Biodiversity Indicator Guidance: Improvement in Status of Threatened Species as a Result of Funding

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Summary

This report provides guidance on the implementation of a proposed biodiversity indicator to estimate the impacts on biodiversity of a funding portfolio. It was selected in the context of, and is presented in the format of, an ICF (International Climate Finance) KPI (Key Performance Indicator). Further development and stakeholder consultation may be required to consider suitability for specific implementation.

Biodiversity is often overlooked within funding portfolios, and is not yet included within the ICF KPIs, leaving an important gap in monitoring. The guidance in this report presents an option for filling this gap. Unprecedented levels of species loss as a direct result of human activity are experienced globally. Conserving threatened species and restoring species' status is an important aim of global biodiversity targets. Monitoring the contribution of funding portfolios towards improving species' conservation status is crucial in assessing progress towards achieving these targets. The proposed indicator quantifies the global reduction in threatened species' extinction risk as a result of funding portfolios, based on the International Union for the Conservation of Nature (IUCN) Species Threat Abatement and Restoration (STAR) metric. This report acts as a user guide, outlining the data requirements and methodologies for ICF programmes to report against the indicator, and describing how programme scores can be aggregated to measure the impact of entire funding portfolios.

A second and separate proposed biodiversity indicator that could be used within the same context is presented in "Biodiversity Indicator Guidance: Hectares Under Ecological Restoration as a Result of Funding". Both indicators were selected following a review of existing biodiversity frameworks and indicators.

Contents

1 Rationale

The purpose of this indicator is to monitor the potential contribution towards improving the conservation status of threatened species achieved by nature-based solutions (NbS) receiving UK International Climate Finance (ICF) funding. This is based on the most comprehensive assessment of global species threats, the International Union for the Conservation of Nature (IUCN) Red List of Threatened Species. The indicator uses information on the spatial extent of a reduction in threats to quantify the contributions that reducing threats and restoring habitats in specific locations offer towards alleviating extinction risk, based on the IUCN Species Threat Abatement and Restoration (STAR) metric.

Adopting the IUCN STAR approach enables quantification of the contribution of conservation activities in specific locations towards improving the status of selected threatened species worldwide. STAR estimates the benefits of threat abatement and habitat restoration activities for species extinction risk reduction in terrestrial environments and utilises existing IUCN Red List data to generate an additive, spatially explicit metric. STAR units can be reported annually, based on the threat abatement and restoration activities conducted in that year, and cumulatively across the timeline of the project. While the calculation is largely based on global datasets, the indicator generation will require some project-level input to apply at local scales.

2 Indicator summary

- **Units:** STAR units. One STAR unit is approximately equivalent to reducing the extinction risk of one species by one Red List category
- **Disaggregation summary:** The STAR metric can be disaggregated by threat, based on known contribution of threat to species extinction risk. This gives the potential contribution of conservation activities abating specific threats to reducing extinction risk globally
- **Headline data to be reported:** Annual STAR units and cumulative net STAR units calculated based on programme activities as a result of funding
- **Timing issues:** Reporting should take place annually
- **Links to KPI portfolio:** Aspects of the threat abatement component of STAR overlap with KPI 8 and KPI 17, for example avoided deforestation could be classed as the reduction in "Logging & wood harvesting" (and other threats depending on the intended use of cleared land). However, the STAR process specifically focuses on the impact of avoided threats and restored habitats to species of conservation concern.

3 Technical definition

The STAR metric is based on the Red List classifications of species' extinction risk, threats and habitats. For the purposes of this indicator a threatened species is any species that ranks as Near Threatened, Vulnerable, Endangered, Critically Endangered in the IUCN Red List categories. Species are classified using Red List assessment criteria and any species that is "close to qualifying for or is likely to qualify for a threatened category in the near future" is classed as Near Threatened. The criteria assess the trends in population size, geographic range, number of individuals, restrictions on population size (for example the area of occupancy is restricted due to human activities) and the probability of extinction in the wild. Species assessments are based on all "available evidence concerning its numbers, trends and distribution."

STAR is the sum of two components: the STAR threat-abatement score ($STAR_t$) and the STAR restoration score ($STAR_r$). $STAR_t$ estimates the contribution of threat abatement activities towards reducing extinction risk, while $STAR_r$ estimates the contribution of habitat restoration efforts. In this context threats are defined as "*the proximate human activities or processes that have impacted, are impacting, or may impact the status of the taxon being assessed*." The method assumes that "*complete alleviation of threats would reduce extinction risk through halting the decline and/or permitting sufficient recovery in population and distribution, such that the species could be downlisted to the IUCN Red List category of Least Concern*." It is acknowledged that complete threat abatement is challenging and unlikely that species recovery will be constant throughout its range. The $STAR_r$ reflects the proportion of global remaining habitat for a specific species represented by the area of habitat restored at a specific location. A multiplier derived from a meta-analysis of ecosystem restoration is applied to down-weight the $STAR_r$ score to reflect the slow and low success rates of habitat restoration.

4 Methodological summary

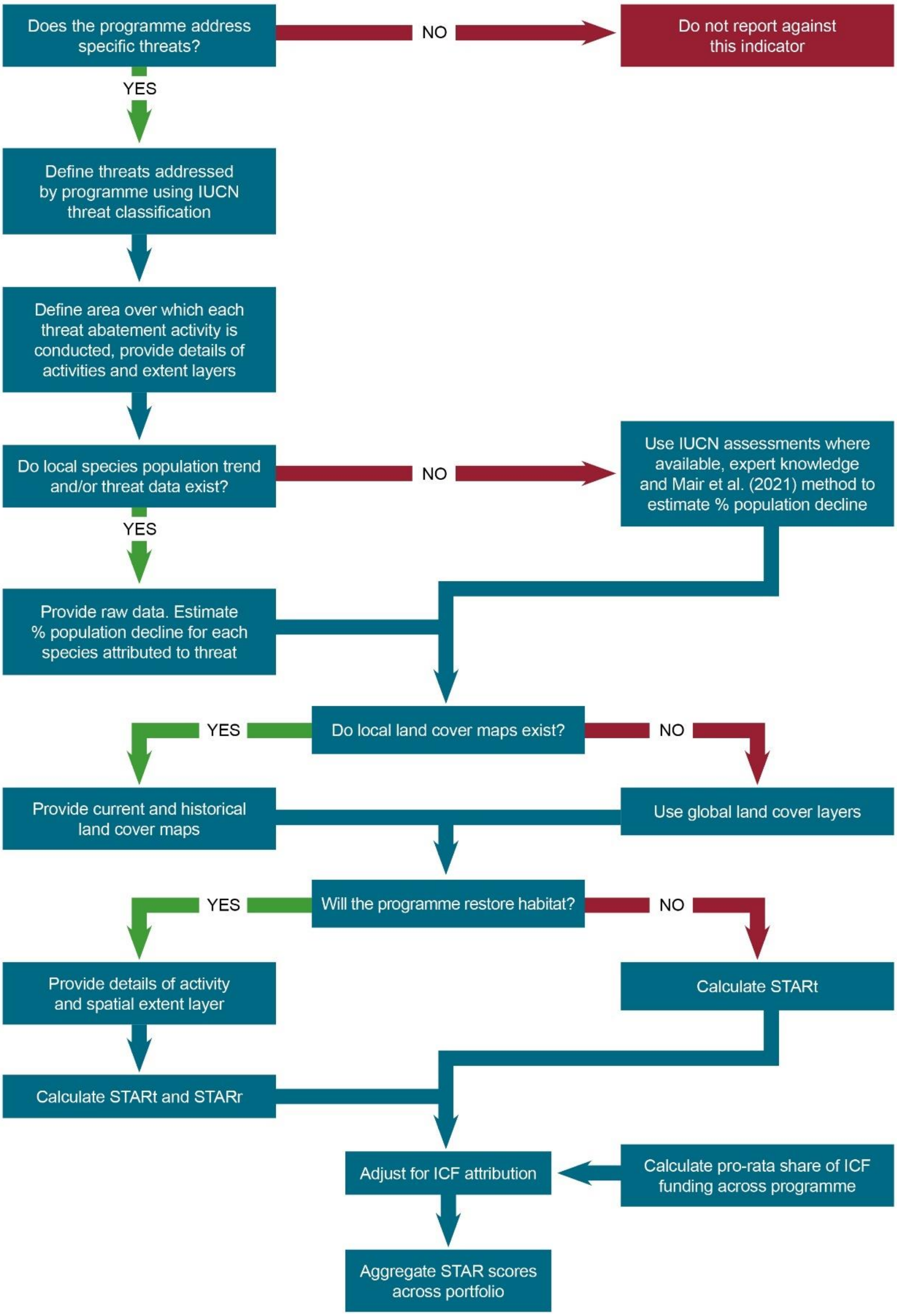

Figure 1: Summary diagram of methodology for STAR indicator calculation.

5 Methodology

The programme managers are expected to collate and report annual data to inform the STAR metric but are not required to complete the calculation at the programme level as ICF analysts will carry out this process (but see Appendix 1 for more detail on STAR calculation using the approach outlined by Mair et al. (2021) and Appendix 2 for steps to aggregate across a portfolio). Steps 1-4 relate to the data requirements of $STAR_t$ while steps 5-6 are additional stages relevant to $STAR_r$ estimation.

1. Identify the threats addressed by the programme

IUCN defines threats as “the proximate human activities or processes that have impacted, are impacting, or may impact the status of the taxon being assessed.” The IUCN Threats Classification Scheme will be applied to define the threats abated in the scope of the programme. The STAR methodology is not prescriptive as to the level of threat reduction or habitat restoration activity that qualifies as contributing towards attainment of STAR units. However, it is assumed that complete abatement of threats to a species will stabilise the population to achieve Least Concern status. Therefore, a significant level of threat abatement and habitat restoration activity is required for a programme to count towards achieving an improvement in species status. Programme managers will need to assess whether NbS activities within the programme demonstrate an appropriate level of threat reduction and habitat restoration to have a positive impact within the context of each project. For example, if a project aims to reduce the pollution from excess nutrient loads over an area of land, a 20% reduction in the amount of fertiliser applied to the land will not significantly alleviate this threat, while a 90-100% reduction in fertiliser applications will qualify as a threat abatement activity. This process is subjective, and the project teams will need to justify decisions within the project activity plan. Discussions with programme managers and ICF teams may be required to establish a reasonable level of threat abatement activity in some projects.

2. Define area over which each threat is abated

The area covered by activities to reduce the impact of each threat addressed by the programme will be provided as a spatial extent layer. The extent of threat reduction activities may overlap. For example, a project establishing agroforestry initiatives in place of intense agriculture will reduce both threat 2.1 Annual and perennial non-timber crops and 9.3 Agricultural & forestry effluents.

3. If local knowledge or data exist, provide estimate of the percentage population decline for each threat for each species in abatement area (Optional)

This step can be replaced by estimates following Mair et al. (2021) methodology (see Appendix 1) where threat scope and severity assessments exist in Red List assessments. Where local data are likely to be higher quality, or if threat assessments are missing from the Red List data, local knowledge, expert opinion and available data can be applied to directly estimate the population decline caused by threats, or to estimate the scope and severity of threats to each species and generate population decline estimates using Appendix 1 Table 4. For example, timeseries data showing the decline in Orangutan abundance in Sumatra could be combined with local expertise and/or data documenting habitat conversion to agriculture for the same area to estimate the percentage population decline attributable to habitat loss.

4. If local data are available, provide current and historical land cover maps (Optional)

Global datasets detailing land cover over multiple years exist at a coarse resolution (for example the European Space Agency provide annual land cover maps at 300m resolution data from 1992 to 2015). However, if local land cover information exists at a finer resolution current and historical layers should be provided by the project. The historical land cover maps will be used to estimate habitat distribution before human disturbance. These data will later be combined with species range extent layers and elevation data to generate estimates of current and restorable AOH (see Appendix 1). During STAR calculation the land cover map classifications are matched to IUCN Red List habitat classification scheme (see Appendix 1).

5. Determine if the project will restore habitat (or expand the extent of existing habitat) to increase species AOH

To quantify the potential contribution of habitat restoration activities on reducing species extinction risk ($STAR_r$), the restorable AOH for species will be estimated by comparing the original AOH (defined as the "extent of original ecosystem types before human impact") with the current AOH. Historic land cover maps are combined with species range extent layers and elevation data to define original AOH (see Appendix 1).

6. If the programme will restore habitat, provide spatial extent layer of restoration activity

The spatial extent layer will feed into $STAR_r$ calculation (see Appendix 1) to determine the programme contribution to reducing extinction risk of threatened species through habitat restoration activities.

7. Calculate pro-rata share of ICF funding across programme

If ICF is responsible for all investment in the programme, the programme reports the STAR units achieved in its entirety. Where there are multiple funding sources across the programme the proportion of total spend attributed to portfolio will be calculated and only that proportion of the programme STAR units can be reported against ICF funding.

6 Worked example

A hypothetical project aims to reduce the impact of agricultural pollution on threatened species by altering the management practices over a large area of oil-palm cropland in southeast Sumatra, Indonesia. Agricultural effluents, including nutrient loads, herbicides and sedimentation, pollute the wetlands and waterways of this region, threatening species such as the otter civet, smooth-coated otter, Chinese egret and spot-billed pelican. The project is reporting progress in its third year.

1. Identify the threats addressed by the project

This project aims to reduce nutrient loading and herbicide/pesticide pollution of the surrounding waterways by changing management practices. In this year the project aims to reduce fertiliser application based on recommendations from consultants and halt the application of chemical herbicides, establishing mechanical weeding protocols instead. These management activities are planned over the entire project boundary, while the project will also trial the establishment of a 1 km buffer strip around a portion of the site. In following years, the fertiliser rates may be further reduced and buffer strips extended over larger areas of the plantation.

2. Define area over which each threat is abated

Table 1 and Figure 2 provide details of the project's activities in the third year.

Table 1: Details of project activities, threats abated and area of each activity.

Activity in year 3	Threat abated	Area of activity for year 3 (ha)	Shapefile provided
Reduce fertiliser rates over entire area	9.3.1 Nutrient loads	15,500	✓
Adapt fertiliser application methods to only apply small amounts to plantation areas, with no spraying of surround areas	9.3.1 Nutrient loads	15,500	[Same shapefile as above showing entire agriculture area]
Create a 1 km buffer strip around the outer boundary of a section of the plantation land	2.1 Annual & perennial non-timber crops 9.3 Agricultural & forestry effluents (including 9.3.1 Nutrient loads, 9.3.2 Soil erosion, sedimentation, 9.3.3 Herbicides & pesticides)	1,250	✓
Restore a portion of buffer strip to forest by planting a variety of native plant seedlings	2.1 Annual & perennial non-timber crops 9.3 Agricultural & forestry effluents (including 9.3.1 Nutrient loads, 9.3.2 Soil erosion, sedimentation, 9.3.3 Herbicides & pesticides)	500	✓
Establish mechanical weeding protocols instead of chemical herbicide application across large section of plantation	9.3.3 Herbicides & pesticides	8000	✓

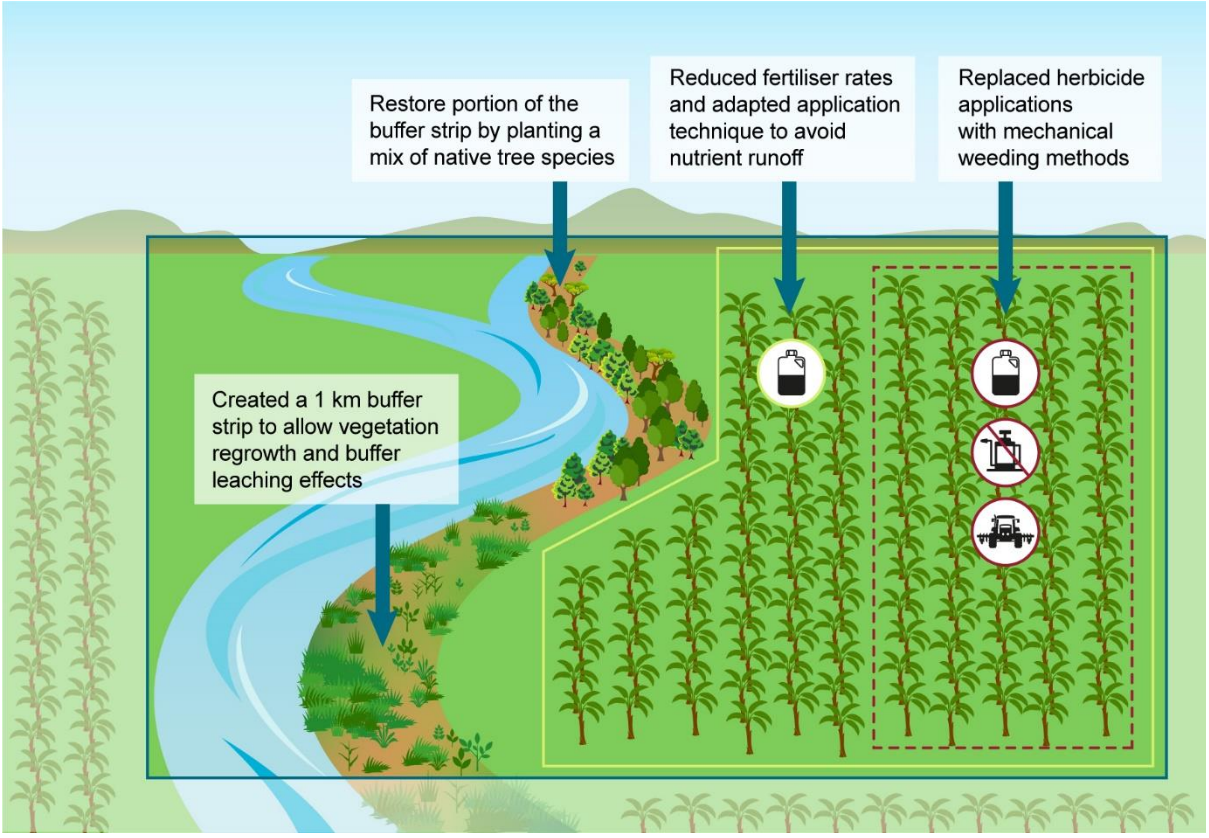

Figure 2: Map of the fictional project area, showing the different areas of threat abatement and habitat restoration activity.

3. If local knowledge or data exist, provide estimate of the percentage population decline for each threat for each species in abatement area

Abundance data exist for the spot-billed pelican collected by BirdLife International over the last 20 years and are provided alongside agricultural management information, including the amount of fertiliser applied and area over which fertiliser was applied, for the last 15 years. Data for other species are not available. An initial population decline estimate for spot-billed pelican is provided based on the population trend data, using expert opinion and the agricultural practice information to attribute this decline to agricultural pollution. The project teams estimate a decline of 15% in spot-billed pelican population over the last 15 years. Calculations and raw data are provided for quality assurance.

4. If local data are available, provide land cover maps for current and baseline scenarios

Local scale land cover maps are unavailable.

5. Determine if the project will restore habitat (or expand the extent of existing habitat) to increase species AOH

6. If the project will restore habitat, provide spatial extent layer of restoration activity

In this project year, a 1250 ha buffer zone will be established, encouraging natural vegetation regeneration. Additionally, seedlings cultivated over the first two years of the project, covering a variety of native species, will be planted over a 500 ha portion of the designated buffer zone and maintained throughout the remaining project years. The spatial extent of the habitat restoration is provided as a shapefile (see Table 2 and Figure 2).

7. Calculate pro-rata share of ICF funding across programme

ICF is the sole investor in this project, so will report the total STAR units against this funding.

For details on the STAR calculation process see Appendix 1. For details on the STAR aggregation process across multiple projects see Appendix 2.

7 Data management

The STAR metric is calculated using the data inputs outlined in Table 2. All possible data inputs from the project are indicated, but the minimum data requirements from individual project teams are:

- Details of threat abatement activities
- Shapefiles of area over which each threat is addressed by each activity

If data exist, projects are particularly encouraged to provide land cover maps, and can also augment with local species abundance timeseries data and threat intensity data. Other data inputs are sourced from the IUCN Red List and global spatial data providers, such as ESA and USGS.

Table 2: Details of data inputs and sources. See also Mair et al. (2021) supplementary table 1. Table continues on next page.

Data input	Data sources	Project input?	Uncertainty/Limitations
Threats addressed by project	Project proposal/advisors	✓	Activities need to be matched with IUCN threats, but some may not have a direct match
Spatial extent of threat abatement activity for each threat	Project proposal/advisors	✓	Spatial variation in occurrence and severity of threats
Expected population decline caused by each threat	Estimated using IUCN methodology (Annex 1 Table 4) **or** project-level species trend data combined with spatial threat estimates **or** local expertise	✓	Incomplete documentation of scope and severity of threats in IUCN assessments Difficulty attributing species change to threat using local data Spatial variation in occurrence and severity of threats
Current/recent land cover map	Project-level maps or global land cover maps (e.g. ESA land cover maps, Copernicus Global Land Service)	✓	
Historic land cover map	Project-level maps or global land cover maps (e.g. ESA)	✓	

Data input	Data sources	Project input?	Uncertainty/Limitations
Species range extent layers	IUCN Red List assessments		
Species habitat associations and elevation ranges	IUCN Red List assessments		Incomplete assessment of Red List species, data not available for all species
Topographic elevation layer	Global layers (e.g. USGS ASTGTM or USGS STRM		
Species extinction risk category weighting (Near Threatened = 1, Vulnerable =2, Endangered = 3, Critically Endangered = 4)	IUCN Red List assessments		Species classed as Data Deficient or Not Evaluated species excluded Extinction risk categories can change with extended data availability Updated at the same frequency as the IUCN Red List
Restoration multiplier	Jones et al., 2018 global calculation based on literature		Recovery rate based on meta-analysis, but will vary according to site conditions and habitat type

7.1 Data limitations

Spatial data are limited by the resolution, which restricts the precision of results, particularly in projects covering small areas. At local scales highest possible resolution is recommended, while at national and global scales coarse resolution maps are acceptable. The quality and resolution of national or local data will be highly variable between countries. In situations where data availability and quality are limited, it is appropriate to use global scale datasets to generate STAR.

Global scale STAR units have been calculated for amphibians, birds and mammals and is currently only broadly applicable in the terrestrial realm, with future development aiming to expand the scope to incorporate the marine environment and a wider range of taxa. As the IUCN Red List species range data are based on predictions, calculating the AOH and restorable AOH assumes the presence of species within project boundaries. To avoid uncertainty, ICF could work with project teams to validate the presence of threatened species using current survey data.

Threat impacts are assumed to be constant across the project boundaries and consequently across species AOH, however it is recognised that threat occurrence and intensity will vary spatially. Future improvement of the STAR calculation would be possible using global threat heat maps of threat intensity (Mair et al., 2021). If available, activity extent and intensity data could be applied at a local scale to inform the generation of threat abatement spatial extent layers.

Expected population declines as a result of a particular threat can either be generated using local species and threat timeseries data or by using the IUCN Red List estimates of threat scope and severity (see Appendix 1 Table 4). As local data on population declines attributable to specific human activities are likely scarce, the Mair et al. (2021) methodology and IUCN data provide a viable alternative. However, threat scope and severity data are not complete for all species, which limits the accuracy of predictions. Mair et al. (2021) describe sensitivity analyses to handle missing data in estimating population declines, concluding that using a median of possible values of scope and severity to replace missing data was a suitable approach.

7.2 Quality assurance

It is expected that projects will conduct quality assurance processes before submitting data to programmes, with detailed plans for this aspect submitted with project proposals. Programmes will need to review and assess the validity of data provided by projects. Any population decline estimates provided by project teams will be verified using available datasets and cross-referenced against the Mair et al. (2021) methodology (see Appendix 1 Table 4) to assess differences in estimates. To verify the presence of Red List species in the project threat abatement boundaries (or likely return based as a result of programme activities) programme teams could liaise with projects to obtain available species survey data or conduct a targeted field survey to validate the IUCN species range predictions.

7.3 Counterfactual baseline

The ICF programme must establish a counterfactual baseline to determine whether the threat abatement and restoration would be undertaken in the absence of ICF support. The counterfactual baseline is based on a qualitative judgement assessment to determine the additionality of the programme activities. Establishing the counterfactual baseline may be challenging and will likely involve identifying the ICF programme's area of interest (if not already identified through programme design documentation), reviewing available documentation for programmes operating within the ICF area of interest, and undertaking discussions with involved parties and stakeholders to determine if the ICF programme's practices are already occurring. Areas of land currently receiving the proposed SLM practices prior to the implementation of the ICF programme cannot be reported under this indicator, unless there is evidence indicating that these practices would cease in the absence of ICF support.

The ICF programme must provide a qualitative description of the geographical area-of-interest to assist fund and programme managers in identifying potential overlap with other ICF programmes or programmes being implemented by other organisations. If the ICF programme is unable to estimate what the counterfactual is, it is suggested to use an 'adjustment factor', which should be high (e.g. 95%) if the programme is confident that results are additional, and the data quality is good. A lower 'adjustment factor' (e.g. 50%) should be used if the programme has a lot of uncertainty and there are other partners in the area undertaking similar activities. This 'adjustment factor' needs to be considered for each threat separately (additionality may not be equal across threats) and should be applied after STAR units for each threat have been calculated, but before they have been aggregated.

8 Data disaggregation

The total reduction in species extinction reported can be disaggregated to that resulting from habitat restoration, and by threat reduction. The threat reduction results can be further disaggregated into threat types, thus quantifying the reduction in species extinction risk due to ICF funding of specific activities.

References

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Appendix 1: Calculating STAR units

Note: Calculation of STAR metric requires technical (Geographic Information System, GIS) expertise. As such it has been excluded from the minimum reporting on the assumption it would be calculated at the portfolio level by ICF analysts, similar to KPI 10. This simplifies the reporting methodology and requirements. However, it should be noted that requiring reporting of the final STAR units after full calculation might be an opportunity for capacity building.

For detailed worked examples see the IUCN examples "Assessment of potential reduction in likelihood of species extinctions for El Salvador Coffee Farms" and "Assessment of potential reduction in likelihood of species extinctions for Bukit Tigapuluh Sustainable Landscape and Livelihoods Project."

Continuing the hypothetical example of the altered agricultural practice in an oil-palm plantation in southeast Sumatra example, this section outlines the process of calculating the STAR metric using project-level inputs and global scale data.

A1.1 Data input

Table 3 provides details of all input datasets for the example project and details of the data source.

Table 3: List of fictional project datasets and sources. Table continues on next page

Dataset	Source
Details of threats covered by this project and activity plan	Project teams
Threat-abatement area shapefiles	Project teams
Habitat restoration activity details	Project teams
Habitat restoration shapefile	Project teams
Spot-billed pelican species trend data collected by Birdlife International over last 20 years	Project teams (but also available openly)
Agricultural management data, including area of land, fertiliser application patterns and loads etc. over last 15 years	Project teams

Dataset	Source
Initial estimate and methods of population decline of spot-billed pelican	Project teams
List of threatened species that fall within project threat-abatement polygons	IUCN Red List
Shapefiles of species ranges	IUCN Red List
Assessment details, including habitat, elevation ranges and threat associations for each species	IUCN Red List
Current land cover map	300m resolution ESA Land Cover Map 2019
Historic land cover map	300m resolution ESA Land Cover Map 1992
Global elevation layer	USGS Shuttle Radar Topography Mission 90m resolution DEM

A1.2 Data processing

1. Collate all data from sources

2. Extract details for threatened species whose range polygons overlap with project boundary.

3. Assign weight to each species (Near Threatened = 1, Vulnerable =2, Endangered = 3, Critically Endangered = 4)

4. Match ESA land cover classes to habitat classes from IUCN classification using a lookup table.

5. Calculate each species' global current AOH

    a. Mask land cover map to suitable habitat classes (based on Red List assessments)

    b. Mask land cover map to elevation ranges (where data available in Red List assessments)

    c. Extract overlap area of masked land cover and species range polygons

6. Extract the AOH within each threat abatement area and express as a percentage of each species' global current AOH.

7. Generate each species' historic AOH using the 1992 ESA land cover map by performing steps 5a-c. Calculate species' restorable AOH as the difference between the historic and current AOH. In this project, the area restored falls entirely within the extent of restorable AOH for each species. As such, the area within the restoration area reflects the extent of restorable AOH for each species, expressed as a percentage of each species' global current AOH. (Optional)

8. Estimate expected percentage population decline caused by each threat addressed by this project for each species within boundary. The spot-billed pelican estimate provided by project teams was verified using available data and expert knowledge. As local data and expert opinion were unavailable for other species, the scope and severity estimates of each threat in the Red List assessments were used to generate expected percentage population decline figures. The methodology presented by Mair et al. (2021) and outlined in Table 4 was applied. Where scope and severity estimates were not available in Red List assessments, the median score (Majority (50-90%) and Slow, significant declines) was applied, as recommended by Mair et al. (2021). Divide these estimates by the sum of percentage population declines from all threats to that species.

Table 4: Taken from Mair et al. (2021) Supplementary Table 2. Expected percentage population decline over 10 years or three generations from combinations of scope and severity scores per threat.

		Severity					
		Very rapid declines	Rapid declines	Slow, significant declines	Negligible declines	No decline	Causing/could cause fluctuations
Scope	Whole (>90%)	63	24	10	1	0	10
	Majority (50-90%)	52	18	9	0	0	9
	Minority (<50%)	24	7	5	0	0	5

A1.3 STAR calculation

$STAR_t$ is generated using the following equation:

$$T_{t,i} = \sum_{s}^{N_s} P_{s,i} W_s C_{s,t}$$

$P_{s,i}$ is the current AOH of each species *s* within location *i* (expressed as a percentage of the global species' current AOH)

W_s is the IUCN Red List category weight of species *s* (Near Threatened = 1; Vulnerable = 2; Endangered = 3; Critically Endangered = 4)

C is the relative contribution of threat *t* to the extinction risk of species *s* (calculated as the percentage population decline from that threat divided by the sum of percentage population declines from all threats to that species)

N_s is the total number of species at location *i.*

$STAR_r$ is generated using the following equation:

$$R_{t,i} = \sum_{s}^{N_s} H_{s,i} W_s C_{s,t} M_{s,i}$$

$H_{s,i}$ is the extent of restorable AOH for species *s* at location *i* (expressed as a percentage of the global species' current AOH)

M_i is a multiplier appropriate to the habitat at location *i* to discount restoration scores. A global multiplier of 0.29 based on the median rate of recovery from a global meta-analysis (Jones et al., 2018) is applied assuming that restoration has been underway for 10 years.

Table 5 provide the data input values generated in steps 3-8 and the estimated $STAR_t$ and $STAR_r$ scores. Scores were calculated using the most detailed threat classification available, as in this fictional example the Red List assessments included detailed threat information. Scores can be aggregated to higher levels in the threat classification scheme by summing scores (Mair et al., 2021). Note that in $STAR_r$ calculation, the threats abated in the habitat restoration area are "Annual & perennial non-timber crops" and "Agricultural & forestry effluents" as the project is restoring areas of cropland to native habitats.

Table 5: Input values for STAR calculation and resulting $STAR_t$ and $STAR_r$ scores for the fictitious example. RL = Red List, AOH = Area of habitat, C = relative contribution of threat to extinction risk of species (calculated as % population decline from that threat divided by sum of % population declines from all threats to that species)

Threat	Species	RL weight	AOH (% of global AOH)	% population decline caused by threat	% population decline from all threats	C		$STAR_t$
Nutrient loads	1	1	0.05130	9	35	0.25714		0.01319
	2	2	0.06220	9	67	0.13433		0.01671
	3	3	0.01030	9	75	0.12000		0.00371
	4	3	0.00460	5	81	0.06173		0.00085
	5	1	0.00092	15	45	0.33333		0.00031
Herbicides and pesticides	1	1	0.02648	9	35	0.25714		0.00681
	2	2	0.03210	7	67	0.10448		0.00671
	3	3	0.00532	9	75	0.12000		0.00191
	4	3	0.00237	9	81	0.11111		0.00079
	5	1	0.00046	9	45	0.20000		0.00009
							Total $STAR_t$	**0.05108**
Threat	**Species**	**RL weight**	**Restorable AOH (% of global AOH)**	**% population decline caused by threat**	**% population decline from all threats**	**C**	**Scale factor**	**$STAR_r$**
Annual & perennial non-timber crops	1	1	0.00414	9	35	0.25714	0.29	0.00031
	2	2	0.00502	9	67	0.13433	0.29	0.00039
	3	3	0.00083	9	75	0.12000	0.29	0.00009
	4	3	0.00037	5	81	0.06173	0.29	0.00002
	5	1	0.00007	15	45	0.33333	0.29	0.00001
Agricultural & forestry effluents	1	1	0.00414	9	35	0.25714	0.29	0.00031
	2	2	0.00502	9	67	0.13433	0.29	0.00039
	3	3	0.00083	9	75	0.12000	0.29	0.00009
	4	3	0.00037	5	81	0.06173	0.29	0.00002
	5	1	0.00007	15	45	0.33333	0.29	0.00001
							Total $STAR_r$	**0.00163**
							Total STAR	**0.0527**

Appendix 2: Result aggregation

Table 6 provides an example of how results are aggregated across a portfolio, by summing totals from all programmes (assuming there is no spatial overlap between programme activities).

If desired, the total reduction in species extinction risk as a result of the portfolio of investments could be expressed as the potential percentage contribution to averting extinction risk for all species across all ICF recipient countries. This is based on calculating the total ICF STAR unit result as a percentage of the potential STAR units across all ICF recipient countries. National STAR scores can be derived from available pre-derived global 50 km resolution data layers (Mair et al., 2021) or calculated at a higher resolution using available datasets.

Table 6: STAR scores for individual programmes and total STAR scores across the portfolio, both as total STAR units, and as a percentage of potential STAR units across all ICF recipient countries.

Programme Number	$STAR_t$	$STAR_r$	Total STAR
1	0.0000009780	0.0000004551	0.0000014331
2	0.0001612450	0.0000671200	0.0002283650
3	0.0002339740	0.0008892200	0.0011231940
4	0.0189700000	0.0000045600	0.0189745600
5	0.0000067544	0.0056111400	0.0056178944
6	0.0234819000	0.0007889100	0.0242708100
7	0.0089341000	0.0056120000	0.0145461000
		Portfolio STAR units	**0.064**
		Portfolio STAR as % ICF STAR	**0.51%**

Appendix 3: Acronyms

AOH	Area of habitat
CBD	Convention on Biological Diversity
ESA	European Space Agency
ha	Hectares
ICF	International Climate Finance
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IUCN	International Union for the Conservation of Nature
KPI	Key Performance Indicator
NbS	Nature-based solutions
SLM	Sustainable land management
STAR	Species Threat Abatement and Restoration
USGS	U.S. Geological Survey