Goal 15 Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

(Updated on 28 March 2016)

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Target 15.1 By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements.

Indicator 15.1.1: Forest area as a proportion of total land area

From FAO:

1. Precise definition of the indicator

The indicator is already included among the indicators for the Millennium Development Goals (MDG) (indicator 7.1 "Proportion of land covered by forest")[1]. In order to provide a precise definition of the indicator, it is crucial to provide a definition of "Forest" and "Total Land Area". According to the FAO definitions, **Forest** is defined as "land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 percent, or trees able to reach these thresholds *in situ*. It does not include land that is predominantly under agricultural or urban land use". More specifically:

- Forest is determined both by the presence of trees and the absence of other predominant land uses. The trees should be able to reach a minimum height of 5 meters.
- It includes areas with young trees that have not yet reached but which are expected to reach a canopy cover of at least 10 percent and tree height of 5 meters or more. It also includes areas that are temporarily unstocked due to clear-cutting as part of a forest management practice or natural disasters, and which are expected to be regenerated within 5 years. Local conditions may, in exceptional cases, justify that a longer time frame is used.
- It includes forest roads, firebreaks and other small open areas; forest in national parks, nature reserves and other protected areas such as those of specific environmental, scientific, historical, cultural or spiritual interest.
- It includes windbreaks, shelterbelts and corridors of trees with an area of more than 0.5 hectares and width of more than 20 meters.
- It includes abandoned shifting cultivation land with a regeneration of trees that have, or are expected to reach, a canopy cover of at least 10 percent and tree height of at least 5 meters.
- It includes areas with mangroves in tidal zones, regardless whether this area is classified as land area or not.
- It includes rubberwood, cork oak and Christmas tree plantations.
- It includes areas with bamboo and palms provided that land use, height and canopy cover criteria are met.
- It excludes tree stands in agricultural production systems, such as fruit tree plantations, oil palm plantations, olive orchards and agroforestry systems when crops are grown under tree cover. Note: Some agroforestry systems such as the "Taungya" system where crops are grown only during the first years of the forest rotation should be classified as forest.

Total land area is the total surface area of a country less the area covered by inland waters, like major rivers and lakes.

2. How is the indicator linked to the specific TARGET as worded in the OWG Report?

Forests fulfil a number of functions that are vital for humanity, including the provision of goods (wood and non-wood forest products) and services such as habitat for biodiversity, carbon sequestration, coastal protection and soil and water conservation.

[1] See: http://mdgs.un.org/unsd/mi/wiki/7-1-Proportion-of-land-area-covered-by-forest.ashx

The indicator provides a measure of the relative extent of forest in a country. The availability of accurate data on a country's forest area is a key element for forest policy and planning within the context of sustainable development. Changes in forest area reflect the demand for land for other uses and may help identify unsustainable practices in the forestry and agricultural sector.

Forest area as percentage of total land area may be used as a rough proxy for the extent to which the forests in a country are being conserved or restored, but it is only partly a measure for the extent to which they are sustainably managed.

This is indicator is primarily proposed for Target 15.1. However, it is also related to Target 6.6.

3. Does the indicator already exist and is it regularly reported?

Yes, the indicator already exists. FAO reports the data to UNSTATS. Further information can be found at: http://mdgs.un.org/unsd/mdg/Metadata.aspx (metadata needs updating).

4. Comment on the reliability, potential coverage, comparability across countries, and the possibility to compute the indicator at sub-national level.

Reliability

It is not possible to determine a statistical margin of error of the estimates. The accuracy varies across countries depending on available information.

When reporting countries are asked to assign a Tier level 1, 2 or 3 indicating the level of detail of data sources used for reporting (where Tier 3 is regarded as the highest level of detail). Typically, Tier 3 estimates are recent data (i.e., less than 10 years ago) from National Forest Inventories (NFIs) or remote sensing, with ground validation or programme for repeated compatible NFIs. Tier 2 are older estimates (i.e., more than 10 years) from NFIs or full cover mapping/remote sensing. Core is any other data sources including expert estimates.

Coverage

FAO carries out global forest resources assessments at 5 year intervals, the results of the FRA 2015 will be released in September 2015 and next assessment will most likely be in 2020. Given the relative low accuracy of the reported data and the slow change, it is not advisable to report these data more frequently (i.e., annual reporting does not provide any added value).

Comparability across countries

The national figures in the global assessments are reported by the countries themselves following standardized format, definitions and reporting years, ensuring that data is comparable across countries and regions.

Further, the reporting format ensures that countries provide the full reference for original data sources as well as national definitions and terminology. Separate sections in the reporting format (country reports) deal with the analysis of data (including any assumptions made and the methods used for estimates and projections to the common reporting years).

Sub-national estimates Currently it is not possible to compute the indicator at sub-national level

Indicator 15.1.2: Proportion of important sites for terrestrial and freshwater biodiversity that are covered by protected areas, by ecosystem type

From IUCN:

These metadata are based on http://mdgs.un.org/unsd/mi/wiki/7-6-Proportion-of-terrestrial-and-marine-areas-protected.ashx, supplemented by http://www.bipindicators.net/paoverlays and the references listed below.

Goal and target addressed

Goal 15
Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.

Target 15.1
By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements.

Definition and method of computation

Definition
The percentage of sites contributing significantly to the global persistence of biodiversity that are wholly covered by designated protected areas.

Concepts
Protected areas, as defined by the International Union for Conservation of Nature (IUCN), are clearly defined geographical spaces, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values. Importantly, a variety of specific management objectives are recognised within this definition, spanning conservation, restoration, and sustainable use:

- Category Ia: Strict nature reserve
- Category Ib: Wilderness area
- Category II: National park
- Category III: Natural monument or feature
- Category IV: Habitat/species management area
- Category V: Protected landscape/seascape
- Category VI: Protected area with sustainable use of natural resources

The status "designated" is attributed to a protected area when the corresponding authority, according to national legislation or common practice (e.g., by means of an executive decree or the like), officially endorses a document of designation. The designation must be made for the purpose of biodiversity conservation, not de facto protection arising because of some other activity (e.g., military).

Sites contributing significantly to the global persistence of biodiversity are identified following globally standard criteria applied at national levels. Two variants of these standard criteria have been applied in all countries to date. The first is for the identification of Important Bird & Biodiversity Areas (IBAs), that is, sites contributing significantly to the global persistence of biodiversity, identified using data on birds, of which >12,000 sites in total have been identified from all of the world's countries. The second is for the identification of Alliance for Zero Extinction sites (AZEs), that is, sites holding effectively the entire population of at least one species assessed as Critically Endangered or Endangered on The IUCN Red List of Threatened Species. In total, 587 AZE sites have been identified for 920 species of mammals, birds, amphibians, reptiles, conifers, and reef-building corals. A global standard for the identification of key biodiversity areas (KBAs) unifying these approaches along with other mechanisms for identification of important sites for other species and ecosystems is in the final stages of development and anticipated to be in place by the end of 2015.

Ecosystem types, following a standard classification scheme, are among the required documentation for KBAs.

Method of computation
The indicator is computed by dividing the total number of KBAs wholly covered by protected areas by the total number of KBAs in each country, and multiplying by 100. "Wholly protected" is defined as >98% coverage to allow for resolution and digitisation errors in the underlying spatial datasets.

Rationale and interpretation

The safeguard of important sites is vital for stemming the decline in biodiversity. The establishment of protected areas is an important mechanism for achieving this aim, and this indicator serves as a means of measuring progress toward the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements. Importantly, while it can be disaggregated to report on any given single ecosystem of interest (e.g., forests), it is not restricted to any single ecosystem type, and so faithfully reflects the intent of SDG target 15.1.

Levels of access to protected areas vary among the protected area management categories. Some areas, such as scientific reserves, are maintained in their natural state and closed to any other use. Others are used for recreation or tourism, or even open for the sustainable extraction of natural resources.

In addition to protecting biodiversity, protected areas have become places of high social and economic value: supporting local livelihoods; protecting watersheds from erosion; harbouring an untold wealth of genetic resources; supporting thriving recreation and tourism industries; providing for science, research and education; and forming a basis for cultural and other non-material values.

This indicator adds meaningful information to, complements and builds from traditionally reported simple statistics of territorial area covered by protected areas, computed by dividing the total protected area within a country by the total territorial area of the country and multiplying by 100. Such percentage area coverage statistics do not recognise the extreme variation of biodiversity importance over space, and so risk generating perverse outcomes through the protection of areas which are large at the expense of those which require protection.

Sources and data collection

Protected area data are compiled by ministries of environment and other ministries responsible for the designation and maintenance of protected areas. They are compiled globally into the World Database on Protected Areas (WDPA) by the UNEP World Conservation Monitoring Centre (UNEP-WCMC). They are disseminated through the Protected Planet knowledge product http://www.protectedplanet.net/, which is jointly managed by UNEP-WCMC and IUCN and its World Commission on Protected Areas (WCPA).

KBAs are identified at national scales through multi-stakeholder processes. Data on IBAs are managed by BirdLife International, and are available online at http://www.birdlife.org/datazone/site/search. Data on AZEs are managed by the Alliance for Zero Extinction, and are available online at http://www.zeroextinction.org/. Both datasets, along with the WDPA, are also disseminated through the Integrated Biodiversity Assessment Tool for Research and Conservation Planning, available online at https://www.ibat-alliance.org/ibat-conservation/login.

Disaggregation

Given that data for the global indicator are compiled at national levels, it is straightforward to disaggregate to national and regional levels, or conversely to aggregate to the global level. The indicator can also be reported in combination across terrestrial and freshwater (and indeed marine) systems, or disaggregated among them. However, protected areas, IBAs, and AZEs can encompass terrestrial, freshwater, and marine systems simultaneously, and so determining the results is not simply additive. Finally, it can be disaggregated according to different protected area management categories (categories I–VI) to reflect differing specific management objectives of protected areas.

In addition to the aggregation of the coverage of protected areas across terrestrial and freshwater systems as an indicator towards SDG 15.1, other disaggregations of coverage of protected areas of particular relevance as indicators towards SDG targets include:

SDG 6.6 Coverage of protected areas (freshwater).
SDG 14.2 Coverage of protected areas (marine).
SDG 14.5 Coverage of protected areas (marine).
SDG 15.4 Coverage of protected areas (mountain).

The indicator can be disaggregated by ecosystem type following the standard habitats classification scheme: http://www.iucnredlist.org/technical-documents/classification-schemes/habitats-classification-scheme-ver3.

Protected area coverage data can be combined with other data sources to yield further, complementary, indicators. For example, protected area overlay with ecoregional maps can be used to provide information on protected area coverage of different broad biogeographical regions. Protected area coverage of the distributions of different groups of species (e.g., mammals, birds, amphibians) can similarly provide indicators of trends in coverage of biodiversity at the species level. Protected area coverage can be combined with the IUCN Red List Index to generate indicators of the impacts of protected areas in reducing biodiversity loss. Finally, indicators derived from protected area overlay can also inform sustainable urban development; for example, the overlay of protected areas onto urban maps could provide an indicator of public space as a proportion of overall city space.

Comments and limitations

The indicator does not measure the effectiveness of protected areas in reducing biodiversity loss, which ultimately depends on a range of management and enforcement factors not covered by the indicator. A number of initiatives are underway to address this limitation. Most notably, numerous mechanisms have been developed for assessment of protected area management effectiveness, which can be synthesised into an indicator of management effectiveness. This is used by the Biodiversity Indicators Partnership as a complementary indicator of progress towards Aichi Biodiversity Target 11 (http://www.bipindicators.net/pamanagement). More recently, approaches to "green listing" have started to be developed, to incorporate both management effectiveness and the outcomes of protected areas, and these are likely to become progressively important as they are tested and applied more broadly.

Data and knowledge gaps can arise due to difficulties in determining whether a site conforms to the IUCN definition of a protected area, and some protected areas are not assigned management categories. Moreover, "other effective area-based conservation measures", as specified by Aichi Biodiversity Target 11 of the Strategic Plan for Biodiversity 2011–2020, recognise that some sites beyond the formal protected area network, while not managed primarily for nature conservation, may nevertheless be managed in ways which are consistent with the persistence of the biodiversity for which they are important. However, standard approaches to documentation of "other effective area-based conservation measures" are so far still in their infancy. As these are consolidated, "other effective area-based conservation measures" will be included into the WDPA and thus this indicator accordingly.

Regarding important sites, the biggest limitation is that site identification to date has focused on specific subsets of biodiversity, for example birds (for IBAs) and highly threatened species (for AZEs). While IBAs have been documented to be good surrogates for biodiversity more generally, the unification of standards for identification of important sites across different levels of biodiversity (genes, species, ecosystems) and different taxonomic groups remains a high priority. This umbrella standard for identification of key biodiversity areas is anticipated to be finalised by the end of 2015, building strongly from existing approaches.

Dates of establishment are not recorded for some protected areas in some countries, generating uncertainty around changing protected area coverage over time. This is reflected in the indicator by assigning dates of establishment for undated sites by selecting dates at random from those for other protected areas in the same country, repeating this 1,000 times, and plotting the 95% confidence intervals around mean protected area coverage accordingly.

Gender equity issues

There are no direct gender equity issues associated with the indicator for coverage of important sites for biodiversity by protected areas. However, it is essential to recognise that women play a central role in the conservation, management and use of biodiversity. In many rural areas of developing countries, women's daily tasks are often tied closely to biodiversity. They are often responsible for gathering edible wild plants (fruits, leaves and roots of native plants) to feed their families as a supplement to agricultural grains, especially during unfavourable situations such as famine, conflicts and epidemics. Women often also gather medicinal plants, firewood and other bush products for medicine, fuel, house-building, paint and even manure and pesticide. Women's knowledge of biodiversity is immense and broad, because their communities' well-being depends on it, and preservation of this knowledge is crucial for maintaining biodiversity. Yet, their contribution is often overlooked. They are

typically “invisible” partners from grassroots to policy level. There is therefore an urgent need to consider gender issues in development efforts, to promote true partnership and ensure the sustainable conservation and use of biodiversity.

Data for global and regional monitoring

UNEP-WCMC is the agency in charge of calculating and reporting global and regional figures for this indicator, working with BirdLife International and IUCN to combine data on protected areas with those for sites of importance for biodiversity. UNEP-WCMC aggregates the global and regional figures on protected areas from the national figures that are calculated from the WDPA and disseminated through Protected Planet. The WDPA and Protected Planet are jointly managed by UNEP-WCMC and IUCN WCPA.

UNEP-WCMC produces the UN List of Protected Areas every 5-10 years, based on information provided by national ministries/agencies. In the intervening period between compilations of UN Lists, UNEP-WCMC works closely with national ministries/agencies and NGOs responsible for the designation and maintenance of protected areas, continually updating the WDPA as new data become available.

Quality control criteria are applied to ensure consistency and comparability of the data in the WDPA. New data are validated at UNEP-WCMC through a number of tools and translated into the standard data structure of the WDPA. Discrepancies between the data in the WDPA and new data are resolved in communication with data providers. Processed data are fully integrated into the published WDPA.

The WDPA is held within a Geographic Information System (GIS) that stores information about protected areas such as their name, size, type, date of establishment, geographic location (point) and/or boundary (polygon).

Protected area coverage is calculated using all the protected areas recorded in WDPA whose location and extent is known. Protected areas without digital boundaries are excluded from the indicator.

IBAs are places of international significance for the conservation of biodiversity, identified using data for birds. IBAs are identified using a standardised set of data-driven criteria and thresholds, relating to threatened, restricted-range, biome-restricted and congregatory species. IBAs are delimited so that, as far as possible, they: (a) are different in character, habitat or ornithological importance from surrounding areas; (b) provide the requirements of the trigger species (i.e., those for which the site qualifies) while present, alone or in combination with networks of other sites; and (c) are or can be managed in some way for conservation.

AZEs are sites meeting three criteria: endangerment (supporting at least one Endangered or Critically Endangered species, as listed on the IUCN Red List); irreplaceability (holding the sole or overwhelmingly significant (≥95%) known population of the target species, for at least one life history segment); and discreteness (having a definable boundary within which the character of habitats, biological communities, and/or management issues have more in common with each other than they do with those in adjacent areas). Hence AZEs represent locations at which species extinctions are imminent unless appropriately safeguarded (i.e. protected or managed sustainably in ways consistent with the persistence of populations of target species).

The IBA and AZE site networks are, by definition, areas of particular importance for biodiversity as referred to in Aichi Biodiversity Target 11, and represent the only networks of

such sites that have been identified systematically worldwide. Hence, they represent important areas to consider designating as formal protected areas.

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Target 15.2 By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally.

Indicator 15.2.1: Progress towards sustainable forest management

From FAO:

Definition	"Sustainable forest management" is a central concept for Goal 15 and target 15.1 as well as for target 15.2. It has been formally defined, by the UN General Assembly, as follows: [a] *dynamic and evolving concept [that] aims to maintain and enhance the economic, social and environmental values of all types of forests, for the benefit of present and future generations*". (Resolution A/RES/62/98) An "index of sustainable forest management" with four sub-indicators can be used as a basic indicator of progress towards sustainable forest management by a country. The four sub-indicators are 1. Annual average percent change in forest area over most recent available 5 year period 2. Annual average percent change in stock of carbon in above ground biomass over most recent available 5 year period 3. Share of forest area whose primary designated function is biodiversity conservation, most recent period 4. Share of forest area under a forest management plan, of which forest area certified under an independent forest management certification scheme, most recent period For each of these components, countries can set national targets, monitor and report on progress. The four sub-indicators will be combined into a single composite index, but targets would be set at the level of sub-indicators. Once targets have been set by national authorities, in terms of the four sub-indicators, and progress measured over an agreed period, countries would assess progress (on track to exceed target, on track to achieve target, progress but at an insufficient rate, no significant overall progress, moving away from target). The final value of the index would be a simple arithmetic average of the values for the four sub-indicators. The use of national targets allows each country to define sustainable forest management for its own specific circumstances, within a coherent international framework. Targets on the sub-indicators can also be set at regional or global levels.
Rationale and interpretation	The definition of SFM by UN GA contains several key aspects, notably that sustainable forest management is a concept which varies over time and between countries, whose circumstances – ecological, social and economic – vary widely, but that it should always address a wide range of forest values, including economic, social and environmental values, and take intergenerational equity into account. Clearly a simple measure of change in forest area, while essential, and used for target 15.1, is insufficient to monitor sustainable forest management as a whole. The index proposed combines the two indicators at present under consideration ("forest loss" and "area certified") with measures of use/degradation (sub-indicator 2), biodiversity conservation (sub-indicator 3) to give a more rounded picture of sustainable forest management. Further "topical" sub-indicators will be needed to provide a more comprehensive assessment of SFM aspects. The significance of the four sub-indicators may be briefly explained as follows: 1. Trends in forest area are crucial for monitoring SFM: clearly, if there is significant uncontrolled deforestation, forest management is not sustainable. The indicator focuses on change as there is no ideal share of forest in land cover, as the share is determined by history, ecological circumstances and competing land uses. The indicator covers the net effect of the other parts of Target 15.2: "halt deforestation" and "substantially increase afforestation and reforestation". However most countries have reliable data on the components of this overall trend (deforestation, afforestation and reforestation), for which separate targets can be specified, if so desired. This component incorporates the concept of "net

	permanent forest loss[4]" at present classified "green" and is also used for Target 15.1 2. Changes in the stock of biomass are determined by the balance between increase in volume of wood biomass (annual increment) and decrease (natural losses and damage by fire insects etc., and wood harvest). In a sustainably managed forest, increment is more than losses, so that the biomass stock increases, or does not decrease, and carbon is sequestered from the atmosphere. With very few exceptions, a decline in total biomass stocks, even if the forest area does not decrease, implies unsustainable management (and possible degradation). As the wood/carbon ratio is constant, there will be exactly the same trends for carbon stocks as for wood biomass. Therefore a single indicator addresses carbon stocks and flows and trends in growing stock of wood, and may be expressed in m^3 of wood or in tons of carbon. 3. Forest areas managed for the conservation of biodiversity are a proxy for trends in forest biodiversity and a clear indication of political will to incorporate biodiversity into forest management. The CBD Aichi Target 11 calls for each country to conserve at least 17 per cent of terrestrial and inland water areas, so this may be taken as a goal for this element. Work is in hand on developing a number of indicators of forest biodiversity, which may be useful in the future. 4. The fourth parameter looks at the area within a country where a key tool for sustainable forest management is applied. The existence of a "forest management plan" is a necessary tool for evidence based, long term management. Those areas that are certified by third party schemes as being sustainably managed work on the basis of an independently verified management plan. While the latter fulfils a higher standard, it should be pointed out that there are very significant areas of sustainably managed forest which are not certified, either because their owners have chosen not to seek certification (which is voluntary and market-based) or because no credible (or affordable) certification scheme is in place for that area. The latter is true for most tropical countries. For this reason, using "area of certified forest" as the sole indicator could give a misleading impression.
Sources and data collection	Countries, through official government-nominated correspondents, provide data for all four elements through established data collection mechanisms, in particular the Forest Resources Assessment (FRA) of FAO. Most recently published in 2015. Data on the sub-indicators is available from practically all countries and territories, accompanied by extensive metadata on sources, definitions, conversion from national data to international standards and data quality. All FRA data are submitted (and officially approved) by national authorities. To the extent that the indicator uses terms compatible with FRA, comparable data are easily available and national statistical offices can validate and modify them as necessary. Definitions and concepts used for the sub-indicators have been specified and agreed over many years of international collaboration between experts nominated by national governments, international bodies and UN agencies. Data supplied by national authorities follow the agreed FRA2015 terms and definitions, which are now well known and accepted by forest specialists. See Forest Resources Assessment Working Paper - 180: FRA 2015 Terms and Definitions, available at http://www.fao.org/forestry/fra/2560/en/
Comments and limitations	The four elements all address major concerns, but, for conceptual and data reasons, some aspects of sustainable forest management are not included, notably jobs and livelihoods,

[4] This formulation presents some problems, notably the fact that over 70 countries have increasing forest area, so "loss" is not the appropriate term. There are also problems with defining "permanent" as changes, positive or negative, are always possible. While the intended concept is now fully addressed in this revised proposal for 15.2.1, in case IAEG members would still like to preserve a separate indicator, FAO suggests that 15.2.2 be amended as "annual average percent change in forest area". This would equally allow tracking forest area loss, as well as forest area gain (which would show up negatively if "Net permanent forest loss" is used as indicator and minus (-) 20,000 ha means a gain of 20,000 ha). Countries usually monitor forest area change and most countries already report the relevant data internationally, including through FAO's Forest Resources Assessment.

	revenue and valuation of benefits, forest health and vitality, protection function of forests (soil, water, erosion etc.). Regional and inter-regional collaboration between countries has been on-going for around 15 years to monitor aspects of sustainable forest management in more detail, supported by intergovernmental bodies. The sub-indicators used in this context build a solid foundation for the further development of more specific "thematic" indicators. However at present, this more comprehensive approach gives results which are too complex and location specific for inclusion in the global multi-sector SDG indicator set. Forest degradation: UNCCD is working together with FAO on land degradation under target 15.3 so degradation of forest land, as mentioned in Target 15.2 ("restore degraded forests") may be monitored through that indicator. Trends in biomass, especially when put on a per hectare basis, can give some indication of forest degradation. Protective functions of forests: A Mountain Green Index is being developed for Target 15.4. This would also provide relevant information on the protective functions and could at a later stage, be incorporated into the SFM index for Target 15.2.
Data for global and regional monitoring	See also "Sources and data collection". Data can be provided directly by member countries or, if necessary, taken from the FAO database at http://www.fao.org/forest-resources-assessment/explore-data/en/. The parameters chosen are all measured directly at the national level, so countries can easily set their target values. If it is considered desirable to aggregate to the regional or global level, this presents no conceptual problems.
Supplementary information	This metadata sheet was elaborated by FAO in collaboration and coordination through an informal partnership of agencies and processes with relevant experience, including notably FAO, UN Forum on Forests, CBD, UNCCD, International Tropical Timber Organisation, and regional criteria and indicator processes for Europe, Amazon, Congo Basin, low forest cover countries, and the Montréal Process[5] region. The SFM index incorporates in a single framework the two indicators already proposed to IAEG: "net permanent forest loss" (in modified form to address weaknesses of the concept of "net permanent forest loss") "area of certified forest", which would not then have to be monitored separately.
References	United Nations General Assembly resolution A/RES/62/98, 31 January 2008 (definition of sustainable forest management, non-legally binding instrument for all types of forest) FAO Global Forest Resources Assessments at http://www.fao.org/forest-resources-assessment/en/

[5] Temperate/boreal countries in North America, South America, Russia, Oceania and East Asia.

Target 15.3 By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world.

Indicator 15.3.1: Proportion of land that is degraded over total land area

From UNCCD:

Definition
This indicator is defined as the amount of land area that is degraded. The measurement unit for indicator 15.3.1 is the spatial extent (hectares or km2) expressed as the proportion (percentage) of land that is degraded over total land area.

Concepts
The following definitions, adopted by the United Nations Convention to Combat Desertification (UNCCD), are considered generic and well-accepted globally:

Land degradation is the reduction or loss of the biological or economic productivity and complexity of rainfed cropland, irrigated cropland, or range, pasture, forest and woodlands resulting from land uses or from a process or combination of processes arising from human activities.[6]

Land degradation neutrality is a state whereby the amount and quality of land resources necessary to support ecosystem functions and services and enhance food security remain stable or increase within specified temporal and spatial scales and ecosystems.[7]

Method of computation
The indicator 15.3.1 is derived by summing all those areas subject to change, whose conditions are considered negative by national authorities (i.e., land degradation) while using "good practice guidance" in the measurement and evaluation of changes to each of the following three sub-indicators:

i) land cover and land cover change,
ii) land productivity, and
iii) carbon stocks above and below ground

The most common method involves the use of site-based data to assess the accuracy of the sub-indicators derived from Earth observation and geo-spatial information. Another approach uses site-based data to calibrate and validate Earth observation indices and measures where the remote sensing variable is used to predict the same biophysical variable on the ground. A mix-methods approach, which makes use of multiple sources of information and combines quantitative and qualitative data, will likely be used to:

i) **Set Baselines** to determine the initial status of the sub-indicators in absolute values. This would include: 1) the preparation of base land cover information which builds on standard land cover ontology (e.g., LCCS/LCML); 2) the establishment of a baseline for land productivity (e.g., NPP/NDVI);

[6] http://www.unccd.int/Lists/SiteDocumentLibrary/conventionText/conv-eng.pdf
[7] Decision 3/COP12 http://www.unccd.int/Lists/OfficialDocuments/cop12/20add1eng.pdf

and 3) the establishment of a baseline for carbon stocks, above and below ground, with an emphasis on soil organic carbon below ground and building on the IPCC's work on carbon above ground.

ii) **Detect Change** in each of the sub-indicators, including the identification of areas subject to change and their validation or evaluation by a participatory national inventory of land degradation, particularly where change in two or three of the sub-indicators coincide or overlap spatially. When contextualized with information at the national and sub-national levels, areas with declining productivity and carbon stocks may be considered degraded while areas with increasing productivity and carbon stocks may be considered improving. The definition of adverse or desirable land cover changes is highly contextual and needs to take into account local ecological and socio-economic circumstances which require in-situ validation.

iii) **Derive the Indicator** by summing all those areas subject to change, whose conditions are considered negative by national authorities (i.e., land degradation) while using "good practice guidance" in their measurement and evaluation of changes within each sub-indicator and their combination.

Rationale and interpretation
Leveraging the existing reporting mechanisms of the UNCCD for these sub-indicators and those of other organizations and agencies would provide a practical approach to monitoring and reporting progress towards SDG target 15.3. **Land cover and land cover change** has multiple applications for evaluating progress towards various SDG targets and gives a first indication of land degradation. **Land productivity** points to long-term changes in the health and productive capacity of the land. On seasonal to decadal timescales, **carbon stocks** of natural and managed systems may be explained largely by changes in plant biomass ("fast variable") but, on longer time scales, soil organic carbon stocks ("slow variable") become a more relevant indicator of the functioning of the system, its adaptive capacity and resilience to perturbations (e.g., floods, drought), and thus its capacity to provide ecosystem services in a sustainable manner over the long term.

Data for global, regional and national monitoring
For land cover and land cover change, most countries have quantitative data and mapping capacities which are derived primarily from Earth observation. For carbon stocks, countries regularly report to the UNFCCC according to a tiered approach. For land productivity, data for large geographical areas can be derived using Earth observation. Following the 2006 IPCC Guidelines[8] with regards to estimation methods at three levels of detail, from tier 1 (the default method) to tier 3 (the most detailed method), the following approach for indicator 15.3.1 is proposed:

Tier 1: Earth observation, geospatial information and modelling
Tier 2: Statistics based on estimated data for administrative or natural boundaries
Tier 3: Surveys, assessments and ground measurements

Each of the tiers may have a unique approach as to how driver (land management/use) and state (land resources) variables interact in a land degradation assessment[9] which depends primarily on the data and upscaling methods available. This approach would allow national authorities to use methods consistent with their capacities and resources. A decision tree would guide the selection of which tier to use for estimating the sub-indicators according to national circumstances, including the interpretation and availability of data. For Tier 1, global and regional data sets are available from a number of reliable sources.

[8] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/0_Overview/V0_1_Overview.pdf
[9] http://www.fao.org/nr/lada/

Disaggregation
This indicator can be mapped and disaggregated by land cover type or other policy-relevant units, such as agro-ecological, bio-cultural or administrative. Land cover is a revealing metric and a disaggregation or stratification tool which provides a spatially explicit information layer for the sub-indicators on land productivity and carbon stocks as well as other SDG indicators.

Comments and limitations
As the sub-indicators will never fully capture the complexity of land degradation processes, there will always be a need for other relevant national or sub-national indicators, data and assessments to account for national circumstances and contexts. Ultimately, the expectation is that national capacities will be sufficiently increased so that each country can independently report on this indicator, as was envisioned in the UNCCD's Land Degradation Neutrality project.[10]

In the absence of national data, Earth observation and geospatial information represents the next best way to measure land degradation over large geographical areas even though it is clear that significant challenges remain. The production of comparative quantitative assessments and corresponding mapping over large geographical zones would help many countries to set policy priorities among diverse land resource areas as well as compare and transfer their experiences.

In order to operationalize this global indicator, further work is needed to provide a standardized approach and "good practice guidance" to derive the sub-indicators and help build monitoring and reporting capacities at the national, regional and global levels. Significant work is underway to develop a global partnership to train and build capacity at the national level, which for many countries can be achieved in a relatively short time frame.

The UNCCD, in close collaboration with the FAO and other relevant partners, would take the lead in compiling data for global reporting because i) the sub-indicators are already part of the UNCCD country reporting mechanism and ii) the UNCCD, with a number of funding and implementing agencies, is now building capacity in 60+ countries for implementing and monitoring SDG target 15.3. This will include the development of "good practice guidance" for indicator 15.3.1 with well-defined methodologies and decision trees using a tiered approach to data use and validation.

Linkages within the SDG indicator framework
The sub-indicators are based on generally agreed upon definitions and methodologies that facilitate interoperability with other quantitative and qualitative indicators, including the SEEA. By using these sub-indicators to derive SDG indicator 15.3.1, countries would be able to complement and validate progress towards other SDG targets. In this regard, the UNCCD is supporting the FAO in its efforts to refine and operationalize the indicators for:

- SDG target 2.4 which aims to "progressively improve land and soil productivity" using the indicator 2.4.1 "Proportion of land under productive and sustainable agriculture", and

- SDG target 15.2 which aims to "restore degraded forests and substantially increase afforestation and reforestation globally" using the indicator 15.2.1 "Progress towards sustainable forest management".

[10] http://www.unccd.int/en/programmes/RioConventions/RioPlus20/Pages/LDN-Project-Country-Reports.aspx

Target 15.4 By 2030, ensure the conservation of mountain ecosystems, including their biodiversity, in order to enhance their capacity to provide benefits that are essential for sustainable development

Indicator 15.4.1: Coverage by protected areas of important sites for mountain biodiversity

From IUCN:

These metadata are based on http://mdgs.un.org/unsd/mi/wiki/7-6-Proportion-of-terrestrial-and-marine-areas-protected.ashx, supplemented by http://www.bipindicators.net/paoverlays and the references listed below.

Goal and target addressed

Goal 15
Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.

Target 15.4
By 2030, ensure the conservation of mountain ecosystems, including their biodiversity, in order to enhance their capacity to provide benefits that are essential for sustainable development.

Definition and method of computation

Definition
The percentage of mountain sites contributing significantly to the global persistence of biodiversity that are wholly covered by designated protected areas. It is a thematic disaggregation of the multi-purpose indicator for protected area coverage of important sites.

Concepts
Protected areas, as defined by the International Union for Conservation of Nature (IUCN), are clearly defined geographical spaces, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values. Importantly, a variety of specific management objectives are recognised within this definition, spanning conservation, restoration, and sustainable use:

- Category Ia: Strict nature reserve
- Category Ib: Wilderness area
- Category II: National park
- Category III: Natural monument or feature
- Category IV: Habitat/species management area
- Category V: Protected landscape/seascape
- Category VI: Protected area with sustainable use of natural resources

The status "designated" is attributed to a protected area when the corresponding authority, according to national legislation or common practice (e.g., by means of an executive decree or the like), officially endorses a document of designation. The designation must be made for

the purpose of biodiversity conservation, not de facto protection arising because of some other activity (e.g., military).

Sites contributing significantly to the global persistence of biodiversity are identified following globally standard criteria applied at national levels. Two variants of these standard criteria have been applied in all countries to date. The first is for the identification of Important Bird & Biodiversity Areas (IBAs), that is, sites contributing significantly to the global persistence of biodiversity, identified using data on birds, of which >12,000 sites in total have been identified from all of the world's countries. The second is for the identification of Alliance for Zero Extinction sites (AZEs), that is, sites holding effectively the entire population of at least one species assessed as Critically Endangered or Endangered on The IUCN Red List of Threatened Species. In total, 587 AZE sites have been identified for 920 species of mammals, birds, amphibians, reptiles, conifers, and reef-building corals. A global standard for the identification of key biodiversity areas (KBAs) unifying these approaches along with other mechanisms for identification of important sites for other species and ecosystems is in the final stages of development and anticipated to be in place by the end of 2015. Elevational range is documented for sites, allowing disaggregation of the indicator for mountains.

Method of computation
The indicator is computed by dividing the total number of KBAs wholly covered by protected areas by the total number of KBAs in each country, and multiplying by 100. "Wholly protected" is defined as >98% coverage to allow for resolution and digitisation errors in the underlying spatial datasets.

Rationale and interpretation

The safeguard of important sites is vital for stemming the decline in biodiversity. The establishment of protected areas is an important mechanism for achieving this aim, and this indicator serves as a means of measuring progress toward the conservation, restoration and sustainable use of mountain ecosystems and their services, in line with obligations under international agreements.

Levels of access to protected areas vary among the protected area management categories. Some areas, such as scientific reserves, are maintained in their natural state and closed to any other use. Others are used for recreation or tourism, or even open for the sustainable extraction of natural resources.

In addition to protecting biodiversity, protected areas have become places of high social and economic value: supporting local livelihoods; protecting watersheds from erosion; harbouring an untold wealth of genetic resources; supporting thriving recreation and tourism industries; providing for science, research and education; and forming a basis for cultural and other non-material values.

This indicator adds meaningful information to, complements and builds from traditionally reported simple statistics of territorial area covered by protected areas, computed by dividing the total protected area within a country by the total territorial area of the country and multiplying by 100. Such percentage area coverage statistics do not recognise the extreme variation of biodiversity importance over space, and so risk generating perverse outcomes through the protection of areas which are large at the expense of those which require protection.

Sources and data collection

Protected area data are compiled by ministries of environment and other ministries responsible for the designation and maintenance of protected areas. They are compiled globally into the World Database on Protected Areas (WDPA) by the UNEP World Conservation Monitoring Centre (UNEP-WCMC). They are disseminated through the Protected Planet knowledge product http://www.protectedplanet.net/, which is jointly managed by UNEP-WCMC and IUCN and its World Commission on Protected Areas (WCPA).

KBAs are identified at national scales through multi-stakeholder processes. Data on IBAs are managed by BirdLife International, and are available online at http://www.birdlife.org/datazone/site/search. Data on AZEs are managed by the Alliance for Zero Extinction, and are available online at http://www.zeroextinction.org/. Both datasets, along with the WDPA, are also disseminated through the Integrated Biodiversity Assessment Tool for Research and Conservation Planning, available online at https://www.ibat-alliance.org/ibat-conservation/login.

Disaggregation

Given that data for the global indicator are compiled at national levels, it is straightforward to disaggregate to national and regional levels, or conversely to aggregate to the global level. The indicator can also be reported in combination across terrestrial and freshwater (and indeed marine) systems, or disaggregated among them. However, protected areas, IBAs, and AZEs can encompass terrestrial, freshwater, and marine systems simultaneously, and so determining the results is not simply additive. Finally, it can be disaggregated according to different protected area management categories (categories I–VI) to reflect differing specific management objectives of protected areas.

In addition to the aggregation of the coverage of protected areas across terrestrial and freshwater systems as an indicator towards SDG 15.1, other disaggregations of coverage of protected areas of particular relevance as indicators towards SDG targets include:

SDG 6.6	Coverage of protected areas (freshwater).
SDG 14.2	Coverage of protected areas (marine).
SDG 14.5	Coverage of protected areas (marine).

Protected area coverage data can be combined with other data sources to yield further, complementary, indicators. For example, protected area overlay with ecoregional maps can be used to provide information on protected area coverage of different broad biogeographical regions. Protected area coverage of the distributions of different groups of species (e.g., mammals, birds, amphibians) can similarly provide indicators of trends in coverage of biodiversity at the species level. Protected area coverage can be combined with the IUCN Red List Index to generate indicators of the impacts of protected areas in reducing biodiversity loss. Finally, indicators derived from protected area overlay can also inform sustainable urban development; for example, the overlay of protected areas onto urban maps could provide an indicator of public space as a proportion of overall city space.

Comments and limitations

The indicator does not measure the effectiveness of protected areas in reducing biodiversity loss, which ultimately depends on a range of management and enforcement factors not covered by the indicator. A number of initiatives are underway to address this limitation. Most notably, numerous mechanisms have been developed for assessment of protected

area management effectiveness, which can be synthesised into an indicator of management effectiveness. This is used by the Biodiversity Indicators Partnership as a complementary indicator of progress towards Aichi Biodiversity Target 11 (http://www.bipindicators.net/pamanagement). More recently, approaches to "green listing" have started to be developed, to incorporate both management effectiveness and the outcomes of protected areas, and these are likely to become progressively important as they are tested and applied more broadly.

Data and knowledge gaps can arise due to difficulties in determining whether a site conforms to the IUCN definition of a protected area, and some protected areas are not assigned management categories. Moreover, "other effective area-based conservation measures", as specified by Aichi Biodiversity Target 11 of the Strategic Plan for Biodiversity 2011–2020, recognise that some sites beyond the formal protected area network, while not managed primarily for nature conservation, may nevertheless be managed in ways which are consistent with the persistence of the biodiversity for which they are important. However, standard approaches to documentation of "other effective area-based conservation measures" are so far still in their infancy. As these are consolidated, "other effective area-based conservation measures" will be included into the WDPA and thus this indicator accordingly.

Regarding important sites, the biggest limitation is that site identification to date has focused on specific subsets of biodiversity, for example birds (for IBAs) and highly threatened species (for AZEs). While IBAs have been documented to be good surrogates for biodiversity more generally, the unification of standards for identification of important sites across different levels of biodiversity (genes, species, ecosystems) and different taxonomic groups remains a high priority. This umbrella standard for identification of key biodiversity areas is anticipated to be finalised by the end of 2015, building strongly from existing approaches.

Dates of establishment are not recorded for some protected areas in some countries, generating uncertainty around changing protected area coverage over time. This is reflected in the indicator by assigning dates of establishment for undated sites by selecting dates at random from those for other protected areas in the same country, repeating this 1,000 times, and plotting the 95% confidence intervals around mean protected area coverage accordingly.

Gender equity issues

There are no direct gender equity issues associated with the indicator for coverage of important sites for biodiversity by protected areas. However, it is essential to recognise that women play a central role in the conservation, management and use of biodiversity. In many rural areas of developing countries, women's daily tasks are often tied closely to biodiversity. They are often responsible for gathering edible wild plants (fruits, leaves and roots of native plants) to feed their families as a supplement to agricultural grains, especially during unfavourable situations such as famine, conflicts and epidemics. Women often also gather medicinal plants, firewood and other bush products for medicine, fuel, house-building, paint and even manure and pesticide. Women's knowledge of biodiversity is immense and broad, because their communities' well-being depends on it, and preservation of this knowledge is crucial for maintaining biodiversity. Yet, their contribution is often overlooked. They are typically "invisible" partners from grassroots to policy level. There is therefore an urgent need to consider gender issues in development efforts, to promote true partnership and ensure the sustainable conservation and use of biodiversity.

Data for global and regional monitoring

UNEP-WCMC is the agency in charge of calculating and reporting global and regional figures for this indicator, working with BirdLife International and IUCN to combine data on protected areas with those for sites of importance for biodiversity. UNEP-WCMC aggregates the global and regional figures on protected areas from the national figures that are calculated from the WDPA and disseminated through Protected Planet. The WDPA and Protected Planet are jointly managed by UNEP-WCMC and IUCN WCPA.

UNEP-WCMC produces the UN List of Protected Areas every 5-10 years, based on information provided by national ministries/agencies. In the intervening period between compilations of UN Lists, UNEP-WCMC works closely with national ministries/agencies and NGOs responsible for the designation and maintenance of protected areas, continually updating the WDPA as new data become available.

Quality control criteria are applied to ensure consistency and comparability of the data in the WDPA. New data are validated at UNEP-WCMC through a number of tools and translated into the standard data structure of the WDPA. Discrepancies between the data in the WDPA and new data are resolved in communication with data providers. Processed data are fully integrated into the published WDPA.

The WDPA is held within a Geographic Information System (GIS) that stores information about protected areas such as their name, size, type, date of establishment, geographic location (point) and/or boundary (polygon).

Protected area coverage is calculated using all the protected areas recorded in WDPA whose location and extent is known. Protected areas without digital boundaries are excluded from the indicator.

IBAs are places of international significance for the conservation of biodiversity, identified using data for birds. IBAs are identified using a standardised set of data-driven criteria and thresholds, relating to threatened, restricted-range, biome-restricted and congregatory species. IBAs are delimited so that, as far as possible, they: (a) are different in character, habitat or ornithological importance from surrounding areas; (b) provide the requirements of the trigger species (i.e., those for which the site qualifies) while present, alone or in combination with networks of other sites; and (c) are or can be managed in some way for conservation.

AZEs are sites meeting three criteria: endangerment (supporting at least one Endangered or Critically Endangered species, as listed on the IUCN Red List); irreplaceability (holding the sole or overwhelmingly significant (≥95%) known population of the target species, for at least one life history segment); and discreteness (having a definable boundary within which the character of habitats, biological communities, and/or management issues have more in common with each other than they do with those in adjacent areas). Hence AZEs represent locations at which species extinctions are imminent unless appropriately safeguarded (i.e. protected or managed sustainably in ways consistent with the persistence of populations of target species).

The IBA and AZE site networks are, by definition, areas of particular importance for biodiversity as referred to in Aichi Biodiversity Target 11, and represent the only networks of such sites that have been identified systematically worldwide. Hence, they represent important areas to consider designating as formal protected areas.

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Indicator 15.4.2: Mountain Green Cover Index

From FAO:

1. **Precise definition of the indicator**

The Green Cover Index is designed to measure the changes of the green vegetation in mountain areas (i.e., forest, shrubs and trees).

2. **How is the indicator linked to the specific TARGET as worded in the OWG Report?**

The scientific mountain community recognizes the existence of a direct correlation between the green coverage of mountain areas and their state of health, and – as a consequence – their capacity of fulfilling their ecosystem roles. Therefore, monitoring the mountain vegetation change over time provides an adequate measure of the status of conservation of mountain ecosystems.

In particular, the "Mountain Green Cover Index" can provide information on the forest and woody cover. Its reduction will be generally linked to forest exploitation, timber extraction, fuel-wood collection, and fire. Its increase will be due to vegetation growth possibly linked to reforestation or afforestation programmes.

The proposed Index will provide a meaningful proxy for assessing the progress of all three mountain targets (i.e., 6.6.; 15.1; and 15.4). If an order of relevance is needed, this is our proposed ranking:

a) 15.4
b) 15.1
c) 6.6

We assign priority to 15.4 because this is solely "pure" mountain indicator.

3. **Does the indicator already exist and is it regularly reported?**

This indicator does not exist yet but it can be developed using the existing dataset Global Land Cover (GLC) SHARE maintained by FAO's NRL Division.

The data set GLC SHARE developed by FAO's NRL Division will be used as basis for the computation of the indicator, jointly with the definition of mountain areas as provided by UNEP-WCMC

Produced in 2000 by UNEP-WCMC, the first map of the world's mountains defined them according to altitude, slope and local elevation range[11]:

Class 1:	Elevation > 4,500 metres
Class 2:	Elevation 3,500–4,500 metres
Class 3:	Elevation 2,500–3,500 metres
Class 4:	Elevation 1,500–2,500 metres and slope > 2
Class 5:	Elevation 1,000–1,500 metres and slope > 5 or local elevation range (LER(*) 7 kilometre radius) > 300 metres
Class 6:	Elevation 300–1,000 metres and local elevation range (7 kilometre radius) > 300 metres outside 23N—19S

As a first step and in order to define the baseline, the exercise will initially provide an overview of the current vegetation cover in mountain areas (based on GLC-SHARE 2014), and will include maps and area

[11] Local elevation range parameter is obtained with a radius of interest around each grid cell: the maximum and minimum elevations within a particular neighborhood are calculated, as well as their difference. The pixel is classified as mountain area if the LER is > 300 on a 7 km radius.

calculations of the current amount of woody vegetation (trees/shrubs) cover for each country, region and at global level and also by mountain class layer.
In five years' time, a comparison will be undertaken between GLC-SHARE 2014 and that of 2019 from which a trend will be extrapolated.
This five-year monitoring cycle is subject to the release of the GLC-SHARE data compiled by FAO's Land and Water Division (NRL); the monitoring and analysis will be under the responsibility of the Forest Conservation and Management Division and in particular of the Mountain Partnership Secretariat.

4. **Comment on the reliability, potential coverage, comparability across countries, and the possibility to compute the indicator at sub-national level.**

The index derives most of the information from GLC-SHARE, so their reliability and potential coverage are highly interrelated.
GLC-SHARE (v. 1.0): "The Global Land Cover-SHARE (GLC-SHARE) is a new land cover database at the global level created by FAO's Land and Water Division in partnership and with contribution from various partners and institutions. It provides a set of eleven major thematic land cover layers resulting from a combination of "best available" high resolution national, regional and/or sub-national land cover databases. The database is produced with a resolution of 30 arc-second2 (~1sqkm). The GLC-SHARE 2012 Beta-Release 1.0 is published by FAO in 2014. Complete free and open access to the data and metadata products are available at FAO GeoNetwork (www.fao.org/geonetwork)."
Thanks to the way GLC-SHARE is structured, the Mountain Green Cover Index has a global coverage and it is possible to compute the indicator at the global, regional, national and sub-national level. In addition, the indicator allows for an analysis across the different mountain elevation classes.
Comparability across countries is technically feasible, but it is not necessarily the most interesting statistics that the index can provide.

Target 15.5 Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity, and, by 2020, protect and prevent the extinction of threatened species.

Indicator 15.5.1: Red List Index

From IUCN:

Definition and method of computation

Definition
The Red List Index is a multi-purpose indicator which measures the aggregate change in extinction risk across groups of species. It is based on the number of species in each category of extinction risk on The IUCN Red List of Threatened Species. This indicator is expressed as an index ranging from 0 to 1.

Concepts
Threatened species are those listed on The IUCN Red List of Threatened Species in the categories Vulnerable, Endangered, or Critically Endangered (i.e., species that are facing a high, very high, or extremely high risk of extinction in the wild in the medium-term future). Changes over time in the proportion of species threatened with extinction are largely driven by improvements in knowledge and changing taxonomy. The IUCN Red List Index (RLI) therefore accounts for such changes to yield a more informative indicator than the simple proportion of threatened species. It measures change in aggregate extinction risk across groups of species over time, resulting from genuine improvements or deteriorations in the status of individual species. It can be calculated for any representative set of species that have been assessed for The IUCN Red List of Threatened Species at least twice.

Method of computation
The IUCN RLI is calculated at a point in time by first multiplying the number of species in each Red List Category by a weight (ranging from 1 for 'Near Threatened' to 5 for 'Extinct' and 'Extinct in the Wild') and summing these values. This is then divided by a maximum threat score which is the total number of species multiplied by the weight assigned to the 'Extinct' category. This final value is subtracted from 1 to give the IUCN RLI value.

Mathematically this calculation is expressed as:

$$RLI_t = 1 - \frac{\sum_s W_{c(t,s)}}{W_{EX} \cdot N}$$

Where $W_{c(t,s)}$ is the weight for category (c) at time (t) for species (s) (the weight for 'Critically Endangered' = 4, 'Endangered' = 3, 'Vulnerable' = 2, 'Near Threatened' = 1, 'Least Concern' = 0. 'Critically Endangered' species tagged as 'Possibly Extinct' or 'Possibly Extinct in the Wild' are assigned a weight of 5); $W_{EX} = 5$, the weight assigned to 'Extinct' or 'Extinct in the Wild' species; and N is the total number of assessed species, excluding those assessed as Data Deficient in the current time period, and those considered to be 'Extinct' in the year the set of species was first assessed.

The formula requires that:

- Exactly the same set of species is included in all time periods, and
- The only Red List Category changes are those resulting from genuine improvement or deterioration in status (i.e., excluding changes resulting from improved knowledge or taxonomic revisions), and
- Data Deficient species be excluded.

In many cases, species lists will change slightly from one assessment to the next (e.g., owing to taxonomic revisions). The conditions can therefore be met by retrospectively adjusting earlier Red List categorizations using current information and taxonomy. This is achieved by assuming that the current Red List Categories for the taxa have applied since the set of species was first assessed for the Red List, unless there is information to the contrary that genuine status changes have occurred. Such information is often contextual (e.g., relating to the known history of habitat loss within the range of the species). If there is insufficient information available for a newly added species, it is not incorporated into the IUCN RLI until it is assessed for a second time, at which point earlier assessments are retrospectively corrected by extrapolating recent trends in population, range, habitat and threats, supported by additional information. To avoid spurious results from biased selection of species, RLIs are typically calculated only for taxonomic groups in which all species worldwide have been assessed for the Red List, or for samples of species that have been systematically or randomly selected.

Rationale and interpretation

The world's species are impacted by a number of threatening processes, including habitat destruction and degradation, overexploitation, invasive alien species, human disturbance, pollution and climate change. This indicator can be used to assess overall changes in the extinction risk of groups of species as a result of these threats and the extent to which threats are being mitigated.

The IUCN RLI value ranges from 1 (all species are categorized as 'Least Concern') to 0 (all species are categorized as 'Extinct'). An intermediate value indicates how far the set of species has moved overall towards extinction. Thus, the IUCN RLI allows comparisons between sets of species in both their overall level of extinction risk (i.e., how threatened they are on average), and in the rate at which this risk changes over time. A downward trend in the IUCN RLI over time means that the expected rate of future species extinctions is worsening (i.e., the rate of biodiversity loss is increasing). An upward trend means that the expected rate of species extinctions is abating (i.e., the rate of biodiversity loss is decreasing), and a horizontal line means that the expected rate of species extinctions is remaining the same, although in each of these cases it does not mean that biodiversity loss has stopped. An upward IUCN RLI trend would indicate that the SDG Target 15.5 of reducing the degradation of natural habitats and protecting threatened species is on track towards halting the loss of biodiversity and thus preventing the extinction of threatened species by 2020. An IUCN RLI value of 1 would indicate that biodiversity loss has been halted.

The name "Red List Index" should not be taken to imply that the indicator is produced as a composite indicator of a number of disparate metrics, in the same way that, e.g., the Multidimensional Poverty Index is compiled. Rather, the RLI is an indicator of trends in species' extinction risk, as measured using the IUCN Red List Categories and Criteria, and is compiled from data on changes over time in the Red List Category for each species, excluding any changes driven by improved knowledge or revised taxonomy.

Sources and data collection

National agencies producing IUCN RLI data include non-governmental organisations (NGOs), government, and academic institutions working jointly and separately. Data are gathered from published and unpublished sources, species experts, scientists, and conservationists through correspondence, workshops, and electronic fora. Data are submitted by national agencies to IUCN, or are gathered through initiatives of the IUCN Red List Partnership, which includes: BirdLife International; Botanic Gardens Conservation International; Conservation International; Microsoft; NatureServe; Royal Botanic Gardens, Kew; Sapienza University of Rome; Texas A&M University; Wildscreen; and Zoological Society of London.

Most countries of the world have initiated programmes to assess the status of their species using IUCN Red List Categories and Criteria. These countries will be able to implement the IUCN RLI based on national extinction risk, once they have carried out at least two national Red Lists using the IUCN system in a consistent way. An increasing number of countries have now completed national RLIs for a range of taxa.

Disaggregation

This indicator can be disaggregated by ecosystems, habitats, countries and other political and geographic divisions, taxonomic subsets (e.g., families), suites of species relevant to particular international treaties or legislation, by species that are exposed to particular threatening processes or that deliver particular ecosystem services, or by biological or life-history traits. In each case, information can be obtained from The IUCN Red List of Threatened Species to determine which species are relevant to particular subsets (e.g. which occur in particular ecosystems, habitats, and geographic areas of interest).

Trends for disaggregated RLIs are typically calculated by excluding genuine status changes (Red List category changes) that were driven by processes operating outside the ecosystem/habitat/country.

Disaggregations of particular relevance as indicators towards SDG targets include:

SDG 2.4	Red List Index (species used for food and medicine); a disaggregation of the IUCN RLI used by the Biodiversity Indicators Partnership as an indicator towards Aichi Target 14 http://www.bipindicators.net/foodandmedicine.
SDG 2.5	Red List Index (wild relatives and local breeds); the assessment of wild relatives and local breeds of domesticated animals and plants would allow the derivation of this indicator as a disaggregation of the IUCN RLI modifying that used by the Biodiversity Indicators Partnership as an indicator towards Aichi Target 13 www.bipindicators.net/domesticatedanimals.
SDG 12.2	Red List Index (impacts of utilisation); a disaggregation of the IUCN RLI used by the Biodiversity Indicators Partnership as an indicator towards Aichi Target 4 www.bipindicators.net/redlistindexforbirdsmammalsandamphibians. This currently indicates trends in extinction risk resulting from biological resource use, derived by excluding all Red List Category changes other than those driven by unsustainable utilisation or from successful efforts to reduce or manage utilisation sustainably.
SDG 12.4	Red List Index (impacts of pollution); a disaggregation of the IUCN RLI derived by excluding all Red List Category changes other than those driven by the negative impacts of pollution or from successful efforts to reduce these.
SDG 13.1	Red List Index (impacts of climate change); a disaggregation of the IUCN RLI derived by excluding all Red List Category changes other than those driven by the negative impacts of climate change and severe weather or from successful adaptation interventions.
SDG 14.1	Red List Index (impacts of pollution on marine species); a disaggregation of the IUCN RLI for marine species, derived by excluding all Red List Category changes other than those driven by the negative impacts of pollution or from successful efforts to reduce these.
SDG 14.2	Red List Index (marine species); a disaggregation of the IUCN RLI for marine species.
SDG 14.3	Red List Index (reef-building coral species); a disaggregation of the IUCN RLI for reef-building coral species. As and when comprehensive or sampled Red List assessments have been completed for coral reef fishes, molluscs, or other taxa, these could also be incorporated into this indicator.
SDG 14.4	Red List Index (impacts of utilisation on marine species); a disaggregation of the IUCN RLI for marine species of the indicator used by the Biodiversity Indicators Partnership as an indicator towards Aichi Target 4 www.bipindicators.net/redlistindexforbirdsmammalsandamphibians, derived by excluding all Red List Category changes other than those driven by unsustainable utilisation or from successful efforts to reduce or manage utilisation sustainably.
SDG 15.1	Red List Index (terrestrial & freshwater species); a disaggregation of the IUCN RLI for terrestrial & freshwater species.
SDG 15.2	Red List Index (forest-specialist species); a disaggregation of the IUCN RLI for forest-specialist species.
SDG 15.4	Red List Index (mountain species); a disaggregation of the IUCN RLI for mountain species.
SDG 15.7	Red List Index (impacts of utilisation); a disaggregation of the IUCN RLI used by the Biodiversity Indicators Partnership as an indicator towards Aichi Target 4 www.bipindicators.net/redlistindexforbirdsmammalsandamphibians, derived by excluding all Red List Category changes other than those driven by unsustainable utilisation or from successful efforts to reduce or manage utilisation sustainably.

SDG 15.8 Red List Index (impacts of invasive alien species); a disaggregation of the IUCN RLI used by the Biodiversity Indicators Partnership as an indicator towards Aichi Target 9 http://www.bipindicators.net/birdrlitrendsdrivenbyias, derived by excluding all Red List Category changes other than those driven by the negative impacts of invasive alien species or from successful efforts to control or eradicate these.

Comments and limitations

There are four main sources of uncertainty associated with IUCN RLI values and trends.

(a) Inadequate, incomplete or inaccurate knowledge of a species' status. This uncertainty is minimized by assigning estimates of extinction risk to categories that are broad in magnitude and timing.

(b) Delays in knowledge about a species becoming available for assessment. Such delays apply to a small (and diminishing) proportion of status changes, and can be overcome in the IUCN RLI through back-casting.

(c) Inconsistency between species assessments. These can be minimized by the requirement to provide supporting documentation detailing the best available data, with justifications, sources, and estimates of uncertainty and data quality, which are checked and standardized by IUCN through Red List Authorities, a Red List Technical Working Group and an independent Standards and Petitions Sub-committee. Further, detailed Guidelines on the Application of the Categories and Criteria are maintained, as is an online training course (in English, Spanish and French).

(d) Species that are too poorly known for the Red List Criteria to be applied are assigned to the Data Deficient category, and excluded from the calculation of the IUCN RLI. For birds, only 0.8 per cent of extant species are evaluated as Data Deficient, compared with 24 per cent of amphibians. If Data Deficient species differ in the rate at which their extinction risk is changing, the IUCN RLI may give a biased picture of the changing extinction risk of the overall set of species. The degree of uncertainty this introduces can be estimated through a bootstrapping procedure that randomly assigns each Data Deficient species a category based on the numbers of non-Data Deficient species in each Red List category for the set of species under consideration, and repeats this for 1,000 iterations, plotting the 2.5 and 97.5 percentiles as lower and upper confidence intervals for the median.

The main limitation of the IUCN RLI is related to the fact that the Red List Categories are relatively broad measures of status, and the IUCN RLI can practically be updated at intervals of at least four years. The IUCN RLI captures trends in one particular aspect of biodiversity: the rate at which species are moving towards or away from extinction. However, biodiversity encompasses a much wider spectrum, from genes, through populations and species, to ecosystems. In addition, the IUCN RLI does not capture particularly well the deteriorating status of common species that are declining slowly as a result of general environmental degradation.

Gender equity issues

There are no direct gender equity issues associated with the IUCN RLI. However, it is essential to recognise that women play a central role in the conservation, management and use of biodiversity. In many rural areas of developing countries, women's daily tasks are often tied closely to biodiversity. They are often responsible for gathering edible wild plants (fruits, leaves and roots of native plants) to feed their families as a supplement to agricultural grains, especially during unfavourable situations such as famine, conflicts and epidemics. Women often also gather medicinal plants, firewood and other bush products for medicine, fuel, house-building, paint and even manure and pesticide. Women's knowledge of biodiversity is immense and broad, because their communities' well-being depends on it, and preservation of this knowledge is crucial for maintaining biodiversity. Yet, their contribution is often overlooked. They are typically "invisible" partners from grassroots to policy level. There is therefore an urgent need to consider gender issues in development efforts, to promote true partnership and ensure the sustainable conservation and use of biodiversity.

Data for global and regional monitoring

The International Union for Conservation of Nature (IUCN) Red List Index (RLI) is used as the basis for calculating this indicator.

The Red List Categories and Criteria and associated documentation for each species on the IUCN Red List are determined globally and provided principally by the Specialist Groups and stand-alone Red List Authorities of the IUCN Species Survival Commission (SSC), IUCN Secretariat-led initiatives, the BirdLife International partnership, and the other IUCN Red List partner organizations. The staff of the IUCN Global Species Programme compile, validate, and curate these data, and are responsible for publishing and communicating the results.

Red List assessments are made, either through open workshops or open-access web-based discussion fora. Assessments are reviewed by the appropriate Red List Authority (an individual or organization appointed by the IUCN SSC to review assessments for specific species or groups of species) to ensure standardization and consistency in the interpretation of information and application of the criteria. A Red List Technical Working Group and the IUCN Red List Unit work to ensure consistent categorization between species, groups and assessments. Finally, a Standards and Petitions Sub-committee monitors the process and resolves challenges and disputes over Red List assessments.

The IUCN RLI can be applied at global, regional, and national scales. Global IUCN RLIs are based on repeated assessments of species' extinction risk at the global scale. While they can be disaggregated to show trends for species at smaller spatial scales, the reverse is not true. National or regional IUCN RLIs cannot be aggregated to produce IUCN RLIs showing global trends. This is because a taxon's global extinction risk has to be evaluated at the global scale and cannot be directly determined from multiple national scale assessments across its range (although the data from such assessments can be aggregated for inclusion in the global assessment).

The IUCN publishes guidelines on applying the IUCN Red List Categories and Criteria at regional or national scales. If all species within a particular region or country have been assessed at least twice using the IUCN approach, an IUCN RLI can be calculated from national data.

The global IUCN Red List is updated annually. IUCN RLIs for any sets of species that have been comprehensively reassessed in that year are usually released alongside the update of the IUCN Red List. Data stored and managed in the IUCN Red List database (IUCN's Species Information Service, SIS) are made freely available for non-commercial use through the IUCN Red List website.

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Target 15.6 Ensure fair and equitable sharing of the benefits arising from the utilization of genetic resources and promote appropriate access to such resources.

Indicator 15.6.1: Number of countries that have adopted legislative, administrative and policy frameworks to ensure fair and equitable sharing of benefits

From FAO:

1. **Precise definition of the indicator**

This indicator builds on concrete cases in which agreement has been reached on the transfer of genetic resources between the resource provider and the resource recipient, including on how benefits arising from the use of the genetic resources will be shared.

Parties to the *Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity* (Nagoya Protocol) that subject access to genetic resources to prior informed consent are obliged under Article 6 (3)e of the Nagoya Protocol to issue a "permit or its equivalent as evidence of the decision to grant prior informed consent and of the establishment of mutually agreed terms." The ABS Clearinghouse will make permits available on-line: https://absch.cbd.int/.

The *Standard Material Transfer Agreement* (SMTA) is a mandatory contract that Parties to the *International Treaty on Plant Genetic Resources for Food and Agriculture* (International Treaty) have agreed to use whenever plant genetic resources falling under the Treaty's Access and Benefit-sharing mechanism are made available. The SMTA defines the conditions of use of the plant genetic resources as well as the benefit-sharing conditions. According to the SMTA providers shall inform the Governing Body about the Standard Material Transfer Agreements entered into. In addition, recipients who transfer resources received under a SMTA to third parties shall do so under the terms and conditions of the SMTA and shall notify the Governing Body. SMTAs are stored in the Data Store of the International Treaty. As of 21 August 2015, the Data Store has recorded 34,898 SMTAs from providers located in 30 countries, distributing material to recipients based in 172 countries. (https://mls.planttreaty.org/itt/index.php?r=stats/pubStats).

It should be noted that the number of permits or their equivalents and the number of SMTAs does not necessarily equal the number of samples/ accessions made available. Many permits/ SMTAs cover a large number of samples/ accessions.

2. **How is the indicator linked to the specific TARGET as worded in the OWG report?**

The fair and equitable sharing of benefits arising out of the utilization of genetic resources, including by appropriate access to them will contribute, it is hoped, to the conservation of biological diversity and the sustainable use of its components. The target therefore aims to monitor cases in which agreement on access to genetic resources and the sharing of benefits derived from their use has been reached.

An increase of permits or their equivalents made available to the ABS Clearinghouse and an increase of SMTAs communicated to the Governing Body of the International Treaty will indicate an increased number of cases in which access to genetic resources has been granted and in which resulting benefits will be shared on the basis of "mutually agreed terms".

3. **Does the indicator already exist and is it regularly reported?**

The information the indicator is based on is already being collected under the International Treaty. The ABS Clearinghouse is ready to start collecting permits/ equivalents. However, it should be noted that the Nagoya Protocol entered into force only recently.

i. Which agency maintains and reports it?

- The CBD Secretariat, through its ABS Clearinghouse, would be responsible for the ABS permits or their equivalents (https://absch.cbd.int/).
- FAO, through its Secretariat of the International Treaty on Plant Genetic Resources for Food and Agriculture, would track the SMTAs (www.planttreaty.org; Aya Idemitsu (aya.idemitsu@fao.org); Francisco Lopez (francisco.lopez@fao.org).

4. Comment on the reliability, potential coverage, comparability across countries, and the possibility to compute the indicator at sub-national level.

In principle, the "permits/ equivalents indicator" will capture all cases of access and benefit-sharing which are covered by ABS laws of countries that are Parties to the Nagoya Protocol.

The SMTA indicator captures all access and benefit-sharing cases relating to material governed by the Treaty's Access and Benefit-sharing mechanism.

Not all countries or providers of genetic resources will always report all permits / SMTAs. However, as countries become Parties to the International Treaty and the Nagoya Protocol and increasingly comply with their reporting obligations under the two instruments, reliability, coverage and comparability across countries will improve.

Sub-national estimates might require additional work.

Target 15.7 Take urgent action to end poaching and trafficking of protected species of flora and fauna and address both demand and supply of illegal wildlife products.

Indicator 15.7.1: Proportion of traded wildlife that was poached or illicitly trafficked

From UNODC:

Definition: The proportion of traded wildlife that was poached or illicitly trafficked is defined as the proportion of total wildlife seizures to the total wildlife traded as evidenced by export permits issued. The different wildlife products traded and seized are compared by applying an aggregation measure.

Concepts:

Wildlife is defined as protected wild species of flora and fauna which are legally traded and included in the CITES Appendices. With the exception of Appendix I species, most protected wildlife is legally traded.

Poaching is defined as the illegal taking of wildlife for the purposes of international trade.

Illicit trafficking is defined as illegal import or export of wildlife.

Export Permits are required to export CITES-listed wildlife by every Member State (defined in Article VI of CITES, which regulates the information export permit shall contain and in Resolution Conf. 8.5, in which the Conference of the Parties to the Convention agreed on the information to be included in an export permit[i]).

Seizures are the result of confiscation of wildlife or wildlife products by national law enforcement authorities. Seizures occur when law enforcement authorities have suspicion that the wildlife or wildlife product they encounter is obtained or trafficked illegally. Depending on where, when and why national law enforcement authorities seize wildlife and wildlife products, the information about the seized items corresponds more or less to the variables defined by CITES in the export permit. A minimum prerequisite of a seizure report is naming the species (or lowest taxonomic level possible) of the seized specimen. Also the quantity of specimens and the unit of measure are ideally included, as well as the trade term defining the product that is seized.

Aggregation measure. The weight and number of seizures cannot be used as an indicator of poaching, because it is meaningless to compare or add the different wildlife products. Since legal trade does occur among all species products, including those listed on CITES Appendix I, it is possible to derive standard prices from import records in a common market and to determine, for example, what the relative value of rosewood is as compared to dried seahorses.

Method of computation

$$PIT = \frac{total\ aggregated\ wildlife\ seizures}{total\ aggregated\ wildlife\ export\ permits\ issued}$$

Aggregation: defining a common matrix to aggregate wildlife seizures related to different species

For the purpose of calculating an aggregated figure import and expert prices are associated to each species.

The methodology used to derive the aggregated indicator is as follows:

- Let commodity *x* have *n* number of reported declared values; $\{v_1, v_2 \ldots\ldots v_n\}$
- Assuming that each report involves several units of the commodity $\{x_1, x_2, \ldots\ldots x_n\}$,
- the value assigned to each report is: $\{x_1 * v_1, x_2 * v_2, \ldots\ldots\ldots x_n * v_n\}$
- Thus, the value of all the reported amounts of the commodity x is: $\sum_{i=1}^{n} xi * vi$
- The wildlife seizure index for commodity x used for this report is the weighted average

$$vx = \frac{\sum_{i=1}^{n} xi * vi}{\sum_{i=1}^{n} xi}$$

Rationale and interpretation

The indicator measures the law enforcement effort to combat poaching and illegal trafficking of protected species of flora and fauna, with seizures representing law enforcement action. Since trends in seizures are meaningless without some indication of trends in demand, import and export permits issued (required under CITES) are used as an indicator of legal market demand.
Comparing seizures of wildlife and wildlife products and legal trade intends to measure the last part of the target "address both demand and supply of illegal wildlife products".

Sources and data collection
Data on the two component of the indicators (seizures and legal trade) are regularly maintained by national authorities. As part of the obligations of the 181 States Parties to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), countries report annually on legal trade and biennially on illegal trade, so **there already exists a global repository of data for monitoring**.

1) The required details on the legal trade in protected wildlife and wildlife products are derived from import and export permits issued. The records of this legal trade collected by the CITES Secretariat. All CITES parties (n=180) are required to submit data annually on the export and import permits they issue - three years of non-compliance results in the sanction of being excluded from the trade in wildlife.
2) Seizures of protected wildlife and wildlife products. The records of these seizures are being collected by the CITES Secretariat and the World Customs Organization. The records of this illegal trade are managed by the United Nations Office on Drugs and Crime under the International Consortium on Combatting Wildlife Crime partnership. The data currently maintained by UNODC includes over 160,000 seizures from 114 countries.
3) Declared values for imported wildlife products. These are collected by national governments and are maintained in the global wildlife database by UNODC.

Disaggregation
This indicator can be disaggregated by Kingdom/Phylum/Class/Order/Family/Genus/Species. This would be useful if there is an interest to only consider certain groups, for example mammals or birds. Disaggregation by units or products would also be possible.

Comments and limitations

Not all parties submit seizure data, and some do not submit comprehensive seizure data. It may be necessary to tailor a sample of countries to compare with the legal import data.

Since a single indicator is sought for poaching across a wide range of species, this indicator will necessarily encompass a wide range of trends among disparate species. If the indicator is disaggregated for specific species, it cannot be applied if there is no legal trade which is the case for Appendix I species (for example elephants). However, for some of these species direct poaching indicators exist, such as the MIKE system for elephants.[ii]

Gender equality issues

Male members of several species are more likely to be poached.

Data for global and regional monitoring

Regional datasets may be more robust. Submission of seizure data within the EU is nearly universal.[iii] Prospects exist for recruiting data through regional Wildlife Enforcement Networks, such as ASEAN-WEN.

Target 15.8 By 2020, introduce measures to prevent the introduction and significantly reduce the impact of invasive alien species on land and water ecosystems and control or eradicate the priority species.

Indicator 15.8.1: Proportion of countries adopting relevant national legislation and adequately resourcing the prevention or control of invasive alien species

From UNEP:

International use of the indicator

This indicator is utilized by the Convention on Biological Diversity for assessing progress towards Aichi Biodiversity Target 9 of the Strategic Plan for Biodiversity 2011-2020:

By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.

Indicator Partner

IUCN SSC Invasive Species Specialist Group

Monash University

Concordia University

BirdLife International

What is the *Adoption of National Legislation Relevant to the Prevention of Control of Invasive Alien Species* indicator?

This indicator measures the management response globally, by tracking invasive alien species legislation for control and prevention at national and international levels. The more countries with Invasive Alien Species (IAS) and Biosecurity related legislation, the greater the global commitment to controlling the threat to biodiversity from IAS. The larger the number of IAS-relevant international policies, and the greater the level of national commitment to these, the greater the global commitment to controlling IAS. The more international agreements a country is party to the more strongly committed the country is to controlling IAS.

Sampling methodology and data selection

Data for this indicator were produced as follows: any national legislation relevant to controlling invasive alien species was identified for each of the 191 Parties to the CBD. Legislation was considered relevant to the prevention of alien species introductions or to control of invasive alien species if it applied to multiple taxonomic groups and was not exclusively intended to protect agriculture. If two separate sets of legislation within a country covered plants and animals, the date of the more recent legislation was used.

Rationale and interpretation

The projection of the current trend of adoption of national policies on invasive alien species projects a non-significant increase by 2020, with a slowing of the rate of increase in the proportion of countries adopting such legislation. The adoption of national and international policies on invasive alien species may be a first step to combatting the spread of invasive alien species.

Strengths

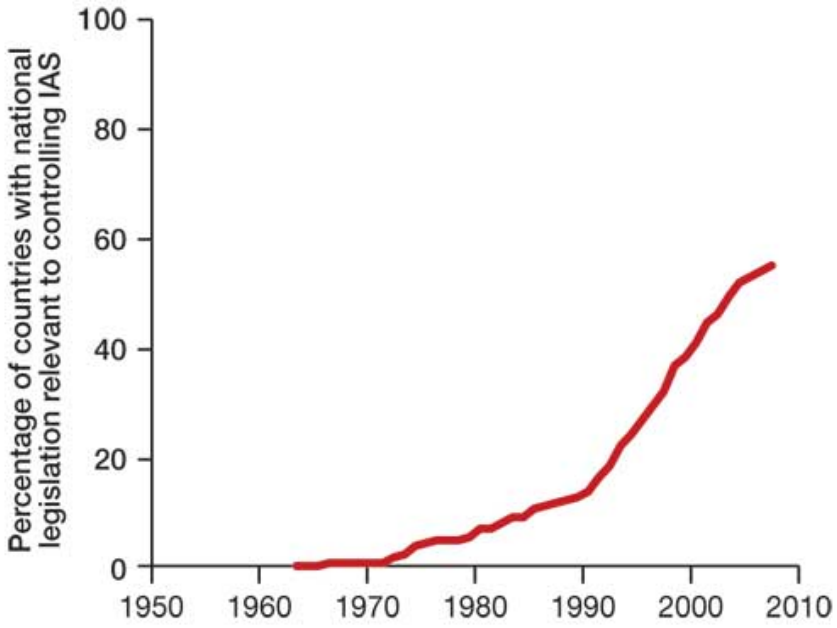
- This indicator covers 191 countries worldwide.

Caveats

- The adoption of legislation does not necessarily indicate the existence of regulations or policy to implement the legislation or how successful such implementation has been on the ground There still remains a need for further indicator development to make this link clearer.
- Legislation does not necessarily capture all efforts against invasive alien species that are happening at the national level.

Current storyline

55% of countries that are Party to the CBD have overarching national legislation to prevent, control and/or limit the spread and impact of invasive alien species.



Adoption of national legislation relevant to the prevention or control of invasive alien species.
Source: McGeoch *et al*. (2010) Global indicators of alien species invasion: threats, biodiversity impacts and responses. *Diversity and Distributions*, **16**, 95-108.

This indicator measures the adoption of national legislation relevant to the prevention or control of invasive alien species. The global trend in policy response has been positive for the few last decades and, since the publication of GBO3, the adoption of policies against invasive alien species has significantly increased.

As reported in 2010, 55% of the countries signatories to the CBD have enacted invasive alien species relevant national legislation, and most CBD parties were signatory to at least one of ten other multilateral agreements that cover IAS in some form. Among these countries 8% are signatory to all 10 international agreements (McGeoch *et al.* 2010). For example, the Council of Europe has been developing and adopting codes of conduct addressing some key pathways (e.g. horticulture, botanic gardens, zoos, hunting, or fishing) of invasive alien species. Moreover, once the European regulation on invasive alien species is fully adopted, it will have major implications for neighbouring countries, but also at a world scale, as the European institution is a major partner for global trade.

Producing this indicator nationally…

All countries (191 in 2010) party to the Convention on Biological Diversity (CBD) were included in this calculation. Ten multinational environment related agreements were used to quantify trends in the adoption of IAS related policy. National legislation related to the prevention, management and control of IAS was recorded including year of enactment, type of legislation (prevention, management etc.) and the data analysed to calculate the indicator.

Use at the national level…

As reported in 2010, 55% of the countries signatories to the CBD have enacted invasive alien species relevant national legislation, and most CBD parties were signatory to at least one of ten other multilateral agreements that cover IAS in some form. Among these countries 8% are signatory to all 10 international agreements (McGeoch et al. 2010). For example, the Council of Europe has been developing and adopting codes of conduct addressing some key pathways (e.g. horticulture, botanic gardens, zoos, hunting, or fishing) of invasive alien species. Moreover, once the European regulation on invasive alien species is fully adopted, it will have major implications for neighbouring countries, but also on a global scale, as the European institution is a major partner for global trade.

Future developments…

This indicator was first calculated in 2010 and there has been no update since. Plans are to update this baseline, enhance it and make it available for global, regional and national use.

Further resources

For further information on *Adoption of national legislation relevant to the prevention or control of invasive alien species indicator* visit http://www.bipindicators.net/iaslegislationadoption

McGeoch, M.A., Butchart, S.H.M., Spear, D., Marais, E., Kleynhans, E.J., Symes, A., Chanson, J. and Hoffmann, M. Diversity and Distributions 16, 95-108

Target 15.9 By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts.

Indicator 15.9.1: Progress towards national targets established in accordance with Aichi Biodiversity Target 2 of the Strategic Plan for Biodiversity 2011-2020

No metadata received on current indicator formulation

Target 15.a Mobilize and significantly increase financial resources from all sources to conserve and sustainable use biodiversity and ecosystems.

Indicator 15.a.1: Official development assistance and public expenditure on conservation and sustainable use of biodiversity and ecosystems

No metadata received on current indicator formulation.

Target 15.b Mobilize significant resources from all sources and at all levels to finance sustainable forest management and provide adequate incentives to developing countries to advance such management, including for conservation and reforestation

Indicator 15.b.1: Official development assistance and public expenditure on conservation and sustainable use of biodiversity and ecosystems

From OECD:

Definition and method of computation

Total official development assistance (ODA) commitments to the forestry sector (purpose code 312). Data expressed in US dollars at the average annual exchange rate.

Rationale and interpretation

ODA is the accepted measure of international development co-operation. In this case it captures aid in support of forestry projects and programmes in developing countries.

Sources and data collection

Data are compiled by the Development Assistance Committee (DAC) of the Organisation for Economic Co-operation and Development from returns submitted by its member countries and other aid providers. Data are available here.

Disaggregation

The data are generally obtained on an activity level, and include numerous parameters. They can thus be disaggregated by provider and recipient country; by type of finance, and by type of resources provided.

Comments and limitations

The data only cover official concessional support from donor countries.

Gender equality issues

OECD/DAC data also include among others a "gender equality" marker which identifies individual projects that have a clear gender dimension.

Data for global and regional monitoring

Data are available for essentially all high-income countries, and for an increasing number of middle-income aid providers.

Supplementary information

See Measuring aid to forestry.

References

OECD, 2015 Aid to the Agriculture, Forestry, Fishing and Rural Development sectors

Target 15.c Enhance global support for efforts to combat poaching and trafficking of protected species, including by increasing the capacity of local communities to pursue sustainable livelihood opportunities.

Indicator 15.c.1: Proportion of traded wildlife that was poached or illicitly trafficked

From UNODC:

Definition: The proportion of traded wildlife that was poached or illicitly trafficked is defined as the proportion of total wildlife seizures to the total wildlife traded as evidenced by export permits issued. The different wildlife products traded and seized are compared by applying an aggregation measure.

Concepts:

Wildlife is defined as protected wild species of flora and fauna which are legally traded and included in the CITES Appendices. With the exception of Appendix I species, most protected wildlife is legally traded.

Poaching is defined as the illegal taking of wildlife for the purposes of international trade.

Illicit trafficking is defined as illegal import or export of wildlife.

Export Permits are required to export CITES-listed wildlife by every Member State (defined in Article VI of CITES, which regulates the information export permit shall contain and in Resolution Conf. 8.5, in which the Conference of the Parties to the Convention agreed on the information to be included in an export permit[iv]).

Seizures are the result of confiscation of wildlife or wildlife products by national law enforcement authorities. Seizures occur when law enforcement authorities have suspicion that the wildlife or wildlife product they encounter is obtained or trafficked illegally. Depending on where, when and why national law enforcement authorities seize wildlife and wildlife products, the information about the seized items corresponds more or less to the variables defined by CITES in the export permit. A minimum prerequisite of a seizure report is naming the species (or lowest taxonomic level possible) of the seized specimen. Also the quantity of specimens and the unit of measure are ideally included, as well as the trade term defining the product that is seized.

Aggregation measure. The weight and number of seizures cannot be used as an indicator of poaching, because it is meaningless to compare or add the different wildlife products. Since legal trade does occur among all species products, including those listed on CITES Appendix I, it is possible to derive standard prices from import records in a common market and to determine, for example, what the relative value of rosewood is as compared to dried seahorses.

Method of computation

$$PIT = \frac{total\ aggregated\ wildlife\ seizures}{total\ aggregated\ wildlife\ export\ permits\ issued}$$

Aggregation: defining a common matrix to aggregate wildlife seizures related to different species

For the purpose of calculating an aggregated figure import and expert prices are associated to each species.

The methodology used to derive the aggregated indicator is as follows:

- Let commodity *x* have *n* number of reported declared values; $\{v_1, v_2 \ldots\ldots v_n\}$
- Assuming that each report involves several units of the commodity $\{x_1, x_2, \ldots\ldots x_n\}$,
- the value assigned to each report is: $\{x_1 * v_1, x_2 * v_2, \ldots\ldots\ldots x_n * v_n\}$
- Thus, the value of all the reported amounts of the commodity x is: $\sum_{i=1}^{n} xi * vi$
- The wildlife seizure index for commodity x used for this report is the weighted average

$$vx = \frac{\sum_{i=1}^{n} xi * vi}{\sum_{i=1}^{n} xi}$$

Rationale and interpretation

The indicator measures the law enforcement effort to combat poaching and illegal trafficking of protected species of flora and fauna, with seizures representing law enforcement action. Since trends in seizures are meaningless without some indication of trends in demand, import and export permits issued (required under CITES) are used as an indicator of legal market demand.
Comparing seizures of wildlife and wildlife products and legal trade intends to measure the last part of the target "address both demand and supply of illegal wildlife products".

Sources and data collection
Data on the two component of the indicators (seizures and legal trade) are regularly maintained by national authorities. As part of the obligations of the 181 States Parties to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), countries report annually on legal trade and biennially on illegal trade, so **there already exists a global repository of data for monitoring**.

4) The required details on the legal trade in protected wildlife and wildlife products are derived from import and export permits issued. The records of this legal trade collected by the CITES Secretariat. All CITES parties (n=180) are required to submit data annually on the export and import permits they issue - three years of non-compliance results in the sanction of being excluded from the trade in wildlife.
5) Seizures of protected wildlife and wildlife products. The records of these seizures are being collected by the CITES Secretariat and the World Customs Organization. The records of this illegal trade are managed by the United Nations Office on Drugs and Crime under the International Consortium on Combatting Wildlife Crime partnership. The data currently maintained by UNODC includes over 160,000 seizures from 114 countries.
6) Declared values for imported wildlife products. These are collected by national governments and are maintained in the global wildlife database by UNODC.

Disaggregation
This indicator can be disaggregated by Kingdom/Phylum/Class/Order/Family/Genus/Species. This would be useful if there is an interest to only consider certain groups, for example mammals or birds. Disaggregation by units or products would also be possible.

Comments and limitations

Not all parties submit seizure data, and some do not submit comprehensive seizure data. It may be necessary to tailor a sample of countries to compare with the legal import data.

Since a single indicator is sought for poaching across a wide range of species, this indicator will necessarily encompass a wide range of trends among disparate species. If the indicator is disaggregated for specific species, it cannot be applied if there is no legal trade which is the case for Appendix I species (for example elephants). However, for some of these species direct poaching indicators exist, such as the MIKE system for elephants.[v]

Gender equality issues

Male members of several species are more likely to be poached.

Data for global and regional monitoring

Regional datasets may be more robust. Submission of seizure data within the EU is nearly universal.[vi] Prospects exist for recruiting data through regional Wildlife Enforcement Networks, such as ASEAN-WEN.

[i] The information to be included in an export permit: 1.The full name and the logo of the Convention, the complete name and address of the Management Authority issuing the permit, a control number,

the complete names and addresses of the exporter and importer, the date of issue and the date of expiry, the name of the signatory and his handwritten signature, the embossed seal or ink stamp of the Management Authority, a statement that the permit, if it covers live animals, is only valid if the transport conditions comply with the CITES Guidelines for Transport of Live Animals or, in case of air transport, with the IATA Live Animals Regulations, the registration number of the operation, attributed by the Secretariat, when the permit involves specimens of a species included in Appendix I that originate from an operation practising breeding in captivity for commercial purposes (Article VII, paragraph 4, of the Convention), and the name of the operation when it is not the exporter. 2.The scientific name of the species to which the specimen belongs and a description of the specimens including the numbers of the marks appearing on the specimens if they are marked or if a Resolution of the Conference of the Parties prescribes marking. 3.The appendix in which the species or subspecies or population is listed, the source of the specimen and the quantity of specimens and, if appropriate, the unit of measure used. 4.The actual quantity of specimens exported, certified by the stamp or seal and signature of the authority that carried out the inspection at the time of the exportation.

A separate permit or certificate shall be required for each consignment of specimens.

[ii] For more information please refer to http://www.cites.org/eng/prog/mike_etis.php

[iii] The EU-TWIX database has been developed to assist national law enforcement agencies, including CITES Management Authorities and prosecutors, in their task of detecting, analyzing and monitoring illegal activities related to trade in fauna and flora covered by the EU Wildlife Trade Regulations. The main section of the database is designed to become a central source of seizures and offences data reported by all 28 EU Member States. http://www.eutwix.org/

[iv] The information to be included in an export permit: 1.The full name and the logo of the Convention, the complete name and address of the Management Authority issuing the permit, a control number, the complete names and addresses of the exporter and importer, the date of issue and the date of expiry, the name of the signatory and his handwritten signature, the embossed seal or ink stamp of the Management Authority, a statement that the permit, if it covers live animals, is only valid if the transport conditions comply with the CITES Guidelines for Transport of Live Animals or, in case of air transport, with the IATA Live Animals Regulations, the registration number of the operation, attributed by the Secretariat, when the permit involves specimens of a species included in Appendix I that originate from an operation practising breeding in captivity for commercial purposes (Article VII, paragraph 4, of the Convention), and the name of the operation when it is not the exporter. 2.The scientific name of the species to which the specimen belongs and a description of the specimens including the numbers of the marks appearing on the specimens if they are marked or if a Resolution of the Conference of the Parties prescribes marking. 3.The appendix in which the species or subspecies or population is listed, the source of the specimen and the quantity of specimens and, if appropriate, the unit of measure used. 4.The actual quantity of specimens exported, certified by the stamp or seal and signature of the authority that carried out the inspection at the time of the exportation.

A separate permit or certificate shall be required for each consignment of specimens.

[v] For more information please refer to http://www.cites.org/eng/prog/mike_etis.php

[vi] The EU-TWIX database has been developed to assist national law enforcement agencies, including CITES Management Authorities and prosecutors, in their task of detecting, analyzing and monitoring illegal activities related to trade in fauna and flora covered by the EU Wildlife Trade Regulations. The main section of the database is designed to become a central source of seizures and offences data reported by all 28 EU Member States. http://www.eutwix.org/