

**UN**  
environment



**WCMC**

**United Nations Environment  
World Conservation Monitoring Centre**

A satellite image of the North Atlantic Ocean. The landmasses of North America and Europe are visible on the left, colored in shades of brown and tan. The ocean is a deep blue, but there are large, swirling plumes of lighter blue and cyan water extending from the coastlines, indicating sediment or other particles being transported. The plumes are most prominent near the coast of North America and the British Isles.

**MAPPING THREATS TO BIODIVERSITY:  
PUTTING INDUSTRIAL ACTIVITIES INTO PERSPECTIVE**

**PROFESSOR NEIL BURGESS  
HEAD OF SCIENCE  
UNEP-WCMC**

# **Focal areas**

**What is threat mapping trying to achieve?**

**What is the relative threat posed by industrial activities?**

**How to map and measure multiple threats?**

**Current research on linking trade to biodiversity impacts**

**Approaches for mitigating threats**





**WHAT IS THREAT  
MAPPING TRYING TO  
ACHIEVE ?**

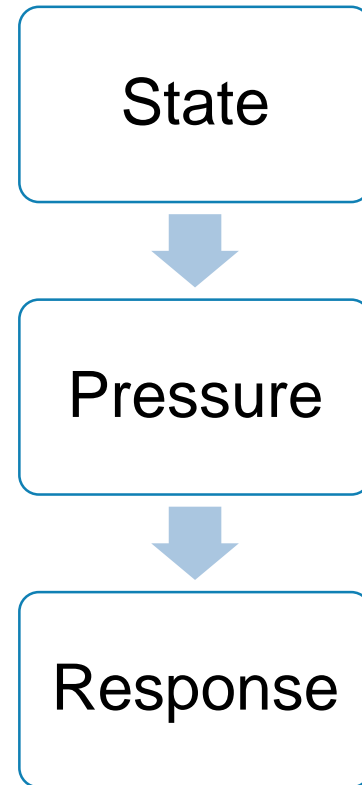
# Threat mapping

## Mapping

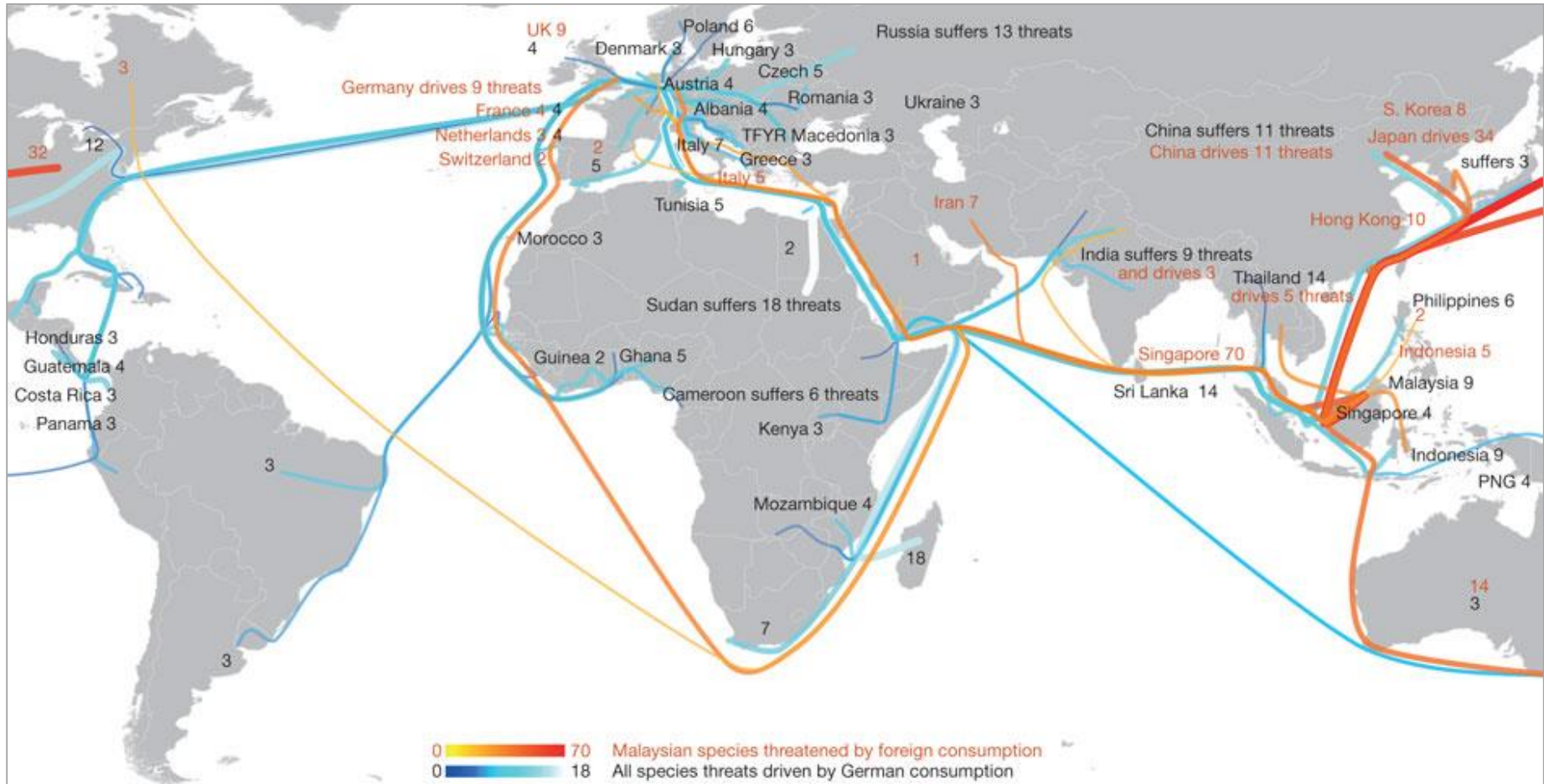
- pressures on habitats and species
- impacts on habitats and species

## Linking production and trade to impacts caused

- by commodity
- by industry sector
- by country
- by individual company

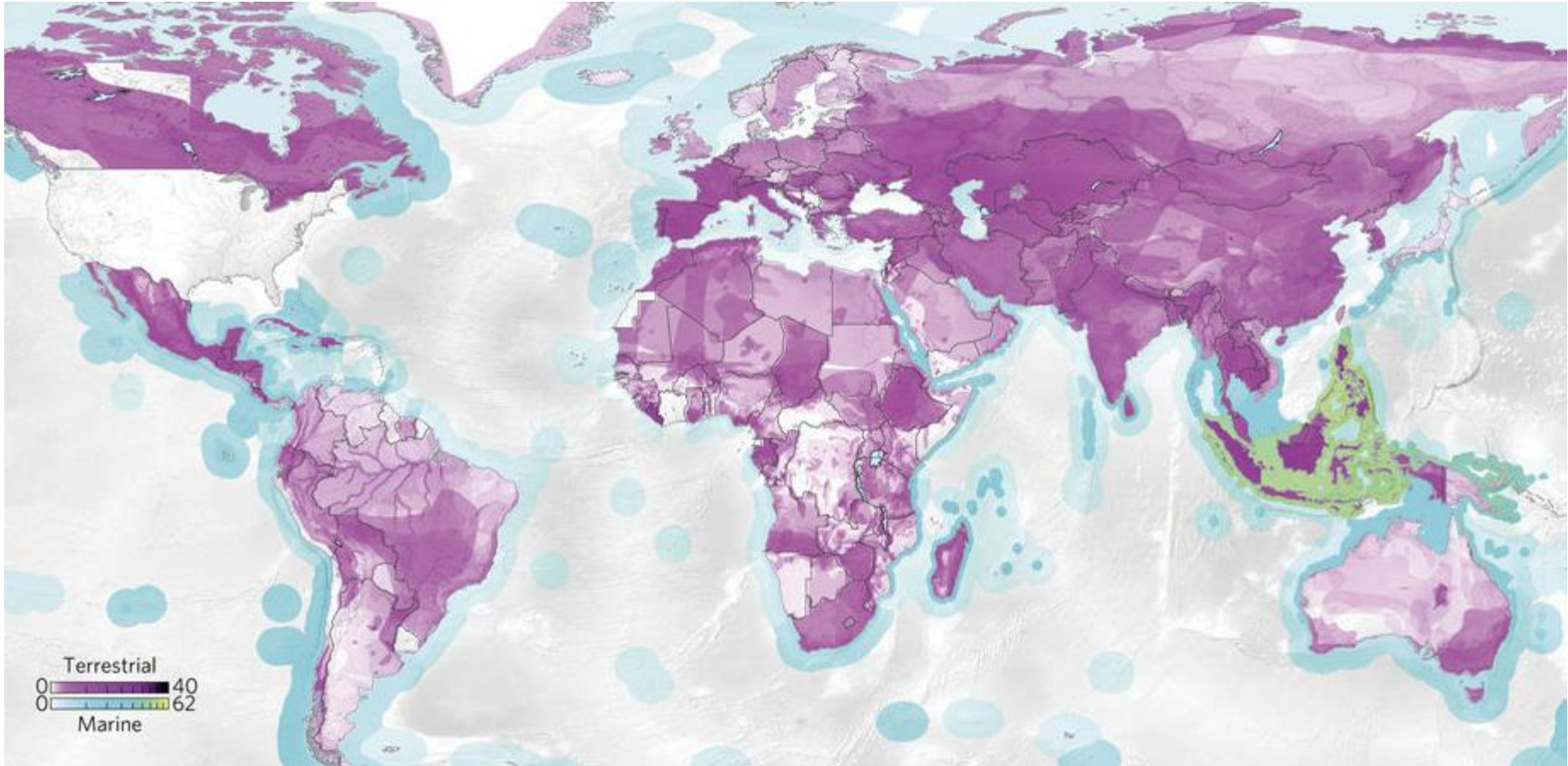


# Challenge 1: Tracking international trade chains



Lenzen et al. (2012) *International trade drives biodiversity threat in developing nations*. Nature.

## Challenge 2: Identifying threat hotspots from supply chains



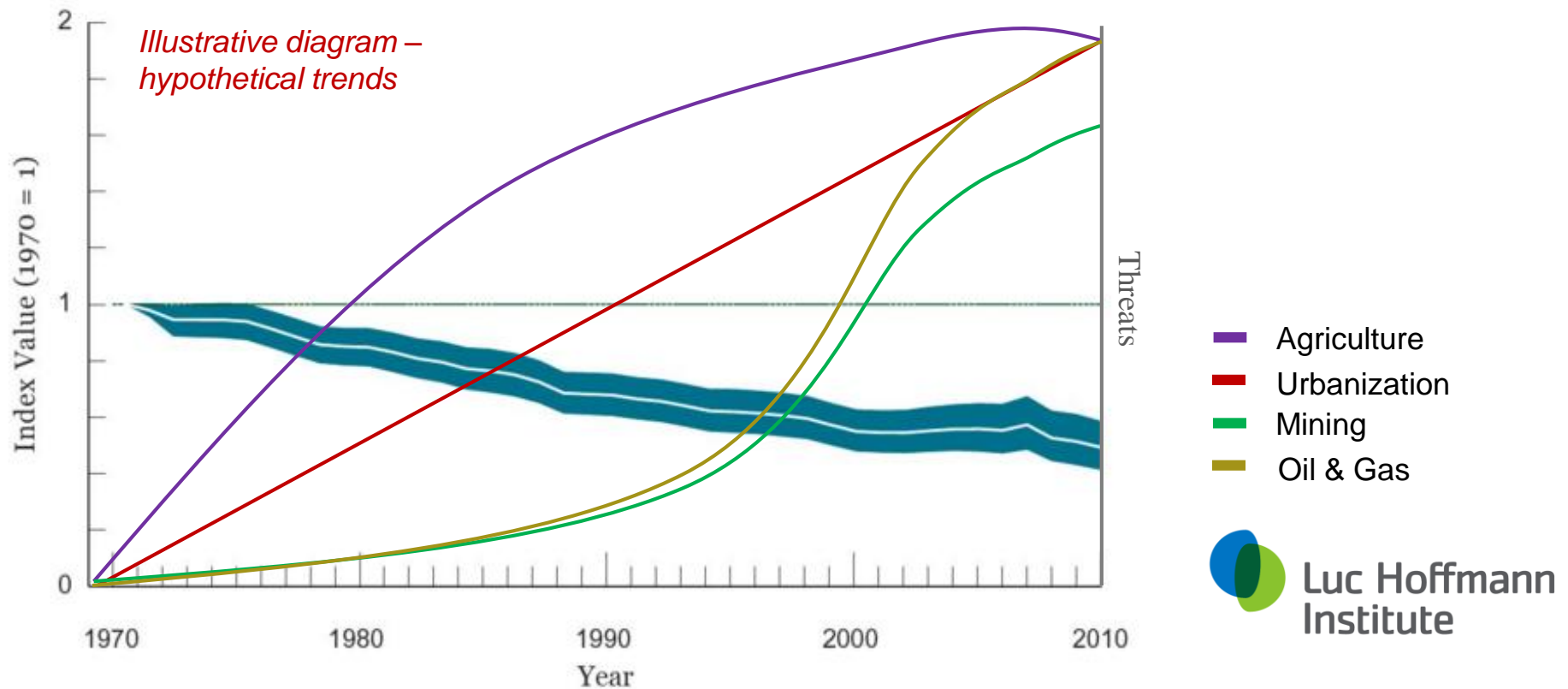
Moran & Kanemoto (2017) *Identifying species threat hotspots from global supply chains*. *Nature Ecology & Evol.*

[Link to paper](#)

30/05/2017

# Challenge 3: Linking threats to species trends

## Linking threats to the WWF / ZSL Living Planet Index





**WHAT IS THE  
THREAT TO SPECIES  
POSED BY INDUSTRIAL  
ACTIVITIES ?**

# Threats to species on the IUCN Red List

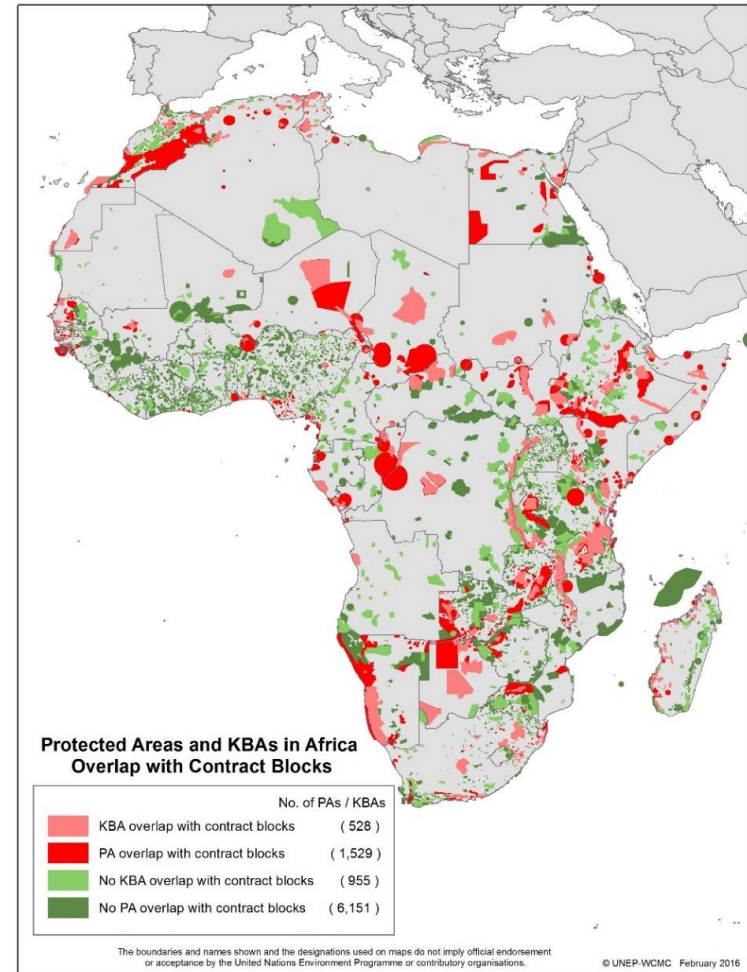


Maxwell et al. (2016) *Biodiversity: The ravages of guns, nets and bulldozers*. Nature Communications.

[Link to paper](#)

# Oil and gas development relative to biodiversity in Africa

- Risk indicator: Overlap of contract blocks with protected areas
- 20 % of protected areas overlap with contract blocks (over half entirely)
- 36% of KBAs overlap with contract blocks (~half entirely)
- Countries with significant overlap include Malawi, Mozambique, Somalia and Djibouti

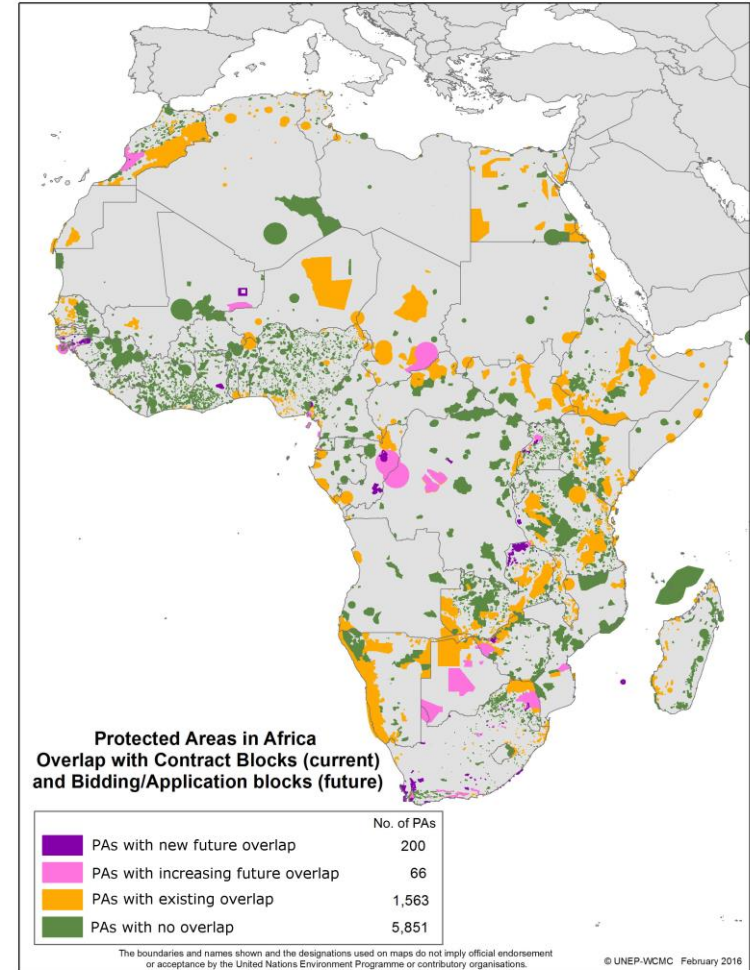


Leach et al (2016) *Potential threat to areas of biodiversity importance from current and emerging oil and gas activities in Africa.*

[Link to UNEP-WCMC publication](#)

# Future potential oil and gas development in Africa

- Risk indicator: Overlap of bidding blocks with protected areas
- 66 protected areas potentially facing increasing threat, 12 internationally recognised
- 200 protected areas potentially facing new threat
- Priority countries include Zambia, South Africa, Guinea-Bissau, and Uganda



[Leach et al \(2016\) \*Potential threat to areas of biodiversity importance from current and emerging oil and gas activities in Africa.\*](#)

[Link to UNEP-WCMC publication](#)

# From threat to impact

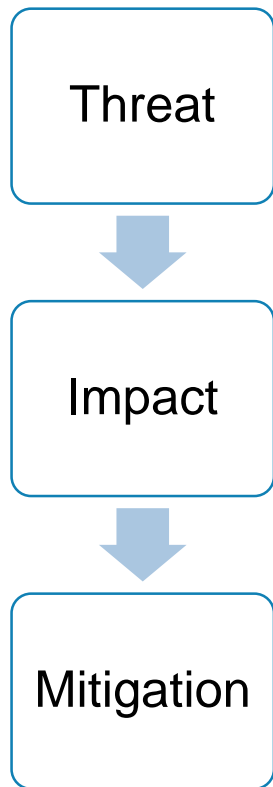


Table 1 Potential and actual impacts and opportunities arising from project activities

IMPACT TYPE	EXPLANATION	EXAMPLE
Direct (primary)	Direct impacts of project activity.	Road construction (clearing) removes or fragments habitat.
Indirect (higher order)	'Knock-on' effects of direct impacts.	Clearing vegetation leads to increased river sedimentation, degrading water quality.
Indirect (induced)	Presence of project triggers third-party development and access with its impacts/risks and opportunities.	Road provides access into an area, thus increasing local timber harvesting and habitat loss. Road also provides better access for subsistence hunters, poachers, recreational users and researchers.
Cumulative	Impacts and opportunities resulting from the combined effects of a project plus other activities, conditions and/or developments external to the project.	Habitat fragmentation and potential reduction in species diversity, but also increased access enabling research activities (e.g. wildlife monitoring) and the responsible use of ES.

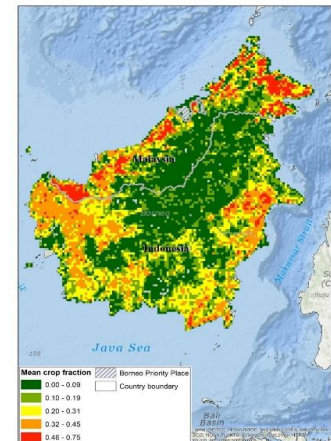
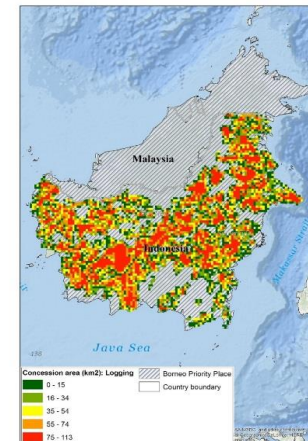
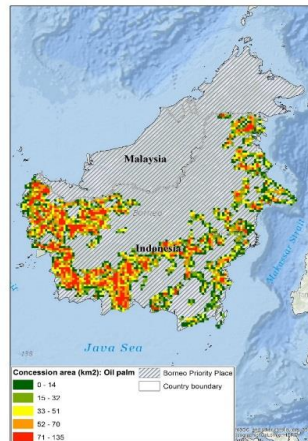
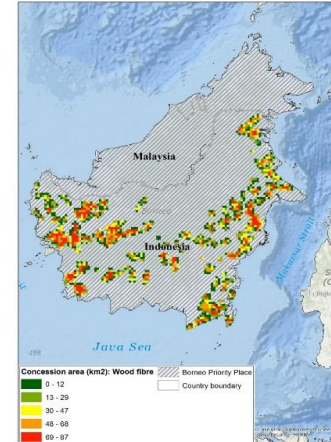
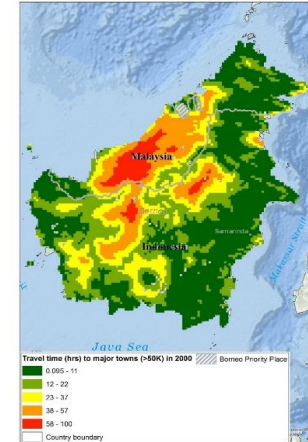
IPIECA (2016) Biodiversity and ecosystem services fundamentals



## HOW TO MAP AND MEASURE MULTIPLE THREATS ?

# What would threat maps look like?

- Examples of standardised threat maps
- Borneo, WWF Priority Place
- Aiming to standardise these kinds of maps globally and provide threat data through GeoPortal system
- Luc Hoffmann Institute and Cambridge Conservation Initiative funding
- Hundreds of maps made for WWF Focal areas

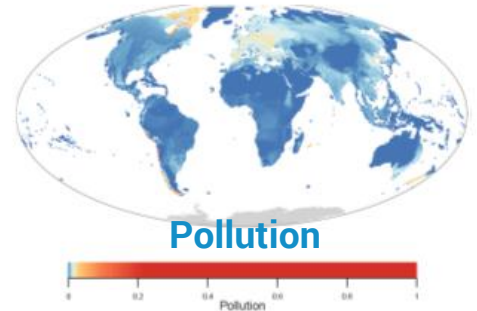
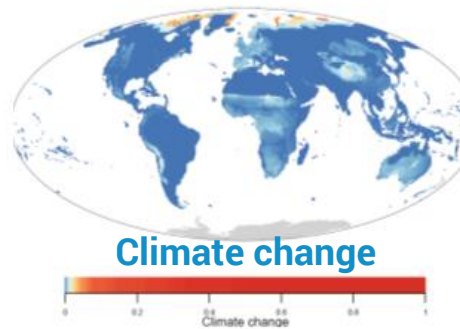
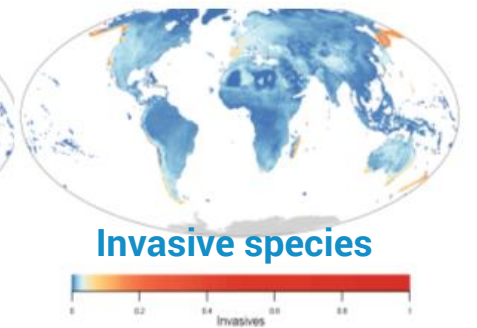
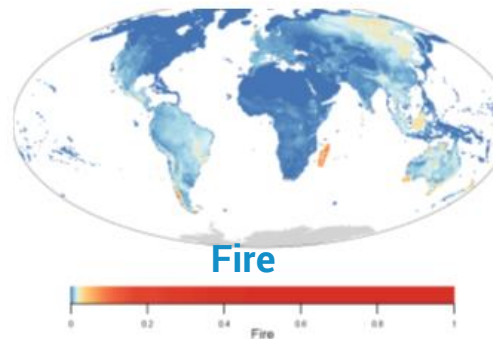
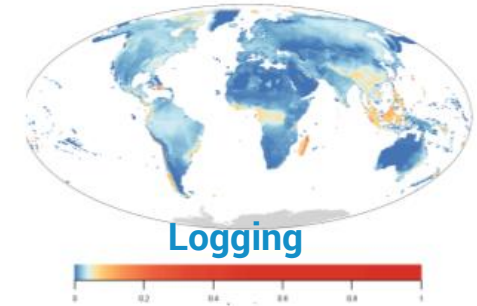
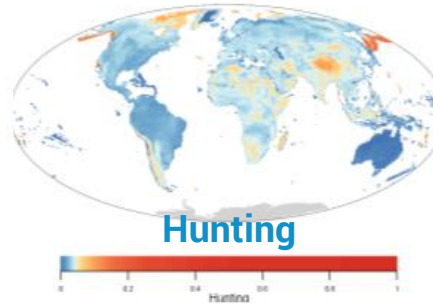


# Mapping threats using data within the IUCN Red List

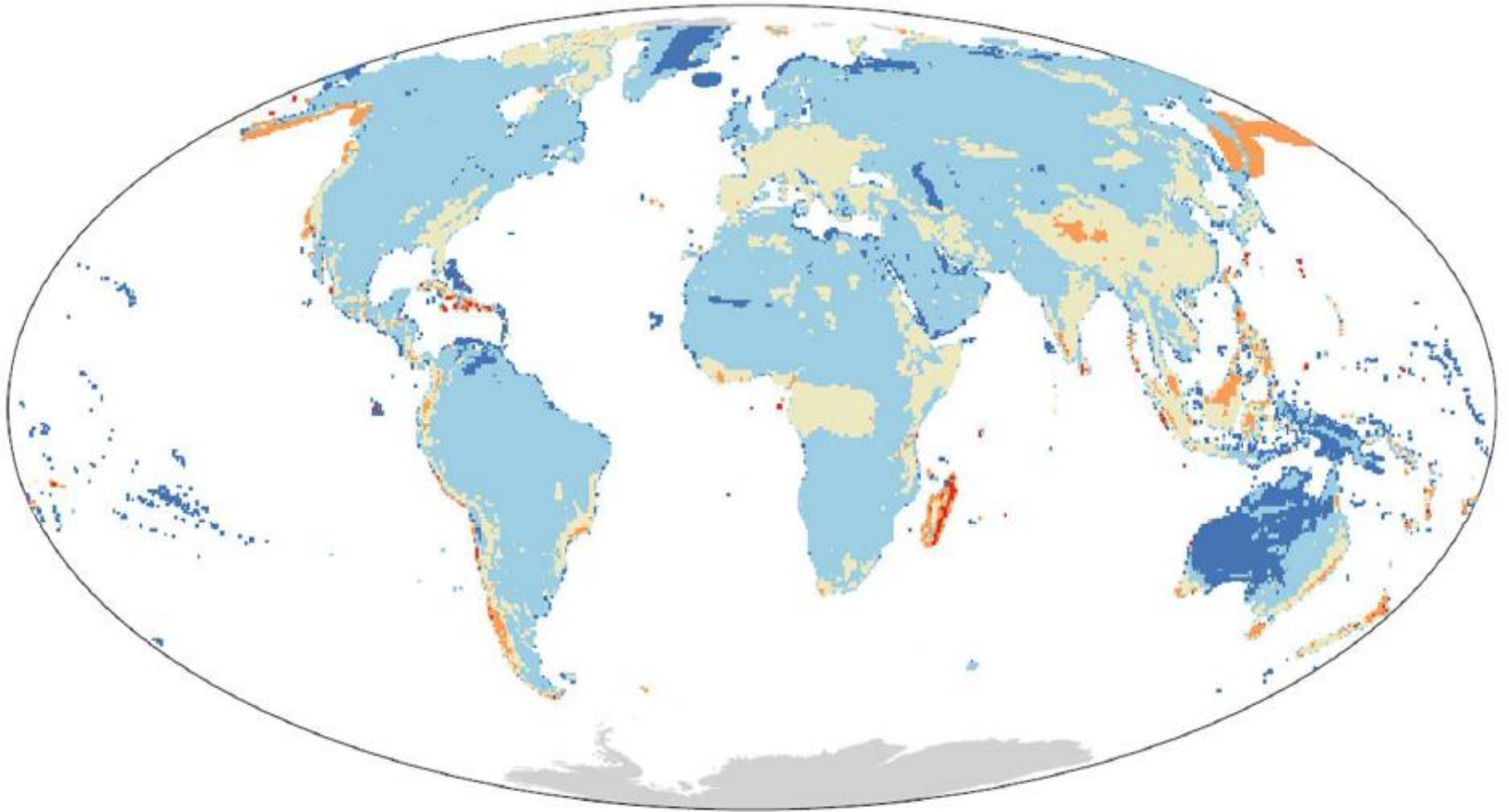
- Applying threats to species to the range polygons and weighting these

Methodology being tested

- Expanded from UNEP-WCMC Information document for CBD COP 13



# Multiple threat hotspots to mammals and amphibians

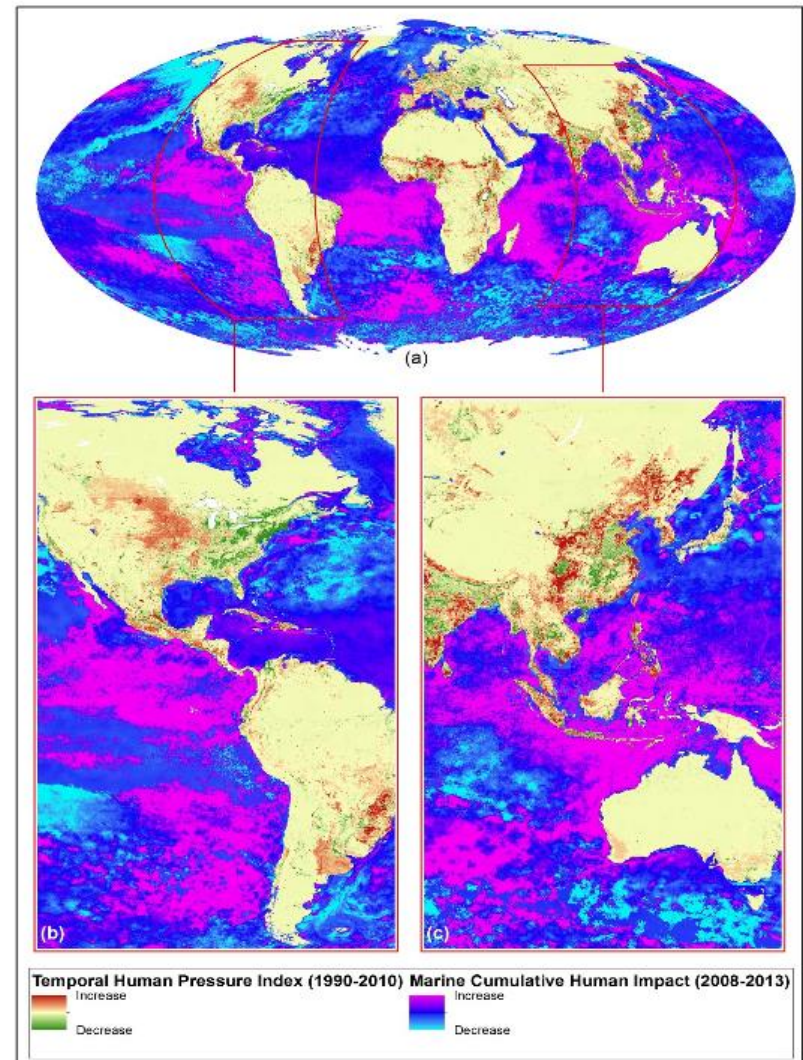


# Can we map temporal changes in threats?

## Map is combined:

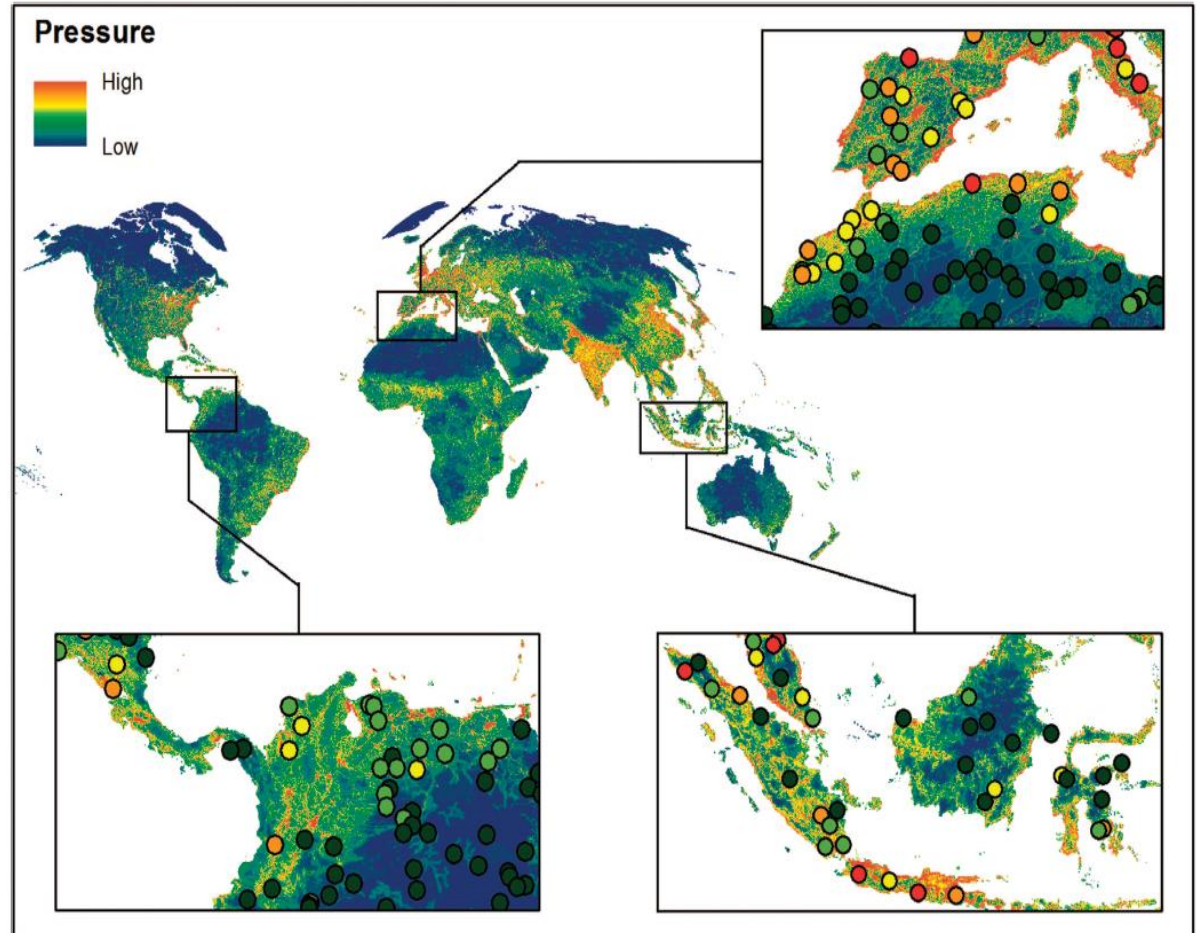
- Terrestrial pressure change 1990-2010 (Geldmann et al. 2014)
- Marine pressure change 2000-2010 (Halpern et al. 2016)

Much harder as very few datasets comparable over time.



# Human Footprint 2009

- 1993 and 2009 as separate maps
- Not possible to make a change product



Venter et al. (2016) *Global terrestrial human footprint maps for 1993 and 2009*. Nature Scientific Data

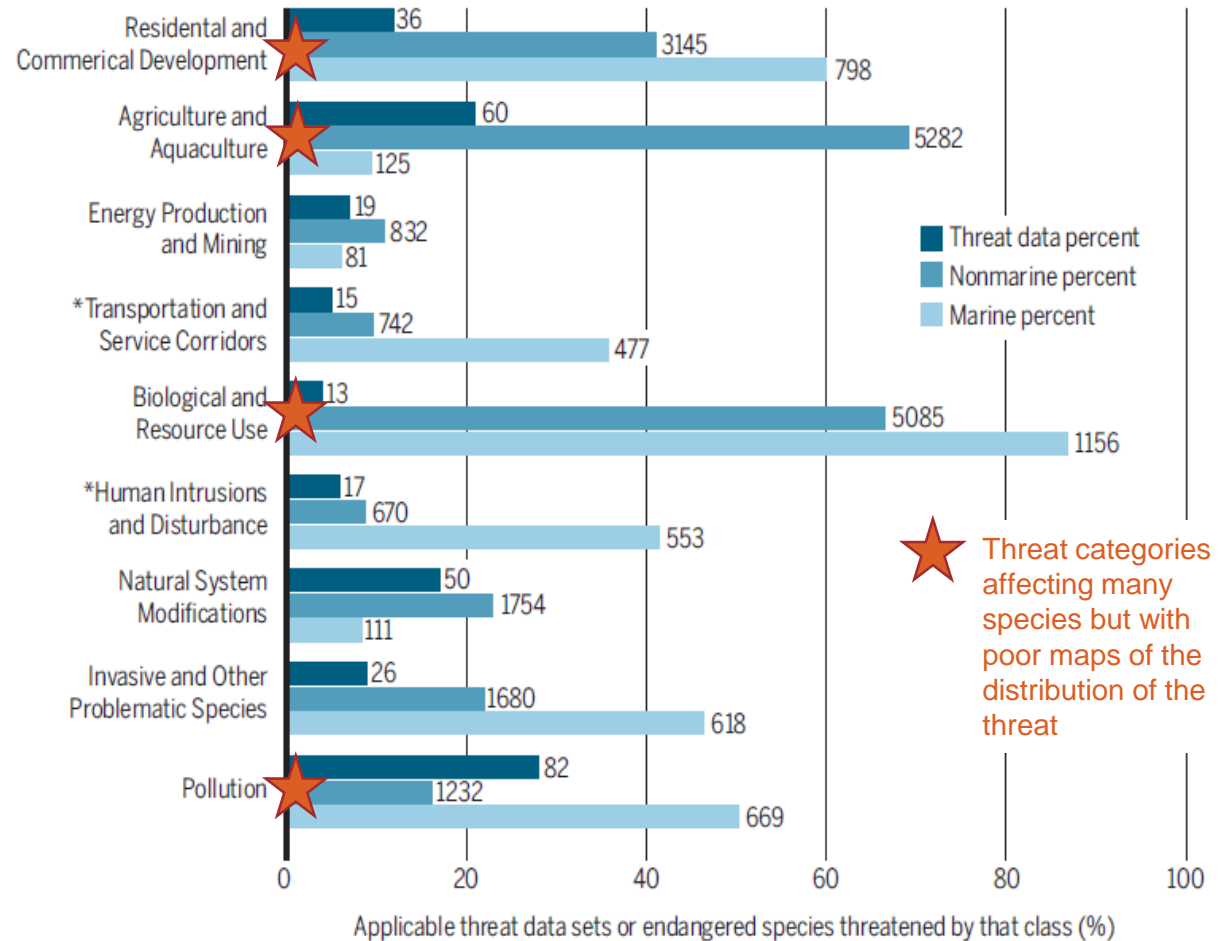
[Link to paper](#)



**CURRENT RESEARCH ON  
LINKING TRADE TO  
BIODIVERSITY IMPACTS**

# Cataloguing available threat data

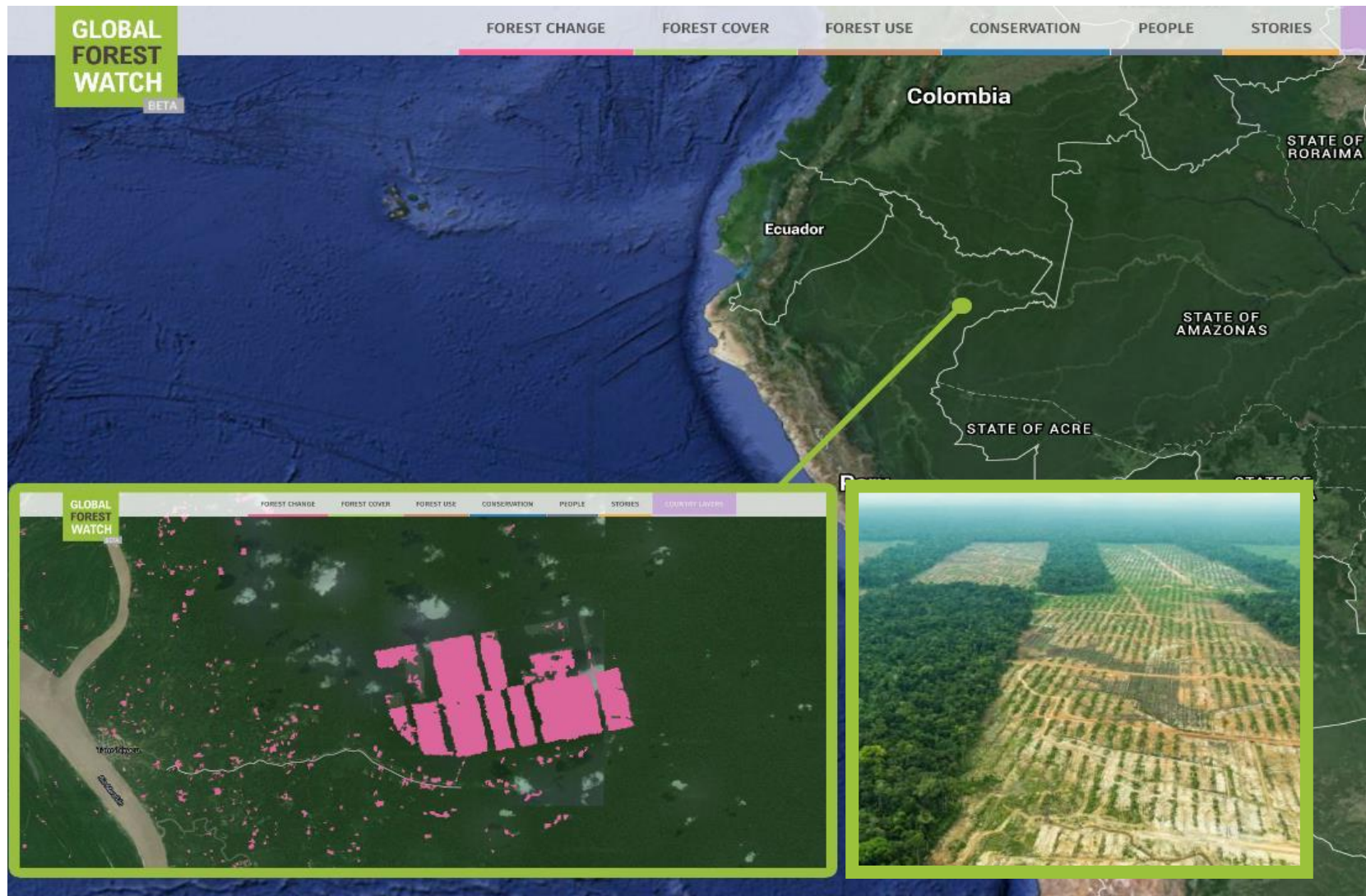
- Some threat classes affecting many species can be mapped using existing data. Others cannot.
- Particular problem in mapping 'biological resource use': logging, hunting, wildlife trade, fishing, etc.



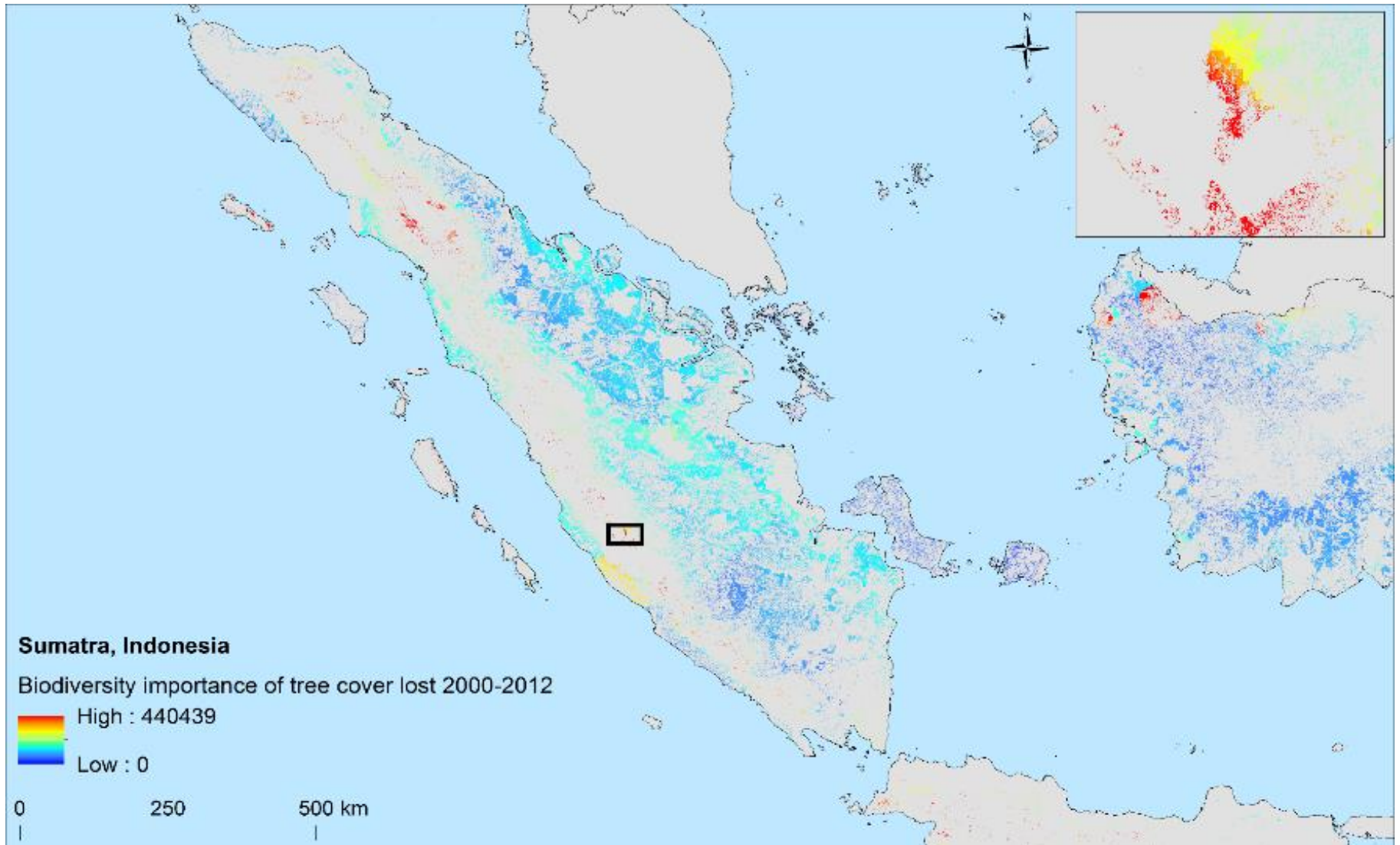
Joppa et al. (2016) *Filling in biodiversity threat gaps*. *Science*.

[Link to paper](#)

# Defining the impacts of a single threat on multiple species

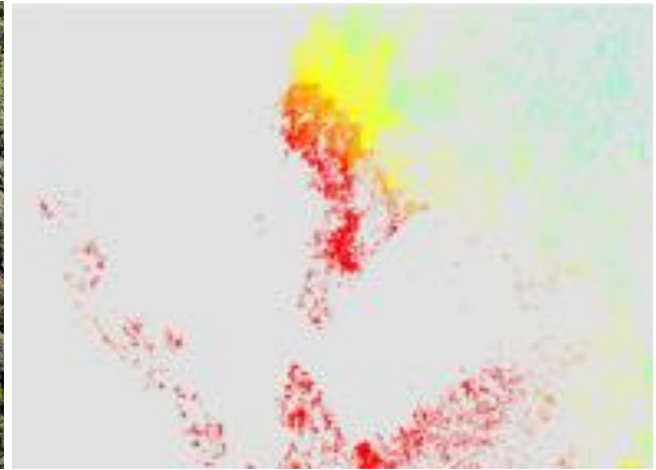


# The spatial impact of forest loss on biodiversity

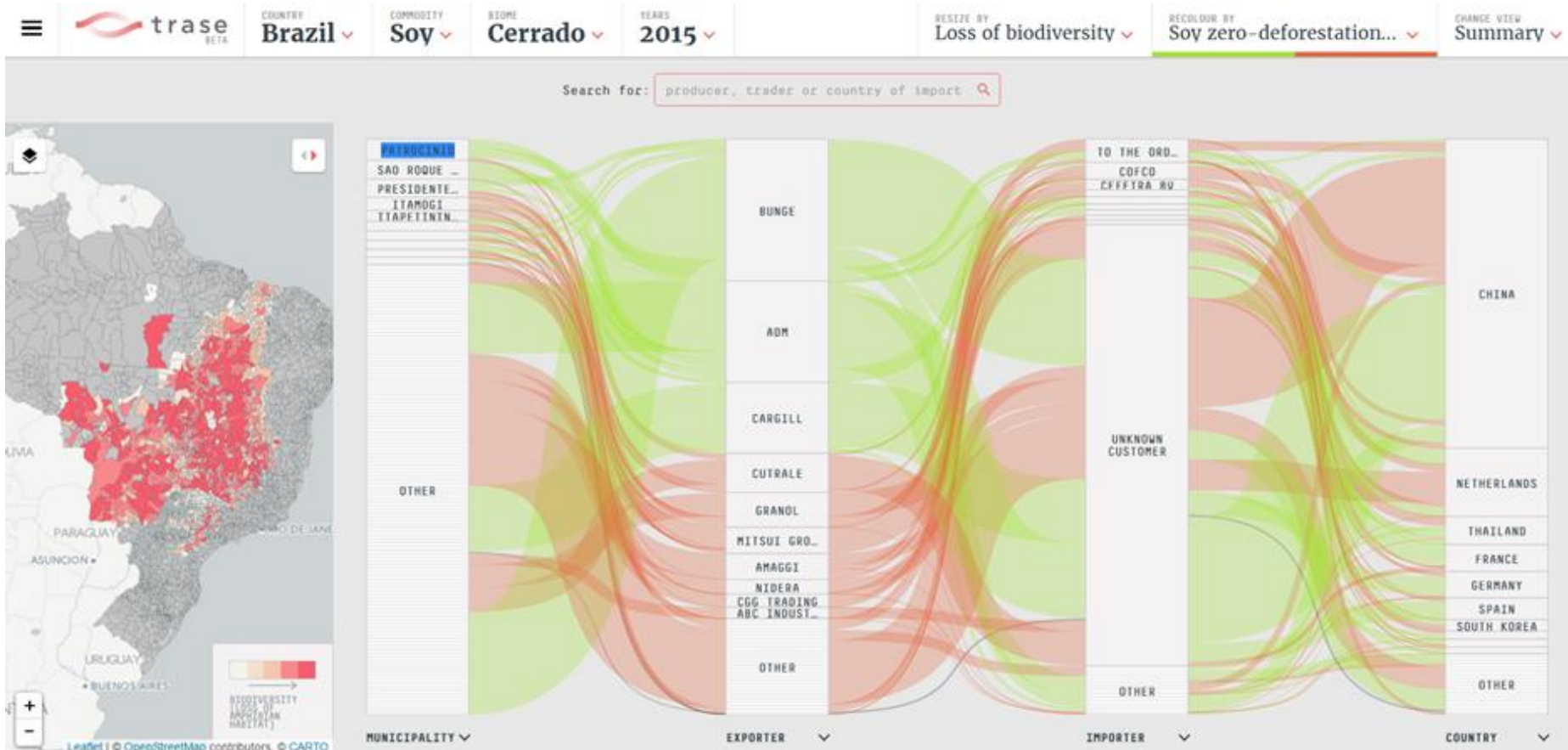


# Spatial loss of forest biodiversity from oil palm

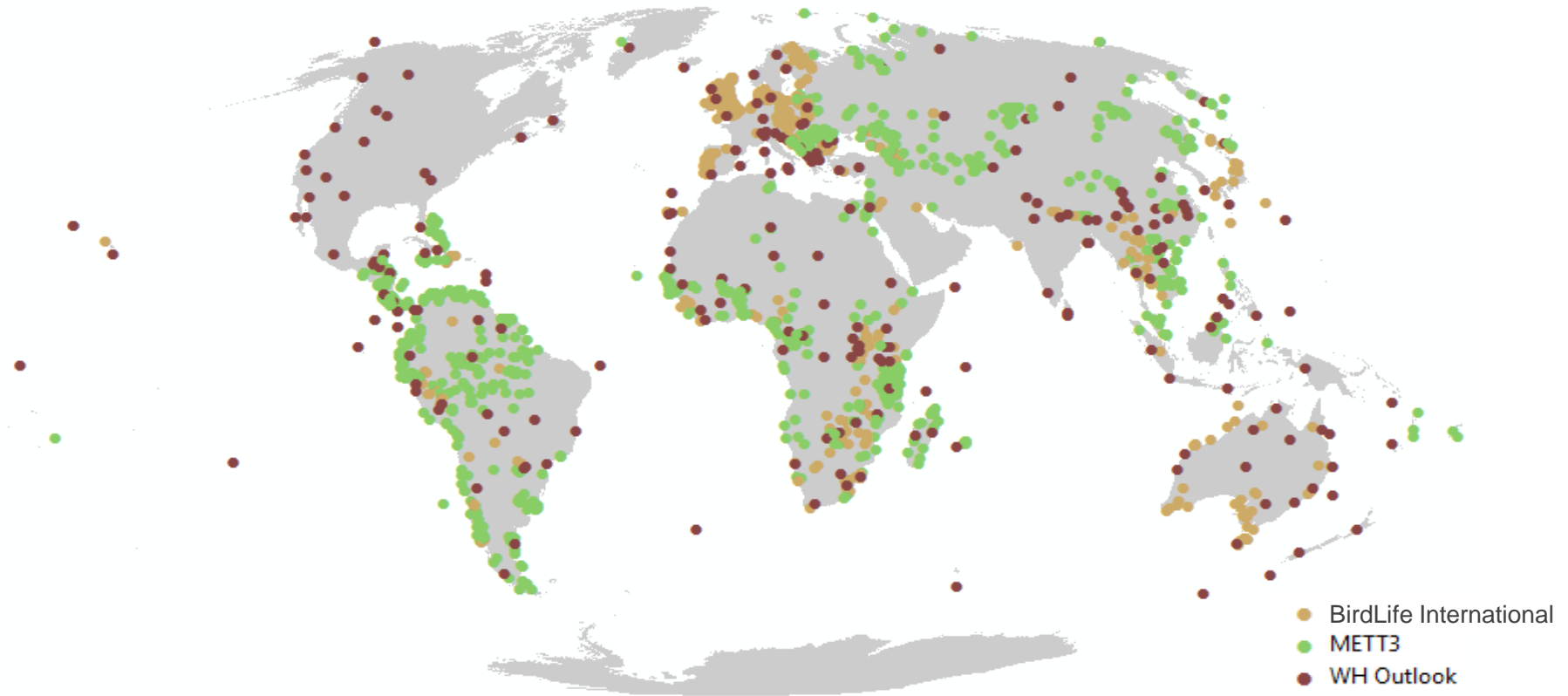
We can trace back to individual oil palm plantations and the species it affects.



# Linking global Soy Bean trade to its biodiversity impact in Brazil



# Managing and reducing threats in protected areas



**If we know what the key threats to protected areas are – then we can manage the site to reduce those threats**



## **APPROACHES FOR MITIGATING THREATS**

# Linking threats to solutions (conservation evidence)

Conservation Evidence  
Providing evidence to improve practice

Search [ ] Select Language [ ]

Browse Evidence | Journal | Synopses | About

Search our free summaries of scientific information to help make your conservation decisions more effective

Browse by category:

- Amphibian Conservation (129 Actions)
- Bat Conservation (78 Actions)
- Bird Conservation (455 Actions)
- Control of Freshwater Invasive Species (139 Actions)

**Limited entries on effective mitigation measures linked to energy and mining**

Forest Conservation (More)

Keywords [ ]

Habitat

- Forest & Woodland
- Artificial Habitats
- Wetlands

More

Threat

- Energy production & mining (14)
- Residential & commercial development
- Agriculture & aquaculture

More

Action type

- Land/water management
- Species management

- Create ponds for amphibians (Beneficial | Based on: 30 studies)
- Create ponds for great crested newts (Likely to be beneficial | Based on: 7 studies)
- Create wetland (Beneficial | Based on: 15 studies)
- Deter bats from turbines using radar (Unknown effectiveness (limited evidence) | Based on: 1 study)
- Deter bats from turbines using ultrasound (Likely to be beneficial | Based on: 6 studies)
- Head-start amphibians for release (Trade-off between benefit and harms | Based on: 25 studies)
- Improve soil quality after tree planting (excluding applying fertilizer) (Unknown effectiveness (limited evidence) | Based on: 2 studies)



**CONCLUDING  
THOUGHTS...**

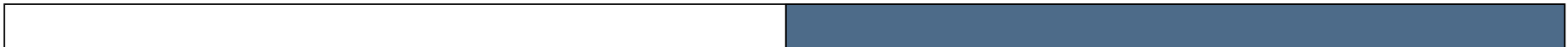
# Summary and key challenges

## Different approaches for threat mapping

Relative threat assessment do not take into account indirect / cumulative impact

## Many threats to biodiversity can be mapped

- But some key ones cannot (biological resource use and invasive alien species), limiting representativeness of multiple threat maps.
- Rather few of the threats are mapped temporally and at fine scale.



# Further information

## Webinar recordings and slides will be uploaded to the Proteus website

- [www.proteuspartners.org](http://www.proteuspartners.org)

## Resources

- IUCN Red List Threats Classification Scheme  
[www.iucnredlist.org/technical-documents/classification-schemes/threats-classification-scheme](http://www.iucnredlist.org/technical-documents/classification-schemes/threats-classification-scheme)
- Conservation Evidence  
[www.conservationevidence.com/](http://www.conservationevidence.com/)



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# Discussion

## Why should threat data be used to inform impact assessment?

- Low existing threat presents a greater risk of increasing indirect threats
- Understanding existing threats at project sites informs cumulative impact assessment
- Opportunities to address existing threats as part of impact mitigation

