Independent Evaluation Office
GLOBAL ENVIRONMENT FACILITY

Leveraging geospatial science for tracking the SDGs through measurement and evaluation of GEF interventions

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United Nations Framework Convention on Climate Change

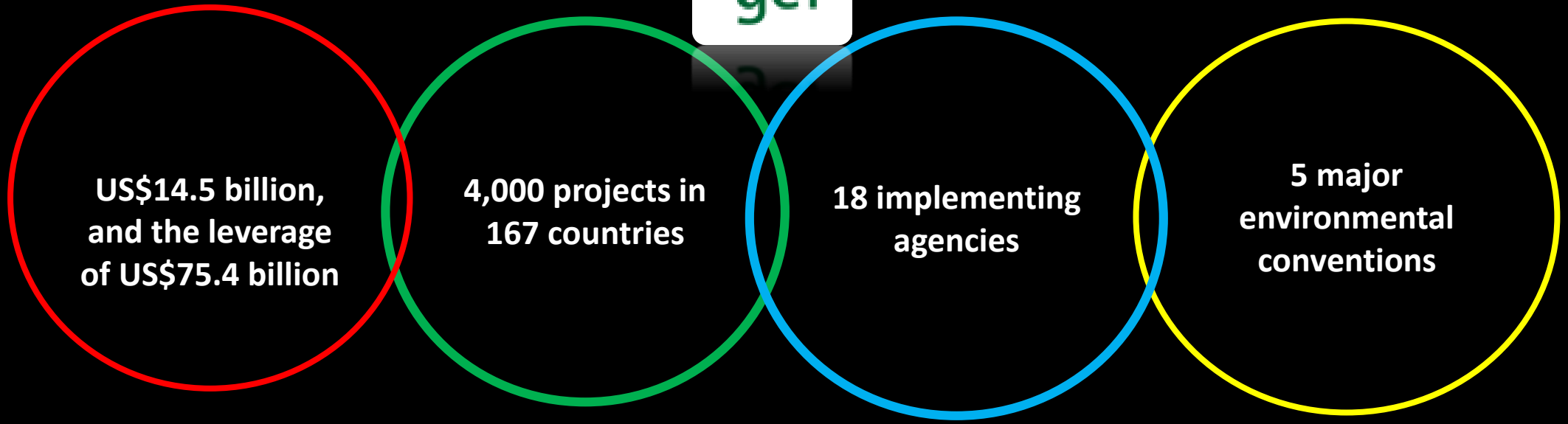
Convention on Biological Diversity

UNFF

United Nations Convention to Combat Desertification

UNEP MINAMATA CONVENTION ON MERCURY

Stockholm Convention on persistent organic pollutants (POPs)



Established in 1992 | Innovator and Catalyst | Unique Partnership | Financial Mechanism

The Global Environment Facility

Thematic Areas

International Waters

Land Degradation

Biodiversity

Cities

Commodities

Chemical and Waste

Climate Change

Food Security

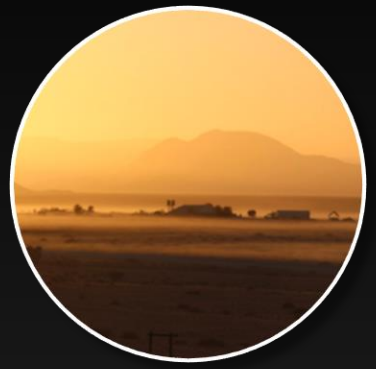
Thematic Area Specific tracking tools and indicators

Reduced nutrient load

Marine protected areas (ha)

Chemical Use

Environmental management



Area under SLM

Area restored

GHG Emissions Avoided

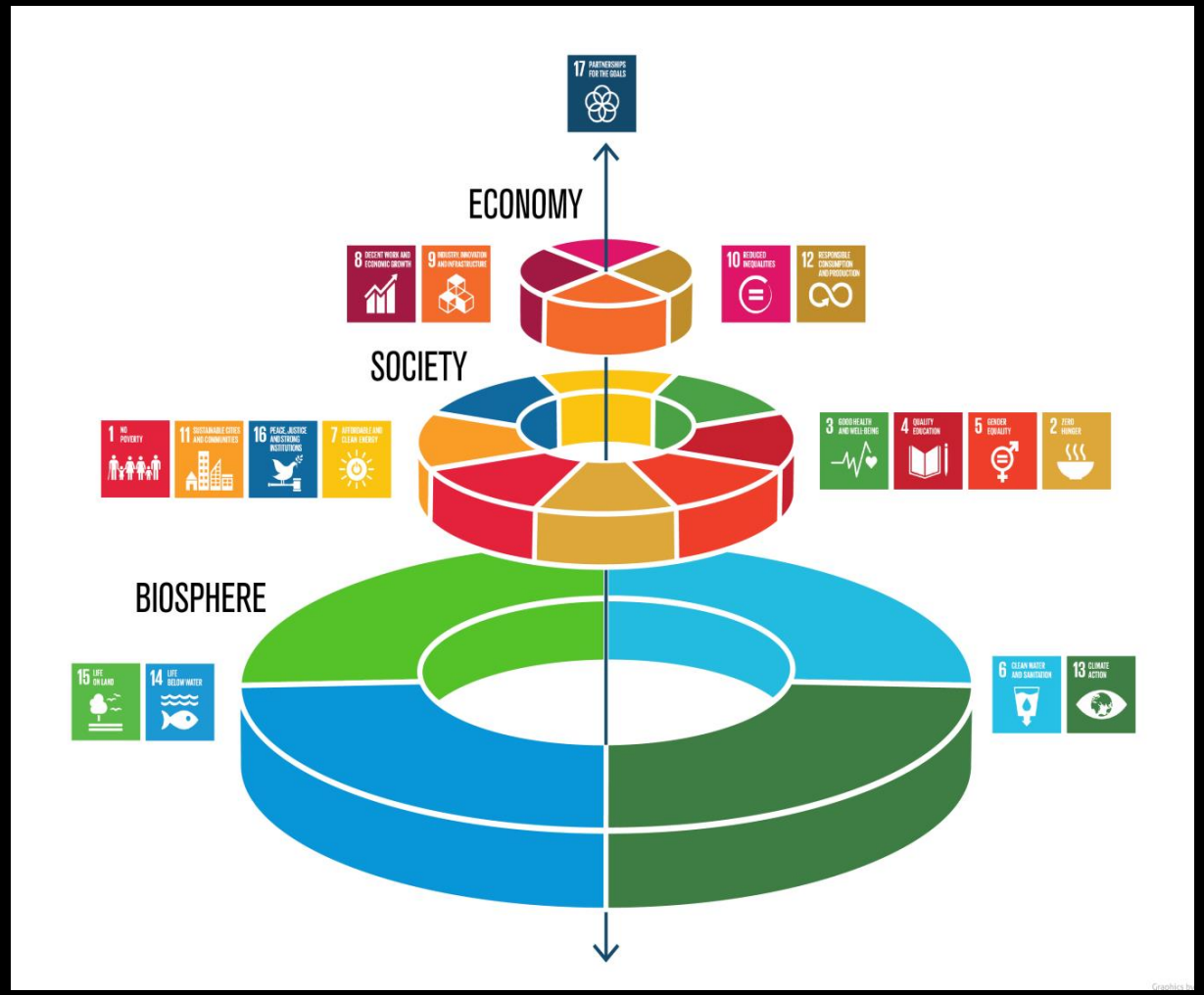
Number of beneficiaries

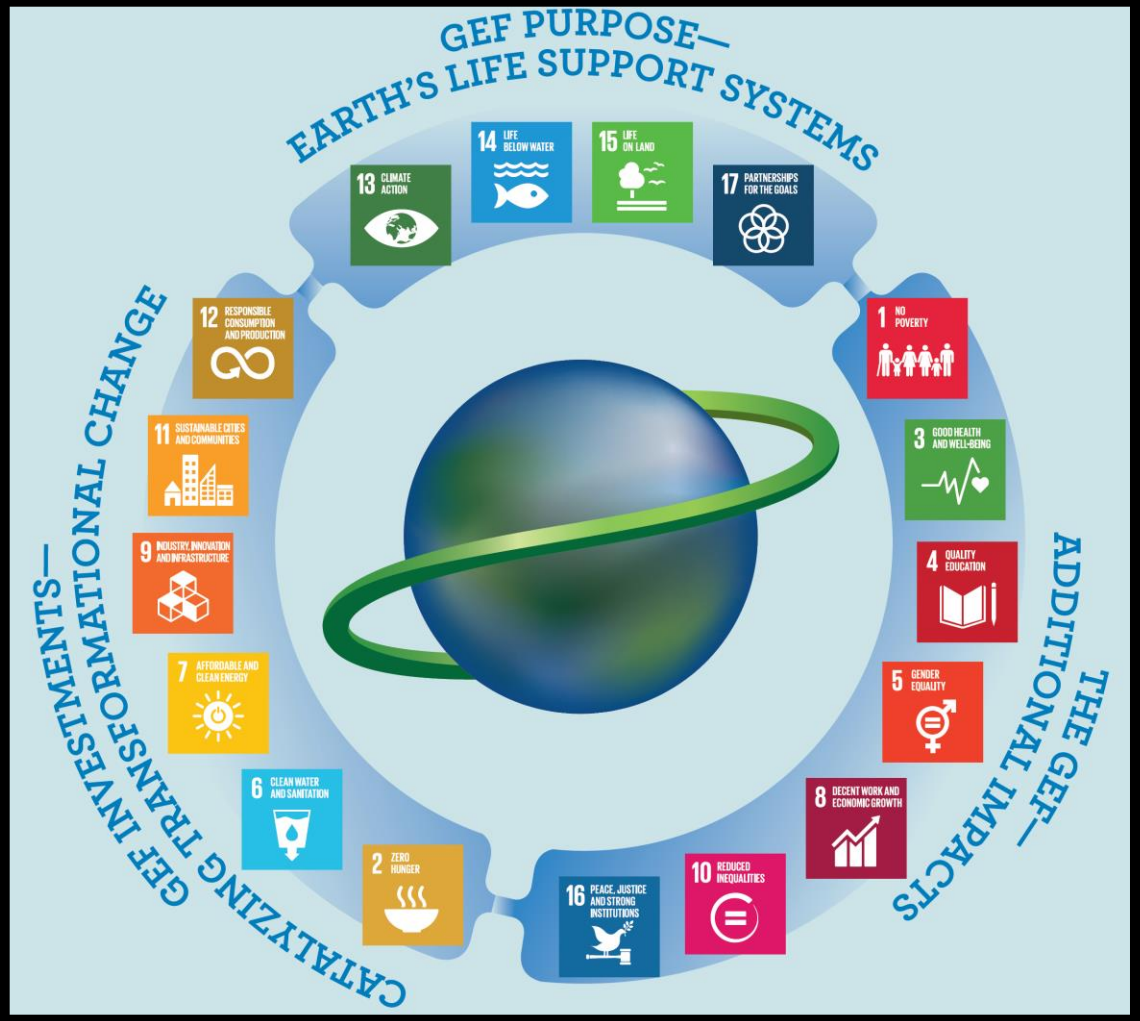
Management Effectiveness(METT)

PA coverage

…..Indicators have limitations

The GEF and the SDGs





Credit: Stockholm Environment Institute

Q: How many SDG Goals, Targets and indicators are there ?

A: SDGs- 17 goals, 169 targets and 232 indicators

Huge Data Needs

SDGs and Earth Observation(EO)

Data from satellite imagery and sensor networks make environment and development indicators increasingly measurable

Geospatial Information and SDGs

GROUP ON EARTH OBSERVATIONS

Sustainable Development Goals

Earth Observations in Service of the *Agenda 2030*

THE GLOBAL GOALS

Target — *Contribute to progress on the Target yet not the Indicator per se*									*Goal*	*Indicator* — *Direct measure or indirect support*				
							1.4	1.5	1	1.4.2				
						2.3	2.4	2.c	2	2.4.1				
					3.3	3.4	3.9	3.d	3	3.9.1				
									4					
								5.a	5	5.a.1				
		6.1	6.3	6.4	6.5	6.6	6.a	6.b	6	6.3.1	6.3.2	6.4.2	6.5.1	6.6.1
					7.2	7.3	7.a	7.b	7	7.1.1				
								8.4	8					
					9.1	9.4	9.5	9.a	9	9.1.1	9.4.1			
						10.6	10.7	10.a	10					
	11.1	11.3	11.4	11.5	11.6	11.7	11.b	11.c	11	11.1.1	11.2.1	11.3.1	11.6.2	11.7.1
				12.2	12.4	12.8	12.a	12.b	12	12.a.1				
					13.1	13.2	13.3	13.b	13	13.1.1				
		14.1	14.2	14.3	14.4	14.6	14.7	14.a	14	14.3.1	14.4.1	14.5.1		
	15.1	15.2	15.3	15.4	15.5	15.7	15.8	15.9	15	15.1.1	15.2.1	15.3.1	15.4.1	15.4.2
								16.8	16					
17.2	17.3	17.6	17.7	17.8	17.9	17.16	17.17	17.18	17	17.6.1	17.18.1			

Targets and indicators that can be supported by Earth Observations
Credit: GEOS

Alignments of the Goals with Geospatial information

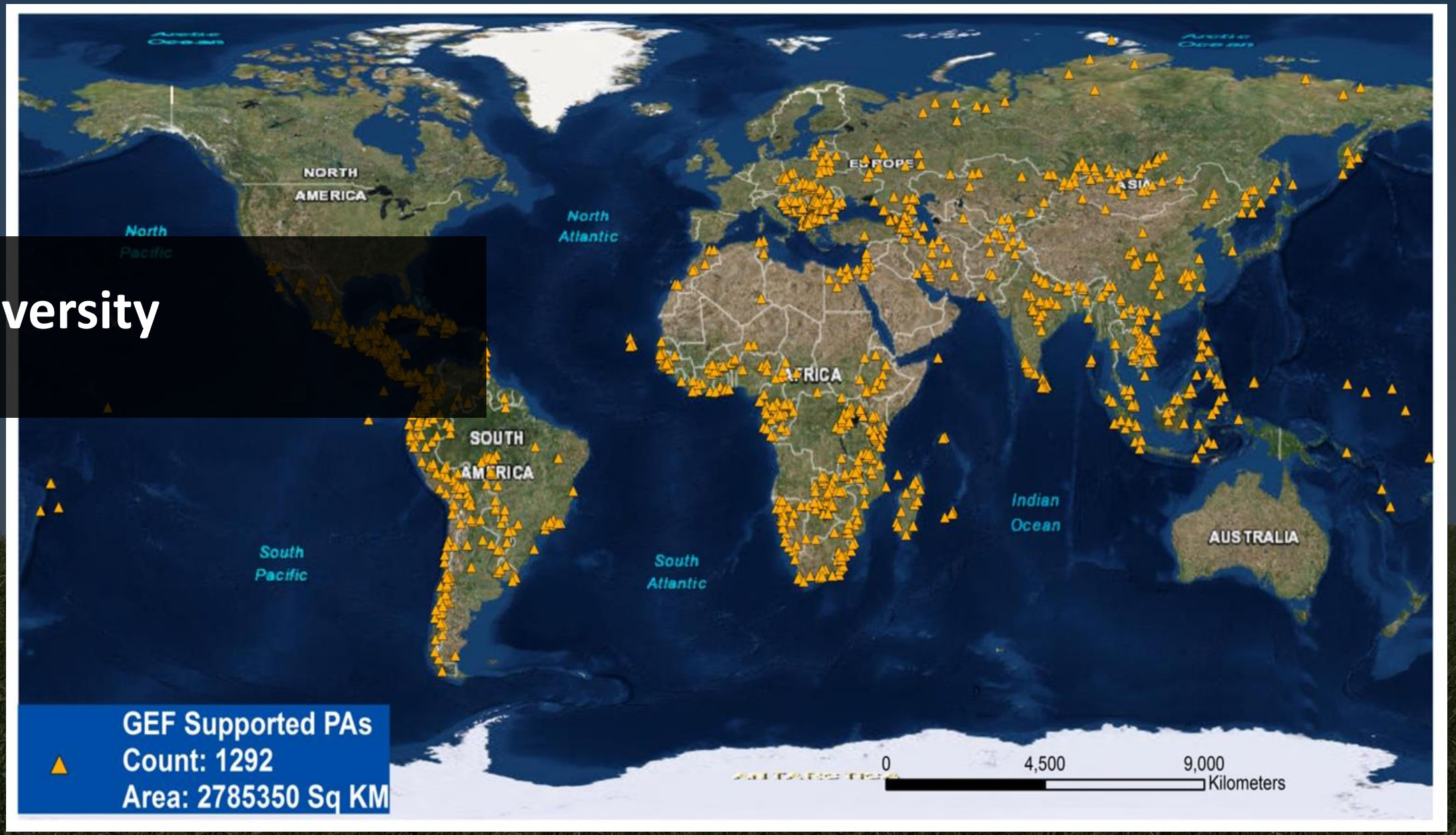
Questions we seek to answer through evaluation

- Relevance of the intervention—is it in the right context?
- Trends in performance and impacts going far back in time…even if we didn't have baseline data?
- Attribution: Did the GEF make a difference? – counterfactuals
- Does the intervention deliver value for money?

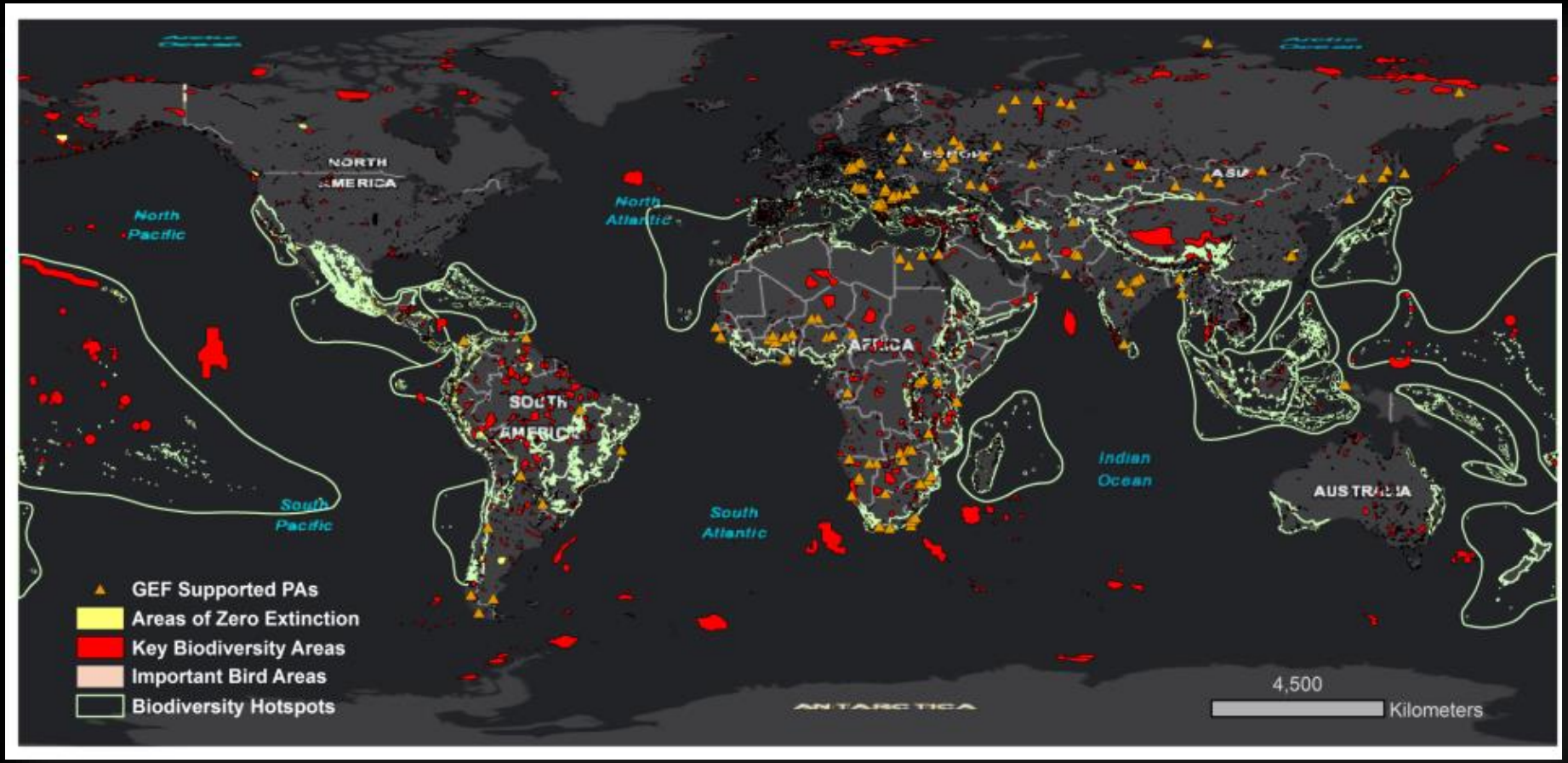
Biodiversity

- Goal 15: **Sustainably manage forests**, combat desertification, halt and reverse land degradation, **halt biodiversity loss**
- Indicators
  - Annual change in forest area and land under cultivation*:Geospatial data
  - Area of forest under sustainable forest management as a percent of forest area: Geospatial data/Administrative data
  - Red List Index: Telemetry, Tracking Data, Surveys/International monitoring
  - Protected areas overlay with key biodiversity areas(KBAs)

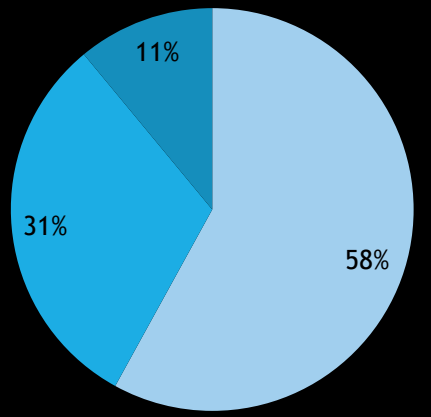
Biodiversity



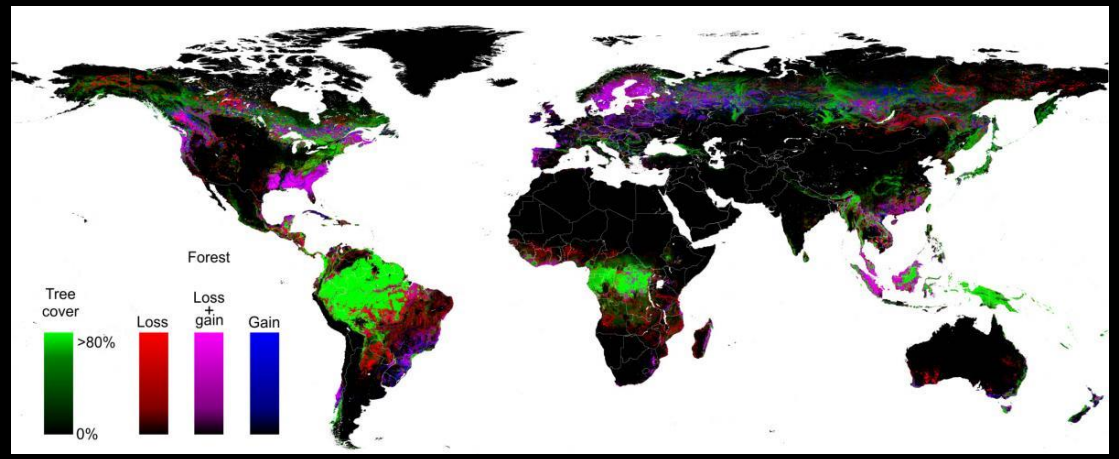
Biodiversity: Relevance

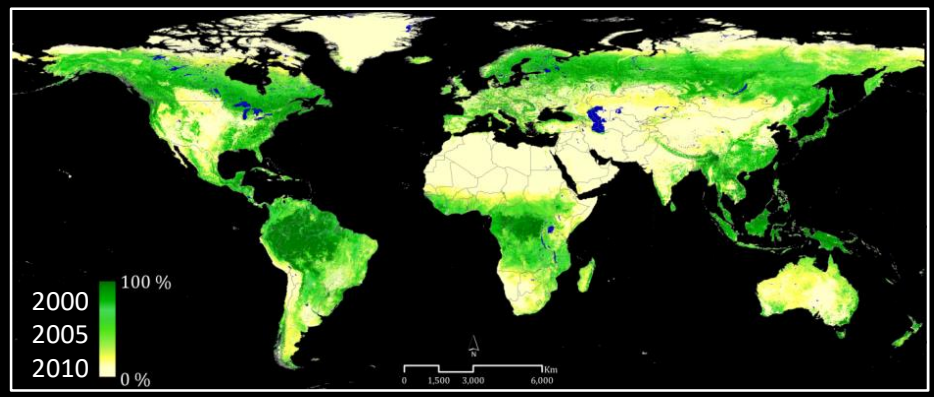


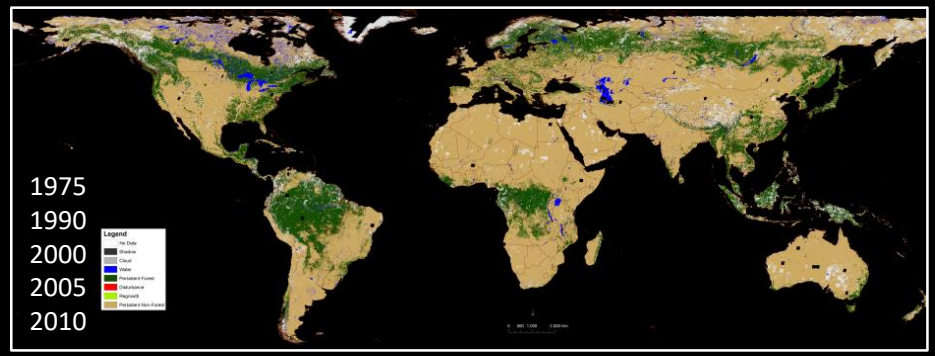
KEY BIODIVERSITY AREAS, highest scientific designation of global biodiversity significance



Study the impact of GEF support to 1292 global protected areas across 147 countries.

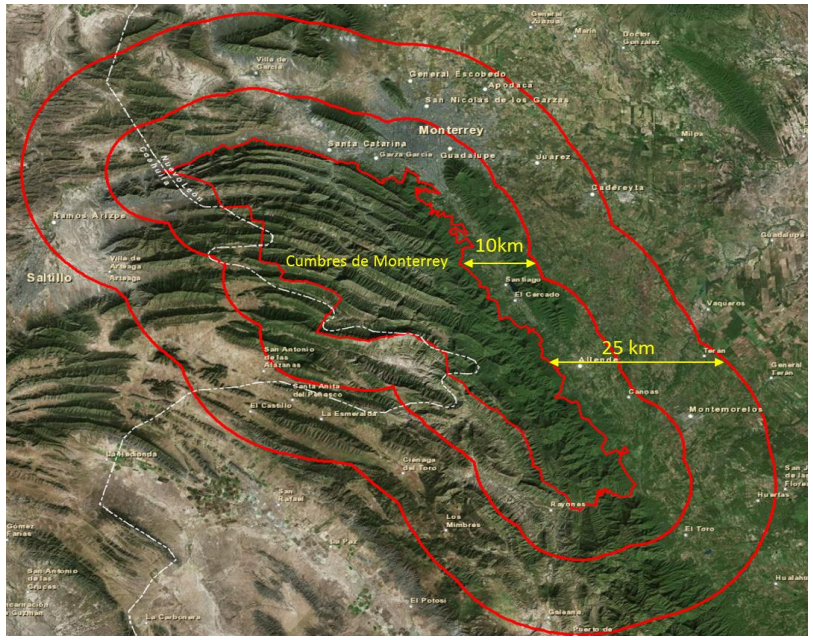




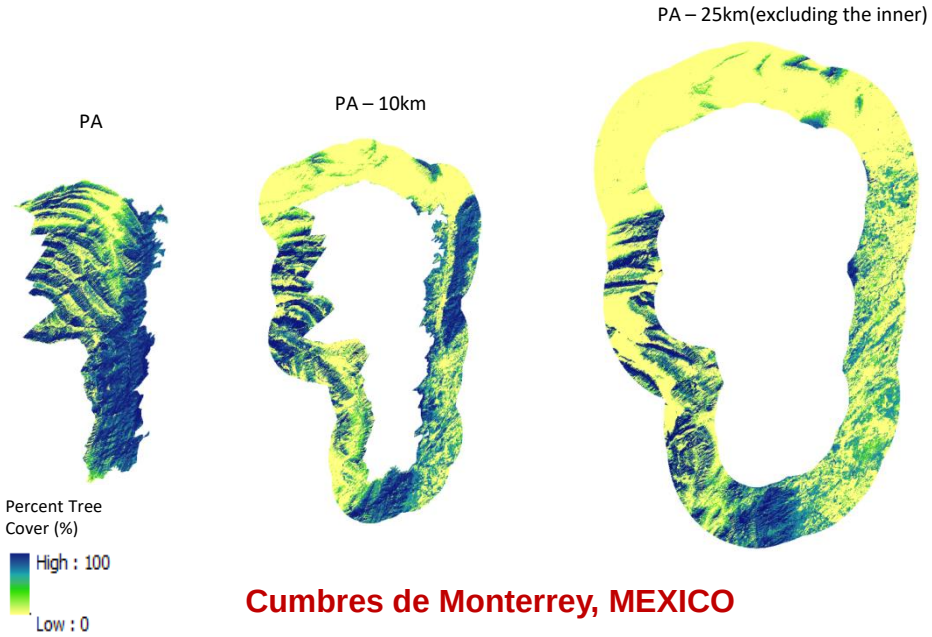


Hanssen et al., 2013, Sexton et al. 2013. *International Journal of Digital Earth* 6: 427-448; Kim et al. 2014. *Remote Sensing of Environment.*

Forest Cover Change Analysis

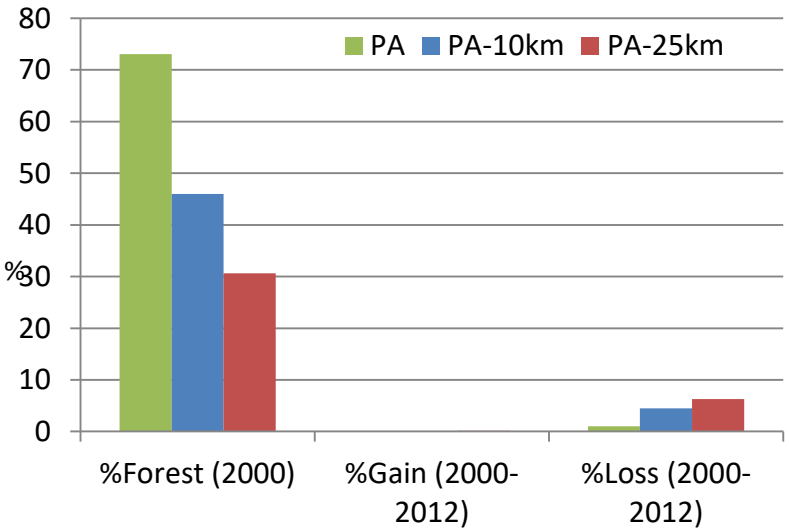


Percent Tree Cover (2000)

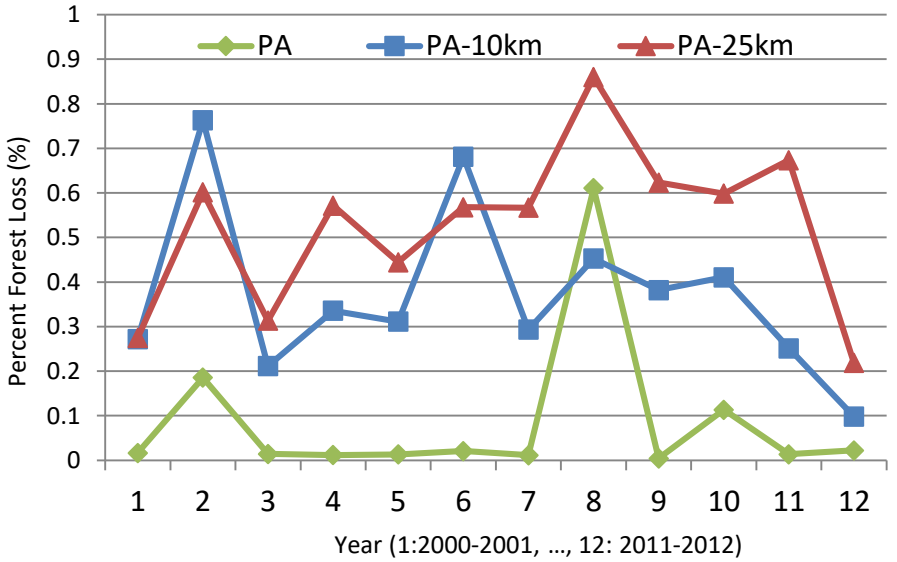


Cumbres de Monterrey, MEXICO

Decadal Forest Cover, Gain and Loss (2000 – 2012)

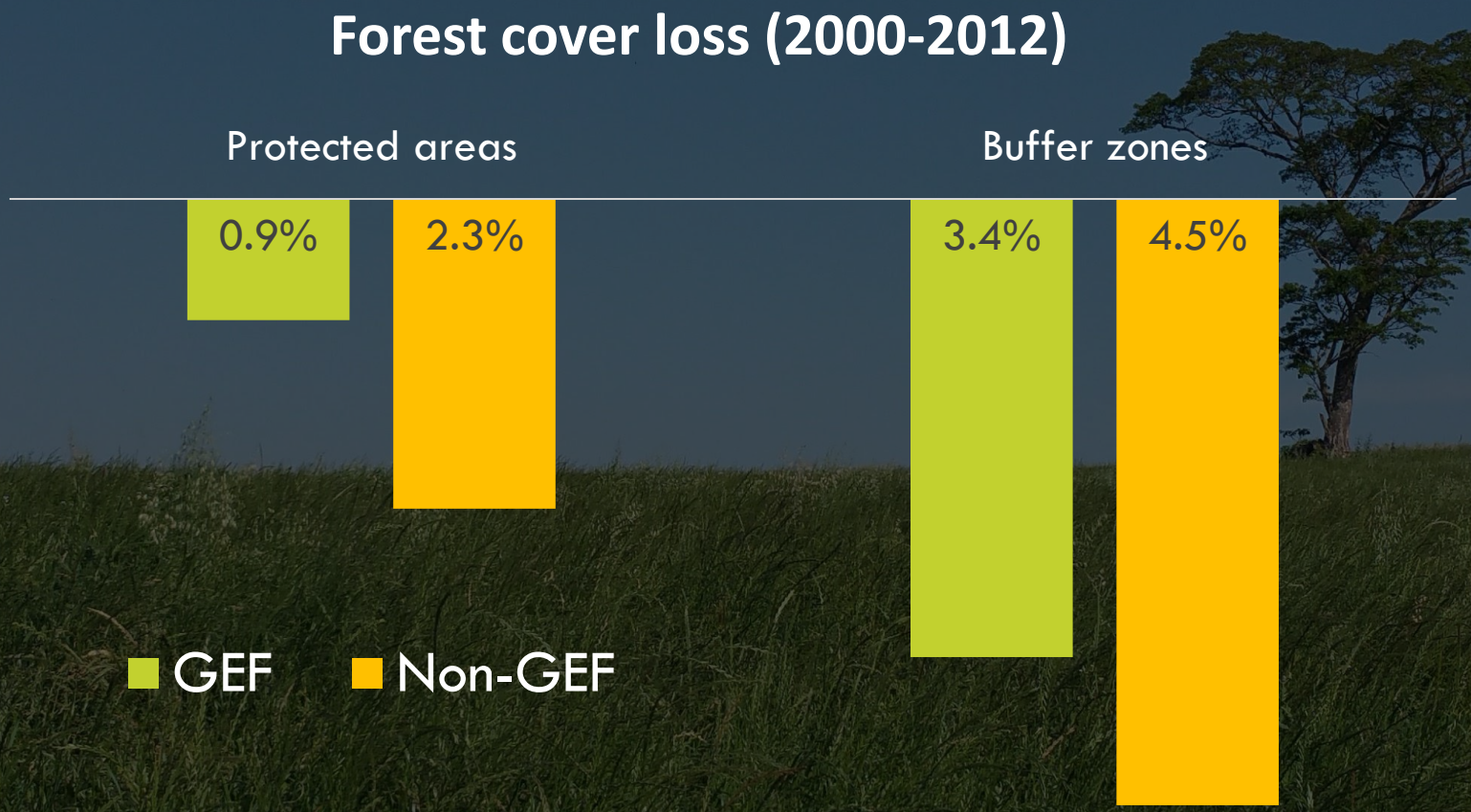


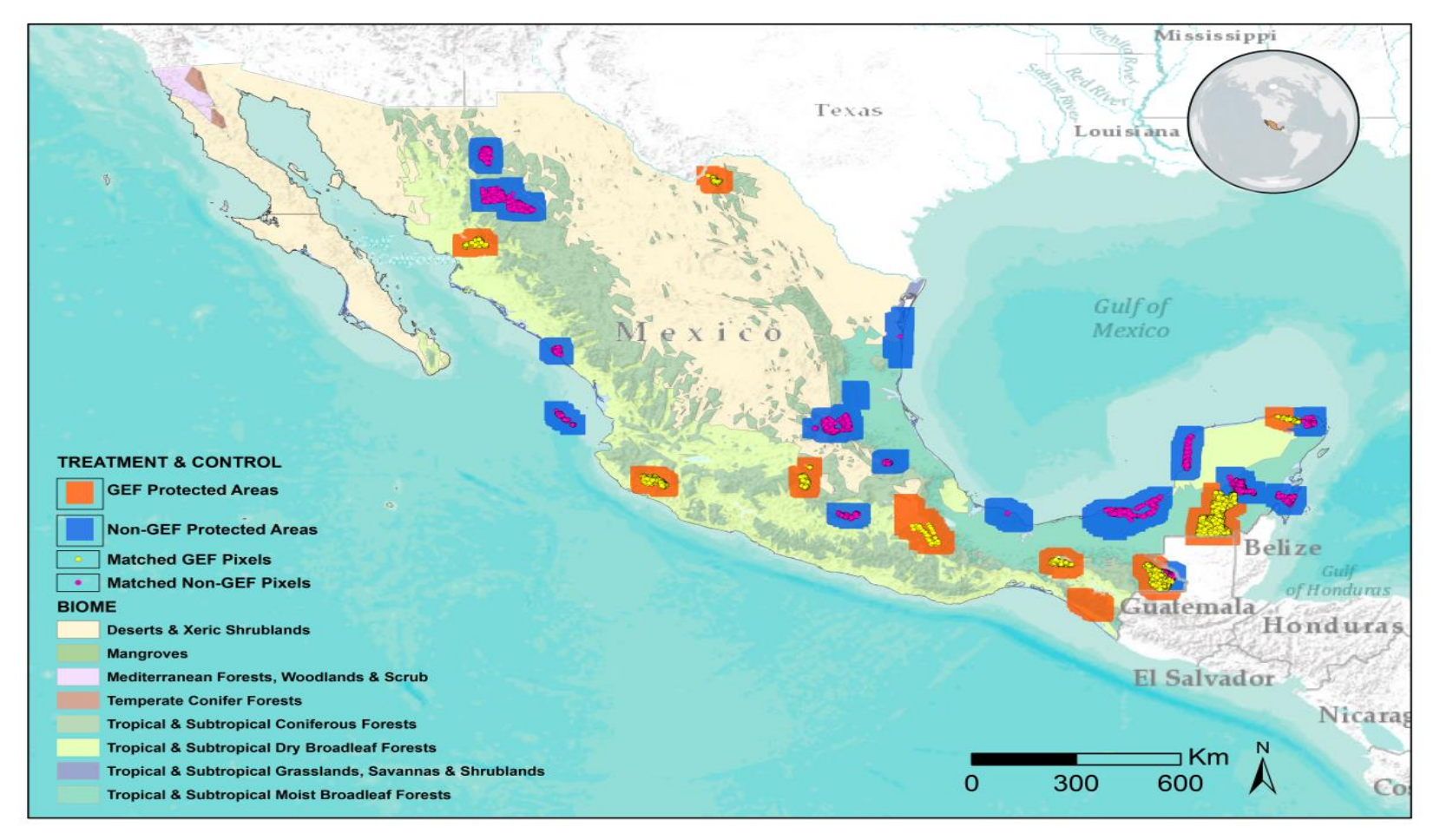
Yearly Percent of Forest Loss (2000 – 2012)

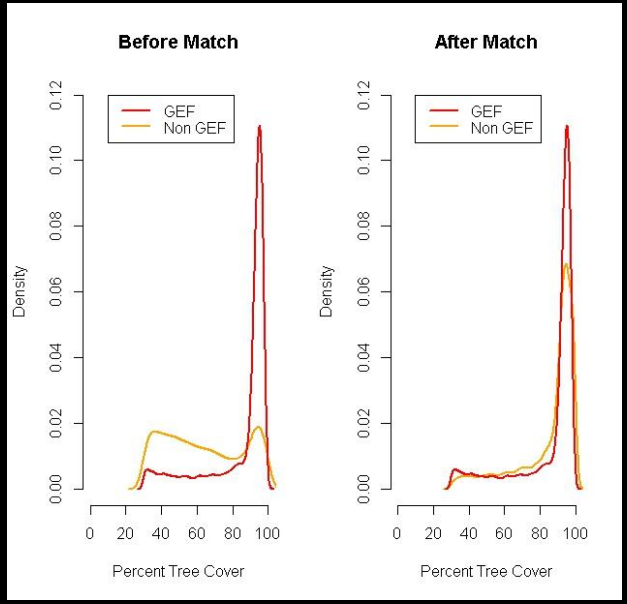


DEMONSTRATING IMPACT

Biodiversity: Global





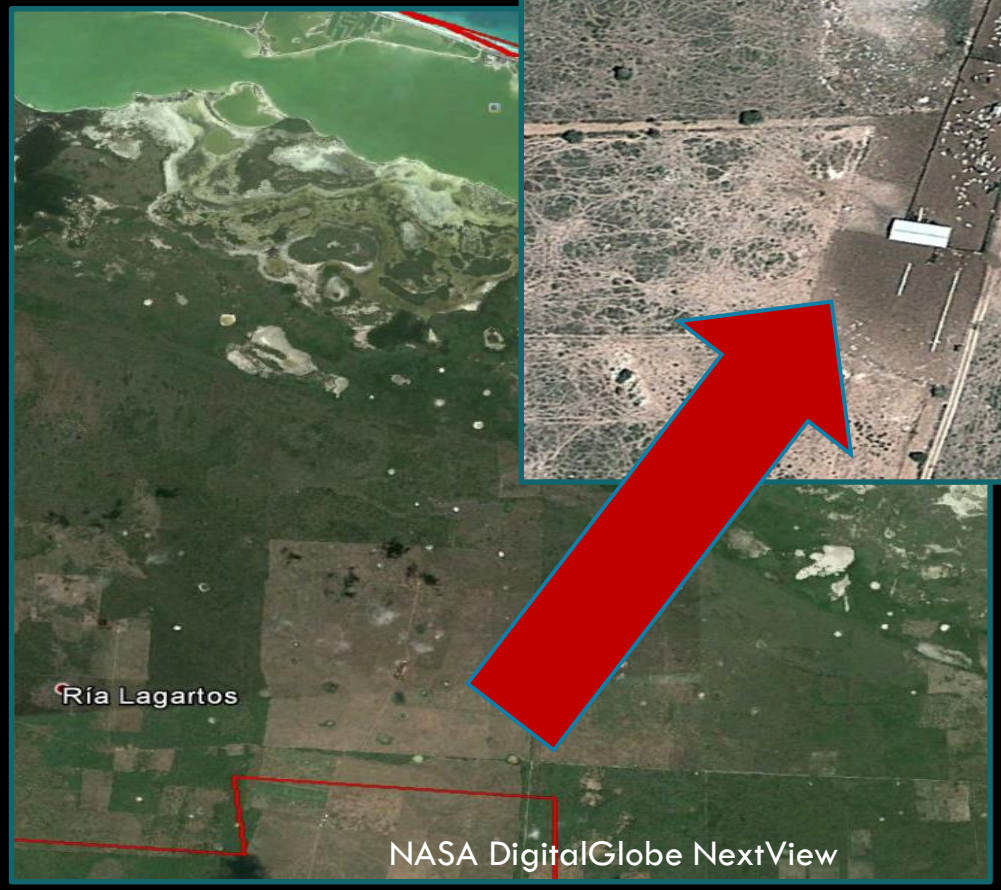


GEF-supported PAs have 23% less forest loss

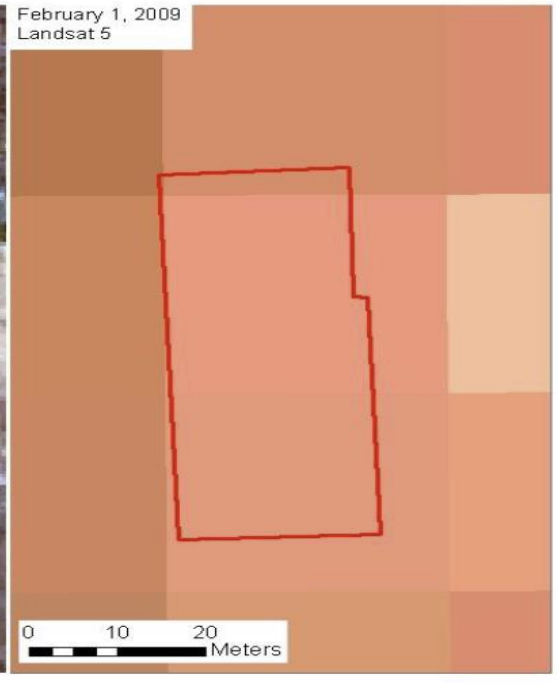
Attribution: Did the intervention cause the change?

Quasi-experimental evaluation design based on Propensity score matching

Identify the drivers



2.5 m

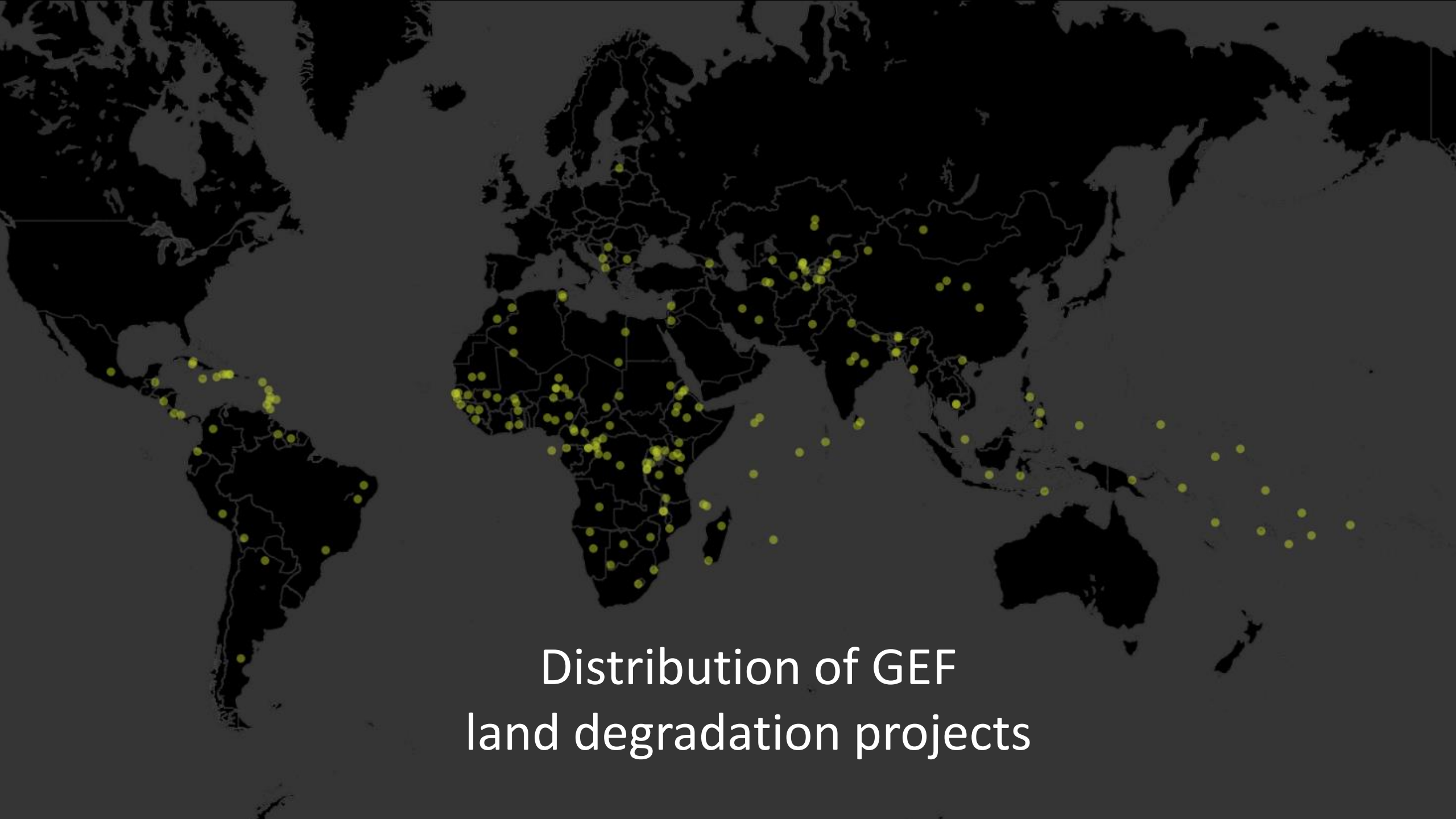


30 m zoomed in to 2.5 m

Images at 2.5 to 0.5 m resolution used to identify drivers of change that hinder success of GEF support

Land degradation

- Goal 15: Sustainably manage forests, combat desertification, halt and reverse **land degradation**, halt biodiversity loss
  - Indicator for Goal 15
  - Annual change in degraded or desertified arable land (% or ha): Remote sensing/satellite and administrative data.
- UNCCD Indicators for Land Degradation Neutrality(LDN)
    - Vegetation productivity (NDVI)
    - Landuse and landcover change and
    - Carbon sequestration

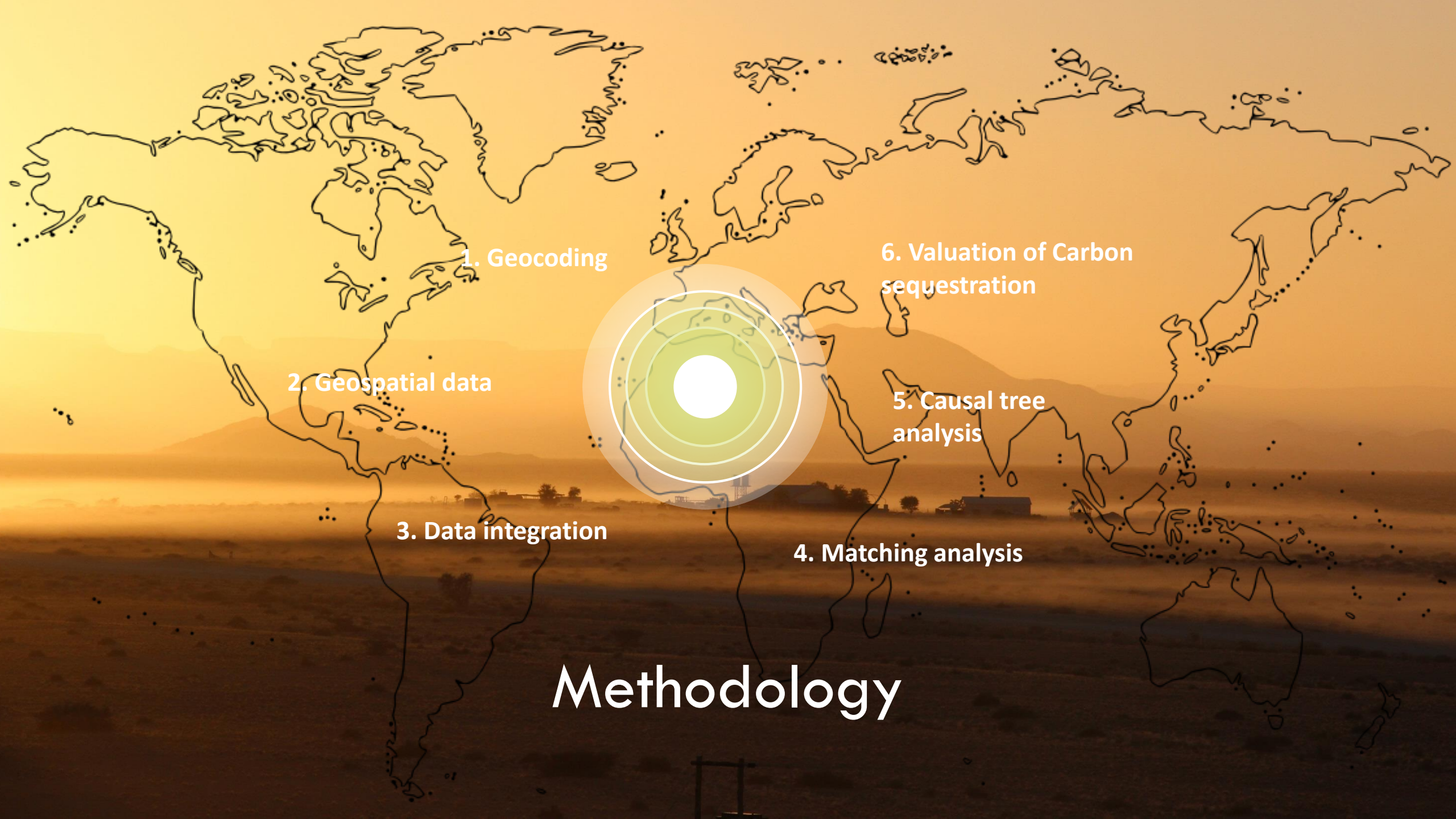


Distribution of GEF
land degradation projects

LAND DEGRADATION

Value for money analysis: 3 main objectives

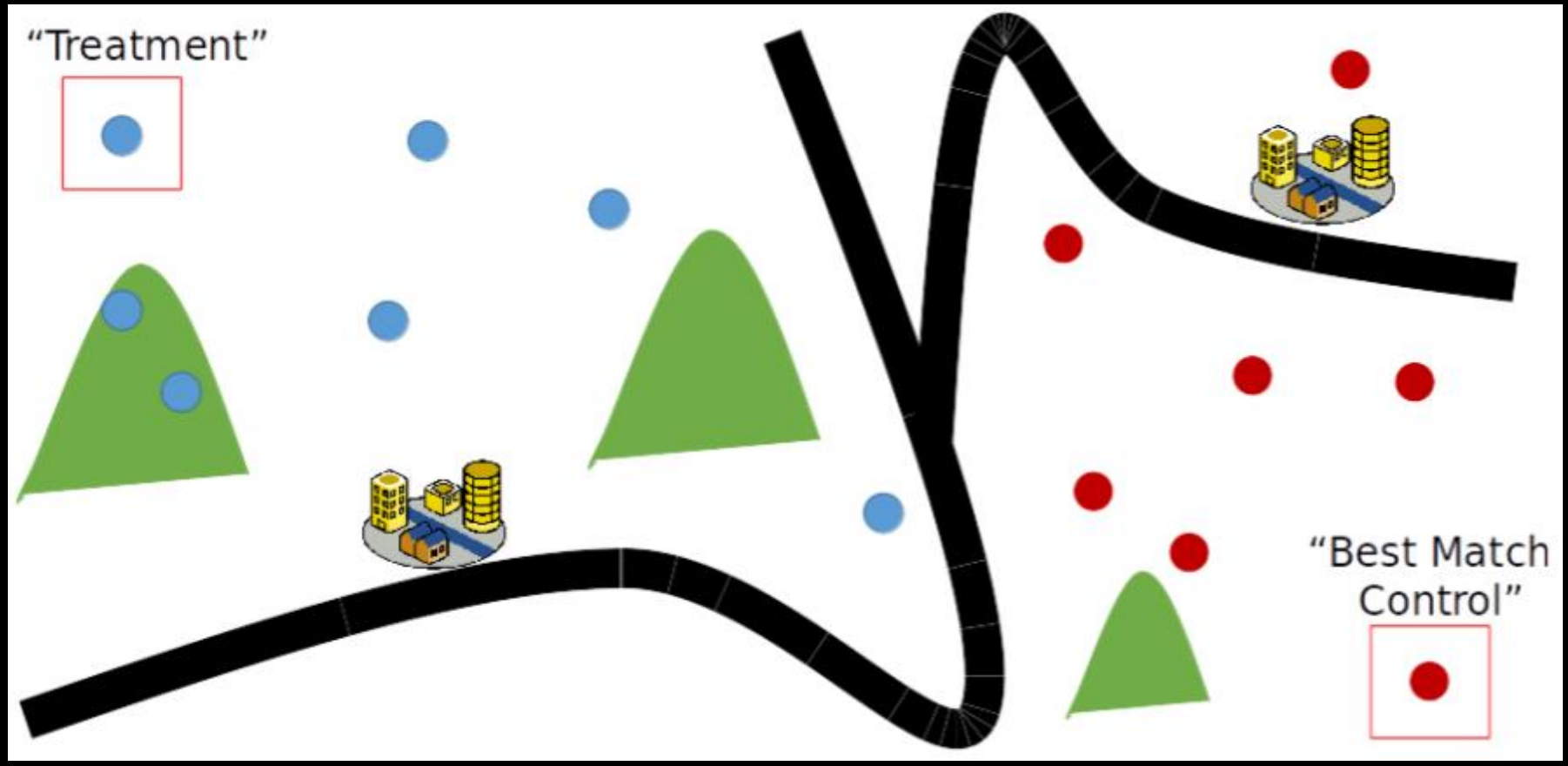
1. Impact of GEF land degradation interventions
2. Factors associated with the environmental outcomes
3. Value for money in terms of carbon sequestered



Methodology

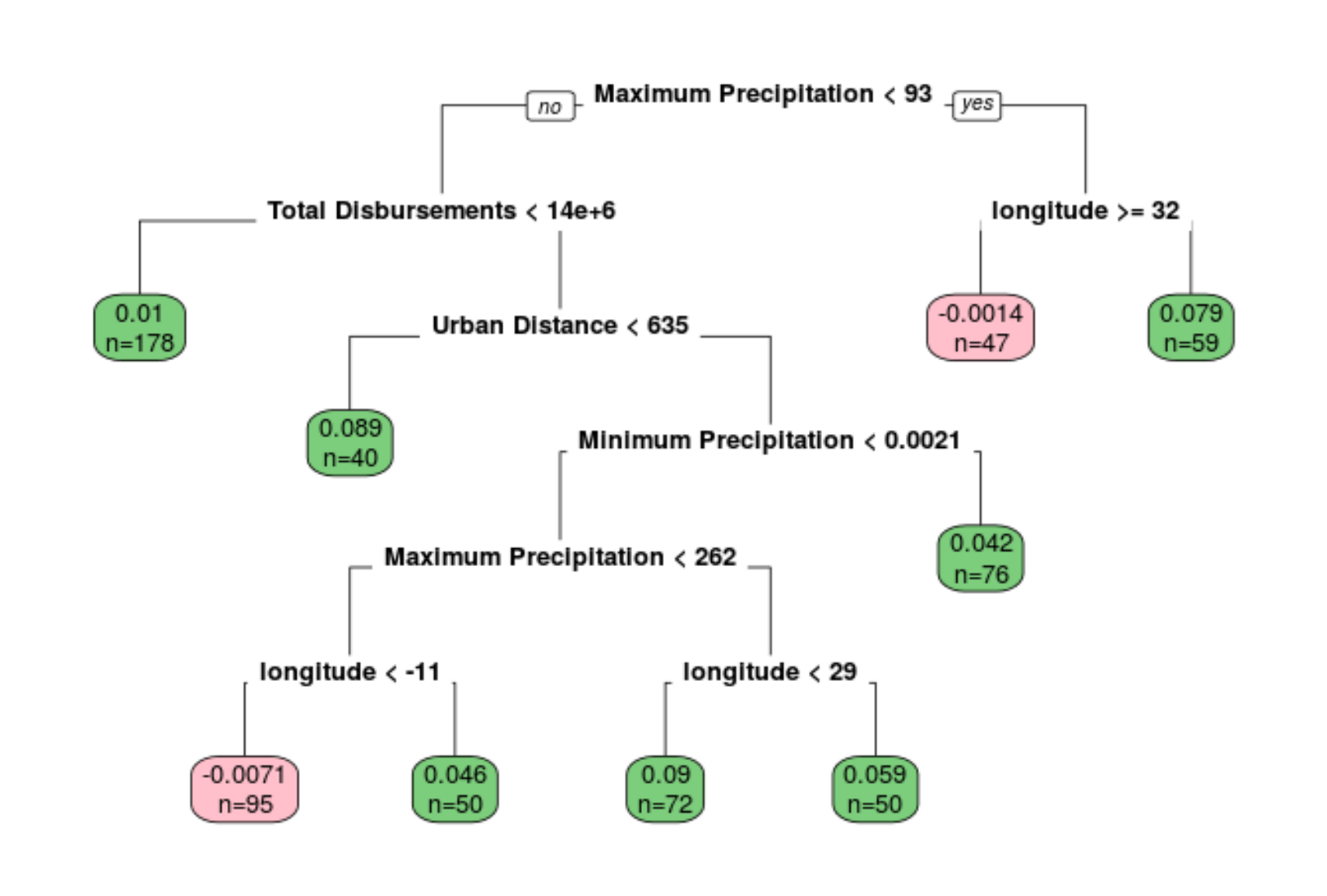
LAND DEGRADATION

Quasi-experimental method



LAND DEGRADATION

Machine learning and causal tree



LAND DEGRADATION

Finding: value for money

+

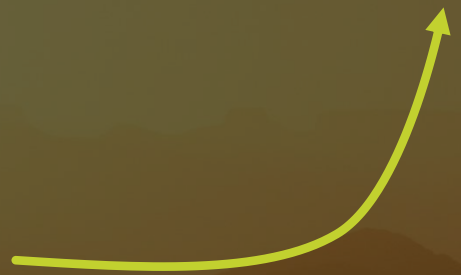
Vegetation productivity

−

forest loss and land fragmentation

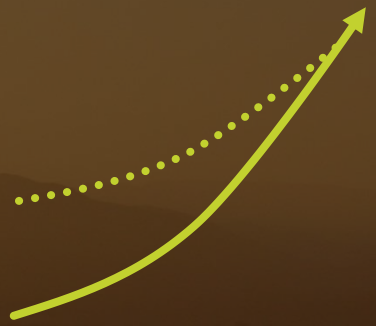
LAND DEGRADATION

Findings: value for money



Lag time of 4.5 to 5.5 years for impacts to be observed

Access to electricity associated with higher impact

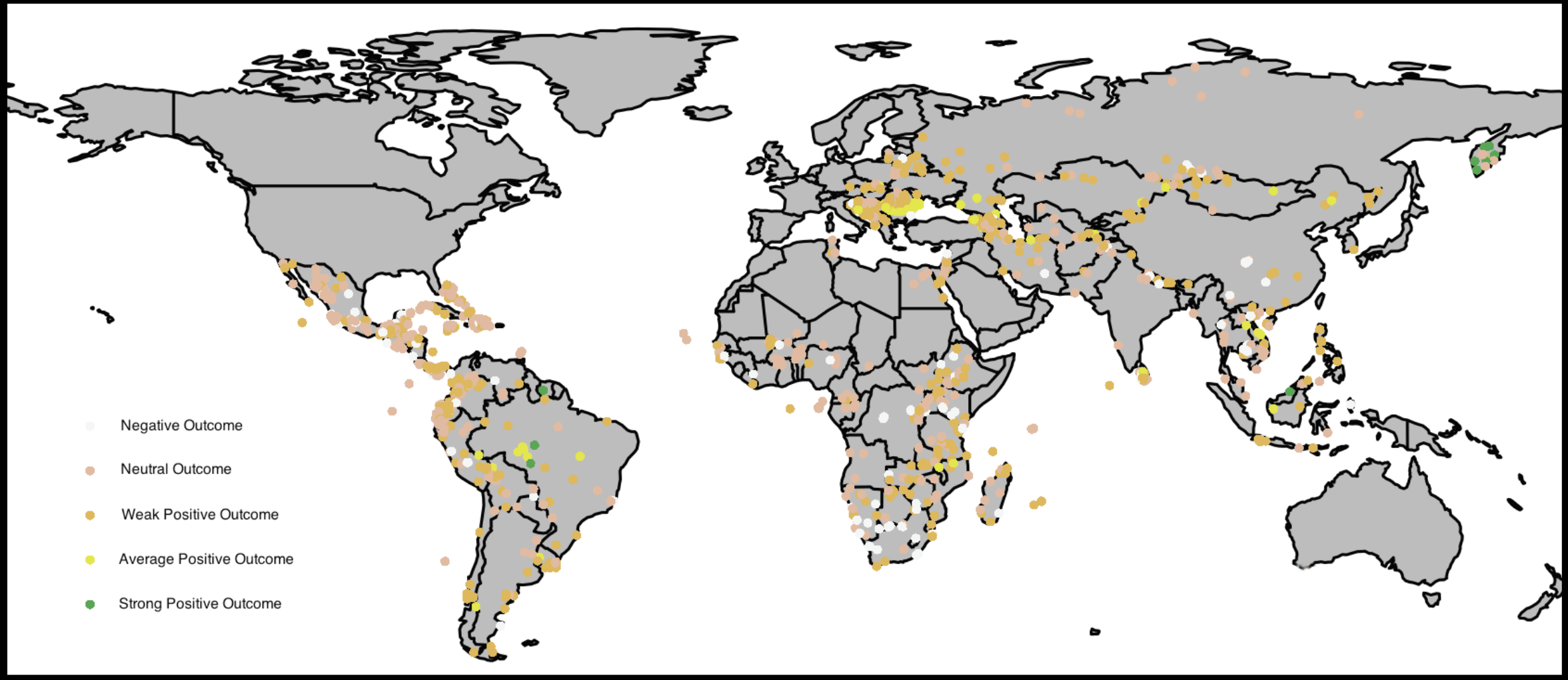


Higher impact observed in areas with poor initial conditions

LAND DEGRADATION

Bang for the buck

$1:1.08

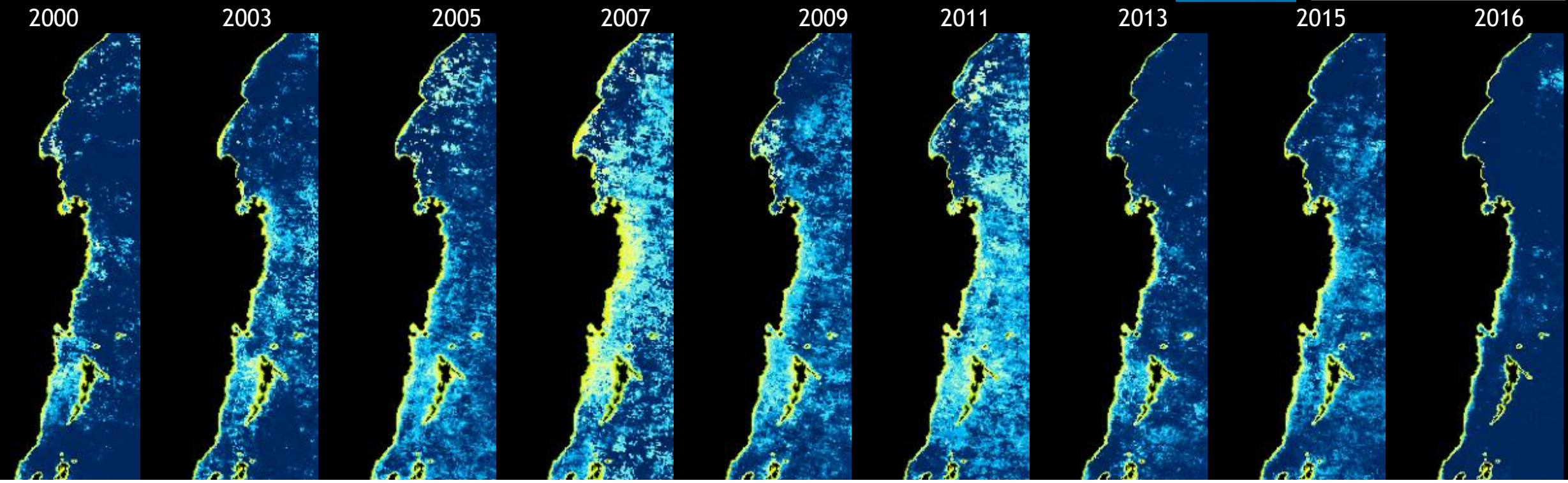


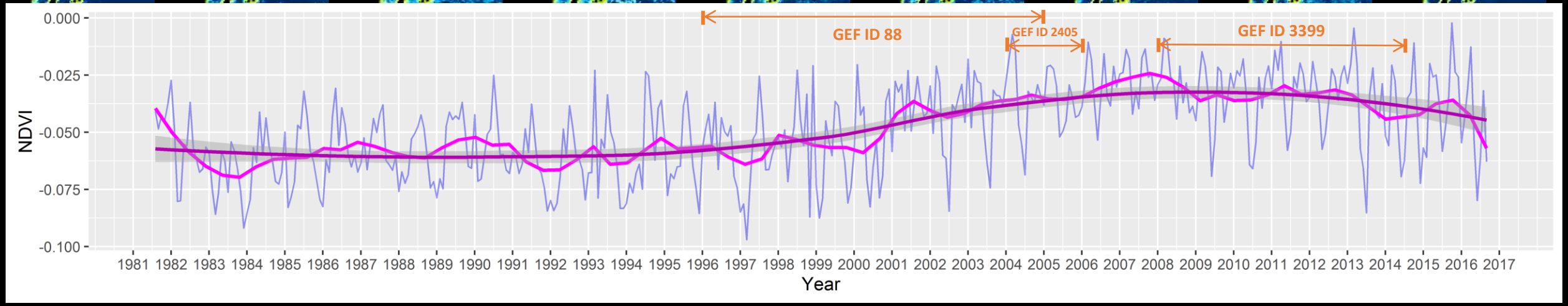
DEMONSTRATING IMPACT

International waters: Lake Victoria

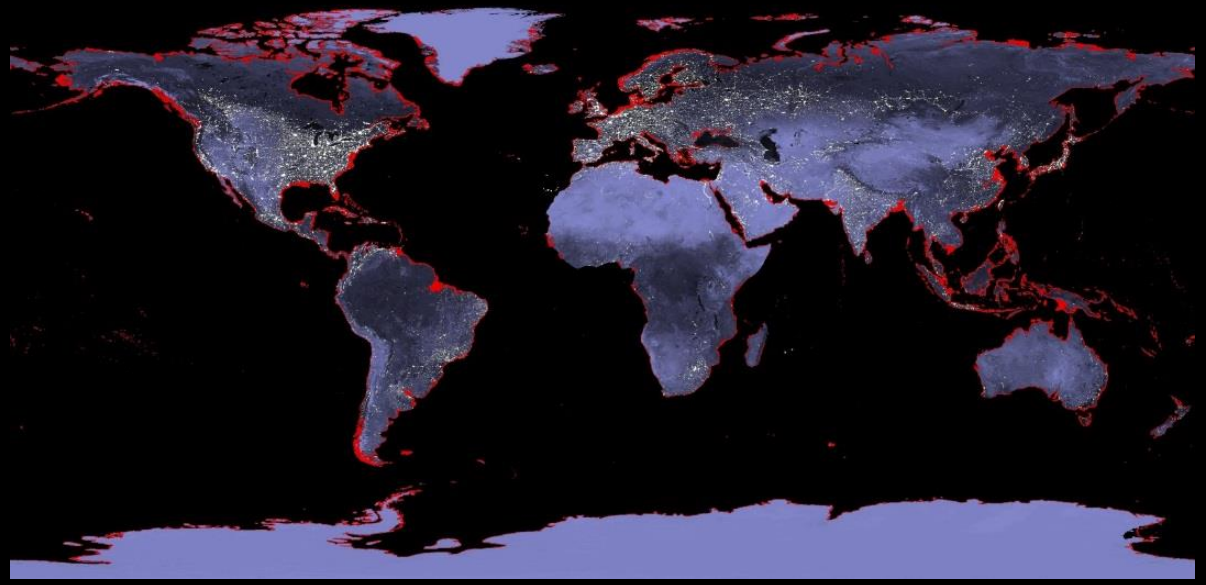
14 LIFE BELOW WATER

Vegetation Water

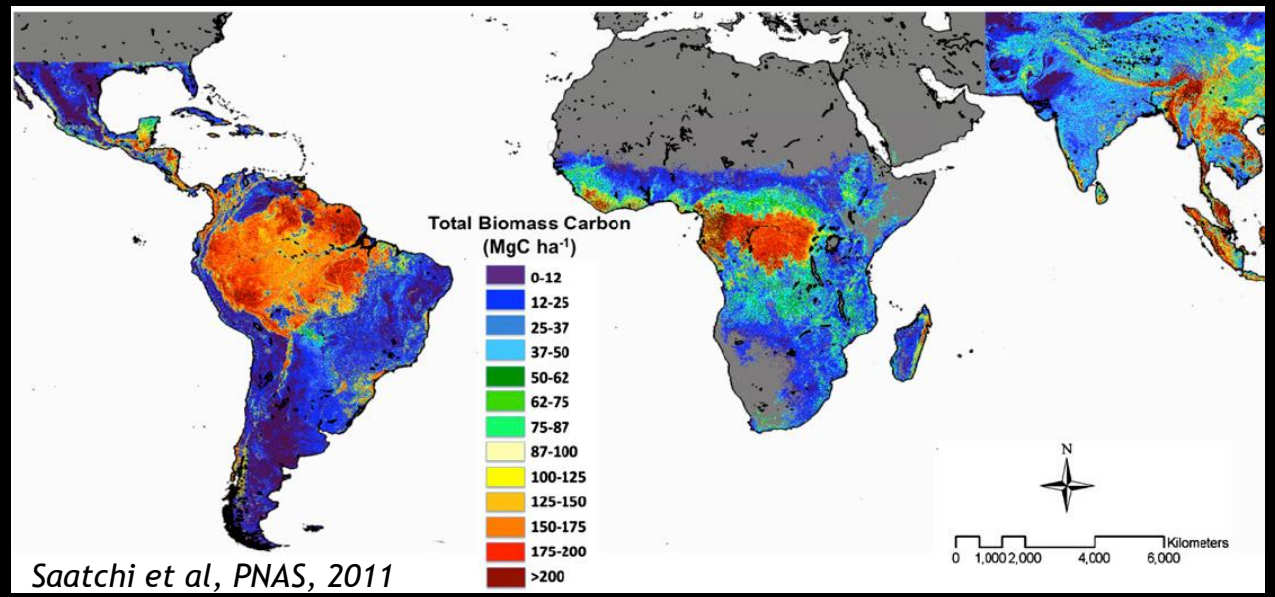




Climate Action



Areas vulnerable to sea level rise



Aboveground biomass

Ecological forecasting: Predicting the future

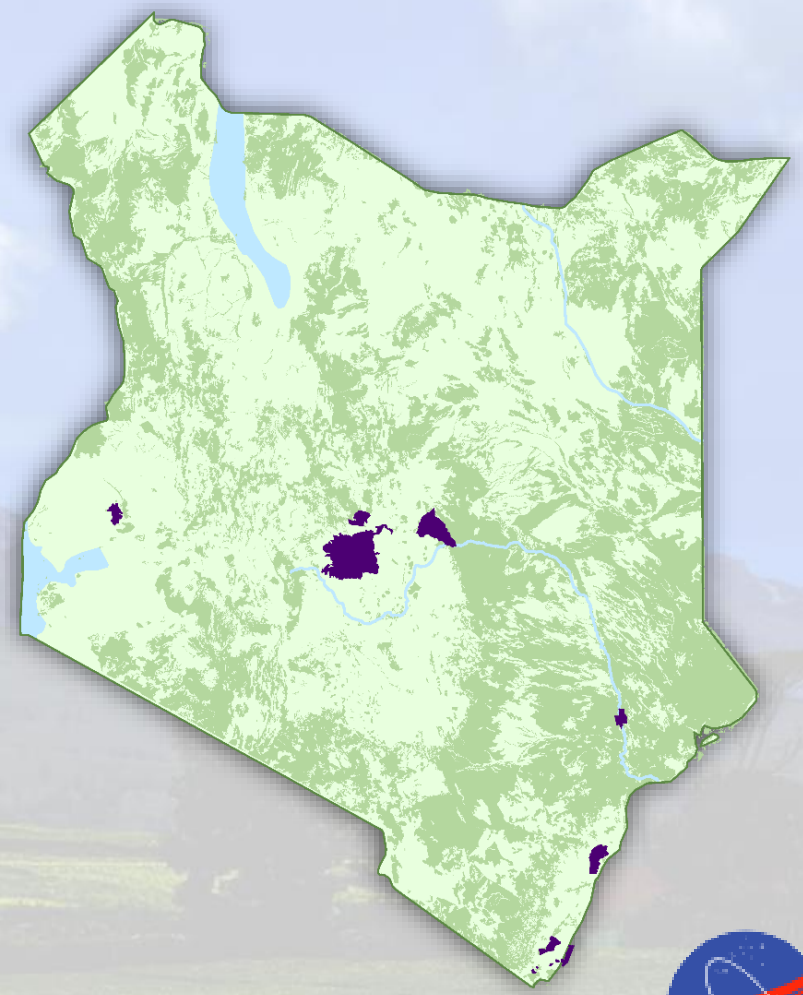
1. Estimating the impact
2. Project design
3. Scenario building

Kenya Ecological Forecasting

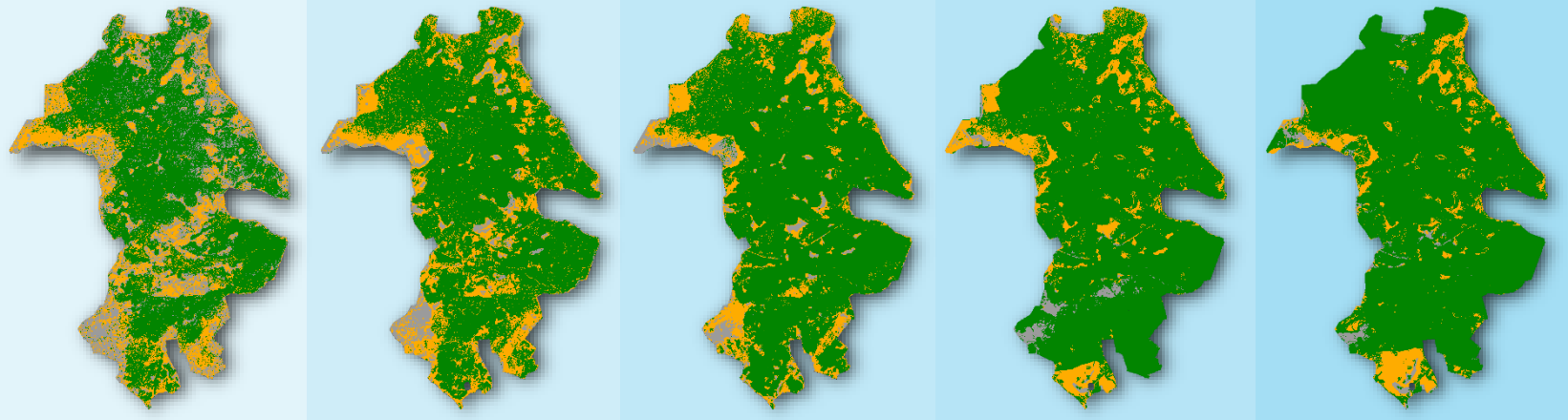
"Estimating Carbon Sequestration within Global Environment Facility (GEF) Funded Protected Areas in Kenya to Aid Future Policy"

- Research collaboration between the Global Environment Facility's Independent Evaluation Office (GEF-IEO) and NASA DEVELOP program

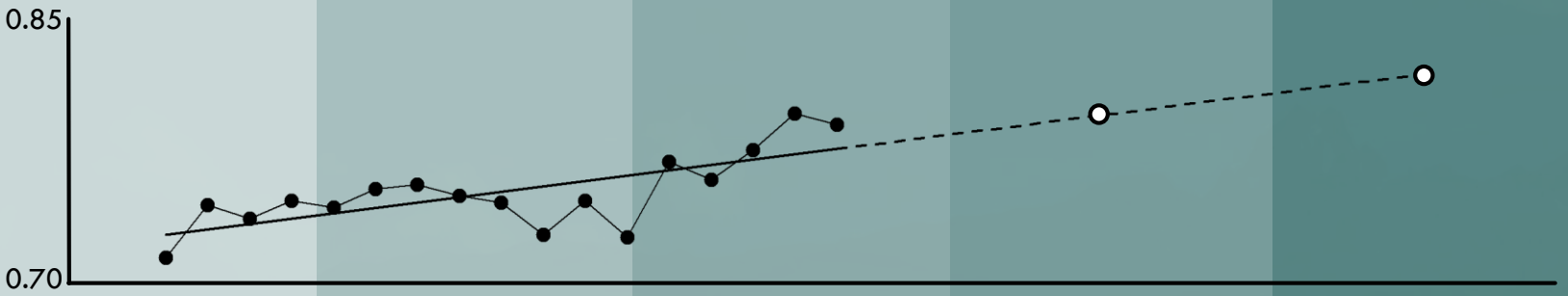
- Evaluated land cover and aboveground carbon stocks for 12 GEF protected areas in Kenya



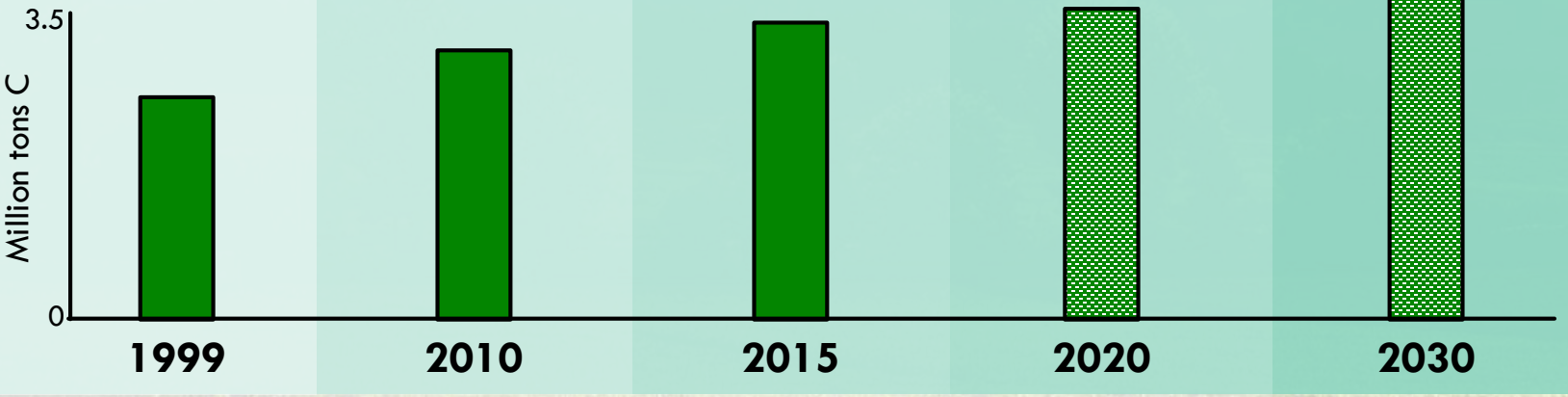
Land Cover Change



NDVI

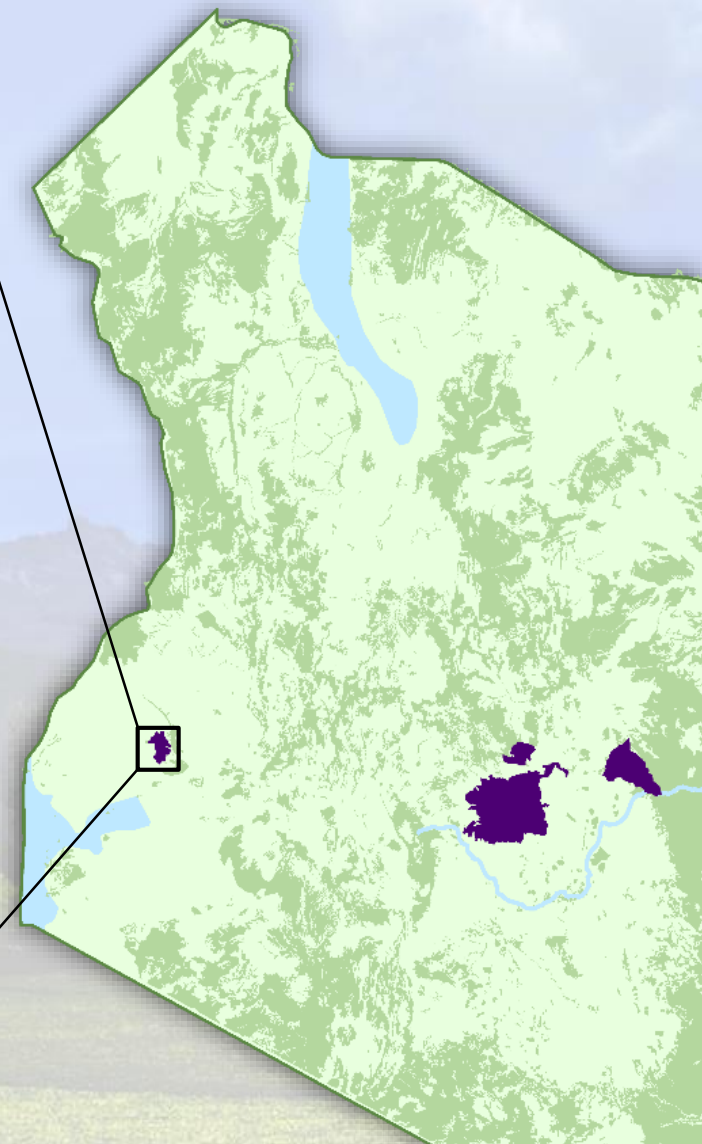


Carbon Sequestration



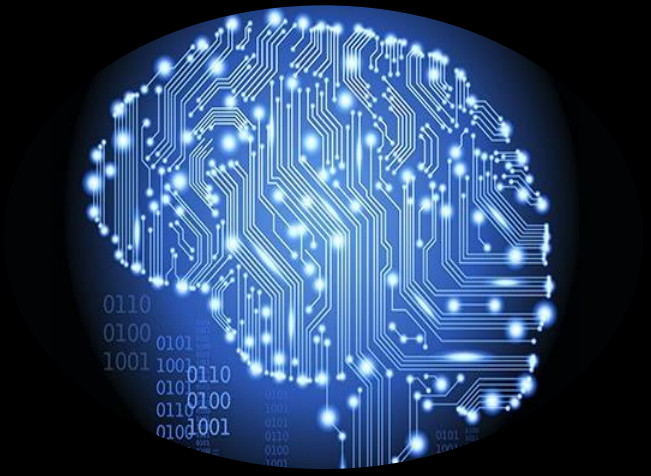
Case Study:

Kakamega Forest Reserve

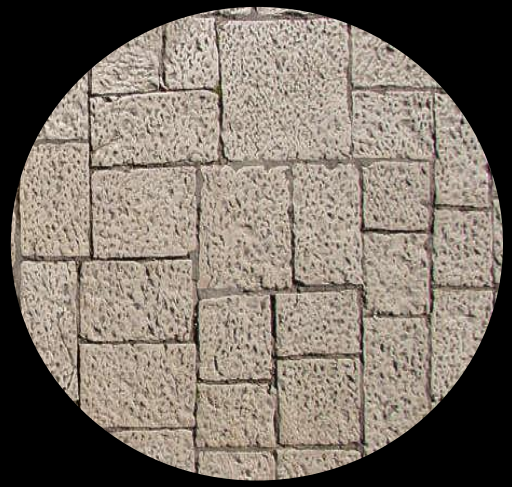


Triangulating Across Methods

Challenges and Limitations



High computing power and technical skills needed



Uneven availability and accuracy of contextual variables across sites

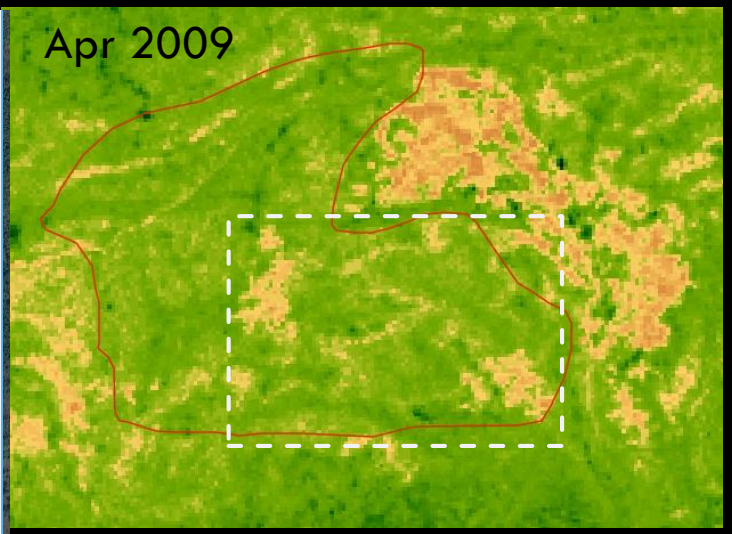
Cannot always answer "how" and "why" questions

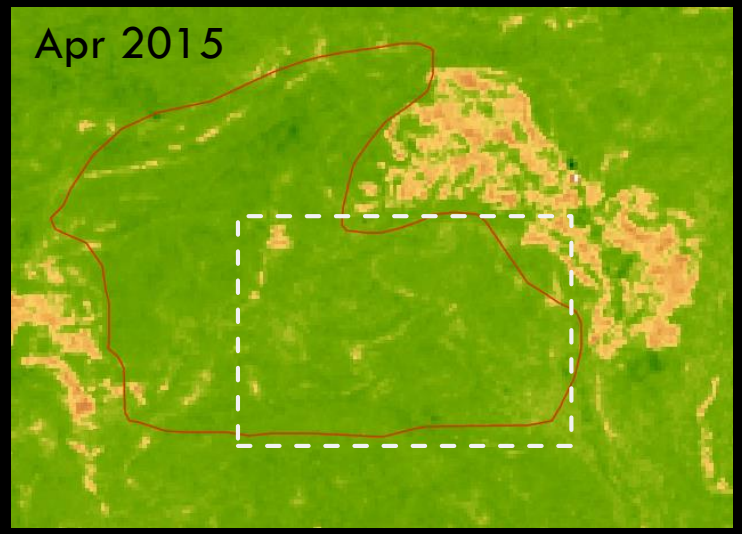
Need for field verification/ groundtruthing

Beneficiary survey

Question	Response
Whats the current date and time	2016-09-18T13:27:00.000+05:30
Where is this interview taking place?	21.76722166205057 78.66110602300134 486.3959563433866 24.0
Can I take a picture?	
Name of Interviewee(s)	Premlal anke
What is your role in the project?	beneficiary
Name of Organization	Borpani
Is the project creating any positive impact in the area/region/site?	yes
Did this project contribute to better land management ?	to_a_moderate_
Has the project increased productivity in rangelands? (Y/N)	yes
Has the project allowed for creating of new jobs and livelihood?	yes
Do you believe project technicians listened to you and took your voice into account when planning or implementing the project?	to_a_moderate_
Did the project involve men and women equally?	yes
To what extent is the local community involved in the project?	to_a_moderate_

Time series analysis using Satellite data





Mixed methods and triangulation of findings

Qualitative methods

- Case study
- Field visits
- Focused group interview
- Stakeholders interview

Lessons for the future

Partner with global institutions

Use mixed approaches and methods

Continue exploring new methodologies and data sources

Approach evaluation as a dynamic learning process

Thank you

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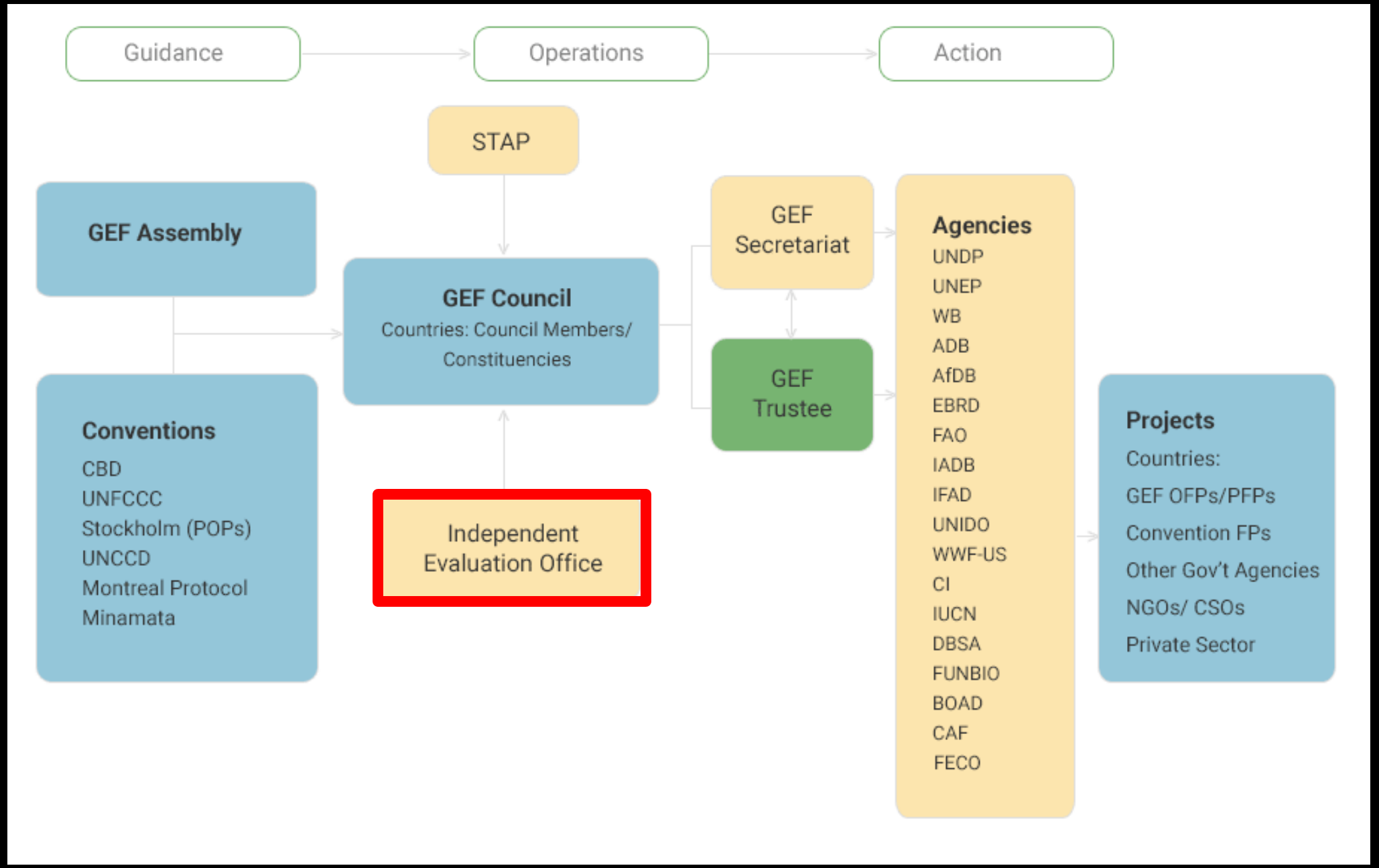

GEF: Institutional Framework

Earth Observation Data

Abstract:
Measuring, monitoring and evaluating the sustainable development goals(SDGS) would be a daunting task given the 169 targets and 230 proposed indicators. The support of the Global Environment Facility (GEF) to various interventions across the globe closely aligns with the SDGs on climate, biodiversity, land degradation, terrestrial and marine ecosystems and resources. Through this session, we share the experience of the GEF on the use of geospatial science complementing other mixed methods approaches for evaluating GEF projects. We draw from both our past and ongoing evaluations in focal areas such as biodiversity(SDG 15), Land degradation(15), International Waters (SDG 14) and Climate change (SDG 13). We demonstrate the use of geospatial science, earth observation and big data, analytics, e-devices and the relevance and applicability of these innovative mixed methods for keeping track on the progress of the SDGs.