



## Report of the

# ***Ad hoc* meeting of Invasive Alien Species data provider and user groups to develop the 2010 indicator**

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**Biodiversity Indicators Sub-Committee, IUCN SSC  
&  
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# 1. Introduction

This document is a summary of the discussions that took place at the *ad hoc* meeting of Invasive Alien Species data providers and user groups to develop 2010 indicators, a workshop held at the Centre for Population Biology, Silwood Park, Imperial College London.

This workshop was a follow-up to the report, *Options for a global indicator on trends in invasive alien species*, prepared for the Secretariat of the Convention on Biological Diversity (SCBD) by Noëlle F. Kumpel and Jonathan E.M. Baillie (2007). Workshop participants reviewed the report and its findings on prospects for invasive alien species (IAS) indicator, and developed a plan for IAS indicator development and implementation under the Biodiversity Indicators Partnership (BIP).

## 1.1. Summary

This ad hoc meeting of IAS data providers, IAS data users and experts on indicators evaluated the data availability, necessary processes and feasibility of alternative indicators for measuring trends in IAS by 2010 (with the consideration of scaleable indicators for the longer term) at a national, regional and global level. The meeting participants identified data gaps and developed a framework to be completed that will transform these recommendations into practical, functional indicators.

The meeting was funded by the SCBD.

Edited by: Georgina Mace and Michelle Taylor, Imperial College.

## 2. Background

### 2.1. The 2010 target and biodiversity indicators

In 2002, the sixth Conference of the Parties (COP) of the Convention on Biological Diversity (CBD) signed a commitment as part of its Strategic Plan, 'to achieve, by 2010, a significant reduction of the current rate of biodiversity loss at the global, regional and national levels as a contribution to poverty alleviation and to the benefit of all life on earth' (decision VI/26). This commitment was endorsed later that year by over 180 governments at the World Summit on Sustainable Development (WSSD) in Johannesburg and has become widely known as the '2010 target'.

At the seventh COP in 2004, the Parties adopted a framework for assessing progress towards and communicating the 2010 target at the global level (decision VII/30). This global framework is split into seven 'focal areas', with 'goals' and 'targets' for each focal area, and one or more 'headline indicators' to measure progress towards each target. Of the proposed headline indicators, some were considered ready for testing, while it was acknowledged that others still required development. Twenty-two headline indicators and a suite of measures were adopted at the eighth COP in March 2006 (UNEP/CBD/COP/8/2), although many of the specific measures for these headline indicators may still change in the run up to 2010.

There are also regional equivalents to this global target. Whilst the CBD has adopted the target of reducing the rate of loss of biodiversity, the European Union Council has set the ambitious target of halting the loss of biodiversity by 2010 (European Council, 2001).

### 2.2. An indicator for trends in invasive alien species

The CBD calls on Parties to, 'prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats, or species' (Article 8(h)).

One of the CBD's focal areas for indicator development is 'threats to biodiversity', with Goal 6 being to 'control threats from invasive species' (UNEP/CBD/COP/8/2).

The targets under this goal are:

**Target 6.1:** Pathways for major potential alien invasive species controlled

**Target 6.2:** Management plans in place for major alien species that threaten ecosystems, habitats or species

### 2.3. What is an invasive alien species (IAS)?

The CBD defines an invasive alien species (IAS) as 'an alien species whose introduction and/or spread threatens biological diversity' (decision VI/23). (This has been changed from 'an alien species whose introduction and spread threatens ecosystems, habitats or species with socio-cultural, economic and/or environmental harm, and/or harm to human health': UNEP/CBD/COP/6/18/Add.1/Rev.1.) In this regard, the CBD definition of invasion differs from the strictly biological definition, which ignores any reference to impacts and simply describes the naturalisation and unintended spread of unwanted organisms in areas where they have not previously occurred naturally (Richardson *et al.*, 2000; Jay *et al.*, 2003; Pysek *et al.*, 2004).

There is widespread agreement that most current invasions are human-mediated; and that the term IAS should be reserved for species that have been either deliberately or accidentally introduced to a new geographical area by humans.

There are four main steps along the invasion pathway: introduction, naturalisation, invasion and transformation, each with a set of different terminology (see table 1 for one set of invasion status definitions).

**Table 1. Definitions of invasion status according to one classification system (based on Richardson *et al.*, 2000, and Pysek *et al.*, 2004, with invasion status categorisation according to McGeoch *et al.*, 2006).**

Invasion status (category)	Synonym	Definition
Alien (I)	Exotic, introduced, non-native, non-indigenous	Species present due to intentional or accidental introduction as a result of human activity; some authors distinguish between prehistoric and recent introductions (e.g. archeophytes and neophytes for Central European taxa introduced before and after 1492; or introductions before or after European colonisation)
(Casual alien)	Waif, transient, occasional escapee, adventive, persisting after cultivation	Aliens that may flourish and even reproduce occasionally in an area, but do not form self-replacing populations and rely on repeated introductions for their persistence
Naturalised (II)	Established	Aliens that reproduce consistently and sustain populations over many life cycles without direct intervention by humans, but do not necessarily invade natural, semi-natural or human-made ecosystems
Invasive (III)		Naturalised species that reproduce often in large numbers and are able to spread over a large area
(Weed/pest)	Harmful, problem, noxious	An anthropocentric term for plants, animals or other pests (not necessarily alien) that grow where they are not wanted and usually have detectable economic or environmental effects. 'Environmental weeds' are alien plants that invade natural vegetation
Transformer (IV)	Edificator (environment-forming plant)	Subset of invasives which change the character, condition, form or nature of ecosystems over a substantial area relative to the extent of that ecosystem

Whilst the policy focus (*sensu* CBD) is on impacts, and therefore on invasive alien species that are transformers (category IV), much of the scientific literature measures only IAS in general, whether or not they are transformers. It therefore seems wise to lump these two invasive categories (III and IV) together for the purposes of an indicator, as suggested by McGeoch *et al.* (2006). Similarly, naturalised aliens (category II) should be categorised together with the alien category (I).

Definitions of IAS are still not universally accepted and often vague, and the issue of non-standardised terminology is a considerable barrier to integrating research and enabling useful interpretation of data. Many different terms are used for alien species and IAS, often depending on the user's nationality or location (e.g. the term

'non-native' is usually used in the US, and weeds or pests are used where the impact is directly on society rather than the environment). The problem of variable terminology confounds cross-referencing between databases and collation of data for the purposes of an indicator, and was indeed a problem that pervaded discussions at the workshop.

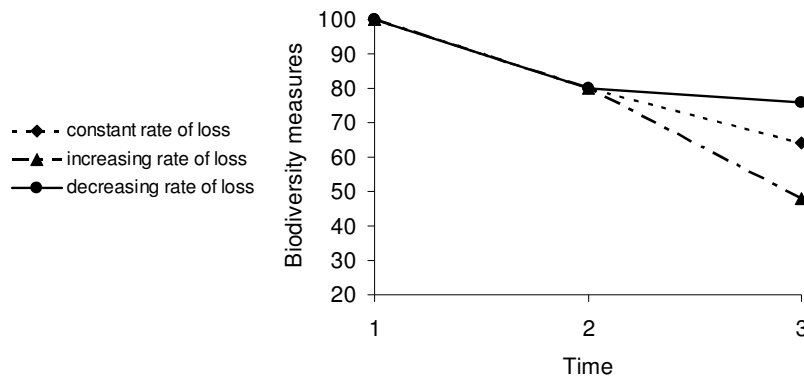
Usually the use of alien (introduced) species and IAS is very subjective. For the purposes of the meeting discussion, workshop participants agreed to adopt the Richardson definitions (Table 1) as well as the aggregation of terms recommended by McGeoch *et al* (2006).

### 3. Presentations

#### 3.1. Background to 2010 indicators (Georgina Mace)

Assessing whether or not the 2010 goal is met requires several steps to be completed by 2010. The first is to agree on the measure of biodiversity to be used; in this case we are seeking a measure relating to the control of invasive alien species that are having a deleterious impact on biodiversity. The goal is to reduce the rate of loss of biodiversity. For any measure of 'state', such as the size of a population, or the area of spread, estimates at two points in time are needed to calculate a rate of change. At least one more is needed to measure the change in rate (see Figure 1). If the measure is already a rate, such as the number of invasives detected per year, then two measures by 2010 will allow progress against the goal to be measured. Given that it is already 2007, measures for which data already exists, or for which historical information can readily be located, are going to be the most promising.

**Figure 1. Simple representation of the 2010 target, with measures at three time intervals showing trends with constant, increasing or decreasing rates of loss.**



Some care is also needed in the choice of points in time at which measures are taken. Where there has already been extensive decline of the biodiversity measure, more recent measures may well show a reduction in the rate of loss, but this could mask the extent of loss that has already occurred. Similarly, it will be important to examine the precision of measures with respect to the observed change, and to be sure that measures fairly reflect the biodiversity attribute of interest.

### **3.2. Options for a global indicator on trends in invasive alien species (Noelle Kumpel)**

Kumpel and Baillie (2007) were contracted to complete an initial assessment of data availability and potentially relevant processes and to create an initial list of IAS indicators for 2010 and beyond. They reviewed and updated previous lists of IAS databases, completed further internet research into additional data sets; and a review of scientific and grey IAS literature.

Most data identified were available at a national level. There is a bias towards North America (where 55% of the datasets used were located) and most data was terrestrial (42%), though the spread across freshwater (32%) and marine (26%) was fairly even. There is a large skew towards plant species and IAS (rather than 'alien', 'general pest', 'weed' etc). Crall *et al.* (2006), contacted 1500 IAS experts and identified 319 new datasets, 43% of which were not available online. They found more focus on sub-national level datasets, low taxonomic completeness, variable geographic completeness and medium-high temporal completeness (which was surprising).

In general there is a strong geographic bias to a few countries and regions (Europe, US, Canada, South Africa etc), most of which are developed and located in high latitude, low biodiversity, limited areas, but the GISD, for example, has some data for all countries and regions. There is a strong overall bias to a few species (plants and weeds – often species that impact economies rather than biodiversity), and the focus is on aliens and IAS or both, often without clarity about what is being included. While this makes data comparisons and standardisation across data sets difficult, GISIN and GRIS (Global Register of Invasive Species) prototypes, which will be available in 2007, both address standardisation.

There are a number of organisations involved in IAS and relevant indicators globally but at the global scale the IUCN, SSC, ISSG and GISD have most in-depth data per species.

There are some regional initiatives e.g. IABIN, HEAR, NBII, DAISIE, SEBI2010, NOBANIS, RBIC, and various international Conventions relevant to IAS directly (e.g. International Plant Protection Convention) or indirectly (e.g. International Convention for the Control and Management of Ships' Ballast Water and Sediments).

Global IAS data portals, such as GISIN, were highlighted as important to develop and it should be mentioned that many nations have their own IAS indicators in place or under development e.g. US, Australia, New Zealand, Canada, UK, Switzerland, South Africa.

### **3.3. A Global Indicator for Biological Invasion (Melodie McGeoch)**

The challenges in selecting an indicator for trends in invasive species include:

- adopting a standard, scientific working definition of IAS / 'major alien';
- arriving at a compromise between inclusivity (national, taxonomic, ecosystem) and information value (data quality and quantity);
- including the understanding that implementation of said indicator(s) would require substantial data collation, standardisation and acquisition.

An extra consideration is to maximise the number of nations that are able to provide data (to ensure global representation of trends) and to use an indicator that is sufficiently information rich to provide an accurate and sensitive estimate of progress towards the 2010 target.

McGeoch *et al.* (2006) suggested single indicators of problem status (number of invasive alien species) and management status (number of IAS introduction pathways covered by operational management plans and number of IAS with operational management plans for existing populations of IAS). These single indicators are then aggregated into composite indicators and national level data is extrapolated to global level.

A minimum indicator/information set for both national and global scales is required for a global IAS indicator. The indicator should be developed directly from the CBD Goal and Targets, and the outcome of initial testing of the indicator should be positive. Trend information will be scarce for indicators but status information should be available. Data availability, quality and management needs to be considered and there must be buy in and implementation at national level. Additionally, IAS Indicator development initiatives must contribute to developing mechanisms to monitor global trends in IAS beyond 2010.

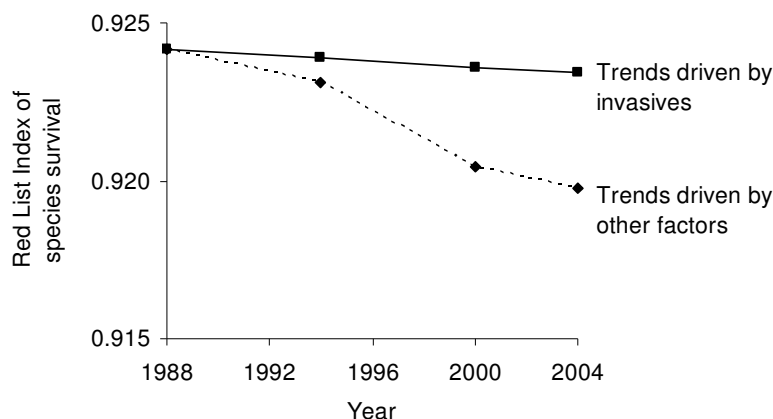
McGeoch *et al.* (2006) finished their summary with a comment on cost as a measure (single indicator) of trends in IAS; Cost to society includes costs of control of IAS and loss of resources as well as cost of lost biodiversity (which is inherently difficult to measure). Therefore, for global application 'cost' does not meet with principles of simplicity or data availability and is also an indirect/weak measure of both IAS problem and management status.

### 3.4. BirdLife International's work on indicators of the impacts of IAS on birds (Stuart Butchart)

Birds are perhaps the most well studied group, especially in terms of invasive species. Invasive species have been and continue to be an important driver of bird population declines; invasives are the third most important threat to bird species and the driver behind 50% of extinctions (67% on oceanic islands). Predation is the most common threat that invasives pose to bird species.

The Red List Index (RLI) illustrates trends over time in overall threat status (relative projected extinction risk) of sets of species. The RLI is based on number of species in each category and number moving between categories owing to genuine status changes. A RLI can therefore be calculated for any set of species that have been fully assessed at least twice. 19% of bird species category changes were driven by invasives (a very conservative approach was taken and these are only to be used as a rough estimate). (Butchart *et al.* 2004, 2005)

**Figure 2. Red List Index of bird species survival for 1988-2004, with a preliminary estimate of trends driven by invasive species versus other factors.**





The overall net trend (Figure 2) is a shallow decline, because although many species have deteriorated in status as a consequence of invasive species (e.g. Balearic shearwater and Golden white eye have been uplisted to Critically Endangered, owing to predation by cats and brown tree snakes respectively), there have also been a substantial number conservation successes in tackling invasive species (e.g. Rarotonga monarch was downlisted to Endangered due to increased rat control and Abbott's Booby has been similarly downlisted following control of yellow crazy ants).

Further validation of the bird data is required and similar analyses are possible for amphibians, mammals, cycads etc. An RLI based on a sampling approach for all vertebrates and plants is expected to be complete in the next few years.

Important Bird Areas (IBAs) are globally important sites for bird species (threatened, restricted-range, biome-restricted and congregatory) that are identified at the national scale through multi-stakeholder processes. Global terrestrial coverage is likely to be complete by 2008 (with marine IBA identification underway). Monitoring of all 10,000 sites by national and local groups is now underway or being initiated. Measures of the state, pressure and responses will be collated, and indicators of trends produced. These indicators will allow the tracking of trends in the impact of invasive species at the site scale.

### **3.5. Streamlining European Biodiversity 2010 Indicators (SEBI 2010) (Snorri Baldursson)**

The SEBI2010 project was initiated to consolidate, test, refine, document and help produce streamlined sets of policy-relevant biodiversity indicators meaningful in the context of the 2010 target in Europe. They also aim to improve coordination, exchange of information, collaboration and international streamlining on indicators and monitoring activities. There were initially 69 indicators/indicator elements documented and reviewed by the SEBI2010 coordination team. Currently 24 – 26 of these are being considered for verification and adoption by the EC.

There are six expert groups within this framework, one of which concentrates on trends in IAS. This group consists of 21 experts representing 14 EEA countries, 1 non-EEA country, EC DG Environment, EEA, ETC Water and ETC Biological Diversity. So far this group has focused on five aspects of potential IAS indicators:

- Cumulative numbers of alien species in Europe since 1900
- List of worst IAS threatening biodiversity in Europe
- Abundance and impacts of IAS in Europe
- Awareness of IAS in Europe
- Cost of IAS in Europe

In January 2007 it was decided that just one indicator should be focused on for the time being including both the cumulative numbers of alien species in Europe and alien invasive species threatening biodiversity in Europe.

## **4. Overview of Potential Indicators**

### **4.1. Potential indicators**

Using the table of potential indicators from Kümpel and Baillie (2007) the participants added additional indicators for discussion and broke into small working groups to discuss and review the potential for development and implementation of these candidate indicators. Each group discussed the merits and drawbacks of each indicator in terms of:

1. Feasibility – how easy would it be to source/develop the data necessary for the indicator to provide meaningful information?
2. Policy relevance – how influential would this indicator be for key policy decisions?
3. Public resonance – how meaningful is the indicator to non-specialists?
4. Geographical representation – is information available across a broad geographic area, or restricted to a few countries or regions?
5. Scientific validity – can the indicator be assessed reliably, and are those data likely to really reflect that the indicator is intended to represent?
6. Scalability – will the indicator work well at different geographical and political scales? Can national and regional data be summed to provide regional and global estimates?
7. Cost-effectiveness. What would be the necessary investment to develop this into a useful and informative indicator?

It was also important to ensure that both target 6.1 and 6.2 had relevant indicators (both measuring response) as well as ideally pressure and impacts on biodiversity, which should link to other indicators.

#### **4.2. Complete list of IAS indicators under consideration**

Following the breakout discussion and presentations from each group, priorities among the candidate indicators became clearer. Working in plenary the participants then considered each indicator in turn, and reviewed the relative merits of each one in terms of what could, given realistic investment, be delivered for 2010, and what could potentially be delivered over the longer term. In particular, the group reviewed the prospects for obtaining one or two measures by 2010 (therefore obtaining a baseline or single rate estimate), or of being able to gather 3 measures, and therefore to assess the 2010 goal.

In addition, each candidate indicator was scored for high (H) medium (M) or low (L), for 1) Relevance (to policy and understanding of threat to biodiversity from IAS, 2) Rigour (i.e. scientific validity, and, 3) Representativeness (geographic) (i.e how well the measure could be developed to reflect a broad range of nations and regions).

Finally, the complete list was reviewed and certain indicators were prioritised for further consideration and development.

The full results of this review are presented in Table 2.

**Table 2. Informal, qualitative assessment of possible indicators created through group consensus. Each indicator is reviewed for 2010 and beyond. The scores are (H)igh, (M)edium and (L)ow for Relevance, Rigour and Representativeness. The selected indicators are asterisked (\*)**

PROSPECTS FOR 2010	LONGER TERM PROSPECTS	SCORE		
<b>I Measures of number</b>				
<b>I.i No. of alien and naturalised species.</b> This is measured at the country scale, so alien indicates out of country. The measure would assess the effectiveness of spread, and to a lesser degree, management. However, an increase in numbers may reflect 'discovery' due to improved surveying and monitoring.				
<p>50 countries (western hemisphere bias) currently have online sources of information about alien /invasive species. 10-15% of available records have date of introduction (approx. 5-20 countries overall could have a trend.</p> <p>Depending on data availability, date of introduction and date of publication (rarely the date a species became invasive) can also be collected and used to create trends for a subset of species and countries. Could also use past dates of introduction to back track to 1980 /1990 baseline.</p> <p>In the marine environment, the origin of many invasive species is unknown, so they will be underrepresented in this indicator unless cryptogenic species are treated as alien.</p>	<p>Could be developed by encouraging countries to record aliens in surveys and expeditions more consistently, using data standards proposed by GISIN.</p> <p>In the future this measure may become more useful and fit well with other measures.</p> <p>Important to distinguish between 'alien' and 'naturalised' in this category.</p>	M-M	L-M	L-H
* I.ii <b>No of invasive alien species</b> This is subset of the measure above and more relevant. Need an operational definition of invasive for this indicator and discussions with data owners about their use of the term (also to define date of intro/publication/invasiveness). Many country lists use a variety of terms (e.g. exotic) and many do not explicitly state whether their alien taxa are invasive or not.				
<p>Feasible at country level for limited no. of countries. Many have date of introduction (but not the date the species became 'invasive').</p> <p>Could, with effort produce trend for 2010 for limited set of countries – though likely to be biased to temperate and European countries.</p>	<p>Preferred measure for longer term development. Need to identify a subset of countries across regions and habitats with limited data to create improved lists of countries for more global dataset.</p>	H-H	L-M	L-H
<b>I.iii No. of invasive species</b> – in this case invasive species are counted regardless of whether they are alien or not. Especially important for large, heterogeneous countries where native species can become invasive.				
<p>Not possible anywhere at present. Needs to be gathered at site / sub-country / country level.</p>	<p>Something that was considered useful. Needs to be defined much more clearly and have data collected. Site and sp level data sets could contribute new info.</p>	-	-	-
<b>II Measures of Spread</b>				
<b>II.i Spread of "worst" IAS.</b> This is a subset of spread of IAS below				

PROSPECTS FOR 2010	LONGER TERM PROSPECTS	SCORE		
Using ISSG list of the worst IAS it would be possible to obtain trends but would need date of introduction, which will be possible for many countries. Most useful at country level - global measure would be of limited use.		H-H	L-L	L-L
<b>II.i Spread of IAS.</b>				
Only country/ regional level state assessments exist. Trends for limited species in certain countries would be possible. Some detailed geographic baselines available (S Africa, NZ, Australia), DAISIE (Europe in 2008) (plants generally, some mammals).  Outstanding issues = Time scale of change.	More regional specific trends may become available. May have some better mapping of habitats that are impacted by invasives (mangroves, etc) in the future but there will be a large resolution issue (Landsat, IKONOS). Good to combine with population / density / impact of invasives. Land surface area free from invasion as a potential measure.	.-H	.-M	.-M
<b>III Measures of Abundance</b>				
* III.i <b>Population trends / abundance</b> (of transformer species). This would be based on databases of population trends accumulated across species, populations and sites, such as the Living Planet Index				
Could have a global trend for 2010, measured as rate of change of populations of alien species from 1970-2010 at biogeographical scale globally. Problems are taxonomic bias to vertebrates, lack of data for certain countries and ecosystems (same as no. of alien species, above). Better measure could be number of invasive populations in state of rapid increase. Requires investment in data gathering and testing for best analysis.	Would be good in the future if there are good population data for more taxa; could be adapted as a measure of management effectiveness.  Encourage national targeted data gathering to include IAS.	M-M	M-M	M-H
<b>IV Measures of Control</b>				
* IV.i <b>No. of countries that are party to relevant international agreements</b> , i.e. where there are articles or obligations regarding IAS				
This is a country level measure but can aggregate to produce global scores. Trends for 2010 can be produced by checking listed conventions for each country. Has the country ratified conventions? Are there legal operations in place nationally?. Baseline possible, trend possible as can backtrack. Needs to be coordinated with CBD reporting.  Illustrative conventions: 1. Convention on Biological Diversity 2. Cartagena Protocol on Biosafety 3. International Plant Protection Convention (IPPC) 4. Convention on Migratory Species (CMS /	Measure management effectiveness in the future. Quality evaluation / validation is an issue.	H-H	H-H	H-H

PROSPECTS FOR 2010	LONGER TERM PROSPECTS	SCORE		
<p>Bonn Convention)</p> <p>5. Convention on International Trade in Endangered Species (CITES)</p> <p>6. Ramsar Convention on Wetlands (Ramsar)</p> <p>7. Ballast Water Convention</p> <p>8. Sanitary and Phytosanitary agreement</p> <p>9. OIE (Organisation International d' Epizootologie)</p> <p>10. Convention on International Civil Aviation (the Chicago Convention)</p> <p>11. International Postal Union</p> <p>12. IAS identified as an issue in National Biodiversity strategies</p> <p>13. IAS identified as an issue in National Biodiversity Action plans e.g. Number of countries scoring &lt; 5</p>				
<p><b>*IV.ii No. of countries with operational management of introduction pathways</b></p>				
<p>Needs to be established with minimum criteria, e.g existence of management regulation / plan, some evidence of implementation and effectiveness of above.</p> <p>A variety of questions about pre-border, at-the-border and post-border measures could be formulated to differentiate between effective and less effective measures.</p> <p>Relevant pathways to score: waterways: marine, waterways: freshwater, postal, air, within translocation, road /rail.</p> <p>Also need to distinguish between pathway management that addresses agricultural versus biodiversity threats.</p> <p>Needs to be coordinated with CBD reporting.</p> <p>Could create baseline/ status for a good sample of countries. Baseline for 2010 (will profile the problem), no trend data.</p>	<p>Measure management effectiveness (effort) in the future. Adopted international system of standards relevant to IAS (under SPS agreement / ISO /IPPC). Precision may improve over time to be quality assessment rather than simple yes/no.</p>	H-H	L-M	M-H
<p><b>* IV.iii No. of IAS management plans in place.</b> Can just be whether the country has a management plan for IAS, could have criteria, e.g. management plan should include components of management, eradication / control and prevention.</p>				
<p>Data to be gathered at country level, but could be accumulated for global measures. Good for profiling the problem (if know where the IAS are etc).</p> <p>Ecosystem / regional / site optional. No trend data but should be able to create a status for some countries.</p> <p>Limited data available for status assessment.</p>	<p>Expand to include more in depth definition of management plan (Has country adopted international system of standards relevant to IAS (under SPS agreement / ISO /IPPC)), effectiveness of plans (surveillance &gt;&gt; management against re-invasion). Requires lots of effort. Good measure in the long run. Co-relating level of management in place with level of</p>	H-H	L-M	L-M

PROSPECTS FOR 2010	LONGER TERM PROSPECTS	SCORE		
	threat?			
<b>V Measures of Cost</b>				
* <b>V.i Economic impacts</b> (cost and benefit) (economic cost of invasives, total – includes economic, livelihoods, biodiversity, control, etc).				
At present only case studies are available. We are still way off gathering biodiversity economic data usefully.  Maybe possible to estimate single impact cost estimates for certain countries (including pests). Requires research into current projects underway (watersheds, climate change, country based etc). No information likely for 2010 beyond case studies.	Possibility of broadened approach based around case studies. Very effective measure if possible.  Also possible to look at predictions of costs of IAS with climate change etc. Modellers and economists needed.	H-H	L-L	.-H
<b>VI Measures of Impacts</b>				
* <b>VI.i Red List Index showing trends in impact of IAS on conservation status of species</b> This can be calculated from data in the IUCN Red List database. [Note this shows trends driven by invasive species issues for <i>all</i> species in a taxonomic group, not just those threatened by invasives]				
Global measure (for certain groups). Trends in threat status available for birds, mammals, amphibians, cycads, conifers and sample of all vertebrates (from sampled Red List Index) plus baseline data for other groups.  By 2008 will be able to ID to individual invasive species. Can't easily disaggregate to scale of small countries, unless evaluate extinction risk at national scale. Only for groups in which all species assessed, or sampled groups from SRLI.	Global level for other groups in time, sampled RLI.	H-H	M-M	H-H
<b>VI.ii Number of species threatened by IAS</b>				
Baseline data only.  Need to record reasons for change against changes in threat coding on IUCN Red List.	Possible. Record impacts of IAS on ecosystems (or ecosystem function) in a more systematic way.	H-H	M-M	H-H
* <b>VI.iii Population trends of species threatened by IAS.</b> As in III.i, this would be based around aggregated population trend data, such as used for the LPI. Could only be done for species whose main threat is IAS, and data gathering to record the type and impact of threat is needed				
With effort could be coarse status information, maybe trends, for 2010.	Could be further developed; complex methodological issues concerning species facing multiple threats whose relative impact is changing over time.	H-H	M-M	M-H
<b>VI.iv Measure of ecosystem health</b>				
No available data	Desirable but huge problems as difficult to aggregate & compare across ecosystems.	.-H	.-L	.-L

PROSPECTS FOR 2010	LONGER TERM PROSPECTS	SCORE		
	Encourage ecosystem health community to consider IAS.			
<p><b>*VI.v Emerging disease outbreaks</b> (number of outbreaks over time). Explore case studies for 1 or 2 selected diseases? E.g. whirling disease, chronic wasting disease, rinderpest, chytridomycosis, malaria (by invasive mosquitoes), Nile virus, exotic Newcastle disease). Issue of how to define an emerging disease, but potentially a good measure. Requires research into what currently available.</p>				
Spread of disease outbreaks over countries possible. Probably no more than a limited case studies available for 2010.	Maybe	H-H	M-M	L-L
<p><b>*VI.vi Number or % areas important for biodiversity (e.g. key biodiversity areas /IBAs, some Protected Areas, Ramsar Sites etc) threatened by invasives</b> (where invasives are one of the most important threats).</p>				
Probably achievable, but not completely global. Status measure possible. Some data with trends for countries (or ecosystems / sites).	Global coverage desired. Needs some further development. IBA coverage soon complete, KBA some way off global coverage. Could look at Protected Areas also, but data patchy and possibly biased, plus PA may be set up for one purpose (e.g. not for biodiversity), with invasives impacting species within the PA	H-H	L-M	M-H





		year with appropriate support.		
<b>Abundance/Spread</b>				
Population trends/ abundance	Living Planet Index (~ 5000 populations, time series of data, can be analysed geographically, taxonomically and by ecosystem)	Requires greater geographic and taxonomic representation	Go through dataset and fill in new data fields: AS, IAS  Explore bias in dataset  Consult databases on IAS/AS  Liaise with other databases to ensure info entered  Specifically target poorly known regions and taxonomic groups	2
<b>Control</b>				
No. of countries that are party to international agreements where there are articles or obligations regarding IAS	No known database	?	Contact CBD secretariat and other conventions for baseline data and past data (dates of ratification etc)	1
No. of countries with operational management of introduction pathways	No known database	?  In some cases data will not be available in the foreseeable future	Contact Globe Ballast for info and other potential sources – postal services, aviation bodies etc.  Develop more detailed criteria for control pathways – primary contacts with each individual country	2
No. of IAS management plans in place	No known database  Potentially – Management Project Register (GPCS) – will cover IAS which impact plants	?	Compile list of available management plans from sources submitting their IAS data i.e. combine with measure (1)  Contact all individual countries and ask if they have management plans for any/all IAS  ● Develop criteria for assessing standard and efficacy of the	2

			management plans and implementation – long term aim	
<b>Cost</b>				
Economic impacts	Unknown at present	N/A	<p>Collect case studies only</p> <p>Develop guidelines for analysis of case studies</p> <p>Define economic impacts on biodiversity</p> <p>Evaluate current studies and their methods of analysis</p> <p>Analytical approach for refining the economic impact data – long term</p>	<p>2 (only case studies)</p> <p>4 (all other work)</p>
<b>Impacts</b>				
No. or % areas important for biodiversity threatened by IAS	KBA, WBDB, IBA Ramsar, Smithsonian long term data plots	<p>Threats to site unrecorded</p> <p>Many sites are not monitoring regularly</p> <p>May not be representative – geographically and taxonomically</p>	<p>Methods for measuring threat trends at sites need further development</p> <p>Review of all potential sites</p> <p>Standardisation of data collation across initiatives</p> <p>Adding data in from other sources</p>	3/4
Trends in impact of IAS on conservation status of species	Red List database, WBDB	Taxonomic coverage	<p>Complete and continue global assessment and implement SLRI</p> <p>Develop system for distinguishing genuine changes in threat process</p> <p>Code all invasives to species consistently</p>	<p>4</p> <p>2</p>
Emerging disease outbreaks	Identify appropriate databases		<p>Case studies for a couple of diseases</p> <p>Identify appropriate databases – WWF? OIE? CDC? WHO?</p>	1

## 5. Next steps for IAS indicators

The above nine indicators are the baseline that this ad hoc meeting believed was suitable for further development. Of the nine, two are case studies leaving seven baseline / trend indicators that could be used to measure progress towards the 2010 target and potentially into the future.

The next steps should be possible with the flow of money from the GEF funded project, *Building the partnership to track progress at the global level in achieving the 2010 biodiversity target* (the 2010 Biodiversity Indicator Partnership), expected in March 2007 or shortly afterwards. GISP will be working to refine the list of indicators above, establish a working group, gather country opinions on IAS indicators and organise with data providers for the additional work to be undertaken to deliver at least some of the measures discussed above.

The above framework is a solid starting point for GISP, who are lead organisation for delivering the IAS indicators to measure progress towards the 2010 target.

## 6. References

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## **7. Appendices**

### **7.1. Appendix 1: Workshop agenda**

#### **IUCN Species Survival Commission Biodiversity Indicators Sub-Committee**

Ad hoc meeting of Invasive Alien Species data provider and user groups to develop the 2010 indicator

#### **Agenda**

22 Jan 2007

- 10.00 Welcome and introductions (GM)
- 10.30 Options for a global indicator on trends in invasive alien species: summary of a report to the SCBD (NK, JB)
- 11.00 A global indicator for biological invasions (MM)
- 11.20 Report from Bird Life International (SB)
- 11.30 Coffee break
- 12.00 Discussion of key issues to identify main areas for further development
- 1.00 Lunch
- 2.00 Working groups on main issues
- 3.30 Tea break
- 4.30 Report back

**23 Jan 2007**

- 9.00 Introduction to day (GM)
- 9.30 Presentation of draft implementation plan
- 10.00 Discussion of key issues arising
- 10.30 Coffee break
- 11.00 Working groups
- 1.00 Lunch
- 3.00 Report back
- 4.00 Depart

## 7.2. Appendix 2: List of workshop participants

<b>Participant</b>	<b>Organisation</b>	<b>Country</b>
Holly Dublin	SSC Chair	US
Georgina Mace	SSC BISC Chair	UK
Jonathan Baillie	IoZ	UK
Noelle Kumpel	ZSL	UK
Richard Smith	BIONET	UK
Lynn Jackson	GISP	South Africa
Michael Browne	ISSG / GISD / GISIN	New Zealand
Melodie McGeoch	University of Stellenbosch	South Africa
Geoffrey Howard	IUCN	Kenya
Snorri Baldursson	SEBI2010	Iceland
Claire Brown	UNEP WCMC	UK
Ronald Chawatama	Chevening UNEP WCMC	UK
Robert Hoft	CBD Secretariat	Canada
Stuart Butchart	BirdLife	UK
Jean-Christophe Vie	IUCN	Switzerland
Annette Olson	USGS	USA
Mar Cabeza	University of Helsinki	Finland

### 7.3. Appendix 3: Acronyms used in the report

BIP	Biodiversity Indicators Partnership
CBD	Convention on Biological Diversity
COP	Conference of the Parties (of the CBD)
DAISIE	Delivering Alien Invasive Inventories for Europe
EEA	European Environment Agency
ETC	European Topic Centre
GISD	Global Invasive Species Database
GISIN	Global Invasive Species Information Network
HEAR	Hawaiian Ecosystems at Risk project
I3N	Invasive Information Network of the Inter-American Biodiversity Information Network,
IABIN	Inter American Biodiversity Information Network
IUCN	World Conservation Union
ISSG	Invasive Species Specialist Group (of the IUCN SSC)
NBII	National Biological Information Infrastructure
NOBANIS	North European and Baltic Network on Invasive Alien Species
PIER	Pacific Island Ecosystems at Risk
RBIC	Regional Biological Invasions Centre
SEBI2010	Streamlining European 2010 Biodiversity Indicators
SPREP 2000	The South Pacific Regional Environmental Programme 2000
SSC	Species Survival Commission (of the IUCN)
WSSD	World Summit on Sustainable Development 2002