

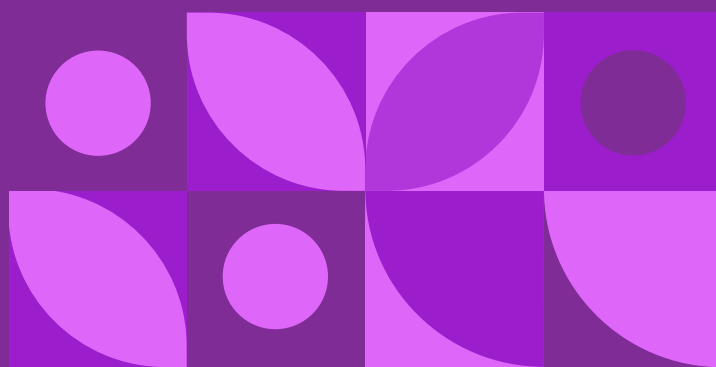


USING THE STAR METRIC TO SUPPORT NATURE-POSITIVE OUTCOMES

Guidance for Civil
Society Organizations



Canada



Cover photograph

Blue-sided Treefrog (*Agalychnis annae*)

VULNERABLE

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Credits

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COLMENAlab



Canada



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Northern King Cobra (*Ophiophagus hannah*)
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01

WHO IS THIS GUIDANCE FOR?



Espada's Rocket Frog (*Hyloxalus pulchellus*) - NEAR THREATENED - © Demian Hiß (CC BY)

This guidance provides an overview of the **Species Threat Abatement and Restoration (STAR)** metric and the range of ways in which civil society organisations (CSOs) can use it to support their work for biodiversity conservation.

The guidance is relevant for any CSO involved in advocating, researching, funding, planning, implementing or monitoring the protection or restoration of nature.

This includes among others sub-national, national or international Non-government Organisations (NGOs), Indigenous Peoples associations, local community groups, research or policy institutes, foundations, other conservation funders, and any non-state, non-commercial actors working towards nature-positive objectives.

This guidance is also relevant for CSOs working in partnership with business or government institutions.

Complementary STAR guidance is available for the private and public sectors.

STAR datasets, and applications of the metric, continue to develop rapidly. **Guidance updates and new examples will be posted on IUCN's [conservation tools web page](#).**



Diamond Stingray (*Hypanus dipterurus*)
VULNERABLE

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02

The context for STAR





2.1

Nature Positive and the KMGBF

The concept of Nature Positive, originating from civil society, represents an aspirational, inclusive and intuitive summary of societal goals for nature.¹ [The Nature Positive Initiative](#), of which IUCN is a partner, defines Nature Positive as the global societal goal to **halt and reverse nature loss by 2030 on a 2020 baseline, and achieve full recovery by 2050**.

The Nature Positive goal has been given formal policy expression, and a plan of action agreed by the world's governments, through the [Kunming-Montreal Global Biodiversity Framework](#) (KMGBF) adopted at the 15th meeting of the Conference of the Parties to the Convention on Biological Diversity (CBD COP15) in December 2022.

The KMGBF is structured around four outcome goals for 2050 and 23 action targets to be urgently implemented by 2030. The targets and goals provide a coherent collective basis for achieving the KMGBF mission to **“halt and reverse biodiversity loss and put nature on the path to recovery” by 2030, and the vision of “living in harmony with nature” by 2050**. The targets cover a broad set of actions to reduce direct threats, ensure sustainable use, and put in place the mechanisms for effective biodiversity conservation.

Section C of the KMGBF, on considerations for implementations, stresses the need for a whole-of-society approach, as “a framework for all - (...) the whole of society”, with success relying on “actions

and cooperation by all levels of government and by all actors of society”. Governments are urged to **foster “the full and effective contributions of women, youth, Indigenous Peoples and local communities, civil society organizations, the private and financial sector, and stakeholders from all other sectors.”**

Unlike governments, CSOs have no obligation to plan their actions and report on outcomes in relation to the KMGBF's goals, targets and indicators. However, for CSOs focused on biodiversity conservation the KMGBF provides a platform for effective advocacy and resource mobilization, and for clearly demonstrating their nature-positive contributions.

¹ IUCN 2025.



2.2

Global species goals and targets

The CBD recognises genes, species and ecosystems as the components of biological diversity. Similarly, achieving the Nature Positive goal requires improvement in the abundance, diversity, integrity and resilience of species, ecosystems and natural processes. A key part of putting nature on a path to recovery is to safeguard species, and reducing species' risk of extinction is fundamental for this.

KMGBF Goal A aims to halt human-induced extinction of known threatened species and

reduce the extinction rate and risk of all species tenfold by 2050. KMGBF Target 4, which aims to ensure urgent management actions to halt human induced extinction of known threatened species and for the recovery and conservation of species, is also highly relevant here. KMGBF Target 2 on restoration, Target 3 on protection of important sites and Targets 5–8 on reducing threats from unsustainable harvest, invasive alien species, pollution, and climate change, respectively, are also relevant.

STAR was designed to guide actions to reduce global extinction risk, and so directly supports implementation and measurement of actions towards KMGBF Goal A. It is relevant also to the strategic goals of many other multilateral environmental agreements², including the Ramsar Convention, Convention on Migratory Species, World Heritage Convention and UN Convention to Combat Desertification; and to the Sustainable Development Goals (SDGs), specifically SDG Target 15.5 on halting extinction.

² More detail of how STAR can support a range of targets in the KMGBF and other MEAs is provided in Annex II of the companion STAR guidance document for governments.





Ateles hybridus
ENDANGERED

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03

WHAT IS STAR?



STAR Guidance for Civil Society Organizations

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STAR stands for '[Species Threat Abatement and Restoration](#)'. It is a global biodiversity metric based on the [IUCN Red List of Threatened Species](#), calculated in a standardised way using spatially explicit data.

STAR combines data on the current and former presence of threatened and near-threatened species, the threats they face and their risk of extinction, to produce two complementary global data layers

for **threat abatement (STAR_t)** and **restoration (STAR_r)**. The STAR methodology generates STAR scores, and for any given Area of Interest the scores indicate the potential contribution of relevant actions in that area to reduce species extinction risk, through either threat abatement or restoration.

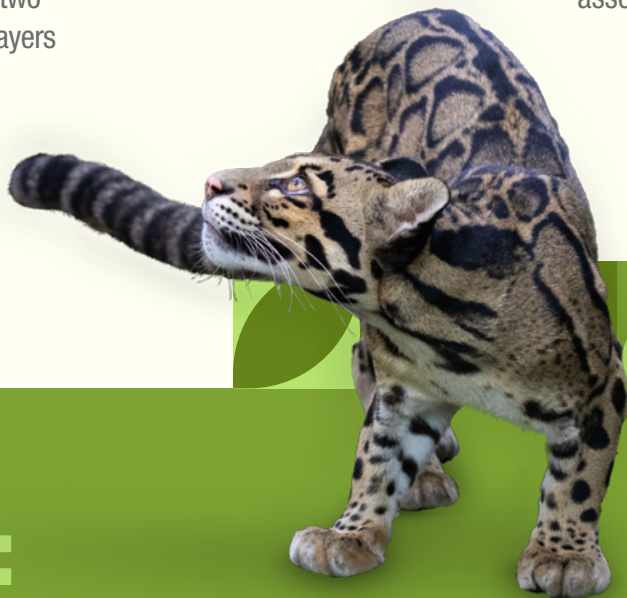
STAR scores can be broken down into scores for specific threats,

based on Red List information on the intensity of threats facing individual species. This enables identification of targeted actions needed to abate those threats, and comparison of their potential contribution to reducing extinction risk. STAR scores are additive, comparable and scaleable across different threats, and across all geographies, creating a versatile metric for planning and outcome assessment.

Mainland Clouded Leopard
(*Neofelis nebulosa*)

VULNERABLE

© Cloudtail the Snow Leopard



Box A: STAR and the RLI



In the KMGBF Monitoring Framework, STAR supports the headline Red List Index (RLI) as a complementary indicator. Both indicators are derived from the IUCN Red List, an authoritative global biodiversity dataset for species, but they have quite distinct roles. The RLI tracks changes in the aggregate extinction risk of species, showing improvements or deteriorations. The RLI indicates overall progress towards reducing species extinction risk at a national, regional or global level. It is not applicable at small scales and responds relatively slowly to change. In contrast, STAR is fully scalable and provides a quantitative score that can be broken down by threat type to help identify and prioritise conservation action.





3.1

Estimated, Calibrated, Target and Realised STAR

STAR scores in the global layers are called **Estimated STAR** because they provide an estimate of local STAR values based on global datasets, under the assumption that species occur uniformly throughout their mapped Area of Habitat, and species-specific threats are uniform across their entire range (section 6.1).

Estimated STAR provides a sound basis for target-setting and prioritisation. When planning specific interventions, Estimated STAR values need to be calibrated using site-specific data (which might include local knowledge and further surveys) to check the presence of species and threats, and actual

threat intensity, on the ground or water, and/or the feasibility of restoration³. For a particular Area of Interest, **Calibrated STAR** provides a validated measure of the location's potential to contribute to global extinction risk reduction (section 6.2).

To guide their actions, a CSO would then set a **Target STAR** (section 6.2). The first step is to set realistic (but preferably ambitious) targets for reduced intensity levels of focal threats, or for habitat restoration combined with threat prevention. Which threats to address can be prioritized based on feasibility, urgency and those most material or relevant to the organisation in question. These operational

targets for reduced threat intensity are converted into a Target STAR score that reflects the anticipated contribution to reducing extinction risk. A realistic Target STAR score is usually smaller than the Calibrated STAR score for an Area of Interest, since fully addressing every threat, or complete restoration, may not be feasible.

Interventions will aim to improve the status of targeted STAR species through reducing particular relevant threats and/or carrying out habitat restoration. **Realised STAR** is an outcome measure calculated from the measured reduction in threat intensity and/or success of restoration.

3.2

The STAR global layers

STAR_T scores have been generated globally for the terrestrial, freshwater and marine realms. STAR_R scores have so far been generated only for the terrestrial realm. To ensure that STAR scores from anywhere in the world can be

validly compared, the STAR global layers are based on a sub-set of taxon groups that have been comprehensively assessed in the IUCN Red List. This is because to include incompletely assessed taxon groups would introduce

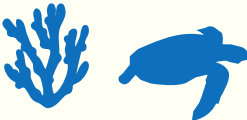
significant geographical bias. STAR focuses on the species at highest risk of extinction, namely those assessed as Near Threatened, Vulnerable, Endangered or Critically Endangered on the Red List. Least Concern and Extinct species are not included in STAR.

³ The calibration methodology for STAR_R is in development.



Estimated STAR

Red List category and threat data
for **globally threatened and near-threatened** species in
comprehensively assessed
taxon groups

	Area of Habitat (AoH) maps	Global spatial layer	Status of layer
	Current AoH ▶	Terrestrial STAR _T , (threat abatement) ▶	Available and updated 2025, trees included in next version
Terrestrial vertebrates (amphibians, reptiles, birds, mammals)	Restorable former AoH ▶	Terrestrial STAR _R , (restoration) ▶	Available, 2025 update pending (to include reptiles)
	Current AoH ▶	Marine STAR _T , (threat abatement) ▶	Available
Marine seagrasses, reef corals, sharks and rays, bony fishes (certain families), reptiles, birds, mammals	Restorable former AoH ▶	Marine STAR _R , (restoration) ▶	For future development
	Current AoH	Freshwater STAR _T , (threat abatement)	Available by end of 2025
Freshwater decapod crustaceans, dragonflies, fishes	Restorable former AoH	Freshwater STAR _R , (restoration)	For future development

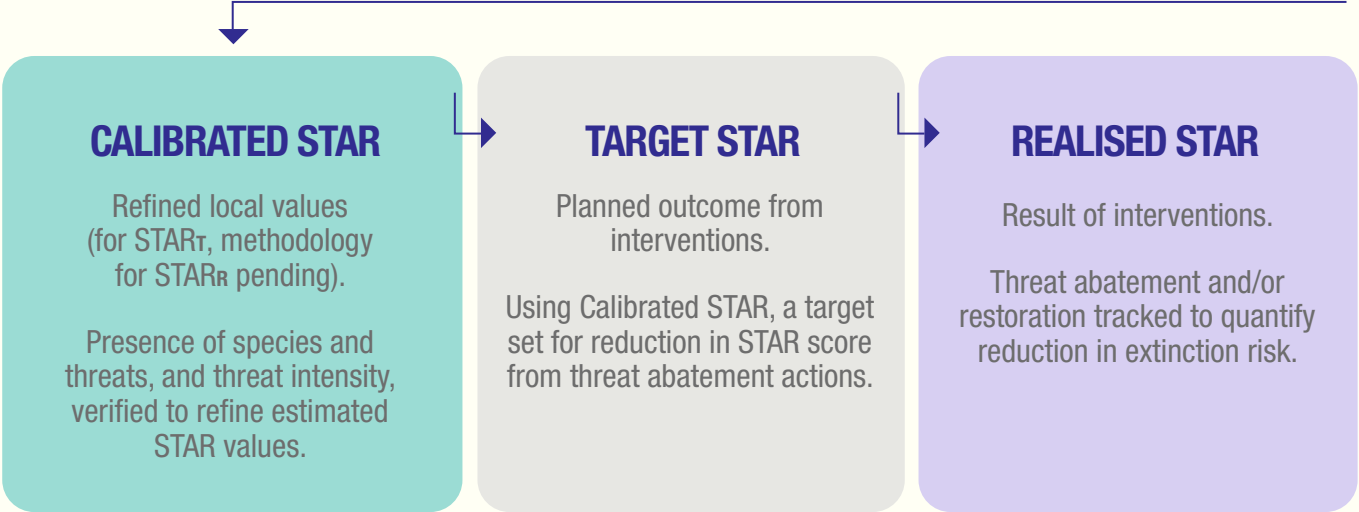


Figure 1 - Outlines the different elements of the global STAR metric and how Estimated STAR relates to Calibrated, Target and Realised STAR.



Himalayan Takin
(*Budorcas taxicolor*)

VULNERABLE

© Narayan Katel



Box B: What do STAR scores mean?

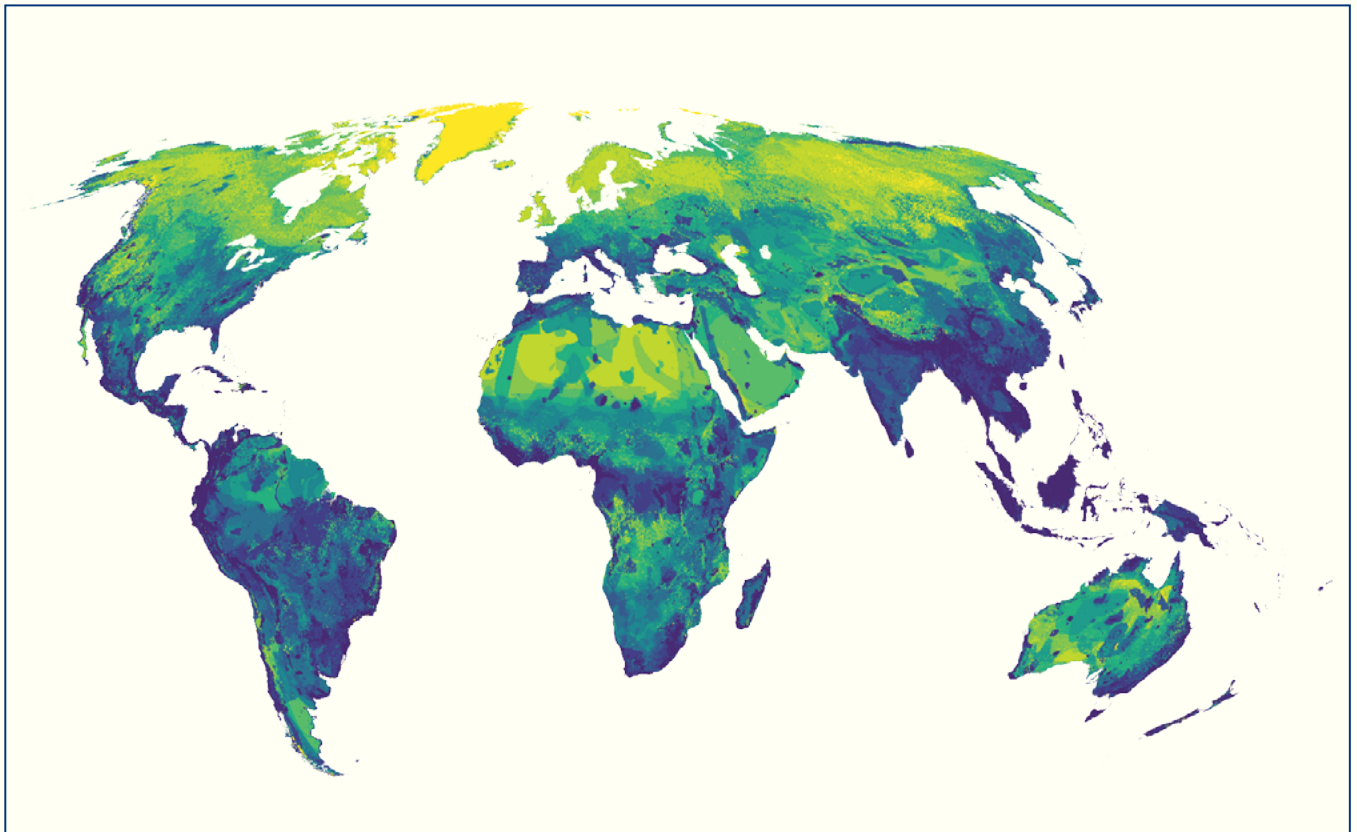
High threat **abatement (STAR_T)** scores show areas that currently contain high numbers of threatened species, a large proportion of individual species' ranges, and/or species that are severely threatened. These are locations where positive interventions could make a large contribution to reducing global species extinction risk and where developments that increase threats to species should be mitigated. Such locations may include [Key Biodiversity Areas](#), identified for their global significance for biodiversity. KBAs collectively cover less than ten percent of the world's surface area but include nearly 50% of the global STAR_T score.⁴

High restoration (STAR_R) scores indicate areas that previously supported many threatened species, a large proportion of individual species' ranges, and/or species that are severely threatened. These are locations where restoration activities could make a large contribution to reducing species extinction risk.

Areas with relatively low STAR scores may still include important biodiversity, including threatened species and species of national concern, but are likely to have relatively lower potential for reducing global species extinction risk.



⁴ Mair et al. 2021.



**STAR_T
PERCENTILE
CATEGORY**

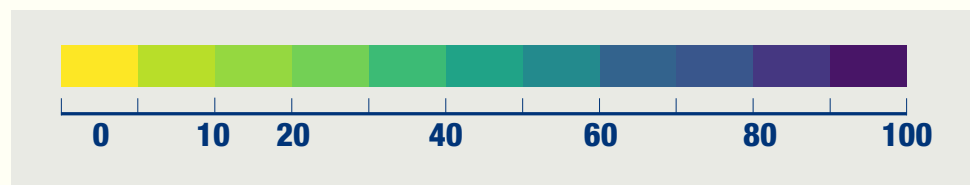


Figure 2 - Updated STAR_T terrestrial global layer (version July 2025) for threat abatement, mapped for c. 1-km grid cells. STAR_T marine and STAR_R terrestrial layers are currently mapped for c. 5-km grid cells. Map colours show the percentile category of STAR scores relative to the global distribution (cells with zero STAR scores shown separately, in yellow).



3.3

How STAR works to reduce global extinction risk

STAR aims to support a threat abatement and restoration 'ratchet', where global extinction risk is driven down through an iterative process of action and assessment, so as to achieve the global goal of a tenfold reduction in extinction risk for all species by 2050.

A conceptual outline of this process is shown in Figure 3.

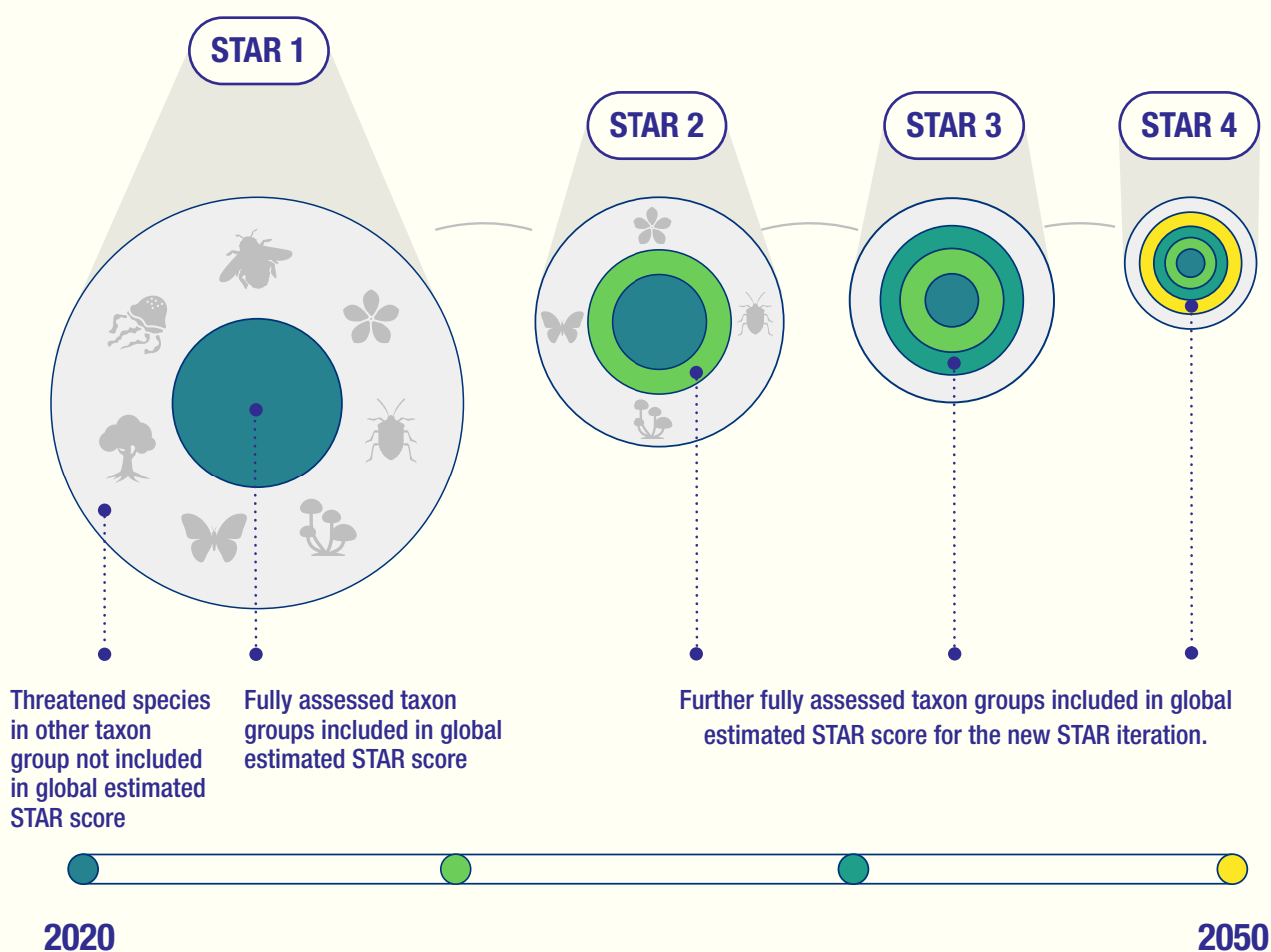


Figure 3 - Conceptual outline of the 'STAR ratchet', an iterative process of assessment and action to reduce species extinction risk tenfold by 2050. The overall area of the circles reflects overall extinction risk and the coloured area total STAR scores in the global layer (thus the overall circle for STAR 4 is one-tenth the area of that for STAR 1). Each iteration of the STAR global layer guides threat abatement and restoration actions for the species included in STAR, reducing extinction risk for those species and also other co-occurring species. With each iteration, more taxon groups are fully assessed and can be included in STAR, but the overall global extinction risk is reduced.



Indian Rhinoceros (*Rhinoceros unicornis*)
VULNERABLE

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04

How STAR can support CSO conservation objectives





STAR is a practical and scientifically robust tool designed to translate ambitious societal conservation goals into actionable and measurable steps at various scales.

STAR can inform and guide CSO conservation priorities, plans and actions, as well as advocacy and engagement with governments and the private sector.

STAR provides a standardized, science-based way to measure and aggregate conservation impacts, enabling CSOs clearly to demonstrate their contributions and how these align with global or national biodiversity goals and targets.

4.1

Prioritise effort and investment

As a spatially explicit metric, STAR helps direct limited conservation resources to where they can have the most significant global impact. By considering the cost and feasibility of addressing threats or implementing restoration alongside STAR scores, CSOs can strategically allocate funds and efforts to areas where they will yield the greatest reduction in extinction risk.

Where relevant to a CSO's particular mission and priorities, STAR scores can be calculated for sub-sets of species and particular threat types.

4.2

Map sensitivity and inform spatial planning

STAR can be used to map biodiversity sensitivity and identify key locations that should be avoided for damaging development. Alongside other relevant datasets, STAR can inform integrated land-use and marine spatial planning.



4.3

Plan and target effective interventions

STAR shows potential gains from both threat abatement and restoration and can be broken down by threat type and by species. This enables CSOs to identify and prioritize effective and cost-effective interventions that are tailored for a particular location.

The STAR calibration process (section 6.2) generates additional, in-depth information on the species and threats present in an Area of Interest, providing science-based justifications for action.

4.4

Quantify and aggregate contributions

STAR provides a transparent and standardised way to account for both planned and realised contributions. STAR enables quantified prediction (via Estimated and Calibrated STAR), tracking and assessment (via Realised STAR) of how far CSO actions reduce species extinction risk. Using STAR, these contributions can be aggregated and compared against targets. The metric thus connects local conservation efforts to national or global biodiversity goals.

4.5

Mobilise resources

Geographic and intervention priorities set using STAR provide science-based justifications for fundraising. Using STAR to demonstrate and quantify progress can demonstrate the effective use of resources and help to scale up resource mobilisation.



4.6

Engagement with business and government

There are numerous ways that CSOs can use STAR in engagement with the private and public sectors to achieve better biodiversity outcomes.

CSOs can advocate for governments to use STAR to inform conservation target setting and National Biodiversity Strategies and Action Plans, and to monitor progress towards achieving biodiversity goals, including for the KMGBF. STAR scores can be used to develop national, regional, or sector-based targets expressed in measurable STAR units. STAR is ideally suited to inform updated National Biodiversity Strategies and Action Plans to align with the KMGBF. Where updated NBSAPs are already developed, STAR can be applied to help implement national targets and actions and track measurable outcomes. As a standardised, spatially explicit, additive and

policy-relevant biodiversity metric, STAR can contribute substantially to strengthen monitoring, reporting and accountability for governments. Similarly, CSOs can use STAR for transparent assessment of how governments are aligning with and achieving international obligations.

CSOs can further promote the use of STAR as a data-driven basis for guiding policy, aligned with KMGBF Targets 1, 14 and 15. This could relate to environmental regulation (including mitigation and offset requirements), integrated land-use and marine planning, allocation of conservation resources and planning Protected Area networks, including the designation and management of new Protected Areas or other effective area-based conservation measures (KMGBF Target 3).

STAR can also provide science-

based evidence to support CSO advocacy on particular planning and development decisions.

CSOs can advocate for business to use STAR in setting science-based targets, corporate biodiversity strategy, risk screening and assessment⁵, disclosure and reporting, impact avoidance, mitigation planning and offset design, identifying opportunities for nature-positive action and assessing nature-positive contributions.

CSOs could also form partnerships with companies or public sector agencies to provide technical support and capacity development in areas such as STAR calibration, intervention planning, implementation of conservation and restoration actions, monitoring of threats and priority species, data analysis, and management and compilation of data for sharing.

⁵ For example, IUCN member Conservation International worked with The Fashion Pact to develop the [Fashion Nature Risk Lens](#). This combined website and dashboard includes STAR as a metric to help fashion companies to understand their potential biodiversity risks and impacts, especially from raw material production.





Abronia vasconcelosii

VULNERABLE

© Vojtěch Vítá

05

How are STAR scores calculated?

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STAR Guidance for Civil Society Organizations



For any threatened or near-threatened species within an Area of Interest, STAR scores reflect the amount of Area of Habitat (see Box C and Glossary) present, expressed as a percentage of the species’ total current Area of Habitat. This percentage is used as a proxy for the proportion of the species’ population in the area, since detailed population data are available for relatively few species. Across a species’ entire current area of habitat, the total score is thus 100.

STAR_T scores are based on the species’ current Area of Habitat, while STAR_R scores are based on potentially restorable areas within the species’ former Area of Habitat.

All STAR scores are then weighted according to each species’ extinction risk, as defined by its IUCN Red List category. The weighting system ranges from 1 for Near Threatened species to 4 for Critically Endangered species (Figure 4). Species listed as Least Concern are excluded from STAR scores. These weightings align with those used in the Red List Index to ensure consistency in extinction risk assessment.

Within a defined Area of Interest, the individual STAR scores of each species are summed to calculate a total STAR score for the area (Figure 5).

Specifically:

- The total STAR_T score represents the combined, weighted contributions of each species’ current Area of Habitat within the area, expressed as a percentage of its current Area of Habitat.
- The total STAR_R score represents the combined, weighted contributions of each species’ restorable Area of Habitat in the area, also expressed as a percentage of its current Area of Habitat.
- Global STAR maps are currently available at a resolution of c. 1-km for STAR_T and c. 5-km for STAR_R.

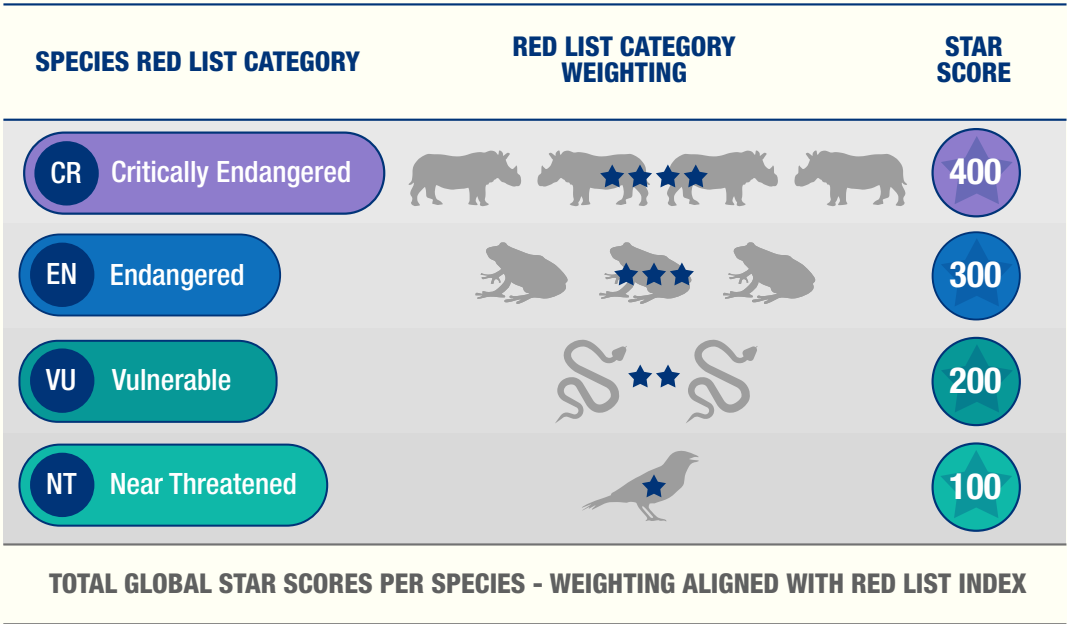


Figure 4 - Species listed as Least Concern are excluded from STAR scores. These weightings align with those used in the Red List Index to ensure consistency in extinction risk assessment.



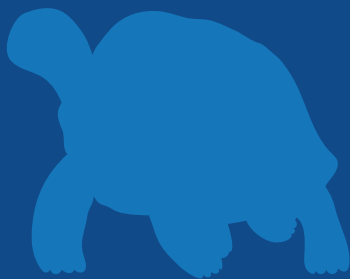
Elongated Tortoise
(*Indotestudo elongata*)

CRITICALLY ENDANGERED

© Rejoice Gassah (CC BY-NC)



Box C: What is 'Area of Habitat'?



Area of Habitat is defined as “the area, characterized by its abiotic and biotic properties, that is habitable by a particular species”⁶. In practical terms, Area of Habitat (AOH) is the area within a species’ range with suitable habitat at suitable elevation.

Within a species’ known range, current Area of Habitat is assessed by combining the species’ defined habitat preferences and elevation range (documented in the IUCN Red List) with land-cover and topographic maps.

Area of Habitat is thus a sub-set of the species’ range where it is likely (but not certain) that the species in question will occur.

Similarly, restorable Area of Habitat is assessed using the historical range of the species (areas where it used to occur, but is not currently found), maps or models of historical land-cover (showing where Area of Habitat used to be present) and current land cover (showing areas that are potentially restorable).

⁶ Brooks et al. 2019

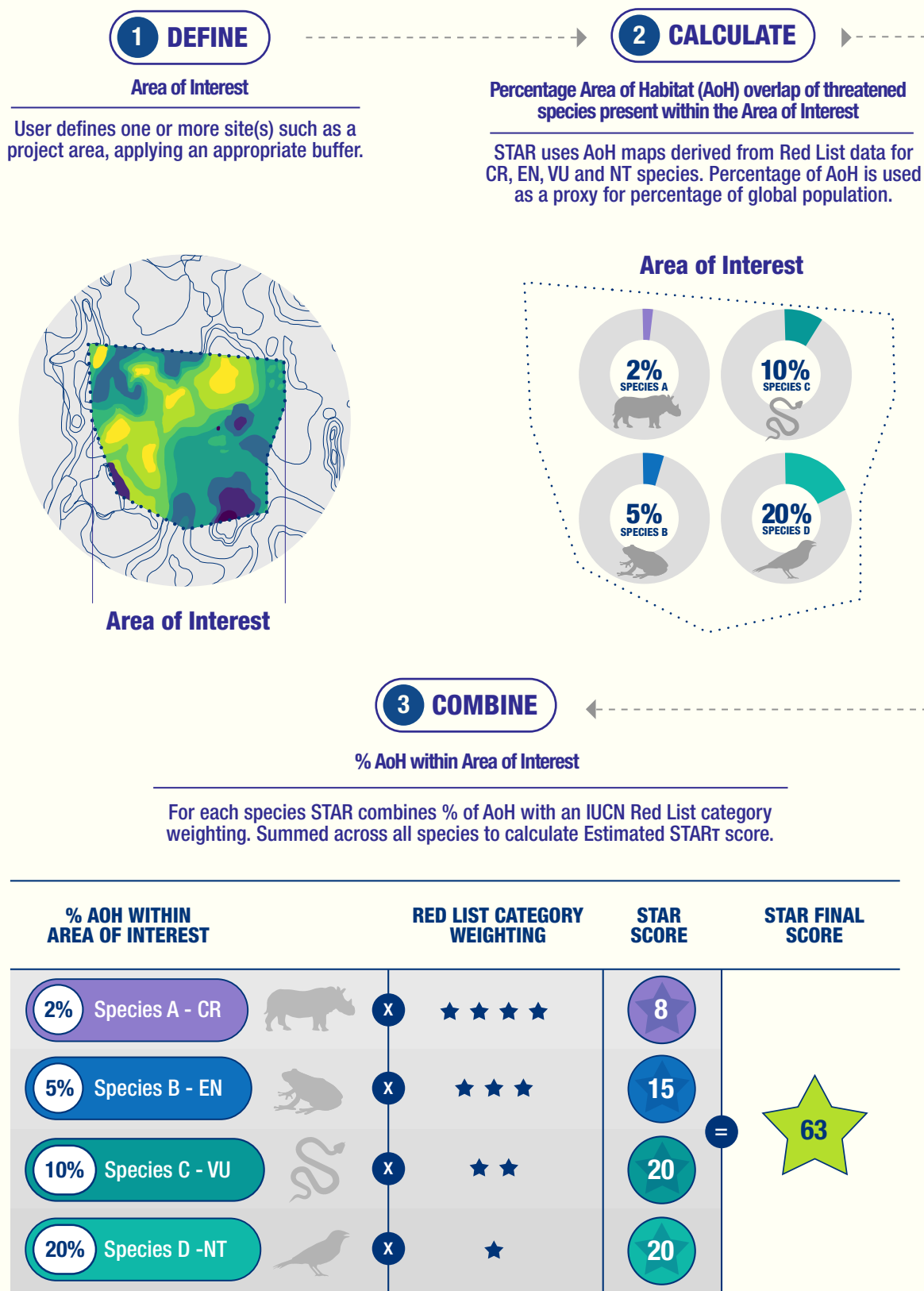


Figure 5 - Outline of the steps in calculating STARt scores for a defined Area of Interest.



5.1

Threat abatement STAR (STAR_T)

The sum of global STAR_T values across all species theoretically represents the global threat abatement effort needed for all species to be downlisted to Least Concern (in practice this is a simplification, as some species would require additional active management measures⁷). For a given Area of Interest, the overall STAR_T score indicates the potential contribution towards reduction of global species extinction risk from threat abatement actions in that

area. High scores indicate areas that currently contain relatively many threatened species, a large proportion of individual species' ranges, and/or species that are severely threatened.

The threats affecting each species are identified and documented as part of Red List assessments. Threats are categorised following the [IUCN Threats Classification Scheme](#) (version 3.3) and scored for severity and scope to show

their impact on a species. The STAR_T score incorporates this information, and can be broken down to show the relative contributions of different threats. This allows the targeting of actions to address specific threats and thus to contribute to species conservation goals. Depending on the threat type, such actions could include, for example, better management of hunting, pollution or invasive species.

			PERCENT OF THE TOTAL AREA OF INTEREST ESTIMATED STAR _T SCORE FOR EACH SPECIES-THREAT COMBINATION						
SPECIES	IUCN RED LIST CATEGORY	ESTIMATED STAR SCORE FOR EACH SPECIES	INVASIVE SPECIES	ENERGY AND MINING	BIOLOGICAL RESOURCE USE	AGRICULTURE	CLIMATE CHANGE	POLLUTION	TOTAL% FOR EACH SPECIES
A MAMMAL 	CR Critically Endangered	8	0%	0%	2%	8%	3%	0%	13%
B AMPHIBIAN 	EN Endangered	15	10%	11%	0%	0%	4%	0%	24%
D BIRD 	VU Vulnerable	20	0%	0%	16%	12%	0%	4%	32%
C REPTILE 	NT Near Threatened	20	0%	0%	14%	18%	0%	0%	32%
ALL SPECIES	PERCENT OF TOTAL STAR SCORE		10%	11%	31%	38%	7%	4%	100%
	TOTAL STAR SCORE	63	6.0	6.8	19.6	23.7	4.4	2.5	

Figure 6 - Example of STAR_T scores disaggregated by threat types, for the hypothetical Area of Interest and species shown in Figure 5.

⁷ Bolam et al. 2022.



COSTA RICA © Colmena Lab para Fondo de Desarrollo Verde para la región SICA - GIZ

5.2

Restoration STAR (STAR_R)

STAR_R uses a similar approach to STAR_T, but for areas that previously supported species that are no longer present. High scores indicate areas that previously supported relatively high numbers of threatened species, a large proportion of individual species' ranges, and/or species that are severely threatened.

For a given Area of Interest, the STAR_R score therefore shows the potential contribution of restoration actions towards reduction of global species extinction risk. In addition

to habitat restoration, such action will involve abatement of potential threats, including those such as hunting, pollution or invasive species that could prevent species' successful re-establishment. These scores can be broken down by species and to show the relative contributions of different threats that may need to be addressed, alongside habitat restoration, in the restorable area.

Based on restoration studies, a discounting multiplier (currently 0.29) is applied to STAR_R scores

in recognition of the fact that restoration of former Area of Habitat can be a slower and less successful process than threat abatement in existing Area of Habitat.

STAR_T and STAR_R scores are in principle fungible (when calculated using consistent datasets), in other words a unit of either represents an equivalent contribution to global extinction risk reduction, whether for a species, a threat and/or an Area of Interest.



Egyptian Vulture (*Neophron percnopterus*)
ENDANGERED

© Ignacio Ferre Pérez (CC BY-NC-ND)

06

Using and interpreting STAR



Bearded Vulture (*Gypaetus barbatus*) - NEAR THREATENED / © Davide Diana (CC BY-NC)

6.1

Estimated STAR

The global STAR_T and STAR_R maps are available through the [Integrated Biodiversity Assessment Tool](#) (see Box D). CSOs can access the STAR datasets, and can generate STAR Reports in IBAT for any particular Areas of Interest. For a defined Area of Interest, the report provides a detailed breakdown of STAR

values, including by species and threats, and indicates their relative importance at both national and global scales. A buffer around the Area of Interest can also be applied so as to understand the ecological context of the wider landscape.

To aid presentation and interpretation of STAR values in IBAT, both STAR_T and STAR_R grid cell scores are mapped in categories based on percentile ranges. Note that important biodiversity (including threatened species) may be present even in grid cells with very low STAR scores.



Saker Falcon
(*Falco cherrug*)

ENDANGERED

© Rino Di Noto (CC BY-NC)



Box D: The Integrated Biodiversity Assessment Tool (IBAT)



The [Integrated Biodiversity Assessment Tool \(IBAT\)](#) provides access to the STAR layer as well as other key global biodiversity datasets including the IUCN Red List, World Database on Protected Areas (WDPA) and Key Biodiversity Areas (KBAs). Access by government and civil society users is free, with registration; commercial use is under license. IBAT is critical to informing risk management and decision-making processes that address potential biodiversity impacts. Developed through a partnership of BirdLife International, Conservation International, International Union for Conservation of Nature (IUCN) and United Nations Environment World Conservation Monitoring Centre (UNEP-WCMC), the vision of IBAT is that decisions affecting critical natural habitats are informed by the best scientific information and in turn decision makers will support the quest to collect and enhance the underlying datasets and maintain that scientific information.



To provide a more comprehensive and accurate picture of the biodiversity significance of an area, it is good practice to contextualize STAR with other biodiversity metrics, particularly those indicating ecosystem condition at local and landscape scales (see IUCN's RHINO framework⁸). Biodiversity

specialists can help interpret Estimated STAR scores and ensure they are considered within the wider ecology and conservation significance of the area.

Estimated STAR is also integrated into the IUCN Contributions for Nature Platform (Box E).

Through this platform, anyone can explore contributions from IUCN Members and see their potential to reduce global species extinction risk through threat abatement and restoration actions.

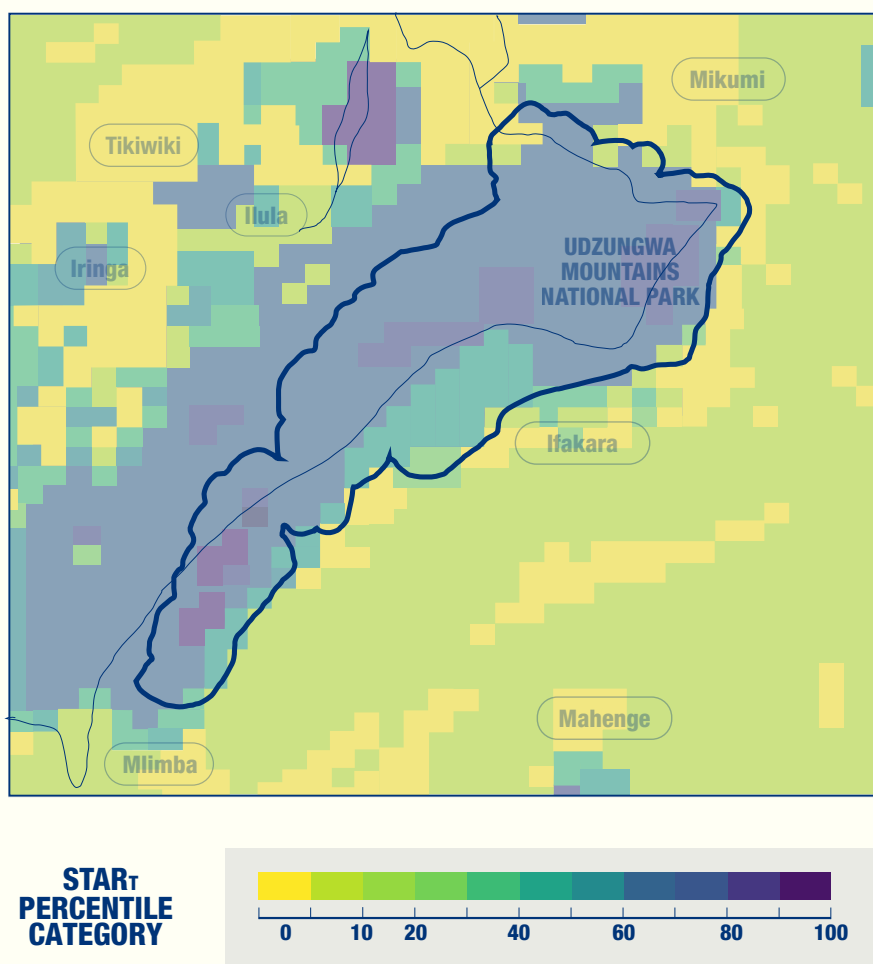


Figure 7 - Example Estimated STAR_t map for a defined Area of Interest (the Udzungwa Mountains Landscape, in Tanzania), generated within IBAT. Map colours show the percentile STAR score for each 1-km grid cell, relative to the global distribution of cells, with zero STAR scores categorised separately in yellow.

⁸ IUCN 2025.



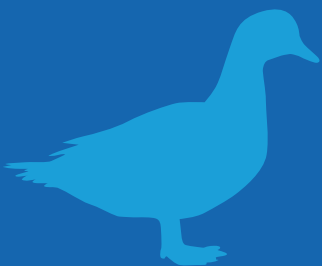
Common Pochard
(*Aythya ferina*)

VULNERABLE

© Яна (CC BY-NC)



Box E: IUCN Contributions for Nature Platform



STAR is embedded within the [IUCN Contributions for Nature Platform](#), an online tool where IUCN Civil Society and Government Members and other constituents can document, visualize and communicate their contributions for nature in support of global biodiversity targets. The platform provides a geospatial interface that supports planning, reporting and collaboration, while also giving global visibility to local initiatives. By overlaying the STAR layers with a project footprint, represented as a spatial polygon, the platform calculates a project's Estimated STAR_r and STAR_h values. Through integration of STAR, the platform offers a powerful, results-oriented mechanism that supports practitioners to assess and communicate the potential conservation and restoration impact of their work to reduce global species extinction risk.



6.2

Calibrated and Target STAR

Estimated STAR_T is based on the best available global data on threatened species. As its name implies, it provides an estimate of the species and threats expected in a given Area of Interest. However, this estimate may not reflect the situation on the ground or water with complete accuracy. Although a species is expected to occur throughout its defined Area of Habitat, distributions may in reality be patchy and uneven. Species range maps may also be based on incomplete knowledge, so that species sometimes are present in an Area of Interest where they have not been mapped. The threats affecting a species may also vary across its Area of Habitat in type and intensity, which Estimated STAR_T cannot take into account in absence of reliable, fine-scale global threat mapping.

Calculation of Calibrated STAR_T therefore uses location-specific data to produce a more accurate estimate for an Area of Interest. This involves confirming that species contributing to the site's STAR score are indeed present in the Area of Interest, checking for the potential presence there of other threatened or near-threatened species, and confirming the presence, severity and scope of each relevant threat (Figure 8).

The calibration process may involve consulting with experts, checking biodiversity databases, accessing local monitoring data, harnessing remote sensing, applying indigenous and local knowledge, and possibly additional field surveys if other data are not sufficient. Clear documentation of sources is

essential and any taxonomic or mapping discrepancies need to be examined and resolved. Threats should be assessed for their actual impact on each species locally, and insignificant threats excluded from the site's STAR score, since attempting to abate such threats does not contribute to extinction risk reduction.

A technical description and example of the STAR_T calibration methodology are in peer review for publication⁹. Practical guidance on information gathering and recalculation is given in the IUCN RHINO (Rapid High-Integrity Nature-positive Outcomes) framework, and IBAT includes functionality to calculate Calibrated STAR_T based on user-inputted values.

⁹ Mair et al. (in review, a and b).



Red-masked Parakeet (*Psittacara erythrogenys*) - NEAR THREATENED / © Tom Benson (CC BY-NC-ND)

The results of the calibration process are a more accurate assessment for the Area of Interest of the threatened species present and the threats that apply to them. Calibrated STAR_r scores can next be used to inform establishing a Target STAR and planning actions for threat abatement. The calibrated values help in identifying the threats that interventions should focus on, and in setting quantitative targets for threat reduction. While Calibrated STAR_r scores show the threats that contribute most to species extinction risk in the Area of Interest, other considerations are also important in identifying focal threats, including feasibility,

cost-effectiveness, and other social, economic or ecological considerations relevant to the site, stakeholders and actors involved. The IUCN RHINO framework¹⁰ provides additional guidance on such considerations.

Threat reduction targets should be quantitative and time-bound. For example, a target could be to reduce the area impacted by invasive plant species in the Area of Interest from 100 ha to 5 ha over a five-year period. This represents a reduction of 95% in threat intensity and can be expressed as a Target STAR score, using the Calibrated STAR_r score for the relevant threat type.

For instance, if the Area of Interest Calibrated STAR_r score for the Invasive Species threat type is 2.4, the Target STAR would be 95% of this, or 2.28. Target scores can be added across threat types to calculate an overall Target STAR score for the site.

A methodology for calibration of STAR_r has not yet been formalised. It would involve assessing the restorability of suitable habitat in an Area of Interest, the likelihood of successful recolonisation or reintroduction of relevant STAR species, and the feasibility of addressing relevant threats in the area restored.

¹⁰ IUCN 2025

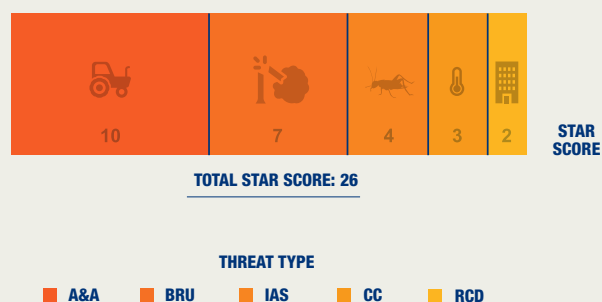
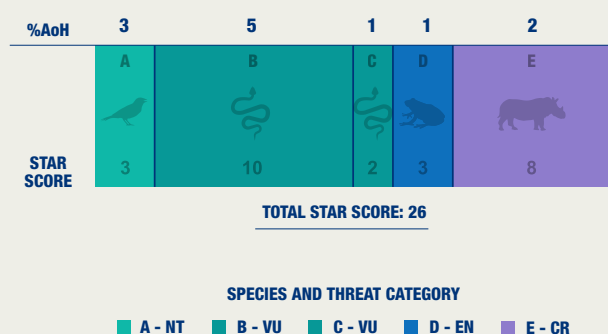


STEP 1

Find estimated STAR_r for the Area of Interest

Based on global data layers the Area of Interest has an estimated STAR_r score of 26

This can be broken down by threat type



STEP 2

Assess the presence of STAR species

- Species C is not present at the site
- An additional threatened Species F (EN) is present, and the site constitutes an estimated 2% of its AoH

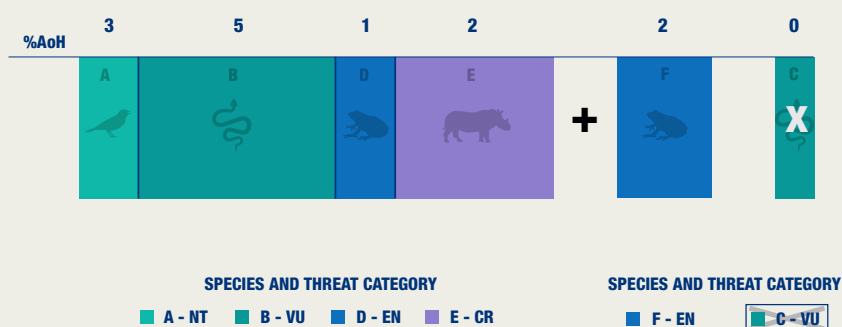


Figure 8-Part 1 - Overview of the STAR_r calibration process, illustrated by a hypothetical example. Threat types: A&A, Agriculture and aquaculture; BRU, Biological resource use; IAS, Invasive and other problematic species, genes and diseases; CC, Climate change and severe weather; RCD, Residential and commercial development.

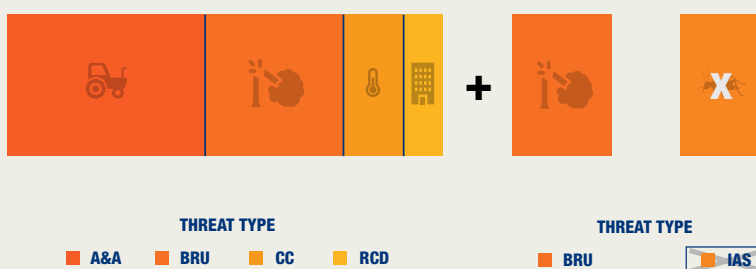


STEP 3

Assess the presence and local intensity (scope and severity) of threats to STAR species

Assessment of threats at the site shows that:

- Invasive Alien Species do not threaten any STAR species here, so this component of the STAR score must be excluded
- Intensity of Biological Resource Use is greater here for species A and E than the average over their global range, so the STAR score associated with this threat will increase

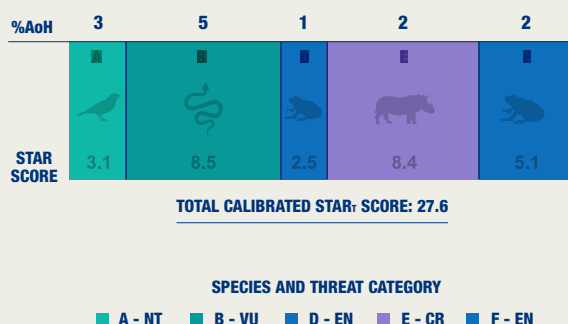


Threat components for species C (not at site) must also be excluded, and threat components for species F (now known to be at site) must be included.

STEP 4

Recalculate STAR scores using the calibration formulae, to give a new site total and a new breakdown by species and threat

Based on global data layers the Area of Interest has an estimated STAR score of 27.6



Calibrate threat components

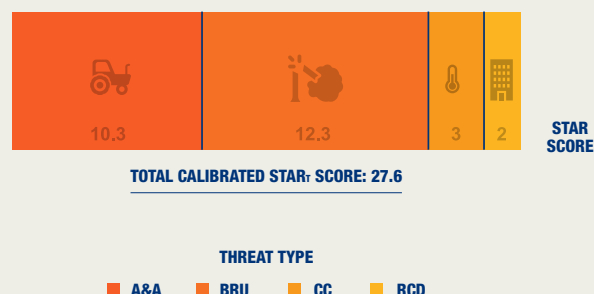


Figure 8-Part 2 - Overview of the STAR calibration process, illustrated by a hypothetical example. Threat types: A&A, Agriculture and aquaculture; BRU, Biological resource use, IAS, Invasive and other problematic species, genes and diseases; CC, Climate change and severe weather; RCD, Residential and commercial development.



Sénégal ©Natur'ELLES

6.3

Realised STAR

Once Calibrated STAR_r has been employed to set threat reduction targets, the next step is to identify a suitable indicator for the intensity of each confirmed threat acting at the Area of Interest. The indicator is used to measure the baseline level of threat intensity and how these change in the Area of Interest over time. Assessing the proportional change in threat intensity over time is the basis for calculating Realised STAR, which is a measure of progress towards the threat reduction target, and of the contribution towards reducing global species' extinction risk (Figure 9).

Note that all non-negligible threats confirmed to be acting at the Area of Interest need to be monitored, as it is possible that threats that are not the focus of interventions may increase in intensity. Monitoring also needs to check for new threats that may emerge over time.

Suitable indicators for threat intensity will depend on the context of the Area of Interest, STAR species and threat types involved. They may use suitable proxy measures that reliably indicate threat. For example, the intensity of threat from unsustainable trapping risk

could be measured as the density of snares detected with standard survey effort, while the intensity of threat from forest conversion to agriculture could be measured directly using satellite imagery.

The methodology for calculating Realised STAR is outlined in Mair et al. (in review, a), and further practical guidance is given in the IUCN RHINO framework¹¹. Functionality for supporting these calculations is also under development in IBAT.

¹¹ IUCN 2025

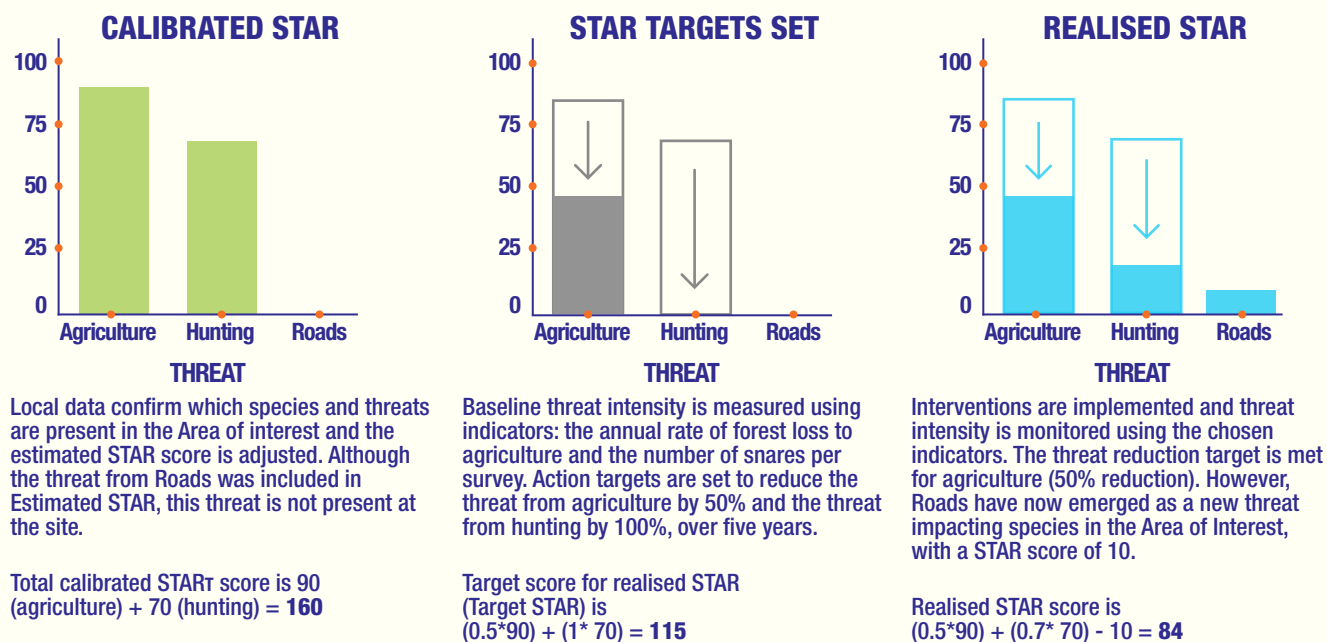


Figure 9 - A simple example illustrating the approach for setting Target STAR and assessing Realised STAR

6.4

Case example: assessing the potential of a suite of restoration sites to contribute to species extinction risk reduction

The Restoration Initiative (TRI) programme is financed by the Global Environment Facility (GEF) and assists nine countries in Asia and Africa to achieve restoration goals in support of the Bonn Challenge. IUCN assessed the potential of a suite of existing TRI project sites in Cameroon, Central African Republic and Kenya to

contribute to reducing species extinction risk, using the Estimated STAR metric with updated high-resolution landcover mapping¹².

The assessments provide a range of information that can support conservation efforts at project sites.

This includes:

- Overall STAR scores at each site, which can inform prioritization of interventions across the suite of sites.
- Maps showing how STAR values vary across sites, which can inform within-site targeting of conservation efforts.

¹² Schneck et al. 2023, Schneck et al. 2024



- Breakdowns of STAR score by threat, which can help focus conservation efforts on the most significant threats, and orient threat-reduction measures to the affected species.
 - Tables providing a list of priority threatened species
 - whose Area of Habitat overlaps with project sites.
 - The assessments also demonstrated the complementary roles of restoration and threat abatement initiatives in reducing extinction risk.
- This information can be used in communicating the importance of these project sites and conservation measures to policymakers, local communities, investors and the broader public, as well as to inform the design of effective conservation and related monitoring work.

6.5

Using STAR to identify key threat types and target intervention approaches across a suite of project locations in West Africa

The NAbSA Initiative (Nature-based Solutions for Climate Adaptation: Monitoring & Impact Evaluation), supported by Global Affairs Canada, is designed to strengthen the design and implementation of nature-based measures through capacity building and equitable access to knowledge, while documenting results and best practices to highlight the biodiversity-climate nexus and societal benefits.

Through the IUCN Contributions for Nature Platform (Box E), a STAR assessment was carried out for three projects across a complex suite of sites in West Africa.

Site polygons were overlapped with the Estimated STAR global layer and the key threat types for STAR species determined (Figure 9). Although threat-specific STAR scores were not calibrated at site level (see section 6.2), this approach gives an indication of the relative importance of different threats, allowing a check that planned intervention approaches are appropriately targeted, and supporting evidence-based reporting to donors and stakeholders.

The projects [Natur'ELLES](#) (focused on 10 mangrove ecosystems protected areas in Senegal)

and [Feminist Climate Action in West Africa](#) (working at multiple sites across four countries) had similar threat profiles, with the key threats being agriculture ('annual and perennial non-timber crops'), hunting ('hunting and collecting terrestrial animals') and logging ('logging and wood harvesting'). The projects' focus on nature-based solutions (Natur'ELLES), improved agro-ecological practices (Feminist Climate Action) and sustainable, climate-resilient alternatives to extractive activities, as well as awareness and training programs (both projects), are well targeted to address these threats.



Sénégal © Natur'ELLES

The project [Ecosystem Solutions for Sustainable Adaptation](#) (SEDAD, focused on three critical Protected Areas in three different countries) showed a different threat profile, with livestock farming & ranching and droughts featuring alongside hunting as the top three threat

types, and a broader suite of threats important overall. This reflects the project's different operating environment, in zones with less rain-fed agriculture, and highlights the importance of SEDAD's explicit focus on climate change adaptation and nature-based solutions.

The project's comprehensive approach to conservation action, including site protection, habitat restoration, training and awareness campaigns, also directly addresses the multi-faceted threat profile identified by STAR.



Figure 10 - Key threat types identified using Estimated STAR for three NAbSA-initiative projects across a suite of spatial locations in West Africa

a. Sénégal Lamine Diop © Photo par M.

b. Sénégal Lamine Diop © M.

c. West Africa Selbé Faye © Interpares



6.6

Weaving STAR into a new conservation framework for Indigenous Territories in Mesoamerica

Mesoamerica is a global hotspot for both biodiversity and culture. Species diversity and endemism are high, and the region is home to numerous Indigenous Peoples possessing unique environmental knowledge. However, many environmental challenges threaten both ecosystems and indigenous livelihoods.

The VOCES¹³ Regional Project, implemented by the IUCN Regional Office for Central America, Mexico and the Caribbean (ORMACC), aims to identify, understand and consolidate the contributions of Indigenous Peoples to conservation in the region. The project uses STAR as a key strand in a new conservation paradigm that weaves together indigenous and scientific knowledge¹⁴.

The first phase of the initiative involved three main steps:

1. Geospatial analysis using STAR to identify conservation opportunities in Indigenous Territories.
2. Intercultural dialogue and participatory evaluation to integrate indigenous knowledge.
3. Development of an integrated conceptual framework that recognizes the complementarity of knowledge types.

STAR uses globally standardised approaches to categorise extinction risk and describe threats. This is a scientific strength, but practical application of STAR in Indigenous Territories must take into account the context of indigenous knowledge and practices. The study highlighted the importance

of adjusting and contextualising narratives for threats, to ensure these are relevant to Indigenous Peoples' local realities and enable their contribution to conservation strategies. Specific threats that disproportionately impact Indigenous Territories in this region, such as organized crime, illegal mining and drug trafficking, are not clearly flagged in the current threat categorisation. Similarly, threats from 'agriculture' do not differentiate between unsustainable expansion of agro-industrial monocultures and traditional agricultural systems, such as the Mesoamerican *milpa*¹⁵, that are essential for food sovereignty and environmental conservation. A more contextual consideration of threats (which could be incorporated as part of the STAR Calibration process) would enable more effective targeting of conservation strategies.

¹³ 'Voices' in English

¹⁴ IUCN 2024

¹⁵ Benrey et al. 2024



Mapping that incorporates local scales, intuitive visual representations and narratives, and also highlights species particularly important to Indigenous Peoples, is another key recommendation of the study. Such species include marine fauna (now incorporated in the global STAR layers) and plants (to be incorporated in future).

The study expands STAR's focus on threat abatement and restoration opportunities to include a third key component, the level of indigenous territorial governance based on the effective exercise of Indigenous Peoples' rights. This approach recognizes that indigenous governance is a key determining factor in the conservation of biodiversity, and

seeks to strengthen it. Detailed criteria are outlined for evaluating indigenous territorial governance, building on established principles for 'governing the commons'¹⁶. Based on these three components, a simple categorization provides a broad overview of each Indigenous Territory, facilitating appropriate actions to be prioritized and resources efficiently allocated.



Regional Coastal Biodiversity Project © IUCN

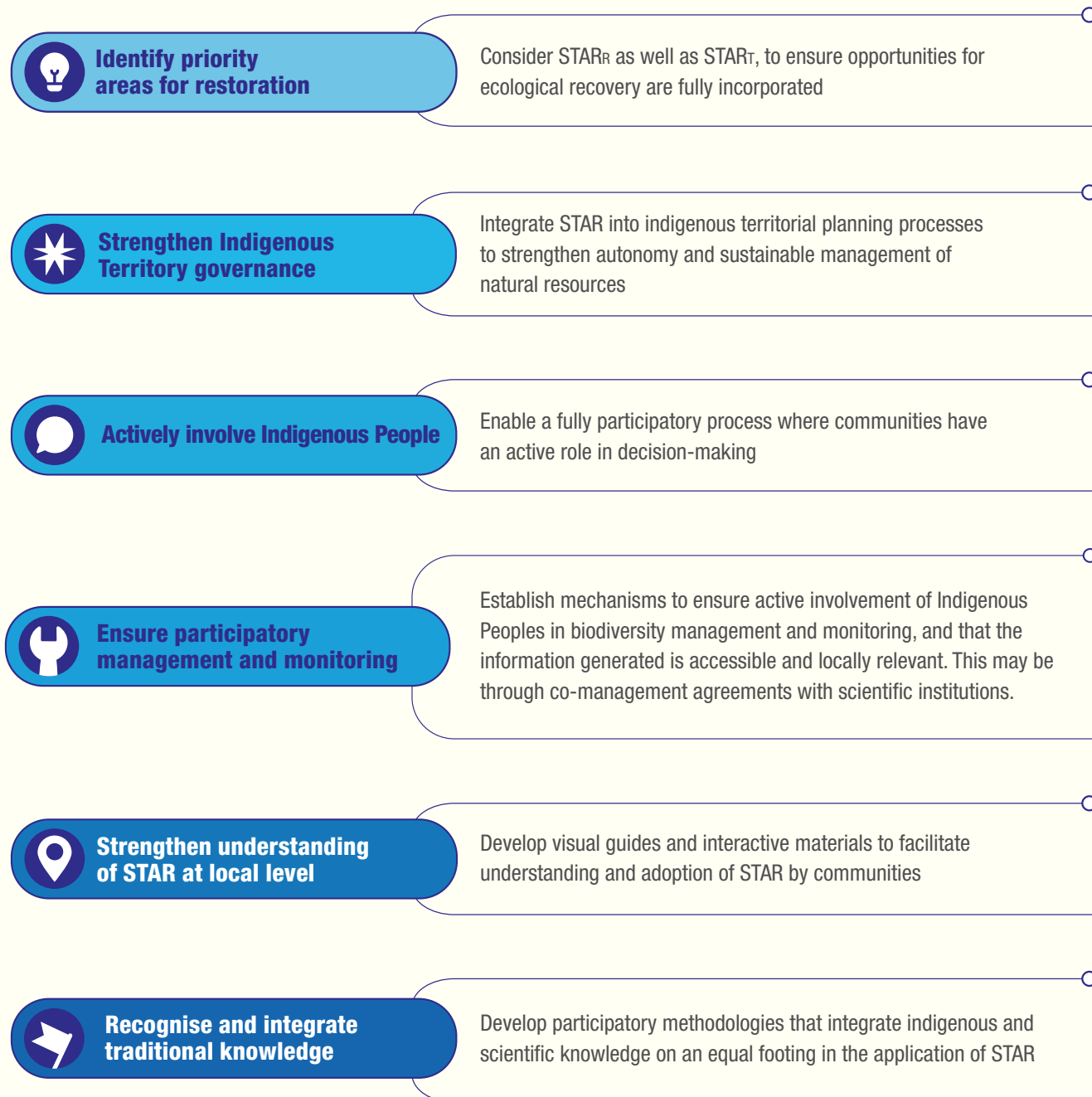


Figure 11 - Summary of key recommendations for the effective use of STAR to support biodiversity conservation in Indigenous Territories in Mesoamerica (adapted from IUCN 2024, p. 18).



IUCN Threat Category		Simple description	Example interpretation in Indigenous Knowledge
EX Extinct		Species that no longer exist.	Spirit that has departed and is present only in oral memory.
CR Critically Endangered		Species at imminent risk of extinction.	Species with spiritual guardians on alert, symbolic of imbalance in nature.
EN Endangered		Species at very high risk of extinction.	Species showing severe decline, related to changed management practices.
VU Vulnerable		Species at high risk of extinction.	Species that needs community protection and ceremonies.
NT Near Threatened		Species that is close to becoming threatened with extinction.	Species of cultural importance that needs ongoing monitoring.
LC Least Concern		Species is not currently threatened.	Species in harmony with the territory, an indicator of ecosystem health.

Table 1. - The IUCN Red List categories of threat have both a scientific and an Indigenous Knowledge interpretation in Mesoamerica.





6.7

Case example: using STAR to provide policy recommendations in Colombia

For the country of Colombia, a collaborative University/NGO study¹⁷ applied STAR alongside other datasets to investigate trade-offs between conservation and economic development.

Colombia is a highly biodiverse country, with an economy mainly reliant on large-scale agriculture. Agricultural expansion has accelerated since 2016 following the end of five decades of internal armed conflict.

This study mapped the opportunity cost of conserving forest rather than using the land for agriculture. These results were combined with STAR_r maps to produce a prioritization map that guides policy-makers to target conservation actions toward regions where conservation benefits are high and economic impacts are low.

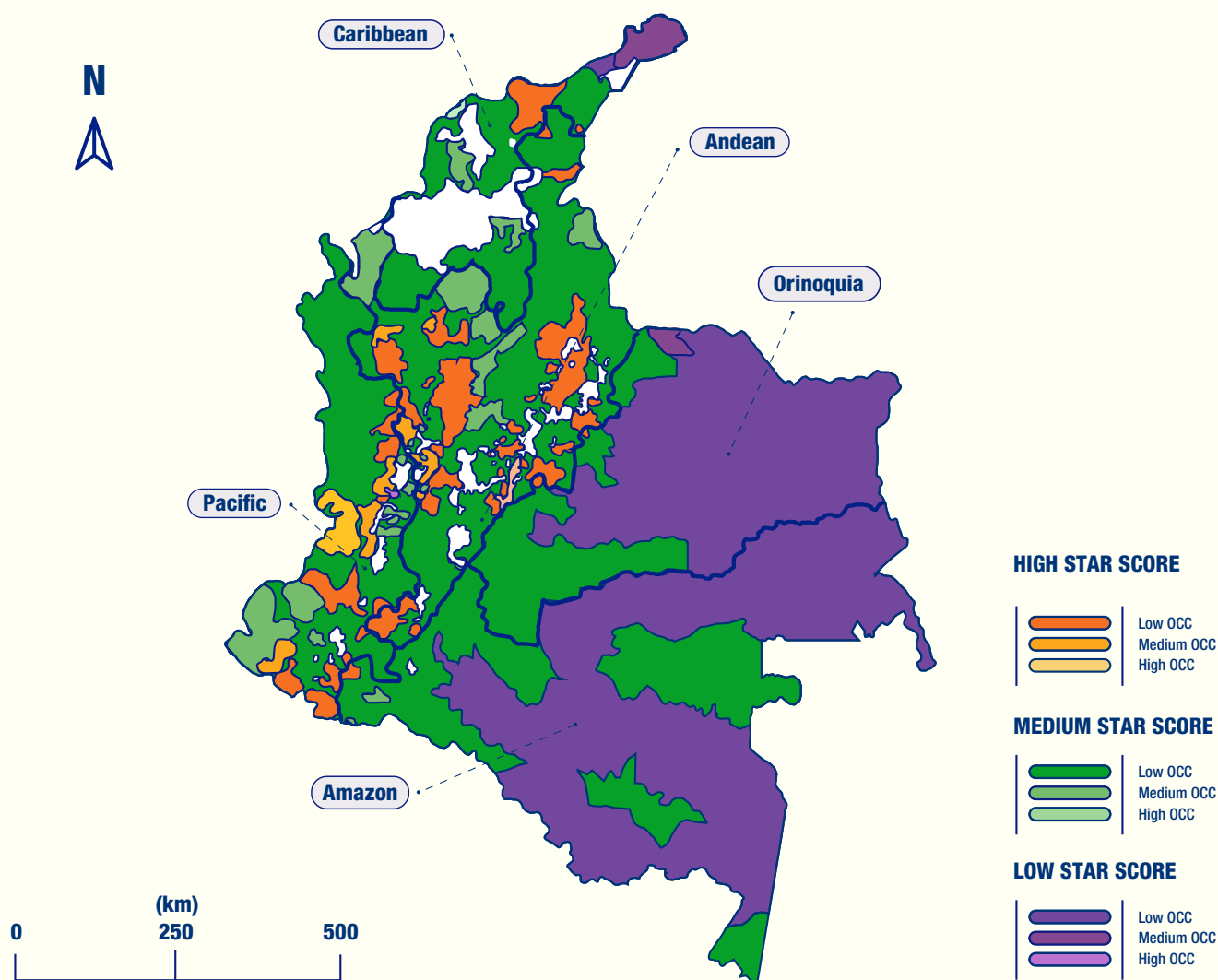
The approach demonstrates how to use the STAR metric as a benefit layer in a return-on-investment analysis, together with a proxy for the cost of conservation actions, to inform biodiversity conservation spending while ensuring the economic benefits of agriculture.

The authors developed a predictive spatial model for the risk of forest conversion and the probability of different types of agricultural activities following conversion. To assess the opportunity cost of conservation (OCC), this model was combined with the expected annual returns of each agricultural activity. Opportunity costs varied widely across different natural regions of the country, but relatively small proportions of currently forested areas were assessed as having 'medium' or 'high' opportunity costs (14% and <1%, respectively).

Next, the agriculture-related threats component of Estimated STAR_r was used to map expected benefits of conservation investment. Of areas of the country that were forested in 2017, 31% had medium STAR_r scores and 6% high STAR_r scores, showing a concentration of potential conservation benefits in relatively small regions.

Using a simple classification of STAR and OCC scores, municipalities could be identified with high potential benefits for conservation and low opportunity costs, and vice versa (see Figure 11).

¹⁷ Guerrero-Pineda et al. 2022



These findings are directly relevant for policy decisions, as they guide approaches to maximize the biodiversity benefits from investments using limited conservation funding while ensuring that landowners maintain returns equivalent to agricultural development. The approach can be adapted and applied in other contexts to optimise trade-offs between conservation and development objectives.

Figure 12 - Results from categorisation of STARr scores and opportunity cost for conservation (OCC) across municipalities within different natural regions of Colombia, redrawn from Guerrero-Pineda et al. 2022. Municipalities with high STARr score and low OCC show high potential for cost-effective conservation investment.





Costa Rica ©Colmena Lab

6.8

Case example: calibrating STAR_T for San José Northern Subcatchments landscape, Costa Rica

6.8.1

Context

The International Union for Conservation of Nature (IUCN) led a collaborative process to calibrate global STAR_T estimates for the San José Northern Subcatchments (SJNS) landscape, an area of 957 km² located within the central

mountain range of Costa Rica that includes the northern region of the country's capital, San Jose. This is a key water catchment area where a water fund, Agua Tica, is co-ordinating nature-based solutions for water protection

across public and private actors. The STAR metric was used to identify the potential contributions towards KMGBF Goal A from specific actions across the SJNS landscape.



6.8.2

Process

Specialist consultation was used to validate the presence of species and the presence and intensity of threats. A first round of consultation involved 15 volunteer specialists selected based on their taxonomic expertise and relevant research experience in the landscape, and working separately to each other. A second and third consultation round involved a small number of paid national specialists, to fill gaps in data for certain species and then to combine the consultation results with additional information from the literature to compile a consensus view. In parallel, to separate out certain threat types more clearly, a land-use change analysis was undertaken to

estimate natural habitat loss over the landscape in the period 1998-2019 related to different drivers.

The calibration process was robust and scientifically grounded but was carried out with relatively limited resources. External consultants were engaged to coordinate the bibliographic review and consolidate inputs from biologists, while IUCN staff supported the consultation process, GIS analysis, calculation of calibrated scores and review of outputs. Rather than direct field verification of species presence (challenging at the time because of COVID-19 restrictions) the exercise relied on expert knowledge and existing datasets. A key strength

was the strategic engagement of volunteer biologists affiliated with the IUCN Species Survival Commission, whose taxonomic expertise and familiarity with the landscape added significant value. The calibration also built on recent updates to national Red List assessments, ensuring alignment with current conservation status data. Despite constraints, the process was completed within a eight-month timeframe, demonstrating the feasibility of conducting high-integrity STAR calibration using a collaborative and resource-efficient approach.



6.8.3

Results

Key results of the consultation process included:

- Eight of the 43 threatened or near-threatened species included in Estimated STAR_T were considered unlikely to be present, either because of local extirpation or because they did not in fact occur in this part of their mapped Area of Habitat
- Relatively low intensity (compared to global averages for Estimated STAR_T species) for threats from invasive alien species, in particular related to chytrid fungi disease affecting amphibians

- Identification and intensity scoring of one or more new threats (for example, agricultural and forestry effluents) for nearly all of the Estimated STAR_T species thought to be present
- Identification of nine additional threatened species thought likely to be present but not originally included in Estimated STAR_T.

Calibration adjusted the total STAR_T score for the SJNS landscape from 898 STAR_T units to 768 STAR_T units. This calibrated score does not include the additional threatened species identified, as the method to incorporate these had not yet been developed when this study was carried out.

The calibration process gave a better understanding of the threats important in the landscape, with STAR_T scores spread more evenly across a wider suite of threats than before calibration. After calibration, the largest opportunity to reduce species extinction risk was linked to land-use change, with livestock farming and ranching the most significant threat (14% of the total). The threat from invasive non-native species/diseases (related to chytrid fungi disease) was 13% of the total after calibration compared to 65% beforehand. This highlighted the need not only to address ongoing threats, but for proactive management to reduce potential future threats to amphibians from chytrid fungi.



6.8.4

Lessons

Other lessons from this exercise for future Estimated STAR calibration include:

- For efficiency, information gathering efforts can be prioritised for the species and associated threats that make the greatest potential contribution to the Area of Interest's Estimated STAR score.
- Use of multiple information sources, from expert input, geo-spatial analysis and literature and database review, generated valuable complementary information for calibration.
- Future calibration exercises could also consider spatial variation within the landscape in the presence of species, and presence and intensity of threats.
- Using structured expert elicitation techniques could have provided clearer indications of confidence in the calibration findings. Documentation of data sources and uncertainty, and incorporation of publicly available species occurrence records, are also important. Quantified levels of uncertainty can help in focusing interventions on the species most likely to be present in the Area of Interest.
- The calibration process can inform the most appropriate indicators for monitoring changes in threat intensity in response to future conservation interventions.
- Information collected during calibration should be fed back into the Red List, and into public databases of species observations.
- Specialists engaged through the calibration process have potential to continue to contribute to target-setting, intervention planning, implementation and monitoring to assess Realised STAR.



Blue Iguana (*Cyclura lewisi*)
ENDANGERED

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07

Considerations when using STAR

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Biodiversity is complex and multifaceted. Similarly, biodiversity decision-making involves a wide range of information types and considerations, including social and economic aspects. No single biodiversity metric will be suitable for every situation, and in some cases a suite of complementary metrics may be needed.

STAR is a robust and versatile biodiversity metric with many practical applications. Like any such metric, however, it has limitations and constraints that relate either to its design or to gaps in available data.

It is important to understand these limitations, both intrinsic

and data-related, so as to ensure that STAR is used and interpreted appropriately. Note that work is actively underway to address known data gaps and improve and extend the global STAR datasets.

7.1

STAR focuses on threatened species

STAR gives higher scores to locations with many threatened species that have small global ranges. This follows a well-established approach to conservation priority-setting that emphasizes threat (reflecting limited options in time) and irreplaceability (reflecting limited options in space).

As the KMGBF goals and targets illustrate, these are important aspects to consider when targeting

conservation interventions, but not the only ones. For instance, STAR does not directly highlight opportunities for conserving intact ecosystems or species communities, ecological processes, ecosystem functions and services, economically or culturally important species, or the recovery of species that are depleted but not yet threatened with extinction. It does not directly address evolutionary history, although

research is underway to develop a linkage between STAR and the “Evolutionarily Distinct & Globally Endangered” (EDGE) metric¹⁸.

A low STAR score for an Area of Interest does not necessarily mean that the Area of Interest lacks current or potential biodiversity value. It does show that there is relatively limited opportunity for interventions there to reduce global species extinction risk (for the taxa included in STAR).

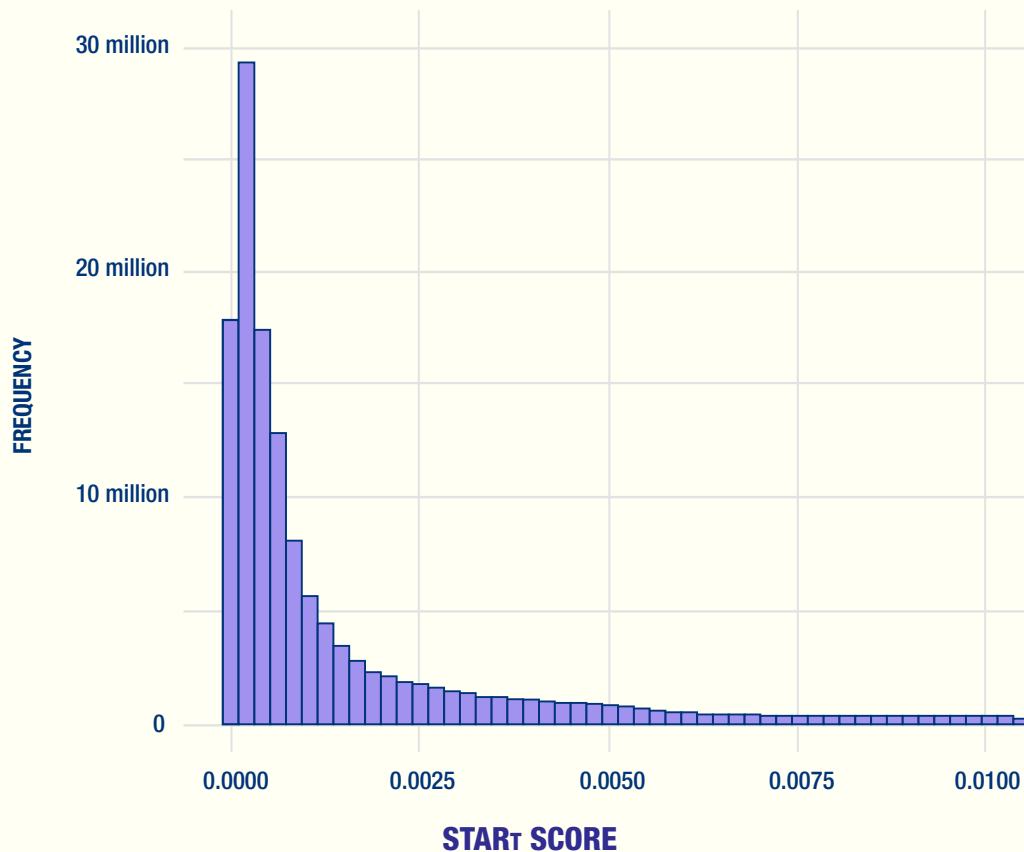
¹⁸ Gumbs et al. 2023



7.2

STAR scores have a skewed distribution

Global patterns of species richness and range-size mean that STAR grid-cell scores have a distribution that is substantially right-skewed. This means most grid cells have low scores while a few have very high scores.



This pattern of STAR scores is generally apparent for any large-scale geographical unit, whether globally, regionally, or nationally.

Across the world, very high STAR scores are concentrated mainly in the tropics, and especially

in certain tropical mountain, island and coastal marine areas. This concentration reflects the biogeographic distribution of threatened species, and hence opportunities to reduce global extinction risk.

There are, however, few areas globally with STAR scores of zero. Even if an area has a low STAR score, for example in many high latitude regions, in deserts and in the high seas, there are still important opportunities to implement actions within the area to reduce extinction risk.

Figure 13 - The global frequency distribution of Estimated STAR_t scores for terrestrial 1-km grid cells (the very small proportion of cells with scores higher than c. 0.011 form a long 'tail' that is not shown).



7.3

Global STAR only includes comprehensively-assessed species groups

Global STAR scores reflect the status of taxon groups currently included in the STAR. To ensure that STAR scores are comparable across the world, these taxon groups must be comprehensively assessed on the Red List. How well these groups indicate the status of other, less well-known taxon groups (for example, terrestrial higher plants) may vary.

Global STAR scores also do not consider species threat at national or regional scale. However, it is possible to calculate STAR based on national or regional red lists to address such species (Section 6.4).

As further taxon groups on the Red List become comprehensively assessed, the global STAR layers

will be updated. For instance, terrestrial STAR_r has recently been updated to include reptiles alongside amphibians, birds and mammals, and now covers all terrestrial vertebrates. Freshwater species and tree species are in the process of being added into terrestrial STAR_r.

7.4

Geographic variation in species life-cycle stages is not fully reflected in STAR

Currently, the Area of Habitat calculations in STAR do not fully account for species that spend different parts of their life-cycle in different locations, and sometimes different realms. Such species include, for example, migratory terrestrial birds or bats, oceanic seabirds that nest on islands, or fish that spend part of the lives

in freshwater and part in the sea. These complex life-cycles are not yet adequately reflected in Area of Habitat estimates which could lead to STAR scores under- or over-estimating potential for extinction risk reduction at a location.

The STAR methodology is being refined so that it better accounts

for different life-cycle stages. In the next iteration, global STAR is also expected to present a single global layer across all realms, rather than separate terrestrial, freshwater and marine layers.



Lemur Leaf Frog (*Agalychnis lemur*) - CRITICALLY ENDANGERED / © leonardbolte (CC BY-NC)

7.5

Estimated STAR makes some simplifying assumptions

To enable calculation of standardised, comparable scores, estimated global STAR assumes that across a species is present, at uniform densities, and subject to uniform threat intensities across its Area of Habitat.

The STAR calibration process (section 6.2) is applied to refine STAR estimates using ground-truthed data. At present, calibration corrects for species' presence and the local presence

and intensity of threats. The calibration methodology is being further developed to account for spatial differences in species population density.



7.6

STAR scores are comparable only when based on the same datasets

Estimated, Calibrated, Target and Realised STAR scores are comparable when calculated in the same way using the same underlying datasets.

However, it is not appropriate to compare STAR scores that are calculated using different datasets, for example where different STAR scores are based on:

- National Red Lists compared to the global IUCN Red List

- Differently dated versions of the Red List
- Inclusion of different taxon groups
- Different methodologies (including land cover datasets) for Area of Habitat mapping.

The global IUCN Red List is continually updated and refined as new information becomes available and new or revised assessments are made. Similarly, global STAR

estimates are updated (on a less frequent schedule) to reflect the latest Red List information. This results in different versions or 'vintages' of STAR being available over time.

Assessment of Realised STAR over time should be based on the STAR version that was used to calculate Calibrated STAR for a location, and not altered to reflect subsequent versions.

7.7

Some threatened species require additional targeted interventions

Fully addressing the threats faced by a species, over its entire range, is expected to reduce its risk of extinction, so that it would no longer be assessed in a threatened category on the Red List¹⁹. However, some species may require further targeted

interventions in addition to reduction of relevant threats²⁰. These could include, for example, captive breeding for population replenishment or re-introduction, focused habitat management, or assisted movement. KMGBF Target 4 is designed to mobilise

such interventions as needed over and above threat abatement and restoration. Potential species-specific needs should be assessed when planning interventions after the STAR calibration process (section 6.2).

¹⁹ Mair et al. 2021.

²⁰ Bolam et al. 2021.



Smooth-coated Otter (*Lutra perspicillata*)

VULNERABLE

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08

Other approaches and metrics to complement STAR



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The global STAR layers provide robust and versatile biodiversity metrics with varied applications. However, in some contexts other approaches and metrics, outlined below, may be useful to complement STAR.

8.1

IUCN Green Status

The STAR metric focuses on reducing extinction risk, guiding actions that can move threatened species to the Least Concern Red List category. While a Least Concern species has relatively low risk of near-term extinction, it may be far from fully recovered to a healthy, viable and functional status. KMGBF Goal A for 2050 recognises this, with the aim that by 2050 “the abundance of native wild species is increased to healthy and resilient levels”.

The [IUCN Green Status of species](#) complements the Red List by providing a tool for assessing the

recovery of species’ populations and measuring their conservation success.

The Green Status assesses species against three essential facets of recovery²¹. A species is considered to be fully recovered if, across all parts of its range (including those previously occupied before major human impacts) it is all of

1. **Present**
2. **Viable**, i.e. not threatened with extinction
3. Performing its **ecological functions**.

These factors contribute towards a **Green Score** that ranges from 0–100%, which shows how close a species is to its **fully recovered** state.

The Green Status framework and Green Score can be used as a complementary measure to STAR for target-setting and action planning to achieve the component of Goal A focused on healthy and resilient species.

²¹ Akçakaya et al. 2018



8.2

National Red Lists

Many countries have developed National Red Lists using IUCN's [Guidelines for Application of the IUCN Red List Criteria at Regional and National Levels](#). National Red Lists assess and categorise the extinction risk status of species at the national level.

The STAR metric methodology is applicable at national (or regional) scale as well as globally (Section 6.2). Depending on the robustness, completeness and recency of the national Red List assessment, developing a national STAR dataset may have some practical advantages:

- National Red Lists may include additional taxon groups that are fully assessed (at national level) and can be incorporated

in the STAR metric. For example, some National Red Lists include full assessments for higher plants and certain invertebrate groups. National STAR datasets may thus give a more broadly representative view of biodiversity than the global STAR layer.

- STAR based on National Red Lists may show greater differentiation of scores across grid cells, especially for countries where there are relatively few globally threatened species present.
- National Red Lists can help to highlight not only global but national-level responsibilities and priorities for reducing species extinction risk.

On the other hand, there may be practical challenges in assessing current and former Area of Habitat, and the relevance, scope and severity of threats, for nationally threatened species that are not already in the STAR global layer.

Mair et al. (2023) provide examples of applying STAR based on national Red Lists, focusing on vascular plants in Brazil, Norway and South Africa, to identify key opportunities for reducing extinction risk by threat type and location.



Giant Armadillo (*Priodontes maximus*) - VULNERABLE - © Kevin Schafer (CC BY-NC-ND)

8.3

Other metrics focused on species extinction risk

The recently-developed Land-cover change Impacts on Future Extinctions (LIFE) metric also focuses on opportunities to reduce extinction risk. It has similarities to STAR but can be used for complementary purposes. The metric estimates change in species' extinction risk from land-cover changes²². LIFE uses a non-linear model to relate past and present habitat loss to a species' extinction probability. Global layers for LIFE show the marginal effect of converting or restoring natural

habitats to or from arable land.

Like STAR, LIFE is based on Area of Habitat mapping for species of terrestrial vertebrates, and LIFE scores are comparable and scaleable. Unlike STAR, LIFE is focused on land-cover change in the terrestrial realm (not other threats or realms), but includes Least Concern as well as threatened species. As with STAR, LIFE has a range of potential applications²³. It is likely to be particularly useful for situations

relating to land-use planning for agricultural development, and where STAR scores are relatively low and the larger species complement in LIFE provides better differentiation of scores across grid cells in a landscape.

[The LIFE global layers](#) have been published, with conditions of use as set out by the custodians of the underpinning data sets.

²² Eyres et al. 2025a

²³ Eyres et al. 2025b



Glossary

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AoH - Area of Habitat	The area within a species' range with suitable habitat at suitable elevation. A species' Area of Habitat is estimated based on IUCN Red List data on species' ranges, habitat associations (cross-walked to landcover classes) and elevation limits.
Area of Influence	In impact assessment, the Area of Influence is the geographic extent where a project's direct and indirect environmental and social impacts may potentially occur. It defines the spatial scale for identifying and managing risks, including both the project's direct operations and any unplanned but predictable developments that might be caused by the project.
Area of Interest	A defined geographic area for potential interventions to reduce species extinction risk. Estimated STAR scores for an Area of Interest are obtained by overlaying a user-defined location or polygon on the global STAR map.
Calibrated STAR	A validated measure of an Area of Interest's potential to contribute to species' extinction risk reduction. It is based on adjustment of Estimated STAR following further assessment using location-relevant data on the presence of species, and presence and intensity of threats.
CBD - Convention on Biological Diversity	An international treaty adopted in 1992 with three main goals: the conservation of biodiversity, the sustainable use of its components, and the fair and equitable sharing of benefits from the use of genetic resources.
CMS - Convention on Migratory Species	Also known as the Bonn Convention, an international treaty under the United Nations Environment Programme (UNEP) adopted in 1979 to protect migratory species of wild animals and their habitats on a global scale.
Critically Endangered species	See 'IUCN Red List categories'
EDGE species - Evolutionarily Distinct and Globally Endangered species	Species identified using a scientific framework that considers both evolutionary uniqueness and risk of extinction. EDGE species capture significant evolutionary history and are at the brink of disappearing, so their extinction would result in a disproportionate loss of the planet's unique evolutionary heritage.
Endangered species	See 'IUCN Red List categories'



Estimated STAR	STAR scores mapped as global layers that provide an estimate of local STAR values based on global datasets, under the assumptions that species occur uniformly throughout their mapped Area of Habitat, and species-specific threats are uniform across their entire range.
IUCN Contributions for Nature Platform	An online tool and geospatial interface where IUCN Government and Civil Society Members and other constituents can document, visualize and communicate their contributions for nature in support of global biodiversity targets.
IUCN Green Status of Species	A scientific framework that measures a species' recovery by assessing how close it is to being ecologically functional and viable across its entire native range.
IUCN Habitats Classification Scheme	A hierarchical framework used to standardize the categorization of habitats for international conservation efforts. It provides the basis for assessing species-habitat associations and mapping species' area of habitat. The scheme has three levels of organization, moving from 18 broad categories (Level 1) to more specific habitat classes (Level 2) and specific habitat sub-types (Level 3).
IUCN Red List categories	The IUCN Red List of Threatened Species divides species into nine categories based on their risk of global extinction. Species are assessed based on scientific criteria such as population size, rate of decline, and geographic distribution. The Red List categories used in STAR calculation are: • Critically Endangered (CR): Highest risk of extinction. A taxon is Critically Endangered when the best available evidence indicates that it meets any of the criteria A to E for Critically Endangered, and it is therefore considered to be facing an extremely high risk of extinction in the wild. • Endangered (EN): Very high risk of extinction. A taxon is Endangered when the best available evidence indicates that it meets any of the criteria A to E for Endangered, and it is therefore considered to be facing a very high risk of extinction in the wild. • Vulnerable (VU): Risk of extinction. A taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable, and it is therefore considered to be facing a high risk of extinction in the wild. • Near Threatened (NT): A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered, or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future. In addition, Least Concern (LC) species are those that do not qualify or nearly qualify for a threatened category, because they remain relatively abundant and widespread, and are not suffering rapid declines. Their inclusion on the Red List helps to track overall biodiversity trends as well as identify species that may be declining but are not yet threatened with extinction. Least Concern species may still be a focus for conservation attention to achieve species recovery.



IUCN Red List of Threatened Species	International standard for assessing species extinction risk. The IUCN Red List of Threatened Species is compiled by IUCN's global network of experts, specialist groups and partners.
IUCN Threats Classification Scheme	A standardized, hierarchical framework used to document and categorize direct threats to species and ecosystems, and a core component of the IUCN Red List of Threatened Species assessment process.
KBA - Key Biodiversity Area	A site of global significance for the persistence of biodiversity, identified consistently and rigorously using the set of quantitative scientific criteria in the KBA global standard.
KMGBF - Kunming-Montreal Global Biodiversity Framework	A framework adopted at the 15th Conference of the Parties (COP15) to the UN Convention on Biological Diversity in December 2022 that sets out a pathway to halt and reverse nature loss and reach the global vision of a world living in harmony with nature by 2050. The framework sets 23 global targets for 2030 and four long-term goals for 2050.
Least Concern species	See 'IUCN Red List categories'
LIFE metric - Land-cover change Impacts on Future Extinctions metric	A global metric that considers species' current and past Area of Habitat to map the impact of land-use changes on extinction risks , currently for terrestrial vertebrates. See.
MEA - Multilateral Environmental Agreement	A legally binding international agreement between three or more countries that addresses shared environmental problems through collective action and coordinated rules, aiming to foster international cooperation to manage environmental issues that are global or transboundary in nature.
NBSAP - National Biodiversity Strategy and Action Plan	A country's official plan for addressing biodiversity loss that outlines national actions and strategies to meet international goals, such as the targets set by the global Kunming-Montreal Biodiversity Framework. NBSAPs identify threats, define conservation and sustainable use strategies, and promote concerted and cross-sectoral efforts to protect nature and ensure human well-being.



Near Threatened species	See 'IUCN Red List categories'
OCC - Opportunity Cost of Conservation	The lost direct economic or social benefits arising from alternative land or resource uses that were forgone to protect biodiversity.
OECM - Other Effective Area-based Conservation Measures	As defined by the Convention on Biological Diversity (Decision 14/8), a geographically defined area other than a Protected Area, which is governed and managed in ways that achieve positive and sustained long-term outcomes for the in-situ conservation of biodiversity, with associated ecosystem functions and services and where applicable, cultural, spiritual, socio-economic, and other locally relevant values.
Protected Area	IUCN defines a Protected Area as a clearly defined geographical space, 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. Such areas have the primary goal of nature conservation, even if other activities, such as sustainable resource use, are permitted.
Ramsar Convention	Also known as the Convention on Wetlands, an intergovernmental treaty adopted in 1971 (in Ramsar, Iran) that provides a framework for nations to conserve and wisely use wetlands and their resources. The convention's three main pillars are the designation of important wetlands as Ramsar Sites, promoting wise use of all wetlands, and fostering international cooperation on shared wetland systems and resources.
Realised STAR	A conservation outcome measure in STAR units, calculated from Calibrated STAR values and the measured threat intensity reduction and/or restoration success resulting from conservation interventions in a defined Area of Interest.
RHINO - Rapid High-Integrity Nature-positive Outcomes	An approach developed by IUCN providing science-based pathways for the delivery and reporting of rapid, high-integrity contributions to the Kunming-Montreal Global Biodiversity Framework (KMGBF) and the Sustainable Development Goals (SDGs).



RLI - Red List Index	A metric that tracks the global extinction risk of a group of species by measuring changes in their IUCN Red List Categories over time, showing whether species are overall becoming more or less threatened. The RLI is recognized as a key indicator for international biodiversity and sustainability goals.
SDGs - UN Sustainable Development Goals	A set of 17 interconnected goals to transform the world by 2030. Adopted by all United Nations Member States, they constitute a universal call to action to end poverty and inequality, protect the planet, and ensure that all people enjoy health, justice, and prosperity.
STAR_R - Species Threat Abatement and Restoration metric - Restoration	A metric to show the potential or achieved contribution to reducing species' extinction risk, based on actions to restore species' habitat while preventing threats in a defined Area of Interest.
STAR_T - Species Threat Abatement and Restoration metric - Restoration	A metric to show the potential or achieved contribution to reducing species' extinction risk, based on actions to lower the intensity of specific threats in a defined Area of Interest.
Target STAR	An objective for reduction in species' extinction risk measured in STAR units, calculated from Calibrated STAR values and targets for reduced threat intensity and/or restoration success resulting from conservation interventions in a defined Area of Interest.
UNCCD - United Nations Convention to Combat Desertification	An international agreement adopted in 1994 that links land management, environment and development. It aims to restore degraded land, mitigate the effects of drought, and improve conditions for people in drylands (arid, semi-arid, and dry sub-humid areas) through a participatory approach to sustainable land stewardship.
Vulnerable species	See 'IUCN Red List categories'
WHC - The World Heritage Convention	An international treaty under the United Nations Educational, Scientific and Cultural Organization (UNESCO), adopted in 1972, to identify, protect and preserve cultural and natural sites of 'Outstanding Universal Value' around the world. The Convention establishes a framework for international cooperation, the criteria for inscribing sites onto the World Heritage List and the duties of States Parties to protect these properties.

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Annex I

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Annex I: STAR methodology and underpinning data

The STAR methodology and calculation of the first-version terrestrial STAR layer are described in Mair et al. 2021. Calculation of marine STAR is described in Turner et al. 2024.

The estimated global STAR_T layer (version 2) was updated in 2025 and is based on the following datasets:

- [The IUCN Red List](#) of Threatened Species. Version 2025-1
- IUCN Threats Classification Scheme ([Version 3.3](#))
- IUCN Habitats Classification Scheme ([Version 3.1](#)).

For Area of Habitat²⁴ estimates (see Box C) in the current STAR_T global layer, species' suitable habitat was determined by applying habitat associations listed in the Red List assessments. To map this, terrestrial habitats in the IUCN habitats classification scheme were matched to Copernicus Global Land Service Land Cover (CGLS-LC100, version 3.01, 2019 epoch) discrete landcover classes through a crosswalk table²⁵. Elevation thresholds were applied through the Copernicus GLO-30 Digital Surface Model, considered the most recent and accurate elevation data²⁶, corrected via a machine learning algorithm to remove forests and buildings²⁷.

For the first terrestrial global STAR layers (v 1), including the current STAR_R layer, and for Marine STAR_T the Red List datasets used were:

- [The IUCN Red List](#) of Threatened Species. Version 2019-3.
- IUCN Threats Classification Scheme (Version 3.2, 2019)
- IUCN Habitats Classification Scheme ([Version 3.1](#)).

AoH mapping for terrestrial STAR was based on Strassburg *et al.* 2020, and for marine STAR is described in Turner *et al.* 2024.

²⁴ Brooks et al. 2019

²⁵ Dahal et al. 2022, Lumbierres et al. 2022

²⁶ Guth & Geoffroy 2021

²⁷ Hawker et al. 2022



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