystems and can be detrimental to the environment;
- alert list: alien species not yet observed in Belgium that are invasive in neighbouring countries and considered as highly detrimental to biodiversity.

Figure 3-1 Belgian listing system to identify alien species that threaten native biodiversity



Source: Belgian Forum on Invasive Species

A draft Royal Decree[131] provides for a ban on the import, export and transit of 20 listed IAS[132] in categories A0/A1, after consultation with horticulture and pet trade stakeholders. It establishes a business exemption from liability where the breeder / other responsible actor can prove that all reasonable steps were taken to avoid escape of listed species.

[130] Maintained and developed by the Belgian Forum on Invasive Species (BFIS), part of the Belgian Biodiversity Platform. Under the Invasive Species Environmental Impact Assessment (http://ias.biodiversity.be/ias/documents/ISEIA_protocol.pdf. data are reviewed for accreditation by a scientific committee before publication. Lists can be sorted or filtered through different criteria including taxonomy, habitat, introduction date or hazard categories. Specific icons indicate recent additions to the list and changes of listing category. To date, only vascular plants and vertebrates have been subject to risk assessment.

[131] Proposed in May 2009; adoption scheduled end 2010 but subject to ongoing political reorganisation.

[132] Including 8 vascular plants; 1 bird (sacred ibis); 2 fish; 8 mammals, including American mink; and 1 amphibian.

Expansion of IAS regulation to address trade, holding and ancillary activities

Growth in national or subnational IAS regulations has continued, despite the uncertainty identified in previous studies regarding compatibility of measures with the Single Market.

Consistency remains a challenge, both between neighbouring countries and within MS with decentralised competency for nature conservation. Typically, importation and movement are regulated at national level whilst domestic trade, holding, release and management come under subnational jurisdiction. This enables local IAS problems to be addressed close to the ground but can complicate IAS communication and enforcement efforts. There are several examples where trade in known IAS is banned in some jurisdictions and legal across the border.[133]

Spanish legislation (Natural Heritage and Biodiversity Act 2007) provides an overarching framework for a consistent approach at national and subnational levels. Implementing regulations for the National Catalogue of Invasive Alien Species are under development. Some Autonomous Communities have developed regional IAS catalogues which provide a basis for regulating possession and trade within their territory (e.g. Valencia).

The lack of explicit EU-level tools to regulate holding and breeding in captivity (except aquaculture) is identified as a common problem. Some MS address this by using municipal regulations for registration of exotic animals (e.g. Canaries[134]) and/or through dangerous animals-type legislation. The latter can be used to regulate import and keeping of certain species; require licensing of premises holding captive populations; specify keeping conditions; allow control of species 'at large'; and require owners to notify the authorities following escape.[135]

Example of incorporating IAS into existing regulations: In September 2010, France published amended regulations on conditions for holding in captivity, breeding, trade, transport and display of specified alien vertebrates, excluding fish, in metropolitan territory.[136] These extend the suite of existing measures to cover a range of known IAS.[137] Equivalent regulations will be developed for flora, fish and invertebrates on metropolitan territory and for individual Overseas Territories.

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[133] e.g. in Austria, trade, movement and breeding of listed alien reptiles is authorised in certain provinces and prohibited in others. Grey squirrel bans are in place in e.g. France, Switzerland and The Netherlands but not Italy: a draft decree to ban trade and keeping throughout national territory was drawn up in July 2009 but has not been adopted.

[134] Draft Decree to regulate holding and trade in reptiles: September 2010 version available at http://www.gobiernodecanarias.org/cmayot/servlet/ViewDocu?id_documento=10710&id_pagina=1

[135] The draft Wildlife and Natural Environment (Scotland) Bill will, if adopted, incorporate these legal tools into dedicated IAS prevention and control legislation. In England, the Destructive Imported Animals Act 1932 has already been used to prohibit or control importation/keeping of 'non-indigenous mammalian species' and address their management. Permanent Orders were made for musk rats (1933), grey squirrels in 1937, non-indigenous rabbits in 1954 and coypu in 1987. Temporary orders have been made for mink.

[136] *Arrêté du 30 juillet 2010 modifiant (1) l'arrêté du 10 août 2004 fixant les conditions d'autorisation de détention d'animaux de certaines espèces non domestiques dans les établissements d'élevage, de vente, de location, de transit ou de présentation au public d'animaux d'espèces non domestiques et (2) l'arrêté du 10 août 2004 fixant les règles générales de fonctionnement des installations d'élevage d'agrément d'animaux d'espèces non domestiques*, published in the Official Journal on 10 September 2010.

[137] Several mammals and 4 birds: *Threskiornis aethiopicus, Alopochen aegyptiacus, Branta canadensis, Oxyura jamaicensis* (http://www.legifrance.gouv.fr/affichTexte.do;jsessionid=?cidTexte=JORFTEXT000022806737&dateTexte=&oldAction=rechJO&categorieLien=id).

Example of dedicated IAS regulations: Poland's draft IAS regulations under the 2009 Nature Conservation Act[138] are due for publication by end 2010. For black-listed species, a permit will be required for import into Poland, keeping, breeding or sale (conditions may be varied for different species on the list). As currently drafted, all permit decisions will be subject to prior consultation with the State Council for Nature Conservation.

Introductions into the natural environment

MS practice varies widely in terms of legal approach (black list: restrictions applicable only to listed species cf. white list: presumption against release except under permit) and between animals and plants. The most common scenario is for nature conservation restrictions to co-exist with sectoral legislation for key economic sectors e.g. agriculture, forestry, plant health, hunting and/or fisheries and angling. This highlights the need for common criteria and coordinated decision making across concerned sectors, which is far from the case in most countries. Another constraint relates to enforcement: prosecutions for unlawful releases are extremely rare.

Example of white list approach coupled with other sectoral legislation: Germany's amended Federal Nature Conservation Act[139] lays down specific measures for non-native, foreign and invasive species (defined in terms of threat to ecosystems, biotopes and species). Specific measures are directed to IAS (early warning, monitoring, controlling, eradication) and potential invasive species (monitoring). All releases of animal species (alien or native) into urban or natural areas require a permit. For plants, the release to the wild of 'foreign shrubs and seeds' (i.e. alien plant genotypes/species outside their area of occurrence) will require a permit after 1 March 2020 (i.e. 10 year transition period). The federal agency is responsible for decision making on releases in the 200 nautical mile zone and for new alien species in Germany for which no occurrence in Germany is known. In other cases Länder are the competent authorities. The Act specifies that a permit should be refused if a threat to other Member States' ecosystems, biotopes or species cannot be ruled out.

However, these broad provisions do not apply to the agriculture, forestry, plant health, hunting and fisheries sectors covered by separate legislation at federal / Länder level. The Act is thus mainly concerned with activities in the framework of nature conservation e.g. compensation measures, although it could also be applied to e.g. landscaping and road verge planting. Where necessary to prevent threats to ecosystems, biotopes or species, the competent authority may order the elimination of plants spreading unintentionally in natural surroundings (including e.g. invasive plants spreading from biofuel plantations into the wild) or animals that have escaped into natural surroundings.

Example concerning release to the marine environment: UK regulations implementing the habitats Directive make it illegal for anyone on an offshore installation or on board a ship to deliberately introduce into a relevant part of the coastal sea any live animal or plant of a kind having a natural range that does not include those waters, where the introduction

[138] Polish text availabe at http://www.mos.gov.pl/g2/kategoriaPliki/2009_04/67e632d51bb8aa7fd64d8050d36016a9.pdf

[139] Entered into force 1 March 2010: http://www.bmu.de/naturschutz_biologische_vielfalt/downloads/doc/44597.php.translation available at http://www.bmu.de/files/english/pdf/application/pdf/bnatschg_en_bf.pdf

would give rise to a risk of prejudice to natural habitats within their natural range or a risk of prejudice to wild native flora and fauna (whether in the place of introduction or elsewhere).[140] However, no offence is committed if an introduction results from a ballast water discharge of water that was necessary to protect the safety of any person or ship and all reasonably practical steps were taken to minimise risks to natural habitats or wild native flora or fauna.

Alert systems and early eradication actions

Several MS have started actions on emergent invasive species either independently or under the umbrella of a regional network (e.g. *Ambrosia artemisiifolia* in Germany and Austria[141]; Raccoon dog in Nordic countries). In 2010 the Irish National Invasive Species Database[142] released Species Alerts for the recent arrival of *Hemimysis anomala*, *Ludwigia grandiflora*, *Harmonia axyridis*, *Trachemys scripta scripta*, *Chelydra serpentina* and *Sus scrofa*. A recording scheme for eight of Ireland's Most Unwanted invasive aquatic plant species has also been launched.

Several MS note that funding constraints can hamper rapid response. For example, if a high-risk species arrives mid to late financial year when budgets are already fully committed, it is very difficult to get any funding to undertake monitoring and eradication / control works.

Cooperative approaches to IAS control and ecological restoration

Cooperation at the transboundary, biogeographic or regional level is increasing. Several bilateral INTERREG-supported programmes are in place e.g. Flanders and southern parts of The Netherlands are developing a cross-border policy to develop IAS management options.[143] At the level of a single biogeographic unit, Invasive Species Ireland (ISI) links the Northern Ireland Environment Agency and the Irish National Parks and Wildlife Service and oversees or coordinates large-scale IAS management programmes in shared ecosystems (see 5.2.4).[144]

Environmental liability and accountability

Criminal penalties have been increased in several MS to reflect EU legislation on environmental criminal offences. There is gradual alignment of penalty levels for IAS-related offences with protected habitat / species offences (e.g. up to 2 years imprisonment plus fines under the Spanish Ley Orgánica 5/2010[145]). Some MS are introducing a legal basis for mandatory control orders for listed IAS which could provide a basis for remediation and cost recovery, although this area is still very under-developed. Examples include the new federal

[140] See Guidance note on the Conservation (Natural Habitats, &c.) (Amendment) Regulations 2007: Introduction of new species from ships (http://www.defra.gov.uk/wildlife-pets/wildlife/protect/documents/habitat-speciesprotectchange.pdf).

[141] Austria has launched a large (400,000 EUR) project for this flagship alien: see: https://forschung.boku.ac.at/fis/suchen.projekt_uebersicht?sprache_in=de&menue_id_in=300&id_in=7256

[142] http://invasivespecies.biodiversityireland.ie

[143] See http://www.inbo.be/content/page.asp?pid=OwnCapital_InternationalProjects

[144] source: NOBANIS Newsletter No.3/2010

[145] http://www.boe.es/boe/dias/2010/06/23/pdfs/BOE-A-2010-9953.pdfPágina 54858

German nature conservation legislation[146] and draft Scottish legislation.[147] Belgium has established a specific liability regime for damage arising from transportation of IAS (see 5.6.2).

IAS strategy development and coordination

All but four MS have adopted or are developing IAS strategies (stand-alone or embedded in national biodiversity strategies and action plans). This represents significant investment at MS level since the adoption of the Bern Convention IAS Strategy and the EC Biodiversity Action Plan in 2006. However, strategies continue to be mainly driven by environment ministries with several MS experiencing difficulty interacting with other sectors e.g. plant health, agriculture, forestry or fisheries.

Examples of cross-sectoral coordination: The UK has gone furthest to provide a single co-ordinating body for IAS policy and management. The Great Britain Non-Native Species Programme Board was set up to deliver strategic consideration of IAS threats across England, Wales and Scotland and comprises senior representatives from these administrations, supported by an independent secretariat. A stakeholder forum is held annually. Stronger links are now proposed with the ISI initiative e.g. through a joint Strategy and Legislation Working Group that would include representatives from all UK and Irish administrations.[148]

The Netherlands created a dedicated IAS team in 2009 responsible for: maintaining a surveillance network (including significant volunteer participation) and alien species databases to include 'level of invasiveness/impact' after 2010; risk assessment; advising the minister on risks and management options; and risk communication. The team targets IAS that impact on biodiversity but also takes account of impacts on human and animal health, the economy and safety. It has 3 FTE with an annual budget of 1 million EUR (including staff costs) and is part of the new Food and Consumer Product Safety Authority.[149]

Examples from EU Overseas Entities: Two Outermost Regions have recently or will soon adopt stand-alone IAS Strategies: La Réunion[150] and the Canary Islands.[151] The South Atlantic Invasive Species Strategy, covering five UK Overseas Territories and developed with EU co-financing[152], has been approved by all concerned administrations and will be published in November 2010.

[146] See footnote 139.

[147] See footnote 118.

[148] Cathy Maguire, pers.comm.

[149] Presentation by Wiebe Lammers, Invasive Alien Species Team, Netherlands Ministry of Agriculture, Nature and Food Quality at NOBANIS Workshop, Waterford, 1-2 June 2010.

[150] *Stratégie de lutte contre les espèces invasives 2010* (http://www.especes-envahissantes-outremer.fr/actualites.php#34).

[151] 2009 draft scheduled for finalisation at workshops in November 2010 and February 2011 (Juan Luis Rodrigues-Luengo, pers.comm): see http://www.gobiernodecanarias.org/noticias/index.jsp?module=1&page=nota.htm&id=134074

[152] See footnote 106.

3.6 Major voluntary initiatives

Voluntary measures to address risks associated with the introduction or use of alien species can play a multiple role: awareness-raising, stakeholder innovation, leverage/dissemination of best practices, supplementing existing regulations or filling a regulatory gap (see 5.6).

Several areas of regime change have ben catalysed by voluntary approaches. The IMO's voluntary standards and Globallast Programme activities led to the adoption of the BWM Convention. At the pan-European level, the ICES Code of Practice on the Introductions and Transfers of Marine Organisms informed development of the EU aquaculture Regulation.

The Council of Europe (Bern Convention), in consultation with stakeholders, has led development of pathway codes for sectors not covered by international or EU regulatory frameworks:

- jointly with EPPO, the Code of Conduct on Horticulture and Invasive Alien Plants (Heywood and Brunel 2009);
- draft European Code of Conduct on Companion Animal and Invasive Alien Species (Davenport and Collins 2009), developed in collaboration with the Ornamental Aquatic Trade Association and pet trade associations;
- draft European Charter on Recreational Fishing and Biodiversity (Brainerd 2010).[153]

Experience suggests that high-level 'soft law' instruments can contribute positively to raising the baseline. For example, the EPPO/Council of Europe horticulture code is non-binding but was formally approved by the respective member countries of these two intergovernmental organisations (including EU-27 MS). Governments are invited to endorse the Code at national level and draft harmonised national codes of conduct.[154]

In the UK, non-binding statutory codes of conduct have been developed for specific IAS (e.g. Japanese knotweed) or pathways (e.g. horticulture). These may be referenced in legal proceedings in the event of environmental damage i.e. a court may take account of any failure to comply with such guidance when reaching its decision.[155] In 2010, relevant administrations launched a joint 'Be Plant Wise' campaign[156] to encourage responsible practices by pond owners, with business and NGO support.

[153] The draft Code and draft Charter will be considered by the Bern Convention Standing Committee in December 2010.

[154] LIFE+ is co-financing a pilot project in Belgium for its implementation (InvHorti - Increase awareness to curb horticultural introductions of invasive plants in Belgium. Total budget 1 million EUR). A Dutch voluntary agreement has been concluded with the horticulture industry for aquatic plants (http://www.onkruid.nl/artikel.lasso?MzY5MjA=; http://ias.biodiversity.be/ias/documents/def_fr.pdf).

[155] Natural Environment and Rural Communities Act 2006 (England and Wales). Similar provisions apply or are under development in Scotland, Northern Ireland and upcoming in the Republic of Ireland.

[156] www.direct.gov.uk/beplantwise and in Scotland at www.scotland.gov.uk/beplantwise

3.7 Overall conclusions on the policy baseline

This section summarises the EU policy baseline (3.7.1), key gaps and constraints to be addressed through the Strategy (3.7.2) and suggested priorities (3.7.3).

3.7.1 Synthesis of coverage under existing EU instruments

The baseline analysis shows that numerous EU policies and instruments tackle aspects of IAS prevention and management and that many MS have updated or extended implementation measures at national and/or subnational level. This confirms the trend observed in earlier studies towards more systematic consideration of IAS environmental impacts.

Table 3-5 summarises the study team's findings on key components of EU instruments. This highlights instrument variability in terms of coverage, decision-making procedures, regulatory interventions and support systems. It also makes it possible to identify matters that are either not covered or are inefficiently covered under existing policy tools and approaches.

Table 3-5 Policy baseline: synthesis of existing coverage under key EU instruments

ACTIVITY	ANIMAL HEALTH INSTRUMENTS	PLANT HEALTH DIRECTIVE	WILDLIFE TRADE REGULATION	AQUACULTURE REGULATION	HABITATS AND BIRDS DIRECTIVES	WATER FRAMEWORK DIRECTIVE	MARINE STRATEGY FRAMEWORK DIRECTIVE	COMMENTS
Scope/coverage								
Taxonomic coverage	Animal pathogens & diseases Wild bird imports (avian flu)	Animals, plants, pathogens to the extent these are 'harmful organisms' (pests of plants or plant products)	'Species'	Aquatic organisms/GMOs	'Species'	Not limited.	'Species'	AQR not applicable to pet-shops, garden centres or aquaria.
Impact coverage	Health of farmed & wild animals	(Current) direct impacts on plants	Ecological (wild native species)	Biodiversity & ecosystem functions	Natural habitats, wild native species	Ecological (inland, transitional, coastal waters)	Ecological impact (marine waters)	
Risk assessment & decision-making procedures								
Decision level	COM	MS initiate proposals: adopted at COM level	COM	MS COM oversight if transboundary	MS	MS	MS	
Listing mechanism	Black (open)	Black (open)	Black (open)	White (closed): exemptions for long-used species	Variable, mainly black	N/A	N/A	
Adaptable to biogeographic/areas?	✓ (zonation)	✓('protected zones')	No	✓(explicit)	Depends on interpretation of 'territory'	✓(river basins)	✓ (marine regions)	WFD/MSFD both based on ecosystem approach.
Formal risk assessment?	✓ EFSA	✓ EFSA	No	✓(non-routine movements)	✓ (impacts to Natura 2000 sites)	N/A	N/A	
Prevention								
Import	✓	✓	✓	(✓)	N/A	N/A	N/A	AQR references EU fish health legislation applicable to imports
Intra-EU movement/ holding	✓	✓ BUT not possible for HO once established or common in part of EU, unless protected zone	✓(not used)	✓('closed' facilities)	N/A	If needed	If needed	Unclear for MS (Single Mkt, holding in captivity)
Introduction to wild	N/A	N/A (movement focus)	N/A	✓('open' facilities)	✓	If needed	If needed	Renewable Energy Directive: biofuel plantation to avoid ecol. impacts
Unint'l introductions: commodities/transport	✓	✓	N/A	✓('non-target organisms')	N/A	If needed	✓(ballast water)	
Unint'l: corridors and natural spread	N/A	Under consideration	N/A	(Implicit)	N/A	If needed	If needed	
Early warning & rapid response								NOBANIS

ACTIVITY	ANIMAL HEALTH INSTRUMENTS	PLANT HEALTH DIRECTIVE	WILDLIFE TRADE REGULATION	AQUACULTURE REGULATION	HABITATS AND BIRDS DIRECTIVES	WATER FRAMEWORK DIRECTIVE	MARINE STRATEGY FRAMEWORK DIRECTIVE	COMMENTS
Surveillance & monitoring	✓(being strengthened)	✓ (under review)	N/A	✓ (2 years min.)	Yes, monitoring is required for Annex species	Big MS variations	✓ (specific descriptor)	WFD and MSFD: EU guidance in progress
Reporting & information exchange	✓	✓(under review)	N/A	✓	Yes, Article 17-reports (6 yrs-intervals)	N/A	N/A	
Contingency planning	✓(being strengthened)	✓ (under review)	N/A	✓ (MS)	N/A	N/A	N/A	
Fast track decisions for emergency action	✓	✓	N/A	✓ (MS)	N/A	If needed	If needed	
EU co-financing?	✓	✓ (under review)	N/A	No	✓(but mechanism not fast)			
Control and management								
Long-term management	No	No	N/A	✓	✓ (N2000/ protected species)	✓ (good ecol. status)	✓ (good env. status)	
Ecological restoration	No	No	N/A	✓ (remediation)	✓ (N2000/ protected species)	✓ (good ecol. status)	✓ (good env. status)	
Cross-cutting instruments & infrastructure support								
Funding (variable scope)	✓ (Solidarity)	✓ (Solidarity)	✓ (Occasional, contract services)	N/A	LIFE+ (management, awareness raising, etc.) Contract services			Opportunities under EAFRD, INTERREG, RTD framework programmes, contract services, etc.
Responsibility & cost recovery	Under development	Under development		✓	Env. Liability			
Capacity building	✓	✓	✓					
Research	✓	✓	✓ (Occasional)	(✓)	RTD (limited)	✓	✓	

3.7.2 Key gaps and constraints to be addressed through the Strategy

Low awareness at political and public levels

This is a problem throughout the EU. It has two aspects: lack of understanding of what IAS are and the activities that lead to their introduction, and lack of information on ways to do things differently and how this could bring social and economic benefits. Some excellent voluntary initiatives are coming on stream, mainly focused on specific target audiences. However, there is no overarching platform to raise awareness of IAS as an EU-wide issue.

Administrative constraints

Stakeholder consultations (e.g. NOBANIS 2010) routinely highlight the sheer number and complexity of policy instruments as a barrier to coordinated implementation. The absence of a streamlined and visible EU policy framework can make it harder for a single government department, particularly the environment department, to take 'ownership' of the IAS issue and leverage more robust measures across sectors.

MS essentially work in absolute separation from the EU in terms of IAS prevention, management and funding decisions - except where binding regimes are in place (aquaculture Regulation) or where the EU co-finances specific control or research projects (e.g. LIFE+, RTD framework programmes). Bottom-up efforts are hampered by data and capacity constraints and patchy funding.

Gaps in species, pathway and impact coverage

As currently applied, taxonomic coverage of EU instruments is weakest for alien animals and for alien plants that do not qualify as diseases or pests, has gaps for captive-bred specimens and is not explicit at the level of sub-species and genotypes. Major pathways for introduction to vulnerable ecosystems, in particular isolated islands, are not addressed. The framework does not address environmental impacts or threats to ecosystem functions in a clear and consistent way.

Inconsistent use of terms and concepts and lack of key data

There are no common definitions and criteria even for basic terms like 'invasive' (i.e. to interpret what constitutes an impact). Difficulties arising from confusion in invasion terminology, and the lack of agreement on concepts, affect the development of reliable indicators and accessibility of existing databases (Genovesi et al. 2011 in press). Lack of data on both invasive and native species means that alien species' invasiveness tends to be underestimated and increases difficulty in detection of impacts (McGeoch et al. 2010).

Lack of a single IAS information portal

This affects all areas of IAS policy, particularly horizon scanning, early warning, rapid response and monitoring. IAS have no equivalent of the maintained EU information, early warning and emergency response systems for animal and plant health.

No common framework for IAS risk assessment

IAS impacts on biodiversity and ecosystem functions are not explicitly addressed in existing EU risk assessment frameworks except for aquaculture. A few MS have made substantial unilateral investments to develop robust systems to assess a wider range of species, often modelled on the EPPO PRA methodology, but in most cases RAs are not well coordinated with other national systems or easily replicable. Risk screening under EFSA and other European bodies could provide a basis to build up a more transparent decision making process.

Fragmented intervention logic and lack of prioritisation

Apart from the animal and plant health regimes, the EU lacks a joined-up approach to managing invasion pathways from pre-border to post-border and down to control and management at appropriate scales. There are no targeted policies to protect the most vulnerable ecosystems and prevent further escalation of IAS damage elsewhere.

Current policies are insufficiently precautionary and do not optimise efforts for prevention and to rectify environmental damage at source, even though these are recognised as the most cost-effective type of IAS intervention. Prevention efforts are mainly focused on the agricultural sector. Available regulatory tools (e.g. Wildlife Trade Regulation) are not used proactively to address known high-risk IAS moving in trade. Rapid response is essentially a matter for national / local discretion.

The EU lacks a coordination framework to promote consistency across key sectors and manage policy trade-offs. For example, EU policies for climate change adaptation include measures for landscape connectivity which could affect the viability of IAS containment strategies.

Legal uncertainty in the context of the Single Market

Except for aquaculture organisms, there has been no clarification of the criteria on which MS may regulate IAS movement / holding without impeding operation of the Single Market. Good practice can be deduced (e.g. from ECJ rulings) and this has reassured some MS who have developed comprehensive trade and movement controls for high-risk species. However, several other MS view the legal uncertainty at EU level as a barrier to national action, leading to foreseeably higher control or damage costs.

Monitoring and management gap

There are no EU instruments to monitor the status and spread of IAS at the EU level or to support a common approach to managing IAS already established in at least part of the EU. There is also no comprehensive inventory of monitoring schemes covering IAS, which represents a major knowledge gap for sound management of IAS threats.

The plant health Directive targets certain HOs for eradication or control if detected but measures are no longer applicable once an HO is established or widespread (except within a pest-free protected zone, if declared). The nature Directives establish implicit management obligations for EU-protected species and natural habitats. Environmental criteria are not systematically considered in sectoral programmes that use potentially damaging products and practices on a large scale (e.g. pesticide application, biocontrol agents, clear cutting of forest for pest control).

The water and marine strategy framework Directives support harmonised frameworks for shared aquatic ecosystems. However, there is no common approach to using alien species data in WFD ecological status classification and MS practices vary widely in this area.

Constraints on funding and positive incentives

Opportunities to leverage existing EU funds for IAS interventions are not optimised and IAS considerations are poorly integrated in EU programmes funded with the major budget lines (Scalera 2008). The EU's main biodiversity funding instrument (LIFE+) has provided significant funds for IAS control and management but is not equipped to fund rapid response as the selection procedure takes about 12 months and inevitably involves some uncertainty as to whether a candidate project will actually be funded. The absence of accessible funding for rapid response actions leads to delay or non-intervention, with higher socio-economic and environmental impacts over time.

IAS may be considered as a form of biological pollution. The polluter pays principle is embedded in the environmental liability Directive and specific instruments such as the MSFD. There is scope to broaden its practical application to IAS (see 5.6.6). Except under the aquaculture Regulation, however, there are few or no 'carrots' or 'sticks' to encourage stakeholders to do things differently and to internalise risks associated with use of potential IAS within decision-making. Some existing EU policies can unintentionally provide economic incentives to introduce potential IAS without prior screening for invasiveness risks (e.g. renewable energy).

3.7.3 Suggested priorities

The overarching need for the Strategy is to raise the profile of IAS as a key biodiversity and economic issue for the European Union and support a consistent and efficient framework of measures for prevention and management.

The following priorities are suggested as a basis for developing actions under the Strategy:

- a strong risk assessment platform, informed by science, research and technical innovation, to support effective action on key IAS and pathways;
- structured pathway management focused on prevention and rapid response, linked to development of an EU / Europe-wide information and early warning system;
- a regionally coherent approach to managing established IAS and ecological restoration, integrated across relevant policies and taking account of climate change as a future driver of IAS spread;
- a clear framework of incentives to promote responsible practices and make best use of available resources.

4 Proposed conceptual framework for the future Strategy

The future Strategy needs to provide direction for the coherent development of IAS policy across the EU and establish a coordinated framework and package of measures to guide action by MS and at EU level.

In addressing this policy area, the EU needs to:

- aim for a high level of environmental protection;
- align activities under the Strategy with the precautionary principle and the principles that preventive action should be taken, environmental damage should as a priority be rectified at source and the polluter should pay;
- consider the principles of subsidiarity, proportionality, cooperation, solidarity and transparency;
- addresses anomalies and weaknesses identified in the current legal framework;
- ensure the integration of IAS concerns into relevant sectoral policies.

This chapter focuses on overarching issues that will influence the Strategy's scope, level of ambition and operational approach. It covers:

- overall objective and strategic goals (4.1);
- a common understanding of key terms (4.2);
- a common framework for risk assessment to strengthen the scientific platform for decision making (4.3); and
- possible criteria for 'IAS of EU concern' (4.4).

4.1 Overall objective and strategic goals

The mandate from EU institutions and the identified priorities for action provide the starting point for proposing an overall objective and strategic goals. Preliminary proposals are outlined below as a basis for discussion. Operational objectives and possible implementation actions are discussed under each component in Chapter 5.

Suggested overall objective

The suggested formulation:

- specifically covers ecosystem services as well as biodiversity throughout the EU;[157]

[157] Consistent with EC 2010b. Options for an EU vision and target for biodiversity beyond 2010 (COM(2010) 4 final p9): '*although conservation must remain a key pillar of EU biodiversity policy, any new target must factor in the role of ecosystems and ecosystem services*'. It should be noted that some experts emphasise that ecosystem services are not always harmed by IAS e.g. an invasive grass or oyster can have soil or beach stabilisation functions.

- addresses both environmental and socio-economic impacts of IAS and their possible future escalation;
- recognises the need to strike the right balance between IAS risk management and freedom of movement and trade.

Suggested overall objective

To protect EU biodiversity and ecosystem services against present and future impacts of invasive alien species and genotypes and minimise damage to our economy, human health and wellbeing, without limiting our use of species that do not threaten such interests.

Four strategic goals are suggested to guide the formulation of Strategy components.

Strategic Goal 1: ***Development of risk-based prioritisation protocols for EU-level action and capacity building***

This cross-cutting Goal supports a strong risk-based foundation for Strategy activities to support transparent and justifiable policy interventions and target available capacity and resources for maximum results consistent with EU policy goals.

Measures to achieve this could include:

- development of a common framework for risk assessment, building on available protocols, best practices and capacity developed for application at species, pathway and/or biogeographic level;
- categorisation of IAS risks according to EU relevance, based on robust scientific criteria that feed into sequenced management components;
- systematic consideration of biodiversity and ecosystem impacts and, where possible, socio-economic impacts linked to cost-benefit analysis;
- identifying strategic research needs and circulating research results to continually improve the knowledge base for identifying, managing and monitoring IAS risks;
- tools / capacity building adapted to the needs of e.g. the Outermost Regions.

Strategic Goal 2: ***A structured framework to manage pathways into, within and from the EU, focused on prevention and rapid response at the appropriate biogeographic scale***

This Goal supports the development of a policy continuum, based on best available scientific information, to minimise unwanted introductions and maximise opportunities to exclude or respond promptly to incursions before species become problematic.

Measures to achieve this could include:

- addressing current gaps in taxonomic and pathway coverage, building on the knowledge base developed under Strategic Goal 1;
- threat and pathway identification and detection programmes;
- species and pathway measures to address risks associated with imports and exports, intra-EU movement and holding and releases into the natural environment;
- development of an EU Information and early warning system to support a structured approach to rapid response and provide opportunities for prompt and effective intervention;
- possible mandatory exclusion, surveillance and crisis preparedness for 'IAS of EU concern', based on risk assessment;
- possible adapted measures for e.g. the Outermost Regions;
- clear allocation of roles and responsibilities at each pathway stage.

Strategic Goal 3: ***Integrated IAS management linked to ecological restoration and ecosystem resilience, taking account of climate change as a future driver of IAS spread***

This Goal supports the development of a regionally coherent approach to controlling or eradicating established invasive alien species within the broader framework of EU policies.

Measures to achieve this could include:

- an integrated approach to post-hoc action for established IAS (monitoring, eradication, mitigation, restoration) based on clear criteria and feasibility of results;
- coordinated action plans at an appropriate biogeographic scale, linked to ecosystem-based approaches supported under existing EU policies;
- possible mandatory control actions for 'IAS of EU concern', based on risk assessment;
- targeted eradication actions for e.g. isolated islands, including the EU Outermost Regions;
- maintaining or restoring resilient ecosystems to improve adaptation capacity to climate change and continued supply of ecosystem services;
- mainstreaming IAS in relevant sector policies and in monitoring strategies linked to landscape connectivity as part of climate change adaptation.

Strategic Goal 4: ***EU-wide awareness, responsibility and incentives adapted to target audiences and key stakeholders, based on a partnership approach***

This cross-cutting Goal supports measures to raise the profile of IAS as an EU-wide biodiversity and economic issue and to provide a framework of incentives to promote

responsible practices and distribute the costs and benefits of IAS interventions more equitably.

Measures to achieve this could include:

- awareness-raising and communication campaigns to increase issue visibility at policy, stakeholder, industry and consumer levels;
- voluntary codes of conduct, best practice and other initiatives to support risk reduction, technical innovation and species substitution;
- market-based instruments, including development or extension of certification schemes to address key IAS pathways;
- progressive development of cost recovery and liability mechanisms, based on the polluter pays principle, linked to prevention and remediation of IAS damage;
- IAS-proofing of EU / MS policies across key sectors with clear allocation of respective responsibilities and ownership of risk;
- efficient leverage of EU funding instruments to support IAS mainstreaming across all key sectors.

4.2 Developing a common understanding of key terms and concepts

A common understanding of key terms and concepts is essential for:

- consistent interpretation and application of the suggested Strategy components;
- efficient and effective information exchange;
- development of indicators to monitor implementation;
- awareness raising and ease of communication on IAS issues.

The starting point for the EU Strategy should be the suite of definitions annexed to the CBD Guiding Principles.[158] However, it is recognised that terms vary by instrument and sector. The EU *acquis* uses a range of terms and definitions to refer to IAS-related concepts: the same is true for legislation in MS. Table 4-1 therefore presents a compilation of key terms, their CBD definitions and equivalent terms derived from existing EU legislation in order to facilitate use of common criteria and promote a uniform approach.

The study team recognises that certain terms require further clarification. The table is followed by a short discussion of key terms, highlighting the main points of variability or possible difficulty in their interpretation and showing how such terms are used for the purposes of this report.

[158] Consistent with the 2008 Communication: see http://www.cbd.int/invasive/terms.shtml .

Table 4-1 Definition of key terms and equivalents in common use

TERM	CBD DEFINITION	COMMON SYNONYMS	EU EQUIVALENCIES
alien species	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.	*exotic species* *non-native species* *non-indigenous species*	Animal and plant health regimes: Do not distinguish diseases/pests by origin, except for specific management regimes. Aquaculture Regulation: **alien species**: (a) 'a species or subspecies of an aquatic organism occurring outside its known natural range and the area of its natural dispersal potential; (b) polyploid organisms (i.e. artificially induced tetraploid organisms (4N)) and fertile artificially hybridised species irrespective of their natural range or dispersal potential' (Art.3.6.a and b). **locally absent species** : 'a species or subspecies of an aquatic organism which is locally absent from a zone within its natural range of distribution for biogeographical reasons' (Art.3.7). Habitats Directive: **any species which is not native to their territory** (Art.22b): not further defined. Birds Directive: **species of bird which do not occur naturally in the wild state in the European territory of the Member States** (Art.11): not further defined. Water Framework Directive: Not defined but CBD definition accepted as starting point. Marine Strategy Framework Directive: **non-indigenous species**: not defined.
invasive alien species	An alien species whose introduction and/or spread threaten biological diversity.	*invasive non-native species* *(environmental) pest* *plant pest* *marine pest* *noxious weed* *injurious wildlife (USA)* *unwanted organism (New Zealand)*	Animal health regime: Various infectious diseases/pathogens: only qualify as IAS to extent non-indigenous. Plant health regime: **harmful organism:** 'pests of plants or of plant products, which belong to the animal or plant kingdoms, or which are viruses, mycoplasmas or other pathogens' (Art.2e): only qualify as IAS to extent non-indigenous. Wildlife Trade Regulation: 'live specimens of species for which it has been established that their introduction into the natural environment of the Community presents an ecological threat to wild species of fauna and flora indigenous to the Community' (Art.4(6)). Aquaculture Regulation: Alien/locally absent species that cause 'adverse effects to biodiversity, and especially to species, habitats and ecosystem functions' (Art.4). **non-target species**: 'any species or subspecies of an aquatic organism likely to be detrimental to the aquatic environment that is moved accidentally together with an aquatic organism that is being introduced or translocated, not including disease-causing organisms which are covered by Directive 2006/88/EC' (Art.3.8). Habitats Directive: '…so as not to prejudice natural habitats within their natural range or the wild native fauna and fora' (Art.22b). Birds Directive: '…does not prejudice the local flora and fauna' (Art.11): individual terms not defined. Water and Marine Strategy Framework Directives: Not defined but referenced in terms of anthropogenic impact/biological disturbance in relevant waters.
introduction	The movement by human agency, indirect or direct, of an alien species outside of its natural range (past or present). Can be either within a country	*entry of a pest resulting in its establishment (IPPC ISPM 5)*	Plant health regime: Terminology used relates to 'entry', 'establishment' and 'spread', in line with IPPC concepts. Note on the CBD definition: • broad enough to include transport of species through manmade infrastructure e.g. canal systems • excludes natural spread/migration e.g. linked to climate change (see discussion below).

	or between countries or areas beyond national jurisdiction.		Aquaculture Regulation: **movement:** 'introduction or translocation': (§3.9)
intentional introduction	The deliberate movement and/or release by humans of an alien species outside its natural range.		Aquaculture Regulation: **introduction**: 'the process by which an alien species is intentionally moved to an environment outside its natural range for use in aquaculture' (Art.3.10). **translocation**: the process by which a locally absent species is intentionally moved within its natural range for its use in aquaculture to an area where it previously did not exist because of bio-geographical reason (Art.3.11) **routine movement: '**the movement of aquatic organisms from a source which has a low risk of transferring non-target species and which, on account of the characteristics of the aquatic organisms and/or the method of aquaculture to be used (e.g. closed systems), does not give rise to adverse ecological effects' (Art.3.16) **non-routine movement:** 'any movement …which does not fulfil the criteria for routine movement' (§3.17) Habitats Directive: '…deliberate introduction into the wild' (Art.22b): individual terms not defined. Birds Directive: '…any introduction…' (Art.11): individual terms not defined.
unintentional introduction	All other introductions which are not intentional.		This definition under the CBD is broad enough to include natural spread/migration linked to climate change (i.e. a contradiction in the definitions).
establishment	The process of an alien species in a new habitat successfully producing viable offspring with the likelihood of continued survival	*establishment and spread*	Plant health regime: Terminology used relates to entry, establishment and spread, in line with IPPC concepts.
Other terms	**Instrument**		
environmental biosecurity	Protection of the environment and social amenity from the negative effects associated with invasive species; including weeds, pests and diseases. It occurs across the entire biosecurity continuum: pre-border preparedness, border protection and post-border management and control (interpretation underpinning Australian biosecurity policy)		
risk assessment	WTO-SPS Agreement 'the evaluation of the likelihood of entry, establishment or spread of a pest or disease within the territory of an importing Member according to the sanitary or phytosanitary measures which might be applied, and of the associated potential biological and economic consequences'.		
pathway	Any means that allows the entry or spread of a pest (IPPC ISPM 5) European Strategy on Invasive Alien Species (Genovesi and Shine 2004): 'Pathway means, as applicable: - the geographic route by which a species moves outside its natural range (past or present); - the corridor of introduction (e.g. road, canal, tunnel); or - the human activitiy that gives rise to an intentional or unintentional introduction'.		
vector	European Strategy on Invasive Alien Species (Genovesi and Shine 2004): 'the physical means or agent (i.e. aeroplane, ship) in or on which a species moves outside its natural range (past or present).		
trade	Wildlife Trade Regulation: 'the introduction into the Community, including introduction from the sea, and the export and re-export there from, as well as the use, movement and transfer of possession within the Community, including within a Member State, of specimens subject to the provisions of this Regulation' (art.2(u)).		
sending MS	Aquaculture Regulation: 'the Member State from the territory of which the alien species is introduced or the locally absent species is translocated' (Art.3.19).		
receiving MS	Aquaculture Regulation: 'the Member State into the territory of which the alien species is introduced or the locally absent species is translocated' (Art.3.18)		
facilities	Aquaculture Regulation: **open aquaculture facility:** 'a facility where aquaculture is conducted in an aquatic medium not separated from the wild aquatic medium by barriers preventing the escape of reared		

	specimens or biological material that might survive and subsequently reproduce' (§3.2) **closed aquaculture facility:** 'a facility where aquaculture is conducted in an aquatic medium, which involves recirculation of water and which is separated from the wild aquatic medium by barriers preventing the escape of reared specimens or biological material that might survive and subsequently reproduce' (Art.3.3)
quarantine	Aquaculture Regulation: **quarantine:** 'a process by which aquatic organisms and any of their associated organisms can be maintained in complete isolation from the surrounding environment' (Art.3.14) **quarantine facility:** 'a facility in which aquatic organisms and any of their associated organisms can be maintained in complete isolation from the surrounding environment' (Art.3.15)
pilot release	Aquaculture Regulation: 'the introduction of alien species or translocation of locally absent species on a limited scale to assess ecological interaction with native species and habitats in order to test the risk assessment assumptions' (Art.3.12).

'Alien species' and interpretation of natural range

The CBD definition is broadly followed by MS although some MS have no single agreed definition. Species should be interpreted to species, sub-species, populations and genotypes.[159] Hybrids may be explicitly referenced.[160]

The critical point from the EU perspective is that 'alien' should be capable of application at the appropriate biogeographic scale (i.e. not limited by political or administrative boundaries). The definition selected will need to explicitly cater for species that are native in part of a country and alien (and potentially invasive) in other terrestrial parts, water catchments or marine areas of that country. This is particularly relevant to larger countries but also to e.g. countries with islands.

Example: The European Eel (*Anguilla anguilla*) is native to freshwaters draining into the Atlantic and Mediterranean Sea but alien to freshwaters draining into the Black Sea. In Austria and Germany, for example, the species is therefore native to some parts of each country but alien in others. In Austria, such species are known for management purposes as 'regional aliens'.

'Native/natural range'[161] (distribution) can be interpreted by reference to jurisdictional, historic[162] or biological parameters, provided they are ecologically relevant. Casual alien species[163] also need to be considered.

A key point for the Strategy is to have a clear line on how to treat the expansion of species ranges within EU territory, including but not necessarily limited to altered distribution linked to climate change. ECOSTAT 2009 noted widespread uncertainty on this, linked to the difficulty in separating (i) climate change from other anthropogenic impacts and (ii) human-mediated introductions from natural expansion in species ranges.

Consistent with the CBD and pathway definitions in Table 4-1, the concept of 'alien' should be explicitly linked to human-mediated movement of a species outside its natural range. Support for this approach at the European level includes:

- guidance developed under the habitats Directive[164] which specifies that 'individuals or feral populations of an animal species introduced deliberately or accidentally by man to locations where they have never occurred naturally, or where they would not have spread to naturally in the foreseeable future, should be considered to be outside their

[159] Consistent with COM(2006)216) and Action Plan (SEC(2006)621).

[160] e.g. the draft Scottish legislation defines the native range of a hybrid animal or plant to cover any locality within the native range of both parents of the animal or plant concerned (see footnote 118).

[161] Term used in the habitats Directive and aquaculture Regulation.

[162] DAISIE uses 1500, representing the discovery of the Americas. In the WFD context, ECOSTAT 2009 indicated that over half of MS do not limit 'alien' by reference to date of introduction. It suggests that a historical date should only be used as a criterion if ecologically relevant e.g. opening of the Suez Canal linking the Mediterranean and Red Seas (1869). Although there is scope to use regionally relevant dates, this could make it harder to harmonise approaches across Europe.

[163] 'Alien species that may flourish and even reproduce occasionally in an area, but which do not form self-sustaining populations, and which rely on repeated introductions for their persistence' (McNeely et al. 2001).

[164] *Guidance document on the strict protection of animal species of Community interest under the Habitats Directive 92/43/EEC*. Prepared by the Environment Directorate-General, European Commission (EC 2007b).

natural range and consequently not covered by the Directive. Vagrant or occasional occurrences would also not be considered as part of the natural range';

- the Bern Convention recommendation that the IAS definition should not be interpreted to include native species naturally extending their range in response to climate change.[165]

The suggested approach for managing IAS dispersal in the EU under the Strategy is discussed in 5.2.4.

'Invasive' alien species

As emphasised in 2.1, only a subset of alien species go on to become problematic. The approach to classifying an alien species as 'invasive' is a crucial issue for development of policy and indicators.

CBD terminology focuses on impact (which does not necessarily imply spread) whereas definitions used by plant ecologists tend to focus on spread potential and use varying combinations of four criteria to assess invasiveness: mode of introduction, ability to reproduce in the wild, spatial dispersion and impact.[166]

For the purposes of the EU Strategy, it is suggested that impact/threat should be the main trigger for policy concern, consistent with the CBD and most national classifications used for management purposes.

Impacts covered by the CBD definition focus on biodiversity and do not explicitly include alien species that negatively affect economies and human health. However, recent CBD decisions including references to ecosystem services are clearly broad enough to imply that the negative effects of IAS on human livelihoods could also be brought into the scope of IAS policies. In practice, there is a clear trend towards more integrated consideration of negative non-biodiversity impacts of IAS.[167] Tackling IAS as both a biodiversity and economic issue is fully consistent with the UN- and EU-backed programme on The Economics of Ecosystems and Biodiversity (TEEB).[168]

Socio-economic impacts are explicitly covered by the definition of risk assessment under the WTO-SPS Agreement. They have been included in the development of an European indicator for IAS (EEA 2009b) and are relevant for WFD assessments (see further 4.3).

Consistent with the suggested approach to 'alien species', the Strategy's interpretation of IAS should explicitly cover species native in part of the EU that, following introduction in

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[165] *Recommendation No. 142 (2009) of the Standing Committee to the Convention on European Wildlife and Habitats interpreting the CBD definition of invasive alien species to take into account climate change*.

[166] e.g. Richardson, D., Pysek, P., Rejmánek M., Barbour M., Panetta F. and West, C. 2000. Naturalization and invasion of alien plants: concepts and definitions in Diversity and Distributions 6: 93-107.

[167] See e.g. *European Strategy on Invasive Alien Species* (Genovesi and Shine 2004); Japan IAS Act 2004; draft Scottish legislation (see footnote 118); the IPPC taking notice of pests' effects on human and animal health (e.g. ISPM 11); and recent decisions adopted by the CBD Conference of the Parties (e.g. collaborative work with economic sectors potentially affected by stricter IAS pathway measures).

[168] See generally www.teebweb.org

another part of the EU, threaten biodiversity, human health or wellbeing and/or socio-economic interests.

'Movement'

This term should be interpreted, unlesss the context indicates otherwise, to cover commercial and non-commercial movement of alien species into and/or within EU territory (see also WTR definition of trade in Table 4-1 above).

'Holding'

This term should be broadly interpreted, unlesss the context indicates otherwise, to cover keeping and possession in containment or captivity, including but not limited to facilities for breeding, propagation, display etc.

'Release into the natural environment'

The term 'introduction' can be applied to a wide range of pathway actions (see Hulme et al. 2008 and Figure 2-1) and be defined in various ways (Table 4-1). It is suggested for the purpose of clarity that the Strategy use the term 'release' to cover intentional introduction and 'natural environment' (i.e. outside settled areas) in place of 'the wild'. This should be clearly interpreted to cover the marine environment up to the limits of national sovereignty / jurisdiction.

4.3 Developing a common framework for IAS risk assessment

In line with Strategic Goal 1, a common framework is needed to evaluate the environmental and socio-economic risks associated with the introduction of specific alien species and/or pathways for introduction. This will contribute to improved consistency and efficiency of MS-level interventions and support the proposed listing of 'IAS of EU concern' (see 4.4).

The role of risk assessment in decision making

Risk assessment (RA) is the technical process of evaluating biological or other scientific and economic evidence to determine the level of invasion risk associated with a species or pathway. It builds on information collected for a target alien species, group of species and/or a specific pathway and may be tailored to an appropriate biogeographic scale (e.g. island, regional sea).

RA provides an objective basis to inform risk management (evaluation and selection of options to reduce the risk of IAS introduction and spread) and risk communication. The selection of response options may be a political and/or administrative responsibility, depending on the type of measure envisaged. The components outlined in chapter 5 cover each stage of the risk management and risk communication sequence.

As a major global trading bloc, the EU needs a solid foundation for RA to inform decisions on measures that may affect imports into the EU and future agreements with trade partners without infringing the rules and disciplines of the WTO agreements. The Committee of the Regions has drawn 'particular attention to the significant risks inherent in opening up the markets to the distribution of potentially invasive natural or genetically modified species (and urged) the inclusion of biodiversity conservation requirements in all international trade agreements' (COR 2009).

The international framework governing sanitary or phytosanitary measures to minimise risks to importing countries, including pest-related damage to the environment[169], is laid down by the WTO-SPS Agreement. National / EU measures based on international standards[170] do not require separate RA. In other situations, the burden of proof is reversed: an RA is needed to justify a potentially trade-restrictive measure:

- in the absence of an international standard; or
- if a higher level of protection (stricter national measure) is sought than that available under an existing standard.[171]

As noted in 3.1, there are major gaps in IAS coverage in existing international standards, reflected in the EU baseline. A more comprehensive EU response to IAS threats thus implies a significant expansion in species/pathway RA capacity as a basis for developing appropriate measures.

Precaution in the context of RA

RA involves the comprehensive evaluation of the likelihood of entry, establishment or spread of an alien species in a given territory, and of the associated potential biological and economic consequences, taking into account possible mitigation options that could prevent spread or impacts.[172]

Experience has shown that due to gaps in information systems and capacity, countries must make IAS decisions using risk assessments based on limited data and information i.e. apply the precautionary principle in the light of scientific uncertainty. The WTO-SPS Agreement does not use the term 'precaution' but provides for 'provisional measures' to be taken pending further assessment. This is reflected in the EU Animal Health Strategy:

'*where a potentially serious threat to health is identified, but there is scientific uncertainty about its likelihood of occurring, proportionate provisional measures should be taken to*

[169] Annex A.1 defines these to include (a) measures to protect animal or plant life or health within the territory of the Member from risks arising from the entry, establishment or spread of pests, diseases, disease-carrying organisms or disease-causing organisms; (c) human life or health within the territory of the Member from risks arising from diseases carried by animals, plants or products thereof, or from the entry, establishment or spread of pests; or (d) to prevent or limit other damage within the territory of the Member from the entry, establishment or spread of pests.

[170] i.e. OIE codes, IPPC ISPMs, EPPO RSPMs.

[171] See Arts.5.1-5.3 and 5.7 of the WTO-SPS Agreement.

[172] Elements to be considered include: RA objectives, history of invasiveness of the taxon elsewhere, analysis of known pathogens or parasites, suitability of environmental conditions for persistence, probability of establishment and spread anywhere in the area of concern, potential impacts, available mitigation options and socio-economic considerations.

ensure a high level of health protection pending further scientific information clarifying the extent of the risk'.[173]

A 2007 ECJ judgment related to animal welfare notes that full RA should be established:

'… on the basis of the most reliable scientific data available and the most recent results of international research. Where it proves impossible to determine with certainty the existence or extent of the risk envisaged because of the insufficiency, inconclusiveness or imprecision of the results of the studies conducted, but the likelihood of real harm to human or animal health or to the environment persists should the risk materialise, the precautionary principle justifies the adoption of restrictive measures.'[174]

In practical terms, an RA should acknowledge uncertainty (and quantify it or categorise it where possible) but this should not delay the selection of an appropriate management response. As additional data and/or capacities become available, a more complete RA should be performed, the results of which can be used to review and amend the initial decision as appropriate.

Support for robust measures to address risks associated with IAS moving in trade is provided by a CBD-backed workshop (Simons and de Poorter 2009), other recent literature (see e.g. Burgiel et al. 2006; Genovesi and Scalera 2007; Shine 2007) and MS practice (see 3.5).

Advantages of regional and biogeographic coordination for RA

A NOBANIS workshop in 2010 identified multiple benefits for EU and neighbouring countries of regional technical coordination on risk assessment, linked to a European information and early warning system. These included:

- standardisation of methodology;
- screening of risks at a biogeographical level;
- better prioritisation of RA, including possible extension to cover related (repacement) species which may have similar impacts;
- exchange of information between countries within the region at risk;
- consistency of RA procedures and results and better sharing of findings;
- RA capacity building for the region;
- shared understanding and acceptance of risks and impacts of IAS;
- more effective and harmonised IAS responses (NOBANIS 2010).

[173] See also *Position Statement on the Application of Precaution in Managing Biosecurity Risks Associated with the Importation of Risk Goods* (http://www.biosecurity.govt.nz/bio-strategy/library/position-precaution.htm).

[174] Case C-219/07: judgment delivered on 19 June 2008 (§36-38): see 3.4 above.

Starting point for developing a common framework for the EU

The Strategy should support approaches aligned with available RA protocols, capacity and research as well as ongoing technical work to harmonise approaches to the invasiveness concept. These include:

- the EPPO streamlined PRA Decision Support Scheme addressing risks to biodiversity which has recently been used for pathway-scale risk analysis for aquatic plants.[175] EPPO is now developing a prioritisation tool and risk-based criteria to identify the most invasive plant species in Europe;[176]
- the EU-supported PRATIQUE project[177] to produce advanced methodology to streamline and speed up PRA production. This is explicitly designed for use in the plant health sector but will include consideration of environmental impacts;
- criteria developed under the aquaculture Regulation;
- IMO risk assessment guidelines for ballast water management requirements;[178]
- guidance on pre-screening protocols for invasive animals, including generic non-binding RA criteria based on national best practices (Simons and de Poorter 2009).

A common EU framework would need to consider the progression of biological invasion from introduction through to establishment and impact and to have well-developed procedures to estimate probabilities in any of these steps and provide statistical confidence limits. Building on the discussion of impact coverage in 4.2, and consistent with the ELD approach to assessing significance of damage (see 3.2.8), this should include:

- environmental risks associated with a target alien species, including as a possible vector for parasites and pathogens that could threaten native wildlife (i.e. both direct and indirect threats);[179]
- criteria to assess risks associated with climate change;[180]
- negative socio-economic impacts, where feasible. This should go beyond narrowly-defined commercial impacts to cover consequences of IAS on public goods and other interests (e.g. resource productivity and/or ecosystem services on which other sectors depend for livelihoods; human health and wellbeing; amenity values that improve quality of life and contribute to future development options, including tourism; and ecosystem resilience, including to the effects of climate change.

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175 http://www.eppo.org/QUARANTINE/plants/pathway_analysis/aquarium_plants.htm

176 The EPPO Panel compared the RA methodology in five MS in the same biogeographic region for analysing potential for establishment, local spread capacity and environmental impact. Only four species had the same listing across the national systems analysed. In contrast, Mean Standard Deviation was significantly reduced under the EPPO priorisation model.

177 https://secure.fera.defra.gov.uk/pratique/index.cfm: Development of more efficient risk analysis techniques for pests and pathogens of phytosanitary concern (PRATIQUE).

178 These cover three RA methods for granting an exemption to ballast water treatment requirements: environmental matching of donor ballast water and recipient region (compares environmental conditions between locations of ballast water uptake and discharge); species' biogeographical RA (compares the overlap of native and non-indigenous species to evaluate environmental similarity and to identify high risk invaders); and species-specific RA (evaluates the distribution and characteristics of identified target species).The three approaches may be used individually or in any combination, recognising that each approach has its limitations.

179 e.g. Chytrid fungus moving through the live amphibian trade; organisms fouling on oyster shells.

180 As noted in 3.2.4, existing criteria under the aquaculture Regulation do not address increased establishment risks for some escaped species linked to warming of the oceans due to climate change.

A WFD workshop (ECOSTAT 2009) noted consensus that lists should include impact categories such as 'high', 'low' or 'unknown' negative impact, to indicate the level of risk associated with each alien species. Allocation of a species to a particular impact category may change over time as research improves our understanding.

Possible scenarios for a common IAS framework for risk assessment

Key questions for the EU context, considered in appropriate sections of the report, include:

- who should carry out RA?
- who should pay for developing RAs?
- when should RA be legally required?
- should RA be subject to formal oversight (e.g. EFSA)?
- how could fast-track RAs be instituted for emergency situations?

The development of an common framework to oversee and coordinate IAS RA activities within the EU could be envisaged at different levels of formality. Four levels are outlined below and presented in Table 4-2. For ease of reference, these are aligned with the COM Options to indicate an increasing gradient of ambition. In practice, the most appropriate framework would depend on the decision taken with regard to the nature of the EU Strategy and possible implementation instruments. Discussion of the most appropriate option may form part of considerations concerning suitable architecture for the future EU / Europe-wide information and early warning system (IEWS) (see 7.4).

COM Option A: Business as usual

MS wishing to take action would continue to develop their own national RA protocols, working in relative isolation. Existing variability of approach would continue (procedures, criteria, range of impacts considered). Current best practices mainly modelled on the EPPO PRA methodology could be extended. Links to existing non-maintained information resources (e.g. DAISIE) could provide useful data.

COM Option B: Maximising uses of existing approaches and voluntary measures

This approach could involve a regionally-driven informal technical expert network. MS wishing to take action – or groups of MS within the same biogeographic region or vulnerable to the same introduction pathways - could be technically supported through an advisory panel, possibly modelled on the EPPO Invasive Plants Panel. This could also conduct RA itself and identify priorities for future pathway RA.

COM Option B+: EU expert panel(s) linked to one or more existing bodies

This formalised approach would build on existing European institutions or agencies at biogeographic or sector level, depending on the taxonomic group or pathway. These could include EFSA (see 3.2.9), EPPO, the European Centre for Disease Control (ECDC) and/or the European Maritime Safety Agency (EMSA).

COM Option C: Formally-constituted dedicated IAS expert panel

As noted (see 3.2.9), the legislation creating the EFSA established expert panels on animal and plant health. The extent to which these could address IAS risks to biodiversity – or whether a dedicated IAS panel might be envisaged under a comprehensive dedicated EU legal framework - will depend in part on ongoing changes under the AHR and PHR regimes. This issue is further addressed in the analysis of Strategy components in chapter 5.

Table 4-2 Possible scenarios for IAS risk assessment aligned with COM Options

COM OPTION	DESCRIPTION	ADVANTAGES	DISADVANTAGES
A	Nationally-driven informal panel All actions conducted at MS level	Best practices	No oversight No consistency
B	Regionally-driven informal expert network MS actions conducted with informal technical support from EPPO-type Panel	More harmonisation Some access to state-of-art methodologies Some contribution to horizon scanning and prioritisation Administratively light	Cannot secure consistency Less robust in e.g. WTO context No formal quality control Capacity constraints mainly remain
B+	EU expert panel linked to existing bodies	Optimised use of existing EU agencies and expertise Potentially strong driver for mainstreaming	No guarantee of overarching approach
C	Formally constituted dedicated EU expert panel	Potentially most robust option in WTO context Strong driver for pathway prioritisation at biogeographic scales Potential improved coverage of socio-economic impacts	Possible duplication / overlap Additional resources Possible delay before establishment

4.4 Possible categorisation of 'IAS of EU concern'

The EU has an overarching interest in preventing the entry and establishment of IAS into the EU and the eradication of already-established invasive species, even though concrete management actions are carried out at local level.

However, prioritisation is essential to (a) to target IAS interventions at the highest risks and (b) allocate limited resources based on feasibility of outcomes. For IAS, this will be of increasing significance following the adoption of the CBD Strategic Plan 2011-2020.[181] This requires Parties, by 2020, to identify and prioritise IAS and pathways and to control or eradicate 'priority species' but does not specify what is meant by this term or how these might be selected.

Each MS is obviously free to determine its own strategic priorities. However, for shared

[181] Tenth meeting of the CBD Conference of the Parties (Nagoya, Japan, 18-29 October 2010).

interests protected through EU policy instruments, the Strategy could establish a framework to ensure a coherent and coordinated response to risks of EU relevance.[182] It is suggested that these could be known as 'IAS of EU concern', even though the threat and required response may be local (e.g. isolated islands), transboundary (e.g. shared river basins) or subregional (e.g. European marine waters).

The identification of 'IAS of EU concern', using criteria-based risk assessment, could give rise to mandatory prevention, monitoring and/or management measures under appropriate implementation instruments. This would require amended or new legislation (i.e. COM Options B+ or C). The use of EU funding instruments to support defined actions – going beyond actions already required under the regulatory baseline - is considered in 5.6.7.

Criteria for regulatory listing would need to be aligned with the EU acquis and developed in consultation with stakeholders. As a starting point, they could include IAS that:

- threaten native species with extinction (as a minimum in the EU Outermost Regions, not covered by the nature Directives);
- threaten the maintenance or restoration of FCS for protected species and natural habitats under the habitats and birds Directives;
- compromise the achievement of good ecological status of WFD waters and /or good environmental status of the marine environment (MSFD);
- impact on green infrastructure (subject to upcoming EU policy instruments: see 5.2.4);
- have significant environmental, economic and/or health impacts affecting other EU sectors and policy objectives (e.g. sustainable forestry), even if only locally;
- are bilaterally/regionally problematic with the potential to expand over a larger area;
- are covered by EU action plans or equivalent measures supported by EU funding.

A biogeographic approach to listing 'IAS of EU concern' for mandatory actions could be envisaged in the context of a future IAS framework. This would require careful consideration as there are not many alien taxa whose range reflects the biogeographic regions in the sense of the habitats Directive.[183] One approach might be to specify that the listing of 'IAS of EU concern' applies 'only for areas in Europe outside their natural range.'

Through NOBANIS, risk mapping for IAS based on EU biogeographic regions is at an early stage of development. However, these data are at an early stage and only deal with NOBANIS countries. Further technical analysis would be needed to assess the feasibility of the biogeographic approach in the regulatory context.

At EU level, this type of approach to prioritisation would only be possible with (a) a robust common framework for IAS risk assessment (see 4.3) and (b) an extremely flexible, regular and rapid decision-making procedure to ensure that the Strategy is responsive to changes in

[182] Term used under the Animal Health Strategy.

[183] Which supports an area-specific approach for protecting or excluding species from protection e.g. the wolf south of the Duero in Spain.

target species / ecosystems (e.g. as a consequence of the emergence of new threats, changes in species distribution and possibly the disappearance of formerly occurring IAS).[184]

Application of the 'IAS of EU concern' concept is further discussed under the suggested Strategy components (see chapter 5).

[184] An overly-rigid approach to listing can impede the allocation of resources to new emerging threats (e.g. in Western Australia the list of target species has become a serious constraint for this reason).

5 Suggested outline for Strategy components

The suggested outline for the Strategy components covers each stage of the risk management sequence aligned with the three-stage hierarchy, followed by cross-cutting components. For each component, the chapter presents:

- a suggested operational objective;
- background information and suggested general approach;
- action(s) to achieve this objective, with supporting analysis aligned with the COM Options. Where appropriate to content, a preliminary indication of the impacts, advantages and disadvantages of different options or sub-options is summarised in a short table;
- where applicable, a recommendation on the preferred option or sub-option i.e. that in the study team's opinion best responds to the Strategy objective and goals.

The chapter concludes with a synthesis table of suggested key Strategy components and recommended options (5.8). Chapter 6 provides evidence of the range of administrative costs associated with these components, following a gradient of ambition. Possible delivery mechanisms are discussed in chapter 7.

5.1 Prevention: intentional introductions

Suggested operational objective: Pathways involving the intentional import, intra-EU movement & holding and / or release of alien species into the natural environment are managed and prioritised, based on risk assessment, to prevent or minimise adverse impacts on EU biodiversity or ecosystem services as a result of:

- the introduction of new IAS into the EU;
- the further spread of already introduced IAS within the EU; and
- the introduction of species with a partially native range in the EU to areas within the EU where they are not native and may become invasive.

5.1.1 Background and general approach

Public and private actors in many sectors carry out activities involving the intentional introduction of alien species and genotypes as commodities (see Table 5-1).

Table 5-1 Main sectors providing pathways/vectors for intentional introduction

PLANTS	ANIMALS
Forestry	Hunting (e.g. game stocking)
Agriculture (including biofuels)	Sport fishing (e.g. fish stocking, live bait)
Horticulture	Fisheries
Intentional planting in the wild	Aquaculture
Landscaping (reclamation, erosion control, tourism)	Animal trade including for pets and aquaria
Biological control	
Scientific research	
Tourism (e.g. personal souvenirs)	

The ecological risks associated with these pathways are not well understood or efficiently managed under existing policies and instruments. Doing things differently will involve a flexible approach based on partnership with relevant stakeholders. The Strategy should support a flexible policy mix for this purpose that combines the strengths of government, industry and civil society.

There are several ways in which prevention systems can designate species / activities to be addressed, based on species or pathway risk assessment (see 4.3 above). These are not mutually exclusive. To provide a one-stop refererence, the main types of listing systems are outlined here and discussed in detail in appropriate sections of this report (see Table 5-2: details of their use in third countries are provided in Annex 2).

Table 5-2 Characteristics of listing tools used in IAS prevention

TYPE OF LIST	CHARACTERISTICS	COMMENT	EXAMPLES
Black	• Finding of harm/threat is precondition for listing • No restrictions on non-listed species	• Main system used to regulate international/domestic trade, transport, movement and holding etc. • Used in many jurisdictions to regulate release to the natural environment • Politically most familiar and acceptable • Proposals usually made by administration (possibly by NGOs too) • Least precautionary approach • Needs quick RA procedures to ensure regular updating of list • Ineffective as strong prevention tool unless legally binding • Can be adapted to risk level through permit conditions	WTR USA (Annex 2.1)
Combination (grey/black)	• Black list underpins regulatory framework • 'Grey' list where risk level is unknown but likely to be high • RA informs decision to allow an introduction or add species to black list	• Explicit precautionary approach for defined group of species • Can target species in same group (genus/family) and hybrid/look alikes • Gives advance warning of species that require additional scrutiny • Makes cost-recovery for RA easier • Needs efficient RA procedure and fixed timeline for decision • Needs regular updating procedure for additions to and transfers between lists	Japan (Annex 2.2)
Combination (white/black)	• White listing can be applied to release in natural	• Explicit precautionary approach for part of coverage	Israel: animals (Annex 2.3)

	environment alongside black or black/grey listing for trade • Possibility of different listing for different taxonomic groups	• Presumption of no release without permit • Possible derogations for some activities, subject to risk-based conditions • Easier to apply cost recovery and liability • May require additional communication efforts but can help change attitudes in long term	Norway: all taxonomic groups unless exceptions (Annex 2.4)
White	• Everything excluded unless listed • Satisfactory RA needed to justify inclusion in lists	• Most precautionary approach • Biggest departure from current EU trade practice (traditional open system) • Needs robust, transparent RA procedures to minimise risk of legal challenge • Strong basis for cost recovery	New Zealand, Australia (Annex 2.5)

The following three sections discuss prevention options related to import, export and border control, intra-EU movement / holding, and release into the natural environment, taking account of these listing tools.

5.1.2 Options and analysis: import, export and border control frameworks

Aim of action:
Prevent the introduction of new IAS into the EU

This section consider species/pathway coverage under each Option and how IAS-related permitting and inspections might be efficiently integrated into existing EU border control infrastructure.

COM Option A: business as usual (see baseline)

The EU would continue to operate an open import system except for a limited blacklist of ecological threat species (WTR), 'harmful organisms' with direct impacts on plant health (PHR) and diseases affecting animal health (AHR).

IAS risks to EU biodiversity and ecosystem services, and to socio-economic interests, human health and wellbeing, would not be systematically addressed (except for imports of organisms for aquaculture under the decentralised procedures in the AQR).

COM Option B: maximising use of existing approaches and voluntary measures

Species/pathway coverage:

Continuing the trend noted in the baseline (3.5), a growing number of MS could adopt regulatory controls with variable procedures, capacity and robustness in terms of RA.

Leverage to reduce IAS risks would mainly depend on existing and new voluntary initiatives that could be developed at different levels to fill some identified gaps and harness innovation.

There are few data available to evaluate the efficacy of industry codes of conduct i.e. industry-funded and managed schemes to engage stakeholders involved in the sector to voluntarily remove certain high-risk species from their stock.

A general OECD study on voluntary agreements in 2003 found limited evidence as to their environmental effectiveness. They were likely to generate significant 'soft effects' for dissemination of information and awareness-raising but seemed to provide little incentive to innovate and could be weakened by a lack of credibility. Their ability to reduce administrative costs remained an open question and transaction costs needed to be evaluated. 'Free-riding' and regulatory capture could seriously reduce their effectiveness (OECD 2003).

In the IAS context, these findings were borne out by a study on voluntary controls on the sale of invasive garden plants (Moss and Walmsley 2005). This examined the conditions needed to ensure a voluntary measure is successful.[185] It highlighted that voluntary measures have positive benefits for education and awareness-raising but concluded that additional mandatory measures were needed to achieve a level playing field in the plant import sector as a whole and to avoid perverse effects.

However, the Strategy could explicitly build on the pan-European 'reference point' codes now coming on stream with intergovernmental and industry federation backing (e.g. for horticulture and for the pet trade: see 3.6). As these codes are recommended for endorsement by MS governments, they can provide a source of best practices which could inform future development of environmental liability regimes with regard to IAS.

COM Option B+: targeted amendment of existing legislation

Species/pathway coverage:

Reflecting current OIE standards, there would be little scope to regulate potentially invasive animals under the animal health regime to the extent that this focuses on diseases and pathogens of animals moving in trade and not on possible risks to the receiving environment. However, the ongoing modernisation of AHR instruments could provide opportunities for the EU to:

- list certain zoonotic diseases affecting wild native animals e.g. the chytrid fungus killing native amphibians in the EU;
- manage the amphibian pathway through which this disease is moved into and out of the EU;
- formally pursue an integrated animal health-native biodiversity agenda through the EU delegation to the OIE;[186] and
- support the coordinated cross-sectoral development of environmental biosecurity plans for this type of threat.[187]

[185] Using OECD and Australian government research and national/regional case studies from Australia and New Zealand.

[186] Part of the inter-agency liaison called for by CBD Parties at COP10, Nagoya 19-30 October 2010: see 3.1).

The current plant health Directive covers plants that are themselves harmful organisms (HOs) or are carriers for HOs. It does not explicitly cover indirect impacts (e.g. wild plant biodiversity and non-agricultural ecosystems) although this environmental coverage is implicit in the existing regime and applied *de facto* in some MS.

The PHR Evaluation (FCEC 2010: see 3.2.2) has recommended clarifying and expanding the regime's scope regarding HOs that affect environmental public goods (i.e. IAS) in order to align it with the IPPC's stronger environmental focus. It identified a gradient of five options and based on stakeholder consultation, recommended a level of expansion considered to represent the best balance of advantages/disadvantages against anticipated impacts (see Table 5-3).

Table 5-3 EU plant health regime: options for clarification/expansion

PHR EVALUATION OPTION	DESCRIPTION	EXAMPLES
1. Status quo (direct impacts on plants and plant products)	May include some IAS, but lack of clarity, systematic approach and harmonised/ consistent definitions on IAS categories.	250 HOs currently listed.
2. Explicit inclusion of IAS plants of economic impact (direct & indirect impact on plant health)	Explicitly include IAS that impact on plant health (crops and forestry). Key IAS for inclusion are invasive plants (weeds) with direct impacts (competition) and indirect impacts (interference/ reservoir of pathogens/ post harvest effects).	*Cyperus esculentus*; *Striga spp*.
3. Explicit inclusion of IAS plants with wider environmental impacts and/or economic impacts on wider range of stakeholders	Impact via plants on plant health and biodiversity extends to habitats and ecosystems. Would include aquatic plants.	*Hydrocotyle ranunculoides, Eichhornia crassipes*[188]
IPPC and EPPO application of current definitions and practice stop here: Stakeholder feedback (MS, competent authorities, industry) suggested that IAS inclusion should also stop here		
4. Inclusion of IAS with important human health impacts	Impact via plants on human health (primary impact is human health; plant health impacts may be secondary or indirect).	*Ambrosia artemisifolia, Thaumatopoea processionea, Toxicodendron radicans*
5. Inclusion of IAS vertebrates with impact on plants	Considered by FCEC team to represent big jump moving in the direction of the DG ENV IAS Strategy and to involve different skills for assessment and management.	Grey squirrel *Sciurus carolinensis* *Wider group of vertebrates including birds, fish, mammals, etc.*

Source: adapted from FCEC 2010

Depending on EU/MS priorities and the selected approach to implementation, the level of expansion recommended under the PHR Evaluation could lead to the addition of around 10-15 invasive plants, including aquatic invasive plants, to the list of HOs (encompassing IAS that are not already present in the Community or are present but not widely established and are being officially controlled). This would already be a major shift for some stakeholders in the plant health sector.

[187] See e.g. the 'key threatening process' designation for this fungus under Australian biodiversity legislation (Annex 2.5).

[188] Recommended for regulation at EPPO level (following PRA) and for trade/movement restrictions and coordinated management under the Bern Convention (*Recommendation No. 133 (2008) of the Standing Committee, adopted on 27 November 2008 on the control of the water hyacinth (Eichhornia crassipes)*. Its spread is currently limited (S. Europe, especially the Iberian peninsula) but there are no EU-level restrictions on its intra-EU movement and holding.

The PHR continues to have a species-based black listing approach. To be consistent with the approaches emerging through the IPPC, and partially reflected in EPPO, the development of a black list of pathways could also be envisaged (i.e. an integrated approach to all commodities that may contain HOs that are moving in that pathway: e.g. soil, non-debarked wood).

The Wildlife Trade Regulation IAS provisions could already be used more proactively to blacklist (i) species that are not yet present in the EU and/or (ii) species have been introduced but for which prevention of further imports can efficiently reduce the risk of establishment and/or further spread (for captive breeding, see 5.1.3). These provisions should clearly apply to non-commercial as well as commercial movements (e.g. IAS moved as personal souvenirs). Additional opportunities for EU-level action would include consulting on exports of potentially invasive species from the EU[189] and participating in initiatives to improve control of internet trade in CITES specimens.[190]

The EU Scientific Review Group (SRG)[191] conducts reviews of species' conservation status to determine whether imports of a species from a particular country should be suspended and advises the Commission accordingly. Proposals for listing may be made by the chair or MS. Annexes are updated after every CITES COP or more frequently if needed. A large number of taxa are regularly added or removed.

The WTR does not establish formal RA criteria to assess listing proposals for potentially invasive species. Criteria could be adopted to expand the 'ecological threat' criterion to explicitly cover biodiversity, socio-economic and human health risks. This would require a new horizon scanning focus and stronger risk assessment platform.

Option C: Comprehensive dedicated legal framework

In the import/export context, any new EU legislation would need to build on the AHR/PHR components of the EU acquis (based on the OIE / IPPC procedures and standards embedded in the international trade framework i.e. WTO-SPS Agreement) and be integrated with existing border permitting systems, infrastructure and capacity (see end of section).

Three different approaches could be envisaged with different legislative, administrative and technical implications. The short summaries below draw on fuller descriptions in Annex 2.

Option C(i): Combined black/grey listing system (example of Japan)

Japan's Invasive Alien Species Act 2004 combines conventional black listing with a holding Uncategorised Alien Species (UAS) category for which RA is required prior to the grant of an import permit. UAS include species/groups of species belonging to the same group (genus

[189] With the Management Authority of a proposed country of import: Resolution 13.10 (Rev. CoP14) on *Trade in alien invasive species*.

[190] See e.g. Decisions 15.57 and 15.58 on *E-commerce of specimens of CITES-listed species*, adopted at CITES COP15 Doha (Qatar), 13-25 March 2010, and background document 15.32.

[191] Consisting of representatives from each MS CITES Scientific Authority, chaired by a Commission representative .

or family) as a black-listed IAS because of the possibility of similar ecological impacts.[192] Import permits may be differentiated by occupational activity, with holding limited to 'special raising facilities'.

UAS listing has the effect of suspending imports: an application to import a UAS triggers an RA process which must be completed within six months. The Act also establishes an advance procedure for would-be exporters to consult with competent authorities in Japan. To facilitate administrative inspections, it requires mandatory labelling of designated species[193] certified by competent authorities of export countries. An official database records the scientific names for imported wildlife and quantities imported in order to facilitate monitoring of imports and build a knowledge base to improve targeted regulation.

Option C(ii): White list organised by groups with possibility of group derogations (Norway)

Norway's Nature Diversity Act 2009 applies a white list approach to all living or viable organisms (i.e. all imports are subject to permit) except for biological control agents (separate permit regime) and terrestrial plants and specified livestock. No permit may be granted to import an organism for release into the environment if there is reason to believe this will have substantial adverse impacts on biodiversity. All species proposed for import must be screened through RA by an independent body and by a Government institute.

To facilitate administration, species evaluated as low risk[194] are included in a regulatory white list. For other species, individual RA are required: importers/applicants meet the costs or otherwise bear the burden of proof that an import will not pose a risk. This is a demanding standard but in practice assessments will be made on the basis of already available information, including from neighbouring states and organisations, based on the precautionary principle which underpins the whole Act.

Although the initial phase of list development is extremely labour-intensive and still needs extra capacity, the Norwegian authorities consider that a white list approach will be easier in the long term for applicants and the administration by shortening the time required for handling applications. Practical implementation is primarily based on electronical communication with applicants and registered importers to reduce administrative costs.

[192] e.g. if the taiwan macaque (*Macaca cyclopis*) is designated as IAS, all species included in genus *Macaca* are designated as UAS as a rule. The expert groups advising on the lists estimate risks by the possibility of establishment in any part of Japan, based on the precautionary approach. Criticism from some participants during the public consultation phase considered that risks should also be estimated by purpose, amount, and frequency of importation, but this was considered impractical under currently limited information.

[193] The LORCA category: *Living Organisms Required to have a Certificate Attached during their importation* in order to facilitate identification.

[194] This assessment draws on a comprehensive knowledge base established over several years and the national technical black list supported by the Ministry of the Environment (Artdatabanken 2007, to be revised in 2011).

Option C(iii): Comprehensive white list system, based on integrated biosecurity framework covering all pathways and commodities

The most ambitious border biosecurity frameworks apply commodity-based import health standards (IHS) or equivalent for all risk goods[195], defined broadly to cover environmental and human health risks. Pathway-based risk analysis is used to assess and manage all risks moving along the same pathway cf. the taxon-specific approach more familiar in Europe. The complexity of IHS development varies according to scope (range of potential hazards), amount of information available, existing international standards and level of public interest. Administration is carried out by integrated quarantine/biosecurity authorities. Biosecurity-based cost recovery procedures have expanded over the last five years.

These approaches are best known from Australia and New Zealand but environmental biosecurity systems are being developed in several other islands, including two EU Overseas Countries and Territories (Nouvelle Calédonie, Polynésie Française). These are supported through formal regional IAS cooperation and harmonisation frameworks (SPREP 2009). In contrast, the EU Outermost Regions - though also isolated and harbouring globally significant biodiversity - are not able to apply different import policies to the rest of the EU, except for e.g. specified harmful organisms listed in dedicated annexes within the PHR.

Discussion of Options

Based on EU and third country experience, an exclusively black list approach (Options A and B) is typically too slow and reactive to address emerging threats effectively and cost-efficiently. To meet the Strategy's goals, a dynamic RA and listing procedure – including procedures for fast-track risk screening - would be needed to ensure rapid addition of new species and regular review of existing lists.

An exclusively white list approach - i.e. **Option C(iii)** - based on pathway analysis for all imported goods (commercial and non-commercial movements) is the most precautionary approach to managing IAS risks at point of entry. Integrated environmental biosecurity systems are most developed in Australia and New Zealand. As 'closed' systems in the international trade context, they require extremely robust RA to withstand challenge within WTO fora.

For the EU, a closed system of this kind would imply radical overhaul (e.g. in the PHR context, pathway risk analysis has been very little used to date). It would probably be politically, commercially and publicly unacceptable as well as unenforceable in the context of a continental land mass. However, a targeted white listing approach (taxa-specific or for certain groups of species) could be envisaged i.e. **Option C(ii)** based on production of white lists following risk assessment or a screening process. This option would prohibit imports except for species assessed as low risk and included in a white list, or species covered by a derogation (import licences on a case by case basis).

[195] Issued under section 22(1), Biosecurity Act 1993. IHS are required for commodities ranging from species, plant and animal produce and derivatives and anything that may harbour organisms that are biosecurity risks, including vehicles. The term 'risk goods' covers anything that it is reasonable to suspect may constitute, harbour or contain an organism that may cause unwanted harm to natural or physical resources or human health in New Zealand.

From an scientific perspective, Option C(ii) would be an effective response as it would support exclusion of non-assessed species that – based on DAISIE data – continue to arrive regularly and may go on to damage EU biodiversity. However, based on experience elsewhere in the world, any move in this direction requires sustained up-front coordination and consultation with key stakeholders, particularly (a) the plant health sector to avoid regime conflict or overlap and (b) affected industries including e.g. pet trade. A phased approach to implementation might be considered, with pre-import risk screening becoming mandatory for newly-imported taxa only after a specified period to allow for industry adjustment.

Option C(ii) would require significant up-front investment in RA expertise, to ensure streamlined procedures to add permitted species to the white list to maximise legal and commercial certainty and minimise conflicts with importers and other stakeholders. The establishment of a dedicated EU IAS expert panel with an RA remit for species / pathways / biogeographic regions not covered by the existing framework would ensure the highest-quality decision support to IAS risk management, consistent with the criteria and standards applied under WTO agreements.

Option C(i) - based on a combined black-grey system incorporating a precautionary component - would build on but significantly extend the familiar WTR approach. It would entail a set of legal provisions to create different regulatory categories adjusted to risk level e.g. bans for the highest-risk species, a holding category pending RA, and occupational activity permits for species intended for use in appropriate holding facilities (see 5.1.3).

Depending on the scale of possible amendments under Option B+, this approach could be implemented through the WTR if formal RA procedures / criteria and a new 'grey' category of list were introduced. To be responsive to emerging threats i.e. adequate horizon scanning function, this would also require significant investment in the RA framework and capacity. The technical structure envisaged to host the EU Information and early warning system (see 7.4) could play a key support role, e.g. advising on IAS for inclusion in or transfer between different lists, taking account of species listing under other EU policy instruments to identify possible inconsistencies and need for adjustment.

Based on this preliminary assessment:

- any expansion of species/pathway listing needs to be closely coordinated with ongoing changes within the EU Plant Health Regime and developed in consultation with affected stakeholder groups;

- for the mainland EU, the most <u>feasible</u> option for introducing a risk-based and precautionary framework focused on 'IAS of EU concern' would be Option C(i);

- however, an Option C(ii) white list approach for certain groups of species would be likely to have longer term benefits in terms of <u>visibility, understandability, refocusing of incentives and reduced IAS impacts</u>, provided that the necessary political support and up-front investment in RA were forthcoming;

- for the Outermost Regions, consistent with the higher level of IAS threat and CBD-backed best practices, a white listing approach should be given strong consideration.[196]

Integration of IAS permitting, inspection and border controls into existing systems

IAS-related measures could be integrated within the existing EU border infrastructure and information networks, based on strengthened coordination between MS veterinary services (see 3.2.1), plant health services (3.2.2) and Customs services (primary responsibility for WTR compliance and enforcement in cooperation with CITES management authorities and police: see 3.2.3).[197] Coordination could be administratively streamlined through the EU's ongoing modernisation of customs techniques and procedures (risk management, post-clearance control/audit, computerised environment).[198]

Maximum use could be made of the electronic information systems in place for animal health (TRACES), plant health (EUROPHYT) and wildlife trade. The EU Action Plan on CITES Enforcement[199] provides a framework to strengthen wildlife trade controls through improved cooperation between MS, supported by the online EU Trade in Wildlife Information Exchange (EU-TWIX) database to help enforcement personnel undertake RA and coordinate joint investigations.

In terms of IAS inspection capacity, reinforced controls should be targeted at hubs (airports, harbours) i.e. the existing network of EU designated entry points. Additional resources would be needed for deployment of appropriate detection aids (scanning equipment, trained sniffer dogs for baggage etc.) and powers for the seizure and destruction of specified consignments. Some targeted capacity support (e.g. identification and taxonomic guides) and training (e.g. national and regional workshops) would also be needed.

In terms of cost recovery, existing EU frameworks already support and could further extend cost recovery for certain costs associated with implementation of border controls and RA e.g. recovered via permit charges on commodities, quarantine fees and so on (see 5.6.5 and, for details of CITES permitting structure and charges, see Annex 3).

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[196] See Recommendations from the IUCN-EU conference on *The EU and its overseas entities: strategies to counter climate change and biodiversity loss* (La Réunion, 7-11 July 2008).

[197] Building on e.g. General Guidance for CITES Entry Points and EU Border Inspection Posts (BIPs) on procedures applying to import/transit to the Community of live animals and their products (DG SANCO document D3/MG D(2009)430493.1 dated 7 August 2009 : http://ec.europa.eu/food/animal/bips/docs/gen_guidance_CITES_EU_BIPS_en.pdf .

[198] See e.g. http://ec.europa.eu/taxation_customs/customs/policy_issues/customs_strategy/index_en.htm ; 8th ASEM Customs DGs/Commissioners meeting 15-16 October 2009, Heraklion, Greece.

[199] Adopted 13 June 2007.

Table 5-4 Summary of options: import, export and border control frameworks

		IMPORT, EXPORT AND BORDER CONTROL FRAMEWORKS: PRELIMINARY ANALYSIS OF EACH OPTION		
Option	**Description**	**Impact (compared to baseline)**	**Advantages**	**Disadvantages**
A	Limited black listing to address ecological impacts	Neutral.	• continuity • recognises limited resources • least restrictive to trade	• continued exponential rise in impacts • major gaps in taxonomic coverage • very limited coverage of environmental impacts • different regime objectives and terminology • no incentive to do things differently
B	Extended black listing under existing WTR. Voluntary cooperation between CITES and veterinary authorities for animal imports. Voluntary measures at MS / regional level	Low	• maximises existing WTR provisions • scope for region-wide voluntary codes for specific pathways • encourage voluntary species substitution and risk avoidance	• continuing gaps and fragmentation • does not overcome weakest link • fragmented coverage of ecological impacts • socio-economic and human health dimension not addressed • no RA procedures under WTR • no coherent framework of incentives
B+	Expansion of: • AHR (limited number of animal pathogens affecting native wildlife) • PHR > harmful organisms with environmental impacts (10-15 invasive plants anticipated) • WTR > expanded application + possible coverage of socio-economic and health impacts	Medium-high, depending on scope. Additional resources for: • prioritisation to support increased production of RA for IAS • increased capacity for cost benefit analysis • increased border control capacity • taxonomic training. Increase in costs to be balanced against potential benefits of prevention/early detection (see 6)	• retains familiarity of open import system • builds on harmonised administrative, information & compliance machinery • EFSA RA panels in place for animal and plant health • existing EU co-financing for plant/animal health inspection infrastructure • WTR shift consistent with CITES policy • stronger driver for cost recovery • potential driver for cross-sectoral and EU/global integrated approach	• fragmentation could continue • different objectives and terminology • risk of low/limited precautionary focus (retains dominant black list approach) • gaps for species not listed under WTR or PHR • no/limited pathway focus • sector change of culture/unfamiliarity (PHR) • resistance for species already in trade • PHR: higher degree of uncertainty for IAS cf. (agricultural) quarantine pests • uncertainty if mainly human health impacts • WTR responsiveness depends on RA & fast-track screening
C (i)	Dedicated biodiversity framework based on black/grey listing (e.g. Japan) • 'IAS of EU concern' approach • differentiated permitting possible for occupational activities holding IAS in 'special raising facilities' designated by regulations	Medium-high, in terms of expanded RA production and efficient listing/review procedures to ensure appropriate coverage of grey list and rapid response to importer applications. May be combined with cost recovery mechanisms. Higher requirements for taxonomic training of border personnel	• familiarity of black list as basis for regulatory framework: dedicated EU-level RA panel can speed up process • stronger ex ante prevention for grey list i.e. pre-border management of risks • potential for group coverage cf. individual species • onus on importer to initiate RA for grey-listed species: can encourage substitution • improved scope for cost recovery	• relationship to AHR/PHR must be specified to avoid overlap • prioritisation needed as potential pool of IAS for RA likely to increase substantially • requires cross-sectoral coordination and strong procedures for stakeholder consultation • requires strong horizon scanning (including improved information system and monitoring of emerging species and trade volumes and patterns) as basis for proportionate measures

		IMPORT, EXPORT AND BORDER CONTROL FRAMEWORKS: PRELIMINARY ANALYSIS OF EACH OPTION		
Option	**Description**	**Impact (compared to baseline)**	**Advantages**	**Disadvantages**
		Increase in costs to be balanced against potential benefits of prevention/early detection (see 6)	• coverage of hybrids, look-alikes etc. can help communicate approach and enhance compliance • could address IAS not covered under envisaged PHR expansion • opportunities for synergy with WTR enforcement, even if new instrument • could be adapted to Outermost Regions	
C (ii)	Dedicated biodiversity framework based on white listing e.g. Norway (comprehensive)	Initially high to expand RA capacity to develop basic white lists Ongoing capacity and procedures to rapidly respond to importer applications for non-listed species High up-front consultation & communication Increase in costs to be balanced against potential benefits of prevention/early detection (see 6)	• clear and easy to understand • relationship to animal and plant health legislation specified to avoid overlap • reduced challenge of prioritisation • reduced problem of reactive listing • potential pool of species for assessment likely to decrease substantially: • scope to apply flexibly to groups of species / different taxonomic groups • suited to organisms not yet in trade • strong basis for cost recovery • could be adapted to Outermost Regions	• primarily species focus • pressure for derogations for commercially important species and species already in trade • possible higher risk of WTO challenge • feasibility in continental context with many shared land borders
C (iii)	Comprehensive environmental biosecurity frameworks based on white listing for all commodity pathways e.g. Australia, New Zealand	High and maintained Increase in costs to be balanced against potential benefits of prevention/early detection (see 6)	• strongest ex ante prevention • very clear and easy to understand • integrated approach to all pathways • integrated coverage of all impacts • easier to apply biosecurity levies • supports continuum to management of IAS as threatening processes	• biggest change to EU practice • closed import system less acceptable at political level • possible higher risk of WTO challenge • impracticable in continental EU context

5.1.3 Options and analysis: intra-EU movement and holding

Aim of action:
Prevent or minimise further spread of already introduced IAS within the EU and the introduction of species with a partially native range in the EU to areas within the EU where they are not native and may become invasive.

Once an MS clears goods at the EU's external border, there are no administrative barriers to prevent free movement and holding of a species alien to the EU unless specific rules apply under e.g. the AHR, PHR or WTR. Within EU territory, species with a partially native range may be freely moved to other areas within the EU where they are not native.

In both cases, a subset of introduced species may go on to become invasive if released, planted or escaped into the natural environment in an area where ecoclimatic conditions are suitable for establishment. The environmental and / or socio-economic impacts can be felt at multiple scales, from potentially catastrophic local impacts in biodiversity hotspots (e.g. isolated islands) to exponentially-rising impacts at the ecosystem level (e.g. forests, freshwater systems) or even across whole biogeographic regions.

In the intra-EU context, two types of movement / holding measures need to be considered:

- post-border measures for species alien to the EU, building on exclusion mechanisms at EU entry points (see 5.1.2 above). These form an integral part of the prevention continuum and complement border and quarantine control efforts and investments;
- measures for regional invasive species i.e. species which are native to or long-established in parts of the EU but alien and potentially invasive in other parts of EU territory (including at localised scales e.g. in the Outermost Regions).

In managing these risks, a balance needs to be struck between the Strategy's overall protection objective and the need to minimise disruption to the Single Market.

COM Option A: business as usual (see baseline)

COM Option B: maximising use of existing approaches and voluntary measures

The AHR and PHR frameworks already cover the movement of regulated diseases and harmful organisms within the EU, coordinated through the TRACES and EUROPHYT electronic information networks. To facilitate operation of the Single Market, harmonised documentation (Common Veterinary Entry Document, 'plant passports') must accompany relevant commodities. IAS are only marginally covered under existing systems.

For the aquaculture pathway, the dedicated AQR framework establishes a continuum of prevention and response measures, with permitting tailored to risk level (routine/non-routine movements; open/closed holding facilities (see 3.2.4 and for key terms, 4.2).

Option B would not end the current uncertainty and inconsistencies surrounding national movement / holding restrictions in the context of the Single Market. This affects both trade and non-trade activities (see 3.5).

The current expansion in voluntary codes and information material (e.g. European codes on horticulture and the pet trade: see 3.6) could be scaled up with support from public bodies, industry federations, user groups and/or NGOs as appropriate. These flexible tools can address key pathways identified in Table 5-1 and also respond to new market demands.

Technical best practices could be further developed for professional stakeholder groups responsible for moving / holding facilities, including industry, research, game and bird breeding facilities etc. For example, the European Botanic Gardens Consortium aims to ensure responsible, proactive policies, apply these in a coherent manner across Europe and, particularly in the context of climate change, identify emerging problem taxa in botanic collections to alert collection holders to their potential risk in terms of invasiveness.[200]

Additional non-legislative measures that could be envisaged under this option relate to labelling, certification and accreditation (5.6.3) and green public procurement (5.6.4).

COM Option B+: targeted amendment of existing legislation

Certain AHR/PHR mechanisms are not easily transferable to the IAS context e.g. plant passports focus on a portable phytosanitary/contaminant risk whereas biological invasiveness depends on the physical context for introduction.

The plant health Directive provides for intra-EU movement/holding controls on listed HOs and/or HO-contaminated commodities, including adapted lists to regulate entry of HO into some Outermost Regions. HOs can be regulated to the extent they are present but not widely distributed (and under official control) but not once they are established or common in part of Europe (see 3.2.2).

In addition, the Directive provides an area-specific zoning mechanism that might be adapted to the IAS context. By way of exception to the principle of free movement, an MS may request activation of a 'protected zone' (PZ) procedure to prevent further spread through movement of HOs from areas where they are established into areas that are currently HO-free, but where favourable ecological conditions exist for the HO to establish. This is subject to strict survey conditions and notifications of findings to the Commission. PZ status must be withdrawn if the HO is found to occur there and either no official measures have been taken for its eradication or such measures have proved for at least two successive years to be ineffective. The PHR Evaluation has broadly recommended the system's maintenance but with improved verification, surveillance targets and stakeholder involvement (FCEC 2010).

[200] http://www.plantnetwork.org/aliens/

Under the IPPC framework, if a plant species is common but only in gardens and begins to be a problem, it is theoretically possible to regulate its movement.[201] However, this is not European practice at the current time.

Under the Wildlife Trade Regulation, intra-EU movement, holding and ancillary activities involving import-banned species could be systematically prohibited/regulated as part of the prevention continuum. This would obviously be easier where done proactively before species have become embedded in trade or other uses. Transitional arrangements would need to be envisaged, covering personal as well as commercial activities (see experience of Israel in using CITES legislation for this purpose: Annex 2).

The CITES COP has called on Parties to develop an ecological risk assessment procedure for use '*prior to the establishment of captive-breeding operations for exotic species … in order to safeguard against any negative effects on local ecosystems and native species*.'[202] Under an expanded WTR or a new instrument, differentiated permitting could be envisaged to address pathway gaps for containment / captivity activities presenting foreseeable risk of environmental damage in the event of escape.[203] Recognised gaps include e.g. game/bird breeding and re-stocking[204], fur farming, the pet / aquaria trade, sport fish and live bait supply, holding of species imported for conservation programmes and/or for zoos or experiments (see Table 5-1). However, regulatory measures should only be considered where justified by risk level, feasibility and lack of a less restrictive alternative. Depending on assessment of risk level, pathway activities listed for regulation could be included in Annex III of the Environmental Liability Directive, thereby stimulating development of risk reduction practices and adapted insurance practices (see 5.6).

The WTR does not have a biogeographic focus or stand-alone provisions to address regional invasiveness i.e. species which are native to or long-established in parts of the EU but alien and potentially invasive in other.

COM Option C: comprehensive dedicated legal framework

Option C could build on or incorporate the changes envisaged under Option B+ and establish a common EU framework and criteria for decentralised decision-making on movement / holding for other IAS. This would give MS legal certainty when developing trade, movement and holding restrictions adjusted to biogeographic, national or local priorities and address current problems of inconsistency and delay.

Restrictions could be specifically tailored to ecologically vulnerable areas e.g. via controls on inter-island and island-mainland introductions and / or between continental European and Outermost Regions.

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[201] Jens Unger, pers.comm.

[202] §23 Resolution Conf. 12.10 (Rev. CoP14) on *Guidelines for a procedure to register and monitor operations that breed Appendix-I animal species for commercial purposes.*

[203] This is the rationale behind several EU instruments (e.g. aquaculture Regulation, GMO legislation, research licencing procedures). In the IAS context, this approach is applied through Japan's system of permits for 'special raising facilities' and Norway's generalised duty of care provisions (see Annex 2).

[204] The hunting pathway was specifically highlighted at CBD COP10. Guidance under the EC Sustainable Hunting Initiative does not address IAS risks associated with this pathway (e.g. stock replenishment): see footnote 76.

Listing could be nuanced to establish different levels of regulation and types of allowable uses for each species. It may also be nuanced according to the biogeographic approach e.g. certain actions prohibited in the Mediterranean but allowed (with some rules) in the boreal zone. All lists must be available for up-dating and revision at a biologically appropriate frequency.

Criteria and elements for consistency would obviously require detailed discussion. They could include (non-exhaustive list):

- mandatory stakeholder consultation;
- mandatory RA, working with neighbouring countries as appropriate and supported by the technical IEWS structure envisaged under the Strategy (see 7.4);
- a formal notification procedure to the Commission with a central register of MS-level measures and circulation of this information to MS competent authorities (CAs);
- an emergency procedure, possibly modelled on the plant health Directive.

Based on this preliminary assessment:

- a two-tier approach is suggested for development under the EU Strategy;

- EU-level actions could build on envisaged expansion of the PHR and WTR;

- MS IAS measures could be developed within a harmonised framework consistent with the Single Market, tailored to biogeographic scale and ecological vulnerability;

- local priority-setting could be promoted in line with the principles of subsidiarity and proportionality.

Table 5-5 Summary of options: intra-EU movement and holding

		INTRA-EU MOVEMENT AND HOLDING: PRELIMINARY ANALYSIS OF EACH OPTION		
COM Option	**Description**	**Impact (compared to baseline)**	**Advantages**	**Disadvantages**
A	Limited black listing to address ecological impacts, with legal uncertainty surrounding scope of permitted measures	Neutral.	• continuity. • recognises limited resources. • some MS independently developing robust procedures for national / local measures • least restrictive	• lack of prevention continuum e.g. captive breeding, intra-EU invasiveness • legal uncertainty for MS • no adaptation to biogeographic regions • no consistency in use (or not) of RA • no oversight of cross-border implications
B	Expanded voluntary approaches	Low-medium	• strong driver for best practices by motivated industries/sectors • flexible and administratively light • can be combined with liability mechanisms at national level	• weakest link • no consistency or enforcement mechanisms • unlevel playing field • continued fragmentation
B+	Based on PHR and WTR expansion	Medium-high depending on scope. • needs prioritisation to support increased RA production to justify listing • increased capacity for cost benefit analysis • extension of procedures for licensing, inspection, contingency planning etc. Increase in costs to be balanced against potential benefits of prevention/early detection (see 6)	• familiar legislative machinery + comitology • potential to use PHR PZ mechanism to prevent further spread of a limited number of HOs • activate untapped potential of WTR	• heavy reliance on WTR – different objectives • limited increase in issue visibliity • risk of low/limited precautionary focus (retains dominant black list approach) • gaps for species not listed under WTR or PHR • no biogeographic approach in WTR • no formal RA procedure or fast-track screening • resistance for species already in trade • unilateral MS approaches likely to continue
C	Two tier approach, building on B+ (as applicable) Centralised listing for 'IAS of EU concern' + Common framework for decentralised listing for IAS of MS national/local concern + Capable of adaptation to needs of Outermost Regions, other islands and vulnerable ecosystems	Medium-high depending on scope. Needs RA prioritisation and related facility controls. Scope for some cost recovery through permit systems / higher compliance costs to stakeholders to the extent that regime coverage extended to new pathways. Increase in costs to be balanced against potential benefits of prevention/early detection (see 6)	• EU-wide consistency for highest risks • enabling framework for occupational permits/liability for IAS pathway gaps • resolves long-standing uncertainty in MS on national measures vs Single Market • common risk-based criteria for MS decision making on IAS of local/regional concern • can be coordinated for biogeographic approach • potential for strong local driver • improved allocation of responsibility/liability for introduction risks	• additional costs due to the introduction of new obligations to act • stakeholder consultation procedures and possible high resistance (though may be reduced if more locally proportionate approaches are seen as acceptable) • oversight & consistency procedure needed for cross-boundary/biogeographic threats

5.1.4 Options and analysis: release into the natural environment

Aim of action:
No alien species is intentionally released into the natural environment unless it is possible to exclude or minimise risk of causing impacts to EU biodiversity and ecosystem services.

COM Option A: business as usual

The baseline analysis of MS practices (3.5) reveals a pattern of complex and fragmented rules in different sectors, applied with different levels of rigour in different countries. Emerging pathways are not systematically screened for IAS risks and there are no deterrents to potentially high risk practices. Reporting on this provision under the habitats Directive (Art.22) is not adequate to provide oversight of current practices or cumulative risks.[205]

COM Option B: maximising use of existing approaches and voluntary measures

Voluntary tools and positive incentives could be promoted to encourage choice of native or harmless species over higher risk IAS. These could include:

- information materials on alternative species and practices for private users / specific target audiences (gardening, hobby aquarists, anglers etc.) (see 5.6.2);
- codes for professional users: The EPPO/CoE Code of Conduct on Horticulture and Invasive Alien Species encourages governments to collaborate with the horticultural industry and managers of public spaces, such as municipalities, in implementing and helping disseminate good practices and codes of conduct to preventing release and proliferation of invasive alien plants. Other types of guidance could relate to e.g. avoiding IAS in selection of game crops;
- market-based instruments such as industry-led accreditation and certification schemes for specific pathways involving alien species release. For example, the Forest Stewardship Council (FSC) certification scheme provides that 'the use of exotic species shall be carefully controlled and actively monitored to avoid adverse ecological impacts'. Participating countries may set more specific standards adjusted to national conditions, which may include planting limits (i.e. prevention or restriction on afforestation with alien species)[206] (see 5.6.3);
- green procurement policies (GPP): These enable governments to target purchasing at reliably sourced native or low-risk alien species for planting in the environment e.g. landscaping, roadside planting etc. Such policies may be linked to native species-related certification and labelling schemes which can provide new incentives (5.6.4).

COM Option B+: targeted amendment of existing legislation

The IAS provisions of the nature Directives (Article 22, habitats Directive; Article 11, birds

[205] In the Article 17 reports (2001-2006) filed in 2008, most MS (16/23 reports examined) did not report on implementation of Art.22.b even though several of them are pursuing active IAS policies or management programmes. The MS that did report on this provision took different approaches (species/habitat-specific impacts cf. general information).

[206] See generally http://www.fsc.org/

Directive) may be interpreted as already providing a legal basis for developing a white list approach. However, they are not sufficiently clear in several respects to meet the suggested Strategy overall objective (see 3.2.5) and also have low visibility in comparison to the species / habitat protection objectives of the directives.

COM Option C: comprehensive dedicated legal framework

The clearest conceptual approach under the Strategy would be to establish a general presumption against the intentional introduction of alien animals and plants into the natural environment without prior risk assessment where this could harm EU biodiversity and ecosystem services (i.e. white list approach).

Implementation instruments could build upon voluntary codes, market-based instruments and green procurement policies as far as practicable (see 5.6.2-5.6.4). As part of a smart policy mix, these would be coupled with a streamlined and transparent permitting and derogation framework for certain occupational activities, organised on a general or case-by-case basis, to avoid disruption to non-damaging routine practices.

This shift of approach could have some important advantages:

- precaution: it would give legal effect to the biological principle that releases of alien organisms into the wild can cause severe but largely unpredictable ecological harm and should be carefully regulated;
- understandability: its simplicity would help maximise levels of understanding and thus implementation by contributing to attitude change and over time, to improved compliance;
- consistency: it would align IAS-related provisions with accepted rules and international guidance for the reintroduction of native species into their former natural range;[207]
- basis for formalised coordination with key sectors providing pathways for release;
- internalisation of costs of environmental damage resulting from a release, consistent with the EU acquis, via clear duties of care, liability and cost recovery mechanisms.[208]

General approach

Scope: the way in which 'natural environment' is defined would obviously influence the scope of this type of approach e.g. voluntary enrichment of flora; planting for nature conservation purposes; roadside plantings and other transport corridors; stocking of fish and game; forestry; certain agricultural activities etc.

[207] Art.22, habitats Directive; IUCN Guidelines for Re-Introductions http://www.lcie.org/Docs/LCIE%20IUCN/IUCN%20Reintroduction%20guidelines.pdf

[208] Measures for this purpose are being increasingly included in modern IAS instruments e.g. in the draft IAS regulations under South Africa's National Environmental Management: Biodiversity Act, draft Scottish and Irish regulations to implement the habitats Directive etc. IAS notification and remediation requirements under Norway's 2009 Nature Diversity Act are explicitly based on the duty of care principple: 'any person that is responsible for releasing living or viable organisms into the environment shall exercise due care, and as far as possible seek to prevent such release having adverse impacts on biological diversity (s.28, Nature Diversity Act 2009 : for full summary, see Annex 2).

Standard of conduct expected: in the event of environmental damage, a liability defence is generally available for activities carried out under permit and/or in accordance with permit conditions (the 'due diligence' defence). This standard may need clarification in the IAS context e.g. through species or pathway technical standards[209] and / or though dedicated legislation.[210] Defined responsibilities should attach to the introducer with regard to prevention, monitoring, contingency planning and remediation in the event of damage (e.g. as under the AQR). In the EU context, it may be appropriate to apply a strict liability approach to pathway activities presenting foreseeable high risks (see discussion of environmental liability in 5.6.6). A transitional procedure could be envisaged to enable affected sectors to adapt and promote a transition to lower-risk alternatives.[211]

Cross-cutting requirements: competent sectoral authorities could be required to have regard to IAS-related environmental risks in the course of their operations e.g. MS legislation could provide for formal consultation procedures and/or joint licensing procedures consistent with the procedures and standards applied under the habitats Directive.

Transboundary impacts: in line with the EU acquis, mandatory notification and prior consultation should be envisaged where an introduction may have transboundary impacts. In the IAS context, this is now enshrined in e.g. German federal legislation. Consideration could be given to possible formal consultation / override powers at Commission level e.g. EU-level corrective scrutiny is provided for under the aquaculture Regulation.

Risk mitigation conditions: introductions, if permitted, should be subject to appropriate conditions at the introducer's expense including e.g. physical containment (e.g. fencing, clearance of buffer zones), biological containment (e.g. reproductive sterilisation) and/or traceability (e.g. micro-chips, record-keeping).

Introductions affecting European waters (WFD and MSFD)

A precautionary approach is particularly important in the aquatic environment, given the difficulty of carrying out an eradication once an organism has established. MS should take appropriate regulatory or other measures to prevent introductions that may significantly impact the good ecological status of WFD waters or the good environmental status of European marine regions. These should be the subject of consultation with neighbouring countries sharing the same river basin and, where feasible, a coordinated approach to risk management should be developed.

The aquaculture Regulation does not cover e.g. release of fish for angling or use of alien live bait. Some MS already provide for strict regulation of this pathway, although enforcement

[209] See 155 above on statutory IAS codes of conduct in the UK.

[210] e.g. under Norway's Nature Diversity Act, if an organism is released in accordance with a permit issued by a public authority, the duty of care is considered to be fulfilled if the conditions of and for the permit are still satisfied. If damage is caused to biodiversity or there is a risk of serious damage to biodiversity as a result of the release or unintentional discharge of alien organisms, the person responsible shall immediately notify the competent authority under this Act, and take measures in accordance with sections 69 and 70, unless such duty to notify the authorities and take measures is prescribed in another statute.

[211] See e.g. new German federal nature conservation legislation (3.5).

presents obvious practical difficulties. Guidance on IAS risks in the context of angling is due for approval under the Bern Convention in December 2010 (see Box 5-1).

Box 5-1 Addressing IAS risks through the draft European Charter on Recreational Fishing and Biodiversity

The draft European Charter on Recreational Fishing and Biodiversity (Brainerd 2010)[212] proposes guidelines to **maintain populations of native species with adaptive gene pools (Principle 4).**

Regulators and managers are encouraged to: prevent the release, spreading and translocation of IAS that can have significant impacts on native fish populations or the environment; engage recreational fishers in IAS removal programmes; facilitate the reestablishment of originally indigenous fish species in accordance with IUCN guidelines and have clear management plans that define their recovery; incorporate genetic considerations into management plans; seek transboundary cooperation to ensure genetic adaptability of populations; and monitor genetic characteristics of species populations of special concern.

Recreational fishers are encouraged to favour re-stocking from appropriate sources but only introduce or reintroduce species in accordance with IUCN guidelines; avoid exclusively selecting for specific phenotypic or behavioural traits of individuals which are not representative of the wild species population and that can consequently be detrimental; and aid scientists and managers in monitoring genetic characteristics of populations.

For the marine environment, the simplest and most understandable approach may be to prohibit any deliberate introduction into the sea of a live animal or plant beyond its natural range where this would give rise to a risk of prejudice to natural habitats or wild native flora and fauna (formula used under UK legislation for introductions from offshore installations or ships: see 3.5).

Outline approach for occupational activities in the wider environment

Consistent with EU policies for ecosystem-based adaptation to climate change, the Strategy could support a precautionary approach to intentional introductions of alien species, notably for large-scale farming and forestry.[213] Pathway risk assessments and management measures could be used to identify and prioritise sector-specific risks that may need a coordinated EU-level approach.

Introductions of alien species for agricultural crops and trees are very often one of the main factors in weakening the stability of agricultural/forestry habitats, providing vectors for new pests and making them still more vulnerable to pest outbreaks. Conversely, use of native planting material can be a very effective way of improving ecosystem resilience both to invasion and to climate change impacts.

The following measures could be given further consideration through the Strategy:

[212] Guideline 2.4.2, see also 153 above. The draft Code notes that stocking and/or translocations of non-native fish species (or in some cases hatchery reared native fish species) can directly and negatively affect native fish stocks and aquatic systems through introduction of exotic competitors, predators, diseases and/or parasites.

[213] Supported under the CBD Guiding Principles, by the Council and under EIA/SEA guidelines set out in the European Bank for Reconstruction and Development's Environmental and Social Policy 2008.

- targeted awareness-raising to promote traditional/native plant species as the best choice both for ecosystem resilience and economic grounds;
- mandatory assessment prior to introduction of new species for plantations and afforestation. This should include cost-benefit analysis to assess scientific evidence for economic arguments based on higher productivity/yields and/or pest resistance and consider a range of possible costs (loss of more valuable commodities, degraded ecosystem services linked to increased water scarcity or fire vulnerability);
- possible application of the PHR risk assessment rules to justify exclusion of IAS from zones in which they are not present but could establish and spread if introduced;
- review of use of EU funding instruments to identify and phase out perverse incentives e.g. subsidies for cultivation of known IAS;
- liability and remediation for environmental damage (see above).

Choice of agricultural, horticultural and forestry planting material and handling of traceability

Several invasive alien plants were first introduced/planted for forestry and whilst providing sector benefits, have become problematic with negative biodiversity impacts.[214] As forests, once planted, stay for decades, the choice of the right planting material and the handling of its traceability (provenance and/or origin) is of utmost importance for forests and their adaptation to changing climatic conditions.

Native species, and where possible native communities of forest species, should generally be selected for land management, reforestation and restoration in forest landscapes to improve biodiversity conservation and associated services. Local genotypes of tree species should be chosen, whenever feasible, when selecting species for planting. In this context, particular care should be taken regarding use of alien genotypes i.e. locally adapted species from other parts of their native range which represent different genetic lineages and may introduce alien genes into the local genome of native populations. This 'genetic pollution' may reduce adaptability of local populations and may have evolutionary implications through natural selection.

Approach to species selection for agricultural biodiversity

The Strategy will need to address increasing demand for introduction of resilient species/varieties such as drought-tolerant crops and fast-growing species for energy generation for afforestation and cultivation (e.g. for biofuels and animal feed).

[214] e.g. *Prunus serotina, Robinia pseudoacacia* (central Europe) *Pseudotsuga menziesii.* Representative examples of invasive plants damaging EU forest ecosystems include *Ailanthus altisimat* (tree of heaven); *Rhododendron ponticum* (UK); *Prunus virginiana* (lowland western Europe); Buddleia spp. and *Impatiens glandulifera* in W. Europe; and invasive insects e.g. *Cameraria ohridella* (horse chestnut leafminer).

The Strategy should provide for an assessment procedure and adequate environmental safeguards[215], based on the precautionary approach, to screen new species and genotypes intended for such purposes. Specific measures should include:

- avoiding the use of species which are already recognised as invasive in the proposed planting region;
- screening for invasiveness of species to be used in agriculture (e.g. as biofuel crops)[216] and for other purposes, carrying out the necessary risk assessments, including risk analysis of cross-pollination with wild relatives and habitat vulnerability;
- monitoring possible spread of new crops into natural habitats and their effects on species and habitats protected under the birds and habitats Directives;
- appropriate mitigation measures to minimise its spread and impact on native biological diversity.[217]

Responsible practices can be leveraged through EU financial instruments. In the context of the Renewable Energy Directive (see 3.3), agricultural raw materials cultivated in the EU and used for biofuel production must respect cross-compliance rules i.e. meet the statutory management requirements of the nature Directives and respect GAEC.[218] In June 2010, the Commission announced sustainability criteria with which biofuels must comply to count towards the 2020 target. These include 'sustainable biofuel certificates': governments, industry and NGOs are encouraged to establish voluntary schemes which must be independently audited to be recognised by the Commission.

Approach to alien species releases for biological control

Biological control is the most important pathway for deliberate release of terrestrial alien arthropods (Rabitsch 2010). It is generally aimed at permanent establishment and control of the target pest organism at below damaging thresholds. Where it involves the intentional introduction of an alien species to combat an earlier introduction, the risks to other species present in the area (in particular, native and commercially important species) must be rigorously assessed. This may involve a balancing act: whereas non-target effects are considered problematic by conservationists, these are often considered acceptable from an economic point of view.

Decision making on possible introduction of alien biological control agents must be based on prior risk assessment and an explicitly precautionary approach. It should follow

[215] e.g. CBD SBSTTA XIV/5 generally calls for ecosystem and species vulnerability assessments when planning and implementing effective climate change mitigation and adaptation activities, including renewable energies.

[216] See e.g. IUCN (2009). Guidelines on Biofuels and Invasive Species. Gland, Switzerland: IUCN. 20pp, available for download at: http://www.iucn.org/what/tpas/energy/resources/publications/?uPubsID=3964 ; Council Conclusions 2009, §20 (general risks to biodiversity) and §38 (specific risks of favouring future IAS expansion); Bern Convention *Recommendation No 141 (2009) of the Standing Committee, adopted on 26 November 2009, on potentially invasive alien plants being used as biofuel crops*. The EPPO Council has also advised NPPOs against using invasive alien plants for biofuel crops. See also CBD Decision IX/2§3 and SBSTTA XIV/10 *Agricultural Biodiversity*, endorsing application of the precautionary approach to the production and use of biofuels.

[217] e.g. a 'biological buffer zone' of non-invasive crops between the crop field and natural vegetation. The width of such a zone needs to be calibrated according to the invasiveness capacity of the biofuel crop.

[218] See Annex II, Regulation (EC) No 73/2009 of 19 January 2009 establishing common rules for direct support schemes for farmers under the CAP and establishing certain support schemes for farmers and in accordance with the minimum requirements for good agricultural and environmental condition defined pursuant to Article 6(1) of that Regulation.

internationally-recognised best practices where available (e.g. IPPC Code of Conduct for the import and release of exotic biological control agents). Standardised scientific methods and protocols to evaluate risks to indigenous non-target species should be used where available.[219]

Example: In the UK, the phased release of a biocontrol agent, psyllid *Aphalara itadori*, to stop the spread of Japanese knotweed was authorised in March 2010 by the UK's Department for Environment, Food and Rural Affairs (Defra) and the Welsh Assembly Government. This followed public consultation and technical advice from the statutory Advisory Committee on Releases to the Environment (ACRE) which specialises in GM issues but also covers biological releases. Initial use will be limited to defined sites subject to strict monitoring.

[219] e.g. EU-supported ERBIC project 1998-2002: *Evaluating Environmental Risks of Biological Control Introductions into Europe.*

Table 5-6 Summary of options: release into the natural environment

		RELEASE INTO THE NATURAL ENVIRONMENT: PRELIMINARY ANALYSIS OF EACH OPTION		
COM Option	**Description**	**Impact (compared to baseline)**	**Advantages**	**Disadvantages**
A	Variable and complex application at MS level	Neutral.	• continuity. • several MS have independently developed robust procedures • maximum flexibility for industry	• no consistency in use • emerging practices not screened for risk • no deterrent to risky activities • no oversight of cross-border implications
B	Strong voluntary measures, can inform application of existing instruments	Low.	• technical innovation • some screening of species/activities to reduce risks • voluntary internalisation of costs • roll out of responsible practices across e.g. government, industry	• continued fragmentation • complex rules varying by sector • low/inconsistent approach to precaution and RA: no horizon scanning for emerging pathway risks, including in context of climate change • no guarantee of lower-risk practices • different approaches in neighbouring jurisdictions • few incentives for species substitution • costs of damage not internalised
B+	Similar to Option B	Low	• possible potential to use PHR PZ mechanism to prevent further spread of a limited number of HOs • possible scope for fuller consideration of climate change risks in PHR context	
C	Overarching white list approach + Coherent framework for occupational activities based on risk assessment	Potentially high for COM and MS, depending on scope of RA prioritisation and regulatory listing and related facility controls. Scope for some cost recovery through permit systems. Scope for some cost recovery through permit systems / higher compliance costs to stakeholders to the extent that more activities may require permits Increase in costs to be balanced against potential benefits of prevention/early detection (see 6)	• presumption of no-release supports high protection for vulnerable ecosystems • supports EU-wide coherence and consistency aligned with robust interpretation of existing habitats Directive approach • coherence / IAS policy proofing • flexibility for MS to design permit systems and conditions appropriate to national or local conditions • compatible with statutory duty of care and/or voluntary codes • clear basis for allocating liability for monitoring and damage remediation • strong incentive for substitution	• major shift in settled practice • requires commitment to cross-sectoral coordination • stakeholder consultation procedures and possible high resistance (though may be reduced if more locally proportionate approaches are seen as acceptable) • oversight & consistency procedure needed for cross-boundary/biogeographic threats

5.2 Prevention: unintentional introductions

Suggested operational objective: Pathway-based measures tailored to risk level minimise unintentional introductions into and within the EU in partnership with relevant stakeholders at all levels.

5.2.1 Background and general approach

The two key pathways for unintentional introductions concern contaminants in transported commodities and stowaways in transport vectors. These pathways are integrally linked to the expanding global and regional movement of goods and people. A wide range of stakeholders are potentially involved in effective biosecurity activities, from international traders and transporters to individuals moving boats or soil from one place to another.

At the EU level, systems to completely prevent unintentional introductions would be impossible to devise and implement. However, constant vigilance and sustained prevention effort can help to minimise IAS introduction effort (propagule pressure).[220] The tools envisaged under the Strategy for this purpose are:

- prioritised pathway risk assessment to identify appropriate response options;
- sequenced risk management measures that define responsibilities and actions at each stage of a transport pathway (point of export, carrier, point of import, quarantine etc.);
- targeted monitoring around entry points and a coordinated framework for early warning and rapid response when prevention fails (see 5.3 below).

The main implementation instruments for this part of the Strategy are located outside the nature conservation sector. The Strategy needs to ensure systematic consideration of environmental risks through these instruments and also guide EU cooperation with relevant organisations to strengthen international pathway standards, consistent with CBD Decisions. It should also provide a framework for cooperative prevention with neighbouring countries and regional seas organisations.[221]

5.2.2 Pathway management for contaminants

A key focus of the EU animal and plant health regimes is controlling unintentional introductions of pests and diseases via imported and exported commodities. Ongoing AHR and PHR modernisation is intended to take account of a broader range of biosecurity risks

[220] This is a measure of the number of individuals of a species released into a region to which they are not native; it includes temporal and spatial patterns of propagule arrival (Simberloff 2009).

[221] As highlighted in e.g. the IMO Ballast Water Management Convention.

linked to globalisation and climate change (see 3.2.1 and 3.2.2).

EU-level risk analysis could support a sequenced approach to pathway management to strengthen the prevention continuum. The AHR and PHR can be used to improve offshore risk management (i.e. at third country level), using the external cooperation instruments to expand training, knowledge sharing and support through regional expertise, and also minimise risks linked to EU exports via export certification procedures.

At point of entry, border control and inspection procedures and capacity are the main tools to detect and prevent entry of IAS as contaminants. Under a risk-based approach, more pre-arrival information on cargo content, origin and destination can facilitate up-front targeting of the highest risk consignments (products/countries) and selection of containers to be examined physically. As noted, improved cooperation and information exchange between Customs, veterinary and phytosanitary services is essential. This needs to be supported by regular training of regulatory personnel to ensure unity of purpose between preclearance international personnel and receiving port personnel .

The EU could support systematic consideration of risks to biodiversity in pathway measures and quarantine procedures for e.g. forestry, honeybee imports (parasite risks); animal feed and soil; consignments of hay, straw, wool; and packaging (consistent with new pathway standards being developed by the IPPC that explicitly consider environmental risks).[222]

Improved levels of biosecurity could specifically target risks to the Outermost Regions and other vulnerable areas e.g. introduction of weeds from the EU mainland, other EU islands or third countries.

Science-based risk standards need to be developed for pathway management to indicate how much risk will be tolerated or where a zero tolerance regime applies. Proactive use could be made of existing baseline instruments for this purpose. For example, EFSA has advised DG SANCO on the scope to use *Directive 2002/32/EC on undesirable substances in animal feed* to prevent contamination of bird seed by *Ambrosia artemisiifolia*.[223]

With regard to funding, charging systems[224] can be adapted to increase cost recovery for environmental biosecurity (e.g. New Zealand: see Annex 2). At the industry level, IAS risks could be more systematically addressed through programmes based on Hazard Analysis & Critical Control Points. HACCP provides an assessment tool to identify risks associated with specific activities and facilities in order to incorporate risk reduction measures into industry operations and practices. For example, the Nursery & Garden Industry Australia has developed a nationwide programme for Biosecure HACCP: entry into the Nursery Industry Accreditation Scheme is subject to audit to ensure that applicable standards are followed (see 5.6.3).

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[222] ISPMs under development in the current work programme cover: *Minimizing pest movement by air containers and aircrafts; Minimizing pest movement by sea containers and conveyances; Guidelines for the movement of used machinery and equipment; Handling and disposal of garbage moved internationally; International movement of grain*.

[223] e.g. contamination of imported sunflower seeds provides the main introduction vector for *Ambrosia artemisiifolia*. Denmark has developed a Code of Conduct with industry to try to stop the import of contaminated seed (source: NOBANIS 3/2010).

[224] Applied to inspections, cargo clearance, passenger clearance, quarantine procedures and import permits: costs met by the importer, transporter or passenger as applicable.

At the non-industry level, the EU could scale up communication and awareness-raising to make target audiences aware of restrictions and responsible practices. Many personal (non-trade) introductions are unintentional e.g. where people smuggle animals back to their home country, thereby introducing pathogens and diseases that could affect native biodiversity.

Examples of risk vectors that can be addressed though codes and information materials include disposal of potentially contaminated soil or aquarium water. Transport operators can play a key role in information dissemination for travellers, including for contaminants.[225]

5.2.3 Pathway management for transport vectors

At international and intra-EU levels, releases of untreated ballast water and hull fouling are by far the most significant vectors of unintentional introductions of alien species. The EU baseline provides a good starting point for developing an integrated approach to shipping vector management based on the ecosystem approach.[226] Inland water routes within the EU (e.g. from the Mediterranean to the EU-Atlantic coast) must receive specific attention (matching climate = high risk for ballast water release).

As a priority, MS that have not already done so should ratify the IMO BWM Convention and take steps to e.g. implement the applicable ballast water discharge standards, designate ballast water exchange areas, establish adequate reception facilities for sediments, monitor coastal waters, apply Port State monitoring and compliance requirements and provide sanctions for non-compliance.[227]

At EU level, and in cooperation with neighbouring marine regions, risk-based decision support tools could be developed in collaboration with the European Maritime Safety Agency (EMSA) to facilitate consistent implementation at MS level and provide economies of scale. These could include:

- a Joint European Ballast Water Sampling Strategy to cover sampling protocol, analysis methodology and interpretation of results;
- risk assessment protocols to exempt low risk ships from the BWM requirements and to impose more stringent measures on high risk vessels;[228]
- BWM strategies for the four Regional Seas Organisations surrounding Europe[229], including identification/planning of ballast water exchange zones and coordinated warnings to mariners on no-uptake zones;

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[225] e.g. following the adoption of clearer EU rules on the introduction of personal consignments of animal products into the EU (Commission Regulation (EC) No 206/2009) with better explanation of the role of the general public in ensuring EU biosecurity, transport operators are now required to inform passengers of applicable rules e.g. through existing means of communication like in-flight magazines (http://ec.europa.eu/food/animal/animalproducts/personal_imports/index_en.htm .

[226] WFD; MSFD; EU Integrated Maritime Policy; EU Maritime Transport Strategy; EMSA mandate.

[227] Article 8 provides that sanctions should be adequate in severity to discourage violations wherever they occur.

[228] i.e. vessels arriving with and intending to discharge ballast water from high risk ballast water donor regions (port and voyage specific).

[229] HELCOM/OSPAR (Atlantic, North and Baltic Seas), REMPEC (Mediterranean) and Black Sea Commission. The MSFD provides a strong basis for cooperation on marine waters at the regional level.

- regional training programmes for Port State personnel and joint R&D programmes;
- communication and information exchange with IMO and regional seas organisations;
- consideration of the social aspects of relevant measures / activities, particularly the health risks associated with gasification of tankers upon arrival in EU ports (EESC 2009).

Measures to target the continuous improvement of shipping environmental performance could be coordinated through the European Environmental Management System for Maritime Transport. This explicitly covers ballast water treatment but should also be used to address alien species transported via hull fouling (pending the adoption of formal IMO standards). In line with Strategic Goal 4, incentives should be introduced to reward efforts towards greener shipping e.g. modulation of registration fees, lower port dues for ships carrying out proper ballast water management, adjustment of other charges.

The MSFD provides a strong basis to develop cost recovery instruments based on the polluter pays principle. A regionally coordinated approach could ensure a level playing field and reduce the adminstrative burden on individual operators, ports or MS. This could include:

- vector fees or a tax based on risk categorisation[230] e.g. reduced port fees for ships equipped with best available technology or treatment systems or conforming to industry best practice standards;
- levies on specific commodities or cargo containers;
- insurance (linked to contingency planning and monitoring);
- revenues recovered from fines imposed on ships or shipping companies if they fail to comply with ballast water discharge requirements (non-compliance penalty fee) (see 5.6.5).

Given the identified gap in the international regulatory framework for hull-fouling vectors and civil aviation, the EU should contribute to ongoing international efforts to develop standards to address these pathway risks. This could involve participation in relevant IMO and ICAO negotiations but also support for development of non-binding best practices.

Voluntary codes could be developed, possibly at the biogeographic scale, to target specific types of transport vector e.g. the Spanish code of practice on recreational boating, covering the transport of boats between different water bodies.

5.2.4 Approach to managing IAS dispersal within the EU

IAS can be dispersed within the EU through two pathways:

- manmade corridors, such as infrastructure linking previously unconnected regions, including canals, roads and railways;

[230] The IMO BWM framework provides incentives for risk reduction. The ship owner pays the costs of risk assessment: if the vessel is exempted on the basis of that risk assessment, s/he does not need to buy a ballast water treatment system.

- natural (ecological) corridors, which may facilitate the (unaided) dispersal of IAS, including in the context of EU policies for 'green infrastructure' to increase resilience to climate change.

These types of pathways are fundamentally different but share key characteristics. Dispersal opportunities are created or increased by projects and policies that pursue important EU objectives: improved inter-regional links for socio-economic development throughout the EU and improved landscape connectivity as part of climate change adaptation. This involves inevitable policy trade-offs – thus reinforcing the need for ex ante prevention at the EU level in line with 5.1 and 5.2 above. In both cases, an integrated approach to spatial and sector planning is needed to minimise risks to the extent feasible.

Manmade corridors

Human-facilitated corridors may facilitate movement of species within a country or province or may have a larger-scale effect by connecting previously isolated biogeographic regions where the likelihood of environmental impacts might be greater. Canals, tunnels and island-mainland bridges are examples of this type of infrastructure.[231]

The EU baseline generally contributes to ensuring that the environmental impacts of infrastructure development and spatial planning at EU level are minimised. More specifically, the transport sector has committed to mitigate its negative environment impacts and take all elements of sustainability into account, including landscape fragmentation due to expanded transport infrastructure.[232] Within this context, activities under the Strategy may support:

- integration of IAS criteria, including dispersal risks, into EU SEA/EIA frameworks for transport infrastructure (roads, railways, ports, inland waterways and canals);
- development of guidance on avoidance/mitigation strategies to be undertaken by developers, coupled with support for research into barrier technologies;
- mainstreaming consideration of climate change-related risks in the management of aquatic infrastructure e.g. droughts and floods are expected to pose growing problems in inland waterways.[233]

In the WFD context, methods for identifying the risk of spread and invasion to previously unaffected water bodies need to be identified for use under Article 5 (river basin characterisation). Rapid responses can be then targeted appropriately under Article 11 (programmes of measures) where water bodies are not in good ecological status due to IAS (ECOSTAT 2009: Conclusion 3). Inter-agency and cross-border cooperation are critical to leverage investments (for an example of large-scale formalised coordination on aquatic IAS, see e.g. US Aquatic Nuisance Species Task Force in Annex 2).

[231] Trans-biogeographical corridors that enable species to move beyond their natural range include canals (e.g. connecting river catchments and seas or connecting different seas e.g. the Suez Canal), tunnels (e.g. linking mountain valleys) and bridges (e.g. between islands and mainlands) (Hulme et al. 2009).

[232] Sustainable Transport COM (EC 2009a).

[233] IPCC (2007), Fourth Assessment Report.

LIFE+ funding can be used to support measures to limit IAS dispersal through aquatic corridors. For example, the CAISIE Project (Control of Aquatic Invasive Species and Restoration of Natural Communities in Ireland) is a large-scale IAS management project, implemented by the Central Fisheries Board from 2010, to control IAS in major parts of the canal system linked to Lough Corrib which is a key dispersal route for IAS.[234]

Natural (ecological) corridors for unaided dispersal

This pathway involves natural expansion in species ranges, not linked to human-mediated introductions. European IAS experts have recommended that the concept of 'alien' should not be interpreted to include native species naturally extending their range in response to climate change, which could lead to them being unnecessarily controlled (see 4.2).

The Commission's upcoming policy to increase landscape connectivity between habitats and Natura 2000 sites and facilitate species migration will increase natural spread opportunities for IAS in the same way as for native species. In accordance with the subsidiarity principle, this will support coordinated development of and investment in 'green infrastructure'[235] in the 83% of EU territory falling outside the Natura 2000 network (COM 2010).

Policy trade-offs are also recognised under the CBD which encourages Parties to reconcile the need for gradual adaptation of biodiversity and ecosystems to climate change and other environmental pressures with the need to mitigate the impacts of existing and potentially new IAS. Activities to increase the adaptive capacity of species and the resilience of ecosystems (including possible *ex situ* measures such as relocation, assisted migration and captive breeding where natural adaptation will be difficult) should take the precautionary approach into account to avoid unintended ecological consequences such as IAS spread.

Prevention efforts for natural dispersal in the wider landscape therefore need to be treated as a management issue within a broader integrated framework. Some highly mobile IAS - such as the corn rootworm – can spread from just one or a few points of introduction across much of Europe. Lack of an integrated approach to the pinewood nematode, for example, enabled the island of Madeira to become infested as well as continental Portugal.

The existing PHR regime only covers spread through movement but its possible extension to cover natural spread has been considered through the PHR Evaluation. This could feasibly increase opportunities to use existing solidarity funds to support measures to halt further spread. Cross-sectoral action plans to address movement and natural spread of 'IAS of EU concern' could also be developed in collaboration with the plant health, agriculture, forestry and other key sectors (see further 5.4.4).

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[234] source: NOBANIS Newsletter No.3/2010.

[235] 'Green infrastructure' is an interconnected network of natural areas, including agricultural land, greenways, wetlands, parks, forest reserves, native plant communities and marine areas that naturally regulate storm flows, temperatures, flood risk and water, air and ecosystem quality.

5.3 Early warning and rapid response

***Suggested operational objective**: Identifying and responding to biological invasions before they take hold is made possible through a coordinated system of measures for surveillance and monitoring, diagnosis, risk assessment, circulation of information, reporting and appropriate responses.*

5.3.1 Background and general approach

Prevention can never be foolproof. If an invasive species has been introduced, early detection and rapid eradication is the most cost-effective way of preventing its establishment and wider spread within EU territory. Countries where a biological invasion first occurs have the key responsibility to prevent spread, both within and beyond national jurisdiction.[236]

An effective framework for early warning and rapid response (EWRR) is a crucial element of any policy aimed at mitigating the impacts of biological invasions (Genovesi et al. 2010; Genovesi and Shine 2004; Wittenberg and Cock, 2001: also G8 Environment Ministers 2010[237] and CBD 2008[238]).

The EU baseline includes well-established EWRR systems in other sectors (e.g. animal and plant health) but these only marginally address disease and pest risks to biodiversity. No equivalent system of defined responsibilities and support funding exists for the nature conservation sector. The lack of a coordinated EWRR system in Europe undermines the ability of regional and national authorities to respond effectively to invasions.

This part of the Strategy proposes a sequenced framework for this purpose, bearing in mind that many key activities are carried out at local level. It also identifies the situations in which a mandatory EU-level response may be required. The establishment of clear roles and responsibilities at each stage is essential (see discussion on liability in e.g. 5.4.3 and 5.6.6).

Effective and transparent information flow underpins every stage of a coordinated EWRR framework of activities (see Figure 5-1). These stages include

- development and maintenance of a knowledge base;
- coordinated surveillance and monitoring to ensure prompt detection of new incursions;

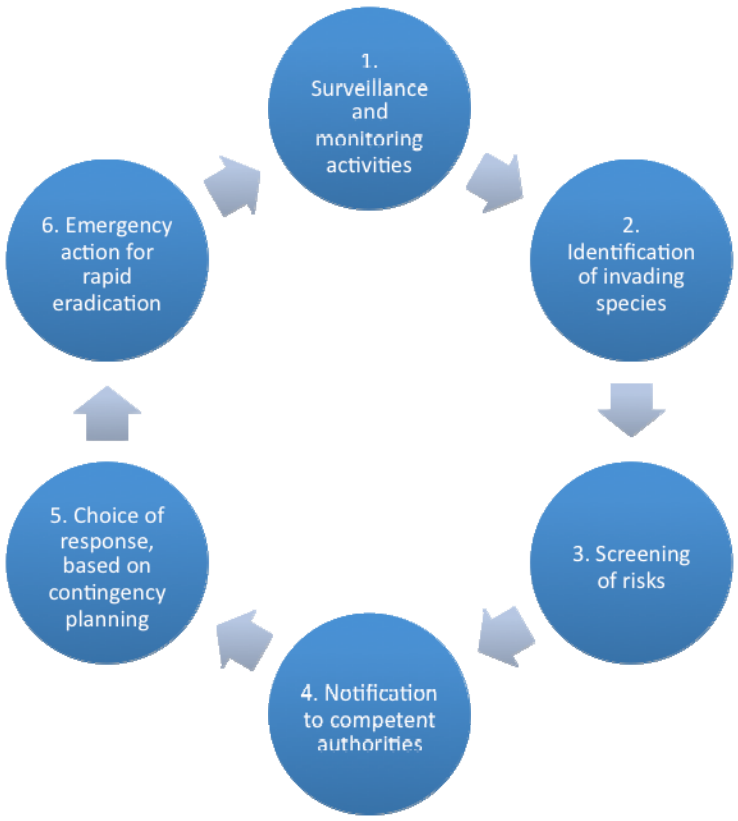
[236] Environment Council meeting on 4 March 2002.

[237] The 'Charter of Syracuse' on biodiversity recalls the 'need to develop effective global early warning and rapid response systems' (22–24 April 2009, Syracuse, Italy).

[238] Decision IX/4 (COP8, 2008) invites Parties 'to collaborate on the development and use of early warning systems, including networks of focal points, and on the development and use of rapid response mechanisms'.

- identification of invading species, based on technical support for rapid diagnosis, and timely and reliable screening procedures of the risk level associated with incursions;
- notification to and follow-up reporting from competent authorities; and
- implementation of appropriate management responses, based on prior contingency planning and emergency action where feasible for early eradication.

Figure 5-1 Structured sequence of activities to support early warning and rapid response



Source; adapted from Genovesi et al. 2010

The following sections outline each component activity, highlighting potential synergies with EWRR systems in the animal and plant health sectors. They compare different approaches to delivery, loosely following the gradient of COM Options for ease of reference (seen as mutually reinforcing). Associated costs of EWRR activities are discussed in chapter 6, drawing on data from existing EWRR systems. Possible architecture and cost implications for the future EU/European information and early warning system to provide technical support for these activities is discussed in 7.4.

5.3.2 *Options and analysis: IAS inventories and horizon scanning*

For both prevention and rapid action, it is essential to identify those alien species that are likely to invade new territories. This requires development and maintenance of inventories of alien species at different scales. The starting point should be the European biogeographical region, followed by the most connected areas to this region (notably the EU Overseas Entities) and then other parts of the globe.

Useful information on IAS, their geo-referenced invasion occurrence and climate conditions in invaded areas is currently stored in different databases. At the European level, the DAISIE inventory developed by the Delivering Alien Invasive Species Inventories for Europe project can allow identification of species not yet present in a country, but recorded in neighbouring countries. It also provides information on the known impacts caused by the species concerned in other areas.

Other European information resources include NOBANIS[239], ALARM[240] and the EPPO reporting service.[241] The data contained in these tools form an exceptional baseline, providing a solid starting point to develop an EWRR framework. It is vital to make these available resources interoperable so that the information can be used in decision support systems (e.g. risk/impact assessments) and for on-the-ground management.

As introduction pathways and vectors are increasingly globalised, it is also essential to coordinate and network the European IAS inventory and database with global information systems providing additional data. Examples of existing accessible online databases include:

- IUCN Invasive Species Specialist Group's Global Invasive Species Database (GISD)[242] and Global Registry on Invasive Species (GRIS);
- the upcoming CABI Invasive Species Compendium;[243]
- the Global Invasive Species Information Network (GISIN);
- the Invasives Information Network of the Inter-American Biodiversity Information Network (IABIN-I3N).

In terms of added value, a regionally interlinked scheme can play a much more systematic role in horizon scanning, particularly if coordinated with animal and plant health information systems. By making it possible to identify IAS moving in trade into and within the EU and also the emergence or substitution of new subspecies or varieties, this type of

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239 European Network on Invasive Species (formerly North European and Baltic Network on Invasive Alien Species) ; www.nobanis.org .

240 Assessing Large scale Risks for biodiversity with tested Methods.

241 http://www.eppo.org/PUBLICATIONS/reporting/reporting_service.htm

242 http://www.issg.org/database/welcome/.

243 http://www.cabi.org/isc/ . This is a global project led by CABI and the US Department of Agriculture, in partnership with EPPO and OIE, to develop and maintain a strategic knowledge tool for use in biodiversity maintenance, sustainable environmental management and IAS management e.g. in response to climate change. Several MS have supported the development of this Compendium financially and have access to its content during the pilot phase. Access to this maintained data will be subject to a fee to cover costs of development and upkeep.

system can facilitate compliance with applicable regulations and reveal where new or amended regulations may be needed.

Formalised horizon scanning procedures are in place under the EU animal health regime. Pending modernisation, the legal framework behind this system is very complex and not based on a single directive. The list of alarm pathogens is codified by OIE, based on the movements of pathogens among countries as reported from MS. At the pan-European level, EFSA is in charge of analysing the risk of introduction of listed pathogens. The EU establishes an alert framework based on this decision support system.

Robust maintained data is a precondition for developing prioritised alert lists for prompt detection and identification of newly arrived alien species and to characterise alien species that are already present in Europe but have not yet become invasive and/or widespread. Comprehensive and regularly updated lists (information on host commodities, source region, seasonal/environmental factors important for their introduction and establishment, and actual/potential pathways for their introduction) should be available to EU and national/local authorities.

This information may be used to identify the highest-risk IAS (including source areas and pathways) for which it may be appropriate to develop an EU alert list for 'IAS of EU concern' (see Table 5-7).

Table 5-7 Summary of options: IAS horizon scanning and inventories

		HORIZON SCANNING AND INVENTORY: PRELIMINARY ANALYSIS OF EACH OPTION		
COM Option	**Description**	**Impact (compared to baseline)**	**Advantages**	**Disadvantages**
A	Only selected sectors (plant health, animal health) covered by existing EU frameworks Comprehensive DAISIE inventory available at European scale. Some MS (GB, Ireland, Sweden, etc.) have full inventories NOBANIS provides a network with number of MS regularly increasing	Negative (many invasive alien species are expected to be introduced and being unnoticed for years before they become a threat)	Existing inventories provide very solid information basis NOBANIS network ensures (limited) updating	Major information gaps are expected to increase with time Adjustment and correction of existing databases not ensured No harmonisation and interlink of different datasets and/or terminology used Risk of rapid outdating of available information Limited horizon scanning for emerging risks Possible waste of invested resources Lack of economic resource is a key limiting factor for effective use of the existing systems
B	As under A + Network of national focal points without a centralised structure	Formal establishment of network required with limited operational funding (see Architecture A in 7.4)	NOBANIS network provides potential basis for enlargement to EU-27 Voluntary basis for networking guarantees high level of commitment and motivation	Fragmented approach may undermine overall efficacy (weakest link in chain may undermine regional action) Maintains problems of harmonisation of different datasets and terminology Lack of funding may affect continuity
B+	Maximised use of AHR/PHR systems for matters covered by their remits + Structured permanent centralised information for IAS, supporting an EU database based on a common and agreed data shell	Establishment of more complex technical structure to ensure comprehensive IAS coverage (see Architecture B under 7.4)	Support common data format and harmonised terminology Maintained links to global and other regional databases Authoritative information provided as basis of effective EWRR	New obligations to act in order to keep the system updated Complexity of required organisational structure may increase in the future Risk of inefficiency / duplication if roles and remits not well defined
C	As under B+ + EU database recognised for regulatory purposes (species listing)	As above (see Architecture B or C under 7.4)	Can support proposals for 'IAS of EU concern' (e.g. EU/European alarm lists, black lists, etc.)	As above

5.3.3 Options and analysis: IAS surveillance and monitoring

Surveillance (aimed at identifying alien species new to a country) and monitoring (of patterns of distribution and spread) are essential to collect the information needed to guarantee rapid response actions.

Effective surveillance programmes need to focus on entry points and other high-risk areas. Prioritisation of surveillance effort requires support tools such as alert lists and appropriate indicators and modalities for collecting and reporting information on new incursions. In general terms, surveillance programmes would be of limited efficacy if carried out on a unilateral local scale.

Monitoring programmes can be adapted to specific areas and species and used proactively to improve understanding of IAS ecology, distribution, patterns of spread and response to management. This information can build capacity to predict the consequences of alien species introductions and provide a stronger scientific basis for decision-making and allocation of resources.

Option A: Business as usual

Outside the animal and plant health sectors, IAS surveillance/monitoring remains mainly voluntary (MS discretion) except for:

- a generic requirement to monitor possible threats to Natura 2000 sites and protected species under the habitats and birds Directives. As far as possible, IAS should be integrated within existing programmes focused on native species to minimise new administrative burdens. Some expansion may be needed to bridge the gaps in taxonomy and environments not covered by such programmes. Public reporting can be encouraged through national species observation gateways;
- explicit monitoring obligations under the aquaculture Regulation;
- monitoring linked to the qualitative descriptors for determining good environmental status under the Marine Strategy Framework Directive, which are now covered by Commission guidance adopted in 2010 (see 4.3). These can support consistency at the biogeographic level (European marine regions).

Current wide variations of MS approach to monitoring ecological status under the water framework Directive would continue, with some best practices supporting transboundary monitoring of shared watercourses (e.g. Republic of Ireland/northern Ireland).

Option B: Voluntary coordination of programmes with technical support

To increase the ability of MS and local governments to detect new incursions of alien species promptly, the number of surveillance activities and monitoring programmes dedicated to alien species could be increased with EU-level support.

Advisory alert lists or reference guides could be developed for dedicated surveillance programmes at EU entry points (i.e. ports, airports), building on existing systems for border control and quarantine where possible to make best use of available capacity and expertise. Additional taxonomic training may be required. Particular efforts could be focused on ecologically vulnerable areas, such as islands, including the Outermost Regions.

Public alert mechanisms, linked to interactive national portals, are already in place in some MS (e.g. Sweden, Ireland) and are being tested in the participating countries of the NOBANIS network. This approach could be rolled out on a broader scale if given backing under the Strategy. Species alerts and information materials could be developed to engage target audiences (e.g. truck drivers, garden centres, pet shops, anglers, tourists).

Data obtained through existing monitoring programmes (e.g. Natura 2000, EU Forest Monitoring System, public health systems for allergenic plants etc.) could be integrated into the IEWS (see 7.4 below) to efficiently circulate information on relevant sightings. Additional monitoring targeted at high-risk pathways and vectors could be coordinated at the EU level in collaboration with appropriate sectors and stakeholders e.g. through the development of an EU Ballast Water Sampling Strategy.

Alien species should be formally included as a monitoring parameter through guidance under the WFD to phase out current disparities of approach. This would require IAS to be systematically addressed within existing monitoring programmes for freshwater systems, consistent with the approach already in place under the MSFD.

Innovative new practices could be used to tailor monitoring effort to the appropriate biogeographic context. Within the NOBANIS network, for example, early warning 'risk maps' based on a biogeographic approach are being developed for selected species, again to ensure a coordinated approach to IAS established in different countries.[244]

At the MS level, general issues that would need to be addressed include:

- who is responsible for surveillance/monitoring? Active programmes are typically undertaken by government, local government, NGOs or research providers but can be extended to promote collaboration with key stakeholders (farmers, foresters, hunters etc.). They may be complemented by passive surveillance/monitoring where members of the public are encouraged to look out for certain things e.g. bird watchers, gardeners, volunteers;
- how are priorities established?
- what to look out for (species/impacts)?
- is additional training needed to support these activities?

[244] Branquart et al. 2010. *Harmonising the invasiveness concept: the EPPO prioritization scheme as a tool to identify the most invasive plant species in Europe.*
http://www.nobanis.org/files/Wed%209.30_Harmonising%20the%20invasiveness%20concept_Etienne%20Branquart.pdf

Option B+: Optimised integration of IAS into animal and plant health surveillance

Optimum use of existing capacity can be made by coordinating surveillance at the EU or European scale.

Under the EU animal health regime, the import of live animal or derived products is prohibited except under bilateral agreements agreed with the exporting country and is subject to inspection by the EU Food and Veterinary Office (FVO), based in Dublin. Early warning is a mandatory element of bilateral agreements and clear duties apply both to exporting and importing countries. An MS is required to notify the FVO electronically when it detects an infection of a listed alarm pathogen in their territory. This information is officially circulated to border offices and regional local health offices. Competent agencies are required to increase their surveillance following standard operation procedures. Decisions on trade regulations are taken by the Standing Committee on the Food Chain and Animal Health (formerly the Standing Veterinary Committee).[245]

Under the EU plant health regime, the EC Food and Veterinary Office manages EUROPHYT, an electronic rapid alert system between the Commission and MS. MS are required to conduct regular and systematic official surveys of the presence of HOs on their territory and to notify new occurrences to the Commission.

At the pan-European level, in the plant health sector, EPPO operates as a central authority, developing reference lists, collecting information on new incursions and notifying member countries of the presence in their territory of new plant pests that need to be managed. To run such a system EPPO has a central headquarters, a permanent secretariat and a small permanent staff dedicated to reporting.

Option C: Mandatory surveillance / monitoring for 'IAS of EU concern'

This option would additionally require surveillance for listed 'IAS of EU concern', similar to the approach already used under the animal and plant health regimes. As envisaged under 4.4, this risk-based list would be developed by the Commission and MS based on technical advice from the future IEWS structure. Legislation would be required to establish relevant requirements, define responsibilities and provide as appropriate for specific tasks (see 5.6).

[245] See http://ec.europa.eu/food/committees/regulatory/scfah/animal_health/summary36_en.pdf for a description of how the Committee's work is organised.

Table 5-8 Summary of options: IAS surveillance and monitoring

SURVEILLANCE AND MONITORING: PRELIMINARY ANALYSIS OF EACH OPTION				
COM Option	**Description**	**Impact (compared to baseline)**	**Advantages**	**Disadvantages**
A	No EU coordinated IAS surveillance and monitoring schemes (except plant health/animal health) Some MS (GB, Ireland) have established coordinated programmes of surveillance and monitoring	Negative (many invasive alien species are expected to be introduced and being unnoticed for years before they become a threat)	Surveillance and monitoring follow national priorities Some proactive initiatives in place	Limited efficacy No harmonised procedures and approaches Lack of knowledge about already-existing monitoring schemes Limited circulation of information and data Risk of major information gaps expected in the future Lack of economic resources is a key limiting factor for filling in the gaps
B	Voluntary coordination of programmes with technical support Extension and improved integration of IAS in surveillance and monitoring	Establishment of network of institutions or single experts (see Architecture A in 7.4)	Advisory Harness and promote consistency across existing efforts Address WFD gap Active stakeholder engagement with EU support for materials Existing LIFE+ funds can support	Limited harmonisation of procedures and approaches Lack or uncertainty of economic resources is a key limiting factor for expanding the network to all MS
B+	Centralised EU system with formally required reporting mechanism for defined information	Advanced technical structure to provide risk-based advice to inform listing decisions (see Architecture B in 7.4)	Delivers coordinated EU/MS surveillance tailored to risk level Standardised and more robust approach Better definition of responsibilities and incentives Sound implementation of database and information system Increased synergies from monitoring schemes established at the regional level	Needs development of criteria and indicators for listing Needs development of criteria to identify gaps and priority monitoring schemes to support
C	As under B+ + Mandatory surveillance/ monitoring for 'IAS of EU concern'	As above + regulatory functions (see Architecture C in 7.4)	Can support proposals for 'IAS of EU concern' (e.g. EU/European alarm lists, black lists, etc.)	Introduction of new obligations to act, outside the existing EWRR obligations Further consideration of financing options necessary

5.3.4 Options and analysis: IAS identification and screening

Correct taxonomic diagnosis of detected species is critical. Depending on its design and mandate, the future EU / Europe-wide information and early warning system could provide essential support to MS and leverage resources efficiently through the development and sharing of the most advanced identification tools (detailed fact sheets, photographs, online European DNA-code systems, web based ID keys and guides).

The IEWS system could be designed to provide access to the most advanced scientific expertise on a wide range of issues, in particular species taxonomy and biology (including for species not yet recorded in Europe). Experts' contact details should be easily available to competent authorities and all actors involved in EWRR at national and regional levels (e.g. customs and quarantine services). A comprehensive and updated expert registry could be developed on the basis of the DAISIE registry.

Once a new incursion has been identified, rapid screening of potential risks should be carried out to provide a sufficient basis to decide on management options. Regional support and precedents for rapid screening could have several advantages (NOBANIS 2010) in speeding up a transparent evaluation process based on documented but rapidly accessible information.

Key criteria for a fast-track risk screening procedure should cover:

- distribution (already widespread, present and invasive, localised, etc);
- species status (invasive in other European contexts, not yet present in Europe and invasive elsewhere, considered as low risk, etc.); and
- biology (native range with similar climatic conditions to Europe, high spread potentiality, etc).

If the detected organism is recorded as invasive elsewhere in Europe or the rest of the globe under comparable ecoclimatic conditions, measures aimed at removing the target species should be undertaken without further investigation.

Under the animal health regime, early warning and diagnosis is the responsibility of each MS which must have a specialised laboratory for all pathogens, including alien pathogens. At centralised EU level, there is a designated reference laboratory for each pathogen that must confirm at least the first occurrence data. The AHR establishes reporting obligations, but these primarily affect the costs (EU co-financing).

The plant health Directive provides a decentralised emergency procedure for non-listed HOs (fast track PRA conducted by an MS for an organism that is not regulated under the Directive). In legal terms, fast-track PRAs are already a sufficient basis for emergency measures aligned with the broader WTO-SPS context (see 4.3).

A comparable approach for 'IAS of EU concern' would require enabling legislation, supported by full RA to justify measures involving possible restriction of trade (see 4.4). As

these are time consuming, steps to prioritise candidate species may precede a full risk assessment. Guidance for this purpose is currently under development by EPPO's *ad hoc* panel on invasive alien plants.[246]

[246] http://www.eppo.org/ABOUT_EPPO/ias_activities.htm

Table 5-9 Summary of options: IAS identification and screening

		IDENTIFICATION AND SCREENING: PRELIMINARY ANALYSIS OF EACH OPTION		
COM Option	**Description**	**Impact (compared to baseline)**	**Advantages**	**Disadvantages**
A	No framework for identification and screening of risks (except plant health/animal health) Some MS (e.g. the Netherlands, GB) have structured frameworks for risk screening	Neutral	Analysis performed at the scale where most actions are undertaken Risk screening at the local scale more reliable and detailed	No harmonisation of procedures, potential differences in assessments Most countries lack a identification and screening system
B	Establishment of a network of institutions or single experts to support taxonomic identification and risk screening	Establishment of network and technical support basis required (see Architecture A in 7.4).	Improved harmonisation Flexible open-ended structure	Limited temporal scope substantially limits efficacy Fragmented approach does not ensure full harmonisation of procedures Weakest link problem remains
B+	Structured system; permanent body with technical expertise in identification and risk screening	Establishment of technical structure required to ensure full range of competences (see Architecture B in 7.4)	Standardised and more robust approach Effective networking activities	Challenge to harmonise different national approaches
C	As under B+ + status adapted to regulatory functions	As under B+ + regulatory functions (see Architecture C in 7.4)	Can provide technical support to regulatory implementation activities e.g. for fast-track screening to justify emergency action	Introduction of new obligations to act, outside the existing EWRR obligations Further consideration of financing options necessary

5.3.5 *Options and analysis: IAS notification and follow-up reporting*

There is a direct link between speed and efficacy of response to incursions. It is therefore crucial for the EWRR framework to ensure rapid and transparent flow of information from the person detecting the new invader to the body responsible for its identification and screening, in order to expedite information on the relative urgency and appropriate response to the competent authorities.

Option A: Business as usual

Under the baseline, only the animal and plant health regimes have a mandatory reporting and notification system for this purpose. The most robust is the Animal Disease Notification System[247] – which is not surprising, given the speed at which infectious agents can be spread through livestock moving in trade. This requires notification of listed diseases by the designated MS competent authority but also functions as a management tool to ensure immediate access to information about outbreaks in the countries connected to the application and thus avoid unnecessary disruption of trade. Data is correlated centrally by the Commission and circulated to all MS through the system.

Option B: MS notification provisions and voluntary reporting through expert network

National legislation can be used proactively to establish formal duties of notification and reporting with regard to IAS, based on a generalised duty of care with regard to IAS. Examples of this upcoming approach include Norway's Nature Diversity Act (see Annex 2) and draft Scottish legislation on IAS (see 3.5).

Non-binding electronic reporting and communication systems covering aspects of IAS are in place for plant health (EPPO Reporting Service) and other networks. In June 2010, the NOBANIS member countries concluded that centralised European reporting and circulation would significantly increase the efficacy of a EWRR framework, and that this would be the most important element for justifying a centralised European system (NOBANIS 2010). The network has since developed a pilot *Email Alert* project to test the efficacy of an early warning system based on voluntary emails. Under this mechanism, the NOBANIS secretariat sends information to the NOBANIS network of government agencies (steering committee), each of which will then be responsible for circulating the information to the relevant national authorities and stakeholders.

Roles and responsibilities need to be clearly defined to ensure that data and information flow smoothly to competent authorities for analysis and follow-up action.

[247] ADNS : Animal Disease Notification System for species listed in Annex I of Council Directive 82/894/EC http://ec.europa.eu/food/animal/diseases/adns/index_en.print.htm

Option B+: Optimised integration of IAS into animal and plant health

Under Option B+ a structured system for reporting on IAS, e.g. in the form of a permanent body with a mandate to report and collect follow-up data on IAS, could be developed under the already existing frameworks for plant and animal health. In practice, this would mean expanding the existing framework for plant and animal health beyond their existing remits to include specific reporting obligations for alien species that have negative impacts on native species and/or broader human wellbeing (see discussion on the existing policy baseline in chapter 3).

Option C: Mandatory notification for 'IAS of EU concern'

In addition to Option B+ and building on the precedent of the animal and plant health regimes, a procedure would be established by legislation for mandatory notification of the highest risk category included in the official list of 'IAS of EU concern'. This would require Commission machinery for correlation and onward circulation of the data.

Table 5-10 Summary of options: IAS notification and follow-up reporting

		NOTIFICATION AND FOLLOW-UP REPORTING: PRELIMINARY ANALYSIS OF EACH OPTION		
COM Option	**Description**	**Impact (compared to baseline)**	**Advantages**	**Disadvantages**
A	No EU reporting and follow-up system (except plant health/animal health) No established reporting system at the MS scale	Neutral	No additional resources required	Lack of circulation of information Lack of reporting systems reduces ability to respond Lack of follow-up mechanisms reduces improvement of responses
B	Reporting and follow-up through a network of institutions or single experts	Establishment of network and of reporting mechanisms required. Identification of roles and responsibilities, national authorities, etc.	Improved circulation of information	No formal EU system substantially limits promptness of reactions No formal EU follow-up system limits possibility to provide support and advices
B+	Structured system; permanent body with mandate to report and collect follow-up	Establishment of centralised structure required with regular contacts with national authorities	Central correlation of data More rapid and effective circulation of crucial information Standardised procedures overcome problems of harmonisation	Introduction of new obligations to report / notify, outside the existing EWRR obligations Further consideration of financing options could be required
C	As under B+ + a procedure for mandatory notification of the highest risk category included in the official list of 'IAS of EU concern'.	As above + establishment of a dedicated procedure for 'IAS of EU concern' with regular contacts with national authorities	As above + comprehensive coverage with specific notification and reporting of 'IAS of EU concern'	Introduction of new obligations to report / notify, outside the existing EWRR obligations Further consideration of financing options could be required

5.3.6 Options and analysis: IAS contingency planning and rapid response actions

Criteria for success in early eradication of newly detected alien species - except those recognised as low risk - include informed personnel, rapid-response capacity, sufficient resources and the legal authority necessary to deal with issues that often arise in eradication projects.

The goal of rapid response should be eradication, where feasible. This aims to completely remove an IAS and is more cost-effective than long-term control. However, it is difficult to predict with any certainty the length of the critical period during which eradication is feasible after species detection (i.e. before the IAS reaches a certain level of population and/or range expansion). Eradication is especially difficult in the marine environment once the species is abundant and widespread (see
Box 5-2).

Box 5-2 Monitoring and incursion management in the marine environment

A monitoring programme to provide early warning of IAS incursions may be undertaken quarterly, focusing on sites in close proximity to potential species introduction activities (e.g. ballast water discharge sites).

An rapid response plan should be prepared. Once a known or suspected IAS has been detected, the first steps are to survey and delineate the infected area, and then to take quarantine actions to remove vectors that could assist its spread. After the incursion has been contained, the response team can focus on reviewing incursion management options, including impact mitigation (ICES WGITMO 2010[248]).

Management options include eradication, containment and control. Eradication in the marine environment should only be attempted if it is ecologically feasible, has the necessary financial and political commitment to be completed and when the target species is confined to a very limited range. In other cases, the species may be controlled by physical, chemical or biological methods. The response plan may be used to address the feasibility or practicality of management options, undertake a cost-benefit analysis, estimate the damage and select management options. Post-control monitoring is necessary to determine the success of an eradication programme for a specific target species with limited distribution and to assess the efficacy of control techniques and the effects on non-target species and the environment (ICES WGITMO 2010).

When new invaders are found, the RA-based exemption of ballast water management measures need to be double checked as the low risk evaluation seems to be/may be wrong. Ballast water management requirements put in place for high risk shipping routes should also be revisited as new invaders indicate that the protection measures implemented may not be sufficient. Further, outbreaks of harmful organisms can be documented which triggers warnings to shippers that no ballast water should be taken onboard under these circumstances (IMO Risk Assessment Guideline G7[249]).

Lastly, a comprehensive port baseline study may be undertaken to document all species (native and introduced) in the area considered. This study will facilitate the risk assessment and will also support an evaluation of the impact of the port facilities should the study be repeated e.g. every two years (IMO Risk Assessment Guideline G7).

[248] Report of the ICES Working Group on Introductions and Transfers of Marine Organisms 2010 Meeting.

[249] IMO Guideline for Risk Assessment under Regulation A-4 of the BWM Convention.

Risk management (i.e. selection of appropriate response) needs to be location- and species-specific. Assessment of feasibility and related risks is important but should not prejudice the chances of success (i.e. a rapid decision process is needed without conditions that undermine the efficacy of the project).

Option A: business as usual

For certain diseases and harmful organisms regulated through the animal and plant health sectors, mandatory contingency planning and rapid response obligations are in place with co-financing via the solidarity funds. Procedures are thus designed to ensure a harmonised response to the most serious threats to EU interests, with the cost burden shared between the EU and MS.

Outside the animal and plant health sectors, preparation, contingency planning and implementation of emergency actions for early eradication are primarily an MS responsibility. As noted in the baseline, lack of up-front technical, personnel and financial capacity regularly compromises MS efforts to take early and efficient actions when an incursion is detected. With certain exceptions (e.g. the Invasive Species Ireland initiative covering the all-island biogeographic unit), there are no structures in places to leverage cooperation between MS.

Option B: scaled-up voluntary MS planning with response coordinated by expert network

At this level, a coordinated EWRR framework can facilitate the diffusion of expertise and relevant technical protocols to reduce delay, duplication of effort and inconsistency (e.g. following indication of IAS action plans).

Each MS needs to provide for emergency control authority to take the necessary steps to address IAS. This requires:

- clear allocation of roles and responsibilities between competent authorities (environment, agriculture and health and at local and protected area level);
- defined legal powers to remove IAS and alien species with a high potential to become invasive, including prior authorisation to use regulated control agents;
- emergency orders where urgent action is needed e.g. to co-opt services of other agencies, to activate powers of access to land/water for officials or their agents (see new draft Scottish legislation and also 5.4.2).

These powers can be underpinned by legislation. At EU level, the aquaculture Regulation provides an example of a continuum of prevention, pilot release, monitoring, contingency and response obligations linked to intentional introductions for aquaculture (see 3.2.4).

At MS level, contingency planning can be generic and/or targeted at specific threats. In both cases, it will require response teams to be provided with adequate funds, materials and equipment with staff trained to use the control methods selected.

A more ambitious technical network could provide regional economies of scale through advance preparation of technical protocols based on prediction tools and by developing generic contingency plans for groups of species with similar characteristics that could be adapted to MS conditions.

Option B could also involve the development of subregional or catchment-scale contingency plans tailored to biogeographic scale. Emergency action networks could be created to leverage available expertise and capacity, particularly for smaller MS, local governments and isolated regions that do not have the necessary field capability.

At this level, it would be possible to identify possible conflicts of interest e.g. the possible impacts of some toxic products on protected species or sites. This assessment could be circulated to concerned sectors and be used to identify areas in which targeted research is needed to develop lower-impact eradication and control techniques and products.

Option B+:

Under the baseline, EU solidarity-type funding is available for defined actions under the animal and plant health regimes to maximise efforts to prevent a species from establishing or to control its further spread. MS may receive an EU financial contribution to co-finance the costs of eradicating or containing HOs that are spread through trade-related movement.

Option C: Mandatory contingency planning and response for 'IAS of EU concern'

For 'IAS of EU concern', mandatory contingency planning and emergency action may be considered. The enabling legislation could be based on the approach under the plant health Directive. This would establish a procedure for fast-track decisions to support emergency action, including for newly-identified threats that have not yet been listed (see 4.4). The initial assessment of risk would be carried out by competent MS authorities and / or with technical support through the IEWS (see 7.4). Depending on the threat level, risk management activities could then be coordinated at appropriate level (EU, biogeographic, localised) with support from MS and Commission services. Response powers would need to be enabled under MS legislation.

When developing new legal restrictions e.g. on toxicants, the need to ensure availability of effective management tools should be taken into account. Derogations for IAS eradications may need to be considered and possibly cost-benefit analysis.

An additional option would be to provide for an EU-supported emergency team to ensure that for the most serious threats, the necessary response can be secured. This type of approach is already in place in the animal health sector and, under a networked approach, in New Zealand (see Annex 2). In the biodiversity context, it might be a practical option for high biodiversity / low local capacity areas, possibly including the Outermost Regions.

Table 5-11 Summary of options: IAS contingency planning and rapid response actions

		CONTINGENCY PLANNING AND RAPID RESPONSE ACTIONS: PRELIMINARY ANALYSIS OF EACH OPTION		
COM Option	**Description**	**Impact (compared to baseline)**	**Advantages**	**Disadvantages**
A	No framework for contingency planning or mobilising emergency action Some member states (GB, Ireland) have established frameworks for contingency action	Neutral	Mobilisation of contingency funds and actions possible at the national level	Lack of contingency planning framework reduces ability to respond promptly to new incursions Lack of framework reduces ability to respond in a coordinated manner to established IAS Difficulties in obtaining funding for transboundary actions
B	Networking among national competent authorities to coordinate responses to new incursions	Low-medium: establishment of network and of coordinated funding mechanism required.	Improved ability to respond to new incursions Improved harmonisation of actions	Decentralised framework substantially limits promptness of reaction and efficacy of regional action Lack of regional funding mechanisms limits efficacy of action
B+	Structured system to mandate rapid response to highest-risk category (possibly with EU co-financing)	High, depending on scope	Ensures promptness of response. Secures consistent national actions for highest risks Positive incentives for MS to act [(co-financing)] Possible sanctions for inaction Can overcome the weakest link problem	Additional costs due to the introduction of new obligations to act Commission machinery required Introduces additional decision step
C	As above + 'IAS of EU concern', mandatory contingency planning and emergency action	High (but depending on allocated resources)	As above + a dedicated focus on 'IAS of EU concern'	As above

5.4 Control and management of already established invasive species

Suggested operational objective: An integrated management framework, based on realistic priorities and stakeholder engagement, prevents further spread of already established invasive species in order to reduce impacts on EU biodiversity and ecosystem services.

The following sections proposes a common framework to guide effective and mutually supportive actions by MS and then consider specific situations in which complementary EU-level actions may be appropriate. These are synthesised in Table 5-12 with reference to the COM Options.

5.4.1 Background and general approach

This part of the Strategy addresses the transition from rapid response to ongoing management of already-established IAS.

The EU role in regulating IAS management on the ground needs to comply with the subsidiarity principle. Under the baseline, control, eradication and management investments are decided at decentralised (often local) level without higher coordination. However, IAS spread and associated impacts do not stop at jurisdictional boundaries. One country's management efforts are integrally connected to prevention across the border.

IAS do not respect boundaries between public and private goods. Pests affecting the managed environment (e.g. agriculture, commercial forests, horticulture) can spread into the natural environment and have serious environmental as well as social and economic impacts. Conversely, failure to address IAS spreading in the natural environment can have implications for the long-term production potential of key economic sectors (see Kettunen et al. 2009). Impacts to key ecosystem services like water supply potentially affect an even wider range of stakeholders.

Although coordination is important and recommended, it should be stressed that Europe is a large continent with different climates / landscapes and that a specific IAS may be a greater problem in one region than in another. From the EU perspective, a biogeographic approach is fundamental to proportionate action. A strong information system is also essential to build knowledge on the behaviour of an IAS in order to design an effective and timely response strategy to maximise chances of eradication.

The overarching aim of control is the long-term reduction in the distribution, abundance or density of an IAS to maintain its population at a level that does not cause significant economic, ecological and/or health impacts. Where complete eradication is not feasible, and where serious impacts on native species and ecosystems are evident, long-term control is sometimes the best available option, particularly in areas of high biodiversity value.

There are broadly three types of control option:

- physical control: *in situ* decrease or reduction by mechanical removal of individuals that may involve trapping, barriers and various equipment and/or treatments. It is labour intensive, often very expensive and may increase dispersal of vegetative propagating species. It can include the harvesting/fishing of commercially valuable IAS but care must be taken not to create perverse incentives in the process;
- chemical control: *in situ* decrease or reduction by release of toxic chemicals that should be as specific as possible and with minimal effects on non-target species. However, most chemicals are not highly specific and their environmental and safety risks should therefore be assessed before use. Particularly for aquatic environments, application methods that directly target IAS need to be developed;[250]
- biological control: *in situ* decrease or reduction by use of habitat, pathogens, parasites, predators and/or genetic manipulation for long-term control (not suited to rapid response) (see 5.1.4).[251]

Integrated IAS control may be described as the optimum combination of the above control methods to reduce populations to an economical acceptable level with as few harmful effects as possible on the environment and non-target organisms.[252]

5.4.2 Common framework for IAS control and management

This part of the suggested Strategy proposes basic elements to guide consistent approaches at MS and local level to control and manage IAS that threaten biodiversity and ecosystem services.

MS legal / administrative frameworks need to provide for:

- clearly defined roles for relevant authorities and agencies with competence for different aspects of IAS regulation and/or management;
- consultation and coordinated decision making for IAS with multiple impacts;[253]
- an appropriate legal status for alien species i.e. to avoid unintended legal protection for IAS and potential IAS under measures applicable to higher taxa;[254]
- consultation procedures to take account of socio-economic concerns e.g. commercial importance, customary/traditional uses, animal welfare issues;[255]

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[250] e.g. the 'biobullet' (Aldridge, D.C., Elliott, P. & Moggridge, G.D. (2006) Microencapsulated BioBullets for the Control of Biofouling Zebra Mussels. Environ. Sci. Technol., 2006, 40: 975–979).

[251] For the marine environment, biocontrol options, while a theoretically suitable option, are either not generally available or not yet sanctioned for use (Carlton 2001). Successful eradication examples are only known from islands (Genovesi 2005). However, recent studies raise concern for the efficacy and safety of biological control in the aquatic environment.

[252] Adapted from definition of integrated pest control by R.L. Hix, *CA Agric.Magazine, 55:4 (2001)*.

[253] e.g. forest pests that affect urban trees, wild lands and timber and also raise public health/safety issues that must be addressed by local governments.

[254] Where entire families of species are automatically protected although some sub-species may be invasive.

- consultation procedures with neighbouring states to support coordinated management and identify possible transboundary impacts of control techniques;
- development of national IAS action plans – or incorporation of IAS into existing biodiversity action plans - to support coordinated management involving relevant public and private stakeholders;[256]
- flexible procedures to add new species to the list of IAS subject to management measures e.g. including those detected via horizon scanning or surveillance.[257]

All control measures should be based, as far as possible, on sound scientific information. The environmental and ecological impacts of eradication and control techniques must be taken into account within risk management to balance the benefits of IAS removal against possible long-term negative impacts of the control techniques in their own right (e.g. excessive pesticide use, large-scale clearance of native vegetation to control pest spread).

Adaptive management techniques are of fundamental importance (see also ecological restoration: 5.5). Clear and responsive lines of communication between managers and practitioners are needed for optimum results.

5.4.3 Compliance and incentive aspects of IAS control

Depending on the context, a response to address IAS damage could be:

- required where an identifiable actor has caused the problem (directly or indirectly); or
- rewarded where IAS management actions contribute to maintenance of biodiversity and broader socio-economic benefits (payment for ecosystem services approach).

Consistent with the polluter pays principle and the environmental liability Directive (see 3.2.8 and 5.6.6), responsibility for taking action to prevent and/or remedy environmental damage caused by an IAS should lie with the person / entity considered under applicable legislation to be responsible for the original introduction, where identifiable.

For this purpose and building on the suggested duty of care for activities involving releases into the natural environment (see 5.1.4), MS frameworks may provide for:

- IAS control orders to mandate actions for specific IAS and to regulate activities contributing to further spread;
- access and inspection powers for designated officials to land / waters concerned by the IAS control order;

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[255] Conflicts of interest may be most accute for popular introduced species (e.g. *Rosa rugosa* along the Danish coastline, *Psidium cattleianum* in Réunion) and for culling of feral animals.

[256] e.g. as an ecologically threatening process: see Australian legislation (5.4.4 and Annex 2) and Ireland's draft European Communities (Birds And Natural Habitats) Regulations 2010 Regulations which envisages the development of threat response plans: http://www.environ.ie/en/Legislation/Heritage/NatureConservation/FileDownLoad,23675,en.pdf.

[257] In New Zealand, the Department of Conservation uses the National Heritage Management System to prioritise actions based on the return in terms of biodiversity gain associated with a given action at any site and the cost/feasibility of success of the action (GB Non-Native Species Programme Board, pers.comm.): see Annex 2).

- powers of substitution by an authorised agent in the event of non-compliance by the owner/occupier, supported by cost-recovery measures;
- meaningful criminal penalties for offences;
- as appropriate, a 'due diligence' defence (burden of proof on the introducer to demonstrate compliance with a defined standard of reasonable conduct). MS may define the standard required by reference to IAS codes of conduct developed by concerned stakeholders to tackle specific pathway risks (see 5.6.2).[258]

Positive incentives to reward IAS management actions to protect environmental public goods could be promoted through the Strategy. Existing EU funding instruments could be harnessed more systematically to reward land managers that carry out IAS control operations e.g. to achieve Good Agricultural and Environmental Conditions under the EAFRD (see 5.6.7). However, European funds should not be used to pay for situations where IAS-related damage has been caused by an identifiable negligent actor.

5.4.4 Options and analysis: EU-level actions for IAS management

IAS that threaten Europe's biodiversity heritage, including but not limited to EU-protected species and natural habitats, need to be treated as a shared problem entailing common responsibilities at the appropriate biogeographic scale.

A regionally coordinated approach to control can have a range of benefits: to contain problems before they affect neighbouring units[259], to prevent spread to other MS even if local eradication fails or simply to slow down IAS spread to postpone its foreseeable social, economic and environmental impacts.[260]

At the biogeographic/regional level, a well-structured approach to assess the need for and feasibility of action could be based on the following criteria:[261]

- does the species affect species / habitats of EU importance at a transboundary scale?[262]
- does the species still have a significant area suitable for further spread in the EU?
- based on available information, would eradication/containment be technically feasible?
- is it possible to permanently avoid supply of new propagules from nearby areas?[263]

[258] On the use of this approach in the UK, see 155.

[259] e.g. in Austria, control of Asian Longhorned Beetle (*Anoplophora glabripennis*) has been carried out for the last ten years and the species – although still present locally – has not spread from this single point of occurrence to nearby areas.

[260] e.g. Western corn rootworm (*Diabrotica virgifera virgifera*) or ragweed (*Ambrosia artemisiifolia*).

[261] Broadly aligned with prioritisation criteria developed by EPPO Invasive Plants Panel (meeting of 23-24 February 2010).

[262] e.g. in the case of the Ruddy duck, the main concern that justified EU financial support for a coordinated control programme was the threat that its continued expansion posed to an endangered protected EU species.

[263] This is essential to avoid the common situation where, following control investments, the situation reverts to the original problem because the species has invaded the site again.

Technical (i.e. non-legislative) level

EU-level action plans could be prepared for selected key species / groups of species that threaten biodiversity and other values of EU relevance. These could address information on the species, its biology, ecology, control methods, to be supplemented by mapping and legislative information specific to the country/region concerned.

Clear biological goals, indicators, environmental safeguards and monitoring arrangements are integral to the design of long-term control programmes supported through EU funding instruments. The choice of the best management strategy should involve a range of considerations e.g. evaluation of available techniques for the target species, legal aspects, costs and environmental impacts.[264] Results should be monitored and findings fed back into the future EU / Europe-wide information and early warning system (see 7.4) .

Screening of proposed control measures could be facilitated through the technical support structure hosting the IEWS to ensure access to state-of-the-art protocols and best practice[265] and avoid duplication of MS effort. This structure could also identify and monitor possible inconsistencies with EU legislation on e.g. health and safety, pesticide use and biocontrol.[266]

Eradication may be an appropriate EU / biogeographic management goal for IAS affecting public greens and natural habitats: if timely and well-targeted, it can be justified on environmental as well as economic grounds (e.g. pinewood nematode). However, control techniques must be subject to impact assessment to avoid excessive damage when eradication measures go beyond reasonable scope. Management objectives also need to provide for a second-best target where eradication does not achieve its objective in order to contain the risk of escalating environmental damage. These choices feed into ecological restoration (see 5.5).

Candidate IAS could include:

- IAS with biodiversity impacts that affect multiple MS e.g. *Heracleum sosnowskyi*, raccoon dog, mink[267];
- migratory IAS for which population management needs to be considered at the European level;
- IAS with serious impacts on globally significant EU biodiversity e.g. feral animals on islands;
- building on synergies with other relevant sectors, IAS with human health impacts e.g. Tiger mosquito *Aedes albopictus*[268], ragweed *Ambrosia artemisiifolia*.[269]

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[264] For introduced marine pests, Australia's CRIMP system supports a web-based interactive approach that provides access and guides the user to available information on control options: http://crimp.marine.csiro.au/nimpis/controls.htm.

[265] e.g. the Forest Stewardship Council has banned the pesticide Cypermethrin from their list of permitted chemicals in sustainable forest practices because of its toxicity to fish, aquatic organisms, water insects and bees.

[266] e.g. measures regulating the use of anticoagulants should not prevent or unduly delay key island mammal eradication programmes to the detriment of native wildlife, notably seabirds (BirdLife, pers.comm).

[267] Plan under development in Denmark, completion expected in 2010.

[268] A study on possible expansion due to climate change was published recently by European Centre for Disease Control:

Linked to the EU Post-2010 Biodiversity Strategy, control programmes could also identify and assess key ecosystem services impacted by IAS. The level of ambition required by the target will determine the degree to which such services will be factored into the agreed target, ranging from maintenance to full restoration (COM 2010).

The EU could support the development of 'risk maps' to zone areas at risk in which IAS interventions may be prioritised. These could take account of climate modelling predictions to identify possible future range expansion, as a support for targeted surveillance. The EU could additionally support MS actions through research projects/technical guidance on:

- management options for already widespread IAS;[270]
- containment strategies and standards[271]; and
- regional training courses for land and water resource managers.

Possible legislative actions

Protected species lists under the nature Directives should be reviewed as necessary to remove legal protection from known IAS and enable control actions (see 3.2.5).

The Strategy could require mandatory control actions[272] for 'IAS of EU concern' in order to ensure a consistent response at the appropriate biogeographic scale, irrespective of jurisdictional boundary. Listing criteria could be drawn up in accordance with the approach envisaged in 4.4. As a starting point, the environmental objectives should be closely aligned with the acquis and could include:

- maintenance or restoration of favourable conservation status of the Natura 2000 network and/or nature Directive Annex 1 habitats and species;
- achieving good ecological status of inland and coastal waters covered by the WFD. This will require progress on a common approach to using alien species data in WFD ecological status classification (ECOSTAT 2009: see 3.2.6);
- achieving good environmental status of marine waters under the MSFD.

More broadly, the concept could be applied to IAS that are problematic in the EU Outermost Regions, which are not covered by the nature Directives.

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http://www.ecdc.europa.eu/en/publications/Publications/0905_TER_Development_of_Aedes_Albopictus_Risk_Maps.pdf

269 The European Parliament has called for a study on ways to manage / control the negative impacts of ragweed at the EU level noting its current expansion (e.g. due to a longer growing season, *Ambrosia artemisiifolia* is now able to establish in Denmark). The EFSA opinion on ambrosia has now been published: http://www.efsa.europa.eu/en/scdocs/doc/1566.pdf .

270 The EPPO system uses non-binding PM9s to publish standards describing desirable national measures against pests too widely distributed for international regulation. Current examples include *Ambrosia artemisiifolia, Eichhornia crassipes* and *Heracleum mantegazzianum, H. sosnowskyi, H. persicum* (http://archives.eppo.org/EPPOStandards/regulatorysystems.htm).

271 e.g. buffer zones around specific biotopes to protect against invasive trees used in forestry.

272 The PHR Evaluation noted that the most successful results for HO control had been obtained under HO-specific control directives (i.e. strict and detailed measures with common procedures in place) (see FCEC 2010).

A precedent for an overarching listing of this type is found in Australia.[273] Under the Environment Protection and Biodiversity Conservation (EPBC) Act, the Commonwealth-level technical assessment and regulatory listing of a 'key threatening process' triggers the development and implementation of IAS threat abatement measures across affected states and territories. A key threatening process is defined to cover a process that 'threatens or may threaten the survival, abundance or evolutionary development of a native species or ecological community' protected under the EPBC.[274]

Use of EU funding instruments to support co-financing of mandatory management measures for 'IAS of EU concern' would need to be optimised and possibly considered in further detail. A procedure would need to be developed to ensure compliance and address possible inaction by Member States.

[273] See Annex 2.

[274] Current listings cover predation by the European red fox, feral rabbits or unmanaged goats, rodents on islands, red imported fire ants, *Phytophthora cinnamomi*, chytrid fungus and Psittacine beak and feather disease.

Table 5-12 Summary of options: control and management of already established IAS

		CONTROL AND MANAGEMENT OF ALREADY ESTABLISHED IAS: PRELIMINARY ANALYSIS OF EACH OPTION		
COM Option	**Description**	**Impact (compared to baseline)**	**Advantages**	**Disadvantages**
A	Status quo	• neutral • continued escalation of IAS damage	• full subsidiarity • voluntary prioritisation by MS according to national/local needs	• continued gaps and inconsistencies at MS level • continuing lack of basic EU IAS management instruments • no change to gaps in current intervention logic • not coordinated across political/administrative boundaries • resource inefficient
B	Common framework for MS actions + Voluntary IAS action plans (MS and/or EU level)	• dependent on MS level of ambition	• framework for consistent MS approaches • strong local driver: can target most vulnerable ecosystems • criteria to guide MS prioritisation • optimise use of liability provisions • promotes voluntary consultation and cooperation across borders and sectors • leverage of regional information and technical resources	• non binding (weakest link) • no leverage to secure consistent action • continued lack of EU visibility for IAS management • continued fragmentation • legal uncertainty for certain control techniques
B+	Common framework for MS actions + EU technical IAS action plans	• medium-high, depending on scope • scope for some cost recovery through e.g. liability-based systems • increase in costs to be balanced against potential benefits of avoided impacts (see 6)	• possible fuller consideration of climate change risks (spread) in PHR context • possible use of PHR protected zone mechanism)to prevent spread of limited number of IAS affecting plant diversity • optimise existing funding instruments (e.g. EAFRD, LIFE+, REGIO) • formalise cooperation between sectors • can require environmental assessment of IAS control techniques	• continued fragmentation and lack of EU-level visibility • limited scope of black listing, depends on extent and focus of PHR modernisation • grey area for e.g. invasive plants if not listed as harmful organisms under PHR • financing remains ad hoc except for matters covered under PHR
C	Common framework with mandatory elements + Mandatory control of 'IAS of EU concern'	• potentially high for COM and MS, depending on scope • resource implications linked to mandatory controls • scope for some cost recovery through e.g. liability-based systems • increase in costs to be balanced against potential benefits of avoided impacts (see 6).	• consistent basic framework across all MS • highest contribution to raising visibility • highest contribution to tackling regime complexity and fragmentation • EU-coordinated action for most serious threats, implemented at appropriate biogeographic scales and across sectors • environmental assessment of control techniques • mandatory monitoring of outcomes to feed back into knowledge base	• time involved in stakeholder consultation procedures • possible high resistance linked to mandatory nature of controls (though may be reduced if more locally proportionate approaches are seen as acceptable) • additional administrative requirements (MS-COM) • need for oversight & consistency procedure

		CONTROL AND MANAGEMENT OF ALREADY ESTABLISHED IAS: PRELIMINARY ANALYSIS OF EACH OPTION		
COM Option	**Description**	**Impact (compared to baseline)**	**Advantages**	**Disadvantages**

5.5 Ecological restoration

***Suggested operational objective**: Ecological restoration builds on IAS management activities to reinstate functioning ecosystems dominated by native species.*

5.5.1 Background and general approach

Restoration is an integral part of managing IAS. Although IAS removal is sometimes a goal in itself, it should also be seen as an important element in achieving other environmental targets such as recovery of endangered species or repair of ecosystem function.

Many restoration efforts have succeeded in mitigating negative IAS impacts with important benefits. However, they may have also unforeseen consequences that exacerbate rather than mitigate the original IAS problem. For example:

- invasions can cause long-lasting changes to the ecosystem that persist well after the removal of the IAS;
- 'secondary invasions' involve the rapid replacement of the removed species by others that capitalise on the disturbance caused by the control operations and/or the resource alteration caused by the IAS;
- IAS management can degrade ecosystems and negatively affect indigenous species;
- where alien species invade by infiltrating ecosystem networks (e.g. pollination and dispersal networks, food webs), their removal can cause trophic collapses;
- restoration efforts can be compromised by conflicts of interest, an example being IAS that provide habitat or food for endangered native species.

These examples highlight the need to consider all implications of planned control and restoration programmes.

Well-designed restoration of IAS-damaged sites can reduce their vulnerability to future invasion and may strengthen ecosystem resilience to other environmental stresses to avoid ecosystems being pushed beyond certain thresholds or tipping points.[275] Restoration may include release or stocking of native specimens, e.g. native crayfish in alien-free rivers or river catchments. Restoration programmes can also secure broader socio-economic benefits where they contribute to the maintenance and enhancement of ecosystem functions and services. They may also strengthen public acceptance and understanding of necessary control measures.

Even when technically feasible, restoration can be potentially very expensive and needs

[275] *Third edition of the Global Biodiversity Outlook: implications for the future implementation of the Convention on Biological Diversity*.

continuous supervision, assistance and monitoring of developments. It is usually executed locally as a by-product of eradication or control actions, rather than as an overarching target at national or regional scale. Generic elements for effective programme design should therefore include:

- incorporating prevention objectives into relevant sector policies e.g. primary production, land and water management, spatial planning;
- defining the situations in which MS may be required or encouraged to carry out restoration;
- defining the state to which restoration should be carried out, taking account of feasibility and an appropriate timescale;
- providing guidance if restoration includes the release of specimens;
- establishing responsibilities for restoration actions.

Actions taken under the EU IAS Strategy will be nested under the Post-2010 Strategy which will provide for explicit restoration targets for the first time. The Council has recognised the importance of setting a clear baseline outlining the criteria against which achievements are to be assessed, while taking into account that in some cases, restoration may also consist of natural regeneration.[276]

5.5.2 Approach to restoration for EU protected species and natural habitats

Ecological restoration as a general policy objective is embodied in the nature Directives. Under the CBD, Parties are encouraged to consider the role of IAS management as a cost-effective tool for the restoration and maintenance of protected areas and the ecosystem services they provide.

For Natura 2000 sites, the restoration objectives could be based on the requirement to attain favourable conservation status for species and habitats as defined in the habitats Directive. The current status of species and habitats, as assessed by recent reporting under the Directive, could serve as a benchmark (COM 2010). Ongoing monitoring activities under Article 11 of the Directive may contribute to detecting any positive or negative trend in FCS.

The reintroduction of native species, following the control/eradication of IAS which represent a threat to them, may be envisaged provided that such programmes are fully consistent with international guidance.[277] Such a reintroduction would not only justify the removal of the alien species but can also facilitate gaining support of the public opinion. However, this should not be confused with assisted colonisation (i.e. translocating and releasing species beyond their current range limits as part of a climate change adaptation strategy).

[276] Council Conclusions 2010 §4.

[277] IUCN Guidelines for Re-Introductions http://www.lcie.org/Docs/LCIE%20IUCN/IUCN%20Reintroduction%20guidelines.pdf

The LIFE+ Regulation already provides a basis for co-financing IAS ecological restoration projects. Allocation of funding to date has been ad hoc rather than geared to broader strategic objectives. Consistent with the Strategy, MS should maximise opportunities to secure co-benefits at the site- and broader ecosystem level through restoration projects.

Examples:

In Ireland, the LIFE Shannon Regional Fisheries Board project for *Restoration of the Lower Shannon SAC for lamprey, Atlantic salmon and European otter* includes an objective to 'stop and reverse the damage caused by invasive exotics Giant hogweed and Japanese knotweed, restore the natural riparian zone and develop a management programme to ensure re-colonisation does not occur after completion of the project.'[278]

In Austria, the LIFE-Nature project for *Protection and Maintenance of Pannonic Steppes and Dry Grasslands* included measures to reduce black locust (*Robinia pseudacacia*) and Tree-of-Heaven (*Ailanthus altissima*), both invading nutrient-poor dry grasslands in eastern Austria, and thereby restore natural plant and animal species communities.[279]

5.5.3 Approach to restoration for European waters and marine regions

At the ecosystem level, the WFD and MSFD provide a policy framework through which restoration objectives may be set and measured through common indicators, monitoring and assessment. However, linked to the particular difficulties associated with eradication and control in aquatic environments, prevention should always be the overriding goal.

For the WFD, restoration needs to be addressed as an integral part of national measures to achieve or maintain good ecological status for European inland, transitional and coastal waters by 2015 and prevent their further deterioration. However, as noted (3.2.6), there is currently no common approach to using alien species data in classifying ecological status which makes it difficult to develop a regionally or subregionally consistent approach or to define restoration objectives at the river basin level.

Restoration actions could also be tailored to the Flood Risk Management Directive linked to the WFD. This prioritises soft non-structural measures that use natural processes to the maximum to reduce flood risks. IAS restoration could specifically focus on riparian zones and wetlands to address riverbank erosion and restore wetland retention capacity.

Responsibilities for restoration, and associated cost recovery, should be defined where appropriate in accordance with the environmental liability Directive (see 5.6.6).

Under the MSFD, measures to maintain or achieve good environmental status should also include restoration measures where feasible. Proposed biopollution indicators currently under consideration could provide a tool to develop an appropriate target tailored to marine biogeographic regions (ECOSTAT 2009).

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[278] Source: NOBANIS Newsletter No.3/2010.

[279] http://www.steppe.at/downloads/Kurzbericht_STEPPE_E.pdf

5.5.4 Approach to restoration in the wider landscape

The CBD supports actions to address non-climatic stressors, including IAS, within the broader context of climate change adaptation. It links these to increased efforts for restoration of ecosystems and habitats, including connectivity as appropriate.

As noted, implementing measures to enhance / restore 'green infrastructure' might open up the landscape for IAS dispersal and therefore involve trade-offs (see 5.2.4). Once again this strengthens the case for prevention. However, integrated restoration programmes based on the ecosystem/regional landscape approach[280] can increase resilience to invasion and support targeted monitoring of areas most at risk from possible dispersal. The Commission could support this through exchange of best practices to deliver co-benefits for conservation and climate change adaptation (COM 2010, Council Conclusions 2010).

Lastly, the EAFRD includes an agri-environment measure on protection and promotion of local animal breeds and local plants to preserve them and preserve traditional genetic resources. MS could use this measure to support restoration in the wider agricultural environment by promoting actions based on existing/traditional and native species. These existing instruments should be taken into account as achieving the economic results (yields, resilience) with European/local species.

[280] In South Africa, extensive experience on combined programmes for IAS control/biome restoration and restoration of key ecosystem services has been gained through the Working for Water/Wetlands/Fire/Energy programmes centred on invasive plant clearance and watershed rehabilitation (see http://www.dwaf.gov.za/wfw/).

5.6 Changing the incentive culture: responsibilities and financing

***Suggested operational objective**: A balanced framework of incentives encourages responsible behaviour, distribute IAS costs efficiently and equitably and provide targeted support from EU financial instruments.*

5.6.1 Background and general approach

The current distribution of costs and benefits of IAS action is extremely uneven. Most costs associated with IAS control and lost production, ecosystem services and amenities are met by stakeholders on the ground, with a major part of the burden falling on local authorities. The beneficiaries of activities providing pathways for IAS introduction/spread usually have few or no economic incentives to minimise such risks. Market-based instruments provide few correctives as they are only just beginning to reward responsible practices, based on e.g. technical innovation or species substitution.

Compliance and enforcement present well-recognised difficulties in the IAS field (see e.g. Shine et al. 2005). Many of the actions that lead over time to damaging invasions are lawful, unknowing or inadvertent. By the time an incursion is detected, it may be impossible to trace its source back to individual transporters or traders. Even where specific actions are formally prohibited, it is simply not feasible to put a policeman by every pond to watch for reptile releases or to search anglers' bait bags.

The Strategy needs to address these fundamental constraints for three key reasons:

- to promote a level playing field and consistency of approach across the EU;
- to optimise available resources to support measures to achieve the Strategy's overall objective;
- to avoid perverse incentives, incoherence or waste in the use of EU funds – and in investments at MS level.

A smart policy mix of regulations and incentives (positive and negative) is needed to encourage public and private actors to shift towards low-risk practices and to internalise environmental costs associated with invasions (consistent with the approaches discussed in TEEB 2010a and 2010b). This should be developed through cooperation between public authorities (at all levels) and stakeholders from trade, transport, primary production and environmental sectors. A partnership-based approach to shared problems is particularly important for such a complex and dynamic policy area.

The suggested Strategy components for prevention, early warning and rapid response, control and restoration (see 5.1-5.5) provide a preliminary indication of how responsibilities and costs might be allocated and distributed. The following section discusses ways in which

implementation actions could support greater accountability and cost recovery as part of a generalised shift in the incentive culture. The contribution of EU financial instruments to support the establishment and implementation of Strategy components is considered in 5.6.7.

5.6.2 Voluntary codes of conduct and best practice

Voluntary codes of conduct and best practices to address risks associated with the introduction or use of alien species can play a multiple role: awareness-raising, stimulating stakeholder innovation, leverage/dissemination of best practices, supplementing existing regulations or filling a regulatory gap. The incentives for industry to participate are often focused on good public relations and 'environmentally friendly' branding as a contribution to enhanced corporate social responsibility.

The effectiveness of voluntary codes is difficult to evaluate with precision: without an underpinning regulatory framework, there are identified risks of 'free-riding' and regulatory capture (see OECD 2003; Moss and Walmsley 2005; discussion under 5.1.2). A 2009 workshop comparing national experiences and lessons learnt in developing voluntary codes[281] found that to be fully effective, they should be combined with information campaigns and be widely disseminated to avoid the 'best-kept secret' phenomenon. This may increase the cost but also the likelihood of measurable long-term behaviour change.

The Strategy could proactively support integrated voluntary programmes that combine development of sectoral codes with targeted media campaigns and training. Such actions could be supported through existing EU funding instruments (see
Box 5-3). At a higher level of ambition, it could also require MS to consider developing statutory codes of conduct that clarify responsible practices and establish a baseline for a duty of care (5.6.6).

Box 5-3 Using EU funds to support voluntary IAS codes: example of InvHorti (Belgium)

InvHorti - Increase awareness to curb horticultural introductions of invasive plants in Belgium (2010-2013) is a national programme supported through the LIFE+ Communication funds. The project objective is to raise awareness of the environmental risks of invasive alien plants (IAPs) along the ornamental horticulture supply chain through actions targeted at professionals (estimated 2560 organisations or individuals)[282], amateur gardeners (an estimated 400,000 regularly consult gardening magazines and TV programmes) and horticulture teachers. Preparatory work included assessment of the economic value of IAPs to Belgium's horticulture sector[283], development of a voluntary code of conduct, development and publishing of communication material and targeted awareness-raising. Intended project benefits (i.e. measurable changes of attitude) include:

[281] See case studies presented at the EPPO/Council of Europe Workshop on the Code of Conduct on Horticulture and Invasive Alien Plants (Oslo, 4-5 June 2009) at www.eppo.org

[282] E.g. nurseries, garden centres, wholesalers, garden contractors, landscape architects and public green managers.

[283] Horticultural use of 'black' and 'watch' list plant species identified by the Belgian Forum on Invasive Species and their relative importance in trade was quantified by surveying the catalogues of plant growers and suppliers within horticulture federations and through professional consultations.

- endorsement of the voluntary code by at least 20 per cent professionals in horticulture federations and 60 per cent public green space managers;
- organisation of annual IAP-related training in at least 50 per cent of Belgium's horticultural schools;
- doubling of the number of gardeners with good knowledge of invasive plants;
- at least 10 per cent of amateur gardeners aware of the voluntary code and knowing that invasive plants may be substituted by harmless alternative plants.

Source: Etienne Branquart, Belgian Biodiversity Platform, pers.comm.

5.6.3 Labelling, certification and accreditation

A range of market-based instruments could be used or developed for the IAS context.

The Strategy could support appropriate initiatives, consistent with and building on the approach developed in the Commission's 2009 **Communication on Contributing to Sustainable Development: The role of Fair Trade and non- governmental trade-related sustainability assurance schemes**.[284] Although Fair Trade focuses on social rather than environmental criteria, EU support is a positive development for the certification industry in general (TEEB 2010b). Support for 'BioTrade' - production and commercialisation of goods and services derived from native biodiversity under strict sustainable development criteria – has been formally expressed by e.g. CBD, the UN Conference on Trade and Development, CITES and a growing number of countries. Governments can directly endorse such approaches through green public procurement policies (see 5.6.4).

Labelling can be deployed at point of sale to provide guidance to retailers and consumers, usually backed by information materials to indicate native and / or low-risk alien species. This type of initiative can support species substitution on a voluntary basis.

Environmental labelling / certification schemes could be used proactively to promote IAS risk reduction measures for specific pathways, linked to available international standards[285], best practices and recommendations.[286] Several of the highest profile schemes have been catalysed by civil society (NGOs) working in partnership with industry and already have significant market penetration.[287]

In the IAS context, certification can be designed to achieve several complementary objectives:

- generally reduce the environmental and possibly social impact of participating companies in a specific sector;
- generally maintain/improve the industry's image and reduce costs via shared marketing and promotions, logos and branding;

[284] Brussels, 5.5.2009 COM(2009) 215 final.

[285] e.g. Forest Stewardship Council standards, IMO voluntary hull-fouling standards, FAO Code of Conduct for Responsible Fisheries etc..

[286] Aligned with CBD recommendations adopted at COP10, Nagoya 19-31 October 2010.

[287] See e.g. Franke, G. The industry view on importance and advantages of Codes of Conduct in EPPO (2009).

- provide for measures to avoid the release of and/or control and monitor known or potential IAS particularly in high-biodiversity and ecologically vulnerable areas e.g. in the forestry[288], biofuel and agricultural sectors[289];
- promote high environmental biosecurity in production and retail practices e.g. for horticulture[290] and the pet / aquaria trade.[291]

At a more formal level, operators / suppliers who meet the specified standards may be accredited through professional industry federations or international accreditation organisations. Accreditation usually requires regular audit with the possibility of sanctions in the event of non-compliance e.g. withdrawal of participation in industry scheme.

Certification schemes may be developed at different levels from in-country to global level. Global certification schemes that address IAS risks in third countries – e.g. avoidance of potentially invasive species for biofuel plantation in specified areas – may help EU consumers and authorities to reduce their global IAS-related footprint (see 5.7.5).

5.6.4 Greening the supply chain: new approaches to public procurement

'Green public procurement' (GPP) means that public purchasers take account of environmental factors when buying products, services or works. A product or service can only qualify as 'green' if it goes beyond what is required by law and beyond the performance of products comonly sold in the market. Governments can use GPP policies to target purchasing at environmentally certified or labelled products. This can not only have direct environmental benefits but also raise the profile and market penetration of such schemes (TEEB 2010b).

In the IAS context, public authorities can directly influence species purchasing patterns and pathway risk management through existing and upcoming GPP policies. The common aim of such mechanisms should be to ensure that only native or low-risk alien species are used in e.g. public infrastructure, development and landscaping programmes. To be effective, such GPP policies would need to support measures to ensure product availability e.g. to expand availability and traceability of reliably-sourced species.

Procurement-based approaches can be informal or based on legislation (e.g. via administrative circular or more formal regulations). Depending on design, they may:

- focus on proactive choice of native species, linked to information on species selection (see example in Box 5-4);
- specifically exclude black listed species based on a technical and/or regulatory list (see example in Box 5-5).

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[288] See http://www.fsc.org/certification.html

[289] Several labels and standards have been developed for organic agriculture and sustainable farm certification to identify farms and products using environmentally favourable practices e.g. GlobalGAP (Good Agricultural Practice) is a private sector body that sets voluntary agricultural standards covering biodiversity issues: see http://www.globalgap.org/cms/front_content.php?idcat=3 .

[290] Relevant stakeholders include the International Association of Horticultural Producers.

[291] Relevant stakeholders include the Ornamental Aquatic Fish Association.

Box 5-4 Public procurement based on listed native/non-invasive species: Sète, France

Stakeholders directly affected by IAS impacts and avoidance strategies include local authorities. In France, where the value of the national plant production market is estimated at 1.6 billion EUR / year, local authorities have a major economic stake both as producers and users of plants (estimated 8-10 per cent of global value of the industry, including direct responsibility for around 6 per cent of plant production: source Onhiflor).

One municipality on the Mediterranean coast (Sète) has developed a decision support system to promote use of native and/or non-invasive plants instead of regionally invasive plants. The scheme is voluntary but has been progressively integrated into all planning policies and public contracts, which means that architects, landscape planners and other urban and green space operators must comply with its recommendations to have access to publicly-funded projects or to obtain other types of planning consent. The scheme is currently being scaled up for regional and ultimately national application, with provision for adapting the species list to different bioclimatic conditions elsewhere in France.

Source: Brot, F, Ehret, P. and Mandon, I. Initiatives in the South of France: from involvement of the nursery industry toward voluntary codes of conducts for local authorities (in EPPO 2009)

Box 5-5 Public procurement based on exclusion of black listed IAS: Walloon Region, Belgium

In 2009, the Government of the Walloon Region (Belgium) adopted a dedicated IAS Circular that builds on its social and environmental public procurement plan adopted in March 2007 and applies to all public authorities within their area of competence. This defines IAS and specifies that:

- all public procurement involving the supply or use of animal and plant species must have regard to applicable IAS regulations consistent with the circular;
- invasive species naturalised in Belgium that are likely to cause significant environmental harm (black list) and invasive species that are not yet naturalised in Belgium but have caused environmental harm in neighbouring regions (alert list) are listed in the *Harmonia* online database (http://ias.biodiversity.be/ias/species/);
- all public procurement contracts (*cahiers spéciaux des charges*) must prohibit any intentional introduction of IAS included in the black or alert list.

Source: Circulaire relative aux espèces exotiques envahissantes adopted on 23 April 2009 (M.B. 26.05.2009)

5.6.5 Taxes, charges and cost recovery mechanisms

Taxes, fees and other charges can be applied to pathway actors to set appropriate incentives, recover all or part of administrative costs, reduce burdens on public budgets and, depending on design, generate revenues for conservation purposes. They may be applied to specific actions at different stages of a specific introduction pathway.
Conventional charging mechanisms can be applied to intentional introductions as the onus can be placed on an identifiable actor to comply with defined procedures and meet associated costs. Implementation actions providing a basis for cost recovery could include:

- import / border control frameworks (import permit fees, inspections, quarantine);

- biosecurity levies based on volume or risk level of commodities;
- paying for risk assessment directly or covering the competent authority's costs;
- permit, registration and inspection systems for facilities holding alien species in captivity or containment;
- fees on disposal of vector material e.g. contaminated soil, landfill charges;
- monitoring and contingency planning;
- emergency response;
- control and management.

The Strategy could support the extension of this type of charging system to a wider range of vectors for unintentional introduction. Incentive frameworks to share responsibility and spread risks among pathway users are explicitly supported under the EU Animal Health Strategy and the EU Maritime Strategy 2009.[292] A regionally coordinated marine pathway approach can ensure a level playing field and reduce the adminstrative burden on individual operators, ports or MS through e.g.:

- vector fees or a tax based on risk categorisation;
- levies on specific commodities or cargo containers;
- insurance (linked to contingency planning and monitoring);
- revenues recovered from fines (see 5.2.3).

For ballast water, cost recovery should be aligned with best practice under the BWM Convention. This includes providing concrete incentives to shipping operators (RA-based exemptions from ballast water management requirements) in return for compliance with formal IMO RA guidelines, under which MS may undertake the RA themselves in order to grant exemptions or else require the shipowner / operator to carry it out (the latter is expected to become the standard procedure). If an exemption is granted, the shipowner or operator saves the cost of installing a full ballast water treatment system (see 6).

IMO is currently working towards an instrument to address alien species movements through hull fouling of vessels. It is expected that similar cost recovery measures will be developed to manage this vector.

As in other areas of environmental policy, (a portion of) revenues generated from levies on wildlife shipments and /or charges and penalties related to alien species activities could be paid into a designated fund to support defined actions for a particular sector or pathway. Fund objectives could include improving prevention and rapid response infrastructure and / or ecosystem management and restoration.[293] Examples of possible approaches for further consideration in the EU context include:

[292] This notes that soft regulation measures, innovative public-private solutions and a team effort for improving the international system are key elements of such an approach.

[293] This type of approach is used in several American states and recommended under guidelines for state IAS legislation (see ELI 2004).

- a dedicated biosecurity fund e.g. Hawaii's Pest Inspection, Quarantine and Eradication Fund is generated from a system of levies on cargo shipments introduced in 2008;[294]
- charges levied on wildlife trade pathways e.g. Canada's Wild Animal and Plant Protection and Regulation of International and Interprovincial Trade Act provides for a portion of fines imposed to be paid into the Environmental Damages Fund administered by Environment Canada on behalf of the federal government. This enables the courts to direct money from fines to be paid towards works to restore and protect the environment.[295]
- dedicated ballast water management funds generated from fees levied in the same way as existing port fees levied for oil pollution response, ship waste collection, provision of navigation aids, dredging. For example, in 1998, Australia's Ballast Water Research and Development Funding Levy Act[296] was enacted to support a levy on certain ships to help finance elaboration of the future national BWM strategy.

At EU level, the feasibility of cost recovery approaches for IAS would need to be carefully assessed and developed in close consultation and over time with concerned industries and other stakeholders. This approach is embedded in the EU Animal Health Strategy. Earlier guidance developed for the IMO Globallast programme – but also relevant for other introduction pathways - also supports a phased approach:

- in the initial phase, government funding is needed to allow proper planning of the initiative;
- in an intermediate phase, government funding may be combined with revenues from self-financing mechanisms to generate resources for a BWM programme. The efforts and costs involved to gather funding may be underestimated: joint financing is essential in these cases to guarantee the programme's success, continuation and financial sustainability;
- once a system is up and running, administrative costs should be covered by sums generated and the system should also enable funding for BWM programmes and related activities;
- revenues generated by self-financing mechanisms should be used in a transparent way. One way to achieve this could be to establish a fund control and supervision board, with representatives of all relevant authorities and donor stakeholders (i.e. those who pay the fees). Annual revenue reports could also be released (Gollasch 2004).

5.6.6 Environmental liability and the potential role of the insurance sector

IAS and their associated impacts in terms of lost output, business interruption, increased land management costs and altered water and fire regimes present a substantial and

[294] Inspection, Quarantine, and Eradication Service Fee and Charge (HRS 150A- 5.3), covering aviation and marine cargo shipments to the islands. The fee was imposed regardless of cargo type (i.e. risk level) but later adjusted to exclude low risk cargos (liquid bulk freight, cement bulk freight) from the charge.

[295] Cited in TRAFFIC Bulletin Vol.21 No.3 (2008) p121.

[296] Act no.21 of 1998, available at http://www.comlaw.gov.au .

growing financial risk for individuals, companies and the financial sector. Financial services and insurance markets will need to find innovative ways to respond efficiently to increasing exposure to IAS-related risks.

The liability issue is linked to growing awareness of IAS as a key threat that can be included in IAS / biodiversity proofing tools to ensure coherence between policies and objectives.

Under the baseline, the environmental liability Directive establishes a dual system of strict liability for Annex III-listed occupational activities that damage protected species and habitats, pollute EU waters or contaminate land with impacts for human health, and fault-based liability for actions or omissions that result in damage to EU protected species and habitats (see 3.2.8).

Reflecting emerging trends and best practice at MS and third country level, the suggested Strategy components could envisage:

- extension of the Annex III strict liability regime to additional occupational activities presenting high IAS risks, in line with the development / amendment of EU legislative instruments as the evidence base of IAS impacts develops in the coming years;
- a general duty of care with regard to activities that may lead to releases or escapes, to be implemented through a permit system and/or codes of conduct that establish a threshold for assessing reasonableness / negligence (5.1.4).

Example of application of liability to alien species transportation: In 2007, Belgium enacted federal legislation for prevention / remediation of damage resulting from transport by road, railway, navigable waterways or air of non-native animals, plants and parts thereof, following their import, export and transit into the country. This excludes situations where causality cannot be established and retrospective damage or damage occurring thirty years ago. It provides for notification duties; the possibility of substitution by the competent authority; cost allocation; possible deposits and guarantees to support cost recovery; and a possible procedure for cost recovery linked to damage caused outside Belgian territory. It also establishes a legal duty of collaboration between the country's three regions and with MS.[297] The decree has been followed up with regional instruments.

The Strategy could reference formal global or regional 'reference point' codes[298] as sources of best practices that may inform the application and development of the IAS-related environmental liability regime. Guidelines to e.g. importers of plants and fish, supported by a major communication campaign, could also help in this area.

Within the framework of the Strategy, the development of insurance products for specific IAS risks could be encouraged in order to (a) improve and secure access to funds for prevention and remediation in the event of damaging releases, discharges or spread and (b)

[297] 8 novembre 2007 - *Arrêté royal concernant la prévention et la réparation des dommages environnementaux dus au transport par la route, la voie ferrée, par voie navigable ou par les airs : d'espèces végétales non indigènes et d'espèces animales non indigènes, ainsi que les dépouilles de ces derniers suite à leur import, export et transit, ainsi que de déchets lors de leur transit* (M.B. 09.11.2007)

[298] Laid down by e.g. IMO, EPPO and the Council of Europe.

provide incentives (variable premiums) for insured operators to encourage compliance with best technical practices and standards.

Box 5-6 Interaction of legislation and insurance for IAS: example of Japanese knotweed (UK)

In the UK, the legislative framework (subject to differences between the devolved administrations) broadly treats Japanese knotweed (JKW) as a form of biological pollution. Developers are required to prepare Knotweed Management Plans as part of their duty of care obligations under the Knotweed Code of Practice for managing JKW on development sites.[299]

In Northern Ireland, for example, soil from contaminated sites is regulated as controlled waste and its disposal is subject to regulatory safeguards and volume-based charging. Companies involved in the actual removal of JKW material and polluted soil material off site are required to use a licensed waste carrier, inform them of what the material is, give prior notification to a licensed landfill site that will accept it (Controlled Waste (Duty of Care) Regulations (NI) 2002). Actions by private individuals are subject to the Waste Management Regulations (NI) 2006.

Major insurance claims have been made for JKW control / damage costs, particularly in England and Wales. In 2009-2010, both Great Britain and Northern Ireland saw cases where mortgages were refused by some of the larger UK banks because the survey reports prepared in support of the mortgage applications indicated JKW contamination.

Source: Northern Ireland Department of the Environment and GB Non-Native Species Secretariat, pers.comm.

It is important to emphasise that liability is only part of the picture and that competent authorities may need to provide directly for remediation or restoration of IAS damage in a range of situations. Specific constraints in the IAS context include:

- cases where the operator responsible for damage cannot be traced, resulting in 'orphan liability' for affected sites;
- damage generated by repetitive actions and negligence that lead to significant cumulative damage (e.g. diffuse biological pollution). In such cases, transaction costs for assessing natural resource damage can be substantial;
- apportioning responsibility between individual operators: conventional liability rules may not apply if e.g. the individual polluter's share of the damage is not enough to trigger liability.

5.6.7 Contribution of EU funding mechanisms to establishing and implementing Strategy components

The Strategy provides a general framework of guidance that should be taken into account in national programming to mobilise available financial resources and ensure policy coherence.

With regard to existing EU financial instruments, LIFE+ and RTD funding may be used to support projects to build capacity for IAS-specific monitoring actions (i.e. based on categorisation of threats, mapping of high-risk areas for incursions and delimiting surveys). For the new financial period, the new LIFE regulation (or a Regulation similar to LIFE) could

[299] http://www.environment-agency.gov.uk/static/documents/Leisure/japnkot_1_a_1463028.pdf

explicitly reference IAS issues, based on a wider ecosystem-based approach, as part of the integrated mainstreaming approach supported by the Council.

Under the EAFRD, a two-pronged approach is necessary to support risk reduction practices in agriculture and forestry and phase out perverse subsidies that encourage high-risk practices. Additional opportunities exist to address IAS control under the cross-compliance rules (see 3.2.10) and to use an agri-environment measure on protection and promotion of local animal breeds and local plants to preserve these and traditional genetic resources. This measure could be deployed in both the prevention context (promotion of alternatives) and for restoration using existing/traditional and native species. For the new financial period, future rural development measures could explicitly integrate IAS criteria into enhanced payments for ecosystem services schemes to support stronger mainstreaming.

Under the EU Cohesion Policy, i.e. the Cohesion Fund and the European Fund for Regional Development (EFRD), a stronger focus has been given to support the prevention and mitigation of environmental risks. In addition, given the growing threats to biodiversity and ecosystem services, there could be an increasing interest in using the EU Cohesion Policy funding to support the conservation of biodiversity and the maintenance / restoration of ecosystems and their services. Previous invasions of alien species in Europe and elsewhere have shown that IAS can be considered a serious environmental risk, with possible severe socio-economic consequences and drawbacks for sustainable development. Therefore, it is foreseen that prevention of IAS risks and/or restoration of damage caused by IAS to ecosystems and their services could be one of the areas more explicitly addressed under the EU Cohesion Policy, e.g. a recipient of dedicated funding to support the policy goals.

Opportunities to integrate IAS more systematically into the future risk structure of existing public and private funds need to be further explored, notably from the perspective of natural disasters. For example, Madeira is shifting money to RD measure 126[300] to support eradication measures for pinewood nematode.

Other types of natural hazard associated with IAS include increased fire and flood risks. The transboundary and biogeographic dimension of IAS prevention and control activities should be explicitly recognised and scaled up, using funding opportunities under the Cohesion policy funded by the Structural funds.

Looking to the future, the Council has noted that adequate financing for biodiversity funding needs, including IAS activities, should be considered through the forthcoming EU budget review.[301] In the IAS context, the main gap consistently identified by MS and other stakeholders relates to up-front funding for early warning and rapid response.

The suggested framework of mandatory rapid response actions for 'IAS of EU concern' is designed to ensure that affected MS take prompt and consistent steps to tackle detected problems at an early stage. This is intended to reduce longer-term environmental and socio-economic costs, including possible intra-EU barriers to free movement of goods. The

300 *Axis 1: Restoring agricultural production potential damaged by natural disasters and introducing appropriate prevention actions*.

301 Council Conclusions 2009 §6

development of new obligations under existing or new legislation would have obvious financial implications.

The extent to which EU solidarity funding instruments could support new obligations will depend on foreseen changes under the AHR and PHR as part of their ongoing modernisation, including the possible inclusion of natural spread in the eligibility criteria for the PHR solidarity funds. Within the study's terms of reference, it is not possible to make more specific and detailed proposals. However, Chapter 6 presents a range of data and supporting analysis on the costs of the different types of measures / activities that could be co-funded, tailored to a gradient of ambition. This data can be used to inform the Commission's impact assessment and provide a foundation for more detailed assessment.

5.7 Other cross-cutting components

5.7.1 Awareness-raising and communication

***Suggested operational objective**: IAS have visibility as a shared European concern to build understanding and engagement amongst decision-makers, industry, interest groups and the general public.*

Spreading IAS messages to target audiences

The most desirable way to tackle IAS threats is to build awareness, foster responsible practices and support voluntary compliance. Europeans are a vital part of the solution. MS and the Commission have a key role in increasing public awareness, responsibility and education, and ensuring public participation and involvement.[302]

Education, information and awareness-raising campaigns are needed to influence future consumer behaviour and facilitating choices to reduce IAS risks. Better information on the reasons for concern and on the available alternatives can increase understanding of the challenges ahead and pave the way for more robust solutions.[303]

Improved public awareness can feed into political awarenesss and political support.[304] This could help environment authorities compete successfully for resources, speed up the adoption of legislation, increase the visibility of biodiversity amongst policy-makers and create more accountable decision-making.

[302] Council Conclusions §40.

[303] Modelled on EC 2009a (Sust. Transport COM: Behaviour: educate, inform and involve).

[304] e.g. public concern about the allergenic impacts of *Ambrosia artemisiifolia* in Switzerland and in Germany helped in monitoring the occurrence of the species and led to implementation of prevention and control measures on various levels from local to federal (Bohren 2006, Starfinger 2009).

Public awareness strategies are also an essential part of MS activities and should be planned and resourced as an integral element of IAS initiatives. Elements for consideration may include:

- incorporating information on biosecurity and prevention into educational materials;
- involving the public and relevant interest groups[305] in monitoring activities, with appropriate training and information materials;
- targeted awareness-raising to increase the chances of early detection of new IAS[306] and build understanding of why eradication may be necessary;
- actively encouraging the scientific and research community to support these efforts by ensuring prompt circulation of information on new arrivals;
- using an eradication or control programme to communicate information on what different stakeholders can do to reduce the chance of future incursions;
- involving interest groups and appropriate media channels in the design and dissemination of public awareness materials for both terrestrial and aquatic systems, including information on success stories and practical ways to reduce risks.

Information and communication campaigns

At EU level, the Commission may support national and/or regional initiatives through LIFE+ funding for information and communication campaigns.

Integrated EU communication strategies could be considered by relevant Commission DGs:

- for long-term information and education campaigns targeted at border inspection points and transportation carriers, to make travellers aware of applicable restrictions and the importance of quarantine for the public, transporters and producers;
- to discourage harmful introductions through e.g. passenger baggage, personal effects, mail services and the internet;
- to support communication tools for emergency alerts, such as airport and port posters;
- to incorporate information on IAS risks to biodiversity into relevant sectoral information materials (e.g. agriculture and forestry, fisheries, shipping, trade, animal and plant health);
- outreach activities to highlight applicable legal regulations and best practices through websites (e.g. for EU wildlife trade);[307]
- using possible 'flagship' IAS to build recognition and operationalise support (e.g. Asian Ladybird, red swamp crayfish, Asian tiger mosquito, Japanese knotweed, ragweed, *Ludwigia*).

[305] e.g. hunters, fishermen, birdwatchers, botanists.

[306] In the marine environment, several incursions have been detected by the general public (divers, fishermen) but usually only after the species is well established.

[307] http://www.eu-wildlifetrade.org/html/en/topics.asp#Welfare

It is particularly important to communicate the environmental and economic benefits of a robust IAS Strategy to the industries and operators whose actions and investments are affected and who are in a position to influence markets and consumer demand. Awareness-raising should highlight the importance of traditional species/plants (e.g. in agriculture and forestry decisions) and promote these as the best choice, both in terms of resilience and in economic terms, supported by cost-benefit analysis where necessary. Over time this can encourage market substitution and preference for native or non-invasive species (see also 5.1.4).

Targeted outreach activities to the public, based on a cross-sectoral approach where appropriate, can include web sites, newsletters and other media to circulate specific alerts.

5.7.2 National IAS strategy development and coordination

***Suggested operational objective**: Policy level direction, coordination and planning on IAS issues is enabled between key authorities and agencies, supported by a framework for stakeholder consultation and engagement.*

Each MS should develop and periodically update an IAS strategy, either stand-alone or within the context of its national biodiversity strategy. The appropriate level for such a strategy will vary between MS depending on its legal and administrative framework and its biogeographic characteristics. Each strategy needs to identify the respective roles and responsibilities of relevant bodies for implementation to ensure a streamlined approach to IAS prevention and management.[308]

Mechanisms to operationalise coordination between key sectors can contribute to issue visibility as well as efficient IAS governance. The US National Invasive Species Council[309] provides an example of legislative backing for coordination at federal level. The Great Britain Non-Native Species Programme Board, supported by a dedicated secretariat[310], provides an example of a non-legislative platform involving key administrations.

At EU or appropriate biogeographic level, the creation of one or more stakeholder fora on IAS could facilitate consideration of different socio-economic and environmental interests, including with regard to species already in trade.

In the UK, an IAS Stakeholder Forum is held annually and brings together representatives from a wide range of sectors involved with IAS issues including representation from industry and local action groups. The Forum provides an opportunity for debate on strategic issues

[308] See e.g. New Zealand's Memorandum of Cooperation between key departments responsible for aspects of environmental biosecurity (Annex 2).

[309] See Annex 2

[310] https://secure.fera.defra.gov.uk/nonnativespecies/home/index.cfm .

and is a means of engaging stakeholders in the development of non-native species policy and objectives. It also helps facilitate information exchange.[311]

5.7.3 Research

***Suggested operational objective**: IAS knowledge gaps, uncertainties and areas for technical innovation are strategically addressed through EU Research and Technological Development policies and programmes with adequate funding.*

The EU has already made substantial investments through its Research Framework Programmes to improve the IAS knowledge base and to develop more efficient risk assessment and management techniques for certain sectors.[312]

The Strategy should guide integrated research programming to decrease current biological uncertainties and improve science-based decision support to European institutions and MS, including within the framework of a future technical structure to support the IEWS (see 7.4).

IAS should be explicitly addressed in FP8 from 2013 to ensure the continued allocation of EU financial resources for practical activities to develop and implement IAS tools (e.g. as under DAISIE). The Commission may reference IAS in its annual Work Programmes in order to schedule some Calls for Proposals relevant to implementation of the EWRR system and/or the overall Strategy.

The EU has an important role to play in coordinating assessment frameworks and supporting the establishment of an appropriate network for information exchange. The results of IAS eradication and control actions and other relevant measures should be fed into the future IEWS to build knowledge on IAS as far as possible and target future research priorities. The results of EU-funded IAS research should be rapidly and freely accessible through online journals or equivalent mechanisms.

Priority topics for research should be defined in collaboration with relevant stakeholders, building on the objectives and activities envisaged under the Strategy. They may include:

- research to support the envisaged listing of 'IAS of EU concern' (4.4);
- continued development of common approaches and methodologies for RA (see 4.3);
- further streamlining of RA tools, procedures and capacity for specific sector pathways;
- design-focused research to improve industrial/transport equipment and practices (e.g. ship design) to reduce IAS vector risks;

311 https://secure.fera.defra.gov.uk/nonnativespecies/index.cfm?sectionid=45

312 e.g. DAISIE; PRATIQUE (Enhancement of Pest Risk Analysis Techniques); ALARM (Assessing Large-scale environmental Risk with tested Methods); IMPASSE (Environmental impacts of alien species in aquaculture); and EFFORTS (Effective Operations in Ports): see Scalera 2008 for details of other projects.

- improved surveillance and rapid screening techniques to support early warning and rapid response, including improved taxonomic identification tools;[313]
- studies on the ecological impacts of alien species and genotypes;
- studies on the effects of climate change on IAS;
- improved techniques for economic evaluation of IAS damage and cost-benefit analysis of prevention/management options relevant to specific sectors;
- continued development of indicators to measure IAS as a driver of biodiversity and ecosystem service loss and to support integration of IAS into EU and MS policies and programmes for relevant sectors.

High priority should be given to additional scientific and technical development under the WFD and the MSFD to support a common approach to developing potentially useful indicators, especially of impacts of IAS which remain the main concern for achieving good environmental status. At the European level, a programme should be planned to consider the scope to extend tools such as biopollution indices, developed in the marine context, across all types of surface waters, including their possible application to the WFD (based on ECOSTAT 2009).

The EU currently has a low record in terms of evidence on IAS impacts (Vilà et al. 2010). This is essential for prioritisation. The Strategy could provide for an up-to-date synthesis report on IAS impacts to be produced every 4-5 years by an appropriate body (possibly the European Environment Agency and the Joint Research Centre), based *inter alia* on the results from the EU Research Framework Programmes and national research.

5.7.4 Capacity building

***Suggested operational objective**: Targeted education and training of specialist personnel supports effective implementation of the Strategy and optimises synergies with capacity building programmes in related fields.*

The main needs identified through this study concern :

- training of and information materials on IAS legislation and other related issues for the staff of the national and local authorities in charge of implementing the Strategy (e.g. Ministry of Environment, Ministry of Agriculture, environmental agencies, etc.)
- training of and information materials for biosecurity officers/border control personnel, particularly for IAS diagnosis (taxonomic identification) and interception;
- training in RA in accordance with common EU approaches and available international standards[314], including with reference to risks associated with climate change;

[313] The forthcoming INTERREG Ballast Water Opportunity programme will provide for the development of rapid detection technologies for species in ballast water.

- training in IAS eradication and management;
- training of local staff in monitoring and surveillance.[315]

5.7.5 Beyond EU borders: external policies and international cooperation

***Suggested operational objective**: EU global footprint policies integrate IAS risks in sustainability impact assessment for external development and cooperation activities and trade negotiations. The EU cooperates actively with relevant international organisations to develop effective standards and policies to address IAS risks to biodiversity and ecosystem services.*

External assistance and development cooperation

Biodiversity and ecosystem services are critical to human wellbeing. Particularly in countries dependent on their natural resource base, IAS impacts can compromise livelihoods, food security, economic development prospects, adaptation to climate change and capacity to reach the Millennium Development Goals.

Activities under the Strategy funded by MS and the Commission should contribute to overarching EU objectives on sustainable development. IAS risks should be addressed as an integral part of biodiversity mainstreaming activities in the development strategies of both donor and recipient countries, using existing EU sustainability tools (EIA, Strategic Environmental Assessments).

For programmes that may provide pathways for potentially harmful introductions (e.g erosion control, reafforestation), IAS screening should be used in relevant EU-funded external assistance and development cooperation activities. Reference may be made to the European Bank of Reconstruction and Development's Environmental and Social Policy 2008, aligned with EU environmental policy, which sets out detailed requirements for clients seeking funds for projects involving IAS risks, including in the context of forestry and fisheries (EBRD 2008).[316]

At the biogeographic level, the Strategic Goals and suggested activities should guide the allocation of EU and MS funding for programmes and interventions in border regions and neighbouring countries that face common challenges of IAS prevention and management. This may include cooperation on biosecurity and control measures[317] to minimise the risk of

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[314] NB Existing WTO-SPS training courses, including capacity-building to meet the standards set by IPPC and OIE, do not specifically address the risks associated with trade of pets, aquarium and terrarium species, as live bait and live food as standard-setting for these matters are currently outside the mandate of standard-setting organisations..

[315] This is a pivotal point also emphasised in other IAS strategies e.g. US, New Zealand and Great Britain.

[316] In Australia, if invasive species are identified as an issue through AusAID's environmental assessment and management processes, an activity environmental management plan will be prepared. A country level SEA can provide information for partner countries and regional organisations to raise the issue of invasive species in aid programme consultations.

[317] Particularly in former Yugoslavia and eastern Europe, Norway and Black Sea countries e.g. western corn rootworm was found in Serbia and now causes a damage > 147 million EUR / year in Europe.

IAS spreading across borders into the EU, including in shared international river basins and in European regional seas.

International cooperation with trade partners

The Committee of the Regions has drawn 'particular attention to the significant risks inherent in opening up the markets to the distribution of potentially invasive natural or genetically modified species (and urged) the inclusion of biodiversity conservation requirements in all international trade agreements' (COR 2009).[318]

Assessment of IAS risks linked to trade and transport pathways should be included in Sustainability Impact Assessments (SIA) for future trade agreements at bilateral or broader level, and in targeted consultations with trading partners for specific pathway risks.

The EU should work in partnership with relevant international organisations (CBD, IPPC, OIE, WTO-SPS, IMO, CITES, etc.) that cooperate through the CBD-led Inter-Agency Liaison Group established in 2010, in particular on ways to address current gaps in the international regulatory framework for IAS prevention and management.

5.8 Synthesis of possible Strategy components under the respective COM Options

This section concludes the suggested outline for Strategy components. It brings together the list of the key vertical actions and cross-cutting elements with the measures that could be envisaged under each of the four Options proposed in the 2008 Communication. This synthesis is presented in Table 5-13 below.

The analysis in 5.1-5.7 has distinguished between voluntary and other measures not requiring a legislative basis and those that may require targeted legislative amendment, new legislation or a combination of the two. As noted, there are many possible combinations. Approaches to delivering the future Strategy are discussed in chapter 7 below.

[318] The 2006 EU Biodiversity Action Plan supported action to 'foster links between the WTO and biodiversity-related international agreements, and ensure biodiversity is taken into account as a Non-Trade Concern' (Action A8.1.2 Action Plan (SEC(2006)621).

Table 5-13 Synthesis of possible Strategy components under each of the COM Options

STRATEGY COMPONENT	COM OPTION A	COM OPTION B	COM OPTION B+	COM OPTION C
Overarching element: common framework for IAS risk assessment				
	National systems: some regional alignment (building on EPPO)	Regionally-driven informal technical expert network	EU expert panel(s) linked to one or more existing bodies	EU expert panel(s) linked to existing bodies or formally-constituted dedicated IAS expert panel
Prevention: intentional introductions				
Import, export and border control frameworks	• limited black listing • ad hoc MS action	• strong coordination of existing systems • voluntary species substitution and other measures	• optimised use of border/quarantine infrastructure & capacity • black list system (main focus on species cf. pathways) • PHR expansion enables import ban for some HOs with environmental impacts • WTR coverage of more species and impacts • prioritisation and increased capacity	• builds on B+ border/quarantine infrastructure and capacity • combined listing system (grey/black) for 'IAS of EU concern' AND/ OR white listing for some taxonomic groups • possible white listing for Outermost Regions • overarching RA criteria for biodiversity/ ecosystem services (policy-proofing) • strong basis for pathway approach
Intra-EU movement / holding	• no common black listing • unilateral MS measures	• guidance for MS /regional measures affecting Single Market • expanded voluntary instruments • informal duty of care under codes • general environmental liability	• use of PHR 'protected zone' mechanism to prevent further spread of some HOs • expanded WTR coverage including containment/captivity • possible listing of IAS-related occupational activities under Annex III, Environmental Liability Directive	As under B+ (as applicable) and • continuum of measures for 'IAS of EU concern' with explicit application to containment/captivity • formal framework for biogeographic listing • common risk-based criteria for harmonised approach (Single Market) to MS decision making on IAS of local/regional concern (subsidiarity) • possible adapted approach for Outermost Regions • occupational derogations/ incentive framework
Release into the natural environment	• variable and complex	• possibility but no guarantee of robust MS application • EU-level codes for key pathways (pets, horticulture, angling…) • EU occupational guidelines • voluntary consultation • general environmental liability • incentives for species substitution	• Similar to Option B	• white list (presumption of no release without risk-based screening and appropriate management) • coupled with occupational activity derogations: coherence / IAS policy proofing • terrestrial, freshwater and marine systems • mandatory transboundary consultation • Commission oversight/stronger role • strong incentive element
Prevention: unintentional introductions				
Pathway management for contaminants	• AHR/PHR • limited voluntary	• AHR/PHR combined with voluntary risk reduction measures • voluntary codes for vectors e.g. disposal of soil • general environmental liability • education and awareness	• optimised use of border/quarantine infrastructure & capacity • AHR limited expansion to some pathogens affecting biodiversity • PHR possible expansion to some IAS pathways (climate change dimension)	As under B+ and • formalised inter-agency coordination • expanded pathway analysis addressing IAS • environmental biosecurity focus via respective implementation instruments

STRATEGY COMPONENT	COM OPTION A	COM OPTION B	COM OPTION B+	COM OPTION C
			• new pathway/vector standards linked to international developments • cost recovery mechanisms • driver for industry best practices e.g. certification, HACCP	
Pathway management for transport vectors	• IMO standards and guidance • limited voluntary	• additional voluntary codes for vectors e.g. recreational boating	• optimised use of border infrastructure • expanded pathway coverage (e.g. hull-fouling) • EU technical support (EMSA etc.) • strong incentive framework	As under B+ and • EU-level decision support systems for key vectors • attention to inland (intra-EU) and inter-island water routes • increased investment in inspections & compliance
Managing IAS dispersal within the EU	• voluntary mainstreaming	• guidance on avoidance/mitigation • cooperative management at catchment level	• IAS criteria in SEA/EIA frameworks for transport infrastructure • WFD-coordinated indicators/methods to address spread between river basins • possible PHR extension to cover natural spread (cf movement) backed by existing solidarity funds • fuller consideration of climate change risks in PHR context	As under B+ and • climate change mainstreaming in aquatic infrastructure management • coherence on policy trade-offs, criteria and priorities • natural IAS dispersal integrated as a management issue in broader policies
Early warning and rapid response				
Inventories and horizon scanning	• voluntary	• coordination and exchange of information between concerned people	As under B + optimised use of AHR/PHR mechanisms	• operational national systems for IAS data collation (linked to IEWS)
Surveillance and monitoring	• voluntary	• regional voluntary networks • MS IAS surveillance & monitoring for existing and new IAS, integrated in existing systems where feasible	As under B + optimised use of AHR/PHR mechanisms	• possible mandatory actions for 'IAS of EU concern' • further consideration of funding through cost recovery mechanisms and/or possible co-financing
Identification and screening	• voluntary	• extensive use of existing tools and further development/improvement of new tools (e.g. fact sheets, guides, etc.) • increased likelihood of adequate expertise available within the network	As under B + optimised use of AHR/PHR mechanisms	• EU-level monitoring & rapid screening (IEWS)
Notification and follow-up reporting	• voluntary	• regional voluntary networks with facilitated information flow	As under B + optimised use of AHR/PHR mechanisms	• possible mandatory actions
Contingency planning for rapid response actions	• voluntary	• voluntary, but with increased coordination between countries with same problem • increased synergy in terms of human and financial resources	As under B + optimised use of AHR/PHR mechanisms	• possible mandatory actions for 'IAS of EU concern' • further consideration of funding through cost recovery mechanisms and/or possible co-financing

STRATEGY COMPONENT	COM OPTION A	COM OPTION B	COM OPTION B+	COM OPTION C
Control and management				
Common framework for MS actions		• national IAS action plans for national/local priorities	As under B	• EU framework for MS level actions • formal basis for liability/compliance
EU-level actions		• EU action/management plans for selected IAS	As under B	• possible mandatory actions for 'IAS of EU concern' • further consideration of funding through cost recovery mechanisms and/or possible co-financing
Ecological restoration				
	• voluntary and ad hoc	• optimised use of existing funding instruments eg EAFRD • optimised use of liability instruments e.g. remediation responsibilities & cost recovery explicitly addressed • informal mainstreaming • exchange of best practices	• restoration of IAS damage explicitly addressed in FCS measures under nature Directives • green infrastructure • clarification /development of WFD/MSFD indicators • integration of restoration targets in e.g. marine biogeographic regions under MSFD	As under B & B+ + • clear baseline, targets and criteria for post-2010 • framework for policy trade-offs
Responsibilities and financing				
	• ad hoc	• scaled up • supported by best practices • stakeholder backing	As under B + Annex III Environmental Liability Directive	Coordinated framework optimising use of codes of conduct, market-based instruments, cost recovery mechanisms and EU financial instruments
Cross-cutting components				
Awareness raising and communication	• voluntary	• major programmes rolled out at EU and other levels	As under B	As under B
National IAS strategy and coordination	• voluntary	• voluntary and actively encouraged	As under B	• mandatory IAS strategies • designation of competent authorities • high-profile stakeholder fora meeting regularly
Research	• no overall strategic coordination	• strategic coordination	As under B	As under B
Capacity building	• ad hoc	• coordinated e.g. at biogeographic level	• optimised use of EU funding instruments	As under B+ • scope to consider additional funding
Development and international cooperation	• no systematic consideration	• voluntary inclusion by MS	• IAS considerations formally integrated in e.g. SIA and SEA tools	• formal framework for integration of IAS across EU external policies

6 Costs of suggested key components and benefits of investment

Chapter 6 presents an assessment of the foreseen total scale / level of costs of a comprehensive EU IAS policy, associated with the adoption and implementation of the EU IAS Strategy.

Given the data limitations, the costs presented in this Chapter should be treated as initial and indicative. Regardless of these limitations, however, the developed estimates are considered as a reasonably robust indication of the likely scale of costs associated with the future EU action on IAS.

Note: A number of the outlined measures for IAS are already taking place at the Member State level, therefore the costs presented in this Chapter are the foreseen overall costs of a comprehensive future policy on IAS in the EU, not incremental costs of the adoption and implementation of EU IAS Strategy. The costs of action noted in this report should therefore be seen as an overestimate of the incremental costs of action. The benefits values presented in this report, on the other hand, focus on the potential IAS cost avoidance benefits from actions beyond what is already done. The benefits assessments are from that perspective arguably an underestimate of total potential benefits of action (existing and new).

This Chapter provides an overview of the estimated, indicative level / scale of costs (e.g. a range of administrative costs) that may be associated with a comprehensive EU action on IAS, e.g. the implementation of the key components of the future EU Strategy. The measures / actions for which costs are estimated have been identified based on the discussion and analysis in Chapter 5 above.

The main measures / actions for which the possible level / scale of costs are estimated include:

- **costs of preventative actions**, e.g. EU information and early warning system, IAS risk assessments, management of key IAS pathways and monitoring (see 6.2-6.5);
- **costs of rapid response actions**, e.g. contingency planning and capacity for rapid response / eradication (see 6.2);
- **costs of IAS control, management and restoration** (see 6.7);
- **costs of key horizontal measures** e.g. costs of IAS policy development, administration and coordination of IAS policy, costs of stakeholder consultation and engagement and research (see 6.8-6.10); and
- **costs of key voluntary actions** (see 1).

- The chapter also aims to consider the **overall costs of EU action on IAS**, including highlighting the variety of **possible benefits** associated with the implementation of the future EU Strategy (see 6.12). In this context, the key new costs related to the implementation of the EU IAS Strategy (vs. costs of already existing efforts) and the possible time scale for different costs are being briefly discussed. Also, cost implications (i.e. cost savings) resulting from possible future synergies between the future EU IAS Strategy and other relevant policy sectors (e.g. the EU Plant Health Regime) have briefly been discussed. Finally, the possible level / share of cost of compliance and enforcement to private actors within the context of above measures has been discussed (see 6.12.2).

6.1 Approach and methods for estimations

Approach & data. With the agreement on the scope and content of the EU IAS Strategy still pending, it is not possible to define the exact range of measures (e.g. the related requirements and timelines) to be implemented as the consequence of the upcoming Strategy. Understandably, this prevents any detailed estimation of the costs related to adoption of the EU IAS Strategy at this stage. Therefore, the aim of the assessment has been to provide an initial indication of the possible scale / level of costs associate with a set of key measures foreseen to be part of a comprehensive action on IAS at the EU level. When relevant, an indicative range of costs has been developed to illustrate different levels of investment / ambition possible to be adopted in implementing the given measures. Finally, some consideration has also been given with regard to the possible distribution of costs between the EU, MS and other possible stakeholders. The data have been presented in a transparent manner that should allow for further assessment / extrapolation of costs once a more definitive decisions on the scope and content of the EU IAS Strategy have been taken.

The cost estimates presented in this Chapter have been developed based on two key data sources: 1) information on the costs of existing / ongoing IAS measures, both within and outside the EU and 2) information on the costs of mechanisms and measures from parallel policy areas, considered as reasonably good match with the foreseen measures required for IAS (e.g. the EU frameworks for plant health and international wildlife trade). In addition, general information on the monthly salaries in the EU has been used to estimate the possible levels of administrative costs. Due to the limited information available (see below), in a number of cases the estimated level of costs at the EU level (i.e. EU 27 Member States) has been developed by extrapolating the available national costs, usually available for few Member States only. Consequently, since the analysis is based on extrapolations and/or indicative data from other policy areas the results are presented as the scale / level of costs, not as exact / comprehensive cost estimates (e.g. often using 'rounded up' figures). For example, the information on the European Food Safety Agency (EFSA) budget for plant health ranging from 756 246 – 1 101 000 EUR per year (2008-2010) has been simplified into ~1 million / EUR / year to indicate possible costs for establishing a dedicated IAS risk assessment framework at the EU level.

As for the EU information and early warning system (IEWS), a recent assessment by Genovesi et al. (2010) for the EEA on the possible options for an European-wide IEWS (e.g. foreseen costs) has been used as a basis for the analysis. In addition, a questionnaire was circulated to the national focal points of the NOBANIS network countries and some additional Member States in order to assess the costs of current and future IEWS activities at Member State level. In total 10 countries replied to the questionnaire, corresponding to 37 per cent of EU Member States. Information was also gathered at the NOBANIS network level. More detailed information on the questionnaire results is given in Annex 4 of this report.

Caveats & limitations. The earlier assessments of IAS impacts and policy framework in the EU have noted significant gaps in the available documented data on the costs of IAS measures (e.g. Kettunen et al. 2009, Shine et al. 2008, Scalera 2008). Consequently, as outlined above, the assessment of costs is largely based on the interpretation and extrapolation of existing costs at/to the EU level, e.g. costs of measures from other policy areas. Given these data limitations, the estimated costs of measures to implement the foreseen key EU Strategy components presented in this Chapter should be treated as initial / rough estimations of the level / scale of costs associated with the implementation of IAS measures at the EU level (i.e. not a comprehensive and/or detailed assessment). A short consideration of the robustness, e.g. shortcomings and uncertainties, of the estimates has been provided in the beginning of each section. Regardless of these limitations, however, the developed estimates are considered as a reasonably robust indication of the likely scale of costs associated with a comprehensive EU action on IAS, e.g. the future implementation of the EU IAS Strategy.

Overlaps between estimated costs. The 'breakdown' of identified key measures used in the analysis has been carefully considered so that the different measures should as much as possible be complementary, rather than overlap, with one another. However, since the information available to estimate the scale / level of costs for these measures is limited some overlaps between estimated cost have been unavoidable. An indication of the possible overlaps between the cost estimates has been provided in the beginning of each section.

New vs. ongoing costs. It should be noted that it is has not been possible at this stage (e.g. with the detailed scope and measures of the EU IAS Strategy still being discussed) to quantify the incremental cost adopting a comprehensive EU action on IAS, e.g. additional costs directly associated with the implementation of the EU Strategy (i.e. new costs brought forward by the Strategy vs. costs of already ongoing actions). Consequently, the costs presented in this Chapter reflect the estimated scale / level of total costs related to the EU action on IAS, including a range of new and already existing actions at the EU and national level. It is, therefore, to be kept in mind that a number of the outlined measures for IAS are already taking place at the Member State level and that the total costs presented in this Chapter do not related to required new investments alone. The total cost of action given here should be seen as an overestimate of the actual likely incremental costs of additional actions. A qualitative analysis identifying the most substantial new costs foreseen to be associated with the adoption and implementation of the EU Strategy are given in Section 6.12.

Timeline & level of ambition. Different IAS measures can, of course, be taken within different timescales. Similarly, a varying level of investment / ambition can be used to implement these measures. Without a clearer indication of the timescale for and ambition of different measures it has not been possible to develop a comprehensive / very detailed overall aggregate estimate for the total (e.g. annual) costs of EU action on IAS, e.g. implementing the EU Strategy. For example, monitoring activities are a critical issue for the effectiveness of IEWS. A comprehensive assessment of all taxa in all regions requires high investments whereas relying on the monitoring schemes already in place at national and local provides a less complete picture with no extra cost. Therefore, the assessment of the overall scale / level of costs for implementing the EU Strategy should be taken as indicative.

Foreseen benefits. Finally, IAS are a relatively new area of policy action therefore existing information on the benefits of IAS measures is limited (e.g. Kettunen et al. 2009, Shine et al. 2008, Scalera 2008). Furthermore, it is often not feasible to quantify (e.g. monetise) the full range of benefits related to prevention and control of IAS (e.g. biodiversity benefits). Consequently, the consideration of benefits related to IAS measures in the context of this study remains rather generic and based on the insights on the costs of IAS impacts and the benefits of avoided impacts.

6.2 EU information and early warning system (IEWS)

Key information for interpreting the estimates

Approach & data: Level / range of costs at the national level are based on the data from the NOBANIS network and ten (10) NOBANIS network countries. The national level costs include running costs of IEWS (e.g. personnel and equipment costs, including overheads), costs of developing and updating national inventories, coordinating and gathering data from monitoring / surveillance activities at national level (i.e. costs of 'on the ground' monitoring excluded) and external assistance (e.g. for IT expertise). Note: information on the costs of IEWS related research activities and carrying out risk assessments at national level were also collected but to avoid overlaps this data was used in sections 6.3 and 6.10 below. See Annex 5 for more detailed information on these estimates. The information on the costs at the EU / European level are based on an earlier analysis carried out by Genovesi et al. in 2010. These costs include the overall budget needed to establish IEWS technical structure (e.g. network, an observatory, an agency, etc.) with the declared task to coordinate the activities and facilitate the flow of information between the concerned actors and institutions. As such, the calculation of the costs for such a technical structure didn't include specific 'on-the-ground' monitoring activities and risk assessment related work.

Robustness & limitations: Regarding the national data, the number of countries that provided information via the questionnaire is partial (37 per cent of EU-27). Therefore, the results and the related extrapolations are indicative only, reflecting the perceptions of the Member States responding to the survey. Regarding the EU level analysis (Genovesi et al. 2010), the costs of different IEWS options can be regarded as tentative estimates that have been developed on the basis of similar existing structures and expert analyses in the context of the DAISIE project.

Overlaps with other estimates: The estimated IEWS costs should not, in principle, overlap with other cost estimated presented in this Chapter. The costs of EU and national level RAs, foreseen to be integrated into the IEWS systems as appropriate (e.g. if the EU IAS strategy will include some kind of formal regulation of trade) are considered separately in section 6.3 below.

Possible cost-savings: See 6.3 below.

The baseline analysis shows that this type of system does exist for some EU sectors, namely animal and plant health. At the pan-European level, in the plant health sector, EPPO operates as a central authority, developing reference lists, collecting information on new incursions and notifying member countries of the presence in their territory of new plant pests that need to be managed. To run such a system EPPO has a central headquarters, a permanent secretariat and a small permanent staff dedicated to reporting. Outside these two sectors, there are no dedicated networks of competent authorities in Europe to support early detection and surveillance of other IAS.

The development of a European or EU-wide system could build on a number of valuable decision support tools that are already available. For example, IAS inventories such as DAISIE (en EU-funded FP6 project) and the NOBANIS network[319] exist at the regional level. Making the best use of such existing databases and other tools is foreseen to limit the investments necessary to establish an information and early warning system for the EU. It is acknowledged that other database and inventories exists at the global level (see Genovesi et al. 2010), however their utility in this context is considered to be limited as they are not European focused and some might not be freely available to users.

The estimates presented in this section on the costs for implementing an early warning and information system(s) in the EU, are based on the figures reported in Genovesi et al. (2010) and the data provided by a number of Member States in reply to a dedicated questionnaire circulated in June 2010. Considering the limited number of countries that provided information via the questionnaire (37 per cent of EU-27) the results and the relative extrapolations must be considered indicative only. On the other hand, it must be acknowledged that some of the respondent countries made a special effort in assessing the potential costs of a framework which is currently being tested by just a few countries in Europe and the world (i.e. the baseline information is limited). As a consequence, the figures collected reflect the assessments made by the single countries and their 'subjective' perception of the IAS problem and of the resources / level of ambition needed to deal with it.

Based on the survey carried out in the context of this study, it appears that several European countries are developing national information systems and/or coordinated programmes for IAS. These systems and programmes are based on inventories of alien species, development of decision support tools such as alarm lists and establishment of technical panels and rapid response working groups. In fact, the actual costs currently paid by some MS to implement elements of an information and early warning system in their territory, as revealed from the responses by the countries which replied to the questionnaire, show that the level of resources currently invested varies widely, from a minimum of only 2500 EUR / year (Lithuania: simple maintenance of a national database) to 625 000 EUR / year (Netherlands: a comprehensive national programme for early warning) (Table 6.2). On average the current expenditure of each MS (calculated on the figures

[319] NOBANIS network maintains and constantly updates a list of alien species for countries participating in the network.

provided by 10 countries) amount to over 122 000 EUR / year. Such figure could be even higher if we consider the need for implementing risk assessment (RA) related activities which are currently fully integrated on the IEWS framework of measures on a sub-sample of four countries only, e.g. ranging from 10 800 EUR / year in the case of Sweden up to 225 000 EUR / year for the Netherlands (Note: these RA costs are not included in Table 6.2 below as they are considered in section 6.3 below). Thus, based on the information available, the efforts to establish and maintain their national information systems seem to be taking a considerable amount of MS resources.

Based on the information in Table 6.2 below, the costs of national IEWS could significantly rise in the future close to 450 000 EUR / MS, according to the data provided by a six countries on the estimated costs related to develop a basic national information system on IAS. On the basis of this average figure, the total costs that the EU-27 would spend if each MS is expected to undertake measures to implement its own basic early warning and information systems (e.g. without the central coordination of a EU technical structure) would be extrapolated in around 12 million EUR / year. Again, such figure would not be inclusive of the costs for risk assessment related activities considered in section 6.3 below.

The information compiled was used to carry out a preliminary assessment of the benefits and costs for developing a centralised information system (i.e. potential cost savings). The comparison is based on the assumption that a centralised system could reduce the complexity of individual national systems by carrying out some of their functions and optimising synergies. It is assumed, for example that with a fully operational European information system, individual countries will only need to provide simple inventories of alien species recorded in their territories whilst the centralised system would produce information at the EU level, e.g. robust EU-level alarm lists and expansion models. Also, it is assumed that if no centralised system were developed, individual countries would eventually need to establish complex structures for data handling with significant costs for the national authorities (i.e. as already developed in the Great Britain and the Netherlands).

Assuming that the establishment of an effective information system at the EU level would limit the investment in MS to the development and maintenance of a basic national databases these costs, according to the data provided by a subsample of six countries only, would range from 2500 EUR / year in the case of Latvia, to 55 000 EUR / year for Austria. On the basis of such figures, on average the costs for each MS would be around 26 000 EUR / year / Member State (Table 6-2).

Given urgency to set up IEWS system(s) to promptly and effectively respond to the threat of biological invasions, it is very likely that in an absence of a centralised EU IEWS system MS would soon need to develop their own independent and fully operational IEWS at national level. On the basis of the response provided by a subsample of eight countries, the implementation of a fully operational independent national IEWS would require an average budget of around 1.35 million EUR / year / Member State, ranging from 25 500 EUR / year for Latvia to 9.5 million EUR / year for Sweden. On the basis of this average, the extrapolation of the total expenditure for the EU-27 would amount to over 36 million EUR / year. It therefore appears that the establishment of a European centralised IEWS may reduce the overall required investment at the national level (See Annex 4 for more detailed

information on these estimates). Again, these figures do not include the costs for foreseen risk assessment considered in section 6.3 below.

Regarding the estimated costs of a pan-European framework based on a central information system, a previous assessment by Genovesi et al. (2010) has shown that establishing a coordinated early warning and rapid response framework the EU (and extending it also to the pan-European region) would require between a minimum of 300 000 EUR / year up to a maximum of 6 million EUR / year depending on the levels of commitment by EU institution and MS, e.g. differing budgetary and personnel needs. For example, a dedicated structure could take the form of a scientific panel, an observatory, or a centralised agency which would cost respectively 300-500 000 EUR/ year, 1,5-2 million EUR / year, and 3-6 million EUR / year. At the most comprehensive level, it has been estimated that the development of a dedicated and comprehensive European biosecurity policy would require a budget in the order of magnitude of 10 billion EUR / year. A more detailed description of the alternative architectures proposed for developing a European framework is given in section 7.4.

Table 6-2 Examples of the current & estimated levels of costs related to IAS information and early warning systems at national level (EUR / year). Information presented in this table is based on the questionnaire to the NOBANIS network member countries, see Annex 4 for more information.

	Austria (EUR / year)	**Denmark** (EUR / year)	**Finland** (EUR / year)	**Ireland** (EUR / year)	**Latvia** (EUR / year)	**Lithuania** (EUR / year)	**The Netherlands** (EUR / year)	**Spain** (EUR / year)	**Sweden** (EUR / year)	**UK** (EUR / year)	**AVERAGE** (EUR / year)
Present level of expenditure	5.000	7.500	17.000	36.552	2.500	2.500	625.000	33.000	329.800	170.000	122.885
Estimated costs for collecting information only (literature search, experts networking, etc)	55.000	7.500	50.000	28.486	2.500	12.500	Not available	Not available	Not available	Not available	25.997
Estimate costs for developing a basic national system on IAS	112.000	100.000	Not available	Not available	6.000	30.000	Not available	14.000	2.410.000	Not available	445.333
Estimated costs for developing a fully operational national information system	240.000	200.000	500.000	110.500	25.500	55.000	Not available	Not available	9.500.000	170.000	1.350.125

6.3 IAS risk assessment

Key information for interpreting the estimates

Approach & data: Levels / ranges of costs for EU level are developed based on drawing parallels with existing RA mechanisms in the context of plant health (EPPO) and food safety (EFSA). The number of species / pathway specific RAs needed at the EU level has been roughly estimated based on the existing information and information from experts. The costs of national RA mechanisms are based on information collected via a questionnaire outlined in section 6.2 above.

Robustness & limitations: Apart from current costs of national RAs, the estimates are based on expert opinion / estimates and parallels from other policy areas. Consequently, they should be considered as indicative only. Finally, no information on the level of efforts and investment needed to address other important IAS pathways, such as inland water routes and air traffic, could be found.

Overlaps with other estimates: The estimated RA costs should not, in principle, overlap with other cost estimated presented in this Chapter, e.g. the estimated costs of EU and national level IEWS above (section 6.2) do not integrate costs for RAs.

Possible cost-savings: Depending on the design of the EU level IEWS, the estimated costs of the EU-level expert panel and the frameworks for marine pathway RAs could diminish, as the latter could be integrated into the general IEWS(s). Also, staff costs related to species-specific RAs could be partly covered under IEWS or a dedicated body for IAS (i.e. the highest level of ambition in section 6.8). However, the existing (broad) estimates and information on the scope of EU IAS Strategy / IEWS do not allow a more detailed co-analysis / consideration of possible cost savings at this stage. Also, port baseline surveys could be reduced by linking them with 'on-the-ground' monitoring activities in marine environments (6.5 below).

Species- and pathway-specific risk assessments (RAs) are needed to estimate the risks associated with the introduction of alien species to / within the EU and identify and justify measures to control the spread of likely / potential IAS. Consequently, these measures are foreseen to form one of the key requirements (i.e. cost items) for implementing the EU Strategy. In addition, the development of an EU-wide risk assessment framework, based on actions at MS level and complemented by the establishment of an EU-level expert panel, is needed to oversee and coordinate IAS risk assessment activities within the EU. In general, it is foreseen that the RA related activities, both at the EU and national level could be closely interlinked with the functioning of IEWS mechanisms.

According to available information, the indicative costs of an EU-level expert panel for IAS risk assessment are estimated to be around 1 million EUR / year (Table 6-3 below). This rough estimate is based on the costs of a similar type of expert structure within the European Food Safety Agency (EFSA), created to support pest risk analyses under the EU plant health regime. In general, these estimated EU-level costs are foreseen to cover the expert panel's efforts in leading / coordinating the development of EU-level risk assessments, cooperation with external experts and panel members' travel and subsistence costs. However, the estimate excludes the costs of general institutional framework(s) to support the work of such a panel (e.g. library maintenance). In general, it is foreseen that the establishment of an EU-level expert panel could help to create synergies within the EU e.g. lower the costs of RA frameworks at the national level.

In addition to forming a dedicated risk assessment panel, it is also foreseen that the increased production of different species-specific risk assessments under the Strategy will require input from different European experts. The costs of such support are estimated to be around 15 000 EUR / species-specific assessment (total) (Table 6-3). This estimate is based on the dedicated EPPO budget for carrying out pest risk assessments, including travel and subsistence costs of 5-10 external experts for a 4-day workshop.[320] In addition to the costs of dedicated workshop, it is foreseen that dedicated staff time (e.g. EU level and national experts) would be required to complete a RA (see Table 6.3). In total, the cost of a species-specific RA could be around 42 000 EUR / RA (total). Depending on the level of ambition in implementing the EU Strategy, this could amount to a varying cost amount per year. Based on existing information on the number of invasive / potentially invasive alien species in Europe with record of impact, as proposed in the preliminary European black list developed by Genovesi and Scalera (2007) for the Council of Europe and by Genovesi et al. (2009)[321] for the EEA, the number of species-specific RA needed at the EU level could be roughly estimated at between 515 – 1200 assessments in total (see Table 6-3), depending on the agreed level of ambition (e.g. agreed approach to 'IAS of EU concern'). This can result in total costs of 22 – 50 million EUR in future years for species-specific risk assessments.

Note: RA related staff / expert costs are likely to be diminished by streamlining EU / national RA framework with IEWS and/or establishing an comprehensive body for IAS policy (sections 6.2 and 6.8).

At the national level, according to available information the current costs of national RA activities range between 10 800 – 225 000 EUR / year (including a national RA framework and carrying out species-specific assessments) (Table 6.3 below). Furthermore, Sweden has estimated that a basic, but comprehensive, RA framework at MS level to complement the EU IEWS (section 6.2) could cost around 500 000 EUR / year. Furthermore, this figure would rise to 2 million EUR / year in the case of implementing fully operational IEWS at the national level, without an EU level IEWS.

Managing the introduction of potential IAS into the EU also requires assessment of the risks related to the spread of alien species via identified key pathways. In this context, the risks of IAS introduction via marine vectors (i.e. ballast water, hull fouling) are considered one of the most crucial pathways to be addressed. The costs of marine pathway risk analysis in the EU can vary greatly according to the level of ambition. At the minimum level of prevention, basic ballast water reporting requirements can be established to assess and manage the risks of marine invasions in the EU (e.g. to report the origin, amount, frequency etc. of ballast water). At an intermediate level, more detailed risk assessments can be carried out to estimate the level of IAS risks associated with a number of key shipping routes to / within in the EU (e.g. risks related to both ballast water and hull fouling). At a higher level, the comprehensive management of risks associated with spread of alien species via marine pathways would require the establishment of an EU-wide decision support system (DSS) for

[320] Note: EPPO staff costs and staff costs of national experts outside the workshops excluded.

[321] Genovesi P., Scalera R., 2007. Assessment of existing lists of invasive alien species for Europe, with particular focus on species entering Europe through trade, and proposed responses. Draft. 37 Pp. Convention on the conservation of European wildlife and natural habitats. Standing Committee 27th meeting, Strasbourg, 26-29 November 2007. T-PVS/Inf (2007); Genovesi P., Scalera R., W. Solarz, D. Roy, 2009. Towards an early warning and information system for invasive alien species (IAS) threatening biodiversity in Europe. European Environment Agency, Contract No. 3606/B2008/EEA.53386, ISPRA, Rome.

marine pathway risk assessments. This EU-wide system is foreseen to be supported by a more comprehensive number of shipping route-specific assessments and by carrying out port baseline surveys and implementing decision support systems (DSS) in a number of key EU ports. The estimated annual and/or total costs for these activities are outlined in Table 6-3 below.

The estimated key costs of establishing a general framework(s) for IAS risk assessment at the EU level as outlined above should be considered as indicative only. For example, it could also be advisable to consider establishing risk assessment frameworks for a wider range of IAS pathways to/within the EU. However, no comprehensive information on the level of efforts and investment needed to address other important IAS pathways, such as inland water routes and air traffic, at the EU scale could be found in the context of this study. Naturally, the establishment of additional pathway-specific RA frameworks would increase the total RA related costs. On the other hand, depending on the design of IEWS at EU and national level the estimated costs for the EU-level expert panel and DSS mechanisms could diminish as the latter could be integrated into the general IEWS 'design'. However, the existing (broad) cost estimates for these mechanisms and information on the possible scope of the EU level IEWS do not allow for more detailed co-analysis / consideration of possible cost savings at this stage.

The costs associated with IAS risk assessments are foreseen to be distributed between the EU, MS and other relevant stakeholders. For example, it is likely that the EU would take responsibility for carrying out and financing the risk assessments related to the identification of possible 'IAS of EU concern' whereas MS and other stakeholders (e.g. private actors) would cover the costs of RA to justify possible restrictions and/or authorisations for movement of IAS at national, subnational or local level. Possibilities for cost recovery could be further explored: for example, the costs of marine pathway risk assessments can be at least partially covered by shipping operators and port authorities (see also 6.12.2 on costs of compliance).

Table 6-3 Estimated level of costs for IAS risk assessments

Costs at Member State level estimated for one Member State. Note: the estimated level / scale of costs is indicative only.

STRATEGY COMPONENT			ESTIMATED COSTS OF THE STRATEGY COMPONENT		DATA & APPROACH USED TO DEVELOP THE ESTIMATE	
Type of cost		Level of investment / coverage / ambition	Cost item / indicator of costs	Estimated level / scale of costs	Data and approach	Origin / reference
PREVENTION: risk assessment						
Development of an EU-wide risk assessment framework	IAS risk assessment framework at an EU-level	N/A	Costs of an EU-level expert panel for IAS risk assessment, based on the costs of European Food Safety Agency (EFSA) scientific panel / advice re: plant health	1 million EUR / year	Annual EFSA budgets for plant health: 756 246 EUR (2008) / 1 390 000 EUR (2009) / 1 101 000 EUR (2010) = roughly around 1million EUR / year. These budget costs include scientific co-operation with external experts, subventions for studies and evaluations, travel / subsistence and indemnities expenses for members of the Panel and its Working Groups. **Note:** estimate excludes the costs of general EFSA structure / framework (e.g. maintenance of library) supporting the work of experts **Note**: depending on the design of EU level IEWS cost savings could occur, i.e. DSS system could be integrated into the general IEWS framework.	Annual EFSA budget for plant health: http://www.efsa.europa.eu/en/keydocs/docs/budgetplan2010.pdf
	IAS risk assessment framework at Member State level	N/A	Costs of risk assessment mechanism at Member State level, based on the costs of the risk assessment mechanism in several EU MS	86 000 - 500 000 EUR / year / Member State	Current cost of staff and for running the Great Britain Risk Assessment Mechanism £ 70,000 per year (~80 000 EUR / year) of which £17 - 20 000 are cost of RA expert panel and the rest costs of species-specific RAs; current RA related activities in Ireland 30 000 EUR / year; current RA related activities in the NL 225 000 EUR / year; costs of current RA related activities in Sweden 10 800 EUR / year and estimated costs for a basic but more comprehensive RA framework that would complement EU IEWS 500 000 EUR / year. Based on these known / estimated cost the level of national RA costs could be estimated an average ~86 000	Questionnaire to NOBANIS network in the context of this study, Annex 5.

					EUR / year for existing activities and possibly to 500 000 EUR / year for a future need for a basic RA framework.	
Species-specific assessments	Carrying out species-specific risk assessment at EU level	Low	Costs or risk assessments (total / one off) for a total of **515 species**	22 million EUR / total (over several years) i.e. 2.2 EUR / year for a 10-year time horizon	EPPO budget for each European level pest risk assessment = 15 000 EUR (total) (e.g. travel costs + per diem for 5-10 experts for a 4-days workshop). EPPO staff costs and staff costs of national experts outside the workshops excluded. Consequently, it is estimated that around 30 expert / staff days (900 EUR /day) could be required to complement workshops = 42 000 EUR / RA. **Note**: RA related staff costs are likely to be diminished by streamlining EU / national RA framework with IEWS / establishing an comprehensive body for IAS policy (sections 6.2 and 6.8). Estimated range of foreseen species-specific risk assessments at the EU level (i.e. for IAS of EU concern): the number of 'worst' invasive alien species in the EU is 515 (Genovesi & Scalera 2007 for Bern Convention) and the provisional black list based on DAISIE include over 1200 species (Genovesi et al 2009 for EEA)	EPPO costs: Riccardo Scalera pers. comm. in the context of this study. Costs of expert / staff input: team's own estimate. RAs foreseen to be required: Piero Genovesi (IUCN Invasive Species Programme) pers. comm. in the context of this study, based Genovesi P. & Scalera R. 2007. Assessment of existing lists of invasive alien species for Europe, with particular focus on species entering Europe through trade, and proposed responses. Draft. 37 Pp. Convention on the conservation of European wildlife and natural habitats. Standing Committee 27th meeting, Strasbourg, 26-29 November 2007. and); Genovesi P., Scalera R., W. Solarz, D. Roy, 2009. Towards an early warning and information system for invasive alien species (IAS) threatening biodiversity in Europe. European Environment Agency, Contract No. 3606/B2008/EEA.53386, ISPRA, Rome.
		Moderate	Costs or risk assessments (total / one off) for a total of **850 species**	35.7 million EUR / total (over several years) i.e. 3.57 million EUR / year for a 10-year time horizon		
		High	Costs of risk assessments (total / one off) for a total of **1200 species**	50 million EUR / total (over several years) i.e. 0.5 million EUR / year for a 10-year time horizon		

	Carrying out species-specific risk assessment at MS level	N/A	Integrated (to a certain extent) in the costs of national RA systems above			
Pathway-specific assessments: marine pathway risk analysis	Establishing a comprehensive EU-wide system for marine risk assessments	Low	Costs of establishing / implementing basic ballast water reporting requirements at the EU level, based on similar costs under the EU Plant Health Regime	4000 EUR / shipping operator / year	Estimated time needed for private operators for registration and keeping records under the EU Plant Health Regime (EU-24): 40 hours / private operator / year (20 hours / activity). Estimated associated costs (with assumed 750 EUR day rate for 7.5 h working day): 4000 EUR / year / operator **Note**: Basic reporting requirements foreseen to cover origin, amount, frequency etc. of ballast water. Compilation of information at the national and EU-level carried out by the national and EU EWRR systems (See 6.2 above). Cost of risk assessment per shipping route: 50 000 EUR / shipping route. **Note:** estimate is for ballast water RA, however RA hull fouling can be included with minimal extra costs. Therefore, the costs of 50 000 EUR / RA are considered as a broad estimate to cover both ballast water and hull fouling. The cost includes: implementation of a reporting scheme on ballast water discharges, searching for ballast water origin of vessels, establishing a ballast water discharge model and assessing the risks. **Note**: in order to be effective, shipping route RAs are needed to be renewed around every 5 years. Also, post-baseline studies need to be repeated in regular intervals as new alien species will likely arrive.	Food Chain Evaluation Consortium (FCEC) (2010) Evaluation of the Community Plant Health Regime (draft final report). 364 p. + Annexes. Matej David & Stephan Gollasch pers. comm. In the context of this project
		Moderate	*As above*, combined with costs of carrying out RAs for a limited number of key shipping routes to / within in the EU (10 routes, covering both ballast water and hull fouling)	4000 EUR / shipping operator / year 500 000 EUR / 10 shipping routes / total		

	High	Establishing EU-wide Decision Support Systems (DSS) for marine pathway risk assessments, combined with carrying out RAs for a number of key shipping routes to / within in the EU (30 routes, covering both ballast water and hull fouling) Supported by port baseline surveys in a number of key EU ports and implementing Decision Support Systems (DSS) for marine pathway risk assessments	10 million EUR / total 20 000 EUR / port / total 1.5 million EUR / 30 shipping routes / total 76 000 EUR / port / total	Establishing EU-wide Decision Support Systems (DSS) for marine pathway risk assessments: 10 million EUR (total).Implementing port-specific DSS for marine pathway risk assessments (e.g. installation of modules, training and capacity building) / port authority: 20 000 EUR / port authority (total / one-off). **Note**: depending on the design of EU and national level IEWS cost savings could occur, i.e. DSS systems could be integrated into the general IEWS framework(s). Cost of risk assessment per shipping route: 50 000 EUR / shipping route = 1.5 million EUR / 30 shipping routes Costs of port baseline surveys: 100 000 US$ / total (one-off) (~ 76 000 EUR). **Note:** in order to be effective, port baseline studies need to be repeated in regular intervals as new alien species will likely arrive.	Matej David & Stephan Gollasch pers. comm. In the context of this project
Other pathway-specific assessments	E.g. tourism, air & trail transport	No clear indication re: level of costs available			

6.4 Management of key IAS pathways

Key information for interpreting the estimates

Approach & data: Levels / ranges of costs for managing intentional and unintentional introduction of IAS are developed based on drawing parallels with existing frameworks and mechanisms, e.g. EU Plant Health Regime (PHR) and framework for wildlife trade (CITES). The costs of key measures to control marine pathways has been roughly estimated based on the existing information and expert opinion.

Robustness & limitations: The estimates are based on parallels from other policy areas and expert opinions. Consequently, they should be considered as indicative only. No information available on the possible investment needed in infrastructure for border control inspection / quarantine.

Overlaps with other estimates: The estimated costs for administering the intentional and unintentional introductions at the EU and national level could be diminished / made redundant by establishing a dedicated, comprehensive body to manage the overall implementation of EU and/or MS IAS policies (the most ambitious option in section 6.8 below).

Possible cost-savings: Seeking synergies between different IAS prevention activities and/or parallel policy areas could result in a significant reduction in the level of costs. For example, combining the administration for managing unintentional introductions and intentional trade and movement of non-native species could reduce the overall costs of these activities. Furthermore, integrating preventative actions for IAS into the existing EU regimes for plant and animal health could result in considerable savings, reducing the estimated costs above. However, the existing (broad) estimates and information on the future policy design and synergies (e.g. synergies with plant and animal health sectors) do not allow a more detailed co-analysis / consideration of possible cost savings at this stage.

Preventing the introduction and spread of IAS is generally considered as the most effective (e.g. cost-effective) means of combating IAS. Therefore, investment in establishing a robust EU-level framework to prevent or minimise intentional and unintentional introductions of IAS can be considered as a cornerstone of successful implementation of the EU Strategy. The key cost items to be considered in this context include the cost of measures needed to control the trade and movement of alien species to/within the EU (i.e. intentional introductions of potential IAS) and the costs associated with preventing unintentional introductions of IAS to / within EU (e.g. via trade and transport-related pathways).

The investment required to establish a framework for controlling the trade and movement of alien, and potentially invasive, species in the EU can be roughly estimated from the costs of running the permitting, inspection and border control procedures under the EU wildlife trade regime. Based on this information, the costs associated with the administration of such a framework (i.e. running permit systems supported by appropriate scientific advice and carrying out a number of inspections) can add up to around a minimum of about 2000 EUR to over 1 million EUR / year / Member State, depending on the level of ambition (e.g. overall scale of movement of alien species within / via a MS) (see Table 6-4 and Annex 3). In addition, a certain level of administration and coordination is also foreseen to take place at the EU level (i.e. in the Commission) with estimated costs of around 115 000 EUR / year.

With regard to prevention of unintentional introductions, the comparable costs under the EU plant health regime (PHR) indicate that administrative costs associated with the overall regulation and monitoring of unintentional introductions of IAS could be around another 115 000 EUR / year at EU level (i.e. in addition to intentional introductions above) and around 203 000 EUR / year / MS (Table 6-4) In addition, again drawing parallels from PHR, the Member State's costs related to actual inspection activities (e.g. inspections at border / place at destination and place of production) could possibly range between 500 000 EUR – 2.5 million EUR / year / Member State, depending on the level of agreed investment (Table 6.4). Finally, some investment is also foreseen to be required for establishing appropriate infrastructure to support border control activities (e.g. quarantine measures). However, no estimate of the level of such costs has been available.

Note: the estimated costs for administrating the intentional and unintentional introductions at the EU and national level could be diminished / made redundant by establishing a dedicated, comprehensive body to manage the overall implementation of EU and/or MS IAS policies (i.e. selecting the most ambitious option in section 6.8 below) (Table 6.4).

In addition to trade, managing the spread of IAS via marine pathways can be considered as one of the main elements for preventing IAS introductions and impacts to / within the EU. Therefore, financial investments are also required to support the implementation of management systems for ballast water and hull fouling in the EU. In general, this is foreseen to include the uptake of systems for ballast water and hull fouling treatment and procedures to ensure compliance of shipping operators with agreed requirements (i.e. ballast water and hull fouling inspections). The estimated costs of these measures could range between a few thousands of EUR to over ten thousands EUR / vessel / event, depending on the level of requirements (Table 6-4 below). In addition, the estimated one-off costs for installing on-board ballast water treatment systems is estimated to range between around 290 000 EUR to over 660 000 EUR (total).

It is to be noted that seeking synergies between different IAS prevention activities and/or parallel policy areas could result in a significant reduction in the level of costs. For example, combining the administration for managing unintentional introductions and intentional trade and movement of alien species could reduce the overall costs of these activities. Furthermore, integrating preventative actions for IAS into the existing EU regimes for plant and animal health could result in considerable savings, reducing the estimated costs above. However, the existing (broad) estimates and information on the future policy design and synergies (e.g. synergies with plant and animal health sectors) do not allow a more detailed co-analysis / consideration of possible cost savings at this stage.

As in the context of risk assessments, the costs associated with the management of IAS pathways are foreseen to be distributed between the EU, MS and other relevant stakeholders. Based on the similar types of arrangements under the EU wildlife trade and plant health regimes, the majority of the costs related to permitting and border control systems are foreseen to be covered by MS. However, depending on national frameworks a significant part of these costs can be recovered via fees to private actors, i.e. different

sectors involved in trade and/or movement of alien species (see 6.12.2 below). Similarly, the costs associated with the management of marine pathways could be foreseen to be covered by private actors, i.e. by shipping operators or port authorities. At the EU level, EU funding instruments could be used to facilitate the uptake of different IAS measures, for example to support investments by MS and/or private actors in infrastructure improvements (e.g. border control infrastructure or the installation of ballast water treatment systems).

Table 6-4 Estimated level of costs for managing key IAS pathways

Note: the estimated level / scale of costs is indicative only. Please see Annex 3 for more detailed information re: calculation of these estimates.

STRATEGY COMPONENT			ESTIMATED COSTS OF THE STRATEGY COMPONENT		DATA & APPROACH USED TO DEVELOP THE ESTIMATE	
Type of cost		Level of investment / coverage / ambition	Cost item / indicator of costs	Estimated level / scale of costs	Data and approach	Origin / reference
PREVENTION: management of key pathways						
Control of intentional introductions: permitting / inspection / border control system to control non-native species trade / movement	Administration of an EU-level framework for non-native species trade / movement	N/A	Administrative costs associated with the overall regulation of the trade / movement of non-native species in the EU, based on similar costs under the EU Plant Health Regime **Note**: could be combined with the administrative costs of unintentional introductions below, resulting in potential cost savings. Also, these cost could be diminished / made redundant by establishing a dedicated body to manage the implementation of EU IAS policy (See Section 6.8 below)	115 000 EUR / year	Administrative costs (at the Commission level) associated with regulating the trade pathways under the EU Plant Health Regime, namely notification of interceptions of trade: 115 386 EUR / year.	Food Chain Evaluation Consortium (FCEC) (2010) Evaluation of the Community Plant Health Regime (draft final report). 364 p. + Annexes.

	Administration of permitting framework & costs of inspection by Member State	Level of trade in / movement of non-native species - LOW	Administrative costs associated with the running a permitting system for non-native species trade / movement, based on the average staff input in the context of CITES and general level of wages in the EU. Cost of non-native trade related inspections, based on estimated similar costs from Norway. **Note**: could be combined with the administrative costs of intentional introductions below, resulting in potential cost savings. Also, these cost could be diminished by establishing a dedicated / comprehensive body to manage the implementation of MS IAS policy (See Section 6.8 below).	60 000 / 112 500 EUR - 120 000 / 225 000 EUR / year / Member State (1.5 - 3 fulltime staff, with around < 100 – max 1000 permits issued / year) 100 000 EUR / year for inspection / Member State	Estimated number of fulltime staff running CITES permitting systems in different Member States (inc. permitting and scientific advice): e.g. Estonia ~1.5, Ireland ~1.5, Finland ~3, Poland ~3 (exc. sci. advice), Hungary ~3.3, FR ~8, Spain ~13, the NL ~13, UK ~15. Based on CITES reporting, 1.5 - 3 fulltime staff = around < 100 – max 1000 permits issued / year; 8 - 15 fulltime staff = around 3000 – 60 000 permits issued / year. **Note**: rough estimates only, based no the information provided by MS in the context of CITES reporting (e.g. majority of the staff / experts involved in CITES contribute only a part of their time for CITES). Estimated range for an average salary / year across new and old EU MS: 40 000 - 75 000 EUR (general estimation, inc. over heads). This leads to annual salary costs of 60 000 - 112 500 EUR / year (1.5 fulltime staff), 120 000 - 225 000 (3 fulltime staff), 320 000 - 600 000 EUR/ year (8 fulltime staff), 600 000 - 1 125 000 EUR / year (15 fulltime staff) Norway: staff costs for administrating the existing permitting procedure for import or introductions into the nature of certain alien species: 2 fulltime plus 10 part-time staff. Rough estimated costs of the inspection for intentional introductions: 100 000 EUR / year.	CITES annual / biannual reports: http://ec.europa.eu/environment/cites/reports_en.htm Øystein Størkersen (Directorate for Nature Management, Norway) pers. comm.. in the context of this project
		Level of trade in / movement of non-native species - HIGH		320 000 / 600 000 EUR - 600 000 / 1 125 000 EUR / year / Member State (8 - 15 fulltime staff with around 3000 – 60 000 permits issued / year) 100 000 EUR / year for inspection / Member State		
Control of unintentional introductions: permitting / inspection / border control system to control trade pathways	Administration of an EU-level framework for preventing unintentional introductions of IAS	N/A	Administrative costs associated with the overall regulation of trade pathways, based on similar costs under the EU Plant Health Regime **Note:** could be combined with the administrative costs of intentional introductions above, resulting in potential cost savings. Also, these cost could be diminished / made redundant by establishing a dedicated / comprehensive body to manage the implementation of EU IAS policy (See Section 6.8 below).	115 000 EUR / year	Administrative costs (at the Commission level) associated with regulating the trade pathways under the EU Plant Health Regime, namely notification of interceptions of trade: 115 386 EUR / year	Food Chain Evaluation Consortium (FCEC) (2010) Evaluation of the Community Plant Health Regime (draft final report). 364 p. + Annexes.

	Administration of a Member State framework for preventing unintentional introductions of IAS	N/A	Administrative costs associated with the overall regulation / monitoring of trade pathways, based on similar costs under the EU Plant Health Regime **Note:** could be combined with the administrative costs of intentional introductions above, resulting in potential cost savings. Also, these cost could be diminished / made redundant by establishing a dedicated / comprehensive body to manage the implementation of MS IAS policy (See Section 6.8 below).	203 000 EUR / year / Member State (**Note**: average for EU24)	Administrative costs associated (at MS level) with regulating the trade pathways under the EU Plant Health Regime, namely registration of plants / plant products, authorisation and issuing of permits (Plant Passport) and notification of inceptions of trade: 4 880 557 EUR / year for EU-24 (~ 203 000 EUR / year / MS) **Note:** around 3% of these costs are covered by fees to private operators in EU-24	Food Chain Evaluation Consortium (FCEC) (2010) Evaluation of the Community Plant Health Regime (draft final report). 364 p. + Annexes.
	Inspection effort by Member State **Note**: could be combined with the inspection activities of EU Plant / Animal Health Regimes, resulting in potential cost savings / efficiency gains.	Low	Costs of inspection by Member State (e.g. inspections at border / place at destination & place of production), estimated as **1/5** of the similar costs under the EU Plant Health Regime	500 000 EUR / year / Member State	Cost of import inspections for the competent MS authorities (at border or at the place of destination) under the EU Plant Health Regime: 25 983 570 EUR / year for EU-24 (~ 1. 1 million EUR / year / MS). Costs of official inspection of plants, plant products or other objects at the place of production under the EU Plant Health Regime: 33 320 135 EUR / year for EU-24 (~ 1.4 million EUR / year / MS). This equals ~2.5 million EUR / year / MS for total inspection costs). This includes for the EU-24: 572,684 documentary checks on average per year; 386,424 identity checks on average per year; 319,600 plant health checks on average per year; 43,982 samples for plant health checks on average per year; 241,823 inspections at the place of production on average per year; and 420,131 samples for the purpose of plant health checks at the place of production.	Food Chain Evaluation Consortium (FCEC) (2010) Evaluation of the Community Plant Health Regime (draft final report). 364 p. + Annexes.
		Moderate	Costs of inspection by Member State (e.g. inspections at border / place at destination & place of production), estimated as **1/2** of the similar costs under the EU Plant Health Regime	1.25 million EUR / year / Member State		
		High	Costs of inspection by Member State (e.g. inspections at border / place at destination & place of production), estimated as **equal** to the similar costs under the EU Plant Health Regime	2.5 million EUR / year / Member State		
	Infrastructure for border control inspection / quarantine	N/A	No clear indication re: level of costs available			

Control of unintentional marine pathway introductions: establishment of ballast water / hull fouling management systems to control marine pathways	Ballast water inspections / control of compliance	N/A	Costs of ballast water compliance control / inspection	1 000 EUR - 1 600 EUR / vessel / event **For scale**: number of ship visits to EU ports: over 50 000 vessel calls / month (2008)	Cost for Port State Control (PSC) of biological sampling for compliance monitoring: 1000 EUR - EUR 1600 EUR / sampling event / vessel. Cost figure includes sample processing. **Note**: Most complex sampling requires getting representative numbers of organisms for the whole ballast water discharge process, may involve 3 or more samples.	Stephan Gollash, pers. comm. EMSA 2008. Implementing the Ballast Water Management Convention – the EU dimension, Workshop report. European Maritime Safety Agency, Lisbon, p. 15 EMSA 2009. European Maritime Safety Agency, Safer and Cleaner Shipping in the European Union. Luxembourg: Office for Official Publications of the European Communities, p. 20.
	Ballast water treatment	N/A	Costs of ballast water treatment (e.g. installing an on-boar treatment facility & operating costs)	290 000 - 660 000 EUR / vessel (total, one-off) 35 EUR / 1000m3 water (running costs)	Mean capital cost of ballast water treatment systems on vessels: 380 000 US$ (200 m3/h system) - 875 000 US$ (2000 m3/h system) (total / one-off) (~290 000 - 660 000 EUR / vessel). Info for 200 m3/h system is based on 14 sets of data, covering a cost range of 145 000 - 780 000 US$ (total). Info for 2000 m3/h system is based on 14 sets of data covering a cost range of 175 000 - 2 million US$ (total). Mean projected operating cost of ballast water treatment systems on vessels: 47 US$ / 1000m3 (~35 EUR / 1000 m3). Key technical features of ballast water treatment systems are the flow capacity, footprint, overall size of the system and capital/operating costs. The 47US$ / 1000 m3 is calculated on basis of 13 sets of data provided, covering a broad range of values from zero / no cost (when waste heat is used) to costs of $320 per 1000m3.	Lloyd's Register, as in Shine et al. 2008.
	Hull fouling inspections / control of compliance	N/A	Costs of hull fouling compliance control / inspection	1 200 EUR - 2 400 EUR / vessel / event	Cost of hullfouling sampling event in Canada: 1 200 - 2 400 EUR / sampling event / vessel (total). **Note**: Cost figure includes sample processing.	Sarah Bailey, pers. comm. In Shine et al. 2009.

	Hull fouling treatment	N/A	Costs of cleaning vessels from hull fouling organisms	minimum 13 700 EUR / vessel / event	Cost of dry-dock cleaning and painting for a Panamax vessel with approx. 10 500 m2 of underwater surface: ~13 700 EUR / total (as part of regular docking event). Based on estimated cost of dry-dock cleaning and painting during regular docking event (1,30 EUR per m2),	Stephan Gollash and Matej David pers. comm. In Shine et al. 2009.

6.5 Monitoring programmes

Key information for interpreting the estimates

Approach & data: Levels / ranges of costs for are developed based on existing costs of monitoring activities in Member States.

Robustness & limitations: The estimated scale of costs for 'on-the-ground' monitoring activities at national level is based on information from one Member State only. Consequently, given the differences between Member States (e.g. salary costs), the estimates presented below should be considered indicative only.

Overlaps with other estimates: The estimated costs should not, in principle, overlap with other cost estimated presented in this Chapter, e.g. the costs of 'on-the-ground' monitoring are not covered under IEWS in section 6.2 above.

Possible cost-savings: The costs of 'on-the-ground' monitoring activities in marine environments could be linked with port baseline surveys to reduce costs (6.3 above).

In addition to EU-level monitoring activities and collating data at the national level, carried out under IEWS (6.2 above), it is also foreseen that implementation of the EU Strategy will result in a certain level of 'on-the-ground' monitoring actions in MS. The level of these costs is likely to range according to the agreed level of EU and/or MS ambition. Cost savings are also possible as several monitoring schemes already exist to cover other legislation/research needs (i.e. habitats and birds Directives) and could be adapted to include IAS.

Based on available information from Great Britain and France, the cost of establishing a general national programme for basic ongoing / annual detection, 'on-the-ground' surveillance and monitoring of existing and new IAS could cost around 150 000 EUR / year / Member State. A more comprehensive framework for monitoring activities could result in costs of around 500 000 EUR – 1 million EUR / year / Member State for 1-5 species, respectively (e.g. including a number of more detailed one-off / baseline IAS-specific monitoring programmes and marine port baseline surveys) (Table 6-5 below).

In general, the costs of 'on-the-ground' monitoring activities are foreseen to be covered by Member States, with possible support from other actors (e.g. port authorities) for carrying out port baseline surveys. Possible support from the EU budget could be provided to cover some of the monitoring costs e.g. establishment of appropriate monitoring infrastructure, training and capacity building.

Table 6-5 Estimated level of costs for monitoring actions Note: the estimated level / scale of costs is indicative only.

STRATEGY COMPONENT			ESTIMATED COSTS OF THE STRATEGY COMPONENT		DATA & APPROACH USED TO DEVELOP THE ESTIMATE	
Type of cost		Level of investment / coverage / ambition	Cost item / indicator of costs	Estimated level / scale of costs	Data and approach	Origin / reference
PREVENTION: monitoring						
EU-level data compilation & analysis	Integrated in the EU IEWS system, see 6.2 above					
Monitoring activities in Member State **Note**: national level data compilation & analysis covered by national EWRR systems, see 6.2 above	'On-the-ground' monitoring actions	Low - High	Costs of 'on-the-ground' IAS-specific monitoring programmes / year, based on such costs in France	260 000 - 1.3 million EUR / year (one-off) / MS for 1 to 5 IAS	In France, in 2008 the costs of monitoring the *Aedes albopictus* (mosquito) and *Ambrosia artemsiifolia* (plant) were 410,000 EUR and 113,750 EUR, respectively (one off costs in one years time). A rough estimate for average costs of monitoring / species / year: 260 000 EUR / year.	Hélène Menigaux, Ministère de l'Energie, de l'Ecologie, du Développement Durable et de l'Aménagement du Territoire, pers. comm. (in Shine et al. 2010)

6.6 Contingency planning for rapid response actions

Key information for interpreting the estimates

Approach & data: The level / scale of costs for rapid response actions has been estimated based on similar mechanism and current costs under the EU plant health regime (PHR).

Robustness & limitations: The estimates are based on the level of existing investment / costs from PHR. Consequently, they should be considered as indicative only.

Overlaps with other estimates: The estimated costs for administrating rapid response actions at the EU and national level could be diminished / made redundant by integrating these into a comprehensive IEWS mechanism(s) or establishing a dedicated, comprehensive body to manage the overall implementation of EU and/or MS IAS policies (the most ambitious options in sections 6.2 and 6.8 below).

Possible cost-savings: N/A

In addition to the key preventative measures outlined above, ensuring rapid eradication and/or containment of newly-detected IAS incursions is envisaged as one of the first lines of defence against the further spread of IAS into / within the EU. Successful execution of such actions requires sufficient resources (e.g. financial investment) to made available in a short timescale. It is therefore foreseen that a dedicated EU-level mechanism is needed to finance the eradication and containment of the highest risk species (e.g. identified 'IAS of EU concern') before they develop into full-scale invasions within the EU.

Based on the current costs of rapid reaction actions under the EU plant health regime, the administration of a dedicated instrument / procedure to finance rapid action on IAS could cost around 16 000 EUR / year at the EU level and less than 1500 EUR / year at MS level (Table 6-6 below). Depending on the general level of ambition, the annual budget for financial support to combat the most significant IAS threats could range between 1 – 3 million EUR / year, covering an estimated 2-5 major or 10-30 minor IAS eradication events / year (Table 6-6 below). However such figures should be considered conservative because they might increase depending on the severity of the invasive potential of the newly-detected species to be eradicated.

In addition, individual MS could earmark / target financing to rapidly halt IAS invasions at national level. This financing could, for example, cover a number of alien species that are of concern at national, subnational or local level (i.e. not necessarily identified as 'IAS of EU concern'). Based on existing information, the costs of IAS eradication initiatives at national range significantly e.g. costing from 50 000 - 100 000 EUR up to 5 - 14 million EUR / eradication event / Member State (for eradicating limited and isolated occurrences vs. large scale and multi-year eradication events respectively).

Note: the estimated costs for administrating rapid response actions at the EU and national level could be diminished / made redundant by integrating these into a comprehensive IEWS mechanism(s) or establishing a dedicated, comprehensive body to manage the overall

implementation of EU and/or MS IAS policies (the most ambitious options in sections 6.2 and 6.8 below).

The actions taken independently by Member States are envisaged to be financed from national budgets. Rapid eradication and containment of 'IAS of EU concern' is foreseen to be an EU-level priority and therefore could possibly be co-financed / compensated (to a certain degree) by the EU budget. In both cases, however, identification of possible liability could be considered as an additional basis for allocating the costs of eradication / containment activities (e.g. to enable recovery of costs from private actors).

Table 6-6 Estimated level of costs for rapid response actions. Note: the estimated level / scale of costs is indicative only.

STRATEGY COMPONENT			ESTIMATED COSTS OF THE STRATEGY COMPONENT		DATA & APPROACH USED TO DEVELOP THE ESTIMATE	
Type of cost		Level of investment / coverage / ambition	Cost item / indicator of costs	Estimated level / scale of costs	Data and approach	Origin / reference
RAPID RESPONSE & EARLY ERADICATION						
Contingency planning and eradication actions at EU level (for 'IAS of EU concern')	Commission: administration of financing for rapid response / early eradication (e.g. solidarity funding)	N/A	Costs associated with the application / administrative procedure, based on the information of such costs under the EU Plant Health Regime. **Note**: These cost could be diminished / made redundant by establishing a dedicated body to manage the implementation of EU IAS policy (See Section 6.8 below)	16 000 EUR / year	Costs of the submission and treatment of applications for Solidarity Funding under the EU Plant Health Regime for the Commission: 15 924 EUR / year = ~16 000 EUR / year	Food Chain Evaluation Consortium (FCEC) (2010) Evaluation of the Community Plant Health Regime (draft final report). 364 p. + Annexes.
	Member State: administration of financing for rapid response / early eradication (e.g. solidarity funding)	N/A	Costs associated with the application / administrative procedure, based on the information of such costs under the EU Plant Health Regime **Note**: These cost could be diminished / made redundant by establishing a dedicated body to manage the implementation of EU IAS policy (See Section 6.8 below)	1 200 EUR / year / Member State	Costs of the submission and treatment of applications for Solidarity Funding under the EU Plant Health Regime for MS competent authorities (EU 24): 28 322 EUR / year (~ 1200 EUR / MS / year)	Food Chain Evaluation Consortium (FCEC) (2010) Evaluation of the Community Plant Health Regime (draft final report). 364 p. + Annexes.

	Investment in rapid response	Low	Costs of EU-level actions on rapid response / early eradication, based on the actual spending on solidarity funding under the EU Plant Health Regime (1999 - 2009) minus the extraordinary spending on pinewood nematode. Based on the average costs of eradication / containment of one harmful organisms under the EU Plant Health Regime (1999 - 2009), this covers the outbreak of around 2 major - 10 minor IAS eradications / year.	1 million EUR / year	Actual EU spending on solidarity funding under the EU Plant Health Regime in 1999 - 2009, minus the extraordinary spending in 2006 - 2009 to eradicate pinewood nematode: 29 257 732 EUR - (8 417 848 EUR + 10 276 063 EUR) = 10 563 821 EUR, i.e. **~1 million EUR / year**. Actual EU spending on solidarity funding under the EU Plant Health Regime in 1999 - 2009, including the extraordinary spending in 2006 - 2009 to eradicate pinewood nematode: 29 257 732 EUR, i.e. **~3 million EUR / year**. In 1999 - 2009, altogether 18 harmful organisms (excluding extraordinary spending on pinewood nematode) have been covered by the EU Plant Health Regime solidarity funding with the total costs of 10 563 821 EUR, ranging from around 1 500 EUR - 2 million EUR / species. This results in average cost of 586 878 EUR / eradication & containment of one harmful organism. Note: EU co-financing under the Plant Health Regime covers about 95% of final payments. Funding covers actions to eradicate or, if not possible, contain harmful organisms	Food Chain Evaluation Consortium (FCEC) (2010) Evaluation of the Community Plant Health Regime (draft final report). 364 p. + Annexes.
		Moderate	Costs of EU-level actions on rapid response / early eradication, based on the actual spending on solidarity funding under the EU Plant Health Regime (1999 - 2009) including around a half of the extraordinary spending on pinewood nematode. Based on the average costs of eradication / containment of one harmful organisms under the EU Plant Health Regime (1999 - 2009), this covers the outbreak of around 3.5 major - 20 minor IAS eradications / year.	2 million EUR / year		
		High	Costs of EU-level actions on rapid response / early eradication, based on the actual spending on solidarity funding under the EU Plant Health Regime (1999 - 2009) including the extraordinary spending on pinewood nematode. Based on the average costs of eradication / containment of one harmful organisms under the EU Plant Health Regime (1999 - 2009), this covers the outbreak of around 5 major - 30 minor IAS eradications / year	3 million EUR / year		

Contingency planning and eradication actions at Member State level (for IAS of Member State's concern)	Investment in rapid response	N/A	MS level costs vary depending on MS ambitions, i.e. number of incidents / year not feasible to estimate A range of possible costs given based on the existing information re: costs of eradication at national level.	50 000 / 100 000 EUR - 5 - 14 million EUR / species / event / Member State	Examples of known eradication national activities: eradication of small populations/isolated occurrences around 50 000 - 100 000 EUR (Norway); eradication of ruddy duck: 5 year eradication program for £ 3.337 million (2005-2010) (~4 million EUR total / 800 000 EUR / year) (UK); eradication of topmouth hudgeon: £ 77 700 / total (one-off) (93 700 EUR) (West Midlands & Lake District UK, 2006 - 2007); estimated eradication of japanese knotweed: 810 000 / year (UK, year(s) unknown); eradication / control of Hottentot fig: 290 000 EUR / year (Spain, year(s) unknown); control / eradication of eucalyptus: 1 580 000 EUR / year (Spain, year(s) unknown); Eradication of american mink: 120 000 EUR / year (Estonia, 2004), 290 000 (France, 2004), 550 000 EUR / year (UK, 2001 - 2013); eradication of muskrat: 3 million EUR / year (Germany, year(s) unknown); eradication of brown rat: 280 000 EUR / year (Britain, year(s) unknown); eradication of cyopu: 5 million EUR / total (UK years unknown), 14 million EUR (total) (Italy).	Øystein Størkersen (Directorate for Nature Management, Norway) pers. comm.; Child et al. 2001 / Moore et al.2003 / Scalera & Zaghi 2004 / Panzacchi et al 2007 in Vila, M. & Basnou, C. 2008. State of the art review of the environmental and economic risks posed by invasive alien species in Europe - DAISIE Deliverable 14 Report. 36 pp.; Defra. 2007. Impact Assessment of the Order to ban sale of certain non-native species under the Wildlife & Countryside Act 1981. Available online at: http://www.defra.gov.uk/wildlife-countryside/pdf/wildlife-manage/non-native/impact-assessment-order.pdf ; Andreu J and Vilà M. 2007. Análisis de la gestión de las plantas invasoras en España. Ecosistemas 3: 1-16; DAISIE profile: http://www.europe-aliens.org/pdf/Ondatra_zibethicus.pdf

6.7 Control, management and restoration

Key information for interpreting the estimates

Approach & data: The level / scale of costs of developing IAS management plans has been developed based on existing costs at European (EPPO) and national level and expert opinion. The investment in / costs of management actions of 'IAS of EU concern' has been estimated based on the past EU and MS investment to these activities under LIFE funding. The possible level / scale of investment in IAS management activities and restoration of IAS impacts at national level are based on existing investments in such activities.

Robustness & limitations: The estimates are based on broad estimations based on existing investments in IAS management activities, expert opinion and examples from other policy areas. Consequently, they should be considered as indicative only.

Overlaps with other estimates: The estimated staff costs related to the development of IAS action plans could diminish if a dedicated body for coordinating / managing IAS policy development and implementation is developed (i.e. the most ambitious options in sections 6.2 and 6.8 below).

Possible cost-savings: Possible costs saving could occur if, where appropriate, joint management for several IAS were developed and if 'on-the-ground' management activities focus on multiple IAS.

The costs associated with IAS control and management in the context of the EU Strategy are foreseen to be caused by targeted actions to manage the spread of IAS within the EU, e.g. developing dedicated EU-level action / management plans and initiating EU-level management actions for those 'IAS of EU concern' that are already established within the EU. In addition, depending on the EU Strategy's overall ambition, a certain amount of financing (e.g. EU funding) could also be dedicated to restoring ecosystems impacted by IAS.

The estimated cost of developing an EU-level action / management plan for an 'IAS of EU concern' is estimated to be around 42 000 EUR / action plan / species (total) (see Table 6.7). Based on this estimate, the costs of developing EU-level action plans could range between 84 000 EUR – 429 000 EUR / year for a total of 2 to 10 action plans (respectively). Based on previous Community support for controlling and managing IAS in the context of LIFE funding, the level of EU investment in IAS management could amount to a minimum of 1.5 – 9 million EUR / year, depending on the level of investment (Table 6-7). Just to put this level of investment into context, in 2002 in Denmark (surface area 43.000 km^2) the authorities from local to state level used 22 800 000 DKK (~ 3 250 000 EUR) and 39 900 working hours to manage *H. mantegazzianum* (Hans Erik Svart, pers. comm.).

At MS level, the current known costs of developing national IAS action plans are known to range between 4000 EUR - 30 000 EUR / management plan / (total). These costs could be foreseen to take place either when there is a need to address IAS of national concern and/or support the above EU level management plans with a more detailed national / regional activities. In terms of 'on-the-ground' management actions, the estimated minimum earmarked national financing (i.e. financing required to complement the EU-financed management actions) currently range between 30 000 - 360 000 EUR / year / Member State

(Table 6-7). This should be considered as an indication of a minimum level of investment to manage IAS at national level, possibly especially targeted to 'IAS of EU concern'. In reality, the total current / future investment in IAS management and control actions at the national level are likely to be higher and will vary widely depending on MS ambitions.

Note: estimated staff costs related to the development of IAS action plans could be diminished if a dedicated body for coordinating / managing IAS policy development and implementation is developed (i.e. the most ambitious options in sections 6.2 and 6.8 below).

The costs of restoration greatly depend on the overall ambition and scale of individual restoration activities. It is therefore not feasible to determine a total / desired level of investment in restoration at the EU and/or MS level. Based on existing information from the US, the investment in / costs of restoration activities at national and/or regional level can range between 100 000 EUR – 2 million EUR / year.

In general, the costs of controlling and managing 'IAS of EU concern' are envisaged to be shared by the EU and MS e.g. to receive support from the EU budget via different EU-level financial instruments (see also 5.6 above). It is also foreseen that EU-level financing could be made available to support key restoration actions at the EU level. Finally, there are also possibilities to finance IAS management from broader financing sources, e.g. identification of possible liability could be considered as an additional basis for allocating the costs of control and restoration activities (e.g. to enable recovery of costs from private actors).

Table 6-7 Estimated level of costs for control, management and restoration actions. Note: the estimated level / scale of costs is indicative only.

STRATEGY COMPONENT			ESTIMATED COSTS OF THE STRATEGY COMPONENT		DATA & APPROACH USED TO DEVELOP THE ESTIMATE	
Type of cost		Level of investment / coverage / ambition	Cost item / indicator of costs	Estimated level / scale of costs	Data and approach	Origin / reference
CONTROL, MANAGEMENT & RESTORATION: management plans						
Developing action / management plans for already established 'IAS of EU concern'	Number of plans: 2 targeted IAS	Low	Costs of developing targeted IAS management plans	70 000 EUR / total (one-off)	Action plans for IAS proposed within LIFE projects, cost between 20 000 and 50 000 EUR / total (one-off) /species), inc. staff costs . Average costs = 35 000 EUR / action plan (total). **Note**: Staff costs are likely to be diminished if a dedicated body for coordinating / managing IAS policy development and implementation is developed (section 6.8)	EPPO costs: Riccardo Scalera pers. comm. in the context of this study. Costs of expert / staff input: team's own estimate.
	Number of plans: 5 targeted IAS	Moderate		175 000 EUR / total (one-off)		
	Number of plans: 10 targeted IAS	High		350 000 EUR / total (one-off)		
Developing action / management plans for already established IAS of Member State's concern		N/A	MS level costs vary depending on MS ambitions, i.e. number of plans / year not feasible to estimate. A range of possible costs given based on the existing information re: costs of developing action / management plans at national level	3900 EUR - 33 000 EUR / management plan / species / Member State (total / one-off)	Examples of costs of national IAS management / action plans: Ireland: costs of exclusion strategies and contingency/management plans ~ 3 900 EUR / plan, excluding the time given in kind by steering group members for peer review; Lithuania: costs of developing an action plan for raccoon dog 40 000 Lt / year (~ 12 000 EUR / year) and amur / chinese sleeper 15 000 Lt / year (~ 4350 EUR) (inc. related research); Italy (Lazio region): Action plan for the eradication of the american mink in the region: 33 000 EUR; Denmark: a plan for eradicating the racoon dog 11.000 EUR (exc.time used in steering group meetings).	Irish national Invasive Species Programme: Cathy Maguire, pers. comm.. in the context of this project Hans Erik Svart (Ministry of Environment /Danish Forest and Nature Agency), pers. comm. In the context of this project Riccardo Scalera, pers. comm. in the context of this project

CONTROL, MANAGEMENT & RESTORATION: management actions						
Controlling / locally eradicating already existing IAS	EU level: investment in controlling / locally eradicating already existing 'IAS of EU concern'	Low	Earmarked financing to control IAS of EU concern, based on the average **previous EU contribution** to manage / control IAS in the context of LIFE funding (as per EU cofinancing arrangements, 50 - 75% match funding from EU)	1.5 - 2.25 million EUR / year with 50 - 75% match funding, respectively	Between 1992 - 2006, the minimum yearly budget spent on IAS (i.e. LIFE budget on eradication, control and containment) was of € 3 million / year (total, inc. both EU and MS contributions), with a peak for a 3-year period corresponding to € 14 million / year. This should be considered as a low level estimate of LIFE contribution to IAS as the analysis was limited by the lack of detail re: different LIFE projects. Also, in in the past LIFE was not designed to specifically address IAS which is likely to have limited the number of IAS project under the fund. To compare the scale of this investment: in Denmark in 2002 the authorities from local to state level used 22 800 000 DKK (~ 3 250 000 EUR) and 39 900 working hours to manage *Heracleum mantegazzianum*. The Danish land area is about 43.000 km^2.	Riccardo Scalera (2010) How much is Europe spending on invasive alien species? Biol Invasions (2010) 12:173-177, Hans Erik Svart (Ministry of Environment /Danish Forest and Nature Agency), pers. comm. In the context of this project
		Moderate	Earmarked financing to control IAS of EU concern, based on **2 x previous level of EU contribution** to manage / control IAS in the context of LIFE funding (as per EU cofinancing arrangements, 50 - 75% match funding from EU)	3 - 4.5 million EUR / year with 50 - 75% match funding, respectively		
		High	Earmarked financing to control IAS of EU concern, based on **4 x previous level of EU contribution** to manage / control IAS in the context of LIFE funding (as per EU cofinancing arrangements, 50 - 75% match funding from EU)	6 - 9 million EUR / year with 50 - 75% match funding, respectively		
	Member State level: investment in controlling / locally eradicating additional, already existing IAS of MS concern	N/A	Earmarked national financing for IAS management actions, estimated as the level of **required MS contribution to complement previous EU LIFE funding** (as per EU cofinancing arrangements, 50 - 25% match funding from MS) In reality, costs will vary depending on MS	30 000 / 60 000 - 180 000 / 360 000 EUR / year / Member State with 25 - 50% match funding, respectively	*As above*, the level of MS contribution to complement previous EU LIFE funding, as per EU cofinancing arrangements (25 / 50% match funding from MS): 0.75 / 1.5 million EUR - 4.5 / 9 million EUR / year (~30 000 / 60 000 - 180 000 / 360 000 EUR / year / EU MS) (for EU25).	

		ambitions.			
Restoration	Investment in restoration of ecosystems after IAS invasions & management / eradication actions (EU - MS level) Low - High	Ranging investment in / costs of restoration, based on existing information of annual costs of restoration projects in the US.	100 000 EUR - 2 million EUR / year **Note**: overlaps with costs of eradication	**US**: Portland / Oregon complete removal and native species revegetation on 40% of public lands (cost per year, over a five-year period): 31 million US$ / year (~23 million EUR) **US**: projected a total cost of removing and replace ash trees in the city of Sandusky's (emerald ash borer management plan for 2006–2011): 153 000 US$ (one-off costs) (~116 000 EUR) **US**: Revegetation invasive weed infested lands in Elko County Nevada (in 2002): 4540 US$ for 50 acres (~ 3400 EUR) **US:** Cost of re-vegetation of denuded/disturbed areas states the NRCS (Natural Resources Conservation Services): 30 260 US$ / year at each Plant Material Centers (PMC)	Cusack, C., Harte, M., and Chan, S., 2009. The Economics of invasive species. Prepared for the Oregon Invasive Species Council. Sea Grant Oregon. http://www.oregon.gov/OISC/docs/pdf/economics_invasive.pdf Windle, P.N., Kranz, R.H., and La, M. 2008. Invasive Species in Ohio Pathways, Policies, and Costs. Union of Concerned Scientists. Available online: http://www.ucsusa.org/assets/documents/invasive_species/Ohio_invasives.pdf Diaz-Soltero, H. 2008. U.S. Department of Agriculture. Report to the Invasive Species Advisory Council

6.8 Policy development, administration and coordination structures

Key information for interpreting the estimates

Approach & data: The level / scale of costs of supporting IAS policy development and implementation has been developed based on information on existing investment / costs and expert opinion.

Robustness & limitations: The estimates are based on considerations of existing investments in IAS policy support & coordination and expert opinion. Consequently, they should be considered as indicative only.

Overlaps with other estimates: The estimated costs (i.e. staff costs) for administrating RAs, intentional / unintentional introductions, rapid response actions and managing IAS, dealt with in sections 6.3, 6.4, 6.6, 6.7, could be diminished / made redundant by establishing a dedicated, comprehensive body to manage the overall implementation of EU and/or MS IAS policies (the most ambitious options in sections 6.2 and 6.8 below). Also, the costs of developing national IAS Strategies (for countries that o not yet have one) could be diminished if a dedicated, comprehensive body for IAS policy would be established and assigned to carry out such a task.

Possible cost-savings: See above.

The administration and coordination associated with the implementation of the EU Strategy is envisaged to require a certain level of dedicated financial investment at both EU and MS levels. In addition, a number of dedicated actions to support the overall implementation and further development of EU and national IAS policies is also foreseen to be necessary e.g. carrying out targeted studies and assessments to update IAS strategies (Note: costs of dedicated IAS research activities are discussed in 6.10 below).

Based on rough estimates, the costs of administration (e.g. coordination) of the EU Strategy at the EU level (e.g. in the Commission) could be foreseen to range between 75 000 EUR – 550 000 EUR / year, for a one fulltime staff member dealing with IAS to a entire unit dedicated to IAS policy, respectively (Table 6-8 below). In addition, financial support to follow up and update the EU Strategy is likely to be required with possible costs of around 100 000 – 120 000 EUR / a half year study (total).

At MS level, the administration and coordination of IAS activities (e.g. the implementation of the EU Strategy) could result in overall costs of less than 100 000 EUR – over 600 000 EUR / year / Member State, for a one fulltime staff member dealing with IAS to a entire dedicated IAS coordination body, respectively (Table 6-8). In addition, the adoption of the EU Strategy is likely to result in a need for specific national IAS policies, e.g. the development of national IAS strategies or addressing IAS in a more comprehensive manner within the context of national biodiversity strategies. This means that investments in IAS policy development are likely to be necessary in MS that still lack dedicated IAS policies (see 3.5 above). Based on the information from Great Britain and Sweden, the costs of developing national IAS strategies[322] are estimated to be around 130 000 EUR – 1.5 million / total / Member State

[322] This is foreseen to be an overall national strategy for IAS, i.e. different from the species-specific strategies for managing IAS considered in section 6.7 above.

(Table 6-8). These costs could be diminished if a dedicated, comprehensive body for IAS policy would be established and assigned to carry out such a task. In addition, the level of financial resources allocated to support further development, follow up and update of national strategies might range between 10 000 – 120 000 EUR (total) / study.

Note: establishing a dedicated body for IAS policy coordination and development could diminish the administration / staff costs for several other activities, e.g. RAs, intentional / unintentional introductions, rapid response actions and managing IAS, dealt with in sections 6.3, 6.4, 6.6 and 6.7.

Table 6-8 Estimated level of costs for policy development, administration and coordination structures. Note: the estimated level / scale of costs is indicative only.

STRATEGY COMPONENT			ESTIMATED COSTS OF THE STRATEGY COMPONENT		DATA & APPROACH USED TO DEVELOP THE ESTIMATE	
Type of cost		Level of investment / coverage / ambition	Cost item / indicator of costs	Estimated level / scale of costs	Data and approach	Origin / reference
HORIZONTAL: policy development & strategy implementation						
National IAS strategies	Development of the national IAS Strategy **Note**: only MS that do not already have a dedicated strategy)	N/A	Total (one-off) costs of developing national IAS strategy, based on the information from Great Britain and Sweden **Note**: These costs could be diminished by establishing a dedicated, comprehensive body for IAS policy (below) and tasking it with such a task.	130 000 - 1.5 million EUR (total) / Member State	Development of the Great Britain IAS Strategy: £ 107 000 / two years (~130 000 EUR). A broad estimate based on a standard daily rate for most meeting attendees (govt and non-govt), standard T&S costs for those travelling to meetings, production and translation costs and time by officials to draft, carry out consultation etc. **Note**: also includes costs of the IAS secretariat dedicated to strategy development. Development of IAS Strategy in Sweden: 1.5 million EUR (total)	Niall Moore (GB non-native species secretariat), pers. comm. In the context of this project
	Updating / follow-up of national IAS Strategy	N/A	Estimated costs of supporting further development / follow-up / updating a national IAS strategy, based on costs of existing assessments / studies that support IAS policy / framework development **Note**: costs of national level administration & coordination and dedicated IAS research considered separately below / section 6.11.	10 000 - 120 000 EUR (total) / study / Member State	**EU**: Estimated one-off costs of around half-year dedicated assessment: 100 000 - 120 000 EUR (total), based on the information from the EU Commission calls for tender in 2009-2010. **Ireland**: review of the national invasive species programme and development of the next programme, including staff time and stakeholder conference: ~9000 EUR (total) **Finland**: estimated budget for a half-year / year scoping studies for the development of national IAS information systems: 50 000 - 80 000 EUR (total)	Commission called for tender ENV.B.2/SER/2009/0101r and ENV.B2/ETU/2010/0043r Maiju Lehtiniemi (Finnish Environment Institute, Marine Centre) pers. comm. In the context of this project Irish national Invasive Species Programme: Cathy Maguire, pers. comm. In the context of this project

EU IAS strategy	Updating / follow-up of the EU IAS Strategy	Low - Medium	Estimates one-off costs of supporting / follow-up of the EU IAS Strategy, based on available information on costs of short assessments / studies supporting the development of EU IAS Strategy. **Note:** IAS basic research at the EU level considered separately below.	100 000 - 120 000 EUR (total) / study	Estimated one-off costs of around half-year dedicated assessment: 100 000 - 120 000 EUR (total), based on the information from the EU Commission calls for tender in 2009-2010. Annual cost to the Commission of checking the correct and uniform application of EU Plan Health Regime (e.g. annual inspection mission in the MS): 553 235 EUR / year	Commission called for tender ENV.B.2/SER/2009/0101r and ENV.B2/ETU/2010/0043r Food Chain Evaluation Consortium (FCEC) (2010) Evaluation of the Community Plant Health Regime (draft final report). 364 p. + Annexes.
		High	*As above plus e*stimated costs of checking the correct and uniform implementation of EU IAS Strategy, based on the costs of such activity under the EU Plant Health Regime **Note:** IAS basic research at the EU level considered separately below.	100 000 - 120 000 EUR (total) / study 550 000 EUR / year		
HORIZONTAL: Administration & coordination structures						
Administration of EWRR			Integrated in the EU EWRR system, see 6.2 above			
General administration & coordination of IAS policy / actions	Administration & coordination of IAS policy / actions at the MS level	Low	Annual costs of one dedicated expert in the existing national env. admin. to coordinate IAS activities, based on estimated average salary costs in EU MS	40 000 - 75 000 EUR / year / Member State (inc. overheads)	Estimated general range of average salary / year across new and old EU MS: 40 000 - 75 000 EUR / year	Info on average salaries: http://workbarometer.org/

		Moderate	Annual costs of running a dedicated national IAS coordination body / secretariat (with around 2 full time positions), based on estimates from the Great Britain and Sweden.	240 000 EUR / year / Member State	Estimated costs of IAS secretariat in Sweden (2 fulltime positions): Skr 2.8 million / year (around 296 000 EUR / year). Cost of running the Non-Native Species Secretariat for Great Britain (around 2-3 full time positions): £ 160,000 / year (around 182 000 EUR / year). Note: total reported costs £230 000, of which£ 7000 / year for annual stakeholder forum has been deducted to avoid double counting with below. The average costs: 240 000 EUR / year.	Niall Moore, GB Non-Native Species Secretariat, pers. comm. (in Shine et al. 2010) Naturvårdsverket. 2008. National Strategy and action plan for alien species. Swedish Environmental Protection Agency. Naturvårdsverkets rapport 5910.
		High	Annual costs of running a dedicated national IAS coordination body / secretariat (with around 7 full time positions), based on estimates from Sweden. **Note**: The staff costs related to administrating RAs, intentional / unintentional introductions, rapid response and management actions, dealt with in sections 6.3, 6.4, 6.6, 6.7 could be diminished / made redundant by establishing a dedicated, comprehensive body.	650 000 EUR / year / Member State	Estimated costs of IAS secretariat in Sweden (7 fulltime positions): Skr 6.2 million / year (around 650 000 EUR / year)	Naturvårdsverket. 2008. National Strategy and action plan for alien species. Swedish Environmental Protection Agency. Naturvårdsverkets rapport 5910.
	Administration & coordination of IAS policy / actions at the EU level	Low	Annual costs of 1 dedicated, fulltime experts in the existing EU administrative structure to coordinate IAS activities, based on estimated average salary costs at the EU Commission	75 000 EUR / year	Estimated general average salary / year at the European Commission: 75 000 EUR / person / year (inc. overheads)	Average salary roughly estimated based on: http://ec.europa.eu/civil_service/docs/salary_officials_en.pdf.

		Moderate	Annual costs of 1 dedicated, fulltime experts in the existing EU administrative structures to coordinate IAS activities Combined with the establishment / running of a dedicated inter-service group on IAS	165 000 EUR / year	Estimated general range of average salary / year at the European Commission: 75 000 EUR / year Establishment / running of a dedicated inter-service group on IAS: estimated time commitment 10 days / year / relevant expert, assuming the attendance of 10 experts from different relevant bodies (outside dedicated IAS coordination), with costs of ~900 EUR / person / day = 90 000 EUR	
		High	Establishment of a dedicated body to manage the implementation of EU IAS policy, based on similar costs under the EU Plant Health Regime **Note**: The staff costs related to administrating RAs, intentional / unintentional introductions, rapid response and management actions, dealt with in sections 6.3, 6.4, 6.6, 6.7 could be diminished / made redundant by establishing a dedicated, comprehensive body.	550 000 EUR / year	Estimated costs of the overall management of the EU Plant Health policy: 555 832 EUR / year. Inc. 1 head of unit, 2 permanent officials, 1 temporary official, 2 national experts, 2 assistants.	Food Chain Evaluation Consortium (FCEC) (2010) Evaluation of the Community Plant Health Regime (draft report from April 2010)

6.9 Stakeholder engagement and communications

Key information for interpreting the estimates

Approach & data: The level / scale of costs of supporting IAS stakeholder engagement and communications has been developed based on parallels from other policy areas (European Centre for Disease Prevention and Control - ECDC) and information on existing investment in these activities.

Robustness & limitations: The possible levels of investment in stakeholder engagement and communication are based on existing investments, e.g. investment in the context of other policy sectors. Consequently, they should be considered as indicative only.

Overlaps with other estimates: The estimated costs could be diminished by establishing a dedicated, comprehensive body to manage the overall implementation of EU and/or MS IAS policies, e.g. coordinate stakeholder actions (the most ambitious options in section 6.8).

Possible cost-savings: See above.

A wider range of stakeholders is foreseen to participate in the implementation of the EU Strategy. Resources are therefore needed to facilitate stakeholder consultations during the implementation of the Strategy and ensure their appropriate engagement in different IAS management activities. In addition, dedicated ongoing efforts are required to communicate the key messages and objectives of the EU and national IAS strategies to all relevant stakeholders and the broader public.

Depending on the level of investment, the financial resources needed for organising stakeholder consultations and supporting stakeholder engagement at the EU level could range between 115 000 EUR – over 530 000 EUR / year, based on the current investment in communication activities by the European Centre for Disease Prevention and Control (ECDC) (Table 6-9 below). At the national level, the existing information indicates that these activities might result in costs around 80 000 EUR – 150 000 EUR / year / Member State.

Note: The estimated costs could be diminished by establishing a dedicated, comprehensive body to manage the overall implementation of EU and/or MS IAS policies, e.g. coordinate stakeholder actions (the most ambitious options in section 6.8 above).

Table 6-9 Estimated level of costs for stakeholder engagement actions and communication. Note: the estimated level / scale of costs is indicative only.

STRATEGY COMPONENT			ESTIMATED COSTS OF THE STRATEGY COMPONENT		DATA & APPROACH USED TO DEVELOP THE ESTIMATE	
Type of cost		Level of investment / coverage / ambition	Cost item / indicator of costs	Estimated level / scale of costs	Data and approach	Origin / reference
HORIZONTAL: Stakeholder consultation & engagement						
Stakeholder consultation & engagement actions	EU level: stakeholder consultation & engagement actions	Low	Organising EU-level stakeholder engagement actions on IAS issues (ad hoc basis), estimated as 1/5 of ECDC annual budget for such activities	115 000 EUR / year	European Centre for Disease Prevention and Control (ECDC): cost of efficient & coordinated communication of key messages and information to the media and public: 530 000 EUR / year	ECDC. 2009. ECDC Annual Work Programme 2009. Available online at: http://www.ecdc.europa.eu/en/About_us/Key_documents/Documents/ECDC_Annual_Work_Programme_2009.pdf
		Moderate	Establishing a dedicated annual programme for EU IAS stakeholder engagement, but with limited earmarked annual budget, estimated as a half of ECDC annual budget	265 000 EUR / year		
		High	Establishing a dedicated annual programme for EU IAS stakeholder engagement, with earmarked annual budget (i.e. total ECDC annual budget)	530,000 EUR / year		
	MS level: stakeholder consultation & engagement actions	Low	Organising an annual national stakeholder forum, based on the information from Ireland and the UK	8000 EUR / year / Member State	**Ireland:** Cost of running the annual national Invasive Species Forum: ~ EUR 2,000 per year but when staff time is added (which includes organisation, producing proceedings etc), this rises to approximately EUR 8,000 per year. **UK:** Cost of organising annual Non-Native Species Stakeholder Forum with multi-sectoral participation: £ 7000 (~ 8000 EUR).	Irish national Invasive Species Programme: Cathy Maguire, pers. comm.. Niall Moore, GB Non-Native Species Secretariat, pers. comm. Questionnaire to the Netherlands as a NOBANIS Member State,

	Moderate	A dedicated (but limited) annual budget for stakeholder consultations programmes and running an annual national stakeholder forum, based on the information from Ireland and the UK	20 000 EUR / year / Member State	**Ireland:** Stakeholder engagement programme: annual running costs of EUR 12,000 (incl. staff time but not the printing and publication costs for information materials)	conducted in the context of this study.
	High	A dedicated annual budget for stakeholder consultation or a dedicated stakeholder consultation event, based on the information from the UK and the NL	100 000 - 150 000 EUR / year / Member State	**NL**: 150 000 EUR / year for awareness-raising campaigns. **UK**: a dedicated public attitudes survey on IAS ~ £90-100 000 (~100 000 EUR)	

6.10 Research

Key information for interpreting the estimates

Approach & data: The level / scale of costs of supporting IAS research has been estimated based on the past investment in such activities under the EU Framework Programmes for Research and Development (FPs) and in the national context.

Robustness & limitations: The possible levels of investment in IAS research are based on past investments, as it is not feasible to estimate the future research needs due to the EU IAS Strategy at this stage / in the context of this study. Consequently, they should be considered as indicative only.

Overlaps with other estimates: The estimated costs should not, in principle, overlap with other cost estimated presented in this Chapter.

Possible cost-savings: N/A

Its is foreseen that IAS-related research activities at the EU and national level will continue as a result of the implementation of the EU Strategy. Based on past investments in IAS research under EU Framework Programmes for Research and Development (FP Programmes), it can be estimated that the possible scale of research funding dedicated to IAS at the EU level could range between 3.5 million – over 10 million EUR / year, depending on the level of investment (Table 6-10). As in the past, EU-level support to research is foreseen to require co-financing from national budgets.

At MS level, the existing level of investment in IAS research indicates that the costs of supporting national / regional IAS research programmes could range between 60 000 EUR - 700 000 EUR (total) / Member State (Table 6-10). In the future it would be also possible to see if some of these costs could also be covered by involving the private sector.

Table 6-10 Estimated level of costs for IAS research. Note: the estimated level / scale of costs is indicative only.

STRATEGY COMPONENT			ESTIMATED COSTS OF THE STRATEGY COMPONENT		DATA & APPROACH USED TO DEVELOP THE ESTIMATE	
Type of cost		Level of investment / coverage / ambition	Cost item / indicator of costs	Estimated level / scale of costs	Data and approach	Origin / reference
HORIZONTAL: Research						
Supporting ongoing IAS research	Supporting ongoing IAS research at the EU level	Low - High	Estimated annual support to IAS reseach by EU R&D framework programmes, based on the past level of EU R&D funding for IAS	3.5 - 10.5 million EUR / year, estimated as 0.5 - 1.5 times the current EU R&D support to IAS.	On average, in the period 1996- 2006, the FPs financed seven IAS related projects per year, with an average cost of about 1 million EUR each. This amounted to a yearly budget of 7 million EUR total (i.e. including EU contribution and MS cofinancing) **Note**: Funding under the EU LIFE programme not considered here as it is not targeted for research activities. See costs of management above.	Riccardo Scalera (2010) How much is Europe spending on invasive alien species? Biol Invasions (2010) 12:173-177
	Supporting ongoing IAS research at the MS level	Low - High	Costs of regional / national funding (one-off) to support general IAS research activities, based on the information on existing IAS research activities.	60 000 - 700 000 EUR (total) / national or regional IAS research project / Member State	**Austria**: a national research project on IAS (3 years) (2007-2008): 700 000 EUR (total) **Germany (Bavaria)**: research on IAS (2002 - 2003): 400 000 EUR (total) **Germany**: research on potential biological control agents, such as pathogenic fungi, bacteria, or viruses: 250 000 EUR (total) **Ireland**: project on alien invasive species in Irish water bodies (2008): 280 000 EUR (total) **UK**: research project on Alien species and Noxious weed Control (Highways Agency) (2006 - 2008): £ 50 000 (total) (~ 60 000 EUR) **Denmark**: Ministry of Environment have had EUR 285 000 for R&D on IAS in the period 2008-10,	Uwe Starfinger, Julius Kühn Institute - Federal Research Centre for Cultivated Plants, pers. comm; Reinhardt, F., Herle, V.M., Bastiansen, B.F., Streit, B. 2003. Economic Impact of the Spread of Alien Species in Germany. German Federal Environmental Agency (Umweltbundesamt). (http://www.umweltdaten.de/publikationen/fpdf-l/2434.pdf); Shine, C., Kettunen, M., Genovesi, P., Gollasch, S., Pagad, S. & Starfinger, U. 2008. Technical support to EU strategy on invasive species (IAS) - Policy options to minimise the negative impacts of IAS on biodiversity in Europe and the EU. (http://ec.europa.eu/environment/nature/invasivealien/docs/Shine2008_IAS_Task%202.pdf); The Highways Agency. Project 'Alien species and Noxious weed Control' (http://www.highways.gov.uk/knowledge_compendium/projects/ADE6F78FDA98415E8AAFCE69BB9AB28B.aspx); Hans Erik Svart (Ministry of Environment /Danish Forest and Nature Agency), pers. comm. In the context of this project

6.11 Voluntary codes and best practices

Key information for interpreting the estimates

Approach & data: The level / scale of costs voluntary actions is based on the past investment in such activities.

Robustness & limitations: It is not possible to foresee the uptake of / requirements for future voluntary actions. Consequently, the estimates below are based on past investments and should be considered as indicative only.

Overlaps with other estimates: The estimated costs should not, in principle, overlap with other cost estimated presented in this Chapter.

Possible cost-savings: N/A

Voluntary codes of conduct, best practices and voluntary information and awareness raising campaigns have played an important role in supporting the update of IAS measures in the EU. It is therefore foreseen that such initiatives will continue to play a valuable role in supporting future implementation of the EU Strategy as part of a partnership-based approach. Based on existing information the costs of developing these types of initiatives could range between around 6000 EUR – 60 000 EUR (total) and 5000 EUR – 1 million EUR (total) respectively, depending on the scale of initiative (Table 6-11). With regard to the distribution of costs, the wide range of possible voluntary actions could be supported by a mix of funding from the EU, Member State and/or private sources.

Table 6-11 Estimated level of costs for IAS voluntary codes and best practices. Note: the estimated level / scale of costs is indicative only.

STRATEGY COMPONENT			ESTIMATED COSTS OF THE STRATEGY COMPONENT		DATA & APPROACH USED TO DEVELOP THE ESTIMATE	
Type of cost		Level of investment / coverage / ambition	Cost item / indicator of costs	Estimated level / scale of costs	Data and approach	Origin / reference
VOLUNTARY ACTIONS to complement / replace mandatory actions						
Developing codes of conduct & best practices	Small scale initiatives - large (e.g. national / international) scale initiatives	Low - High	A range of costs (one-off) of developing IAS codes of conduct, based on the information on already developed codes of conduct..	5 700 - 57 000 EUR (total)	**Global:** cost of developing Pet Trade Toolkit on voluntary and regulatory measures: US$75,000 (one-off, during one year) (~ 57 700 EUR) **Europe**: Cost of developing Council of Europe/EPPO Code of Conduct on Horticulture and Invasive Alien Plants (consultancy, coordination meetings, expert workshop): 22 000 EUR (one-off) **UK** (England & Wales): Cos of developing Code of Conduct on Japanese knotweed (consultancy, coordination meetings): £ 32 000 (one-off) (~ 38 400 EUR) **Ireland**: Development of 3 - 4 codes of conduct over 3 year period (excluding time contributed by stakeholders): 20 000 EUR (~ 5700 EUR / code of conduct) (one-off) **Denmark**: Code of conduct for trade with invasive plant species: EUR 17.000 (inc. drafting and implement it in the plant trade organisations)	Eladio Fernandez-Galiano (Council of Europe), pers. comm; Trevor Renals (Environment Agency), pers. comm; Irish national Invasive Species Programme: Cathy Maguire, pers. comm.; Jamie K. Reaser (Pet Industry Joint Advisory Council (PIJAC)) pers. comm.; Hans Erik Svart (Ministry of Environment /Danish Forest and Nature Agency)

Voluntary information / awareness raising campaigns	Small scale, one-off initiatives - large scale, multi-annual initiatives	Low - High	A range of costs (one-off) of IAS information / awareness raising activities based on the information on existing initiatives	5000 - 1 million EUR (total)	**UK:** Cost of two IAS awareness campaigns by OATA: £ 10 000 (one-off) (~ 12 000 EUR) **Switzerland**: cost of hosting Ambrosia-days in Switzerland (e.g. approx 3 week work time per event and translation): 6500 sFr (one-off) (~5000 EUR) **France**: Cost of government communication campaign on *Ambrosia artemisiifolia:* 119 440 EUR (one-off) **Belgium**: Cost of InvHorti programme to increase awareness to curb horticultural introductions of invasive plants: 1 002 964 EUR (total) over 3 years	Keith Davenport, Ornamental Aquatic Trade Association Ltd., pers. comm; Dr. Corinne Vonlanthen(Swiss Federal Office for the Environment (FOEN)) pers. comm..; Etienne Branquart, Belgian Biodiversity Platform, pers. comm.

6.12 Overall costs and benefits of investing in the EU Strategy

6.12.1 Estimated key annual costs of EU action on IAS

Given that the different timescales within which IAS measures can / are foreseen to be taken up and the different possible levels of ambition in implementing these measures remain to be agreed, it is difficult to estimate the possible level of total (e.g. annual) costs of future EU action on IAS, e.g. costs of implementing the EU Strategy. However, a very indicative assessment - based on the possible scale / level of costs for a number of key IAS measures outlined in 6.2-6.11 above - suggests that the possible scale of total costs (i.e. not incremental costs) for EU policy action on IAS (e.g. actions at the EU and MS level) could be around 40 million – 190 million EUR / year, ranging from low to and high level of investment, respectively (see Table 6-12-1 below).

Note: as the low level estimate is largely based on existing costs it is likely that such a level of investment would not be fully effective in addressing the increasing future risks of IAS in the EU. Therefore, it should be rather considered as a bottom line for future policy action.

It is to be noted that these estimates exclude possible costs of control of some IAS pathways (e.g. control of marine ballast water and hull fouling) as it is difficult at this stage to estimate the possible annual costs of these actions. In addition, it has not been possible to estimate an annual figure for a number of activities that mainly depend on Member States national interest and priorities (e.g. restoration, national investment in rapid reaction, management and research). Consequently, the estimated total costs reflecting the possible range of key costs of IAS policy action only.

The estimated possible range of total costs is the overall costs of a future policy on IAS in the EU, not incremental costs of the adoption and implementation of EU IAS Strategy. This is because a number of the outlined measures for IAS are already taking place at the Member State level. The existing data (e.g. information on the context of the EU strategy) does not allow for a more detailed assessment to be carried out on the possible incremental costs related to the implementation of the EU IAS Strategy. However, it seems that for a significant number of measures some level of investment is already taking place at the national level (Table 6-12-1 below).

Timescale of costs. Several of the measures listed in Table 6-12-1 can be taken within a number of years, i.e. the total annual costs might vary according to the agreement on the timescale for implementation. The key measures with a need for upfront investment are, for example the EU IEWS (300 000 – 6 million EUR / year) and the establishment of frameworks for IAS risk assessments (1 million EUR / year for EU and 500 000 EUR / year / MS, for a comprehensive measure) and management of intentional / unintentional introductions (several hundred thousand EUR / year for EU and Member State) (See Table 6-12-1). However, without a clearer indication of the timescale for different measures (i.e.

requirements and timeline for the implementation of the EU IAS Strategy) it is not possible to say how the costs be distributed over the upcoming years.

Synergies & cost-savings. Seeking synergies between different IAS prevention activities and/or parallel policy areas, in particular the existing EU regimes for plant and anima health, could result in a significant reduction in the level of costs. In particular, integrating IAS related preventative actions, such as administration of permits and 'on-the-ground' inspections, into the existing EU regimes for plant and animal health could result in considerable savings, reducing the estimated costs above. However, there is no clarity yet on the future policy design and possible synergies between IAS and plant and animal health sectors. Consequently, without an extensive, dedicated co-analysis it is not possible to estimate the extent of possible cost savings at this stage.

When considering the cost of policy action vs. inaction, according to Kettunen et al. 2009, the total documented monetary impacts of IAS impacts in Europe amount to around 12.5 billion EUR / year over the last 20 years (see Box 6-12). Most of this total, i.e. 9.6 billion EUR / year, can be attributed to the costs of IAS damage (e.g. to agriculture, fisheries and aquaculture, forestry and health sectors). Much of the 2.8 billion EUR relates to the costs of addressing the IAS problem – costs that could in principle be avoided by due preventive action. This estimate is generally considered as an underestimate of the real situation as in reality a far greater number of IAS cause negative socio-economic effects than are documented in monetary terms. Based on this conservative assessment, the recurring 'business-as-usual' cost of damage by IAS today could be roughly estimated as an average 9.6 billion EUR / year minimum (see Box 6-12). When compared to the estimated level of costs of key policy measures at the EU level (i.e. with the high level of investment around 190 million EUR / year) it seems that the avoided costs of IAS damage would be manifold to the costs of policy action.

Box 6.12 Estimated monetary impacts of IAS (as according to Kettunen et al. 2009)

Based on the information on documented costs over the past 20 years (i.e. real & estimated costs without any extrapolation or benefits transfer) the total documented monetary impacts of IAS in Europe amount to a total of 12.5 billion EUR / year. Majority of these costs, i.e. 9.6 billion EUR, result from the damage caused by IAS whereas the rest, i.e. 2.8 billion EUR, are related to the control of IAS. Costs related to terrestrial IAS (e.g. vertebrates, plants and invertebrates) form a major part of this estimate.

The aggregated estimate above was calculated based on information available on the costs related to IAS in Europe. This included information on costs of altogether individual 131 cases around Europe (94 per cent of which in the EU), associated with altogether 66 IAS. The costs included in the development of the aggregate estimate were real or estimated costs of actual invasions (i.e. no fictive cots were included). Also, there were no overlaps between the costs included in the aggregate analysis. However, it is to be noted that the study was based on interpreting existing information from sources commonly available to general public (e.g. existing reviews and summary reports), i.e. there was no possibility to check the nature of each figure with original source / author.

Majority of the costs (~80 per cent of the total 131 cases) included in the 12 billion EUR / year aggregate estimate were reported as annual costs of IAS invasions, including the most considerable costs documented. For the remaining cases (i.e. cases reported as total costs of taking place over several yeas) an annuity was calculated. Consequently, the aggregate figure can be regarded as a relative robust illustration of the scale of annual IAS costs over the past 20 years.

The estimate by Kettunen et al. includes a number of costs related to IAS that are also plant pests, some of which can also be covered under the EU plant health regime. This is because such information is often the most commonly noticed where as other impacts of IAS remain unrecorded. However, costs caused by IAS that are not covered by any of the existing regimes form a significant proportion of the estimate, e.g. costs of *Fallopian japonica* (over 30 million EUR / year), muskrat (over 20 million EUR) and European rabbit (over 1 billion EUR / year). Given that the exiting estimate of IAS costs is likely to be a significant underestimation (see below) it is considered that judging the estimated costs of policy action on IAS against 12 billion EUR / year (or 9.6 billion EUR / year for IAS damage) is a relatively robust comparison in terms of the overall scale of costs and benefits.

The analysis by Kettunen et al. (2009) clearly shows that the available data on IAS monetary costs remains scarce and unevenly distributed between different geographic areas and IAS taxa. **Consequently, in reality the costs of IAS are probably significantly higher than the estimated 12 billion EUR / year**. The FP6 project DAISIE has estimated that there are over 1000 IAS in the EU where as information on costs was available only for a small fraction of these (~7 per cent, i.e. 66 species). For example, marine and freshwater invertebrates are often reported to have negative effects on fisheries and aquaculture; however, evidence on their monetary impacts is very limited. Similarly, there is a clear lack of information on the costs of IAS to certain economic sectors (e.g. tourism, health and forestry).

In general, it is difficult to estimate in more detail how large of an impact / improvement 'on-the-ground' a certain level of investment in IAS policy would create (e.g. how many entries of IAS into the EU territory would be effectively prevented). Also, a detailed assessment of level of investment vs. foreseen impacts falls outside the scope of this study.

Nevertheless, it is foreseen that the EU Strategy could significantly help to minimise the future costs of IAS damage, for example by helping to control already-established IAS in a more systematic and cost-effective manner and by preventing the introduction of new IAS into the EU territory. Consequently, the current estimates seem to indicate that in terms of avoided costs of IAS damage, the socio-economic benefits arising from the adoption and implementation of the EU Strategy can significantly outweigh the associated costs.

In addition to avoided costs of IAS damage, the implementation of the EU Strategy is also foreseen to result in several benefits that are hard to estimate in monetary terms e.g. benefits to biodiversity, human health and preservation of natural heritage. These benefits, even though less tangible, should be considered on top of the avoided costs of damage. This means that the overall benefits of EU policy action on IAS seem to be significantly higher than the costs.

Table 6-12-1 Estimated key annual costs of EU action on IAS i.e. implementing the EU Strategy (including costs at EU-level and Member State level for EU-27). Estimated scale of annual costs based on the scale / level of costs for IAS measures outlined in 6.2- 6.11.

Type of cost	Level of costs	New cost vs. existing cost	Estimated scale of costs / year for EU policy action **Note: see sections 6.2 - 6.11 for more detailed information on how the ranges have been estimated.**	Possible scale of costs / year at the EU level. inc. EU & national (EU-27)		Comment re: calculation
				Level of investment - low	Level of EU investment - high	
EU-level information and early warning system	EU	**NEW**	300 000 EUR - 6 million EUR / year	300,000	6,000,000	See Genovesi et al. (2010)
National information and early warning systems (to support the EU-level)	Member State (EU-27)	Depends on MS, existing in several MS	Low EU level investment: 122 000 EUR / MS / year (i.e. average level of current investment) High EU level investment: 26 000 EUR / MS / year (i.e. estimated investment to complement comprehensive EU IEWS system)	3,000,000	702,000	Low EU investment foreseen to require higher level of MS investment. EU27: 27 x 122 000 = ~3 million EUR / year Highlevel of EU investment foreseen to require lower level of EU investment: EU27 = 27 x 26 000 EUR = 702 000 EUR / year
National 'on-the-ground' monitoring schemes	Member State (EU-27)	**Largely NEW** for high investment EXISTING for low investment	260 000 - 1.3 million EUR (one-off) year / MS for 1 to 5 IAS	7,000,000	35,000,000	EU27: 27 x 260 000 = ~7 million - 27 x 1.3 = 35 million EUR / year
EU-level risk assessment panel	EU	**NEW**	1 million EUR / year	1,000,000	1,000,000	
National risk assessment frameworks (e.g. coordination & conducting species-specific RAs)	Member State (EU-27)	**Largely NEW** for high investment EXITSING for low investment But RA frameworks already existing in some MS	10 800 - 225 000 EUR / year / MS for existing / minimum level RA systems Upto 500 000 EUR / year / MS for comprehensive system to support EU IEWS	3,000,000	13,500,000	Minimum level = average of given range EU27: 27 x 117 900 = ~3 million EUR / year - 27 x 500 000 = ~13.5 million EUR / year

Species-specific risk assessments	EU and Member State (EU-27)	**NEW for EU level**	42 000 EUR / risk assessment (of which 15 000 EUR costs of expert workshop, rest staff costs) Total costs of ~22 – 50 million EUR for 515 – 1200 assessments, respectively. Total costs of ~7.7 - 18 million EUR for 515 – 1200 assessments (respectively) when excluding staff costs	2,200,000	1,800,000	Annual costs estimated assuming spread of total costs over 10 year period. For the 'high' investment option, staff costs have been left out as assumed to be largely covered under a comprehensive bodies for IAS risk assessment and/or policy coordination.
Eramework for marine pathways risks assessments	EU and Member State (EU-27)	**Largely NEW**	Not possible to estimate annual / total figure	N/A	N/A	
Intentional introductions: administration of an EU-level framework for non-native species trade / movement	EU	**Largely NEW** (apart from aquaculture)	115 000 EUR / year	115,000	Assumed to be largely covered under a comprehensive body for IAS policy coordination (below)	
Intentional introductions: administration of permitting framework & costs of inspection by Member State	Member State (EU-27)		60 000 - 1 125 000 EUR / year / MS for running a permitting system of 1.5 - 15 fulltime staff, with around < 100 – max 60 000 permits issued / year) plus 100 000 EUR / year for inspection / MS = 160 000 EUR / year / MS - 1 225 000 EUR / year / MS	4,000,000	33,000,000	EU27: 27 x 160 000 = ~4 million EUR / year - 27 x 1 225 000 = ~33 million EUR / year
Unintentional introductions: administration of an EU-level framework for preventing unintentional introductions of IAS	EU	**NEW** for IAS that non-pests / diseases	115 000 EUR / year	115,000	Assumed to be largely covered under a comprehensive body for IAS policy coordination	

Unintentional introductions: administration of permitting framework & inspection duties by Member State	Member State (EU-27)		203 000 EUR / year / MS	5.5	(below)	EU27 = 27 x 203 000 = ~5.5 million EUR
Unintentional introductions: inspection effort by Member State	Member State (EU-27)		500 000 EUR - 2.5 million EUR / year / MS, based on 1/5 - equal costs to plant health regime	13,500,000	62,500,000	EU27: 27 x 500 000 = 13.5 million - 27 x 2,5 million = 62.5 million EUR
Unintentional marine & other pathway introductions	EU and Member State (EU-27)	**Largely NEW**	Not possible to estimate an annual figure	N/A	N/A	
Contingency for rapid reaction: administration	EU	**NEW** for IAS that non-pests / diseases	16 000 EUR / year	16,000	Assumed to be largely covered under a comprehensive body for IAS policy coordination (below)	
	Member State (EU-27)		1200 EUR / year / MS	32,400		EU27: 27 x 1200 = 32 400 EUR
Budget for contingency actions on IAS	EU		1 - 3 million EUR / year, based on actual EU spending on solidarity funding under the EU Plant Health Regime	1,000,000	3,000,000	
	Member State (EU-27)		50 000 / 100 000 EUR - 5 - 14 million EUR / total event / MS, based on existing costs	Not possible to determine as varies greatly according to investment / objectives		
Management / control: EU level action plans	EU	**NEW**	20 000 - 50 000 EUR (total) / action plan (average 35 000 EUR / action plan) 70 000 - 350 000 EUR / action plan for 2 to 10 species	17,500	87,500	Annual costs estimated assuming total costs take place in 4 years time, i.e. 70 000 / 4 = 17 500 and 350 000 / 4 = 87 700 EUR / year
Management / control: MS level action plans	Member State (EU-27)	EXISTING	3900 EUR - 33 000 EUR / management plan / species (total / one-off)	Not possible to determine as varies greatly according to investment / objectives		

Management / control of IAS of EU concern	EU and Member State (EU-27)	**Largely NEW** for high level of investment EXISTING for low level of investment	3 - 12 million EUR / year inc. EU and MS contributions	3,000,000	12,000,000	
Restoration	EU and Member State (EU-27)	EXISTING	100 000 EUR - 2 million EUR / year	Not possible to determine as varies greatly according to investment / objectives		
IAS policy development & coordination	EU	EXISTING re: low level of investment	75 000 - 550 000 EUR / year, for one fulltime staff and dedicated body ~7 staff members, respectively	75,000	550,000	High level estimate rather high, as based on information from Sweden. Required investment likely to be much less for several Member States. EU27: 27 x 40 000 = ~1 million EUR - 27 x 650 000 = ~18 million EUR
	Member State (EU-27)	**Largely NEW** re: dedicated bodies for IAS policy	40 000 - 650 000 / year / MS for one fulltime staff and dedicated body ~7 staff members, respectively	1,000,000	18,000,000	
Development of national strategies (for MS that do not yet have them)	Member State (EU-27)	Largely EXISTING	130 000 - 1.5 million EUR (total) / MS	Not possible to determine as varies greatly according MS approach / MS remaining without national IAS plan		
Policy assessment & support	EU	EXISTING	100 000 - 120 000 EUR (total) / study	33,000	100,000	Annual costs estimated assuming one study / three years - one study / year with an average costs of ~100 000 EUR (total). I.e. for 'low' level of investment 100 000 / 3 = 33 000 EUR / year
	Member State (EU-27)	EXISTING	10 000 / 120 000 EUR (total) / study	460,000	1,400,000	Annual costs estimated assuming one study / year, with an average costs of ~50 000 EUR (total). I.e. for 'low' level of investment 50 000 / 3 = 17 000 EUR / year EU27: 27 x 17 000 EUR = ~460 000 EUR - 27 x 50 000 = ~1.4 million EUR
Stakeholder engagement	EU	**Largely NEW** for high level of investment	100 000 EUR - 530 000 EUR / year	100,000	530,000	

	Member State (EU-27)	Largely EXISTING for low level of investment	less than 800 EUR - 150 000 EUR / year / Member State	21,600	4,000,000	EU27: 27 x 800 = 21 600 EUR - 27 x 150 000 = ~4 million EUR / year
Research	EU and Member State (EU-27)	**Largely NEW** for high level of investment	3.5 million - 10.5 million EUR / year	3.5	10.5	
	Member State (EU-27)	Largely EXISTING for low level of investment	60 000 EUR - 700 000 EUR (total) / Member State.	Not possible to determine as varies greatly according MS approach / MS remaining without national IAS plan		
TOTAL				**39,985,509**	**193,169,511**	

6.12.2 Cost of compliance and enforcement to private actors

Note: The costs related to the compliance with and enforcement of IAS policy are integrated in overall costs considered in sections 6.2 – 6.10 above. The purpose of this section is only to provide a better overview of the range of possible costs (e.g. level of costs) that could be covered by private actors.

The main costs of compliance with the EU Strategy affecting different economic sectors and/or private actors are foreseen to arise from the expanded measures to control intentional and unintentional introductions and movement (e.g. trade) of IAS into and within the EU. The key cost elements and the sectors / actors involved are outlined in Table 6-12-2 below.

In general, the costs to private actors linked to compliance with IAS permit and inspection procedures might range from hundreds of thousands EUR to over several million EUR / year / Member State, depending on the general level of ambition of the IAS regime and the agreed arrangements for cost recovery at the national level. With regard to management of IAS pathways, e.g. marine pathways, the costs to private actors may vary widely according to the level of ambition. Similarly, possible costs associated with eradication, management and restoration activities will depend on the agreed arrangements and whether there are possibilities to identify responsible parties.

In addition to the costs of compliance with permit and inspection procedures, costs to private actors can also arise due to the restrictions on introducing and trading specified alien species in the EU (i.e. opportunity costs). However, no information on the overall level of trade and/or use of alien species in the EU could be found to help to estimate the possible scale of opportunity costs associated with this aspect of Strategy implementation at this stage.

Table 6-12-2 Types of costs foreseen to be covered by private actors / sectors

IAS measure	Type of cost	Key private actors / sectors	Level / scale of costs	Reference
Control of trade / movement / of non-native species (i.e. control of intentional introduction of IAS)	Fees for permits for non-native species Risk assessments to prove that import / export / movement of non-native species has no / limited risks	Horticultural sector Aquaculture sector Agriculture & forestry sectors Pet & aquarium trade sectors	**Examples of costs of fees to private actors in the context of the EU Wildlife Trade Regime**[323] (i.e. number of permits x EUR / permit in 2008) Finland: 10 575 EUR / year (75 EUR / permit) UK: 1 777 278 EUR / year (69.5 EUR / import & export permits, 55.4 EUR / re-export permit) NL: 187 860 EUR / year (60 EUR / permit) CZ: 25 613 EUR / year (38.4 EUR / permit) BE: 43 700 EUR / year (25 EUR /	Fees: CITES annual / biannual reports: http://ec.europa.eu/environment/cites/reports_en.htm Risk assessment: EPPO costs Riccardo Scalera pers. comm. in the context of this study.

[323] Note: not all EU Member States have imposed fees for wildlife trade permits

			permit) IT: 951 690 EUR / year (16.87 EUR / permit) **Risk assessment** estimated costs: 15 000 EUR / risk assessment (exc. staff costs)	
Establishing permitting / inspection / border control system to control trade pathways (i.e. control of unintentional introduction of IAS)	Fees for registration of / permits for import of goods that could be potential carriers of / contaminated with IAS	Aquaculture sector Agriculture & forestry sectors Pet & aquarium trade sectors	**Costs to private actors (e.g. registration and fees for permits) under the EU Plan Health Regime:** 150 000 EUR - 500 000 EUR million / EUR by private operators in one EU Member State (30% costs recovered) and 750 000 EUR - 2.5 million / EUR by private operators in one EU Member State (100% costs recovered)	Food Chain Evaluation Consortium (FCEC) (2010) Evaluation of the Community Plant Health Regime (draft final report). 364 p. + Annexes.
Management of marine pathways	Marine pathway risk assessments Port baseline surveys Measures for ballast water and hull fouling management	Marine transport sector	**Marine pathway risk assessments**: 50 000 EUR / shipping route / total and implementing Decision Support Systems (DSS) for marine pathway risk assessments: 20 000 EUR / port authority (total / one-off) **Port baseline** surveys: ~ 76 000 EUR / total (one-off) **Ballast water** reporting requirements: 4000 EUR / shipping operator / year Ballast water treatment: 290 000 - 660 000 EUR / vessel (total, one-off) and 35 EUR / 1000m3 water (running costs) Ballast water inspection: 1 000 EUR - 1 600 EUR / vessel / port authority / event **Hull fouling** inspection: 1 200 EUR - 2 400 EUR / vessel / event Costs of cleaning vessels from hull fouling organisms: minimum 13 700 EUR / vessel / event	Stephan Gollash, pers. comm. EMSA 2008. Implementing the Ballast Water Management Convention – the EU dimension, Workshop report. European Maritime Safety Agency, Lisbon, p. 15 EMSA 2009. European Maritime Safety Agency, Safer and Cleaner Shipping in the European Union. Luxembourg: Office for Official Publications of the European Communities, p. 20. Lloyd's Register and Sarah Bailey pers. comm. in Shine et al. 2009 and 2008.
Management of other pathways such as inland water and air traffic	Dedicated pathway risk assessments Measures for managing spread if IAS via given pathway (e.g. cleaning of vessels / vehicles)	Inland water transport sector Air traffic sector etc.	No information available	
Costs related to eradication, control and management of IAS Costs of restoration due to IAS invasion	Costs of eradication / management / control / restoration actions when liability can be proven	All above Also, individual private actors	Depends on the agreed level of liability	

6.12.3 Development of the costs of EU policy action vs. costs of EU inaction in the future

When considering the development of costs and benefits of EU policy action in the future it can be foreseen that, with a effective, prevention-focused EU policy in place, the costs of several IAS measures are envisaged to diminish over time (Table 6-12-3). For example, a review of plant eradications carried out in New Zealand (Harris and Timmins 2009) found that early removal of plants costs on average 40 time less than removals carried on after an invasive plant has widely established. Similarly, it has been estimated that the early removal of *Ludwigia grandiflora* from the UK would cost approximately 20 times less than the management of already established species (25 000 EUR and 550 000 EUR respectively).[324] On the other hand, increased trade and travel are likely to result in an increasing risk of IAS entry into and establishment in the EU territory, thus somewhat offsetting the foreseen downward curve of costs.

The cost of the EU information and early warning system and costs associated with risk assessments might also decrease once the upfront / one-off investments have been finalised. In addition, monitoring costs are envisaged to go down after establishing the overall frameworks for monitoring IAS (i.e. the running costs are foreseen to be lower that the costs of establishment). The costs of other measures are foreseen to stay more or less constant over time with only inspection costs increasing due to the general increase in trade and travel into and within the EU.

Turning to the likely costs of inaction (i.e. the cost of a 'weak' EU Strategy), studies carried out in the context of the Europe-wide DAISIE project clearly indicate that the numbers and introductions of alien species to the EU have increased rapidly over the past decades. It has been generally estimated that during the period 1970 – 2007, the number of IAS increased by 76 per cent, with no indication of any reduction in this dramatic increase rate (Butchart et al. 2010). This increased rate of introduction can be attributed to the growth in trade and travel linked to globalisation. As the volume of trade and travel is projected to carry on rising steadily, it is likely that introductions of alien species will also increase as a result. Furthermore, research indicates a strong correlation between the growth in GDP and the rate of introductions of new species – both into and within the EU.[325] This also means that the scale of IAS impacts (i.e. associated costs of damage and control) is likely to be higher in the future.

In a sectoral context, the EU has not yet suffered from EU-wide infestations of IAS in forest ecosystems (e.g. forest pests). However, as the recent efforts needed to contain pinewood nematode in Portugal show, with no comprehensive and effective EU-wide system in place it seems only a matter of time before such occurrences / infestations of IAS become a common phenomenon in Europe. The socio-economic costs of such invasions to the forestry sector can be significant. For example, Canada's annual timber losses due to IAS are estimated at 61 million m^3, which is equivalent to CND$720 million / year (~540 million EUR

[324] GB Non Native Species Secretariat, pers. comm.

[325] See e.g. DAISIE (Delivering Alien Species Inventories for Europe (http://www.europe-aliens.org), supported under the Sixth EU Research Framework Programme.

/ year) in financial losses to stumpage, royalties and rent revenues.[326] These estimated losses for one economic sector in Canada are much higher than the estimated costs given above for a high level of investment in EU policy framework to prevent IAS invasions in the EU. The present-day cost of the damage caused by IAS affecting forestry and agriculture in Canada has been estimated to be CND$7.5 billion annually (5.6 billion EUR).[327]

In general, it is foreseen the costs of policy action on IAS (e.g. the implementation of the EU Strategy) in the EU will diminish over time as the risks and negative impacts of IAS become better controlled. In addition, a coordinated framework for joint action at the EU level is foreseen to reduce expenses to Member States in terms of increased cost-effectiveness and reduced risks (e.g. gains in developing a joint EU information and early warning system: see 6.2 above) and by ensuring effective eradication / containment of IAS across national borders. On the other hand, if no coherent action at the EU level is taken to prevent IAS invasions, the costs of IAS damage and costs of control / management action are likely to increase.

Table 6-12-3 Foreseen development of the costs of IAS measures (i.e. costs of EU policy action) over time

Type of cost	Development of costs over time	Comment
Prevention		
EU LEVEL INFORMATION AND EARLY WARNING SYSTEM	↘	Running costs foreseen to be somewhat smaller than the costs of establishment. But some increased expected in the future with EU enlargement
RISK ASSESSMENT (RA)		
Costs of risk assessment mechanism / framework at Member State level	↔	
Costs of an EU-level expert panel for IAS risk assessment	↔	
Species-specific assessments	↘	Carrying out RAs is a one-off cost → overall RA costs foreseen to diminish over time as RAs for key IAS / potential IAS of EU carried out. However, RAs for new 'IAS of EU concern' still needed.
Pathway-specific assessments: marine pathway risk analysis	↘	Carrying out RAs is a one-off cost → overall RA costs foreseen to diminish over time as RAs for key shipping pathways carried out. **Note**: to be fully effective updating pathway RAs in every few years likely to be necessary. This might be of a more limited costs though.
Other pathway-specific assessments	↘	As above
MANAGEMENT OF KEY PATHWAYS		

[326] Kremar-Nozic, E., Wilson, B. and Arthur, L. 2000. *The potential impacts of exotic forest pests in North America: a synthesis of research*. Canadian Forest Service Information Report BC-X-387. 35 pp.

[327] Marcel Dawson. 2002. *Plant Quarantine: Preventing the introduction and spread of alien species harmful to plants*, pages 243-252 in Alien Invaders in Canada's Waters, Wetlands, and Forests. Canadian Forest Service, Natural Resources Canada.

Intentional introductions	Administration of an EU-level framework for alien species trade / movement		
	Administration of permitting framework & inspection duties by Member State		Recurring costs of inspection could increase, given increase in travel and trade
Unintentional introductions	Administration of permitting framework & cost of inspection by Member State		
	Administration of an EU-level framework for preventing unintentional introductions of IAS		
	Inspection effort by Member State		Recurring costs of inspection could increase, given increase in travel and trade
	Infrastructure for border control inspection / quarantine		Establishing infrastructure for border control (e.g. quarantine) is a one-off cost, therefore level of investment required is likely to diminish over the years. But some increased expected in the future with EU enlargement
Control of unintentional marine pathway introductions	Ballast water inspections / control of compliance		Recurring costs of inspection could increase, given increase in travel and trade
	Hull fouling inspections / control of compliance		
	Ballast water treatment		Investment in ballast water treatment infrastructure is one of the key costs. Since this initial investment has been made overall costs are likely to diminish.
	Hull fouling treatment		
Control of other unintentional pathway introductions			
MONITORING	EU-level data compilation & analysis		Information framework builds on previous data and analysis → costs likely to diminish over time.
	'On-the-ground' monitoring actions in Member States		Setting up monitoring schemes is the most costly action whereas costs of running monitoring schemes are less costly → costs likely to diminish over time. Also, the circulation of information in the EU is foreseen to be more effective with the EU-level information system in place, leading to further cost savings.
Rapid response & early eradication			
CONTINGENCY FOR RAPID RESPONSE & EARLY ERADICATION	Commission: administration of financing for rapid response / early eradication (e.g. solidarity funding)		
	Member State: administration of financing for rapid response / early eradication (e.g. solidarity funding)		
	EU-level contingency financing for 'IAS of EU concern'		When preventative measures are in place less money is foreseen to be needed for emergency eradication of IAS. On the other hand, increase in trade and travel is likely to result in an increasing risk of IAS entry into and establishment in the EU territory, thus somewhat offsetting the foreseen downward curve of costs.
	Member State level contingency financing for IAS of Member State's concern		

Control, management & restoration			
MANAGEMENT PLANS	EU-level: developing action / management plans for already established 'IAS of EU concern'		Development of management plans are one-off costs. Therefore, these costs are to diminish over time as the already present 'IAS of EU concern' / IAS of Member State concern are covered. Also, when preventative measures are in place less resources are foreseen to be needed for new IAS.
	Member State level: developing action / management plans for already established IAS of Member State concern		
MANAGEMENT ACTIONS	EU-level: controlling / locally eradicating already existing 'IAS of EU concern'		If control and management of IAS is successful → infestation of IAS and associated costs are hoped to diminish over time. Also, when preventative measures are in place less resources are foreseen to be needed for control and management of new IAS. On the other hand, increased trade and travel are likely to result in an increasing risk of IAS entry into and establishment in the EU territory, thus somewhat offsetting the foreseen downward curve of costs.
	Member State level: controlling / locally eradicating additional, already existing IAS at MS level		
RESTORATION	Restoration of ecosystems after IAS invasions & management / eradication actions		Restoration activities are mainly one-off → costs diminish over time. Also, when preventative measures are in place less resources are foreseen to be needed for restoration ecosystems due to IAS invasions. On the other hand, increased trade and travel are likely to result in an increasing risk of IAS entry into and establishment in the EU territory, thus somewhat offsetting the foreseen downward curve of costs.
HORIZONTAL: policy development & strategy implementation			
Development of the national IAS Strategy (for MS that do not already have a dedicated strategy)			Development of IAS strategies is one-off costs → costs to diminish over time
Updating / follow-up of national IAS Strategy			Depends on the level of ambition
Updating / follow-up of the EU IAS Strategy			Depends on the level of ambition
HORIZONTAL: Administration & coordination structures			
Admin of EU-level information and early warning System			
General admin & coordination: Member State level			
General admin & coordination: Commission			
HORIZONTAL: Stakeholder consultation & engagement			
Stakeholder consultation & engagement actions: EU level			Depends on the level of ambition
Stakeholder consultation & engagement actions: Member State level			Depends on the level of ambition
HORIZONTAL: Research			
Supporting ongoing IAS research at the EU level			Depends on the level of ambition

Supporting ongoing IAS research at the MS level		Depends on the level of ambition
VOLUNTARY ACTIONS to complement / replace mandatory actions		
Developing codes of conduct & best practices		Depends on the level of ambition
Voluntary information / awareness raising campaigns		Successful information / awareness raising campaigns → level of investment foreseen to diminish over time as level of awareness arises

7 Delivering the future EU Strategy

The EU Strategy on Invasive Alien Species is being developed within a dynamic policy context directly linked to globalisation and influenced by global environmental change, including climate change. This context affects not only EU environmental policies but also agriculture, forestry, fisheries, energy, infrastructure, trade, transport, external assistance and cooperation, research and technical development. Around the EU, many public and private stakeholders - from isolated islands to the pan-European scale – are developing best practices and innovative approaches that can inform the design and delivery of the Strategy.

The 2008 Communication described a gradient of four Options, covering both non-legislative and legislative approaches:

- Option A: business as usual;
- Option B: maximising use of existing approaches and voluntary measures;
- Option B+: targeted amendment of existing legislation;
- Option C: comprehensive dedicated legal framework.

Building on the analysis and evidence base presented in this study[328], this chapter considers how the Strategy could be delivered most effectively and efficiently. It contains four sections:

- a summary of suggested Strategy goals and operational objectives (see 7.1);
- a presentation of suggested Strategy components, identifying those that could require a legislative basis and cross-referencing relevant sections of chapter 6 on the costs of different categories of measures associated with the adoption and implementation of the EU IAS Strategy (see 7.2);
- a comparison of the four COM Options in terms of their adequacy / suitability for implementing suggested Strategy components, including consideration of alternative designs for possible new legislation (i.e. Regulation or Directive) (see 7.3);
- overview of possible architecture for the future information and early warning system to be created at EU or Europe-wide level (see 7.4).

[328] These build on the background studies carried out for the Commission, in particular the preliminary impact assessment (Shine et al. 2009b).

7.1 Summary of suggested Strategy goals and operational objectives

Suggested overall objective

To protect EU biodiversity and ecosystem services against present and future impacts of invasive alien species and genotypes and minimise damage to our economy, human health and wellbeing, without limiting our use of species that do not threaten such interests.

Suggested Strategic Goals

SG1: Development of risk-based prioritisation protocols for EU-level action and capacity building

SG2: A structured framework to manage pathways into, within and from the EU, focused on prevention and rapid response at the appropriate biogeographic scale

SG3: Integrated IAS management linked to ecological restoration and ecosystem resilience, taking account of climate change as a future driver of IAS spread

SG4: EU-wide awareness, responsibility and incentives adapted to target audiences and key stakeholders, based on a partnership approach

Suggested Operational Objectives for key components

5.1: Prevention: intentional introductions

Pathways involving the import, intra-EU movement & holding and / or release of alien species into the natural environment are managed and prioritised, based on risk assessment, to prevent or minimise adverse impacts on EU biodiversity or ecosystem services as a result of:

- the introduction of new IAS into the EU;
- the further spread of already introduced IAS within the EU;
- the introduction of species with a partially native range in the EU to areas within the EU where they are not native and may become invasive.

5.2: Prevention: unintentional introductions

Pathway-based measures tailored to risk level minimise unintentional introductions into and within the EU in partnership with relevant stakeholders at all levels.

5.3: Early Warning and Rapid Response

Identifying and responding to biological invasions before they take hold is made possible through a coordinated system of measures for surveillance and monitoring, diagnosis, risk assessment, circulation of information, reporting and appropriate responses.

5.4: Control and management of already established invasive species

An integrated management framework, based on realistic priorities and stakeholder engagement, prevents further spread of already established invasive species in order to reduce impacts on EU biodiversity and ecosystem services.

5.5: Ecological restoration

Ecological restoration builds on IAS management activities to reinstate functioning ecosystems dominated by native species

5.6: Changing the incentive culture: responsibilities and financing

A balanced framework of incentives encourages responsible behaviour, distributes IAS costs efficiently and equitably and provides targeted support from EU financial instruments.

5.7: Cross-cutting components

5.7.1: Awareness-raising and communication

IAS have visibility as a shared European concern to build understanding and engagement amongst decision-makers, industry, interest groups and the general public.

5.7.2: National strategy development and coordination

Policy level direction, coordination and planning on IAS issues is enabled between key authorities and agencies, supported by a framework for stakeholder consultation and engagement.

5.7.3: Research

IAS knowledge gaps, uncertainties and areas for technical innovation are strategically addressed through EU Research and Technological Development policy and programmes with adequate funding.

5.7.4: Capacity building

Targeted education and training of specialist personnel supports effective implementation of the Strategy and optimises synergies with capacity building programmes in related fields.

5.7.5: Beyond EU borders

EU global footprint policies integrate IAS risks in sustainability impact assessment for external development and cooperation activities and trade negotiations. The EU cooperates actively with relevant international organisations to develop effective standards and policies to address IAS risks to biodiversity and ecosystem services.

7.2 Presentation of suggested Strategy components

This section presents the suggested Strategy components, based on the analysis of possible and preferred approaches in chapter 5 (summarised in Table 5-13). For each element or action envisaged, Table 7-1:

- identifies those that could require a legislative basis; and
- cross-references relevant sections of chapter 6, which presents an assessment of the foreseen total scale / level of costs of a comprehensive EU IAS policy, associated with the adoption and implementation of the EU IAS Strategy.

Table 7-1 Presentation of suggested Strategy components, cross-referenced to heads of cost in Chapter 6

Suggested Strategy component & preferred approach	Legislative basis?	Cost item
Key overarching elements		
High IAS visibility, understanding and engagement	No	6.9 & 6.11
Cross-sectoral policy coordination enabled at EU and MS level	Depends on design	6.8
Clear definition of roles and responsibilities	Depends on design	6.8
Common understanding of key terms and concepts	Preferable	6.8
Prevention: general		
EU / Europe-wide information and early warning system (IEWS)	Depends on design	6.2 & 7.4
EU IAS risk assessment framework, supported by EU-level expert panel(s): covers species and pathway assessments with progressive development of biogeographic approach if feasible	Depends on design	6.3
Criteria and procedures for listing 'IAS of EU concern'	Yes	6.3
Optimised coordination and interoperability of border control & quarantine services, infrastructure, inspections, information networks and EWRR	Depends on design	6.4 & 6.8
Prevention: intentional introductions		
Import: Risk-based permit system based on grey/black listing for 'IAS of EU concern' (possible transition to white listing for certain groups of species) White listing potentially enabled for Outermost Regions	Yes	6.3 & 6.4
Intra-EU movement and holding: 'IAS of EU concern' subject to continuum of controls via risk-based permit system Occupational activity permits for risk-based categories of holding facilities, linked to EU liability regime: adapted to biogeographic region EU framework & criteria for decentralised decision making on IAS of national / local concern, ensuring compatibility with Single Market White listing potentially enabled for Outermost Regions	Yes	6.3, 6.4 & 6.11
Release into the natural environment White listing as generalised approach, supported by duty of care Risk-based derogations/permitting for occupational activities linked to EU liability regime: adapted to biogeographic region	Yes	6.3, 6.4, 6.9 & 6.11
Prevention: unintentional introductions		
Pathway/vector risk analysis for wider range of contaminants	Variable	6.3 & 6.4
EU comprehensive system for marine pathway risk analysis (ballast water and hull fouling)	Depends on design	6.3 & 6.4
Integrated planning / management to address intra-EU dispersal pathways	Depends on design	6.3 & 6.4
IAS risks integrated in green infrastructure/ecosystem-based adaptation	Unlikely	6.4 & 6.8

Suggested Strategy component & preferred approach	Legislative basis?	Cost item
Early warning and rapid response		
Operational national systems for IAS data collation (linked to IEWS)	Depends on design	6.2, 6.8 & 6.10
EU-level monitoring & rapid screening (IEWS)	Depends on design	6.2 & 6.3
MS IAS surveillance & monitoring for existing and new IAS, integrated in existing systems where feasible	Likely	6.5
MS contingency planning and eradication actions for national/local priorities	Likely	
Possible mandatory actions for 'IAS of EU concern' (surveillance, reporting, contingency planning and eradication actions)	Yes	6.6
Potential to consider possible co-financing and/or funding through cost recovery mechanisms based (if feasible) on liability		
Control, management and ecological restoration		
EU framework for MS actions to manage IAS spread within the EU (subsidiarity + transboundary, biogeographic & ecosystem approaches)	Preferable	6.7 6.9 & 6.11
Shift towards liability / compliance and incentive-based approaches		
National IAS action plans for national/local priorities	Preferable	6.7
EU action/management plans for selected IAS	Depends on design	6.7
Possible mandatory management actions for 'IAS of EU concern' (biogeographic listing)	Yes	6.7
Supported via range of EU financial instruments and/or funding through cost recovery mechanisms based on liability (if feasible) and other approaches		
IAS addressed as integral part of ecological restoration	No	6.7
Supported via EU financial instruments and/or funding through cost recovery mechanisms based (if feasible) on liability		
Incentives, responsibilities and financing		
EU-level & other formal voluntary codes of conduct for key pathways	No	6.11
Expansion of market-based instruments (IAS risks addressed through labelling, certification and accreditation)	No	N/A
IAS integration in Green Public Procurement policies	Preferable	N/A
IAS integration in cost recovery mechanisms (taxes, charges)	Yes	N/A
IAS integration in EU environmental liability mechanisms, including occupational activities under Annex III, based on 'biological polluter pays' principle: development of adapted insurance products	Yes	N/A
Optimised use of EU funding instruments	Depends on design	N/A
Cross-cutting components		
EU and targeted communication and engagement activities	No	6.9
National IAS strategies	Preferably	6.8
IAS research programmes based on strategic priorities	No	6.10
Capacity building and training	No	Several
IAS integration in sustainability impact assessments, external policies and cooperation with relevant international organisations	No	6.8

7.3 Comparison of COM Options for implementing suggested Strategy components

This section provides a short comparison of the different COM Options for implementing suggested Strategy components, building on the presentation in Table 7-1. As emphasised in chapter 5, these Options may be seen as complementary i.e. individual elements may be combined to design the most appropriate Strategy for EU needs.

7.3.1 Option A: Business as Usual

The BAU scenario could not ensure delivery of the suggested Strategic Goals and would not prevent new potentially invasive alien species arriving in the EU with increased associated ecological, economic and social consequences and related costs (see summary of baseline analysis in 3.7). In terms of monetary implications, the BAU scenario is likely to result in continued / increasing costs of IAS invasions in the EU (see chapter 6).

7.3.2 Option B: Maximising existing approaches and voluntary measures

This pragmatic approach to Strategy implementation could build on synergies with existing investments without waiting for new legislation. Several activities envisaged are already embedded and expanding in practice at local, national or regional level (see 3.5 and 3.6). These could be interlinked and scaled up within the Strategy framework at relatively little incremental cost.

Voluntary codes and best practices

These could be further developed for specific pathways to encourage responsible practices and risk avoidance at industry and user level. This function can be particularly helpful for steering attitude change, not only for species in trade but also for leisure and recreational practices.

EU / MS activities could be leveraged by high-level initiatives spearheaded by the Council of Europe in partnership with specific sectors. MS legislation could be used to give codes statutory force or equivalent formal status. This could increase their persuasive / compliance effect e.g. by establishing a duty of care standard that can be referenced in legal proceedings for IAS-related damage.

EU /Europe-wide information and early warning system (IEWS)

Non-legislative architecture could be used to provide informal technical support, maintain and update the DAISIE inventory and / or support a networked technical structure. The NOBANIS network has operated in this way through voluntary contributions from participating countries, with allocation of limited budget resources and some additional funding from regional institutions (e.g. Nordic Council).

This approach would provide a low/medium ambition level of decision support and require low-level new resources e.g. to maintain and update the DAISIE inventory (see Architecture A in 7.4 below). New investments could be needed to create equivalent networks to cover e.g. the Overseas Entities.

Releases into the natural environment

MS could choose to apply existing powers under the nature Directives more strictly to prevent potentially damaging releases into the natural environment. EU guidance could be developed under these Directives on particular pathways or categories of activities presenting higher levels of risk.

Monitoring, control, management and ecological restoration

MS could choose to adopt mandatory notification and control measures for specified IAS, linked to remediation requirements where appropriate. Voluntary IAS action plans could be expanded, including through cooperation at a biogeographic scale. Under the WFD, an agreed approach could support consistency in monitoring IAS as a pressure on good ecological status (informed by ongoing MSFD work on biopollution indices).

Responsibilities and financing

MS could make more proactive use of environmental liability rules to cover damage resulting from IAS where causation can be demonstrated. Existing EU financial instruments could be used more systematically to support the integration of IAS control measures into broader land and resource management policies.

EU strategic coordination and mainstreaming

Improved communication, coordination and cooperation is critical for cost-efficient interventions. This has been recognised in the AHR and PHR evaluations and in the Strategy mandate from EU institutions (see 2.4). At EU level, IAS issues could be formally considered through a range of existing advisory bodies e.g. Standing Forest Committee, Animal Health Advisory Committee.

MS IAS Strategy development and coordination

Over half of EU-27 MS have adopted IAS Strategies (stand-alone or integrated in national biodiversity strategies) and many others are at the development stage. The main catalyst for this process has been the Bern Convention IAS programme which continues to review implementation and provide targeted guidance on common problem issues. Only four MS have no strategic process under way.

IAS strategies could play an important role in operationalising cross-sectoral coordination, particularly between key environmental, plant health and agriculture and forestry agencies. The Great Britain Non-Native Species Programme Board provides an example of a non-

legislative platform to support coordinated policy development and structured opportunities for engaging public, research, industry and other stakeholders.

At the biogeographic / ecosystem level, the existing integrated planning frameworks under the WFD and MSFD provide opportunities for mainstreaming IAS issues and possible economies of scale or reduced duplication of effort.

Stakeholder engagement and communications

A high-profile communication campaign could be designed to raise broad awareness of IAS as an issue of EU-wide relevance. This could be jointly developed, if desired, with other EU services to present messages and take advantage of synergies e.g. responsible travel and tourism, preference for native species in species selection where possible etc.

MS could make greater use of existing possibilities under LIFE+ to co-finance information and communication programmes for IAS prevention (e.g. a recent example is the LIFE+ Information and Communication project '*InvHorti - Increase awareness to curb horticultural introductions of invasive plants in Belgium*').

Overview of Option B

Option B is clearly not able to deliver the full range of suggested Strategy components as presented in Table 7-1, given the number of elements requiring a legislative basis. However, voluntary codes of conduct, best practices and communication campaigns are foreseen to continue to play a key role in delivery of the EU Strategy, based on a partnership-based approach. These can specifically target areas that present particular challenges to conventional compliance mechanisms, such as trade in potential IAS via the internet.

The actions envisaged under Option B could be optimised through MS-level investments in cross-sectoral coordination, RA using available protocols, voluntary integration of IAS into border control functions and pathway management actions. These would be essentially financed by national funds, although MS could choose to make more systematic use of existing EU funding instruments.

Option B might thus be equated with the 'low-ambition' level within the range of costs discussed in chapter 6 above. However, as chapter 6 also indicates, given the increasing risk of IAS invasions in the EU the Option B level of future investment should in practice be seen as a baseline for action that is not likely to be 100 per cent effective in addressing IAS in the EU.

7.3.3 Option B+: targeted amendment of existing legislation

The ongoing modernisation of the EU animal and plant health regimes is designed to bring them into closer convergence with international biosecurity standards and concepts. This provides an excellent opportunity to address IAS within the areas covered by these regimes, consistent with international trends towards more integrated environmental biosecurity.

Attaching IAS more explicitly within existing systems could provide opportunities for mainstreaming and cost-efficiency in relevant action areas.

The scope of the **animal health regime** to directly address invasiveness of animals (cf. as disease vectors) is limited by the OIE's global remit, the regulatory gap in international standards and the strong veterinary focus of existing instruments and capacity. However, the EU's modernised Animal Health Strategy provides a comprehensive risk-based and incentive-orientated framework to promote high biosecurity standards taking account of environmental aspects. This offers opportunities for synergy with the future EU IAS Strategy. The EU could take a more proactive role to support consideration of a broader range of a) parasites/zoonoses that may affect wild native European animals and b) traded animals that may be carriers of emerging infectious diseases caused by novel pathogens. This focus could be aligned with outcomes from the OIE's Global Conference on Wildlife '*Animal Health and Biodiversity – Preparing for the Future*' which is intended to address coordinated management approaches to health risks at the wildlife/domestic animal and human ecosystems interface.[329]

The international **plant health regime** (IPPC/EPPO) offers strong possibilities to mainstream IAS considerations into phytosanitary interventions: considerable progress has been made on identifying pathways for which new standards should be prioritised. The EU has lagged behind in this area but – depending on outcomes - PHR modernisation could better align the EU regime with international norms and integrate consideration of climate change risks.

As envisaged by the PHR Evaluation (FCEC 2010), the focus of the plant health Directive could be expanded to cover environmental impacts and potentially encompass animal species (e.g. invertebrates) moved with goods and other materials as part of its pest prevention activities. This could involve listing of 10-15 invasive plants, including certain aquatic plants. Listing of terrestrial invertebrates that are pests of plants would constitute significant progress as these represent a major component of recorded invasions in Europe[330] and could provide a key implementation tool for the Strategy components on unintentional introductions. However, it currently seems unlikely that the PHR expansion would cover the impacts of higher herbivorous vertebrate species on wild plants as opposed to crops (the latter already potentially fall within the PHR scope). Human health (i.e. social) impacts would also not be addressed unless ancillary to plant-related impacts.

Amendment of the plant health Directive PHR could also include consideration of natural spread for the first time. This would enable a more integrated approach to preventing IAS spread, however caused, at the biogeographic level. However, the PHR does not have an ongoing management objective (c.f. exclusion, eradication, containment) or the tools to implement an ecosystem-based approach to long-term management programmes. These are key activities foreseen under the Strategy to ensure coherence with EU nature conservation, green infrastructure and broader environmental policies.

[329] 23-25 February 2011, Paris, France (http://www.oie.int/eng/A_WILDCONF/Intro.htm).

[330] Roques et al. 2009. Alien terrestrial invertebrates of Europe. Handbook of Alien Species in Europe, ed. DAISIE (Springer, Berlin), pp 63–79.

Proactive use of existing provisions under the **Wildlife Trade Regulation** would make it possible to list a wider range of ecological threat species, including for regulation of intra-EU movement and holding where appropriate. Extensive data on suitable candidate species are already available to provide a starting point: they suggest that if 10-100 species had been listed, several introductions could have been prevented with relatively little increase in the administrative burden.[331] The WTR has established comitology, supported by the advisory SRG, to review and update species lists and also supports integration and coherence with other EU nature conservation instruments when considering additions to the species lists.

These are significant advantages. However, several issues would need to be addressed to maximise the WTR's potential as a Strategy implementation instrument:

- it has a fundamentally different goal (conservation of donor populations in source countries). Re-focusing or dual-focusing could present challenges at both the political[332] and administrative levels;[333]
- it does not have a horizon scanning element consistent with the precautionary principle. A grey/black listing system for 'IAS of EU concern' and/or fast-track emergency listing procedures would be necessary for the WTR to support the Strategy's early warning and rapid response components;
- efficient and regular review procedures are essential to add or remove new species based on risk assessment. Derogations should only be permitted on scientific grounds;
- to date, the WTR has not been used efficiently to address intra-EU captive breeding of ecological threat species. This is a significant gap as most traded animals are bred in Europe - and would likely be bred in increased numbers if additional species were listed only for import regulation under the WTR;
- the WTR is a centralised instrument that does not cover the intra-EU movement and holding of regional IAS (i.e. species with a partially native range in the EU that are alien and potentially invasive in other areas within the EU);
- the WTR is not designed to provide a management instrument and cannot be used to implement a biogeographic approach to prevent further spread.

It is not foreseen that implementing the suggested Strategy components would require revision of the **nature Directives**. However, relevant annexes could be reviewed to remove some alien species currently listed as priority species for co-financing and to address certain species protected in their whole current range, although they are native only in part of the European range (see 3.2.5 above). Several smaller changes could be envisaged as part of IAS 'policy proofing' but are not discussed in detail here.[334]

[331] See generally Genovesi and Scalera (2007) and NOBANIS updated analysis of selected MS black lists.

[332] Considerable difficulties were encountered within CITES when trying to mainstream IAS: these were eventually removed from the ongoing work programme.

[333] Different competencies and capacity of the SRG and the MS Management and Scientific Authorities.

[334] See generally Chapter 5 and for a comprehensive list of all relevant EU instruments, Shine et al. 2008, Annex 2.

Overview of Option B+

The changes envisaged would guide progress towards more integrated environmental biosecurity in the longer term. However, they would not address the need for basic EU instruments for IAS management or support integrated prevention and management actions for the EU Outermost Regions.

In governance terms, Option B+ is similar to Options A and B i.e. it does not address the number or complexity of institutional mandates and authorities. Clearly, the existence of a comprehensive Strategy would provide an overarching framework to facilitate coordination. However, it could be necessary to consider an inter-service coordination mechanism to avoid overlaps and prevent gaps in areas potentially covered by two instruments. This would be an internal decision for the Commission.

In terms of required investments, seeking synergies with the relevant existing EU policy regimes could results in significant cost savings (see chapter 6 and also Option C below). However, it is likely that the overall costs of Option B+ would be higher than the costs of Option B above (i.e. more in the category of 'high-ambition' investments). More detailed information of the possible scope and content of the future Strategy is required to provide a fuller estimation of the possible scale of these costs

7.3.4 Option C: general considerations

Whatever its design, Option C is envisaged under COM 2008 as a new instrument that takes existing legislation into account i.e. it should be seen as complementary to Option B+.

General considerations

The rationale for new dedicated legislation is that the existing tools are not capable, even with targeted amendments, of providing a sufficient response to IAS threats at the EU level. However, any new instrument should be seen as complementary to existing instruments and policies already suited to implementing key Strategy components. This is particularly true for the sector-specific instruments already in place and equipped to minimise unintentional introductions. Optimising available processes and tools will contribute to feasibility and effectiveness of Strategy implementation.

An essential consideration is consistency with existing and future EU instruments. Any new instrument will need to specify its relationship to matters regulated under e.g. upcoming animal and fish health legislation, the plant health Directive, the aquaculture Regulation and the nature conservation instruments.[335]

The biggest risk of regime overlap/gaps would relate to IAS coverage as 'harmful organisms' under the modernised PHR. If the PHR's scope is not expanded beyond its current focus on agricultural pests, there would be no overlap with a new framework covering e.g. invasive

[335] See e.g. the aquaculture Regulation's 'without prejudice' provisions for matters covered by EU fish health legislation.

plants. However, if the PHR were expanded to cover environmental impacts, then decision making and listing under any new instrument would need to be adapted to reflect this.

As noted above, it is likely that Option C would be associated with the higher level of required investment in IAS measures as outlined in chapter 6. However, as in the context of Option B+, seeking synergies with the relevant existing EU policy regimes could result in significant cost savings. More detailed information of the possible scope and content of the future Strategy is required to provide a fuller estimation of possible costs.

7.3.5 Option C(i): comprehensive dedicated EU legal framework (Regulation)

A regulation is the strictest category of EU policy instrument, specifying both the objectives of MS action and the means by which they should achieve them.

A specific IAS Regulation, if applicable to a comprehensive range of taxa, could be used to address several components proposed for the Strategy e.g. risk assessment, regulation of intentional movement, holding and trade, monitoring of specific sites or facilities and compliance. However, its potential to address a broader range of pathways, to guide integrated planning and to function as a management tool adapted to the different needs of different regions is more questionable.

Experience to date with the aquaculture Regulation suggests that an IAS Regulation may not be the optimal delivery mechanism for this complex Strategy. The AQR is a detailed and technically demanding instrument which has been designed for the specific needs of this trade sector: it deals with a single pathway and a restricted number of actors and applications. Despite this, it has required lengthy deliberation (amendments, completion[336]) before becoming operational and the need for specific implementation strategies is recognised (Angelopoulos et al. 2008). From the biodiversity perspective, the AQR's ambition has been significantly reduced as the list of exempted species[337] now covers many invasive aquaculture species of commercial importance.

A top-down IAS Regulation could be used to fill some recognised gaps in current EU legislation and could occupy a useful place within the legislative toolkit. However, this approach would leave key aspects of the Strategy without an EU legislative basis.

7.3.6 Option C(i): comprehensive dedicated EU legal framework (Directive)

A dedicated IAS Directive could be designed to address IAS as an integral strand of environmental biosecurity, alongside plant and animal health. It could provide a comprehensive and coherent framework with minimum standards based on precaution, significantly reducing current fragmentation and low visibility while allowing for flexibility of

336 Council Regulation (EC) No 708/2007 of 11 June 2007, *ANNEX IV List of species foreseen by Article 2(5)*) has been further extended through recent amendments (Commission Regulation (EC) No 506/2008 of 6 June 2008 *(Amendment of Annex IV of Council Regulation (EC) No 708/2007)* and Commission Regulation (EC) No 535/2008 of 13 June 2008, *implementation of COUNCIL REGULATION (EC) No 708/2007*).

337 Annex IV lists species for which an MS must justify refusal of a permit by RA i.e. reversal of presumption.

MS action. A Directive could also provide an IAS policy proofing tool to assess upcoming policies and emerging pathways and help to inform policy trade offs where unavoidable.

A Directive would make it possible, depending on design, to:

- establish common goals, terminology and principles for MS IAS actions, aligned with the biogeographic and ecosystem approaches and transboundary cooperation and ensuring consistency with the operation of the Single Market;
- provide a comprehensive flexible framework for integrated IAS risk management along the prevention continuum and across different ecosystems, with specific consideration of climate change aspects;
- develop harmonised approaches to key occupational activities presenting IAS risks in the event of release /escape, including provisions for joint decision making between competent sectoral authorities where applicable;
- specifically address IAS in the context of the Outermost Regions and other isolated or vulnerable ecosystems i.e. the need for mainland-island and inter-island biosecurity;
- establish a clear framework of incentives and compliance measures, aligned with the polluter pays principle and EU environmental liability mechanisms;
- give the Commission defined oversight and coordination functions, linked to clear procedures for MS reporting.

Building on the PHR approach[338], annexes could be used to list specified categories of 'IAS of EU concern', triggering mandatory actions (e.g. exclusion / surveillance / reporting / rapid response / control as applicable) where the species concerned is found on MS territory. Several aspects would require further consideration, including in particular the financing of any new obligations assigned to MS. Consideration of possible co-financing for mandatory actions and/or funding through cost recovery mechanisms based on liability could be informed by the parallel discussions within the animal and plant health sectors which are also committed to a progressive shift of incentive culture.

Comitology (EU-level committee with representation from all MS) would be needed to take decisions with regulatory effects (e.g. on categories of species listing, production of black/grey or white lists of regulated species). If this option is retained, a formal technical structure to host the IEWS would need to be envisaged (see 7.4).

A Directive could provide a guiding framework for IAS activities under existing instruments supporting IAS monitoring, assessment and management (e.g. habitats and birds Directives, WFD, Flood Risks Management Directive, MSFD). Technical guidance could be developed by the Commission in consultation with stakeholders to address specific threats. Implementation activities could be progressively adapted in the light of upcoming best practices and codes of conduct.

[338] Listing in relevant annexes to the plant health Directive must be justified by pest risk analysis (PRA). The listing procedure is more flexible than under the centralised animal health regime. A MS competent authority submits a proposal to the Commission which consults the Standing Committee on Plant Health, a regulatory committee meets monthly and delivers its opinion on regulatory proposals.

However, directives are implemented over a phased time period through varying national legislation. In the IAS context, this could risk postponing already much-needed actions and in particular, fail to ensure unified EU prevention and rapid response to the highest existing and emerging threats. As noted, trade in the context of globalisation is the key driver for the increasing rate of introductions into the EU across all taxonomic groups. Effective control of trade aspects could fall outside the scope of a Directive.

It is therefore envisaged that a Directive would need to be combined with a Regulation covering import and intra-EU movement / holding of 'IAS of EU concern' i.e. requiring mandatory measures in line with the prevention continuum. WTR amendment would be likely to offer the strongest potential for synergy and cost-efficiency.

Based on the discussion of costs of policy action vs. the costs of policy inaction in chapter 6, this type of high-ambition prevention-focused framework is still seen to be cost-effective as it can reduce the increase of costs of IAS damage and control / management measures to EU-27 over time. The synthesis in Table 7-2 shows how far these legislative Options could be used to deliver the suggested Strategy components.

Table 7-2 Comparison of Options B+, C(Reg) and C(Dir) to implement suggested Strategy components

Legend:
AHR: animal health regime
PHR: plant health regime (based on possible amendments to plant health Directive 2000/29, see FCEC 2010)
WTR: wildlife trade Regulation
AQR: aquaculture Regulation
HBD: habitats and birds Directives
WFD: water framework Directive
MSFD: marine strategy framework Directive
√ possible
x not possible

Suggested Strategy component & preferred approach	Option B+	Option C: dedicated legal framework	
	Targeted amendments	Regulation	Directive
Key overarching elements			
High IAS visibility, understanding and engagement	(√)	(√)	√√
Cross-sectoral policy coordination enabled at EU and MS level	(√)	(√)	√
Clear definition of roles and responsibilities: designation of national competent authorities	√	(√)	√
Common understanding of key terms and concepts	(√)	(√)	√√
Prevention: general			
EU information and early warning system (IEWS)		√ depending on design	
EU IAS risk assessment framework, supported by EU-level expert panel(s): covers species and pathway assessments with progressive development of biogeographic approach if feasible	√	√	√
Criteria and procedures for listing 'IAS of EU concern'	X	(√)	√
Optimised coordination and interoperability of border control & quarantine services, infrastructure, inspections, information networks and EWRR	√√ AHR, PHR, WTR		
Prevention: intentional introductions			
Import:			
Risk-based permit system based on grey/black listing for 'IAS of EU concern' (possible transition to white listing for certain groups of species)	(√) WTR PHR if modernised	√	x
White listing potentially enabled for Outermost Regions	x	x	√
Intra-EU movement and holding:			

'IAS of EU concern' subject to continuum of controls via risk-based permit system	√ PHR 'protected zone' x WTR	x	√ if coupled with Reg
Occupational activity permits for risk-based categories of holding facilities, linked to EU liability regime: adapted to biogeographic region			
EU framework & criteria for decentralised decision making on IAS of national / local concern, ensuring compatibility with Single Market	x	x	√
White listing potentially enabled for Outermost Regions			
Release into the natural environment	√ HBD	x	√
White listing as generalised approach, supported by duty of care			
Derogations for occupational activities (permits) for risk-based categories of activity, linked to EU liability regime: adapted to biogeographic region			
Prevention: unintentional introductions			
Pathway/vector risk analysis for wider range of contaminants	√ PHR (√) AHR	x	√
EU comprehensive system for marine pathway risk analysis (ballast water and hull fouling)	(√) WFD & MSFD links	x	√
Integrated planning / management to address intra-EU dispersal pathways	(√) PHR √ WFD, MSFD	x	√
IAS risks integrated in green infrastructure/ecosystem-based adaptation	x	x	√
Suggested Strategy component & preferred approach			
Early warning and rapid response			
Operational national systems for data collation (linked to IEWS)	x	x	√
EU-level monitoring & rapid screening (IEWS)		√ depending on design	
MS IAS surveillance & monitoring for existing and new IAS, integrated in existing systems where feasible	√ AHR, PHR √ WFD, MSFD	x	√
MS contingency planning and eradication actions for national/local priorities	(√)	(√)	√√
Possible mandatory actions for 'IAS of EU concern' (surveillance, reporting, contingency planning and eradication actions)	√ AHR, PHR, AQR (√) HBD	√	√ (PHR model)
Potential to consider possible co-financing and/or funding through cost recovery mechanisms based (if feasible) on liability			
Control, management and ecological restoration			
EU framework for MS actions to manage IAS spread within the EU (subsidiarity + transboundary, biogeographic & ecosystem approaches)	√ AHR, PHR, AQR √ HBD, WFD, MSFD	x	√√√
Shift towards liability / compliance and incentive-based approaches			
National IAS action plans for national/local priorities	(√) HBD, WFD, MSFD	X	√
EU action/management plans for selected IAS	(√) HBD, WFD, MSFD	X	√

Possible mandatory management actions for 'IAS of EU concern' (biogeographic listing) Supported via range of EU financial instruments and/or funding through cost recovery mechanisms based on liability (if feasible) and other approaches	(√) PHR	X	√√√
IAS addressed as integral part of ecological restoration Supported via EU financial instruments and/or funding through cost recovery mechanisms based (if feasible) on liability	√ HBD, WFD, MSFD	X	√
Incentives, responsibilities and financing			
EU-level & other formal voluntary codes of conduct for key pathways	√	√	√
Expansion of market-based instruments (IAS risks addressed through labelling, certification and accreditation)	√	√	√√
IAS integration in Green Public Procurement policies	(√)	(√)	√
IAS integration in cost recovery mechanisms (taxes, charges)	√	√	√
IAS integration in EU environmental liability mechanisms, including occupational activities under Annex III, based on 'biological polluter pays' principle: development of adapted insurance products	√	√	√
Optimised use of EU funding instruments	√	x	√
Cross-cutting components			
EU and targeted communication and engagement activities	√	x	√√
National IAS strategies	(√)	x	√√
IAS research programmes based on strategic priorities	√	√	√
Capacity building and training	√ AHR, PHR, WTR	(√)	(√)
IAS integration in sustainability impact assessments, external policies and cooperation with relevant international organisations	√ AHR, PHR existing	x	√

7.4 Possible architecture to support the EU information and early warning system

The future IEWS system should preferably be established at the pan-European scale, aligned with the approaches developed through EPPO (which covers the Mediterranean as well as the whole of Europe) and the EEA.

In the EU context, the nature and role of the IEWS system would depend on the political decision taken on COM Options i.e. whether new legislation is foreseen to implement Strategy components and what form it might take. The IEWS would function as a technical support mechanism for implementation of such legislation: its design would therefore vary depending on whether a regulatory implementation body is foreseen.

Four alternative types of IEWS architecture are outlined below (for detailed analysis of design options and mechanisms, see the EEA report in Genovesi et al. 2010). A comparative synthesis (e.g. estimated costs) is presented in Table 7-3:

- business as usual (i.e. non-legislative);
- non-legislative expert network leveraging existing mechanisms and capacity;
- permanent observatory established by political decision;
- formal agency providing technical support to regulatory implementation.

A fifth option would involve a fully integrated biosecurity system combining regulatory and implementation functions, as in New Zealand. This is the ultimate 'high ambition' reference point but is not seen as feasible for the EU context (see 5.1.2).

BAU scenario: this would maintain the current distribution of role and responsabilities, exclusively focused at MS level, without technical coordination or improved interoperability of information resources. However, it would require increasing commitment of human and financial resources by individual MS as IAS threats and impacts are growing exponentially.

Architecture A (non-institutional EU expert panel): this foresees the establishment of an informal technical/scientific network of experts, institutions and/or government agencies, modelled on the DAISIE consortium and NOBANIS (considered the most cost-effective examples in Europe). The advantage of this type of independent initiative is that it does not foresee any mandatory support from national authorities i.e. it is funded by voluntary commitments from national administrations without fixed fees for participating countries. It is administratively 'light' with a simple cost-effective structure. Actions are based on maximising the use of existing technical instruments. The network has no formal advisory role, either with regard to risk assessments or to proposals for regulatory species listing but can play a major role in implementing initiatives related to IAS management by mobilising human and financial resources (also through the contribution of third parties, financing bodies, etc.).

Architecture B (EU IAS observatory): this foresees the establishment of a permanent technical observatory based on a formal decision at EU and/or MS level. This could involve an administrative decision (the US NISC approach) or build on the functions of an existing intergovernmental body (EPPO approach). The observatory would host the IEWS and coordinate and assist MS efforts to implement measures aligned with the Strategy. However, its recommendations would not have formal weight in the regulatory decision making process i.e. only limited guarantee of follow-through into national actions.

The potential advantages of building on an existing body would need to be balanced against the limitations of that body's mandate i.e. it would not be likely to cover the full range of IAS issues covered by the Strategy. However, the observatory could play a major role in coordinating measures to be implemented by MS by facilitating networking between national authorities, experts and other concerned stakeholders, and by providing advice on a number of IAS-related issues, with special concern for the IEWS component.

Architecture C (centralised EU Agency): this foresees the establishment of a new European Agency on Invasive Alien Species (EAIS) or a European Centre for Invasive Species Management (ECISM).[339] This could be modelled on - and would require a legislative basis similar to - the European Centre for Disease Prevention and Control (ECDC). In addition to the information maintenance and circulation tasks described above, its role would include formal support to regulatory implementation bodies e.g. proposals for listing of 'IAS of EU concern', assistance with or production of RA for evaluation by EFSA (subject to extended mandate and availability of adequate financial resources to be assessed further to an analysis of level of commitment). This would require a standardised and transparent mechanism to process IAS-related information on the basis of rigorous scientific criteria, with due consideration given to possible confidentiality issues regarding data. The Agency would also have an important risk management support role e.g. producing opinions on proper responses to be adopted by MS, evaluating environmental impacts of control methods, monitoring results in the field and feeding data rapidly back into the information system. Its work would be fully compatible with EPPO activities and address matters outside the plant health sector.

The efficacy of a dedicated Agency will partly depend on the approach to legislation to be taken by the EU to implement the Strategy. However, an overarching body of this type could potentially enable improved and more consistent interventions by MS and European authorities. The establishment of a dedicated specialised workforce would ensure best use of synergies and technical ability in terms of EWRR. Permanent financial support would make it possible to make best use of available information systems and also to invest in state-of-the-art information tools for longer-term efficiency, accuracy and synergy.

Increased synergy with other European institutions and structures could also underpin IAS mainstreaming.

[339] Suggested title used in a recent paper in *Science* by some members of the DAISIE consortium (Hulme et al. 2010).

Table 7-3 Comparison of possible architecture for an EU / Europe-wide information and early warning system

Architecture	Scope & characteristics	Mandate envisaged	Legislative implications	Administrative/capacity implications (based on EEA study by Genovesi et al. 2010)
Business as usual	Actions done under national responsibility. Pan-European coverage only in sectors covered by existing legislation (i.e. plant health, animal health, aquaculture). Present gaps remain unresolved.	Implementation of national information systems. No formal coordination mechanism.	No revision required. Some sectors covered (i.e. plant and animal health) by existing framework. Major gaps in other sectors	No burden at the European level. Member States would cover all costs at the single country level, with no technical support or coordination
A. Non-institutional EU panel of experts (DAISIE-NOBANIS approach)	Based on existing databases and information tools. Pan-European coverage only in sectors covered by existing legislation (i.e. plant health, animal health, aquaculture). Present gaps remain unresolved. No pan-European coverage for present gaps. Voluntary participation. Effectiveness depends on commitment of partners. No guarantee of perennity.	Subject to availability of funds Maintenance of freely accessible portal and database for species not covered by existing frameworks (i.e. plant health, animal health, aquaculture). Networking and circulation of information for sectors not covered by existing legislation. Informal advisory role to national agencies and management bodies (e.g. diagnosis, RA, possible responses)	No revision required. Mild decision to support establishment. Work programme enforced through development of MoU, codes of conduct, voluntary agreement between MS for financing the network. No link to mandatory measures (e.g. for rapid eradication) that remain active only for sectors already covered by existing legislation (i.e. plant health, animal health, aquaculture).	One chair; employment of one FTE project manager, plus 3 project assistants (EU-27). Supported by volunteer expert team with c.10 ad hoc coordinators for main taxonomic groups and management techniques. Possible need to employ part-time specialists to provide additional expertise. Availability of one contact person per country from national authorities or relevant scientific institution (30 wd/yr) 1-2 meetings a year. **Estimated cost (based on DAISIE- EU-25): 500 000 EUR / year** **Additional 300 000 EUR needed in start-up phase (1-2 years) to integrate, harmonise and expand existing databases** **Funding from e.g. LIFE+, MS authority contributions, private sponsors.**
B. EU IAS observatory (EPPO/NISC approach)	Formalised coordination. Coverage extended to all sectors not addressed by existing legislation. Integration of available information Best use of existing information tools. Continued financial support ensures sustainability of results.	Maintenance and regular updating of database and inventory, with an integrated approach extending present scope to bridge existing gaps. Networking and circulation of information Voluntary reporting by MS Taxonomic ID support Assessment of risks and advice to national authorities e.g. alert lists Developing technical (non-binding) recommendations to countries and European institutions	Mechanism needing political decision e.g. circular Clear non-binding mandate and strong political commitment. Work programme enforced through development of MoU, codes of conduct, agreements between MSs for financing the network.	Core management team of 5-7 FTE specialists plus some additional staff for IT support and secretariat work (2 FTE). Establishment of a steering committee or council to define work programme and priorities Organisation of technical/scientific panels (e.g. taxonomy, RA) **Estimated cost (if hosted by an existing European institution): 2 million EUR / year of which 500 000 EUR for maintenance of dedicated information system).** **Funding from national voluntary contributions (as in EPPO system) with EU contributions and/or financial support from host country.**

C. EU IAS Agency (ECDC approach)	Independent scientific body Integration of data flow at all levels. Potential coordination among different sectors (plant health, animal health, aquaculture etc)	Maintenance of fully interoperable, globally linked database and inventory , covering all sectors and taxonomic groups Networking & circulation of information Technical support for EWRR (reporting mechanisms; alert list; detection of incursions, including taxonomic ID and expert register; quick screening of risks to guide emergency responses; generic contingency plans; emergency eradication/control campaigns). Control & management advice (criteria, goals, techniques, biogeographic approach, action plans) to national authorities & regulatory bodies Identification of proper responses Coordination of national actions and assistance to MS in the enforcement of legal provisions and policies on the issue.	Structure requiring legislative underpinning to establish necessary mandate and ensure financial continued support. Programme of work based on compliance by MS in line with Strategy/applicable legislation: Agency plays key role in advising regulatory implementation body on listing decisions, including transfer between different lists and regular updating. Mandate may provide for production of/assistance with RA for consideration by EFSA (if applicable). Formal links to other EU alert systems (e.g. animal and plant health, human health) and cooperation with other institutions including EFSA, EMSA, EEA, EPPO etc.	Management board led by an executive director, adopting general guidelines and formal work programmes in line with political priorities. Supported by a scientific committee of leading experts Total no. of personnel: about 30-40 people (including 10-15 scientific experts and 3-5 IT experts). **Estimated costs comparable to costs of ECDC start-up phase: 3-6 million EUR / year. As with other EU agencies, should be funded by EU subsidy (possibly with financial support from host country).**

8 Conclusions and recommendations

The IAS issue involves complex interactions between political, economic, social and technical factors. Trade pathways linked to globalisation are the key driver for the increasing rate of introductions into the EU across all taxonomic groups. An enabling policy framework is needed to protect the EU against exponentially-rising IAS impacts, aggravated by the effects of climate change, and to address the exceptional vulnerability to biological invasion of the EU's Outermost Regions and other isolated or vulnerable ecosystems.

This study has presented a detailed analysis of the baseline, priorities and suggested key components of the future EU Strategy on Invasive Alien Species. The development of an EU framework for IAS risk assessment and an EU / Europe-wide information and early warning system are seen as fundamental to effective action before biological invasions take hold, consistent with the precautionary principle and the EU's commitment to a high standard of environmental protection.

The study also sheds light on the sheer number of EU and MS policies, sectors and actors relevant to implementing the activities envisaged under the Strategy. In the study team's opinion, it is essential for the future visibility of IAS as an EU-wide issue to develop high-level coordination between key services responsible for implementing different Strategy components and to establish appropriate fora for stakeholder consultation. Examples of best practices have been discussed in the report (see 5.7.2).

An initial assessment of the possible level / scale of costs associated with EU policy action on IAS carried out in the context of the study indicates that:

- even at the highest level of investment in policy development and implementation foreseen in this study, EU-level policy action (e.g. implementation of the EU IAS Strategy) is likely to bring more benefits (e.g. avoided costs) than it is estimated to cost;
- furthermore, the cost of overall IAS measures (e.g. measures possibly required to implement the EU Strategy, both at MS and EU level) are foreseen to diminish over time (i.e. Strategy implementation is foreseen to become less expensive as time goes by);
- EU-level measures (e.g. in EWRR) can help to reduce costs for EU-27 as a whole.

The 2008 Communication proposed four policy options for consideration. Based on the findings of this study, **Option A (Business as Usual)** is not a viable option for the EU as environmental, social and economic costs associated with biological invasions would continue to escalate without any gains for issue visibility or policy coherence.

Option B (Maximising existing approaches and voluntary measures) is also not viable in isolation, given the number of suggested Strategy components requiring a legislative basis. However, voluntary codes of conduct, best practices and communication campaigns are

foreseen to play a fundamentally important role in delivery through a partnership-based approach. Industry federations, user groups and many other stakeholders can pilot innovative approaches, supported by governments, and help target pathways that present particular challenges to conventional compliance mechanisms, such as 'exotic' species trade via the internet. Market-based instruments and green public procurement policies can help to shift the incentive culture and support IAS policies. Such approaches are aligned with the EU-supported UN programme on The Economics of Ecosystems and Biodiversity (TEEB), which includes specific modules for policy makers and business.[340]

Option B+ (targeted amendment of existing legislation) provides opportunities to address IAS within the ongoing modernisation of the EU animal and plant health regimes. This could be the start of a more integrated approach to EU environmental biosecurity, to the extent supported by relevant mandates (limitations discussed in 3.1-3.2.2). The recommendations of the PHR evaluation (FCEC 2010) to explicitly address environmental and ecosystem risks associated with some alien plants (including those not yet introduced) and possibly their natural spread have been incorporated in this study.

However, the extent to which the modernised PHR regime could deliver key measures / activities envisaged under this Strategy will depend on (a) political decisions to be taken at EU level by plant health administrations in consultation with stakeholders; and (b) future operational and administrative priorities and resources devoted within MS to protection of environmental public goods. These are key variables which cannot be answered by this study. However, it is foreseen that seeking synergies with these existing regimes (in the context of both Options B+ and C) could bring forward significant cost savings.

Relying solely on adjustments to existing instruments would not address many overarching constraints identified in the baseline analysis. These include the lack of a strong driver and objectives for IAS prevention and management, which undermines issue leverage for environment departments in several MS. Option B+ would not provide the critically needed tools to prioritise risks and manage IAS at the ecosystem or biogeographic scale or to develop policies and tools targeted at the needs of the Outermost Regions and other isolated or vulnerable ecosystems.

The study therefore recommends that new legislation is developed (along the lines of **Option C: comprehensive, dedicated EU legal framework**), taking account of synergies with ongoing AHR and PHR modernisation. For the reasons set out in 7.3.6, a dedicated IAS Directive is the recommended option. This would provide a flexible framework with minimum standards based on precaution and an IAS policy proofing tool to ensure coherence with upcoming instruments and emerging pathways. A Directive could establish common goals, terminology and principles, adaptable to appropriate scales of conservation, and provide much-needed clarity on the compatibility of IAS measures with the operation of the Single Market. By establishing a continuum of prevention and management measures with clearly allocated roles and duties of care, it would support development of more robust environmental liability tools aligned with the 'biological polluter pays' principle.

[340] www.teebweb.org

Under a Directive, annexes could be used to list specified categories of 'IAS of EU concern', triggering mandatory actions where the species concerned is found on MS territory. The financing of key actions, in particular to enable early warning and rapid response before an invasion takes hold, needs specific attention in the context of the Strategy. Consideration of possible co-financing for mandatory actions and /or expanded cost recovery mechanisms could be informed by the parallel discussions within the animal and plant health sectors which are also committed to a progressive shift of incentive culture.

It is envisaged that the Directive would need to be combined with a Regulation covering import and intra-EU movement / holding of 'IAS of EU concern' i.e. requiring mandatory uniform measures for the highest risks to the EU. The existing Wildlife Trade Regulation would require amendment and a targeted new focus (see 7.3.3) for this purpose but as an existing instrument would have the strongest potential for synergy and cost-efficiency.

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Annex 1 List of organisations and individuals consulted

The Report draws extensively on stakeholder consultations carried out during the first phase of technical support to the Commission: the names of earlier contributors are contained in the respective reports. For this report, the following individuals and organisations kindly provided new or additional specific contributions and insights to members of the team. We would like to thank them all warmly.

Country/institution	Name and position
Member States	
Belgium	Etienne Branquart Belgian Forum on Invasive Species
Denmark	Hans-Erik Svart Danish Ministry of the Environment
Finland	Harry Helmisaari Finnish Environment Institute
Germany	Stefan Nehring Federal Environment Ministry
Ireland	John Kelly and Cathy Maguire Invasive Species Ireland Initiative
Lithuania	Ligita Balezentiene Institute of Environment, Lithuanian University of Agriculture
Netherlands	Wiebe Lammers Invasive Alien Species Team, Netherlands Ministry of Agriculture, Nature and Food Quality
Poland	Wojciech Solarz Institute of Nature Conservation, Polish Academy of Sciences
Spain	Vicente Deltoro Government of Valencia
	Juan-Luis Rodrigues-Luengo Government of the Canary Islands
	Monserrat Vila
Sweden	Melanie Josefsson Swedish Environment Protection Agency
United Kingdom	Olaf Booy and Niall Moore Non-Native Species Secretariat
	Duncan McNiven, Natural England
	Huw Thomas Department for Food, Environment and Rural Affairs
	John Early Department of Environment, Northern Ireland
External projects/institutions	
CABI-Africa	Arne Witt
European Food Safety Authority (EFSA)	Elzbieta Ceglarska Head of Unit, Scientific Co-ordinator Panel on Plant Health
European and Mediterranean Plant Protection Organisation (EPPO)	Nico van Opstal, Director General
	Sarah Brunel Invasive Plants Officer
Joint Research Centre (JRC) (Institute for Environment and Sustainability)	Giovanni Bidoglio Head, Rural, Water and Ecosystem Resources Unit
	Ana Cristina Cardoso
	Jochen Vandekerkhove

NOBANIS	Helene Hvid Nyegaard NOBANIS Coordinator, Danish Ministry of Environment
Other stakeholders	
Conservation International	Peter Jenkins
Eurogroup for Animals	Staci McLennan
Global Invasive Species Programme	Stas Burgiel
Pet Industry Joint Advisory Council	Jamie Reaser
ProWildlife	Daniela Freyer
RSPB/Birdlife	Clare Stringer Paul Walton
Wildwings	Chris Feare
World Parrot Trust	Jamie Gilardi
Third countries	
Israel	Ronit Justo-Hanani Dept. of Zoology, Faculty of Life Sciences Tel-Aviv University
	Simon C. Nemtzov Wildlife Ecologist and CITES Scientific Authority, Israel Nature and Parks Authority
Japan	Tomoo Mizutani Head, Department of IAS Control Nature Conservation Bureau, Ministry of the Environment
Norway	Esten Ødegaard, Norwegian Directorate for Nature Management
	Kristin Thorsrud Teien (Department of Nature Management, Ministry of the Environment
	Liv-Stephanie Haug Legal advisor, Norwegian Directorate for Nature Management
South Africa	Guy Preston Chairperson / National Programme Leader, Working for Water Programme
United States	Chris Dionigi Acting Executive Director, National Invasive Species Council
	A.Gordon Brown Department of Interior Invasive Species Coordinator and Liaison to the National Invasive Species Council
	Shawn K. Alam Office of Environmental Policy and Compliance, Department of the Interior
	David Downes Trade specialist, Department of the Interior
	David Miller Chief, Ecology & Trade Division, Department of State
	Peg Murray Office of the Coastguard
	Harry Burroughs Republican Staff Director, Committee on Natural Resources, US Congress
	Jean Flemma Democrat Staff Director, Oceans and Wildlife House Committee on Natural Resources, US Congress
	Ron LeGrand Counsel U.S. House of Representatives Subcommittee on Crime, Terrorism and Homeland Security

Annex 2 Approaches to IAS regulation in selected third countries

This annex provides further information on IAS regulatory frameworks in selected third countries. The summaries are not exhaustive but focus on aspects most relevant to the EU context, including different approaches to species/pathway listing. The range includes:

- black listing with formalised inter-sectoral coordination (USA);
- grey/black listing (Japan);
- white listing for alien animals (Israel);
- comprehensive white list framework with derogations for certain taxonomic groups, supported by general duty of care and notification provisions (Norway);
- comprehensive white listing within an integrated framework for environmental biosecurity (New Zealand, Australia).

Example 1: Black listing with formalised cross-sectoral coordination (USA)

At the federal level, the 'Lacey Act' 1900 (amended 1981)[341] provides for black listing of vertebrates, mollusks and crustacea 'injurious to human beings, to the interests of agriculture, horticulture, forestry, or to wildlife or the wildlife resources of the United States'. This triggers a ban on importation and inter-state movement, except under special permit for approved uses[342] and makes it a federal violation to import, export, transport, sell, receive, acquire, or purchase in interstate or foreign commerce any fish, wildlife or plants taken, possessed, transported or sold in violation of any law or regulation of any State. This category has been used to address a limited range of IAS threats.

To date, the black listing procedure has proved far too slow and unresponsive to deal with emerging threats. Listing requires very detailed analysis (for three carp, it took eight years). The Act does not provide for intermediate (grey) categories. It does not go below species level or provide for emergency action or funds to support state-level action. It does not address possession or commerce/holding within states (separate competency).

In April 2009, new draft federal legislation – the *Nonnative Wildlife Invasion Prevention Act* - was proposed to support pre-import risk screening of non-native wildlife.[343] This essentially proposed a white list approach, requiring a finding of non-harmfulness before a species could be put on the 'Approved List' for importation. It also provided for other wide-ranging powers, including more federal oversight over State-level IAS activities. The bill attracted major opposition from some stakeholder groups (e.g. pet trade, reptile breeders) and was rejected its current form. Alternative proposals, based on a more rapid black listing

[341] http://www.fws.gov/le/pdffiles/Lacey.pdf

[342] An injurious wildlife permit may not be issued for pets but import of almost all listed species is allowed for scientific, medical, education, exhibition, or propagation purposes.

[343] H.R.Bill 669 '*to prevent the introduction and establishment of nonnative wildlife species that negatively impact the economy, environment, or other animal species' or human health, and for other purposes'* (available with stakeholder testimony at http://resourcescommittee.house.gov/index.php?option=com_jcalpro&Itemid=60&extmode=view&extid=246).

approach combined with a precautionary 'grey' listing category (pending risk analysis), have now been drawn up but are yet not available for public consultation.

In 2010, the U.S. Fish and Wildlife Service proposed a new 'injurious' listing under the Lacey Act of nine species of large constrictor snakes[344] on the grounds of ecosystem damage (already recorded in southern Florida, caused by the extremely widespread Burmese python invasion) and danger to people. This proposal is still under consultation.

State-level IAS policies vary widely. Consistency mechanisms across inter-state borders are limited to weeds and plant pests, for which the Plant Protection Act 2000 gives the Secretary of Agriculture pre-emption authority over state actions. Limitation of intrastate movement depends on a state declaring a limited quarantine, at which point the federal quarantine can also be placed with additional financial and legal limitations.

Several states seeking a higher level of environmental protection have adopted a four-tiered classification system (e.g. prohibited, regulated, unregulated and unlisted invasive species) which makes it possible to establish the level of regulation and types of allowable uses for each species. Most recently, in May 2010 the New York state Invasive Species Council[345], completed public consultation on proposed legislation which was then submitted to the state legislature. Landowners would have no obligation to remove invasive species that spread on to their lands through no fault of their own under the proposed regulation. The proposal recognizes the business needs of nurseries and pet businesses to be able to plan and to manage existing stocks, some of which represent years of investment. It would include 'grace periods' to avoid needlessly penalising such industries. The proposal encourages the nursery industry to develop varieties that are sterile so that market demands could be satisfied without posing ecological and economic threats.

Coordination mechanisms and experience of implementation[346]

The US National Invasive Species Council (NISC) was established by Executive Order 13112 (1999) 'to ensure that Federal programs and activities to prevent and control invasive species are coordinated, effective and efficient'. It is co-chaired by the Secretaries of the Departments of Commerce, Agriculture and Interior and includes a policy liaison representative from each of the Departments of Defense, Health and Human Services, State, Homeland Security, Transportation, and Treasury, the U.S. Trade Representative, the Environment Protection Agency, the Agency for International Development and the Administration for National Aeronautics and Space Administration.[347]

Experience of implementation has shown the value of systematic 'big picture' coordination but also that NISC's power is quite limited (an Executive Order can be overridden by

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[344] *Python molurus*, including *Python molurus bivittatus*; *Broghammerus reticulatus* or *Python reticulatus*; *Python sebae*; *Python natalensis*; *Boa constrictor; Eunectes notaeus; Eunectes deschauenseei; Eunectes murinus;* and *Eunectes beniensis* (see http://www.regulations.gov/search/Regs/home.html#documentDetail?R=0900006480abc25c).

[345] Nine state agencies chaired by Department of Environmental Conservation and Department of Agriculture and Markets

[346] Lori Williams, NISC Executive Director, pers.comm.

[347] see http://www.invasivespecies.gov

legislation). The NISC Management Plan covering over 13 agencies is very general, setting out high level goals, and does not seek additional resources to fund implementation.

NISC does not have core funding to support e.g. state-level IAS management plans and focuses its main activities on workshops, databases and screening processes – these activities are funded by NISC member agencies and bureaus. Successes include the development of common guidelines (e.g. for Early Detection and Rapid Response) and cost-benefit analysis (e.g. for invasive tamarisk). Cooperation between agencies to leverage resources has only worked in emergency situations where there is enough funding (e.g. avian flu).

Over half of US states have established state Invasive Species Councils since the creation of the federal NISC. As noted above, there are wide variations in the scope and rigour of IAS regulatory frameworks[348] with inconsistencies presenting similar challenges as in the EU, although considerable efforts have been taken to facilitate legislative development (see e.g. ELI 2004).

Formalised large-scale pathway coordination – across jurisdictional divides – is implemented through the Aquatic Nuisance Species Task Force (ANSTF). This is an intergovernmental body established to implement the Nonindigenous Aquatic Nuisance Prevention and Control Act 1990. The joint ANSTF/NISC Pathways Work Team has developed a training and implementation guide for aquatic pathway definition, risk analysis and risk prioritisation. ANSTF also developed the national *Habitattitude* initiative for which the U.S. Fish and Wildlife Service is the lead federal agency and which issues regular electronic alerts and news updates: this is supported by the pet and aquarium trade and the nursery and landscape industry, university networks and state fish and wildlife agencies.

US islands come under a range of bureau jurisdictions[349] and do not have generalised funding. However, the Office of Insular Affairs supports commerce and conservation for trust territories and provides regular funding for brown tree snake prevention, control and management in the Pacific (as a 'pass-through' agency for USDA APHIS, Fish and Wildlife Service and the Department of Defense: US$ 3million / year for Fiscal Years 10, 11, and 12). It supported the secondment of a NISC staffer to write a Pacific Islands regional plan and also lead development of the Department of Defense Biosecurity Plan. This outlines potential impacts from IAS should they be moved/translocated by troop relocation off Okinawa and back to Guam and vicinity and envisages a large training and support footprint.

The National Invasive Species Information Center site contains links to all federal and state legislation, the National Invasive Species Council, species lists and topic papers.[350]

Example 2: Dedicated IAS legislation using a combined list approach (Japan)[351]

[348] http://www.dnr.state.mn.us/eco/invasives/laws.html

[349] e.g. the Fish and Wildlife Service/Refuges has Aleutian chain responsibilities in some locales; National Park Service has responsibility for the Channel Islands off California.

[350] http://www.invasivespeciesinfo.gov/laws/federal.shtml

The Invasive Alien Species Act 2004[352] is intended to prevent adverse effects on ecosystems caused by IAS to 'help stabilise and improve national life through contributions to conservation of biodiversity, human safety and sound development of agriculture, forestry and fisheries'. It covers pre-border prevention through to management of introduced species in widespread use and requires a national IAS policy to be prepared, in consultation with the Central Environment Council, for Cabinet endorsement.

IAS are defined as 'alien species that are recognised or feared to cause damage to ecosystems, human safety, and agriculture, forestry and fisheries' due to properties different from those of indigenous species. 'Alien' refers to existence outside their original habitats as a result of introduction from overseas into Japan since about 1868.[353] 'Species' covers live individuals (including eggs, seeds etc.) and their organs.

The Act provides for a black listing system, combined with a holding 'grey' category (*Uncategorised Alien Species*) (see Figure 9-1). This is a proactive designation of species or groups of species that belong to the same group (genus or family) as an IAS because of the possibility of similar ecological impacts.[354] It has the effect of suspending imports: an application by an importer to import a UAS triggers a risk assessment process which must be completed within six months.

The IAS listing process is based on scientific consultation and must consider the social and economic impacts that arise from designation. Lists are adopted via Cabinet Ordinance. Criteria used in the evaluation of invasiveness include whether the alien species will (i) predate native species; (ii) compete with native species for ecological niche; (iii) disturb reproductions of native species by inter-species hybridisation; (iv) destroy native flora.

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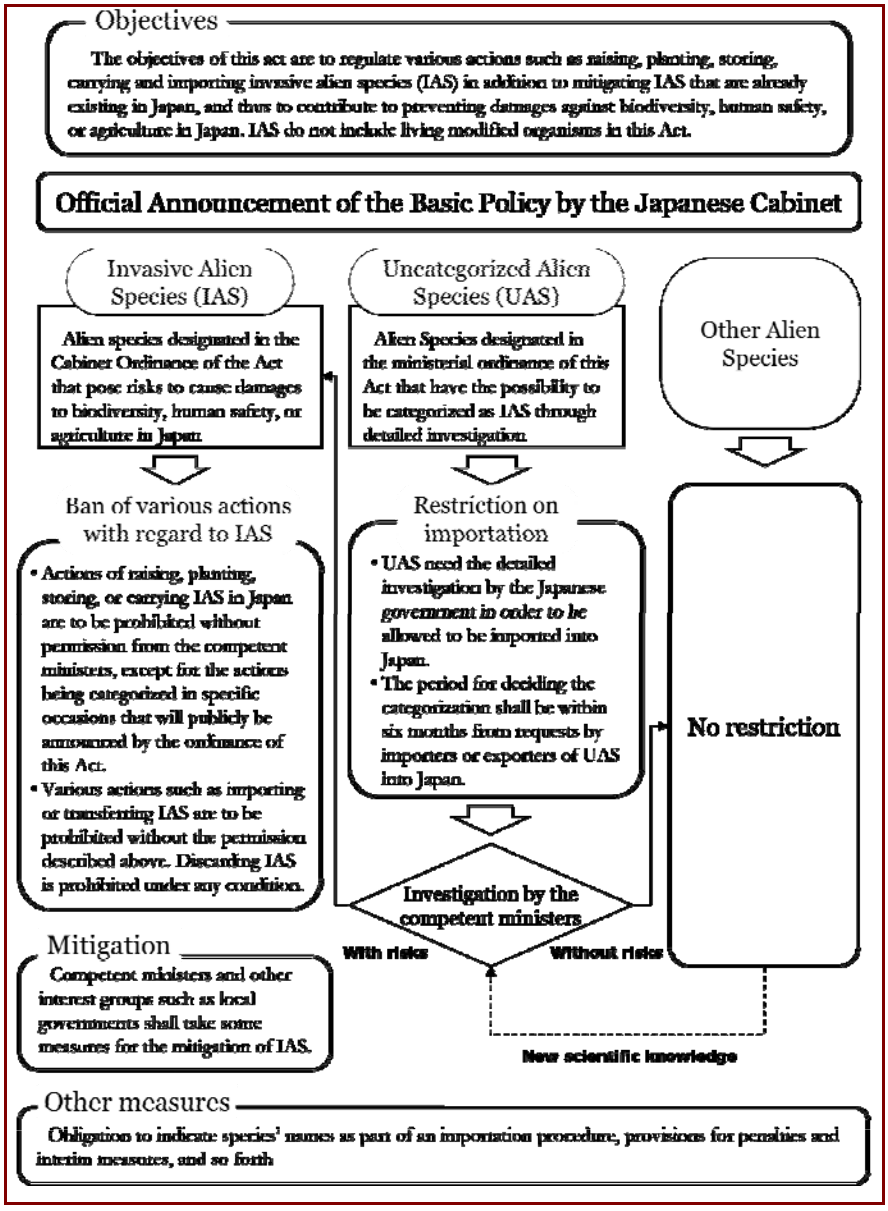
[351] Summary based on Mizutani and Goka 2009 and Mizutani, pers.comm 2010.

[352] Law No. 78, adopted on 2 June 2004, entered into force in July 2005.

[353] i.e. since the Meiji era, when Japan started to trade with the world in earnest and the number and amount of introduction of alien species started to increase rapidly.

[354] e.g. if the taiwan macaque (*Macaca cyclopis*) is designated as IAS, all species included in genus *Macaca* are designated as UAS as a rule. The expert groups advising listing estimate risks by the possibility of establishment in any part of Japan, based on the precautionary approach. Criticism from some participants in the public consultation phase considered that risks should also be estimated by purpose, amount, and frequency of importation, but this is considered impractical under currently limited information.

Figure 9-1 Japan: outline of the Invasive Alien Species Act



Source: http://www.env.go.jp/en/nature/as/040315b.pdf

IAS listing effectively prohibits all commercial use except under permit in 'special raising facilities' (see for European bumblebee below) and also subjects use of IAS for scientific research to permit. Permits for all such activities are subject to specific conditions, reporting and inspection. For UAS, the Act also establishes an advance procedure for would-be exporters to consult with competent authorities in Japan (Arts. 21-24).

To assist in implementation, the Act requires certain groups of species (*Living Organisms Required to have a Certificate Attached during their importation in order to verify their types (LORCA))* to be certified by the competent authorities of export countries. These may only be imported through ports and airport specificed in the Ministerial Ordinance (Article 25).

Lastly, the Act establishes a suite of rules for mitigation of damage caused by listed IAS,

including powers and procedures available to competent authorities and a liability regime applicable to responsible persons, including provisions for recovery of control costs.

Experience of implementation: The Act is considered a good prevention tool for IAS that have not yet been introduced or become established, but is less effective in reducing damage by species that are already widely-established. It does not cover unintentional introductions or the risks of infectious diseases to wild animals, for which it would be necessary to strengthen existing legislation. A white list system, whilst preferable and more precautionary, is considered difficult to use in the Japanese economic context where most natural resources depend largely on introduction from many other countries.

The system of pre-import screening and checks has proved workable for Customs officers[355] with the LORCA system providing the scientific name of imported animals and plants. There have been some cases of detecting illegal import or trade of IAS/UAS, linked to lack of awareness rather than intentional violation of the Act.

As of 1 February 2010, the triple list had been updated six times.[356] The IAS list now contains 17 individual mammals and four whole-genus listings; four birds; 13 reptiles; 11 amphibians; 13 bony fish (Osteichthyes); eight arachnids plus two family/genus listings; two crustacea and three whole-genus listings; five insects and three plants. There are ongoing discussions about the criteria for UAS listing (by end 2008, 14 out of 15 UAS notifications for import were for the pet trade and one for research: the applicants for those 14 species gave up importation). Nearly all listings were carried out at or soon after the Act's entry into force: the only new listings from 2008 have concerned reptiles and amphibians and, in 2010, one mammal.

The two most sensitive listings, requiring special working groups and stakeholder consultations because both were already in widespread use, concerned the largemouth bass *Micropterus salmoides* and European bumblebee *Bombus terrestris.*[357] Over 110,000 comments were received from the general public, mostly against designation of the bass. Newspapers and other media reported the conflict widely, resulting in a rapid increase in public awareness of the Act. By way of exception (in consideration of socio-economic impacts), the bee's continued use was allowed under conditions to control risks to the ecosystem but this entailed significant administrative costs for the Ministry of the Environment (examining applications from 12,000 farmers and monitoring applicants after giving permission) so alternative pollination systems are being actively researched.

There is currently no effective tool for preventing IAS trade via the internet, but some auction trading has been reported to the police or relevant ministry office by other traders, researchers or citizens. The provisions to regulate internal transfers could be used to prevent translocations of already-present species to different islands or to protect vulnerable areas. However, there is no effective tool for preventing natural spread of already-present species.

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[355] e.g. in the first enforcement phase, many Chinese mitten crab brought in by travellers were controlled and discarded.

[356] http://www.env.go.jp/nature/intro/1outline/files/siteisyu_list_e.pdf

[357] Largemouth bass were illegally released into lakes and ponds throughout Japan for game fishing and brought damage to fisheries and native fish species. The Bumblebee is widely used in greenhouses as a useful pollinator.

In terms of resource implications, the Ministry of the Environment recruited an additional 25 staff (1-2 in each of its 13 regional offices). Its estimated budget for implementation of IAS Act (including cost of IAS designation, preparing IAS identification guidebook, maintaining a database of permit holders) is about 45 million Yen (excluding the cost of IAS control). The Customs and Plant Quarantine services have supported implementation through their existent staff. There is no cost-recovery mechanism in place i.e. no fee is charged to importers and traders that apply for permits from the competent ministry.

Local control efforts depend mainly on local government budget and manpower. For raccoon, the worst IAS in terms of agricultural damage in Japan, local authorities are obliged to capture them if agricultural damages reported. Capture programmes have succesfully reduced the damage level but they have no more budget to eradicate raccoon regionally.

Example 3: White listing for alien animals (Israel)[358]

The Israel Nature and Parks Authority (INPA) manages IAS risks (animals) through a combination of controls at borders and ports of entry, enforcement of conditions for keeping exotic wildlife by breeders and zoos, public education, rapid response for capturing escaped animals and an RA programme for new imports. A separate government agency has responsibility for aquatic species, invertebrates and all plants.

The Wildlife Protection Act 1955, through subsequent regulations, requires a permit for the import of all wild animals[359] and gives INPA the power to determine the conditions of such permits. This legal basis has been used to establish a transparent RA system applied equally to all applicants. The system - a simplified version of Australia's white listing approach - was introduced in 2000 as a partial project and got going properly in 2004-2005.

INPA conducts the formal RA itself, which takes 3-4 weeks.[360] The applicant (i.e. potential wildlife importer) is only required to provide basic data (e.g. scientific name of the species, country of origin). The regulations are currently being changed to make the importer pay an substantial application fee to cover the cost of RA.

The information in the initial report is used by INPA (committee of at least three ecologists) to prepare a written scientific opinion and assign an Initial Risk Assessment Category (both posted on the INPA web site). There are three categories:

- high risk (includes all species that have previously invaded habitats similar to those in Israel, especially Mediterranean ecosystems): may be imported and held only at special research or conservation institutions (such as universities and licensed zoos);
- medium risk: authorised for mini-zoos and licensed collectors and breeders;

[358] Based on Nemtzov 2008a; Justo-Hanani et al 2010; pers.comm.Nemtzov and Justo-Hanani in 2010.

[359] NB Israel accepts only captive-bred animals for import, even for zoos.

[360] The usual approach is to pay a freelance biologist (around 125 EUR) to do the literature search and write the initial Risk Assessment Report, based on a standardised set of questions on the species and its ecological requirements in nature. To keep the system manageable in the Israeli context with more limited resources and a small staff of biologists, answers are not scored or weighted as in other countries using the scoring method of Smallwood & Salmon (1992) or the Australian scoring system (Bomford 2008).

- low risk: species permitted for import and trade (general public, pet industry).

Experience of implementation: Species not yet assessed are not allowed into Israel for the general public. Species already in the country may be re-assessed and their risk category revised (e.g. species already in trade like *Trachemys scripta elegans* and the rose-ringed parakeet *Psittacula krameri* were subsequently blacklisted). It is not clear whether INPA has the legal authority to confiscate specimens that were legally acquired: the practice is to allow their continued keeping (with the problem that breeding may continue) but any subsequent trade or transfer is prohibited.

An annual public hearing is held on the internet to enable the public to submit written comments to INPA about the scientific opinions and the black and white (i.e. high and low risk lists). These are checked for accuracy and after consultation with experts, the category may be retained or amended. To date, there have been no legal challenges to the scientific opinions or listing decisions. Several comments are from collectors or importers seeking a more lenient categorisation, but most comments have been from scientists or wildlife proponents encouraging the INPA to restrict the import of exotic species.

The INPA now works with wildlife importers and major pet shop owners to find attractive low-risk species readily available on the world market to import instead of species on the black list. This initiative has been welcomed by the pet industry and reduced feelings of frustration from having attractive but harmful species banned.

INPA considers the formal RA system to be useable, flexible, scientifically sound and fully transparent and to have helped fight smuggling of unwanted species. It has greatly reduced IAS risks from the pet industry: since the programme began, there have been no new cases of invasive vertebrates in Israel. Costs and staffing requirements are difficult to separate from other day-to-day work.

Coordination is poor with the Ministry of Agriculture and the Veterinary Services but efforts are underway to unify the efforts by all competent agencies through a new National Invasive Species Project. Israel does not have any dedicated IAS rapid response/emergency funding: in 2009, response to an incursion of invasive fire ants was delayed by confusion over remits (environment/wildlife; agriculture/agricultural pests; health) and separate sectoral emergency funds.

Example 4: White list with derogations for certain taxonomic groups, supported by general duty of care and notification provisions (Norway)[361]

Norway's new national Nature Conservation Act (2009) devotes an entire chapter to Alien Organisms (Chapter IV).[362]

Import controls

[361] Summary based on pers.comms from Øystein Størkersen, Liv-Stephanie Haug, Esten Ødegaard, Gunn Paulsen, Kristin Thorsrud Teien.

[362] Summary based on pers.comms from Øystein Størkersen, Liv-Stephanie Haug, Esten Ødegaard and Kristin Thorsrud Teien.

The Act establishes a comprehensive framework for all imports of live organisms, based on a white listing approach combined with targeted derogations (s.29).[363]

Living or viable organisms may only be imported to Norway subject to a permit granted by the competent authority. Where an organism is imported for release into the environment, the permit application must clarify the possible effects of such release on biodiversity: no permit may be granted if there is reason to believe that the import will have substantial adverse impacts on biodiversity.

Import regulations may specify: requirements for permits and conditions for permits; waive the permit requirement for specified organisms; or prohibit the import of specific organisms if considered necessary to avoid substantial adverse impacts on biodiversity. By way of exception to the general permit requirement, a permit is not required to import:

- terrestrial plants and specified livestock (unless specifically required under regulations);
- biological control agents for which an import permit has been granted in or under other legislation.

Except for these categories, all species proposed for import will have to be screened by risk assessment, both by an independent institute and by Government institute. To facilitate administration, species of no risk will be evaluated for inclusion in a white list published in a regulation (entry into force 1 January 2011).

The species lists under development build on a comprehensive knowledge base established over several years and the national technical black list supported by the Ministry of the Environment (Artdatabanken 2007, to be revised in 2011). To date, RA has been carried out for fresh water organisms (mostly aquaria species, ca. 5000 species), mammals, reptiles and amphibians, invertebrates and birds. To complete the process, further capacity is needed to assess more organisms, using outside contractors for RA.

For species not included on the white list, individual species assessments are required. Specialist staff deal with applications for import and/or releases into the wild of northern vertebrates, warm climate vertebrates and all invertebrates, fresh water organisms of flora and fauna, and zoos and zoo traders. Importers/applicants are responsible for providing documentation and either for meeting the cost of this risk assessment or otherwise providing proof that an import will not pose a risk. This assessment will be made on the basis of whatever information is already available, including from neighbouring states and organisations, based on the precautionary principle which underpins the whole Act.

Based on experience to date, Norwegian authorities indicate that the initial phase of list development is extremely labour-intensive, pending the production of longer white lists of accepted species, and requires extra capacity. In the longer term, however, a white list

[363] Plant and animal health and animal welfare aspects are separately regulated under the auspices of the Ministry of Agriculture and Food.

approach is expected to make implementation easier for applicants and the administration by shortening the time required for handling applications.

Procedurally, implementation of the new regulation will be based on electronical communication with applicants and registered importers to reduce administrative costs. This will involve an electronic application, registration of importers and reporting to the competent authority and Customs services when the imports take place. The Customs will then have the option to perform actual checks to see if the import complies with the regulation. This will require targeted training of Customs personnel.

The Regulation confers inspection powers on the environment services for the first time. These will be conducted in close cooperation with the Food and Animal Health administration (*Mattilsynet*) but provide the option to develop a dedicated IAS inspection system using rangers in the State nature inspectorate. This would require training to build inspection capacity as well as industry consultations. It is envisaged that guidance will be developed to enable importers and retailers to perform their own inspections and establish their own system of quality control to safeguard personnel and the environment.

Release of species into the natural environment

Section 28 establishes a general duty of care for any person responsible for releasing living or viable organisms into the environment, who must as far as possible seek to prevent any release having adverse impacts on biodiversity. This duty of care is considered to be met if an organism is released in accordance with a permit issued by a public authority and any applicable permit conditions. More broadly, any person who initiates an activity or project that may result in the spread or release of living or viable organisms beyond their natural range must take reasonable measures to prevent this.

Any person responsible for the release or unintentional discharge of an alien organism that causes damage or the risk of serious damage to biodiversity must immediately notify the competent authority and take response measures in accordance with sections 69-70 (unless notification and response measures are covered by a separate statute).

Section 30[364] prohibits, except under permit, the release:

- into the environment, of (a) organisms belonging to species or subspecies that do not occur naturally in Norway, including foreign tree species.[365] All permit applications must describe possible impacts on biodiversity and a permit may not be granted if there is reason to believe that the release will have substantial adverse impacts thereon;
- into the environment(b) wildlife belonging to species, subspecies or populations that do not already occur naturally in the district; and (d) organisms that do not already occur naturally in an area, if required by specific regulations;

[364] General rules regarding the release of organisms or species into the environment.

[365] Regulations listing prohibited alien tree species are currently under development.

- into the sea or a river system (c) organisms not belonging to a native population unless a permit has been granted under the Aquaculture Act;

Subject to compliance with the general duty of care, section 31[366] authorises the release of

- organisms imported under permit for release;
- plants in gardens, parks and other cultivated areas, if not likely to spread outside the area, and Norwegian tree species,
- biological control agents covered by a release permit under other legislation,
- any other organisms covered by specific regulations.

Voluntary and cross-cutting measures

The national IAS strategy provides for sectoral plans on how to tackle IAS and aliens in general (quite successful with the transport sector) and for species-specific action plans. Awareness-raising with specific stakeholders (e.g. the Norwegian zoo traders association) is also under way, funded by the Ministry of the Environment. The private sector has been charged with implementing the EPPO/COE Code of conduct for horticulture. General information is provided to the public through media and organizations (horticultural magazines etc).

Example 5: integrated environmental biosecurity continuum (New Zealand, Australia)

New Zealand

New Zealand has established a comprehensive integrated biosecurity framework to facilitate international trade, protect human health and ensure the welfare of the environment, flora and fauna, marine life and Maori resources.[367]

The Ministry of Agriculture and Forestry Biosecurity New Zealand (MAFBNZ) leads the system and was set up in July 2007.[368] A detailed Memorandum of Understanding[369] addresses all administrative aspects of policy implementation, notably cooperation with three departments with key responsibilities:

- Department of Conservation (DOC): manages animal pests, weeds and wildlife diseases on public conservation lands, on other land where this supports the protection of public conservation lands and in marine reserves, and advises MAF on interventions related to environmental pests and diseases;
- Ministry of Health: addresses biosecurity risks that cause direct harm (e.g. biting or stinging pests) or indirect harm (e.g. exotic mosquitoes that transmit diseases). Manages (i) border health protection to meet international obligations, sea and

366 Release without a special permit.

367 See generally http://www.biosecurity.govt.nz/biosec/sys for links to all relevant legislation, assessments and standards.

368 Following integration of two MAF business groups: Biosecurity New Zealand and MAF Quarantine Services.

369 http://www.biosecurity.govt.nz/bio-strategy/papers/biosecurity-mou.htm#13.

airport sanitation, surveillance for, and exclusion of rats and mosquitoes at international ports of entry; (ii) post-border surveillance of saltmarsh habitats for new incusions of mosquitoes that pose health risks and (iii) nuisance pests under the Health Act;

- Ministry of Fisheries: does not directly deliver biosecurity services but contributes to formulation of strategic goals for the marine biosecurity system and advises on biosecurity risks to fisheries interests e.g. any harmful exotic species that could enter New Zealand waters through the discharge of ballast water (carried in the base of ships for stability) or as fouling on vessel hulls;
- it also provides for a Biosecurity Central/Regional Government (BCR) Forum to ensure vertical coordination between biosecurity agencies and enables effective end-to-end management of the biosecurity system.

The underpinning legislation is the Biosecurity Act 1993 (the foundation for the 2003 Biosecurity Strategy[370]). This covers the full sequence of IAS interventions: management of risks associated with the importation of 'risk goods'[371] (Part 3); monitoring New Zealand's pest and disease status (Part 4); pest management/eradication of pests through national and regional strategies (Part 5); direct exercise of powers by a Government agency outside formal strategies (Part 6); and emergency action (Part 7). Operational policies have been or are being developed for each point of intervention to outline decision-making criteria and processes.

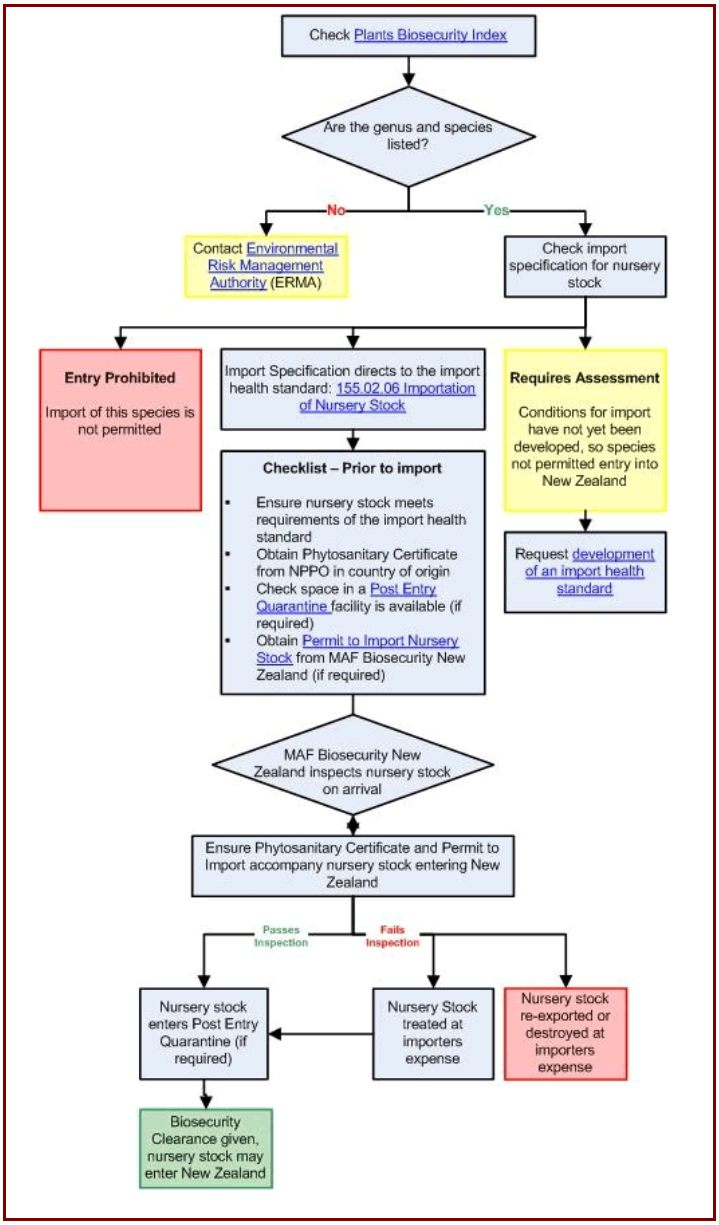
Import health standards (IHS) outline the standards that must be met before goods can be given biosecurity clearance for import into New Zealand (i.e. the system is a closed or white-list approach). Existing IHS already cover a wide variety of pathways for unintentional as well as intentional introductions[372] (see Figure 9-2 for the procedure used for nursery stock).

Figure 9-2 Steps for importing nursery stock into New Zealand

370 www.maf.govt.nz/biosecurity/bio-strategy/biostrategy.

371 'Any organism, organic material, or other thing, or substance, that (by reason of its nature, origin, or other relevant factors) it is reasonable to suspect constitutes, harbours, or contains an organism that may (a) cause unwanted harm to natural and physical resources or human health in New Zealand; or (b) interfere with the diagnosis, management, or treatment, in New Zealand, of pests or unwanted organisms.'

372 e.g. the *Importing used equipment associated with animals or water* Standard requires fishing gear, waders, surfboards, canoes, aquariums, ropes, buoys etc. to be cleaned, checked and dried prior to arrival (http://www.biosecurity.govt.nz/imports/animals/standards/anieqpic.all.htm).



Source: http://www.biosecurity.govt.nz/regs/imports/plants/nursery#permit

MAF is required to maintain a register of 'unwanted organisms'[373] which also includes any new organism that the Environmental Risk Management Authority (ERMA) has declined approval to import.[374] MAF must be satisfied that goods or organisms given biosecurity clearance show no signs of harbouring unwanted organism and keep a register of all unwanted organisms, including notifiable organisms. It is an offence to sell, propagate, breed, release or display an unwanted organism or pest (sections 52-53).

Experience of implementation:[375] The Biosecurity Strategy widened MAFBNZ's remit and

[373] Any organism a chief technical officer believes capable of causing unwanted harm to any natural and physical resources or human health.

[374] ERMA has authority to take decisions on applications to introduce hazardous substances or new organisms, including GMOs, pursuant to the Hazardous Substances and New Organisms Act 1996. MAF is the relevant enforcement agency.

[375] pers.comm Niall Moore, building on interviews with MAF, DOC and other agencies in New Zealand, March 2010.

resources but its focus is still seen as more concerned with agricultural issues than biodiversity. MAF has developed a generic incursion response system as part of the Incursion Response System Review project. The earlier model was seen on the ground as rather inflexible and not entirely appropriate when dealing with a biodiversity-related incursion, but this seems to have been adjusted in response to critical feedback. MAFBNZ is also inhibited by not having an operational arm, apart from border officers and some diagnosticians. It has therefore contracted a state agency (Enterprise AsureQuality) to develop a network of central government, local government, industry and commercial providers who can be deployed in biosecurity responses to exotic pests and diseases. The network is intended to provide certainty that in any biosecurity response situation, the required field operations capability will be available and ready to act immediately across all manner of biosecurity response situations and locations.

For IAS management, MAF handles national leadership and coordination but most operational planning appears to be at regional level with few national action plans in place. Regional Pest Management Strategies, while excellent for laying out policy on a regional level and getting stakeholder buy-in, are inflexible and cannot be altered until the 5-year review comes up: this makes it difficult to incorporate new species that turn up unless they have been anticipated and included via a horizon scanning exercise. Duties for land-owners exist but only at a regional level and under the RPMS. Regional council staff and potentially DOC staff have powers of access to private land (but not boats).

For prioritisation, the DOC uses the National Heritage Management System to help target action on a site and species basis, based on the return in terms of biodiversity gain associated with a given action at any site and the cost/feasibility of success of the action: it also helps to link the NZ Biodiversity and Biosecurity Strategies. In 2006, DOC, Regional Councils, the Ministry of Fisheries and the Crown Research Institutes were asked to submit names of species to MAFBNZ for priority eradication, accompanied by significant evidence. Based on this and a 12 month process involving stakeholder (but not general public) consultation, 20 priority organisms were decided upon (18 plants and 2 animals).

As regards internal border policies, although the Cook Strait is the obvious point to stop invasions, there are no formal mechanisms in place between the North and South Islands apart from public information materials at the ferry terminals on each side. The highly invasive alga *Dydimo* currently occurs only on South Island. MAFBNZ funds a substantial public awareness campaign for this species, about 50% of which goes to Regional Councils.

The government has overall responsibility for funding biosecurity, in particular border management, surveillance and incursions. Around $500 million is spent annually of which $180 million is allocated directly by MAF Biosecurity New Zealand. Activities are undertaken by central government, regional councils, industry and private landowners, with government agencies responsible for about $304 million of total spend. MAF has around 1000 full time and part-time scientific and administrative staff, based across New Zealand and overseas.[376]

[376] http://www.biosecurity.govt.nz/biosec/org#funding, accessed 15 January 2010.

Within this total, MAFBNZ's overall surveillance costs are estimated at $6-8 million/year. ERMA spends about $2 million per/year on risk assessment, of which two/thirds is spent on GMOs and the rest for new organisms. The overall spend on biosecurity research funding in New Zealand is approximately $30 million per year (of which MAFBNZ directly commissions over $2 million worth and DOC spends about $1.5 million: 78% on animals, the rest on plants).

The border control charging system was revised in 2006 to introduce new levies to improve cost recovery, streamline procedures and reduce compliance costs (Biosecurity Risk Screening Levy charged on qualifying import entries and cargo documentation to recover costs of primary screening of import documentation: collected by Customs Service and passed to Ministry of Agriculture and Forestry). New Zealand operates an accreditation and training scheme to undertake pest interceptions by inspecting low-risk containers at approved transitional facilities.[377]

Australia

The Australian framework interprets 'environmental biosecurity' as the protection of the environment and social amenity from the negative effects associated with invasive species; including weeds, pests and diseases. It occurs across the entire biosecurity continuum: pre-border preparedness, border protection and post-border management and control.[378]

The *Australian Biosecurity System for Primary Production and the Environment* (AusBIOSEC) was established in 2005 under the Department of Agriculture, Fisheries and Forestry. It also aims to integrate the entire biosecurity continuum at different levels of government, industry, landholders and other key stakeholders in primary production and the environment and covers the terrestrial, freshwater and marine environments.[379] The Australian Pest Animal Strategy (NRMMC 2007) has been developed within the AusBIOSEC framework to address the undesirable impacts caused by exotic vertebrate animals (mammals, birds, reptiles, amphibians, and fish) that have become pests in Australia, and to prevent the establishment of new exotic vertebrate pests.

Biodiversity-specific aspects are driven by the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). Only species included in the *List of Specimens taken to be Suitable for Live Import* may be imported (i.e. a white list approach). The Minister for the Environment, Heritage and the Arts is required to consider a final assessment report on the potential impacts of the proposed amendment and to consider the precautionary principle before making a decision. In 2008, for example, the definition of domestic cat (white listed) was altered following risk assessment to specificaly exclude serval hybrids in order to prohibit the import of Savannah Cats and other Serval cat hybrids for the pet trade.[380]

The Act establishes a Commonwealth-level procedure to assess environmentally 'threatening processes' and to list processes that meet specified risk criteria:

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[377] http://www.biosecurity.govt.nz/regs/trans#operators

[378] See http://www.environment.gov.au/biodiversity/invasive/index.html.

[379] See generally http://www.daff.gov.au/ba.

[380] Draft available from http://www.zoossa.com.au/__files/f/9159/2008%20savannah%20cats%20risk%20assessment.pdf.

- a biological invasion process may be listed as a 'key threatening process' (KTP) under the EPBC Act[381] where an IAS threatens the survival, abundance or evolutionary development of a native species / ecological community. This is the first step to addressing the impact of a particular threat under Commonwealth law (cf. at state/territory level);[382]
- once a KTP is listed, a 'threat abatement plan' may be developed and implemented if it is shown to be 'a feasible, effective and efficient way' to abate that process. Such plans outline the research, management and other actions necessary to reduce the impacts of a listed KTP on affected listed threatened species / ecological communities.

Regarding criteria, a process may be listed as a key threatening process if it could:

- cause a native species / ecological community to become eligible for inclusion in a threatened list (other than the conservation dependent category); or
- cause an already listed threatened species / threatened ecological community to become more endangered; or
- adversely affect two or more listed threatened species / ecological communities.

The nomination process to list a threatening process as a KTP may be initiated by any person. The Minister invites nominations each year ahead of a new assessment cycle. Nominations are considered by the Threatened Species Scientific Committee: those retained for inclusion in the finalised priority assessment list are assessed by the Committee and made available for public and expert comment. After assessment, the Committee's advice is forwarded to the Minister, who decides whether a threatening process is eligible for listing under the EPBC Act.[383]

The EPBC establishes powers for the Minister to adopt and implement 'recovery plans' for threatened fauna, threatened flora (other than conservation dependent species) and threatened ecological communities listed under the Act. Recovery plans set out the research and management actions necessary to stop the decline of, and support the recovery of, listed threatened species or threatened ecological communities, in order to maximise the long term survival in the wild of a threatened species / ecological community. They should specify actions protect and restore important populations of threatened species and habitat, as well as how to manage and reduce threatening processes. This is done by providing a planned and logical framework for key interest groups and responsible government agencies to coordinate relevant actions.[384]

[381] http://www.environment.gov.au/biodiversity/threatened/ktp.html.

[382] Currently listed invasive species include e.g. rabbits, foxes, cats, pigs, unmanaged goats, rodents on islands, red imported fire ants, Phytophthora cinnamomi, chytrid fungus and Psittacine beak and feather disease.

[383] http://www.environment.gov.au/biodiversity/threatened/pubs/nomination-flowchart.pdf.

[384] http://www.environment.gov.au/biodiversity/threatened/recovery.html.

Annex 3 Information on the volume of permits and level of changes in the context of the EU Wildlife Trade Regime

Table A4.1 Number of issued CITES permits / other documents (2007-2008) Source: national CITES reports (http://ec.europa.eu/environment/cites/reports_en.htm)

Member State	Year	Number of issued CITES permits / other documents					
		Import permits	Export permits	Re-export permits	**Total (permits)**	Other CITES documents	**TOTAL (permits & documents)**
Austria	2007	2096	146	3357	5599	3532	9131
	2008	2216	136	3735	6087	3356	9443
Belgium	2007	1044	637	190	1871	4266	6137
	2008	998	510	240	1748	4075	5823
Bulgaria	2007	41	16	3	60	33	93
	2008	215	16	2	233	10	243
Cyprus	2007	3		26	29	0	29
	2008	1		18	19	0	19
The Czech Republic	2007	463	163	17	643	0	643
	2008	508	152	7	667	0	667
Denmark	2007	1014	197	222	1433	0	1433
	2008	979	229	193	1401	0	1401
Estonia	2007	54	9	3	66	15	81
	2008	68	3	5	76	18	94
Finland	2007	121	5	25	151	104	255
	2008	115	6	20	141	127	268
France	2007	23438	1397	33607	58442	4079	62521
	2008	23324	1369	36232	60925	4578	65503
Germany	2007	6,080	896	8,988	15964	1109	17073
	2008	7,573	1,432	10,808	19813	1,138	20951
Greece	2007	378	1	15	394	1	395
	2008	745	3	17	765	16	781
Hungary	2007	193	22	15	230	0	230
	2008	221	18	7	246	0	246
Ireland	2007	18	3	0	21	70	91
	2008	55	4	0	59	190	249
Italy	2007	7598	183	47237	55018	73	55091
	2008	7291	141	48881	56313	91	56404
Latvia	2007	261	4	10	275	0	275
	2008	258	0	7	265	0	265
Lithuania	2007	158	6	0	164	0	164
	2008	176	9	0	185	15	200
Luxembourg	2007	60	2	5	67	25	92
	2008	86	0	8	94	7	101
Malta	2007	71	20	1	92	28	120
	2008	51	16	0	67	40	107
The Netherlands	2007	2074	515	542	3131	2	3133
	2008	2065	476	437	2978	3	2981
Poland	2007	339	14	13	366	99	465
	2008	418	28	7	453	68	521
Portugal	2007	1243	73	235	1551	3739	5290

	2008	1134	46	284	1464	3838	5302
Romania	2007	167	8	15	190	150	340
	2008	257	42	3	302	241	543
Slovakia	2007	0	13	2	15	79	94
	2008	0	14		14	105	119
Slovenia	2007	122	10	32	164	10	174
	2008	149	17	34	200	10	210
Spain	2007	3715	642	2472	6829	314	7143
	2008	3206	569	2004	5779	248	6027
Sweden	2007	332	125	14	471	0	471
	2008	334	112	8	454	0	454
the UK	2007	13528	2231	8263	24022	29464	53486
	2008	17537	1927	7663	27127	24180	51307

Table A4-2 Charges for permits and certificates for wildlife trade in EY Member States, as per December 2009. *Source: CITES Circa pages.*

Charges for permits and certificates as per December 2009			
Country*	**Permits / Certificates**	**Charges in EUR**	**Comments**
Belgium	Import and export / re-export permit	25	25 EUR per species with a maximum of 125 EUR per document (animals)/25 EUR per genus with a maximum of 125 EUR per document
	Travelling exhibition certificate, personal ownership certificate and Article 10 certificate	12.5	
Bulgaria	**Import permit, export permits and re-export certificate:**		
	a) for each species from the Bulgarian fauna and flora, excluding species used in the institutions under letter 'c' ;	15.33	
	b) for each non native species, excluding species used in the institutions under letter 'c';	23	
	c) for specimens which are part of zoo and botanical garden collections, circuses, dolphinaria, Rescue center, reintroduction programs or museums and other scientific institution – for whole document;	12.78	
	Travel exhibitions crtificates;	25.56	
	Certificates under Art. 8 (3) and Art. 9 (1) of Reg. (EC) No 338/97:		
	a) for each species from the Bulgarian fauna and flora, excluding species used in the institutions under letter 'c' ;	5.11	
	b) for each non native species, excluding species used in the institutions under letter 'c';	10.22	

	c) for specimens which are part of zoo and botanical garden collections, circuses, dolphinaria, Rescue center, reintroduction programs or museums and other scientific institution – for whole document;	5.11	
Czech Republic		**CZK / EUR***	* Exchange rate July 2009
	Import- and export permit	1000 / 38,4	All specimens (exemptions see below)
	Re-export certificate	1000 / 38,4	
	Certificate to authorize movement according to art. 4, 5 and 9 (1 & 2) of Council Reg. 338/97	1000 / 38,4	
	Phytosanitary certificate	500 / 19,2	Issued by the State Phytosanitary Administration of the Czech Republic for export of plants or plant products (exemption of charge: phytosanitary certificate for export of plants or plant products for other than commerical purposes)
	Article 8.3 certificate	0	Exemption from prohibition of commercial activities with Annex A specimens
Denmark	Permit / Certificate	0	
Germany	Import permit	41	Live specimens
	Export permit	21	
	Re-export certificate	25	
	Personal ownership certificate	30	
	Travelling exhibition certificate	50	
	Import permit	16	Dead specimens, parts and derivatives
	Export permit	12	
	Re-export certificate	12	
	Sample collection certificate accompanied by ATA carnet	20	
	Licensing and registration of (re-)packaging caviar plants	500	General
	Negative certificate	13	
	Blank forms for registered propagation units	6	
	Art. 10 certificates	varies / issued by Länder Authorities	The fees payable are regulated by the relevant Länder legislation based on the value of the specimen.
Estonia		0	
Greece	Permit / Certificate	40	
	CITES permit or certificate issued for personal purposes (code P)	15	
Spain	Permit / Certificate	20	Until 4 species; **plus 5 EUR** more for each additional species
	Personal ownership certificate	30	Until 4 species; **plus 5 EUR** more for each additional species
	EU Certificate	20	

	Travelling exhibition certificate	10	
France	Permit / Certificate	0	No fees at the moment
Ireland	Permit / Certificate	0	
Italy	Permit / Certificate	16.87	
Cyprus		0	
Latvia		**LVL / EUR***	* Exchange rate October 2009
	Permit/ Certificate with purpose code T	8 / 12	
	Permit/ Certificate with purpose code Q	6 / 9	
	Permit/ Certificate with purpose code B, E, G, M, N, S	3 / 5	
	Permit/ Certificate with purpose code H, L, P, Z	0	
Lithuania		**LTL / EUR***	* Exchange rate July 2009
	Permit / Certificate	50 / 14,50	
Luxembourg	Permit / Certificate	0	
Hungary		**HUF / EUR***	* Exchange rate October 2009
	Import permit	10600 / 40	
	Export permit	10600 / 40	
	Re-export permit	10600 / 40	
	Certificate	2000 / 8	
Malta		**MTL / EUR***	* Exchange rate July 2009
	Permit / Certificate	5 / 11,65	
The Netherlands	Permit	60	Each additional annex (with 3 species per annexx) costs 60 euro
	Certificate	15	
Austria	Issuance of permits and certificates for live animals of Annex A: Mammals and birds	40	
	Issuance of permits and certificates for live animals of Annex A: Reptiles	15	
	Issuance of permits and certificates for live animals and plants of Annex A: Amphibians, fish, insects, molluscs, and plants	10	
	Issuance of permits and certificates for live animals and plants of the Annexes B and C	10	
	Issuance of permits and certificates for dead animals and plants of Annex A, parts or derivatives thereof, including hunting trophies and antiquities for the purposes of Article 2(w) of Regulation (EC) No 338/97	40	
	Issuance of permits and certificates for specimens of Annex B for hunting trophies and antiquities for the purposes of Article 2(w) of Regulation (EC) No 338/97	40	
	Issuance of permits and certificates for dead animals and dead plants of Annex B, parts or derivatives thereof	7	
Poland	Import permit	28	Budget and territorial self-government units, including

	Export permit	28	scientific institutions, botanical and zoological gardens, are exempted from the charges.
	Re-export permit	28	
	EU Certificate	5	
Portugal	**With commercial purposes and hunting trophies**		
	Permits and Certificates	35	
	Import notifications	30	
	Other purposes		
	Permits and Certificates	25	
	Import notifications	20	
	Emergencies until 72 hours	20	
Romania		**RON / EUR***	* Exchange rate July 2009
	Import and export permit and re-export certificate (natural person)	80 / 19,00	
	Import and export permit and re-export certificate (legal person)	100 / 23,73	
	EU Cerificate / Certificates for personal ownership/ Certificates for traveling exhibitions	80 / 19,00	
Finland	Import permit	75	
	Export permit	75	
	Re-export certificate	75	
	Certificate	40	
	Certificates for personal ownership + traveling exhibitions	75	
Slovakia	Import permit, Export permit, re-export certificate for legal person	66	Nature-oriented museums and zoological gardens are exempted from the charges
	Certificate for legal person	66	
	Import permit, Export permit, re-export certificate for natural person	6.5	
	Certificate for natural person	6.5	
Slovenia	Permit/certificate	17.00-73.00	Issuance of CITES permits. No further details provided.
Sweden		**SEK / EUR***	* Exchange rate July 2009
	Art. 10 certificates	350 / 32,21	
	Import / export / re-export permits	400 / 36,81	Plants
	Import / export / re-export permits	400 / 36,81	Animals
United Kingdom		**GBP / EUR***	* Exchange rate July 2009
	Import / export permits	59 / 69,52	
	Personal ownership certificates	59 / 69,52	
	Travelling exhibition certificate	59 / 69,52	
	Re-export permit	47 / 55,38	

	Certificates under Article 8	25 / 29,46	
	Certificates under Article 9	70 / 82,48	
	Certificates under Article 60	177 / 208,57	-
	(N.B. See Annex to COM 32 Inf. 1 for proposed charges currently out to public consultation in the UK)		

*** The order of protocol for the Member States is alphabetical, based on the original written form of the short name of each country**

Exemptions Czech Republic regarding live specimens:

a) specimens of personal and household effects, including hunting trophies personally hunted by importing or exporting person,

b) specimens exported or imported to a rescue centre or for scientific or educational purposes,

c) export or import in the case of non-commercial loans, donations and exchanges between scientists and scientific institutions, registered by the Ministry of the Environment, of herbarium specimens and other preserved, dried or embedded museum specimens and live plants,

d) export or import of specimens for breeding or propagation purposes within framework of a rescue programme, or specimens originating in or designated to a breeding or collection by zoological or botanical gardens, establishments of universities, the Academy of Science of the Czech Republic and other scientific institutions, registered by the Ministry of the Environment,

e) export or import of a live specimen if the owner of that specimen is travelling with his/her specimen temporarily from or into the territory of the Czech Republic, but not for longer period than 3 months.

Annex 4 Supporting data on costs of national information and early warning systems

To assess the costs of developing national information systems to support early detection of invaders, a questionnaire was circulated to the focal points of the NOBANIS network (15 countries) and selected additional countries (Spain, Lithuania, United Kingdom).

The information requested from each country focused on the annual costs for collecting, managing and sharing information on alien species within the NOBANIS network, describing the present level of costs paid and providing a cost estimate for developing a national information system with different levels of ambition (from basic collection of information to implementing a fully operational national information system). For each level of ambition, the questionnaire asked respondents to provide a breakdown of costs at the national scale for personnel, overheads, development of inventories, monitoring and surveillance, risk assessment and equipment. It excluded on the ground activities such as active surveillance or management. The completed questionnaires are presented in this Annex.

COUNTRY Austria

Annual costs for collecting, managing and sharing information on alien species within NOBANIS network		Personnel costs (specify working time and/or overall budget)	Overheads	Development/updating of national alien species inventories	Monitoring and surveillance (central data collection coordination, etc; field work excluded from estimate)	Risk assessment related activities	Hardware and other material/equipment	External assistance (e.g. IT costs)	Other costs including surveillance (please specify in notes)	TOTAL
a)	PRESENT LEVEL OF COSTS (may be identical to b), c) or d))	3.750 (for 2009)	25% (1.250)	included in the personnel costs	0	0	this is included in the overhead	0	0	5.000
b)	ESTIMATED COSTS FOR COLLECTING INFORMATION ONLY (literature search, experts networking, etc)	2 quarter-time positions (37.500)	25% (12.500)	included in the personnel costs	included in the personnel costs (collecting data only, excl. field work!)				one national expert meeting p.a. (5.000)	55.000
c)	ESTIMATED COSTS FOR DEVELOPING A BASIC NATIONAL INFORMATION SYSTEM ON INVASIVE ALIENS SPECIES	2 half-time positions (75.000)	25% (25.000)	included in the personnel costs	included in the personnel costs (collecting data only, excl. field work!)	external working contracts (20.000)	this is included in the overhead	0	one international expert meeting p.a. (2.000); external working contracts (10.000)	132.000
d)	ESTIMATED COSTS FOR DEVELOPING A FULLY OPERATIONAL NATIONAL INFORMATION SYSTEM	2 full time positions (150.000)	25% (50.000)	included in the personnel costs	included in the personnel costs (collecting data only, excl. field work!)	external working contracts (10.000)	this is included in the overhead	working contracts (25.000)	one national expert meeting p.a. (5.000); external working contracts (10.000)	250.000

Notes	roughly estimated according to cost rate of our agency	networking at national and international levels

COUNTRY IRELAND

Annual costs for collecting, managing and sharing information on alien species within NOBANIS network		Personnel costs (specify working time and/or overall budget)	Overheads	Development/updating of national alien species inventories	Monitoring and surveillance (central data collection coordination, etc; field work excluded from estimate)	Risk assessment related activities	Hardware and other material/equipment	External assistance (e.g. IT costs)	Other costs including surveillance (please specify in notes)	TOTAL
a)	PRESENT LEVEL OF COSTS (may be identical to b), c) or d))	€ 46.972,00		included in the personnel costs	included in the personnel costs	30.000	€ 5.000,00	€ 7.580,00	€7.000,00	€66.552,00
b)	ESTIMATED COSTS FOR COLLECTING INFORMATION ONLY (literature search, experts networking, etc)	€ 23.486,00		included in the personnel costs	included in the personnel costs				€ 5.000,00	€ 28.486,00
c)	ESTIMATED COSTS FOR DEVELOPING A BASIC NATIONAL INFORMATION SYSTEM ON INVASIVE ALIENS SPECIES	Do not have a BASIC system.								
d)	ESTIMATED COSTS FOR DEVELOPING A FULLY OPERATIONAL NATIONAL INFORMATION SYSTEM	€ 70.500,00		included in the personnel costs	included in the personnel costs		€ 20.000,00	€ 10.000,00	€ 10.000,00	€ 110.500,00

Notes	Costs for a) and b) based on 2009 figures. b) costed as half the time period spent by Database Manager on this activity. c) As do not have basic information system, cost not included here. However, costs for developing GIS based internet system of Biodiversity Data Centre for 5 years 500,000. d) Based on the need for having at least 1 F/T and 1 P/T positions per year.	Riak assessment costs are based on cost of developing framework and carrying out RA. Annual running costs would be lower in the range of 15,000 per year if no further methodological development is carried out.	a) based on GIS desktop licence fees and material design and print.	networking at national and international levels. Plus carrying out workingshops on using and submitting to the database etc. Also included are associated travel and subsistence expenses.

COUNTRY Latvia

Annual costs for collecting, managing and sharing information on alien species within NOBANIS network		Personnel costs (specify working time and/or overall budget)	Overheads	Development/updating of national alien species inventories	Surveillance (sentinel data collection coordination, etc; field work excluded from	Risk assessment related activities	Hardware and other material/equipment	External assistance (e.g. IT costs)	Other costs including surveillance (please specify in notes)	TOTAL
a)	PRESENT LEVEL OF COSTS (may be identical to b), c) or d))	1 quarter time position (~2.500 EUR)		included	included		~1.000 EUR			2.500
b)	ESTIMATED COSTS FOR COLLECTING INFORMATION ONLY (literature search, experts networking, etc)	1 quarter time position (~2.500 EUR)		included	included				national expert meeting (at least one per year) ~ 1.000 EUR	2.500
c)	ESTIMATED COSTS FOR DEVELOPING A BASIC NATIONAL INFORMATION SYSTEM ON INVASIVE ALIENS SPECIES	1 quarter time position (~2.500 EUR)		included	included	external working contracts (~5.000 EUR)	~1.000 EUR		national expert meeting (at least one per year) ~ 1.000 EUR + contracts with external experts ~2.000 EUR	11.000
d)	ESTIMATED COSTS FOR DEVELOPING A FULLY OPERATIONAL NATIONAL INFORMATION SYSTEM	2 full time postitions (~15.500 EUR)		included	included	external working contracts (~5.000 EUR)	~1.000 EUR	~5000 EUR	national expert meeting (at least one per year) ~ 1.000 EUR + contracts with external experts ~3.000 EUR	30.500
Notes		annaul costs according to average salaries in the governmental institutions								

COUNTRY	Lithuania									
Annual costs for collecting, managing and sharing information on alien species within NOBANIS network		Personnel costs (specify working time and/or overall budget)	Overheads	Development/updating of national alien species inventories	Monitoring and surveillance (central data collection coordination, etc; field work excluded from estimate)	Risk assessment related activities	Hardware and other material/equipment	External assistance (e.g. IT costs)	Other costs including surveillance (please specify in notes)	TOTAL
a)	PRESENT LEVEL OF COSTS (may be identical to b), c) or d))	2,000 (for 2009)	25% (500)	included in the personnel costs	0	0	this is included in the overhead	0	0	2,500
b)	ESTIMATED COSTS FOR COLLECTING INFORMATION ONLY (literature search, experts networking, etc)	2 quarter-time positions (12,000)	25% (500)	included in the personnel costs	included in the personnel costs (collecting data only, excl. field work)				one national expert meeting p.a. (5.000)	12,500
c)	ESTIMATED COSTS FOR DEVELOPING A BASIC NATIONAL INFORMATION SYSTEM ON INVASIVE ALIENS SPECIES	2 half-time positions (24,000)	25% (6,000)	included in the personnel costs	included in the personnel costs (collecting data only, excl. field work)	external working contracts (5.000)	this is included in the overhead	0	0	35,000
d)	ESTIMATED COSTS FOR DEVELOPING A FULLY OPERATIONAL NATIONAL INFORMATION SYSTEM	2 full time positions (48,000)	25% (12,000)	included in the personnel costs	included in the personnel costs (collecting data only, excl. field work)	external working contracts (5.000)	this is included in the overhead	working contracts (5.000)	0	60,000

COUNTRY The Netherland

Annual costs for collecting, managing and sharing information on alien species within NOBANIS network		Personnel costs (specify working time and/or overall budget)	Overheads	Development/updating of national alien species inventories	Central data collection coordination, etc; field work excluded from	Risk assessment related activities	Hardware and other material/equipment	Risk Communication campaigns	Other costs including surveillance (please specify in notes)	TOTAL
a)	PRESENT LEVEL OF COSTS (may be identical to b), c) or d))	3600 hours		€ 20.000	€ 175.000	€ 225.000	not included in budget	€ 150.000	€ 70.000	1.000.000
b)	ESTIMATED COSTS FOR COLLECTING INFORMATION ONLY (literature search, experts networking, etc)									
c)	ESTIMATED COSTS FOR DEVELOPING A BASIC NATIONAL INFORMATION SYSTEM ON INVASIVE ALIENS SPECIES									
d)	ESTIMATED COSTS FOR DEVELOPING A FULLY OPERATIONAL NATIONAL INFORMATION SYSTEM									
Notes		team of 3 persons + ad hoc support of some other collegues	what do you mean exactly?					one of ou tasks is to carry out risk communication campaigns. Aim is to raise awareness on the risk of IAS + what people can do about it. Campaigns in 2010 are on Ambrosia & invasive waterplants (ponds + aquarium)		1.000.000 is our annual budget, guaranteed until the end of 2011

COUNTRY Spain

Annual costs for collecting, managing and sharing information on alien species		Personnel costs (specify working time and/or overall budget)	Overheads	Development/updating of national alien species inventories	surveillance (central data collection coordination, etc; field work excluded	Risk assessment related activities	Hardware and other material/equipment	External assistance (e.g. IT costs)	Other costs including surveillance (please specify in notes)	TOTAL
a)	PRESENT LEVEL OF COSTS (may be identical to b), c) or d))	31000 (excluding c)	20%	included in the personnel costs	0	0	2000	0	0	5.000
b)	ESTIMATED COSTS FOR COLLECTING INFORMATION ONLY (literature search, experts networking, etc)									55.000
c)	ESTIMATED COSTS FOR DEVELOPING A BASIC NATIONAL INFORMATION SYSTEM ON INVASIVE ALIENS SPECIES	€ 14.000,00		included in the personnel costs			included			132.000
d)	ESTIMATED COSTS FOR DEVELOPING A FULLY OPERATIONAL NATIONAL INFORMATION SYSTEM			included in the personnel costs						250.000

Notes

COUNTRY Sweden

Annual costs for collecting, managing and sharing information on alien species within NOBANIS network		Personnel costs (specify working time and/or overall budget)	Overheads	Development/updating of national alien species inventories	surveillance (central data collection coordination, etc; field work excluded from	Risk assessment related activities	Hardware and other material/equipment	External assistance (e.g. IT costs)	Other costs including surveillance (please specify in notes)	TOTAL
a)	PRESENT LEVEL OF COSTS (may be identical to b), c) or d))	2 fulltime positions total at 3 agencies, 76800 Euros/year	30.000	included un personnel costs	200.000	10.800	included in external assistance	50.000	none	340.600
b)	ESTIMATED COSTS FOR COLLECTING INFORMATION ONLY (literature search, experts networking, etc)									
c)	ESTIMATED COSTS FOR DEVELOPING A BASIC NATIONAL INFORMATION SYSTEM ON INVASIVE ALIENS SPECIES	1.080.000	39 % included in persronel costs	500.000	€ 750.000,00	500.000	included in external assistance	80.000	2.000.000 research	4.910.000
d)	ESTIMATED COSTS FOR DEVELOPING A FULLY OPERATIONAL NATIONAL INFORMATION SYSTEM	2.000.000	39 % included in persronel costs	500.000	5.000.000	2.000.000	included in external assistance	2.000.000	3.500.000 (research)	15.000.000

Notes

COUNTRY Ireland

Annual costs for collecting, managing and sharing information on alien species within NOBANIS network		Personnel costs (specify working time and/or overall budget)	Overheads	Development/updating of national alien species inventories	Monitoring and surveillance (central data collection coordination, etc; field work excluded from estimate)	Risk assessment related activities	Hardware and other material/equipment	External assistance (e.g. IT costs)	Other costs including surveillance (please specify in notes)	TOTAL
a)	PRESENT LEVEL OF COSTS (may be identical to b), c) or d))	€ 46.972,00		included in the personnel costs	included in the personnel costs	30.000	€ 5.000,00	€ 7.580,00	€7.000,00	€66.552,00
b)	ESTIMATED COSTS FOR COLLECTING INFORMATION ONLY (literature search, experts networking, etc)	€ 23.486,00		included in the personnel costs	included in the personnel costs				€ 5.000,00	€ 28.486,00
c)	ESTIMATED COSTS FOR DEVELOPING A BASIC NATIONAL INFORMATION SYSTEM ON INVASIVE ALIENS SPECIES	Do not have a BASIC system.								
d)	ESTIMATED COSTS FOR DEVELOPING A FULLY OPERATIONAL NATIONAL INFORMATION SYSTEM	€ 70.500,00		included in the personnel costs	included in the personnel costs		€ 20.000,00	€ 10.000,00	€ 10.000,00	€ 110.500,00

Notes

COUNTRY UK

Annual costs for collecting, managing and sharing information on alien species		Personnel costs (specify working time and/or overall budget)	Overheads	Development/updating of national alien species inventories	Monitoring and surveillance (central data collection coordination, etc; field work excluded from estimate)	Risk assessment related activities	Hardware and other material/equipment	External assistance (e.g. IT costs)	Other costs including surveillance (please specify in notes)	TOTAL
a)	PRESENT LEVEL OF COSTS (may be identical to b), c) or d))									
b)	ESTIMATED COSTS FOR COLLECTING INFORMATION ONLY (literature search, experts networking, etc)									
c)	ESTIMATED COSTS FOR DEVELOPING A BASIC NATIONAL INFORMATION SYSTEM ON INVASIVE ALIENS SPECIES									
d)	ESTIMATED COSTS FOR DEVELOPING A FULLY OPERATIONAL NATIONAL INFORMATION SYSTEM				510K over 3 years to establish central data collation system. This system (the NNSIP) builds on existing recording schemes and a mechanism for displaying and interrogaring distribution data (for all species) which are not included in the total cost.	Costs approx 84K per annum				254K (approx)

Notes