EO 4 Ecosystem Accounting 2022

EO for ecosystem condition assessments: Lessons from the Myanmar National Ecosystem Assessment

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The Myanmar National Ecosystem Assessment

Aim of the Myanmar National Ecosystem Assessment:

- Assess the status of all of Myanmar's terrestrial, freshwater, subterranean and coastal ecosystems.

Methods:

- Conduct a full IUCN Red List of Ecosystems assessment

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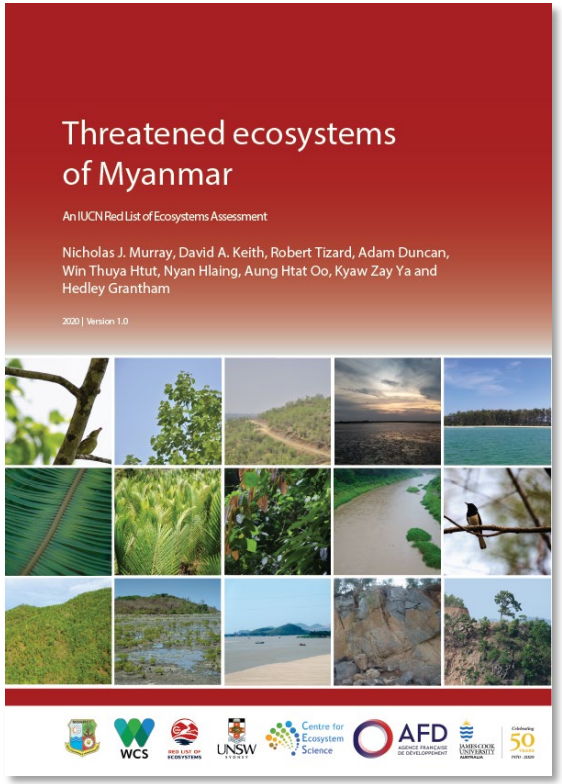

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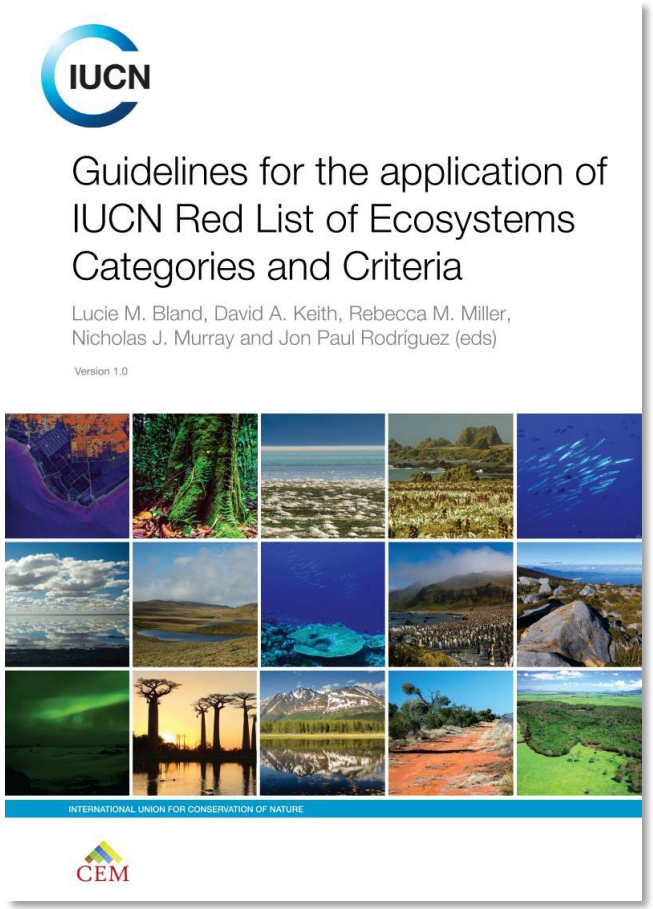
IUCN Red List of Ecosystems requires the evaluation of 5 criteria focused primarily on ecosystem **extent** and **condition**.

A. Reduction in geographic distribution	*Spatial*
B. Restricted geographic distribution	
C. Environmental degradation	*Condition*
D. Disruption of processes or interactions	
E. A quantitative analysis	



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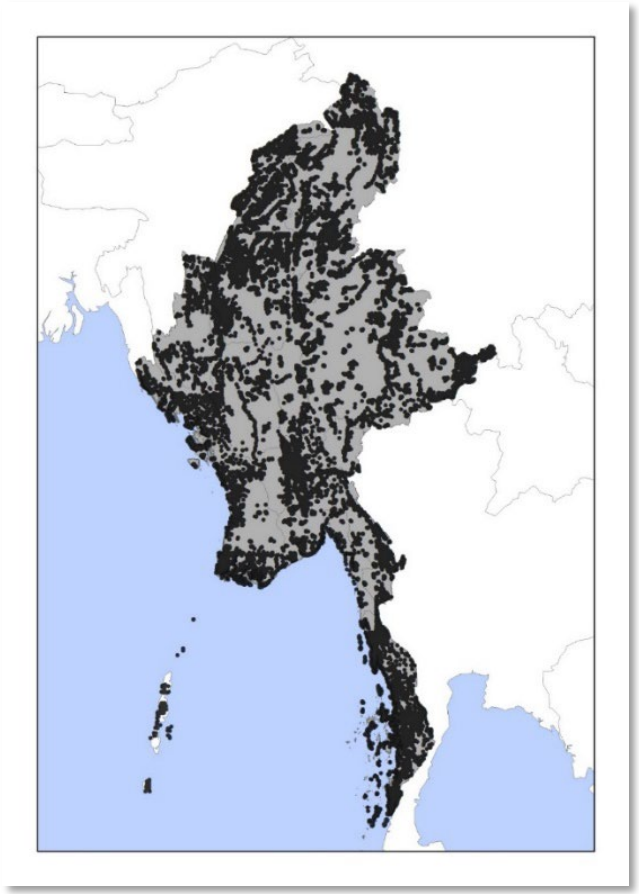
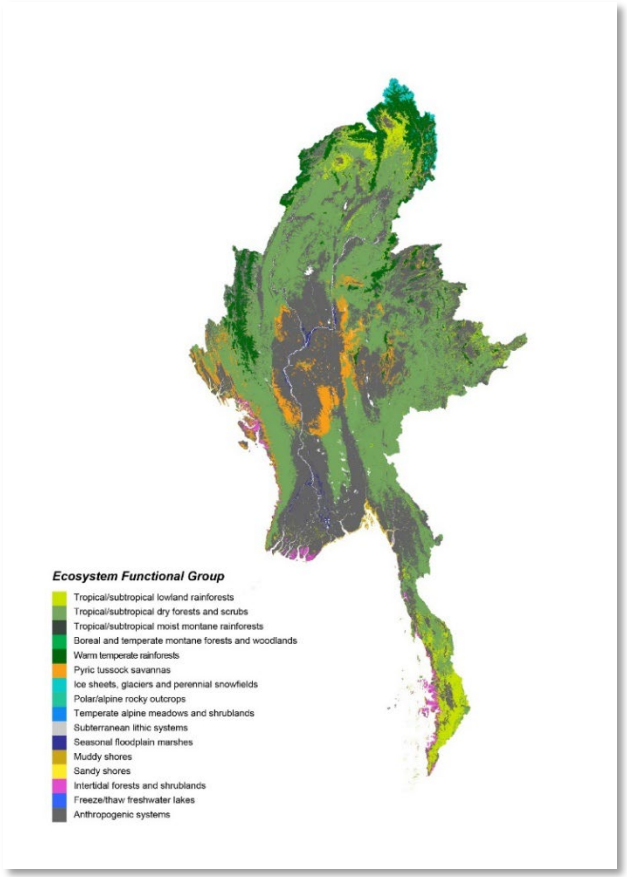
Two spatial extent criteria:

- New national map developed from thousands of hours of field work and image interpretation, together with supervised remote sensing classifications of Sentinel 2 and Landsat data

- Straightforward assessment of the change in extent and distribution criteria.





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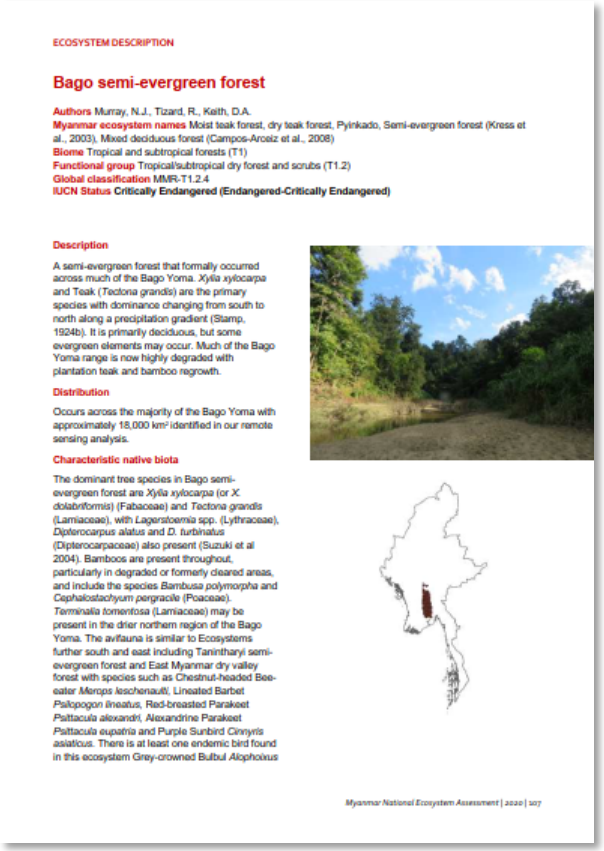
The ‘condition’ criteria were assessed with:

- Per-ecosystem literature review
- Global indicators were effective for many ecosystems – though were compared against field studies where possible
- Multiple indicators used as much as possible
- Choice of indicators clearly justified in every ecosystem assessment summary (5-9 pages)



ECOSYSTEM DESCRIPTION

Bago semi-evergreen forest

Authors Murray, N.J., Tizard, R., Keith, D.A.
Myanmar ecosystem names Moist teak forest, dry teak forest, Pyinkado, Semi-evergreen forest (Kress et al., 2003), Mixed deciduous forest (Campos-Arceiz et al., 2008)
Biome Tropical and subtropical forests (T1)
Functional group Tropical/subtropical dry forest and scrubs (T1.2)
Global classification MMR-T1.2.4
IUCN Status **Critically Endangered (Endangered-Critically Endangered)**

Description

A semi-evergreen forest that formally occurred across much of the Bago Yoma. *Xylia xylocarpa* and Teak (*Tectona grandis*) are the primary species with dominance changing from south to north along a precipitation gradient (Stamp, 1924b). It is primarily deciduous, but some evergreen elements may occur. Much of the Bago Yoma range is now highly degraded with plantation teak and bamboo regrowth.

Distribution

Occurs across the majority of the Bago Yoma with approximately 18,000 km² identified in our remote sensing analysis.

Characteristic native biota

The dominant tree species in Bago semi-evergreen forest are *Xylia xylocarpa* (or *X. dolabriformis*) (Fabaceae) and *Tectona grandis* (Lamiaceae), with *Lagerstoemia* spp. (Lythraceae), *Dipterocarpus alatus* and *D. turbinatus* (Dipterocarpaceae) also present (Suzuki et al 2004). Bamboos are present throughout, particularly in degraded or formerly cleared areas, and include the species *Bambusa polymorpha* and *Cephalostachyum pergracile* (Poaceae). *Terminalia tomentosa* (Lamiaceae) may be present in the drier northern region of the Bago Yoma. The avifauna is similar to Ecosystems further south and east including Tanintharyi semi-evergreen forest and East Myanmar dry valley forest with species such as Chestnut-headed Bee-eater *Merops leschenaulti*, Lineated Barbet *Psilopogon lineatus*, Red-breasted Parakeet *Psittacula alexandri*, Alexandrine Parakeet *Psittacula eupatria* and Purple Sunbird *Cinnyris asiaticus*. There is at least one endemic bird found in this ecosystem Grey-crowned Bulbul *Alophoixus*

ECOSYSTEM DESCRIPTION

griseiceps which has recently been elevated to full species but has yet to be studied. This ecosystem can still support small populations of large mammals that include Leopard *Panthera pardus* (VU), Sambar *Cervus unicolor* (VU), Gaur *Bos gaurus* (VU) and Banteng *Bos javanicus* (EN). Asian Elephant *Elephas maximus* (EN) is known to continue to occur in small numbers in this ecosystem (Campos-Arceiz, 2008).

Abiotic environment

This ecosystem occurs in areas with moderately high rainfall with high seasonality, with most rainfall occurring between May and October. Mean annual rainfall varies from 1,500 mm in the north to 2,500 mm in the south, but to the driest foothills in rain shadows may receive as little as 950 mm (Kress et al., 2003). Mean temperature 26.1° C. Soils are generally light-textured and erodible, with increasing clay content with depth (Suzuki et al., 2004).

Key processes and interactions

Rainfall seasonality and seasonal water stress is a key factor that influences the distribution and species composition of seasonally dry ecosystems such as Bago semi-evergreen forest (Banda et al., 2016). The dominant tree species are drought-deciduous, enabling them to persist through prolonged water deficits in the dry season, and support rapid growth when monsoon rains fuel primary productivity. Flammability is likely to be low, except where extensive disturbance has promoted increased fire activity, particularly in areas with large tracts of bamboo regrowth.

Major threats

The ecosystem has been extensively logged, fragmented by shifting cultivation and the development of plantations (Shimuzu et al., 2017). Only tiny patches of primary forest remain, with the vast majority of this ecosystem now occurring as highly degraded forest regrowth dominated by bamboo. Post-disturbance bamboo thicket may be a persistent steady state, with dense stands limiting dispersal and establishment of tree species typical of primary forest. They may also maintain a fire regime that limits establishment of primary forest species. The impact of shifting cultivation has been reported to be decreasing in the last decade, while logging, plantation development, urban development and water conversion (new dams) have expanded (Shimuzu et al., 2017). Poaching of wild fauna, including elephants, appears regular (Sampson et al., 2018).

Ecosystem collapse definition

Bago semi-evergreen forest is regarded as collapsed when its mapped distribution has declined to zero, or when primary forest accounts for 0% of total forest cover, or when patches of remnant primary forest are less than 1-10 km² in area.

Assessment summary

This ecosystem now occurs across a relatively small distribution, and about 33.9% of the ecosystem is considered degraded since a primary state at year 1750. Ongoing degradation is clearly occurring, with 6.8% of remaining primary areas lost between 2000-2017. Projections from this dataset suggest that ongoing degradation will not occur sufficiently to meet category thresholds for D2b. However, a climate suitability simulation model suggests that environmental suitability for this ecosystem will severely reduce by 2050, with an extent and severity sufficient to meet the thresholds for **Critically Endangered**, with model uncertainty suggesting a plausible bound of listing between Endangered and Critically Endangered.

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Example (forest biomes) – biotic degradation:

- 26 ecosystem assessments used a remotely-sensed dataset of the distribution of primary forest in Asia.
- The ***proportion*** of ecosystem that remains as primary forest is used as a spatially comprehensive estimate of condition.
- Assumption: 100% of forest is primary forest in the year 1750.
- Requires ecosystem map to bound analyses.

Environmental Research Letters

LETTER

Ongoing primary forest loss in Brazil, Democratic Republic of the Congo, and Indonesia

Svetlana Turubanova[1], Peter V Potapov[1], Alexandra Tyukavina[1] and Matthew C Hansen[1,2]

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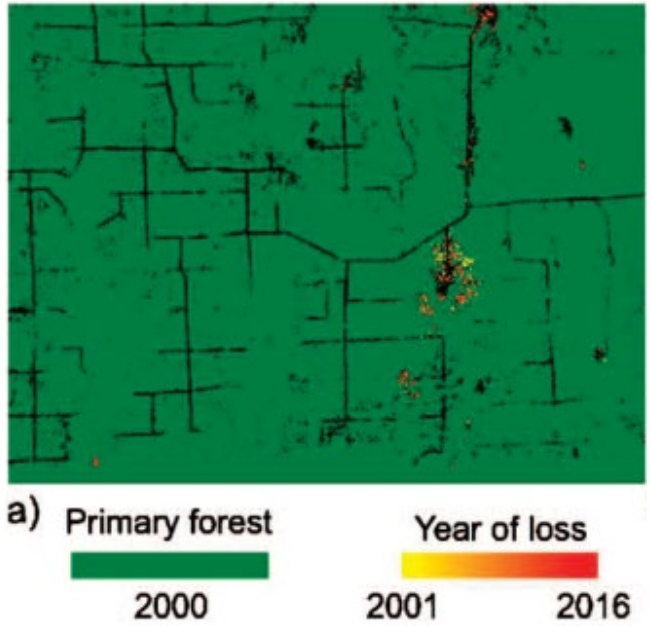

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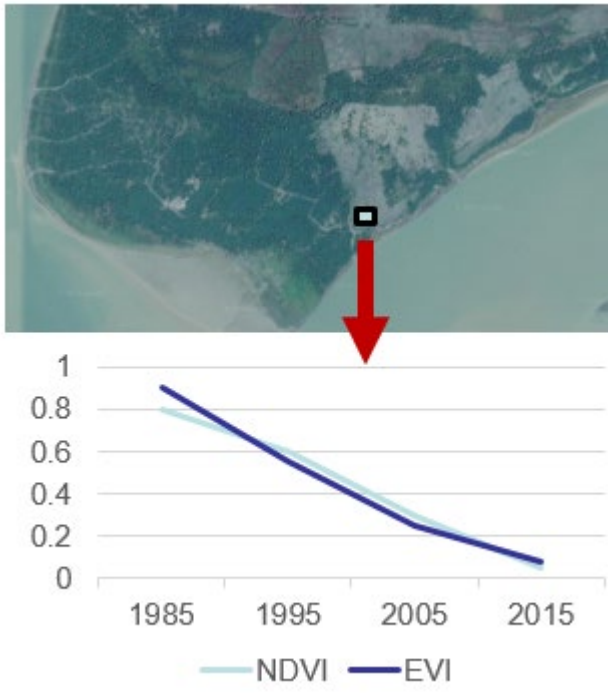
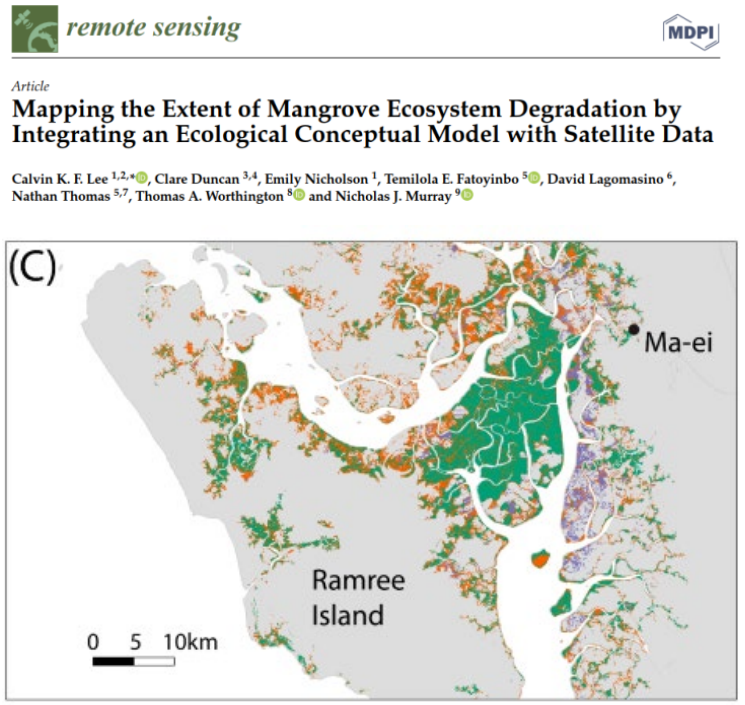
Example (mangrove ecosystems):

- 4 mangrove assessments used remotely-sensed analyses developed for the project:
  - Supervised classification with a ‘degradation’ training set
  - Per-pixel time-series of vegetation indices *within* mangroves
- The **proportion** of ecosystem meeting thresholds of mangrove degradation used to assess the extent of degradation.
- Requires ecosystem map to bound analyses.





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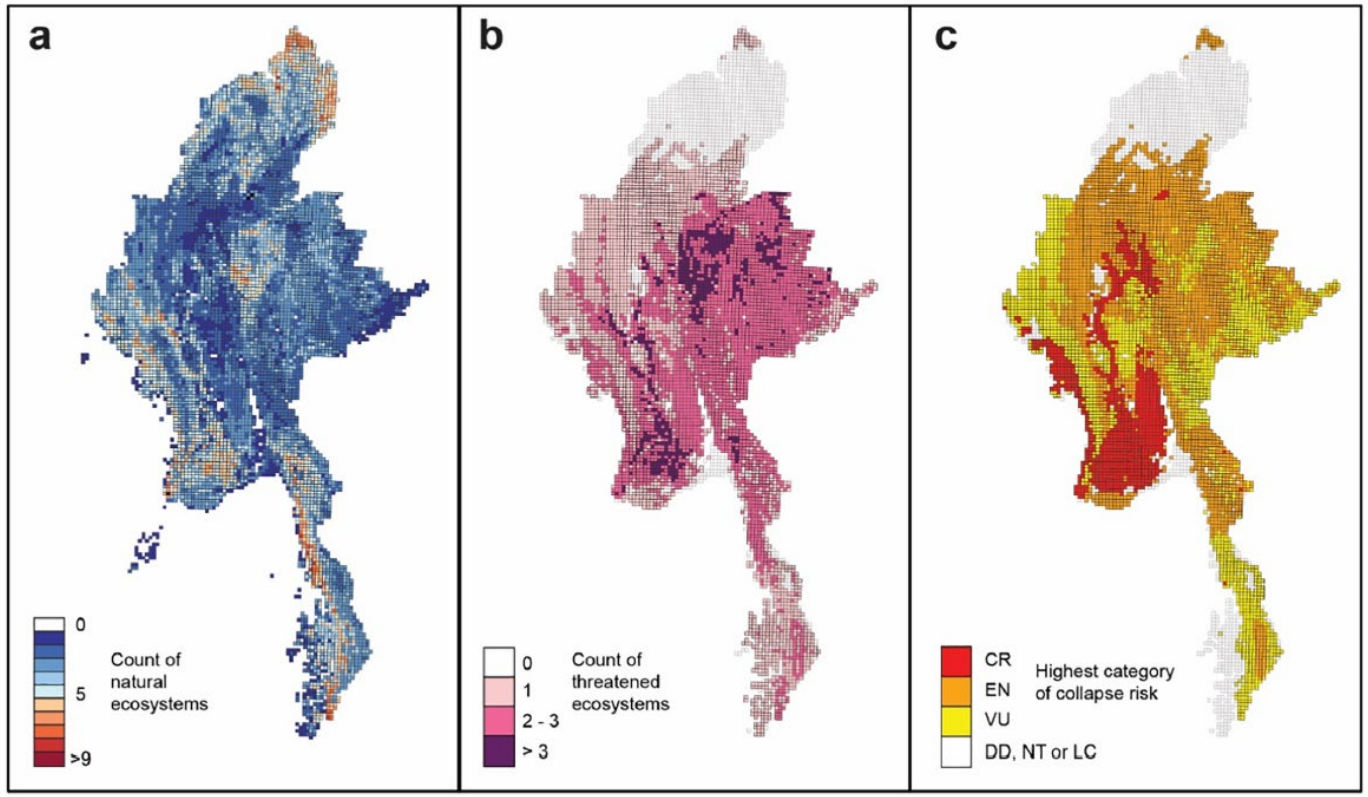
Results:

- Condition criteria set the overall ecosystem assessment outcomes more often than the extent criteria

→ The national ecosystem assessment was not dominated by extent change

Count of natural ecosystems | Count of threatened ecosystems | Highest category



EO challenges, opportunities and recommendations

- Per-ecosystem literature review was effective to identify and/or develop appropriate condition indicators
- Compare against local-scale studies where possible
- Choose validated datasets – or validate them yourself
- Consider extras needed to ‘operationalise’ an indicator (e.g. maps to bound analyses, thresholds of condition)
- Use multiple indicators when several are available
- Propagate uncertainty through to outcomes:
    - Known data errors (e.g. via upper and lower bounds)
    - Where multiple indicators yield different results

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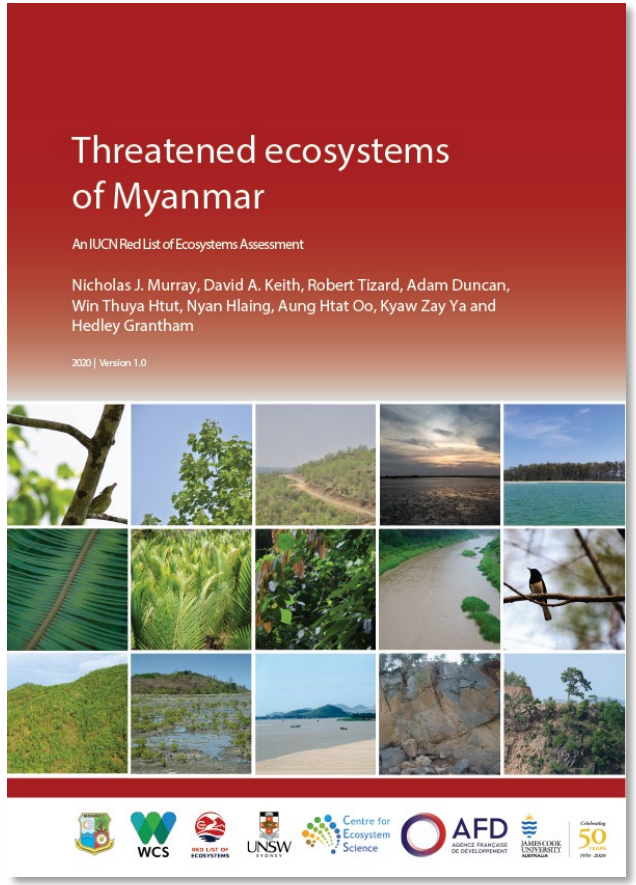

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