



**TECHNICAL SUPPORT TO EU STRATEGY ON INVASIVE ALIEN  
SPECIES (IAS)**

**Recommendations on policy options to minimise the negative impacts  
of invasive alien species on biodiversity in Europe and the EU**

**Final Report**

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**Authors:** Clare Shine (IEEP), Marianne Kettunen (IEEP), Patrick ten Brink (IEEP), Piero Genovesi (ISPRA) & Stephan Gollasch (Go-Consult)

**Contributor:** Uwe Starfinger (Institut für Ökologie, Technical University of Berlin, Germany)

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**ABBREVIATIONS**

ALARM.....	Assessing Large-scale environmental Risks for biodiversity with tested Methods
Ballast Water Management Convention	
.....	IMO International Convention for the Control and Management of Ships Ballast Water and Sediments
CBD .....	Convention on Biological Diversity
Communication.....	EC Communication “Towards an EU Strategy on Invasive Species”. Brussels, 3.12.2008 (COM (2008) 789)
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
EEA.....	European Environment Agency
EPPO.....	European and Mediterranean Plant Protection Organization
EU .....	European Union
IAS .....	invasive alien species
ICES.....	International Council for the Exploration of the Sea
IMO.....	International Maritime Organization
IPPC .....	International Plant Protection Convention
LIFE .....	Financial Instrument for the Environment
NOBANIS.....	North European and Baltic Network on Invasive Alien Species
OIE.....	World Organisation for Animal Health
PRATIQUE.....	Enhancement of Pest Risk Analysis Techniques
Three-stage hierarchy.....	Internationally-recommended sequence of IAS interventions (prevention; early detection and rapid response; long-term control and containment)

# 1 INTRODUCTION

## 1.1 Invasive alien species: a priority for Community biodiversity policy

Invasive alien species (IAS) are non-native species whose introduction and/or spread outside their natural past or present ranges poses a threat to biodiversity<sup>1</sup>. They occur in all major taxonomic groups, including animals, plants, fungi and micro-organisms, and are considered to be the second most important reason for biodiversity loss worldwide (after direct habitat loss or destruction)<sup>2</sup>.

Globalisation increases opportunities for species to move beyond their natural biogeographical barriers. As demand for trade, travel and transport has expanded within the EU and with the rest of the world, the rate of intentional and unintentional introductions of new species has risen exponentially in recent decades (Figures 1.1 and 1.2 below). This trend is predicted to continue, along with the further spread of already established species.

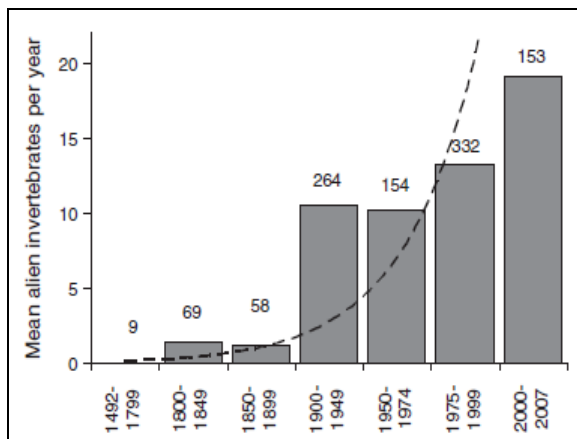


Figure 1.1. Trends in established alien terrestrial invertebrates in Europe since 1492. Calculations made on 995 species for which the first record is precisely known. The numbers above the bars correspond to the number of new species recorded per period (source Roques et al. 2009).

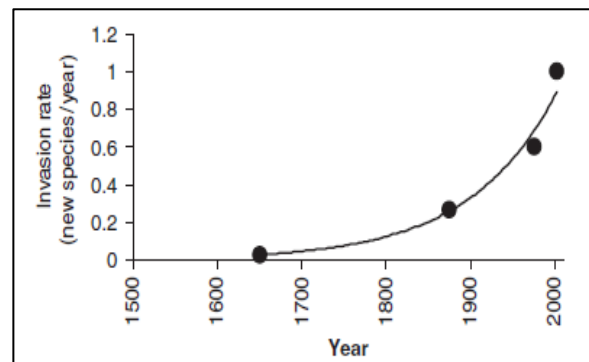


Figure 1.2. Rate of arrival of alien mammals per year in Europe in four periods: 1500-1800; 1800-1950; 1950-2000; and 2000-2005 (source Genovesi et al. 2009).

Many introduced species are of critical importance for production systems that underpin European economies. They provide a range of employment opportunities and are highly appreciated in society (e.g. ornamental plants, pet animals, exotic birds, game, fish for angling and aquaculture). However, the subset of introduced species that have become invasive in Europe generate a range of negative economic, social and environmental impacts that can also be measured in monetary terms and may outweigh their benefits.

<sup>1</sup> The terminology used in the study follows the definitions used under the Convention on Biological Diversity unless otherwise indicated (see <http://www.cbd.int/invasive/terms.shtml>).

<sup>2</sup> 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>.

Environmental degradation caused by pollution, habitat loss and land-use change already creates favourable conditions for some introduced species to establish and spread. Climate change is predicted to have even further-reaching effects as it may modify the whole process of an invasion (sources, pathways and destinations), increase ecosystem vulnerability and alter species' distributions. This could make it easier for:

- species to become established outside their natural range;
- species that are currently non-invasive to become invasive in native ecosystems;
- already-invasive species to turn into greater or reduced threats, potentially affecting the viability of current IAS management strategies<sup>3</sup>.

Climate change could also increase the spread of serious infectious vector-borne diseases, including zoonoses (diseases that can be 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 animals, plants and their products<sup>4</sup>.

#### **Box 1.1 How has the Community responded to the IAS threat?**

The need to address IAS within the European Union, as an integral part of halting biodiversity decline, was recognised in 2001<sup>5</sup>. In 2006, Community institutions<sup>6</sup> made a formal commitment to develop an EU Strategy on Invasive Alien Species to substantially reduce impacts of IAS and alien genotypes in line with Guiding Principles adopted under the Convention on Biological Diversity<sup>7</sup> and the European Strategy on IAS adopted under the Convention on the Conservation of European Wildlife and Habitats<sup>8</sup>. The Community also undertook to establish an Early Warning System for the prompt exchange of information between neighbouring countries on the emergence of IAS and cooperation on control measures across national boundaries, taking into account biogeographical regions.

In December 2008, the Commission issued a Communication “Towards an EU Strategy on Invasive Species”<sup>9</sup> (the Communication) which outlines four possible Policy Options to address IAS-related threats to EU biodiversity. These are based on the internationally-recognised three-stage hierarchy 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.

<sup>3</sup> Capdevila-Argüelles L. & B. Zillett. 2008. A Perspective on Climate Change and Invasive Alien Species. Convention On The Conservation Of European Wildlife And Natural Habitats. T-PVS/Inf (2008) 5 rev. Strasbourg, 16 June 2008.

<sup>4</sup> 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.

<sup>5</sup> Presidency Conclusions, Goteborg European Council, 15-16 June 2001; 6<sup>th</sup> Environmental Action Programme 2002.

<sup>6</sup> 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; 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); 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.

<sup>7</sup> 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>).

<sup>8</sup> Genovesi, P. and Shine, C., 2004. European Strategy on Invasive Alien Species. Nature and Environment No.137, Council of Europe Publishing. 67 p. ([http://www.coe.int/t/dg4/cultureheritage/conventions/Bern/T-PVS/sc24\\_inf01\\_en.pdf](http://www.coe.int/t/dg4/cultureheritage/conventions/Bern/T-PVS/sc24_inf01_en.pdf)).

<sup>9</sup> EC Communication “Towards an EU Strategy on Invasive Species”. Brussels, 3.12.2008 (COM (2008) 789 final). Available online at: [http://ec.europa.eu/environment/nature/invasivealien/docs/1\\_EN\\_ACT\\_part1\\_v6.pdf](http://ec.europa.eu/environment/nature/invasivealien/docs/1_EN_ACT_part1_v6.pdf).

## 1.2 Objectives and scope of the study

The work summarised in this report was carried out in the context of a study for the European Commission (“Technical Support for the Development of an EU Framework on Invasive Alien Species”<sup>10</sup>). The study’s objective was to provide the Commission with information, including recommendations, on cost-effective policy options for controlling IAS and their impacts in the EU.

Three substantive research tasks were conducted for the study. These aimed to synthesise information on the scale of the IAS problem in Europe, policy measures to tackle the problem and their associated costs and benefits. Their findings are documented in three study reports submitted to the Commission between May 2008 and July 2009, covering:

- evidence on current impacts of IAS (e.g. damage and control costs) in Europe (Task 1 of the study<sup>11</sup>, summarised in Chapter 2);
- analysis of current IAS frameworks in and beyond the EU and scoping of policy responses (Task 2 of the study<sup>12</sup>, summarised in Chapter 3);
- information on costs and benefits of IAS policy measures (Task 3 of the study<sup>13</sup>, summarised in Chapter 4).

This report is the final component of the study (i.e. Task 4). It summarises key findings of the three research tasks and uses these to justify its conclusions and recommendations on policy options to the Commission (see Chapter 5). For detailed data and analysis, the three study reports and their annexes should be consulted directly.

## 1.3 Stakeholder involvement in the study

Work for this study was carried out through desk-based research on IAS data and policies at the level of EU/Europe, individual Member States and selected non-EU jurisdictions. The extensive review of literature and existing international and regional databases was followed up by direct contact with Member State focal points, experts included in the DAISIE<sup>14</sup> register, competent officials from third countries and other stakeholders.

Throughout the study, stakeholder consultations formed an important element for seeking broader input and providing updates on work in progress. The main fora through which government, scientific, professional, industry and NGO stakeholders were engaged included:

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<sup>10</sup> Service Contract No 070307/2007/483544/MAR/B2.

<sup>11</sup> Kettunen, M., Genovesi, P., Gollasch, S., Pagad, S., Starfinger, U., ten Brink, P. & Shine, C. 2009. *Technical support to EU strategy on invasive species (IAS) - Assessment of the impacts of IAS in Europe and the EU* (Final draft report for the European Commission). Institute for European Environmental Policy (IEEP), Brussels, Belgium.

<sup>12</sup> 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 control the negative impacts of IAS on biodiversity in Europe and the EU* (Final report for the European Commission). Institute for European Environmental Policy (IEEP), Brussels, Belgium.

<sup>13</sup> Shine, C., Kettunen, M., Mapendembe, A., Herkenrath, P., Silvestri, S. & ten Brink, P. 2009. *Technical support to EU strategy on invasive species (IAS) – Analysis of the impacts of policy options/measures to address IAS* (Final report for the European Commission). UNEP-World Conservation Monitoring Centre, Cambridge/Institute for European Environmental Policy (IEEP), Brussels, Belgium.

<sup>14</sup> Delivering Alien Invasive Species Inventories for Europe ([www.europe-aliens.org](http://www.europe-aliens.org)).

- the series of consultation meetings on the Development of an EU Framework on Invasive Alien Species, organised by the Commission and held in Brussels<sup>15</sup>;
- the IAS segment of the *Conference on the European Union and its Overseas Entities: Strategies to counter Climate Change and Biodiversity Loss* (Réunion, 7-11 July 2008, organised by IUCN-World Conservation Union with EC support);
- the policy segment of the 5<sup>th</sup> *European Conference on Biological Invasions: Neobiota – towards a Synthesis* (Prague, 23-26 September 2008);
- the Regional Meeting of the South Atlantic Invasive Species Project (Ascension Island, 14-19 May 2009, organised by the Royal Society for the Protection of Birds with EC support); and
- the *Workshop on the Code of Conduct on Horticulture and Invasive Alien Plants* (Oslo, 4-5 June 2009, organised by the European and Mediterranean Plant Protection Organisation (EPPO) and the Council of Europe).

## 2 TASK 1: DEVELOPING THE EVIDENCE BASE

### 2.1 Specific objectives

The first research task (Task 1) focused on **assessing the impacts of IAS in Europe and the EU** (Kettunen et al. 2008, updated in 2009). This five-month study provided a more complete picture of the different environmental, social and economic costs and benefits of IAS in Europe and constitutes the first full assessment of all types of IAS impacts at the pan-European scale,

The main objective of Task 1 was to consolidate information that can be used to better understand IAS impacts and to provide a more quantitative picture of the scale of the IAS problem and risks in Europe to inform the development of the future EU Strategy on IAS.

### 2.2 Methodology

Task 1 research covered the whole of Europe, including both EU and non-EU countries and EU Overseas Entities<sup>16</sup>. Information on known IAS impacts was compiled for terrestrial,

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<sup>15</sup> Five meetings, attended by Member States and invited industry, NGO and technical stakeholders, were organised by the Commission (DG ENV) with input from other Directorates General, in June and October 2007, March and June 2008 and March 2009.

<sup>16</sup> These include 7 Outermost Regions which are integral elements of EU territory (French Guyana, Guadeloupe, Martinique and Réunion Island (France); Azores, Madeira (Portugal); Canary Islands (Spain)) and 21 Overseas Countries and Territories associated with the EU (Greenland (Denmark); French Polynesia, French Southern and Antarctic Lands (TAAF), Mayotte, New Caledonia, Saint-Pierre and Miquelon, Wallis and Futuna (France); Aruba, Netherlands Antilles, (Netherlands);



marine and inland water ecosystems and species from all main taxonomic groups (including mammals, plants, reptiles and amphibians, fishes, invertebrates, livestock and human diseases). Genetically modified organisms were excluded from the research as these are subject to separate EU legislation.

To avoid duplication, information already gathered for the EU-supported DAISIE study<sup>17</sup> was used as a baseline to compile a list of species with demonstrated environmental, social and/or economic impacts within European territory. An aggregated assessment was then developed, covering positive and negative impacts on biodiversity, ecosystem services, social well-being (including human health) and economic interests.

The approach was designed to provide both qualitative and quantitative (e.g. monetary) assessments of impacts. For monetary impacts, two broad estimates were developed:

- the first built on actual cost data (real/estimated) without any further estimation;
- the second involved extrapolating information from the identified local study area to the whole of the European range known to be affected by the IAS in question, to give a more representative picture of the scale of potential costs at the European level.

Given the lack of available information, the IAS analysed in Task 1 do not form an exhaustive inventory of IAS with impacts on European biodiversity and human well-being. However, the assessment and estimates presented in the report provide one of the first, albeit very general, indications of the extent and significance of overall IAS impacts at the European level.

### **2.3 Key findings**

Over a hundred IAS with existing evidence of significant environmental, social and/or economic impacts in Europe were selected for analysis in Task 1. These species cover all major biomes ranging from marine ecosystems to terrestrial areas and inland waters and represent a range of taxonomic groups including plants, invertebrates, vertebrates and fungi.

The findings clearly demonstrate the overall negative impacts of IAS upon Europe's environment, key economic sectors and human health and well-being, with real monetary impacts likely to be higher than the figures presented. The best-documented area concerns ecological impacts, whereas evidence is scarcer for the social and economic impacts of IAS and impacts on different ecosystem services. Across all impact types, the positive impacts recorded in the database were found to be largely outweighed by negative impacts.

The range of negative IAS impacts identified in Task 1 include:

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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 Caicos Islands (United Kingdom)). All but one of the Overseas Entities are islands or archipelagos.

<sup>17</sup> DAISIE presented results on the 10,822 alien species known to exist in Europe and identified 1094 species with documented ecological impacts and 1347 species with documented economic impacts in Europe (Vilà et al. 2009). It identified the hundred worst IAS in Europe, mainly based on current knowledge about the ecological effects of IAS on European territory (<http://www.europe-aliens.org/index.jsp>).

- extensive ecological impacts on Europe’s native species and habitats across all types of ecosystem, with IAS documented as a threat to many species and habitats threatened at global or European level<sup>18</sup>;
- disproportionately high impacts on European island biodiversity which often underpins local livelihoods and economies<sup>19</sup>;
- damage to ecosystem services critical to economic development and production processes, human well-being and tourism and recreation opportunities<sup>20</sup>;
- damage to ecosystem processes (supporting services) essential for maintenance of ecosystem services (e.g. soil and sediment formation; maintenance of nutrient cycles); and
- additional socio-economic impacts on individuals and communities through harm to human health<sup>21</sup>, jobs<sup>22</sup>, recreational/tourism amenities and natural/cultural heritage values.

Evidence on monetary impacts was obtained for around one third of the IAS analysed for the report. Available evidence of economic costs is mainly limited to terrestrial plants and vertebrates within the EU. Cost data on IAS damage was derived from agriculture and other biological production sectors resulting from e.g. plant diseases (fungi), insects and fouling organisms (marine, freshwater and terrestrial invertebrates). Cost data on IAS control measures was more widely available across different IAS taxa and ecosystems.

Based on documented costs, IAS damage and control measures are estimated to cost at least 12 billion EUR / year (Kettunen et al. 2009, as quoted in COM (2008) 789). Within this overall figure, available sector-specific evidence shows that IAS cost almost 6 billion EUR / year to key sectors (see Table 2.1).

**Table 2.1. Overview of the documented economic costs (real costs & estimates) of different IAS taxa on different economic sectors in Europe (as in Kettunen et al. 2009).**

Economic sector & pest taxa	Costs of damage (million EUR / year)	Costs of control (million EUR / year)
<b>Agriculture*</b>		
Terrestrial plants (weeds)	1249.5	no info
Terrestrial invertebrates (pests)	1389.3	29.9
Terrestrial vertebrates	1054.2	no info
Freshwater invertebrates	2.2	no info
Fungi / bacteria	1785.0	no info
Pests non-specified for taxa	no info	no info

<sup>18</sup> The IUCN Red List of Threatened Species (2006) indicates that 1911 species out of ~ 16000 are under threat from or have been impacted by at least one IAS-related threat type i.e. predation, competition/herbivory, impact on habitat, hybridisation and health risk to native species. Between 11 – 12 per cent (222) of these species occur in the European region.

<sup>19</sup> In the Azores, Madeira and the Canaries, which are EU Outermost Regions, introduced rats and cats predate on ground nesting birds, rabbits and goats prevent the natural regeneration of the native vegetation and exotic plants out compete and eventually dominate endemic species. For example, the ginger lily *Hedychium gardenerianum*, first introduced as a garden plant in 1934, has undergone a phase of rapid colonisation and is now widespread. On Madeira, it is invading the laurel forests where it smothers other native plants and also prevents the forest from regenerating naturally. Eradication is highly labour intensive and has to be done by hand with the support of local farmers (source : *Natura 2000 in the Macaronesian Region* (EC 2009), [http://ec.europa.eu/environment/nature/info/pubs/paper\\_en.htm#natura2000](http://ec.europa.eu/environment/nature/info/pubs/paper_en.htm#natura2000)).

<sup>20</sup> e.g. food, fibre and water supply; regulation of water, fire and flood regimes; maintenance of climatic conditions and air quality; erosion control; provision of natural buffers to increase resilience to natural hazards and disease outbreaks.

<sup>21</sup> Nearly a quarter of the 125 IAS assessed functioned as vectors for diseases and parasites or caused allergies and asthma.

<sup>22</sup> E.g. in Scotland, the salmon fluke *Gyrodactylus salaris* is estimated to cause nearly 65 million EUR / year in lost income to households and loss of full time employment.

<b>Total</b>	<b>5510.1</b>	
<b>Fisheries / aquaculture</b>		
Freshwater invertebrates	192.6	no info
Freshwater vertebrate	0.032	no info
Marine invertebrates	27.7	no info
Marine plants	19.0	no info
Terrestrial vertebrate	2.1	no info
Fungi / bacteria	0.2	no info
<b>Total</b>	<b>241.6</b>	
<b>Forestry</b>		
Terrestrial plants (weeds)	no info	25.4
Terrestrial invertebrate	no info	0.4
Terrestrial vertebrate	1.1	no info
Fungi / bacteria	123.8	no info
	<b>150.7</b>	
<b>Health*</b>		
Terrestrial invertebrates	22.5	1.7
Terrestrial plants	39.6	11.4
Freshwater plant	7.4	no info
<b>Total</b>	<b>82.5</b>	
<b>TOTAL (million EUR / year)</b>	<b>5985.0</b>	

\* Costs of epidemic animal and human diseases excluded,

These figures are considered to be a significant under-estimate of real impacts of IAS in Europe for the following reasons:

- the impacts of only about 10 per cent of invasive species in Europe are known to ecologists and economists (Vilà et al. 2009);
- monetary estimates for the cost of species extinctions and loss of biodiversity are not commonly available;
- far more IAS have socio-economic impacts (by affecting ecosystem services) than are documented in monetary terms<sup>23</sup>;
- data are inadequate for certain regions (east and south-east Europe) and for some large taxonomic groups (plants, invertebrates and marine taxa);
- economic impact data are only available for a third of the species studied and for a limited range of taxonomic groups (terrestrial plants and vertebrates in the EU);
- such data are inadequate/non-existent for key sectors known to be affected by IAS, such as forestry, fisheries, tourism and infrastructure/utilities.

The study found evidence that costs and benefits related to actions taken to reduce IAS risks are unevenly distributed. The costs of intervention (control and clean up costs) are often met from the public budget, whereas the benefits of avoided damage are often private (see 3.3).

Based on the Task 1 findings, it can be concluded that IAS already have significant negative impacts in Europe and are a cross-sectoral and crossborder issue affecting its continental and insular territory. Existing data provide only a partial picture of current impact levels, which

<sup>23</sup> The DAISIE project identified 1347 species with documented economic impacts in Europe (Vilà et al. 2009).

are likely to increase with globalisation, increased rates of introduction and environmental pressures including climate change (see Figures 1.1 and 1.2. above).

Given the level of current and predicted risks associated with IAS (e.g. negative impacts on several ecosystem services), there is a strong economic case for strengthening the policy framework to address IAS impacts across the EU because the future costs of policy inaction are likely to be significant. In addition, it will be important to spread the costs and benefits of prevention and management actions more evenly.

### **3 TASK 2: SCOPING CURRENT PRACTICE AND FUTURE POLICY OPTIONS**

#### **3.1 Specific objectives**

The second research task (Task 2) focused on **assessing policy options to control the negative impacts of IAS on biodiversity in Europe and the EU** (Shine et al. 2008). It consolidated information on IAS practice at international, Community and Member State levels and discussed a range of tools that could be combined in various ways within the future EU Strategy on IAS.

The main objective of Task 2 was to identify policy measures and packages available to the Commission to minimise IAS damage to European biodiversity in an efficient and cost-effective manner and to provide preliminary insights on the feasibility of different approaches in the EU context.

#### **3.2 Methodology**

Work carried out under Task 2 builds on an earlier study commissioned by the EU<sup>24</sup> which reviewed IAS policy frameworks at EC and Member State level, identified weaknesses and inconsistencies and made preliminary recommendations for action.

A comprehensive picture of current IAS practice was compiled, based on updated reports from 26 out of 27 Member States, targeted contact with selected non-EU jurisdictions and evaluation of policy developments at Community level. The information obtained was synthesised to identify key trends, lessons learnt and ongoing constraints that will require particular attention in the future EU Strategy on IAS. The annexes to the Task 2 report provide a full data trail, including an overview of IAS frameworks in selected complex jurisdictions (Australia, Canada, United States).

Using this baseline information, the Task 2 report identified and compared concrete measures for prevention, early detection and rapid response, long-term control and management,

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<sup>24</sup> Miller, C., Kettunen, M. & Shine, C. (2006) Scope Options for EU Action on Invasive Alien Species (IAS). Final report for the European Commission. Institute for European Environmental Policy (contract ref: ENV.B.2/SER/2005/0078r).

ecosystem restoration and cross-cutting and horizontal measures. For each category of measure, the analytical framework covered:

- the problem to be addressed;
- current practice;
- the rationale for Community action;
- the gradient of possible measures from least to most formal, giving indicators on the action level, scope and possible administrative/resource implications.

This catalogue of measures was subsequently used to collect and screen information on costs and benefits of concrete IAS policy actions for Task 3 (see Chapter 4 below).

The report concluded by identifying a shortlist of policy ‘packages’ for further consideration at Community level.

### **3.3 Key findings**

IAS have risen rapidly up the global policy agenda in the last eight years. Many organisations and different stakeholder groups are contributing to cooperative efforts to strengthen prevention, management and awareness-building programmes.

#### International and regional level

Recent policy developments strongly support:

- closer coordination between competent sectoral authorities and organisations (e.g. veterinary, phytosanitary, agriculture, forestry, fisheries, environment and transport);
- inter-sectoral planning, economic valuation and integrated policy and legal frameworks;
- targeted measures to address pathway risks not covered by the existing regulatory framework (e.g. ornamental, landscape and aquatic plants; pets, aquarium/terrarium species, live bait and food; transport and development assistance);
- improved science-based tools and capacity-building to address IAS threats, including early warning systems, species alert lists and taxonomic identification support for customs and quarantine services at national and regional levels; and
- increased biogeographic cooperation.

#### Community level

A growing number of Community instruments and policies address aspects of the IAS problem (see Table 4.1 in Chapter 4.2 below)<sup>25</sup> but some significant gaps remain:

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<sup>25</sup> e.g. in the areas of plant and animal health, aquaculture, wildlife trade, under the birds, habitats, water framework, marine strategy framework and other Directives and indirectly through policy instruments on e.g. forestry and renewable energy.

- existing procedures, capacity and funding, at the EU's external borders and within Community territory, focus on preventing entry and spread of plant pests ('harmful organisms') and animal diseases and pathogens;
- the only explicit requirement to screen entering commodities for invasiveness risks to biodiversity is for aquaculture (Regulation 708/2007);
- no EU mechanisms are in place to coordinate prevention, rapid response and management efforts for newly-detected species affecting biodiversity and for crossborder IAS threats;
- existing legislation does not address the higher vulnerability to invasion of many European islands;
- EU environmental liability and criminal environmental legislation do not apply clearly to damaging activities related to IAS.

The EU provides some funding for IAS control through earmarked environmental funds (LIFE programme<sup>26</sup>) and potentially through other financial mechanisms (e.g. European Agricultural Fund for Rural Development<sup>27</sup>, European Regional Development Fund). However, IAS considerations are poorly integrated in EU programmes funded with the major budget lines (Scalera 2008) and opportunities to leverage existing funds are not optimised.

No EU funding is available to support rapid response even though this is recognised as the most cost-effective type of IAS intervention. Specifically, there is no equivalent to the Community co-financing regimes for plant and animal health, based on the principle of solidarity, which support expenditure on inspection infrastructure, rapid eradication and containment to reduce costs associated with disease spread and minimise barriers to trade between Member States.

The EU has supported substantial research investments<sup>28</sup> to improve the IAS knowledge base (e.g. DAISIE), risk analysis methodology and decision support schemes (e.g. ALARM, IMPASSE, PRATIQUE).

Lastly, IAS have very low visibility in Europe. A scoping study carried out for the EU Biodiversity Communication Campaign 2008-2010 found that only 2 per cent of general public respondents thought that IAS were an important threat to biodiversity<sup>29</sup>.

### Member State level

The updated analysis revealed significant progress in many Member States. By late 2008:

- 13/27 Member States had adopted or were developing dedicated IAS Strategies/Action Plans<sup>30</sup>;

<sup>26</sup> Total expenditure was 44 million EUR between 1992-2006 (188 projects). This averaged a rate of 12 IAS-related projects each year at an average cost of 230,000 EUR each (Scalera 2008).

<sup>27</sup> At least three Member States make use of EAFRD funds for IAS control. However, such funds may also be used to subsidise activities presenting IAS risks e.g. plantation of invasive tree species in forestry or invasive plants for bioenergy.

<sup>28</sup> 90 IAS-related projects were funded between 1996-2006 under Framework Programmes 4, 5 and 6 at a total cost of €88 million (Scalera 2008).

<sup>29</sup> C.f. pollution (27%), manmade disasters (27%), climate change (19%), intensive agriculture (13%) and land use/development (8%). See Scoping Study for an EU wide Communications Campaign on Biodiversity and Nature (Gellis Communications: Final report to the Commission/DG ENV Contract 07-0307/2007/474126/MAR/A1, March 2008).

<sup>30</sup> Approved or pending approval in Austria, Denmark, Lithuania, Netherlands, Spain, Sweden and United Kingdom; under development in Bulgaria, Finland, Hungary, Ireland, Malta and Slovenia.

- 20/27 Member States had some import/export provisions in place (in some cases, these had been considerably extended);
- 19/27 Member States had provisions to regulate national or subnational possession/trade (again, some countries had enlarged the scope of existing measures);
- 26/27 Member States regulated some introductions of species into the wild but the scope of measures remained uneven (e.g. species coverage, sectoral exemptions);
- 23/27 Member States had a legal basis to control/eradicate some IAS (variable scope) but capacity to measure impacts and prioritise interventions (by species, area, feasibility) was often limited;
- administrative roles and responsibilities were often unclear: together with funding and technical constraints, this hampered efficient contingency and management planning, increasing costs in the longer term;
- the information baseline (species inventories) had been expanded in many countries but is not always interoperable (outside the NOBANIS framework); and
- capacity to address unintentional introductions remained generally low (only France and Spain have so far ratified the IMO Ballast Water Management Convention).

The emerging trend towards national/subnational regulation of IAS trade and movement has obvious implications for the operation of the Single Market. Since previous audits<sup>31</sup>, the Community has not - except for aquaculture – directly addressed IAS risks associated with holding and trade<sup>32</sup> or adopted common criteria to guide national risk assessments. Stakeholder consultations highlighted widespread uncertainty about how far a Member State may legislate to protect biodiversity against risks linked to trade/movement of known high-risk species, particularly because relevant European Court of Justice caselaw is also limited<sup>33</sup>.

Evidence was found of the following variations in Member State practice:

- a few Member States were investing in risk assessment capacity to provide scientific justification for national measures and/or to prioritise management interventions;
- some Member States had adopted measures with less robust scientific backing;
- some other Member States had decided not to adopt any trade/movement measures pending clarification of the legal position at Community level;
- in several cases, trade in known high-risk species was banned in one country/subnational unit and freely permitted in neighbouring units<sup>34</sup>;
- IAS risk assessments were not usually coordinated with other national systems or easily replicable;
- available scientific protocols were not well developed and staff training was needed in the practical application of risk analysis procedures.

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<sup>31</sup> *Thematic Report on Alien Invasive Species* (2003). 2<sup>nd</sup> EC Report to the CBD Conference of the Parties; Miller et al. 2006.

<sup>32</sup> E.g. no invasive alien plants are listed for regulation under the plant health Directive 2000/29/EC.

<sup>33</sup> National measures potentially affecting free movement of goods could 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. Several Member States indicated that the small number of case-specific judgments to date (see Task 2 report, Annex 2) does not provide an adequate level of certainty for development of national measures to secure a higher level of biodiversity protection.

<sup>34</sup> e.g. within Spain, the Autonomous Community of Valencia has banned the sale of the invasive water hyacinth but no equivalent measure is in place in adjacent units. Trade in grey squirrels is prohibited in France and Switzerland but authorised in Italy (although its release into nature is prohibited); however, the Lombardia region in Italy is considering possible development of a subnational trade ban.

## General findings

The research identified awareness-building as critical to cost-effective action on IAS and found that voluntary measures (e.g. information campaigns, industry-led accreditation/certification schemes) tended to be most advanced in the countries that were also developing robust IAS policy frameworks. In several cases, strong codes of conduct were found to play a catalyst role in strengthening IAS regulatory regimes<sup>35</sup>.

A strong knowledge base (access to updated information and specialist expertise) was considered essential to underpin efficient and scientifically-justified decision-making. To address this, the European Environment Agency recently commissioned a feasibility study on a future EU-wide early warning and information system. The findings<sup>36</sup> of the preliminary report on the possible cost of early warning and rapid response systems<sup>36</sup> were considered in Task 3 of this study (see Chapter 4).

Existing IAS policies were found to focus mainly on single species management rather than maintenance and restoration of ecosystem services and biodiversity to secure longer-term returns on investment. Most had been developed in isolation at local/national level except for a few 'flagship' species recognised as bilaterally or regionally problematic.

IAS governance (through systematic cross-sectoral coordination to balance diverse interests) has received considerable attention but was found to be under-developed at the level of the EU and many Member States. The dominant pattern is still of low operational coordination between environment departments responsible for biodiversity-related risks and the quarantine and primary production sectors (e.g. agriculture, forestry, fisheries/aquaculture,) which have higher resources and assessment capacity. Mechanisms to address conflicts of interest (e.g. for culling of feral animals) are also patchy or inefficient.

The current distribution of costs and benefits of IAS action is extremely uneven. Most IAS damage/control costs are met by authorities/companies responsible for e.g. water and utilities services, transport infrastructure, public health services and land/resource management. The beneficiaries of activities providing pathways for IAS introduction/spread often 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).

The same imbalance is also reflected at the cross-border level. In the absence of EU leverage for IAS policy coordination, management investments by one Member State can easily be undermined by inaction in a neighbouring country.

The Task 2 analysis concluded that although IAS policies and legislation are in place in some Member States and in selected areas at Community level, these do not adequately protect EU biodiversity against existing and future invasion risks. Action is needed at Community level

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<sup>35</sup> e.g. the ICES Code of Practice on the Introductions and Transfers of Marine Organisms (reissued in 2005) directly influenced the EU aquaculture Regulation and the IMO's voluntary standards and Globallast Programme led to the adoption of the IMO Ballast Water Management Convention. Several Member States have contributed to the 2008 pan-European Code of Conduct on Horticulture and Invasive Alien Plants, developed by the European and Mediterranean Plant Protection Organization and the Council of Europe to address a pathway currently unregulated at EU level.

<sup>36</sup> See Genovesi, P., Scalera, R., Solarz, W. and Roy, D. 2009. *Towards an early warning and information system for invasive alien species threatening biodiversity in Europe*. Extensive Executive Summary of report prepared under Contract No.3606/B2008/EEA.53386 for the European Environment Agency, May 2009.



to address crossborder issues (river and sea basins, biogeographic regions), solidarity and key sectors that are closely integrated at EU level through the single market and common policies.

The insights and recommendations developed through the Task 2 report are reflected in the four Policy Options set out in the Communication (see 4.2 below).

## **4 TASK 3: ASSESSING COSTS AND BENEFITS OF POLICY OPTIONS**

### **4.1 Specific objectives**

The third research task (Task 3) focused on **analysing the impacts of policy options/measures to address IAS in the EU** (Shine et al. 2009). It responded directly to the Communication “Towards an EU Strategy on Invasive Species” (COM (2008) 789) which sets out the rationale for EU action on IAS and presents four possible Policy Options for further consideration.

The main objective of Task 3 was to gather as much data as possible on the costs and benefits of different IAS policy measures and actions in order to create a solid foundation of evidence and insights to help evaluate and compare the four different Policy Options.

### **4.2 Component measures of the Policy Options in the Communication**

The Communication outlines four Policy Options of increasing intensity, ranging from no change to a package involving new legislation:

- ***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+: Amending 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 instrument**

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.

Table 4.1 summarises the baseline scenario (Option A) based on existing Community instruments and policies<sup>37</sup>. Table 4.2 presents a synthesis table for Options B, B+ and C, based on the study team’s interpretation of the Communication, setting out possible component measures for each Option following an increasing gradient of ambition.

**Table 4.1 Option A: Baseline scenario (i.e. the existing Community framework)**

<b>Option A: Baseline scenario</b> <i>Business as usual - continuation with the ongoing implementation of existing instruments</i>	
<b>Instrument</b>	<b>Current scope and relevance</b>
Plant Health Directive (2000/29/EC)	Community-wide framework for prevention and control of specified ‘harmful organisms’ threatening plant health. No invasive alien plants (e.g. invasive plants with negative impacts on biodiversity) listed.
Animal health instruments	Set of Community instruments for prevention/control of terrestrial and aquatic animal diseases. Not applied to invasive animals that may impact native biodiversity.
Aquaculture Regulation (708/2007)	Only EC instrument exclusively focused on preventing intentional introductions of alien and locally absent species damaging to biodiversity. Distinguishes between introduction to open and closed facilities. MS are responsible for risk assessment and management based on standardised criteria in Annex (except for a list of exempted species) but Commission has decision-making power for introductions that could affect neighbouring MS. Supports precautionary principle through pilot release, contingency planning and monitoring measures. Caters for biogeographic variation. Does not affect application of existing EC plant/animal health legislation. Not applicable to keeping of ornamental aquatic animals/plants in pet-shops, garden centres, contained garden ponds or aquaria.
Wildlife Trade Regulation (338/97)	Legal basis to regulate intentional introduction into the Community of ‘ecological threat’ species and, as optional complement, their intra-Community holding/movement. Import of 4 invasive animal species currently prohibited.
Habitats and Birds	Require MS to regulate intentional introductions to wild of non-native species

<sup>37</sup> Detailed analysis of all relevant instruments is provided in the Task 2 report and its annex 2 (see Shine et al. 2008).

Directives	that could damage biodiversity. MS have full discretion on scope of controls. Indirect management obligation for IAS affecting Natura 2000 sites. No explicit control rules.
Water Framework Directive (2000/60/EC)	No specific reference but IAS (taxonomic composition) could be considered when assessing ecological status of a water body. IAS monitoring covered in some guidance documents under Directive.
Marine Strategy Framework Directive (2008/56/EC)	IAS included in criteria for assessment of European marine waters to identify measures to achieve good environmental status.
Communication on an EU Forest Action Plan (COM(2006) 302 final)	Notes that global trade and climate change have increased potential vectors for harmful organisms and IAS and supports protection strategies, targeted risk assessments and research for harmful organisms/IAS affecting forest biodiversity.
EU Research Framework Programmes	IAS-related programmes qualify for funding. Major FP projects include DAISIE, ALARM, PRATIQUE, IMPASSE and EFFORTS.
LIFE+ Regulation (614/2007)	IAS control projects eligible under Nature & Biodiversity component (potentially under Information & Communication component). Used for control funding, notably on islands. Not adapted to prevention/rapid response.
Other funding mechanisms (eg EAFRD, structural and cohesion funds, development cooperation)	Could be used to address IAS but no earmarked IAS funding (although EAFRD includes IAS control in the requirements to keep land in Good Agricultural and Environmental Condition as part of cross-compliance). Limited examples of national/regional application for IAS (mainly control).

**Table 4.2 Indicative content of Options B, B+ and C, showing gradient of intensity**

Policy measure	Option B	Option B+	Option C
Baseline (legislation, policy)	Unchanged	Limited change	Major change
Coordination mechanism (EU/MS)	Voluntary/informal	Existing committees Existing system of national focal points	Dedicated agency Dedicated network of IAS focal points
National strategic/action planning	Voluntary	Voluntary	Mandatory
<b>Prevention (in addition to existing baseline requirements under EC law)</b>			
Voluntary prevention measures	Encouraged	Encouraged	Possible EU support
Controls on introductions into the environment	Discretionary	No/limited change	Possible major change
Controls on introduction into captivity/containment	Discretionary	No/limited change	Possible major change
Controls on domestic holding, trade and movement	Discretionary	Coverage extended	Possible major change
Import pathway controls	Discretionary	Coverage extended	Comprehensive
Export pathway controls	Discretionary	Possibility of extension	Extended
Border controls and inspections (airports, seaports, other)	Discretionary	Coverage extended (greater range of organisms)	Comprehensive (pathway focus)
Cooperation with non-EU countries	Discretionary	Coverage extended	Formalised
Risk assessment procedures	Discretionary (based on existing)	Coverage extended (based on existing)	Independent procedure, technical support & verification
Integration of IAS into EIA	Discretionary	Encouraged	Mandatory
<b>Early detection and rapid response: creation of Early Warning and Information Exchange System</b>			
Maintenance/interlinkage of inventories and databases	Voluntary	Voluntary	Mandatory
Surveillance and monitoring	Voluntary	Coverage extended	Mandatory
Information exchange	Voluntary	Coverage extended	Mandatory
Contingency planning	Voluntary	Coverage extended	Mandatory

Rapid response mechanisms	Voluntary	Coverage extended	Mandatory
Emergency funding	No	Existing co-financing	New co-financing
<b>Long-term control and containment</b>			
Species action plans/ guidance	Voluntary	Voluntary	Coordinated for certain categories
Control/containment (plants)	Voluntary	Coverage extended	Mandatory for certain categories
Control/containment (animals)	Voluntary <sup>38</sup>	Only if significant change to animal health legislation	Mandatory for certain categories
Funding for control	No <sup>39</sup>	Existing co-financing	New/coordinated co-financing
Restoration	Voluntary	Voluntary	Integrated
<b>Associated horizontal measures</b>			
Communication and awareness	Voluntary	Voluntary	EC backing
Research programmes	Existing	Coverage extended	Coordinated with strategic priorities
EU funding instruments	Discretionary	Guidance on coverage of IAS under existing instruments	New (co-financing for priority threats)
EU development cooperation funds	Discretionary	Discretionary	Integrated
Capacity-building and infrastructure	Discretionary	Medium demand to implement legislative adjustments	High demand to implement new framework

### 4.3 Methodology

The assessment of costs and benefits of different Policy Options was prepared in three stages.

The first step was to collect information on the costs and benefits of IAS policy measures identified through Task 2 and stakeholder consultations. Raw data was entered in a detailed annex, following the order of measures in Table 4.2 above, to provide a transparent data trail and full evidence base. The widely varying data was then screened to select examples to illustrate the range of possible costs identified (i.e. what a given investment can actually deliver in terms of actions). Some insights on costs from parallel sectors (e.g. disease control, natural hazard management) were used to help address information gaps.

The second step was to develop a detailed assessment of the possible costs, benefits and other impacts of Options B, B+ and C over baseline (Option A). Building on the study team's interpretation of the raw data, indicative cost figures were assigned to component measures for each Option, based on likely intensity (low, medium or high level ambition). These were complemented by qualitative analysis of other impacts, particularly for measures where few monetary data were available.

The third step was to compare the four Options, using two complementary approaches to provide the fullest possible analysis:

- a general comparison of environmental, economic, social and other impacts, using criteria based on formal guidance for impact assessment developed by the European Commission<sup>40</sup> and supported by evidence compiled through the study;

<sup>38</sup> For animals that affect plant health, mandatory control possible under plant health legislation.

<sup>39</sup> Partly through solidarity funds, e.g. pinewood nematode.

- species-specific examples to compare the predicted impacts and effectiveness of each Option in addressing IAS threats. The species were selected for their relevance to the IAS issue in Europe as well as the availability of Task 1 data on damage/control costs and current spread in the EU (Kettunen et al. 2009).

#### 4.4 Key findings on costs and benefits of IAS measures

A wide range of examples of costs was obtained, both for administrative systems and for individual measures to address IAS risks. The main insights are highlighted in the summary below, backed by selected examples. The Task 3 report provides a detailed breakdown of indicative costs per measure and per Policy Option.

In contrast, little measure-specific data was found on benefits because these are more usually presented in broad terms of ‘impacts avoided’ (damage foregone/risks averted). Whilst it is relatively easy to identify who pays the cost of IAS action (even if costs are not equitably shared), the beneficiaries of such action tend to be more diffuse (i.e. they may span public and private interests, be located in several Member States, encompass future generations etc.). For this reason, evidence on benefits is mainly expressed in terms of avoided damage/control costs, using Task 1 data.

Evidence on the costs and benefits of IAS measures obtained for Task 3 suggests that:

- costs of measures to prevent or minimise IAS damage to biodiversity remain low on a per capita basis and are significantly less than many investment-heavy directives developed at EU level. Real or estimated costs identified for IAS prevention/monitoring/response systems encompass measures of varying scope but suggest a notional range of less than 1 EUR / person / year to around 7 EUR / person / year at a high level of ambition<sup>41</sup>;
- even at the top end of the identified range, the cost of measures to prevent the arrival of new IAS is significantly less than the current negative impacts of IAS expressed in monetary terms. For administrative systems, a simplified conservative assessment based on a high ambition framework suggests that costs of policy action could amount to between 14 - 27 per cent of the current estimated costs arising from IAS damage/control (see Box 4.3 below). The real cost-benefit ratio is likely to be even more favourable once a fuller picture of current impact levels (e.g. to key economic sectors and infrastructure providers) becomes available;
- if the predicted exponential growth in the rate of IAS introductions is taken into account, policy action now to reduce the risk of higher impacts in the future is likely to provide an even better return on investment (i.e. delivery of increased benefits in terms of damage/control costs avoided);

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<sup>40</sup> European Commission’s Impact Assessment Guidelines (EC, 2009a); Annex to the European Commission Impact Assessment Guidelines (EC, 2009b).

<sup>41</sup> Estimated per capita figures based on system costs provided by the United Kingdom, United States and Sweden (see Task 3 report, section 5.1.2).

- at species level, preventive action (i.e. screening, early detection, contingency planning and rapid eradication) also costs less across all taxonomic groups than delayed action (i.e. the costs that society will continue to face if nothing is done or too little is done too late). Existing estimates of cost-benefit ratios for species-specific measures included the following estimates: 0.27 per cent<sup>42</sup>; around 1 per cent<sup>43</sup>; 3.66 per cent<sup>44</sup>;
- ongoing management costs for established widespread species can be massively high for economic operators or public authorities (e.g. scaled-up area clearance costs for Japanese knotweed can reach 187,000 EUR/ha for development land (UK); annual management costs for one invasive aquatic plant estimated at 3 million EUR / year (Netherlands));
- voluntary prevention initiatives are relatively low-cost but for maximum effect these need to be supported by investment in professional communication and dissemination;
- substantial economies of scale (and thus cost savings) can be obtained by regional sharing of information, alerts, techniques/equipment, expertise and communication materials; and
- cost-recovery mechanisms to contribute to increased biosecurity system costs are being developed or considered in several jurisdictions around the world. Depending on the design, these can be levied on traded commodities and/or entering vectors<sup>45</sup>.

#### **Box 4.3 Comparing benefits and costs of IAS policies, using the example of Sweden**

Documented damage costs to the EU and Europe are at least 12 billion EUR/year (Kettunen et al. 2009 as referenced in the Communication (COM(2008) 789)).

If these total costs are divided by EU-27, the notional estimated cost of IAS impacts per Member State at present could be around 470 million EUR/year (ignoring differences in size of country). If this total is divided by all countries in Europe (i.e. by 50), the notional estimated cost of IAS impacts per country would be around 250 million EUR/year. This very simplified calculation produces an estimated IAS impact range of 250-470 million EUR/year per country at present.

This impact range can be compared to the cost range for prevention, monitoring and control evaluated for one Member State (Sweden) during preparation of its national IAS Strategy. Based on a gradient of ambition, the cost figures developed for Sweden were as follows:

- Low ambition: 1.6 – 2.45 million EUR / year (e.g. including the costs of a national secretariat, a national IAS monitoring system, risk analysis and prevention/early eradication/control measures for five species introduced but not yet established in the country);
- Medium ambition: 10.3 – 11.1 million EUR / year (as above, with additional budget devoted to research and risk analysis as well as control measures for five species already established in the country);
- High ambition: 67.1-67.9 million EUR / year (as above, with additional budget for risk analysis and control measures for five additional species already established in the country).

<sup>42</sup> Pinewood nematode (*Bursaphelenchus xylophilus*): cost of preventing entry 0.13 million EUR per year, probable costs if became established in Sweden 47.25 million EUR per year.

<sup>43</sup> Cost of one-off rapid eradication of black-striped mussel *Mytilopsis sallei* in three Australian marinas: about 1.6 million EUR at 2009 rates c.f. cost of predicted impacts if it became established 167.3 million EUR/year at 2009 rates (ongoing costs of removal from vessels, outlet pipes and other structures and colonisation impacts on the local pearling industry).

<sup>44</sup> Raccoon dog (*Nyctereutes procyonoide*): cost of preventing entry per year 0.1 million EUR per year; probable costs if became established in Sweden 2.73 million EUR.

<sup>45</sup> Experience to date suggests that these are more likely to be perceived as proportionate by affected stakeholders if the charging structure is tailored to the level of threat associated with a particular pathway or vector.

Based on the 'high ambition' level of investment and the lowest IAS impact figure, costs of IAS action would amount to around 27 per cent of benefits (estimated 67.9 million EUR / year costs incurred vs. 250 million EUR / year benefits in terms of costs avoided).

If that IAS impact figure were adjusted to the level of one Member State, costs of IAS action would amount to around 14 per cent of benefits (estimated 67.9 million EUR / year costs incurred vs. 470 million EUR / year benefits in terms of costs avoided).

As noted in 2.3 above, the impact figure of 12 billion EUR/year is accepted as a gross underestimate. This suggests that as more information on IAS impacts becomes available, the cost-benefit ratio in favour of robust prevention is likely to be more favourable (e.g. if the baseline impact figure were increased to 20 billion EUR/year (probably still conservative), the impact per Member State would be 740 million EUR/year (20 billion/27 Member States) and 400 million EUR/year per European country (20 billion/50 European countries).

**Points for further consideration:**

Without more detailed analysis (e.g. development of specific extrapolation methods), it is not possible to quantify future developments in the ratio of costs of action to benefits of action (i.e. avoided IAS costs). However, it appears likely that a high ambition framework would go furthest to decrease IAS risks and that, over time, administrative costs could be gradually reduced:

- evidence from e.g. Sweden and the United Kingdom suggests that investment in management of established IAS can be reduced from a first phase of intensive control to maintenance/monitoring at lower levels;
- costs of setting up a new institutional structure (e.g. an IAS secretariat or monitoring system) are usually higher than ongoing maintenance and running costs, although no specific data on this was available;
- economies of scale available through regionally coordinated approaches and information resources could reduce duplication and reduce the overall cost and administrative burden over time.

At the species-specific level, four detailed estimates developed on the basis of existing information and extrapolated over species' current European ranges (see Task 3 by Shine at al. 2009 for calculations) also indicate that the possible costs of policy inaction at the European level would be significantly higher than the potential costs of preventive action:

- common ragweed (*Ambrosia artemisiifolia*) is known to be a highly allergenic species and several examples of its negative impacts on human health in Europe already exist. If this plant were to spread even more densely and start causing allergies throughout its current European range, human health-related costs could exceed 80 million EUR / year. This is around 20 times higher than the estimated costs of implementing preventive measures across the currently non-infested parts of the EU (i.e. coordinating national campaigns, organising an annual awareness-raising event);
- the cost of damage by muskrat (*Ondatra zibethicus*) throughout its current range could amount to up to 250 million EUR / year (e.g. costs of damage to river banks and dams, damage to aquaculture) whereas the estimated costs of control and eradication would be less than 30 million EUR / year for the same area;
- the cost of damage by grey squirrel (*Sciurus carolinensis*) to timber production could be around eleven times higher than the costs of control (11 million vs. 1 million EUR / year);
- the damage to hydropower plants caused by water hyacinth (*Eichhornia crassipes*) could be nearly double the cost of control (33 million vs. 18 million EUR / year). In 2005-2008,

this species cost over 14 million EUR to control along a 75 km stretch of the Guadiana river, Spain (about 1.8 million EUR / year / km<sup>2</sup>)<sup>46</sup>.

Task 3 also identified possible economic benefits arising from more robust IAS policies, in the form of business and employment opportunities linked to development of new markets and technical innovation (e.g. pest control techniques, substitution policies, uses based on alternative non-invasive species, treatment technologies: see Box 4.4). Reputable industry certification/accreditation schemes could provide opportunities for positive branding of participating businesses, which could enjoy a competitive advantage as public awareness and concern grows in respect of IAS risks. Demonstration of high standards of industry practice could also ensure that restrictions potentially impacting on trade and production patterns are kept to the minimum and are only adopted if proportionate to the risks identified<sup>47</sup>.

#### **Box 4.4 Opportunities linked to IAS prevention: the example of ballast water treatment**

A recent report (WWF, July 2009) estimates the global figure for direct economic loss to society for damage caused by marine invasive species at around US\$ 7 billion per year. Given that international shipping transports around ten billion tonnes of ballast water each year, the WWF estimate calculates the cost per tonne of untreated ballast water as equivalent to about 70 US cents.

The report indicates that up to 80 manufacturing firms, water treatment companies and maritime businesses have undertaken research and development of ballast water treatment technologies since 2000 with the support of some shipping and shipbuilding companies around the world. Twenty treatment systems are currently undergoing the Convention's approval process. If approved, a treatment system may be placed on the market.

The estimated cost of equipping a new ship with treatment technology may be up to 40% cheaper than retrofitting that ship with the same technology later in its life cycle. This provides an economic incentive for ship owners to ensure that new ships are fitted with technology even before this becomes mandatory when the Ballast Water Management Convention enters into force. The WWF report suggests that a wider roll-out of water treatment methods facilitated by the entry into force of the Convention could lower costs to only 4 US cents per tonne of treated water - less than 6% of the annual costs of not addressing the issue of the damaging spread of marine pests.

Source: WWF (2009) Silent Invasion – The spread of marine invasive species via ships' ballast water.

## **4.5 Comparison of the Policy Options**

The four Options presented in the Communication are:

- Option A (Business as usual)
- Option B (Maximising use of existing approaches and voluntary measures)
- Option B+ (Amending existing legislation)
- Option C (Comprehensive dedicated EU legal instrument)

<sup>46</sup> Equivalent to 0.2 km<sup>2</sup> (EPPO. 2008. Pest Risk Analysis for Water Hyacinth (*Eichhornia crassipes*) in Spain; Téllez et al. 2008. The Water Hyacinth, *Eichhornia crassipes*: an invasive plant in the Guadiana River Basin (Spain). Aquatic Invasions (2008) Volume 3, Issue 1: 42-53).

<sup>47</sup> Duan, H. 2009. Healthy Business Practices to Prevent Invasive Alien Species. In Business.2010. Volume 4-Issue 1 (June 2009). Secretariat of the Convention on Biological Diversity ([www.cbd.int/business/newsletter.html](http://www.cbd.int/business/newsletter.html)).



The following section briefly summarises the detailed comparison of their environmental, economic, social and other impacts presented in the Task 3 report.

#### Option A (Business as usual)

Option A involves no new legislative or administrative actions or costs. However, it is not cost-neutral because current impact levels would continue and further increase over time. Production sectors would continue to suffer from reduced productivity and impaired ecosystem services. Distribution of IAS impacts would remain uneven with infrastructure providers, other public authorities, landowners and individuals affected by rising damage and control costs.

#### Option B (Maximising use of existing approaches and voluntary measures)

Option B is a ‘high subsidiarity/low concrete action’ approach that gives maximum flexibility to Member States wishing to tackle IAS risks. It involves no new Community requirements but could support discretionary legislative change at national level. Member States would meet virtually all costs of IAS actions, which would be focused on local and national priorities. Social benefits could include enhanced public confidence and improved recreational experiences by informing and engaging target audiences.

Stakeholders would remain free to import, trade, cultivate, breed and release introduced species (subject to any existing restrictions). Existing collaborative trends towards voluntary IAS prevention at national and regional level could be actively encouraged. Such initiatives could usefully reduce demand for and use of potential IAS in some target sectors and might generate some employment opportunities. On the other hand, inaction or insufficient action could affect the longer-term competitiveness of some sectors through e.g. closure of markets to contaminated commodities.

Option B would not affect the plant/animal health Directives which already support border inspection, electronic reporting, control and co-financing systems throughout the Community, based on a biogeographic approach. The potential for the plant health sector to take more explicit measures to manage IAS that affect wild plants and ecosystems is already acknowledged outside the EU at the global level (International Plant Protection Convention (IPPC)) and regionally (EPPO non-binding recommendations and information tools for certain invasive alien plants). However, as noted in Task 2, equivalent measures have not been developed for application within the EU.

Use of existing institutions and procedures (e.g. European Food Safety Authority) for risk assessments would not be broad enough to cover all pathways and vectors (e.g. risk assessment, sampling and compliance control for ballast water requires very different expertise). Option B would also not address currently unregulated pathways e.g. the IAS-specific aquaculture Directive was developed and adopted precisely because the existing Community legislation was not considered strong enough to tackle this issue.

Option B is non-enforceable (outside existing legislative requirements). It could not secure prompt and consistent action to manage risks in a cost-effective way across the EU or within individual Member States, even with improved horizon-scanning through an early warning

system. The current pattern of rising impacts, differential levels of investment and unilateral regulations would probably continue, with the risk of higher costs to business associated with inconsistent approaches in different Member States.

It would be possible to promote informal Community coordination using an Open Method of Communication-type approach<sup>48</sup> and to use the results of EU-backed research programmes to streamline certain risk assessment procedures. However, Option B would lack the political backing or visibility to mainstream IAS within major Community policy areas and budget lines and could not provide the necessary leverage to tackle transboundary and large-scale threats.

#### Option B+ (Amending existing legislation)

In addition to measures under Option B, Option B+ would expand IAS coverage through adjustment of key regulatory instruments.

The Community plant health regime is currently undergoing major review (since 1 June 2009) to take account of international policy developments related to biosecurity. This could provide opportunities to address some IAS risks affecting biodiversity (e.g. current work under IPPC/EPPO includes development of risk assessment for deliberate introduction of plants). However, major adjustment would be needed to broaden the EU regime's operational focus (sanitary risks to primary production interests) to address threats to the non-managed environment and ecosystem services (including from alien plant genotypes) and to take account of predicted effects of climate change on the distribution of already-established species. In addition, plant health instruments are primarily focused on plant pests that are not yet widely distributed in an area i.e. they cease to apply once the plant pest has invaded.

Existing Community legislation does not address invasive animals that are not pests of plants or vectors for disease (e.g. wild birds that could carry avian flu) unless they are specifically listed as 'ecological threat species' under the Wildlife Trade Regulation. Radical change would be required to fill this gap through the Community animal health regime. The latter is currently being revised and streamlined but is likely to retain a disease focus consistent with global (OIE) standards<sup>49</sup>.

Amendments to the Wildlife Trade Regulation would provide an alternative route to address animals and plants potentially invasive in their own right (e.g. pets, terrarium and aquarium species). However, this instrument has a different focus (CITES implementation), does not support risk assessment and provides no machinery or financial support for rapid response and ongoing control. Its provisions only apply to intentional introductions and movement of species through trade so even if expanded, it would not address all pathways for introduction (e.g. non-parasitic animals entering the EU as hitchhikers).

Option B+ as outlined in the Communication only covers amendment of the above-mentioned

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<sup>48</sup> Ten Brink, P., Farmer, A., Wilkinson, D., von Homeyer, I; and Kranz, N. 2005. Explorations of options for the Implementation of the Open Method of Coordination for Environmental Policy: Final Report. Ecologic and Institute for European Environmental Policy, October 2005.

<sup>49</sup> The *Action Plan for the implementation of the EU's Animal Health Strategy* (COM(2008) 545 of 10 September 2008) proposes development of a single EU Animal Health law and reinforced border biosecurity by 2010 to "address the health of all animals in the EU kept for food, farming, sport, companionship, entertainment and in zoos; wild animals and animals used in research where there is a risk of them transmitting disease to other animals or to humans; and the health of animals transported to, from and within the EU".

instruments. This would not be enough to tackle all policy constraints identified in Task 2 or to address some key IAS pathways/vectors, including ballast water. To tackle a fuller range of pathway risks, higher investment would be needed in horizon scanning, expanded border control infrastructure and risk screening. A piecemeal programme of legislative amendments and gap filling could be as time-consuming and less understandable than the approach proposed under Option C.

Option B+ - like Option B – has the potential to reduce IAS in marine and freshwater ecosystems to the extent that aquatic IAS are addressed through the aquaculture Regulation or by individual Member States that have ratified the IMO Ballast Water Management Convention (not yet in force<sup>50</sup>). However, it does not have a strong management focus. As presented, it would not comprehensively address the IAS-climate change interface or provide a clear basis for mainstreaming IAS in programmes for European marine, freshwater or terrestrial ecosystems.

In terms of social benefits, Option B+ could increase confidence in food security but unless significantly broadened, might not address other types of social impacts e.g. on human health.

In terms of governance, Option B+ would require high-level political and institutional commitment to cross-sectoral coordination to tackle inefficiencies linked to fragmented IAS legislation at Community and Member State level. Without this, the Option would again lack the visibility and leverage to mainstream IAS within major Community policy areas and budget lines.

#### Option C (Comprehensive dedicated EU legal instrument)

Option C potentially offers the highest level of environmental benefits in terms of its capacity to protect biodiversity, increase ecosystem resilience and support adaptation to climate change. It could provide a legal basis to address all categories of IAS and support an integrated response to IAS threats in all natural systems, based on the biogeographic approach and maintenance of ecosystem services. Option C could also support stronger environmental integration measures to minimise the export of species presenting a high risk of invasiveness in destination countries as well as IAS risks associated with development cooperation and other outward pathways.

Option C (like Option B+) would entail costs to economic stakeholders to the extent that it introduced controls and assessment requirements for activities that are currently unregulated. Whilst these economic impacts would be higher under the Option C framework, Option C would also go furthest to contain IAS damage and control costs and make the biggest contribution to reducing future risks.

Option C could support more equitable sharing of IAS-related costs and benefits through co-financing of targeted measures to support more efficient intervention before IAS become widespread. Strengthening the information baseline and leverage for coordinated actions would make it easier to target restrictive measures and thus ensure greater proportionality.

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<sup>50</sup> Currently implemented through voluntary measures on ballast water exchange in place for the HELCOM/OSPAR region which are in line with the Convention standards: however, once it enters into force, ballast water treatment systems will be required to meet the stricter standard D-2.

The Option envisages that key functions might be carried out by a dedicated central agency if appropriate. Costs associated with any dedicated body would vary according to its design and mandate<sup>51</sup>. Core functions could include maintenance of the European IAS inventory (DAISIE database), operation of an early warning system linked to international and regional information systems, improved assessment of risks to biodiversity, coordination of rapid response measures and networking of focal points.

Option C has the highest immediate resource implications for the Community and Member States because it involves new legislation, training and capacity-building for relevant personnel and additional investment in border control and risk assessment. Much of the groundwork to identify legislative requirements has been completed, although the scope, mechanisms and procedures of a new instrument still have to be determined and would obviously affect its overall intensity and the distribution of impacts. Design issues would need to be addressed with relevant stakeholders, taking account of parallel processes under way in the Community plant and animal health regimes and working closely with those sectors.

Option C would offer much higher benefits for policy visibility, consistency and coordination. This could raise the profile of IAS as a European issue, make IAS policy more transparent and practicable and facilitate efficiency gains through better mainstreaming.

Lastly, Option C could also deliver a wider range of social benefits, including a stronger contribution to inter-generational equity by storing up fewer costs for future generations. The costs of policy action, based on any of the scenarios examined in Task 3 (see 4.4) would be a fraction of what Europe is already paying through inaction or could pay in the future.

## 5 CONCLUSIONS AND RECOMMENDATIONS

### **Box 5.1 Snapshot of IAS impacts and future risks in Europe, based on key findings of the study:**

- IAS affect human health and well-being, the environment and economic activities throughout Europe;
- total annual costs of IAS damage and/or control are currently estimated to be at least 12 billion EUR / year;
- out of this total, annual IAS costs identified for key sectors are estimated to be over 6 billion EUR / year;
- these figures are under-estimates as information on ecological and economic impacts is only available for about 10 percent of invasive species already in Europe (Vilà et al, 2009). Managing unknown risks is one of the biggest policy challenges associated with IAS;
- the costs of IAS control are unevenly distributed: they are rarely paid by those who contribute to IAS introductions or who benefit from measures to tackle the IAS problem;
- 11-12 per cent of globally threatened species occurring in the European region are already harmed by IAS;
- IAS have disproportionately high impacts on the biodiversity of European islands which often underpins local livelihoods and economies;
- IAS in Europe already damage ecosystem structure, function and services which are critical to current and future economic development and production processes;
- new species introductions are predicted to increase exponentially with expansion of global trade, travel and transport;

<sup>51</sup> A range of models and indicative costs is provided by the EEA feasibility study (see Genovesi et al. 2009) and summarised in the Task 3 report.

- climate change may alter distribution of established species, increase the spread of diseases and favour new or migrant harmful organisms which could adversely affect trade in animals, plants and their products.

## 5.1 Justification for action at Community level

Europe faces unique challenges when considering how to prevent and manage risks associated with invasive alien species (IAS). The EU already comprises 27 countries across a range of biogeographic zones and includes many biodiversity-rich islands in different oceanic regions. Few if any species are likely to be invasive throughout the EU but many IAS can have impacts across borders or in shared river basins or regional seas. Even locally invasive species can directly impact species and habitats of Community importance, economic development opportunities, livelihoods and human well-being.

This study shows that the IAS issue clearly passes the four tests required to justify action at Community level: the issue is significant, EU-wide, not adequately dealt with through existing legislation and purely national approaches are unlikely to offer a sufficient solution. A high-intensity response is justified for the following reasons:

- the gravity of the issue, even allowing for insufficient data, is evidenced through Task 1 (Kettunen et al. 2009, referenced in the Communication). Failure to contain existing and predicted IAS impacts undermines the Community's ability to meet its biodiversity protection targets, compromises other EU environmental policies and adversely affects social and economic interests across the EU;
- the geographic scale of the problem is documented at EU and Europe-wide level. All taxonomic groups, all types of biome and all types of ecosystem service are affected. Some of Europe's richest areas for biodiversity are the worst affected by IAS impacts;
- the inadequacy of the existing policy framework is evidenced through Task 2 (Shine et al. 2008) and acknowledged in the Communication. Mechanisms are not in place to address a wide range of pathway/vector risks or to support comparable levels of implementation and investment across Member States. Some existing Community policies can provide economic incentives to introduce potential IAS without prior screening for invasiveness risks;
- national approaches, even if strengthened, cannot adequately address IAS threats in isolation. Coordinated action is necessary in key sectors that are closely integrated at EU level through the Single Market and common policies (e.g. agriculture, water, biodiversity, fisheries);
- at the continental scale, Europe's numerous land borders and shared ecosystems make unilateral approaches inefficient and cost-ineffective. The variability of IAS distribution and impacts means that many management measures will be taken at local or national level. However, coordinated policies are needed to tackle crossborder impacts of IAS and to measure, monitor and respond to species/ecosystem modifications linked to climate change;

- the justification for Community action is equally strong for European islands. International policy frameworks formally recognise the need for regional coordination to protect island biodiversity against IAS impacts<sup>52</sup>. However, islands that are legally part of EU territory – i.e. Outermost Regions – have no explicit powers to prevent entry even of known high-risk IAS.

## 5.2 Costs of policy inaction versus costs and benefits of action

The **cost of policy inaction** (business as usual) is known to be at least 12 billion EUR / year, with about half of that total falling on stakeholders in key economic sectors (Kettunen et al, 2009). As noted above, this figure is a significant under-estimate in terms of both overall impacts and sector-specific costs.

Constraints on accurately measuring IAS impacts makes it harder to communicate and manage IAS problems efficiently. The true costs of policy inaction would be revealed as much higher if better data were available:

- on the impacts of all invasive species already established in Europe;
- on IAS impacts to key economic sectors like fisheries, forestry and tourism;
- to quantify the effect of IAS-damaged ecosystem services on economic and social activities and opportunities; and
- to quantify lost efficiency in investments resulting from uncoordinated policy responses and/or delayed intervention.

‘Business as usual’ does not mean that costs of inaction remain the same over time. The predicted increase in the rate of species introductions linked to globalisation (see Figures 1.1 and 1.2 above) means that the number of new IAS in Europe is likely to rise and generate new impacts. Continuing failure to contain existing IAS in Europe will also generate wider costs. In parallel, climate change may increase ecosystem vulnerability, alter species’ distributions, increase the spread of diseases that can be transmitted from animals to humans and favour new or migrant harmful organisms that could adversely affect trade in animals, plants and their products. These changes present additional risks that can only be managed by investing in appropriate adaptation strategies.

With regard to the **cost of policy action**, Task 3 research suggests that even the most ambitious policy framework would cost significantly less than current IAS damage/control costs. The return on investment is likely to be even better if predicted increases in IAS impacts are taken into account: action now is the best way to minimise future unwanted introductions and contain further spread of damaging IAS (see 4.4 and Box 4.3 in particular).

A key question is how cost-benefit ratios might change over time i.e. what would a given level of EU investment secure in terms of reduced risk, both in the short and longer term, and how far might policy costs decrease in time? Further modelling and extrapolation are needed to provide a quantified answer. However, a high ambition framework is considered most likely to reduce risks of new IAS establishing, contain existing problem species and increase ecosystem resilience to environmental pressures, including climate change.

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<sup>52</sup> Eg CBD Programme of Work on Island Biodiversity, CBD Decision IX.4, Bern Convention recommendation 91/2002.

Improved policies for IAS mainstreaming, measurement and management should also deliver efficiency gains through more equitable distribution of costs and benefits and better leverage of EU main budget lines for IAS prevention and control.

### **5.3 Goals and principles for action at Community level**

The future EU framework on IAS should be designed to conserve and enhance European biodiversity at the ecosystem, species and genetic level through coordinated measures to prevent, rapidly respond to or control IAS and mitigate their impacts on the environment, economy and human health and well-being.

IAS are a problem affecting many sectors, stakeholders and future generations. The most desirable way to tackle IAS threats is to build awareness, foster responsible practices and support voluntary compliance. The EU should prioritise steps to improve understanding of and support for IAS issues at all levels. This will require targeted communication for decision-makers, economic stakeholders, resource managers, other interest groups and the public. The future EU framework needs to provide high-level political commitment and strategic direction and ensure close cooperation between key sectors to harness available expertise and resources.

In accordance with the EC Treaty, the EU framework should aim for a high level of environmental protection and be based on the precautionary principle and on the principles that preventive action should be taken, that environmental damage should as a priority be rectified at source and that the polluter should pay<sup>53</sup>. As highlighted through the study, prevention is critical to cost-effective action on IAS because of the technical constraints and higher cost of eradicating or controlling species that have become established and spread.

The EU framework should also be based on the principles of subsidiarity, proportionality, cooperation, solidarity and transparency. Measures to minimise the entry and/or spread of potential IAS into and within the EU should be commensurate with identified risks and impacts, based on objective scientific criteria and avoid undue restriction on trade or on travel and transport opportunities.

For policy areas in which the Community shares competence with Member States, EU measures and funding should focus on objectives that cannot be adequately or cost-effectively met by Member States acting independently, at central or at regional and local level. Contingency planning and response capacity call for solidarity between Member States to ensure that all regions are capable of taking measures necessary to tackle detected problems at an early stage. In other areas, Member States should remain free to set strategic priorities and decide what action is most cost-justifiable, supported by regional information exchange and decision support systems to maximise economies of scale.

The EU framework should also support overarching EU objectives on sustainable development. It should contribute to broader regional and subregional cooperation with non-Member States, building on existing cooperation policies with neighbouring countries that face common challenges of IAS prevention and management.

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<sup>53</sup> Article 174(2).





## 5.4 Recommendations to the Commission

The following recommendations take account of the Council Conclusions (June 2009<sup>54</sup>) which provide strong support for a robust EU framework on IAS, including:

- a jointly developed information system for early warning and rapid response;
- improved cooperation on biosecurity and control measures within and beyond the EU;
- integration of IAS considerations into key Community policy areas affecting the environment, natural resources and ecosystem function; and
- consideration of predicted effects of climate change on the future spread of IAS caused by the shifting of biota and changes *inter alia* in agriculture and forestry practices.

The choice facing the Commission is whether to base future IAS policy efforts on existing instruments or propose dedicated legislation for this purpose. This study<sup>55</sup> focused on collecting concrete data to compare costs, benefits and other impacts of different policy approaches to inform and guide the Commission's decision.

Based on the findings of this study, it is recommended that the formal impact assessment carried out by the Commission should be based on Option C.

The study team's analysis suggests that Option C is the only policy package that could deliver adequate visibility, coverage, coordination, resourcing and horizon-scanning for all types of IAS risks and impacts. Option C could have prevented a large proportion of the current costs of IAS damage and control in Europe and would also be likely to make the biggest contribution to reducing new species arrivals in the future.

Indicative costs of taking action to address IAS threats<sup>56</sup>, even at the highest level of ambition identified, would be much lower than the costs of inaction over the medium to long term. Improved prevention at source, into and within the Community, would bring clear benefits by avoiding new risks and minimising threats to ecosystems, human health, economy and infrastructure. Option C would also provide the strongest basis for an integrated approach to maintain and restore healthy functioning ecosystems. This could provide additional benefits by increasing the resilience of European ecosystems to IAS impacts, taking account of complementary EU policies for climate change adaptation<sup>57</sup>.

Depending on its design, Option C would make it possible to:

- cover all taxonomic groups and types of ecosystems;
- exclude organisms regulated under plant/animal health legislation to avoid duplication<sup>58</sup>;
- support environmental integration of IAS issues across relevant policy areas, including the EU's external policies;

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<sup>54</sup> 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).

<sup>55</sup> Service Contract No 070307/2007/483544/MAR/B2 (Technical Support for the Development of an EU Framework on Invasive Alien Species).

<sup>56</sup> Presented in the Task 3 report (Shine et al. 2009).

<sup>57</sup> 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.

<sup>58</sup> The aquaculture Regulation provides a precedent for this type of approach.

- mandate development of national IAS strategies and designation of competent authorities;
- strengthen prevention based on expanded border control and inspection capacity, an EU-wide early warning system and robust systems for reporting, contingency planning and rapid response;
- regulate the intentional introduction, holding and/or movement of potential or known IAS in the context of the Single Market, with specific consideration to ecologically vulnerable areas such as isolated islands;
- support screening and prioritisation of pathways/vectors for unintentional introductions;
- improve decision support schemes through access to taxonomic information, monitoring and research results, technical expertise and risk assessment/management protocols;
- better incorporate IAS into EU major budget lines and ensure that public funding and state aid do not support policies conducive to IAS introduction or spread;
- support Community co-financing of defined control and emergency activities, based where appropriate on the biogeographical approach;
- address issues related to accountability and compliance; and
- progressively develop cost-recovery mechanisms, tailored to level of risk, to contribute to incremental costs of implementation and share such costs more evenly between public and private sectors and other concerned stakeholders.

In terms of governance, Option C would need to be underpinned by strong cross-sectoral coordination and clear designation of lead responsibilities at Community and Member State level. Resource implications would vary depending on the approach selected. As indicated, implementation could be supported through a centralised body with a specific IAS mandate<sup>59</sup>.

From the legislative perspective, an Option C instrument could take different forms. One possibility would be to develop a framework instrument setting out common key principles and actions on IAS (e.g. risk assessment, application of precaution, reporting and response, duties of technical assistance and crossborder and regional cooperation etc.), supported by different annexes dealing with e.g. specific vectors, species subject to specific reporting and management requirements and/or particular biogeographic regions. This flexible phased approach could support adaptation to technical developments and accommodate guidelines and tools to address emerging issues.

Lastly, Option C need not be mutually exclusive with measures proposed under other Options.

Option C is fully compatible with voluntary prevention and approaches based on enhanced corporate social responsibility, which is fundamental to achieving Community objectives on IAS. Voluntary initiatives and communication programmes need to be actively encouraged throughout the process of developing an EU Strategy on IAS.

Proceeding with Option C would not exclude the development of key Option B+ elements. As noted, the Community animal and plant health regimes are currently undergoing major revision to take account of biosecurity-related developments in international policy frameworks. This process could provide mutually beneficial opportunities for synergy and alignment.

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<sup>59</sup> See range of proposals and cost estimates under Genovesi et al. 2009, summarised in the Task 3 report, including use of the European Centre for Disease Control as a possible model for a European Agency on IAS.

## BACKGROUND DOCUMENTS

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