



**European Cooperation  
in the field of Scientific  
and Technical Research  
- COST -**

**Brussels, 21 November 2012**

**TD1209**

## **MEMORANDUM OF UNDERSTANDING**

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**Subject :** Memorandum of Understanding for the implementation of a European Concerted Research Action designated as COST Action TD1209: European Information System for Alien Species

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Delegations will find attached the Memorandum of Understanding for COST Action as approved by the COST Committee of Senior Officials (CSO) at its 186th meeting on 20 - 21 November 2012.

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**MEMORANDUM OF UNDERSTANDING**  
**For the implementation of a European Concerted Research Action designated as**  
**COST Action TD1209**  
**EUROPEAN INFORMATION SYSTEM FOR ALIEN SPECIES**

The Parties to this Memorandum of Understanding, declaring their common intention to participate in the concerted Action referred to above and described in the technical Annex to the Memorandum, have reached the following understanding:

1. The Action will be carried out in accordance with the provisions of document COST 4154/11 “Rules and Procedures for Implementing COST Actions”, or in any new document amending or replacing it, the contents of which the Parties are fully aware of.
2. The main objective of the Action is to provide support to a European information system for effective and informed decision-making on Invasive Alien Species (IAS) including identifying needs and formats for an Early Warning and Rapid Response System, reviewing pathways of arrival and impact for priority species and explore existing data gaps across all environments.
3. The economic dimension of the activities carried out under the Action has been estimated, on the basis of information available during the planning of the Action, at EUR 116 million in 2012 prices.
4. The Memorandum of Understanding will take effect on being accepted by at least five Parties.
5. The Memorandum of Understanding will remain in force for a period of 4 years, calculated from the date of the first meeting of the Management Committee, unless the duration of the Action is modified according to the provisions of Chapter V of the document referred to in Point 1 above.

## **A. ABSTRACT AND KEYWORDS**

Invasive Alien Species (IAS) threaten biodiversity, society, human-health, well-being and the economy. The economic impact to Europe is estimated 12.5 to 20 billion €(annually). Europe has committed to tackling IAS through the *EU Biodiversity Strategy to 2020*; an information system is a prerequisite to meet strategy through effective early warning and rapid response for prevention and control of IAS. Initiatives to collate information on IAS have resulted in the development of many databases differing in their geographic, taxonomic and ecological coverage. There are a number of constraints that might limit the effective use of existing databases: data obsolescence, lack of interoperability and uncertainties for long-term sustainability of the various tools.

This COST Action will facilitate enhanced knowledge gathering and sharing through a network of experts, providing support to a European IAS information system which will enable effective and informed decision-making in relation to IAS. An overarching priority will be to identify the needs and formats for alien species (AS) information by different user groups and specifically for implementation of EU 2020 Biodiversity Strategy. Correspondingly early warning tools and rapid response protocols will be developed.

**A.2 Keywords:** Invasive alien species (IAS), Early Warning and Rapid Response System, European IAS Information Network, EU Biodiversity Strategy, Pathways and Impact

## **B. BACKGROUND**

### **B.1 General background**

The Millennium Ecosystem Assessment (2005) designated invasive alien species (IAS), alongside climate change, habitat destruction, pollution and overexploitation, as one of the main causes of global biodiversity loss. Alien (or non-native, non-indigenous, foreign, exotic, introduced) species (AS) are defined by the Convention on Biological Diversity (CBD) as “a species, subspecies or lower taxon (such as a variety, race, provenance or stock), introduced outside its natural past or present distribution, which includes any part, gametes, seeds, eggs, or propagules of such species that might survive and subsequently reproduce” where “introduction” refers to the movement by human agency, indirect or direct, of an alien species outside of its natural (past or present) range and invasive alien species (IAS) as “an alien species whose introduction and/or spread threaten biological diversity”. This COST Action will align to these definitions but extend the concept of an

IAS to include threats to society, the economy and acknowledge that the threat IAS pose to biological diversity has far-reaching consequences, including threatening species that are crucial to the delivery of ecosystem services.

Alien species, and particularly the subset that are considered invasive, have received increasing attention in recent years. Alien species (AS) are being introduced into Europe at unprecedented and unpredictable rates and those that become invasive are known to be one of the greatest threats to biodiversity by decreasing the uniqueness of ecosystems at a genetic, functional and taxonomical level. The Guiding Principles of the CBD advocate a three-tiered approach (prevention, eradication and control) which is widely adopted across the globe. It is recognised that an important first step in developing a strategy for addressing the problems posed by IAS is to document the AS already present in regions, as well as those likely to arrive (either because they have been introduced into a adjacent region, or are spread by an existing vector/pathway).

There are a number of international agreements which recognise the negative effects of IAS and reflect the growing concerns of many people. For example, European countries now have obligations in relation to alien species and must: “strictly control the introduction of non-indigenous species” (Bern Convention on the Conservation of European Wildlife & Natural Habitats) and “eradicate those alien species which threaten ecosystems, habitats or species” (UN Convention on Biological Diversity). Many countries across Europe have developed strategies in relation to IAS and there is a move to consider these through a unified European-wide approach. The European Commission has formally recognised the urgent need to tackle invasions in the document 'Towards an EU Strategy on Invasive Species' (COM (2008) 789 final) committing to develop a policy on the issue and establish an early warning system. For example, the European Parliament resolution of 20 April 2012 on our life insurance, our natural capital: an EU biodiversity strategy to 2020, explicitly “Urges the Commission to come forward in 2012 with a legislative proposal which takes a holistic approach to the problem of invasive alien plant and animal species in order to establish a common EU policy on the prevention, monitoring, eradication and management of these species and on rapid alert systems in this area”. Indeed the European Commission is developing a comprehensive legal instrument to combat IAS and the problems they cause. It is essential that such a policy instrument is underpinned by easily accessible, high quality, comprehensive information. A comprehensive approach, including all AS, is crucial to ensure predictive elements such as early warning and horizon scanning at the regional scale.

Information on AS is currently scattered across Europe in a multitude of sources, such as regional and national databases, peer-reviewed and grey literature, unpublished research projects or institutional datasets and with taxonomic experts. There have been recent efforts to consolidate

information into centralised European (DAISIE), regional (e.g. NOBANIS, REABIC, ESENIAS, MAMIAS, the Baltic Sea alien species database) and national (e.g. Britain, Vojvodina) on-line databases. Attempts to fill in regional gaps are also being undertaken, for example by establishing dedicated networks such as ESENIAS (Western Balkan countries) and MAMIAS (Marine Mediterranean). Additionally, a number of tools and resources are being developed within national and regional initiatives linked to citizen science (an example is NatureWatch, a recent Eye on Earth initiative led by the European Environment Agency for a 'global public information service' aimed at creating and sharing environmental information). A major aim of this COST Action will be to harmonise the information in existing AS databases (building on best practices such as those established through complimentary initiatives, e.g. FP7 project VECTORS), explore undiscovered sources of information, and identify the needs and formats for AS information by different user groups and for the implementation of early warning tools and a rapid response system. The COST Action will explore the use of social media (such as Twitter and Facebook) as mechanisms to engage people in surveillance and monitoring.

The establishment of common exchange standards and harmonisation of terminology requires both extensive discussion for their establishment and training for their adoption. The networking activities that could be facilitated through the COST Action would be extremely beneficial to implementing IAS strategy and research. Advantages would include the opportunity for regular meetings coupled with delivery of training workshops to ensure progression towards a harmonised European information system for AS coupled with innovative research tools that would enable early warning and rapid response. Additional synergistic collaborations with European and Global initiatives will enhance the outcomes of this COST Action. Indeed the success of EU 2020 Biodiversity Strategy depends on international cooperation and concerted action. This COST Action has the potential to achieve the expected results, designing and implementing innovative and cost effective solutions that are adapted to the requirements set by the legislative and strategic needs.

## **B.2 Current state of knowledge**

At the ninth meeting of the Conference of the Parties to the Convention on Biological Diversity (meeting in Bonn, 2008), Parties were invited 'to collaborate on the development and use of early warning systems, including networks of focal points, and on the development and use of rapid response mechanisms' (Decision IX/4 In-depth review of ongoing work on AS that threaten ecosystems, habitats or species). Additionally, the need to develop effective global early warning

and rapid response systems has also been stated as a priority action in the 'Syracuse Charter' on biodiversity, adopted at the G8 Environment Ministers Meeting (Syracuse - Italy, 2009). The European capacity to detect and react promptly to new invasions is often limited. Measures to prevent either unwanted introductions or the spread of already established AS through cross-border activities are rarely applied and new entries are often detected or revealed only when effective response is no longer feasible. The need to improve the ability to detect and report new incursions of AS into Europe promptly is widely recognised by policy-makers, statutory bodies, researchers and many other stakeholders. Underpinning this is the need to establish effective pan-European information systems for sharing AS information with neighbouring countries (European and non-European), trading partners and regions with similar ecosystems, particularly those of high conservation status (Special Areas of Conservation and hotspots of unique diversity such as Macaronesian islands), to facilitate identification, early warning and coordination of prevention, mitigation and restoration measures. Such an information system should assist in locating, documenting and providing electronic access to sources of information, provide quality control and ensure controlled, agreed and shared (harmonised) terminology. A pan-European system, which includes all AS, and not just the invasive component, is critical because AS can become IAS in time. Ultimately this will ensure production of timely and reliable risk assessments aligned with effective management responses which are enacted promptly wherever needed.

This COST Action is innovative in multiple aspects:

**Access to distributed information sources.** Maximising links between existing information systems and primarily focusing on establishing a network of expert networks to deliver interoperable IAS data services through the mandatory use of existing data exchange standards and protocols such as Darwin Core for purpose of IAS. Such service would complement but not replace existing systems. Collaboration with LifeWatch ([www.lifewatch.eu](http://www.lifewatch.eu)), a project on the ESFRI (European Strategic Framework for Research Infrastructures) Roadmap, and FP7 project "EU BON: Building the European Biodiversity Observation Network", will contribute to development of this network. Workshops will be essential to building these networks and developing good practice which can be implemented through collaboration with EASIN.

**Georeferenced species occurrence data.** Georeferenced species occurrence records can be retrieved from available information systems, such as national AS databases (e.g. Britain and Ireland), open-access journal supplements (e.g. Aquatic Invasions, BioInvasions Records, NeoBiota) and other databases (e.g. DAISIE, GISD, Nobanis, GBIF, Invasive Species Compendium (ISC), Fishbase, BioFresh, REABIC, VECTORS, ATLANTIS –Azores and Canaries). This COST Action will cover existing AS databases and other information sources, allowing exploration of the

data at multiple spatial levels (site, catchment, country) building on best practice established through projects such as VECTORS and EASIN. Additionally this COST Action will explore mechanisms for integrating data collated through citizen science initiatives (e.g. NatureWatch of Eye on Earth).

**Global scanning.** Facilitation of linkages with existing global information systems, such as the IUCN, GISD, ISC and IUCN Red list. Participants will engage with initiatives driven through the Convention on Biological Diversity addressing Aichi Biodiversity Target 9.

**User-oriented services.** Inclusion of multiple user groups, from scientists to policy-makers, will support the concept of a highly interactive discovery, identification, querying, mapping and processing services for AS data. For example, an important output would be the establishment of the practicalities of an alert system for new introductions to be used by competent authorities to be informed and take prompt actions toward (potentially) harmful alien species.

**Analysis and interpretation.** Analytical techniques will be delivered for addressing key questions in relation to pathways of arrival and impacts (critical areas of relevance to users such as the European Commission). These analyses will help to determine information gaps critical to delivering early warning and rapid response.

### **B.3 Reasons for the Action**

There are a range of international projects and research initiatives collating information on AS but many of these focus only on IAS (the subset of AS that on introduction and/or spread threaten biological diversity, society and the economy). A broad approach including all AS is essential for providing context and enhancing understanding of invasions to allow for early warning and mitigation because AS have the potential to become IAS. The interdisciplinary approach of the COST Action makes it ideally placed for a Trans-Domain COST Action. Deliverables from the COST Action will be cross-cutting and involve theoretical and applied understanding of invasion biology coupled with delivery of outputs through information and communication technologies, ultimately enhancing early warning and rapid response capability. The interactions between Domains will ensure a holistic and inclusive approach.

### **B.4 Complementarity with other research programmes**

This COST Action would support the LifeWatch framework and build on EU FP6 and FP7 programmes including projects such as EPIDEMIE, DAISIE, PRATIQUE, IMPASSE, VECTORS,

ALARM, CHAOS, EnviroGRIDS, ISEFOR and BioFresh, integrating with the NOBANIS, NEOBIOTA, ESENIAS, ERNAIS, the Baltic Sea Alien Species Database and other networks. It will also enable interoperability of these European information systems with global tools such as the Invasive Species Compendium (ISC) and the Global Invasive Species Database (GISD) of the IUCN Invasive Species Specialist Group and the IUCN Red List. Moreover, relevant EU directives and agreements, such as Charter on the Conservation and Sustainable Use of Biological Diversity in European Islands will assist in prioritization.

## **C. OBJECTIVES AND BENEFITS**

### **C.1 Aim**

The aim of the Action is to facilitate enhanced knowledge gathering and sharing to provide support to a European information system for effective and informed decision-making in relation to IAS. The COST Action will achieve this through inter-related objectives.

### **C.2 Objectives**

Objective 1: Identify needs and formats for an Early Warning and Rapid Response (EWRR) System.

Objective 2: Review of pathways and priority species aligning with Strategic Goal B, target 9 of the CBD COP 10 Decision X/2

Objective 3: Review IAS impacts in Europe and impact assessment methods, propose standardized assessment methods and assess present and expected impacts of priority IAS species.

Objective 4: Explore existing data gaps in harmonisation and validation of information distributed in available sources in order to increase interoperability of data across the terrestrial, freshwater and marine environments. Identify needs and formats for AS information by different user groups. These groups include (1) European and national bodies involved in implementation of policy instruments (including “Streamlining European Biodiversity Indicators” - SEBI 2010 and other relevant policies) dealing with AS, (2) the scientific research community, (3) stakeholder associations, and (4) citizens

### **C.3 How networking within the Action will yield the objectives?**

Annual Working Group (WG) meetings will provide an opportunity for sharing expertise and information amongst the Action participants. Short-Term Scientific Missions (STSMs) will provide an opportunity to implement agreed actions leading to the major deliverables. Research needs and gaps will be identified and addressed through STSMs, existing research programmes and applications to appropriate funding bodies. The four WGs will address the four main objectives. Each WG will have overall responsibility for leading one objective but interactions between WGs will ensure optimal sharing of knowledge and expertise across the COST Action. Details of the WGs are provided in section D.2.

STSMs will be organised to align with the activities of the WGs and to maximise progress with all deliverables. At least four STSMs, with specific and realistic objectives, will be undertaken each year and the participants will be expected to report to all WGs through the Management Committee. The participants preparing this COST Action have already expressed interest in committing to STSMs. Knowledge exchange will be a critical component of this COST Action. A dedicated website will provide a platform for delivering knowledge exchange documents and COST Action updates and include an RSS feed. Participants will be encouraged to represent the COST Action through presentations at conferences (e.g. NeoBiota, International Conference on Aquatic Invasive Species), seminars (e.g. regional and national meetings), meetings with relevant stakeholders (e.g. European Environment Information and Observation Network) and demonstration events (e.g. exhibitions). The Management Committee will develop a detailed timetable including deliverables and associated milestones linked to WG meetings and STSMs. The Chair of the COST Action will review the timetable regularly and maintain overall responsibility for progression and reporting.

### **C.4 Potential impact of the Action**

The EC has formally recognised the urgent need to tackle invasions in the document 'Towards an EU Strategy on Invasive Species' (COM (2008) - 789 final) and is developing a comprehensive legal instrument to combat IAS and the problems they cause. Other EU policy tools currently include commitment to addressing IAS. For example, the European Marine Strategy Framework Directive (MSFD) which aims to achieve Good Environmental Status (GES) in Europe's Seas by

2020 sets out eleven qualitative GES descriptors. One of them, the Descriptor 2, specifically addresses the problem of biological invasion in marine environment: “*Non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystems*”. It is essential that such policy instruments are underpinned by easily accessible, high quality, comprehensive information. A comprehensive approach, including all AS, is crucial to ensure predictive elements such as early warning and horizon scanning at the regional scale. IAS data is required for many purposes and the COST Action will:

- Contribute to the development of biodiversity indicators within the SEBI 2010 and other relevant initiatives.
- Develop a protocol for quick risk screening or risk assessment of alien species to facilitate the listing process in dedicated alarm (alert) lists, black lists and watch lists.
- Develop standards and information management procedures at different levels (i.e. national, regional and European).
- Contribute to facilitate the decision-making process on rapid response actions by member states.
- Contribute to awareness raising and exchange good awareness raising practices.
- Provide the knowledge base and the decision support tools to the EC in their work for a dedicated legislation on IAS, and for integrating IAS related considerations into other policies and sectors, such as agriculture, transport, fishery, forestry, climate changes, etc. with the ultimate aim to move towards sustainability.
- Develop protocols for assessing the effectiveness of management actions at both the national and regional level (e.g. in relation to the IAS related project financed by the EC, which have been over 300 in the last 15 years)
- Facilitate the exchange of information on IAS management options between the relevant practitioners.
- Develop standards and information management procedures to facilitate scientific research.

### **C.5 Target groups/end users**

The relevance of the COST Action to a wide range of end users will be ensured through a process of consultation with target groups including policy-makers, decision-makers, NGOs, researchers, consultants, general public. Indeed end users have been involved in the development of this COST Action. The results will be specifically relevant for:

- Informing policy e.g. European Commission officers responsible for development of IAS strategy,

relevant directives and the EEA officers responsible for the SEBI 2010.

- Developing trends in the arrival, spread and impacts of IAS across Europe.
- Raising awareness of IAS with the general public and specific recreational groups by disseminating information on good practice to support preventative measures alongside early warning and rapid response.
- Identification of key pathways and relative importance/impact in relation to the spread of IAS.

## **D. SCIENTIFIC PROGRAMME**

### **D.1 Scientific focus**

Invasive Alien Species (IAS) pose a major threat to biodiversity, society, well-being and the economy. Initiatives to collate information on IAS (and more broadly AS) have resulted in the development of many databases differing in their geographic, taxonomic and ecological coverage. Despite the importance of the information provided by such databases, there are a number of constraints that might limit their effective use, such as lack of interoperability and uncertainties for long-term sustainability of these databases and information management tools. This COST Action will address such issues by establishing a comprehensive network of experts in order to facilitate development of a European information system for AS. This will support development early warning and rapid response protocols through standards and information management procedures at different levels (i.e. national, regional and European) contributing to the implementation of EU 2020 Biodiversity Strategy.

The COST Action will take into account the 2008 Commission Communication towards a Shared Environmental Information System (SEIS). SEIS is a collaborative initiative of the European Commission and the European Environment Agency (EEA) to establish together with the Member States an integrated and shared European environmental information system. Indeed, SEIS aims to improve the collection, exchange and use of environmental data and information and is based on seven principles: 1. Managed as close as possible to its source; 2. Collected once, and shared with others for many purposes; 3. Readily available to easily fulfill reporting obligations; 4. Easily accessible to all users; 5. Accessible to enable comparisons at the appropriate geographical scale, and citizen participation; 6. Fully available to the general public, and at the national level in the relevant national language(s); 7. Supported through common, free open software standards. The application of the principles of SEIS is becoming increasingly relevant for, and perhaps even

necessary elements of, any network which is based on information sharing, and as such it is of fundamental importance to verify whether and how such principles can be applied to the IAS data sources which represent the focus of this project.

In collaboration with a newly established European Commission Joint Research Centre (JRC) initiative, European Alien Species Information Network EASIN (<http://easin.jrc.ec.europa.eu/>) this COST Action will aim to establish a network of experts to contribute to Early Warning and Rapid Response Systems by developing standards and information management procedures at different levels (i.e. national, regional and European). The COST Action will ensure formation of an extensive and active network, already comprising 90 international professionals from many organizations and disciplines, to underpin early warning and rapid response. The COST Action will specifically further harmonise the information in existing AS databases within Europe, explore undiscovered sources of information, and identify the needs and formats for alien species information by different user groups. Additionally this COST Action will look to interact with Map of Life ([www.mappinglife.org](http://www.mappinglife.org)), Global Biodiversity Information Facility (GBIF), BioFresh ([www.freshwaterbiodiversity.eu/](http://www.freshwaterbiodiversity.eu/)) and GEO BON (<http://www.earthobservations.org/geobon.shtml>).

The COST Action framework would provide participants and other interested experts with an infrastructure in which to share information and expertise on AS. Collaboration with EASIN will provide the platform for delivering protocols developed through the COST Action. The aim of EASIN is to increase the access to data and information on alien species in Europe. EASIN facilitates the exploration of existing AS information from distributed resources through a network of interoperable web services, following internationally recognized standards and protocols. The network of this COST will collaborate with the EASIN team for promoting and contributing to the harmonisation of existing information sources as part of an effort to improve the exchange of AS information. The access to AS information is made available free of charge to anyone who wants to use it, but ownership of the data remains with the source. This COST Action will provide the network of experts to support EASIN specifically within the context of early warning and rapid response.

## **D.2 Scientific work plan methods and means**

The COST Action will be based around 12 primary tasks coordinated by 4 WGs with each WG leading activity on specific tasks but in collaboration with the other WGs and Management Committee.

### **WG1: Early Warning and Rapid Response**

Early Warning and Rapid Response (EWRR) has been comprehensively reviewed but this COST Action will systematically review past trends relevant to EWRR which will inform data integration (WG4). Recommendations will be developed for rapid dissemination of IAS notifications within and between countries aligned with SEBI 2010. WG1 will be composed of national scientific and other expert contributors, information system managers (including journal editors) and the European Commission.

Task 1: Undertake a systematic review highlighting successes and failures of EWRR including: evaluation of European and non-European eradication attempts building on the research completed within PRATIQUE for plant pests and diseases; existing mechanisms of early warning through systems in Europe (e.g. EPPO); availability of species identification tools.

Task 2: Develop guidelines for establishment, upgrading or harmonising existing databases integrating with EASIN to meet the needs of EWRR.

Task 3: Summarise possible approaches and tools for rapid dissemination of IAS notifications from primary data holders (experts, citizen science) and between countries coupled with reporting in the context of SEBI 2010 and other relevant policies.

Milestone 1: Publish systematic review and inform key recommendations for EWRR system (Task 1).

Milestone 2: Overview of innovative tools and technologies that have the potential to underpin EWRR including reference to established systems such as EPPO underpinned by harmonization of existing databases (Tasks 1 and 2 linking to WG4).

Milestone 3: Schematic tool kit (flowchart) of approach for EWRR informed by systematic review and established systems including detailed guidelines for database harmonization (Tasks 2 and 3 linking to WG4).

### **WG2: Trends and analyses on pathways and priority species**

Innovative approaches to analysis of trends will be explored in relation to pathways of introduction and priority species for rapid response at various spatial scales. This project will build on the

expertise of the COST Action FP1002 “Pathway Evaluation and pest Risk Management In Transport” (PERMIT), which is presently looking at trends and analyses of pathways of introduction for forest pests and diseases; analyses will be extended to other pathways of invasion. WG2 will comprise data analysts, data providers and data consumers (as for WG1).

Task 1: Explore innovative approaches to analysis of trends particularly in relation to pathways of introduction and priority species for rapid response linking to WG1.

Task 2: Compare priority pathways at different geographic scales (global, European and national scales) and identify priority pathways and traits of species associated with these pathways to inform risk assessment and specifically EWRR (linking to WG3).

Milestone 1: Publish review on innovative approaches to analysis of trends.

Milestone 2: Publish lists of species from existing information sources with information on pathway of arrival and disseminate results of pathway analysis at global, European and national scales alongside recommendations of key actions of analysis relevant to risk assessment.

### **WG3: Trends and analyses on impacts of priority species**

Knowing and predicting the environmental and socio-economic impact of actual and potential IAS is an essential component of an efficient information and EWRR system on IAS. Various attempts to assess the impact of IAS have been made in Europe but, in general, these assessments concerned single species, pathways, countries or categories of impacts. Similarly, several methods and protocols to assess socio-economic and environmental impacts exist in Europe and elsewhere but there is a need to harmonize these methods and protocols among countries and categories of IAS. Environmental impacts on biodiversity and ecosystem functions are particularly difficult to express in monetary terms and, therefore, difficult to compare and rank. This WG will review IAS impacts in Europe and impact assessment methods, propose standardized assessment methods and assess present and expected impacts of priority IAS species to support risk assessments in the framework of an EWRR system. WG3 will be mainly composed of animal and plant invasion ecologists and of socio-economists specialists in IAS.

Task 1: Review studies on environmental and socio-economic impacts of IAS in Europe, and impact assessment methods for IAS available at global, European and National scales.

Task 2: Develop and propose pan-European standardised methods to measure the magnitude of actual and potential environmental and socio-economic IAS impacts in Europe, possibly based on species traits of IAS associated with these impacts and/or in an impact scoring system, to inform risk assessment and specifically EWRR.

Task 3: Assess actual and expected impact of priority IAS at European and National levels based on methods outlined in task 2; create mechanisms to accumulate, analyse and distribute knowledge on IAS impacts useful for researchers and practical for managers.

Milestone 1: Publish systematic review on impact of IAS and impact assessment methods.

Milestone 2: Propose standardized methods for assessing impact of priority IAS.

Milestone 3: Assess impact of priority IAS in Europe and recommend key actions of analysis relevant to risk assessment.

#### **WG4: Data standardisation and harmonisation**

Guidelines will be developed for the collation of AS information (referring to Darwin Core) including (a) consensus on terminology, in coordination with the IUCN to avoid the risk of inconsistencies between the adopted terms at the European and global scale, and (b) identification of minimum and desirable data requirements for quality assurance. Protocols will be developed on the practical implementation of the WG4 guidelines for establishment, upgrading or harmonising existing databases and to explore links between information sources. WG4 will represent all major environment types (terrestrial, freshwater, marine) and taxonomic groups. It will be composed of data providers (database managers, journal editors, monitoring agencies etc), data consumers (scientists, policy makers etc), contributors to national and regional hubs, and information networks.

Task 1: Review available information sources (and exchange standards through Darwin Core) and develop protocols for establishment, upgrading or harmonising existing databases and explore links between existing information sources, particularly focusing on species lists and pathways (WG 2) of arrival in the context of EWRR (WG 1).

Task 2: Harmonise terminology in coordination with global initiatives (such as Global Invasive Species Database) to avoid the risk of inconsistencies between the adopted terms in various data sources at the European and global scale.

Task 3: Identification of minimum and desirable data requirements for quality assurance across all major environment types (terrestrial, freshwater, marine) and taxonomic groups resulting in recommendations for using specific Darwin Core fields for AS

(<http://code.google.com/p/applecore/>). Compare formats and platforms of existing interactive electronic identification tools.

Task 4: Upload new and existing data sources using DAISIE as a repository or EASIN as a mechanism for linking other established databases.

Milestone 1: Publish list of available information sources with metadata and develop guidelines for the harmonisation of AS information including terminology and data standards (reference to Darwin Core).

Milestone 2: Address gaps and inconsistencies among existing European and national databases on AS.

Milestone 3: Publish review of protocols on the practical implementation of information management tools following on from guidelines developed in WG1.

Milestone 4: Combine available distribution information (Map of Life, GBIF, EU BON etc) to be able to give distributional information on AS found in Europe beyond national borders of European countries (if possible finer resolution, including native distribution).

## **E. ORGANISATION**

### **E.1 Coordination and organisation**

The COST Action will be coordinated through the Management Committee (MC), set up in accordance with the provisions in “Rules and Procedures for Implementing COST Actions”. The MC will comprise the Chair, Vice-Chair, WG leaders and STSM managers all nominated and elected at the COST Action kick-off meeting. The MC will oversee the planning and delivery of the COST Action including liaison with the local organisers responsible for hosting WG meetings and training workshops. Each meeting will be assigned a technical committee and editorial board to support the local organiser in logistical arrangements alongside the delivery of meeting outputs such as proceedings through the dedicated COST Action website.

Regular communication will be maintained with the MC, wider COST Action participation, external stakeholders and other interested parties through an open-access dedicated website, e-mail and teleconference.

WGs will include experts from COST member countries and other countries to achieve an effective membership. The WG leader nominated and elected at the kick-off meeting will be responsible for liaison within the WG and with other WGs. The WG leader will report on a monthly basis to the Chair of the COST Action to ensure continuity and progress across the COST Action.

The targets and milestones will be outlined within a detailed timetable which will be reviewed by the COST Action Chair on a monthly basis and by the MC through the WG meetings and annual MC meeting.

The WGs will also provide a structure for research themes and common interests to be

represented. WGs will be encouraged to organise joint activities through STSMs and relevant training workshops and seminars linked to the WG meetings.

Emphasis will be on encouraging capacity building and mobility of early-career European researchers through summer schools in conjunction with workshops (for example: a workshop on systematic review methods will be included)

## **E.2 Working Groups**

Four WGs with cross-collaboration ensuring continuity and broad exchange of ideas:

WG1: Early Warning and Rapid Response

WG2: Trends and analyses on pathways and priority species

WG3: Trends and analyses on impacts of priority species

WG4: Data standardisation and harmonisation

The Management Committee will have responsibilities to:

- establish WG membership and define work programmes
- identify end-users and information needs and sources
- establish links to AS information networks and other biodiversity websites
- exchange knowledge
- involve all relevant expert networks and open information system on AS through development of “network of networks” initiative implemented with EASIN

This COST Action will integrate early stage researchers with other scientists through STSMs and summer training schools.

## **E.3 Liaison and interaction with other research programmes**

The COST Action will catalyze links across existing AS information systems, identifying gaps in knowledge and seeking opportunities to develop research. The consortium will link to ongoing EU FP7 projects, such as EnviroGRIDS, VECTORS and BioFresh, and current COST Actions, such as FP1002 PERMIT, to develop an FP8 proposal that will take the guidelines developed through to

implementation. Interaction with EASIN will also facilitate rapid implementation of the work programme.

The work programme will be managed through workshops (two per year) including training sessions and information exchange. Additionally the COST Action will seek to have joint meetings alongside relevant international conferences such as NeoBiota and linking to ongoing European meetings. The Management Committee will meet every month through teleconferencing and Skype with e-mail exchanges supplementing formal meetings. The project website will facilitate sharing of information and an on-line forum will be established.

#### **E.4 Gender balance and involvement of early-stage researchers**

This COST Action will respect an appropriate gender balance in all its activities and the Management Committee will place this as a standard item on all its MC agendas. The Action will also be committed to considerably involve early-stage researchers. This item will also be placed as a standard item on all MC agendas.

The COST Action will support the development of early-stage researchers to ensure knowledge transfer between research groups. The COST Action will ensure a supportive environment for all participants to contribute and develop. STSMs will be prioritised throughout the duration of the COST Action and considerable support will be provided to all participants (visiting researcher and the host organisation) through the MC. Training schools will be embedded within WG meeting programmes to provide an opportunity for all participants to benefit from acquisition of new skills. Information from the training workshops will be made available through the COST Action website. Scientists participating in STSMs will present their studies at the next relevant WG meeting and will ensure a report is provided for the website.

#### **F. TIMETABLE**

The COST Action will run for four years. The table below indicates the delivery of the COST Action.

Activity	Year 1				Year 2				Year 3				Year 4			
MC & WG Meetings	X		X		X	X	X	X	X	X	X	X	X	X	X	X
STSMs	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
WG 1			X		X	X	X	X	X	X	X	X	X	X	X	X
WG 2			X		X	X	X	X	X	X	X	X	X	X	X	X
WG 3			X		X	X	X	X	X	X	X	X	X	X	X	X
WG 4			X		X	X	X	X	X	X	X	X	X	X	X	X
Training schools			X		X	X	X	X	X	X	X	X				
WG reports				X			X				X					
Annual report					X			X				X				
Conference																X
Conference proceedings																X
Website launched		X														

## G. ECONOMIC DIMENSION

The following COST countries have actively participated in the preparation of the Action or otherwise indicated their interest: AT, BE, BG, CH, CY, CZ, DE, DK, EE, EL, ES, FI, FR, HU, IE, IL, IT, LT, MT, NL, NO, PT, RO, RS, SE, SI, SK, TR, UK. On the basis of national estimates, the economic dimension of the activities to be carried out under the Action has been estimated at 116 Million € for the total duration of the Action. This estimate is valid under the assumption that all the countries mentioned above but no other countries will participate in the Action. Any departure from this will change the total cost accordingly.

## H. DISSEMINATION PLAN

### H.1 Who?

The COST Action will provide rapid and high quality information on IAS and the main beneficiaries from this research are 1) policy makers, government decision makers and non-governmental organizations (NGOs), 2) the general public and schools, 3) relevant industries, 4) researchers.

**Policy makers, governmental decision makers and NGOs:** Findings will be disseminated to policy makers and relevant NGOs through direct consultation with relevant bodies such as EEA, EU and national government departments and through representation at the Global Invasive Alien Species Information Partnership (coordinated through the CBD). Additionally this COST Action will establish collaborations with the Global Biodiversity Information Facility (GBIF) and European Alien Species Information Network (EASIN) to ensure effective delivery of the outputs.

**General public and schools:** The general public is critical to surveillance and monitoring for EWRR. Non-technical summaries of all the major outputs will be made available through the website. These summaries will be publicised through national communication networks such as the National Biodiversity Network in GB and also through other European and global infrastructures.

**Industry:** Representative industry stakeholders (for example, International Biocontrol Manufacturers' Association) will be invited to WG meetings and the final conference. A question and answer forum will be included at these meetings and also virtually through the COST Action website.

**Researchers:** Not all researchers are aware of the problems IAS cause and some IAS remain unreported in e.g. ongoing monitoring programmes. Therefore, the network will include researchers from different disciplines identified through an awareness campaign.

### H.2 What?

**Website:** The COST Action website will be the main platform for disseminating outputs. Summaries of key findings will be published on the website.

**Linking to good practice information packs for the general public:** Links to downloadable resources for the general public across the network, including ID guides and factsheets, will be developed. An impact group will be formed, comprising the Management Committee and two nominated individuals with overall responsibility for leading this important component of the COST

Action.

**Outreach:** The findings of this COST Action will be disseminated through outreach activities, such as exhibitions and conferences. Power point slides will be developed for use at meetings to raise awareness of the COST Action. Additionally full use will be made of networking opportunities such as Twitter and FaceBook for communicating activities and information.

**Training:** Training schools will be included within every WG meeting and through the STSMs.

**Production of an annual report:** An annual report will be circulated to policy makers, practitioners, scientists, government and NGOs to provide and initiate feedback on the progression of the COST Action in the context of ongoing findings.

**Peer-reviewed publications:** The participants have an excellent reputation for publishing results in high quality journals and will ensure that this is the ethos of the COST Action. Indeed the COST Action will actively encourage open access publication so that all end-users will have access to the findings.

**Grant applications:** The COST Action will will promote national applications catalyze links across existing AS information systems, identifying gaps in knowledge and seeking opportunities to develop research. The consortium will link to ongoing EU FP7 projects and current COST Actions, such as FP1002 PERMIT, to develop an FP8 proposal, which will take the guidelines developed through to implementation.

### H.3 How?

The Management Committee will consider progress throughout the COST Action through regular reviews and submissions of key output reports from all WGs at least 4 times a year. The MC will also pursue opportunities for results dissemination (such as media opportunities) as they arise beyond those anticipated at the start of the COST Action. Reports will be published through the COST Action website alongside summaries suitable for non-technical audiences. Links to peer-reviewed publications and conference proceedings will be provided.

The network of this COST Action already includes more than 90 international professionals in many disciplines, including biological invasions, conservation biology, ecological modelling, taxonomy, wildlife management, international relations, regulatory and policy analysis, training and communication. This COST Action multinational team with different backgrounds and qualifications represents a unique diversity that has created strong synergies leading to high-quality

results in past project such as DAISIE. DAISIE represents a very successful example also in relation to the commitment of its partners to keep the database alive even after the end of the relevant FP6 project, as shown by the importance recognized in the years to this infrastructure (examples are not only the many literature work produced so far, but also the important policy development that have been triggered by and based on its data). Additionally this COST Action would play a pivotal role to ensure the continuity of the efforts made so far, and would allow the network to grow in terms of both regional scope, comprehensiveness of data over taxa and biomes, and compliance with the legislative and strategic requirements linked to the recognized growing threat of IAS in Europe.

Since the IAS data and information have a clear spatial dimension, the COST Action will investigate the limits and potentialities related to the adoption of the 2007 INSPIRE directive (INfrastructure for SPatial InfoRmation in Europe) which might facilitate the formulation, implementation, monitoring and evaluation of policies and activities related to IAS (e.g. by ensuring that the spatial data infrastructures of the Member States are compatible and usable in a Community and transboundary context).