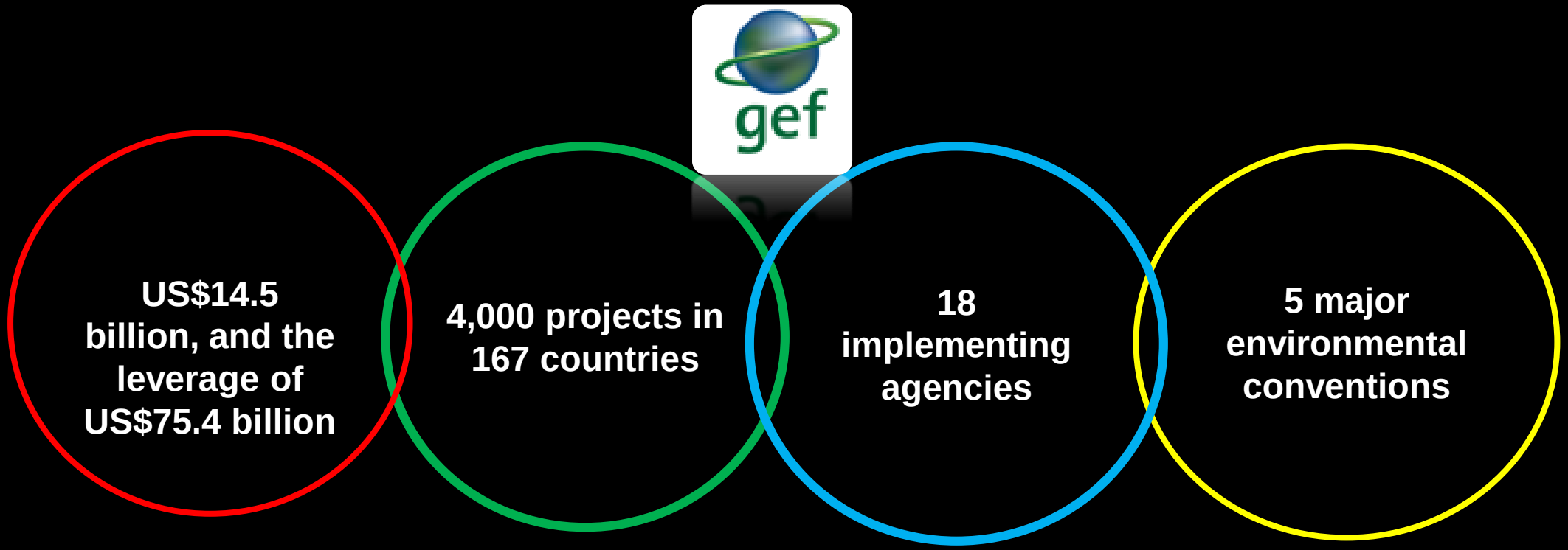
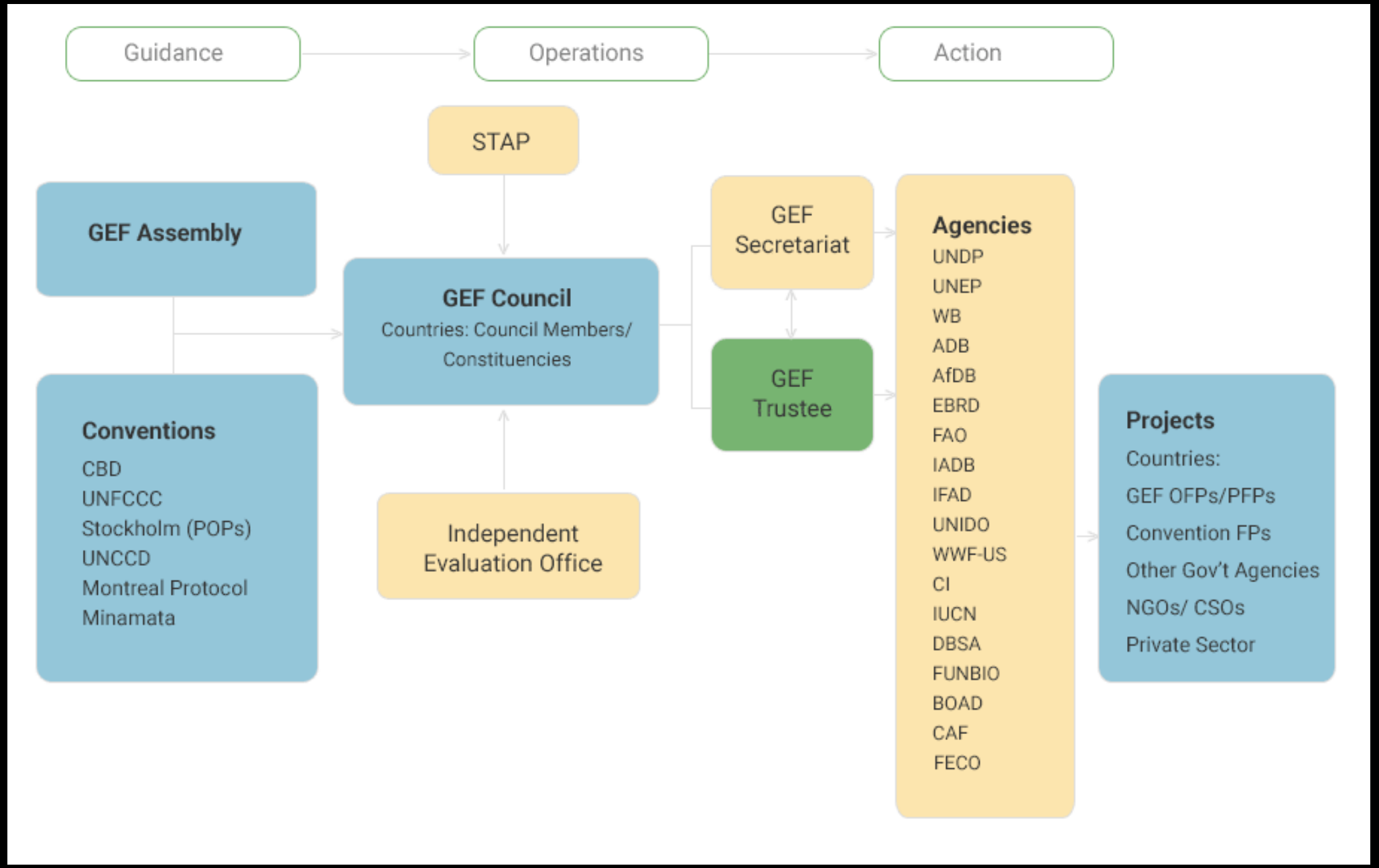
Geospatial Technology at the Global Environment Facility

Dr. Anupam Anand
Evaluation Officer
Independent Evaluation Office, Global Environment Facility
World Bank Group, Washington DC



What is Global Environment Facility?



GEF: Institutional Framework

Efficiency

Analysis at different scales

Aiding objectivity and transparency

Applicable to variety of monitoring evaluation methods

Why do we need Geospatial technology?

Project Design

RBM and Monitoring

Evaluation

Knowledge Management

How do we need Geospatial technology?

GEF Land Degradation Projects

Impact of GEF Land degradation interventions?

Factors associated with the environmental outcomes?

Value for Money in terms of Carbon sequestered?

Objectives

PORTFOLIO

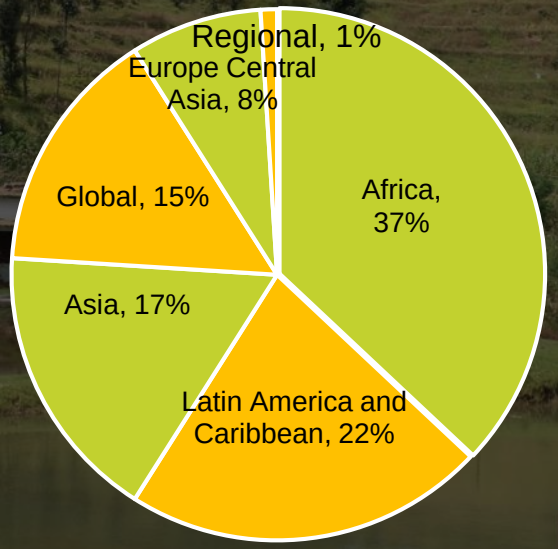
Land degradation

$3.36 billion

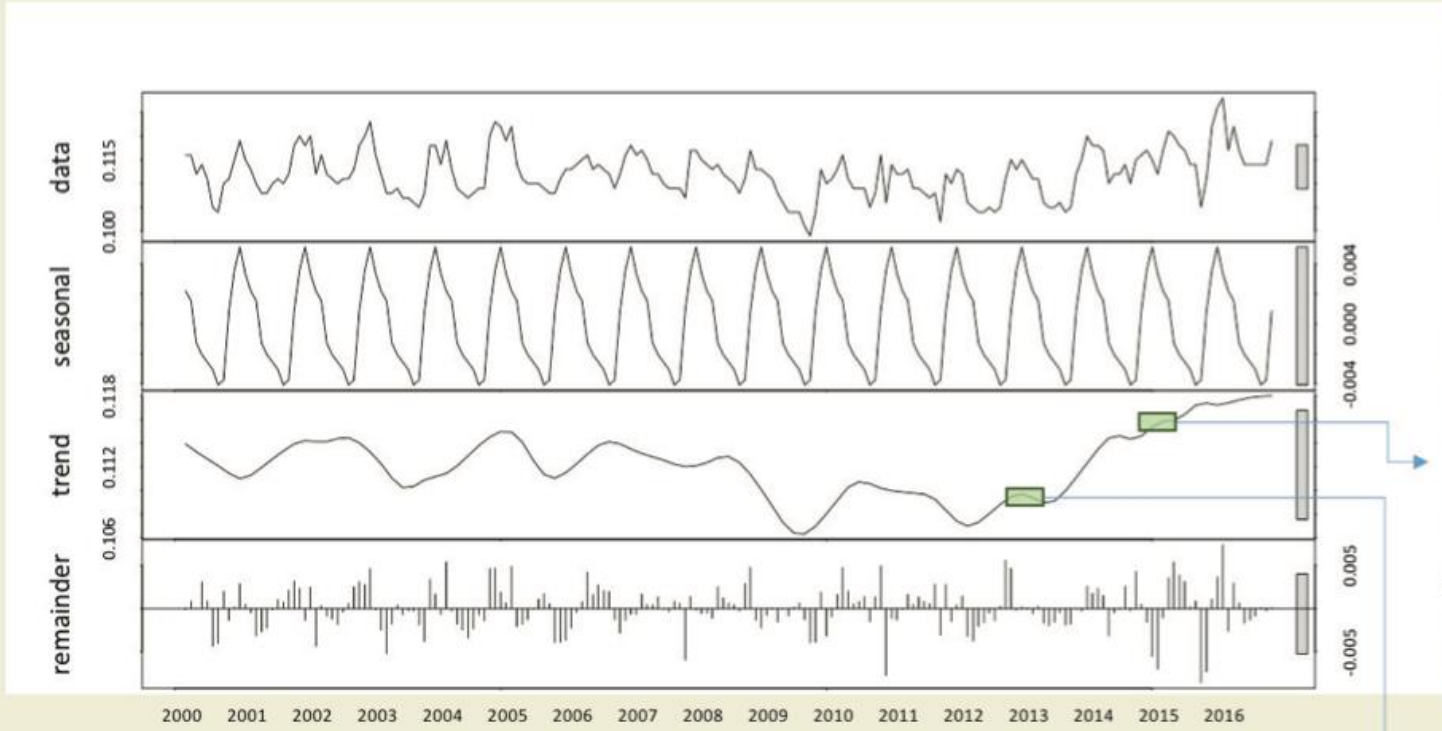
618 projects with an LD component (58% multifocal)

Co-financing

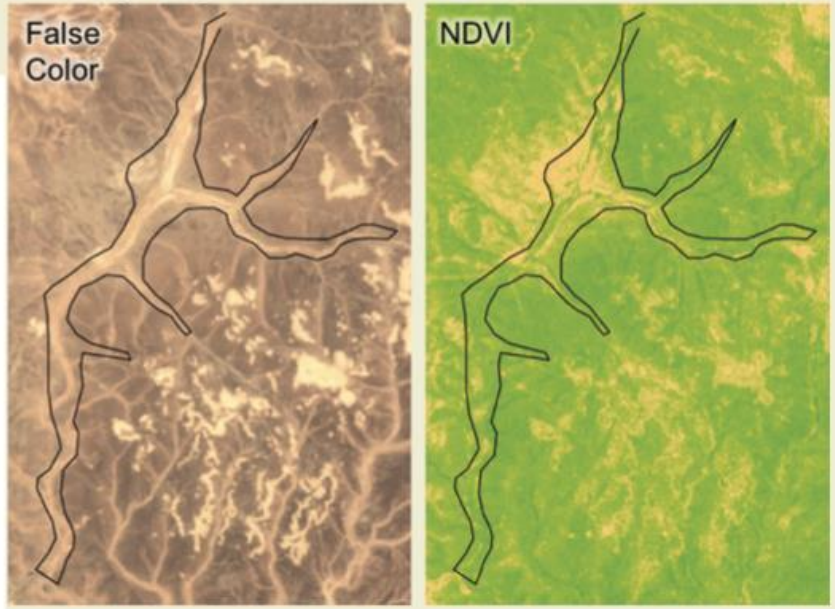
1:6.7



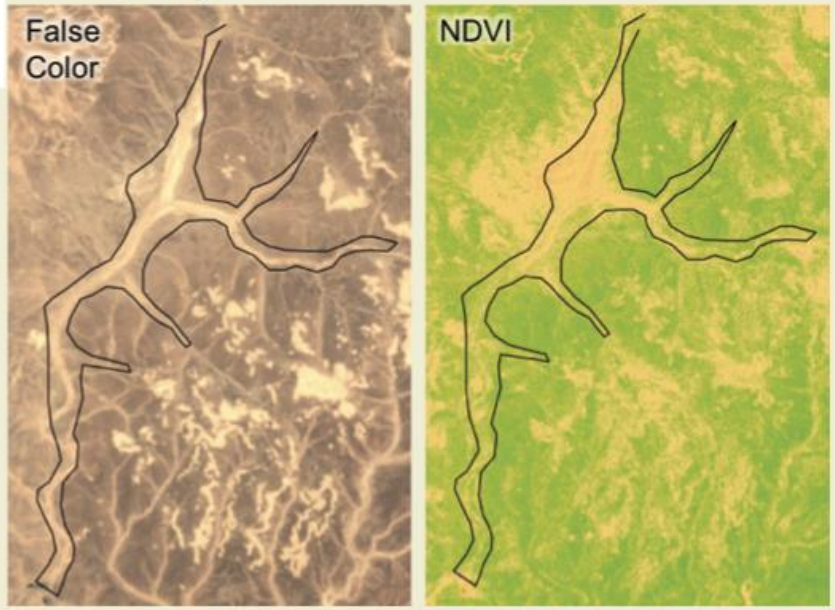
Shift towards integrated landscapes



2015 May - Aug

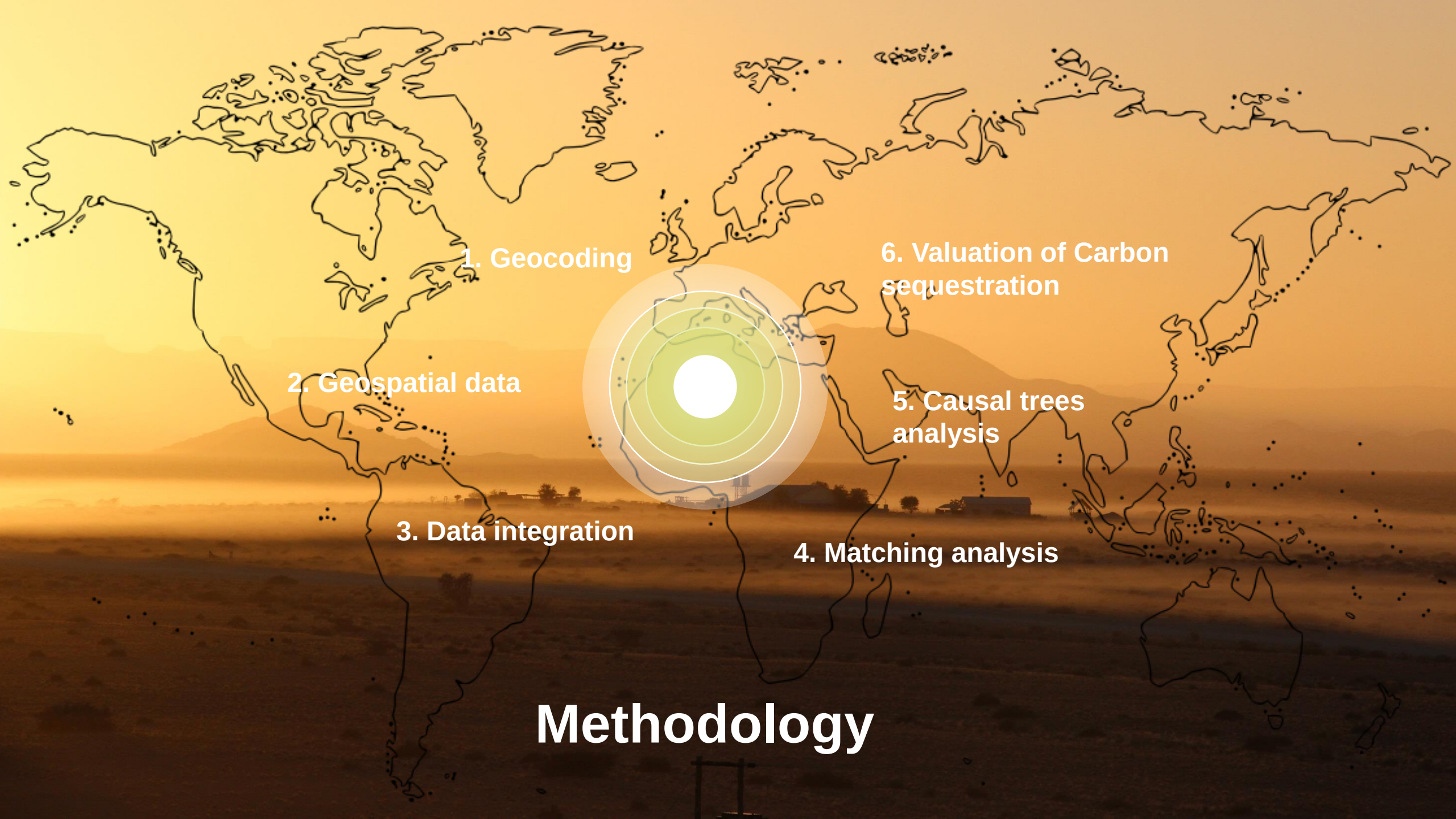


2013 May - Aug



DEMONSTRATING IMPACT

MENA-DELP:Jordan



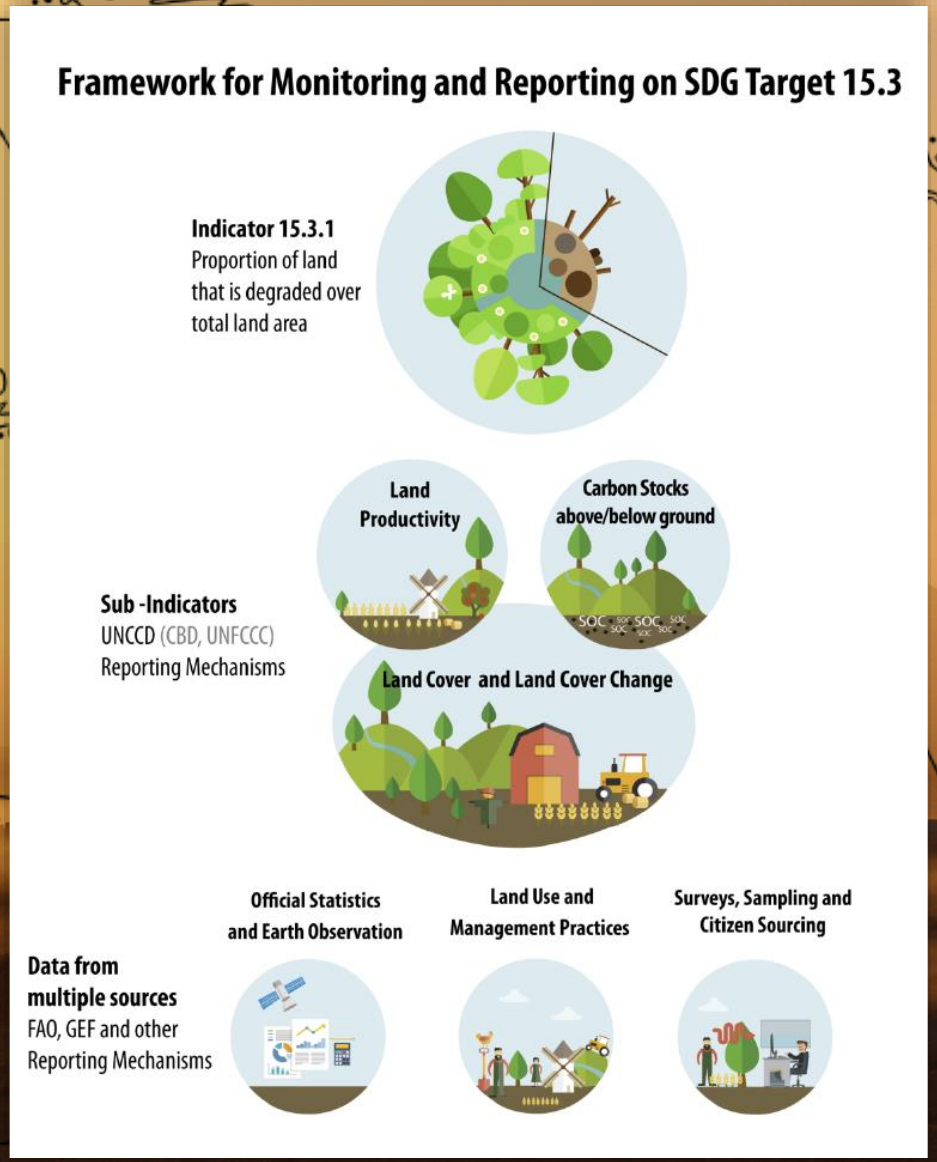
Methodology

Forest Cover(Tier 1)

Vegetation Productivity(Tier 2a)

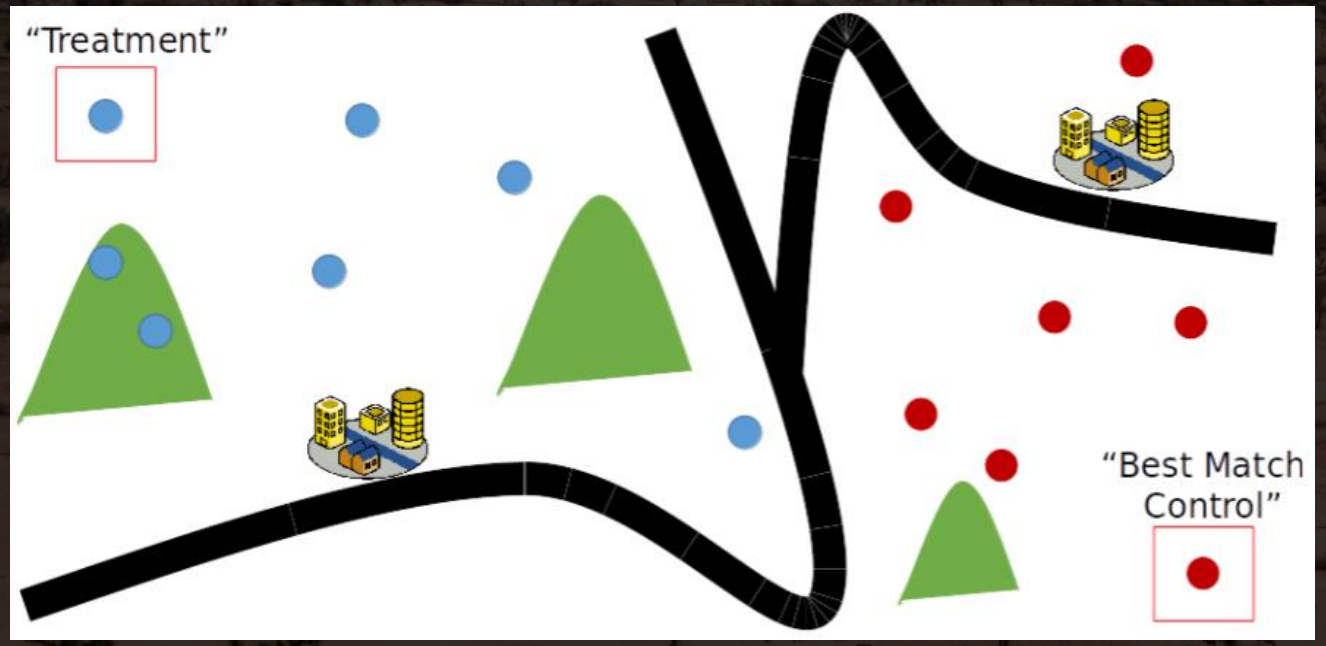
Carbon Sequestration(Tier 2b)

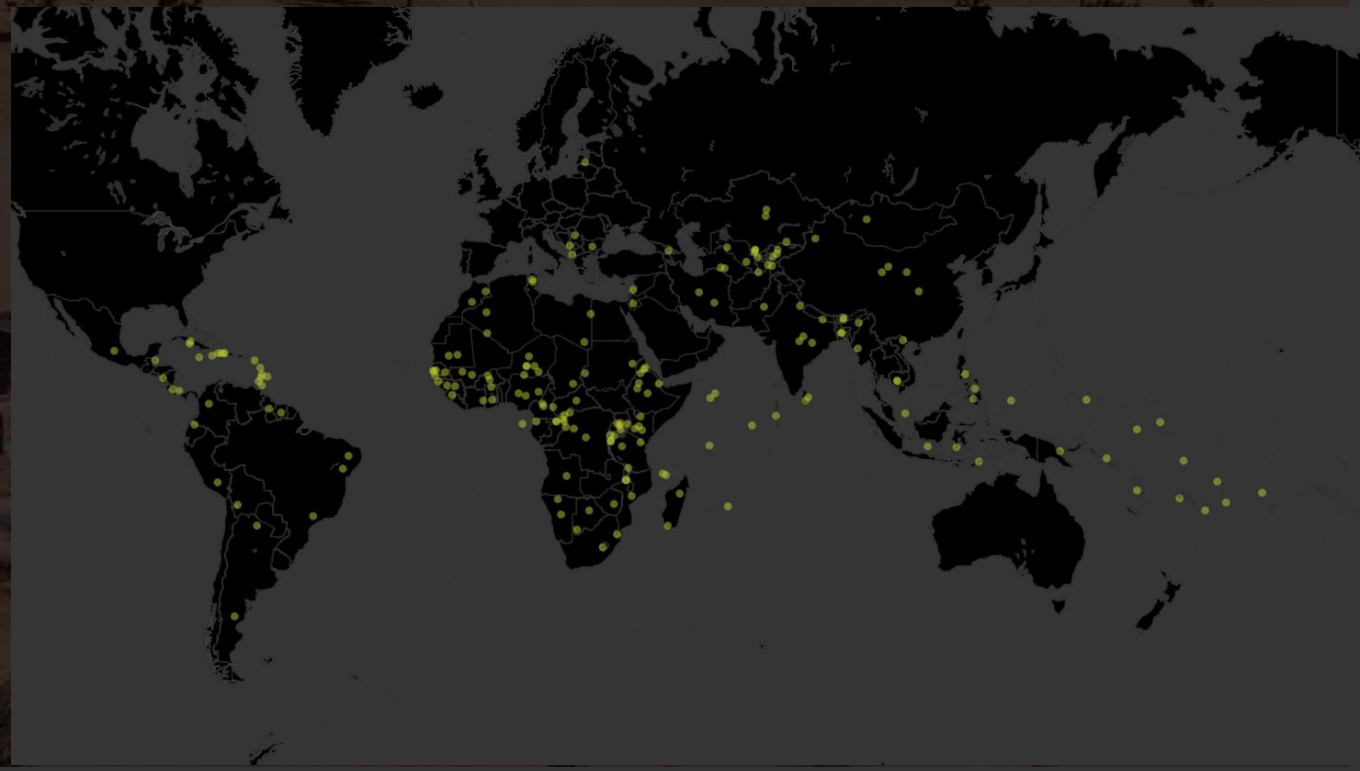
Forest Fragmentation(Tier 3a)



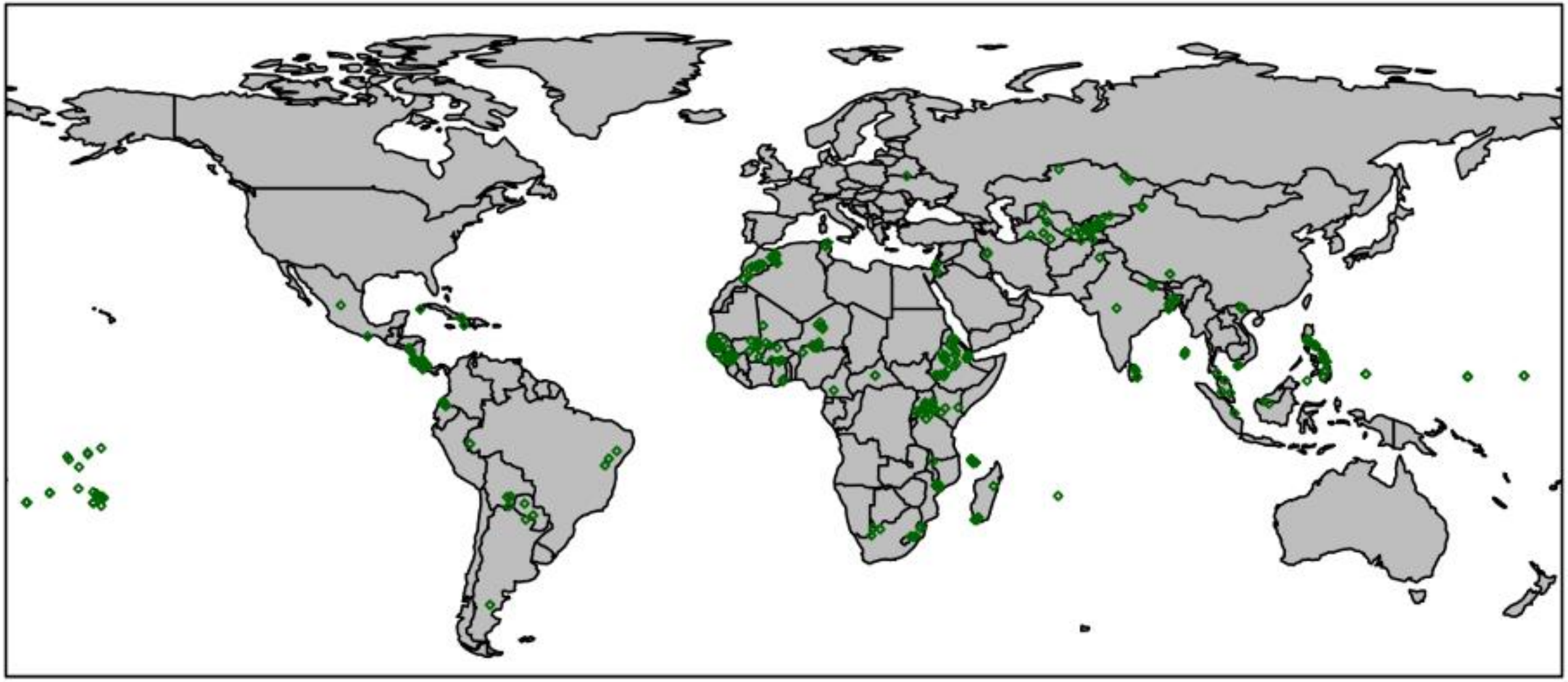
Indicators

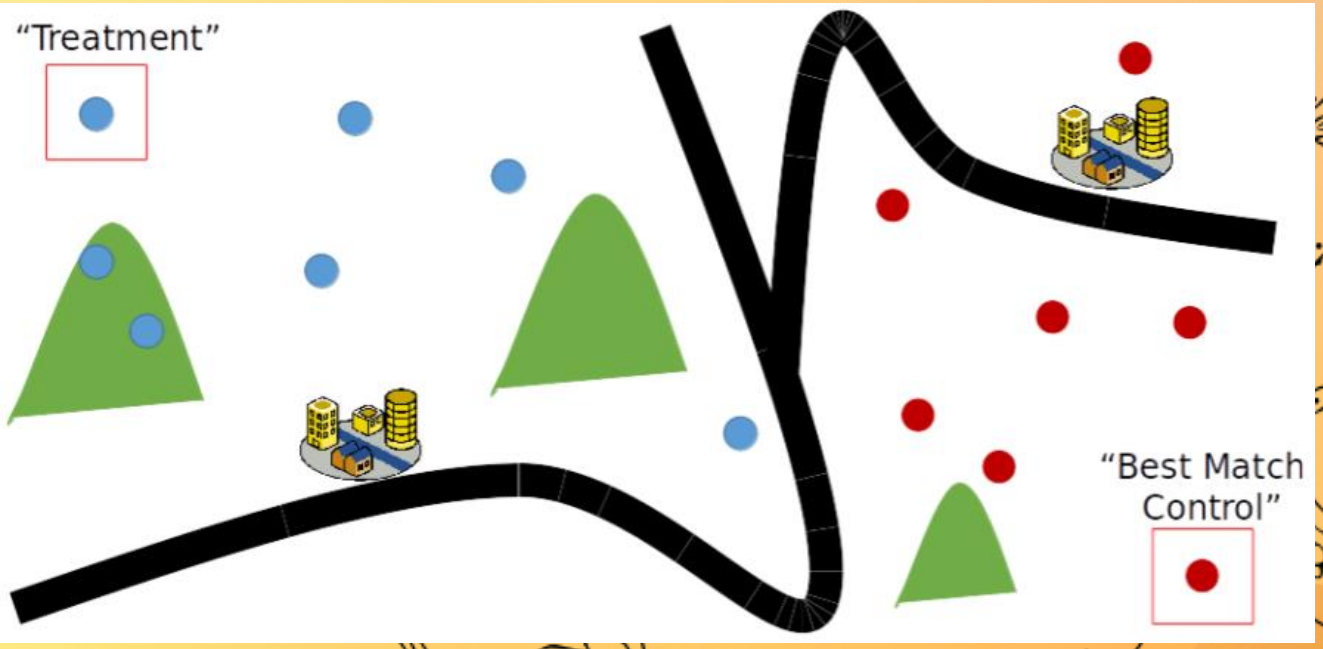
UNCCD


“Treatment”
“Best Match Control”



Location of GEF Land Degradation Projects Known with a High Degree of Geographic Precision




“Treatment”
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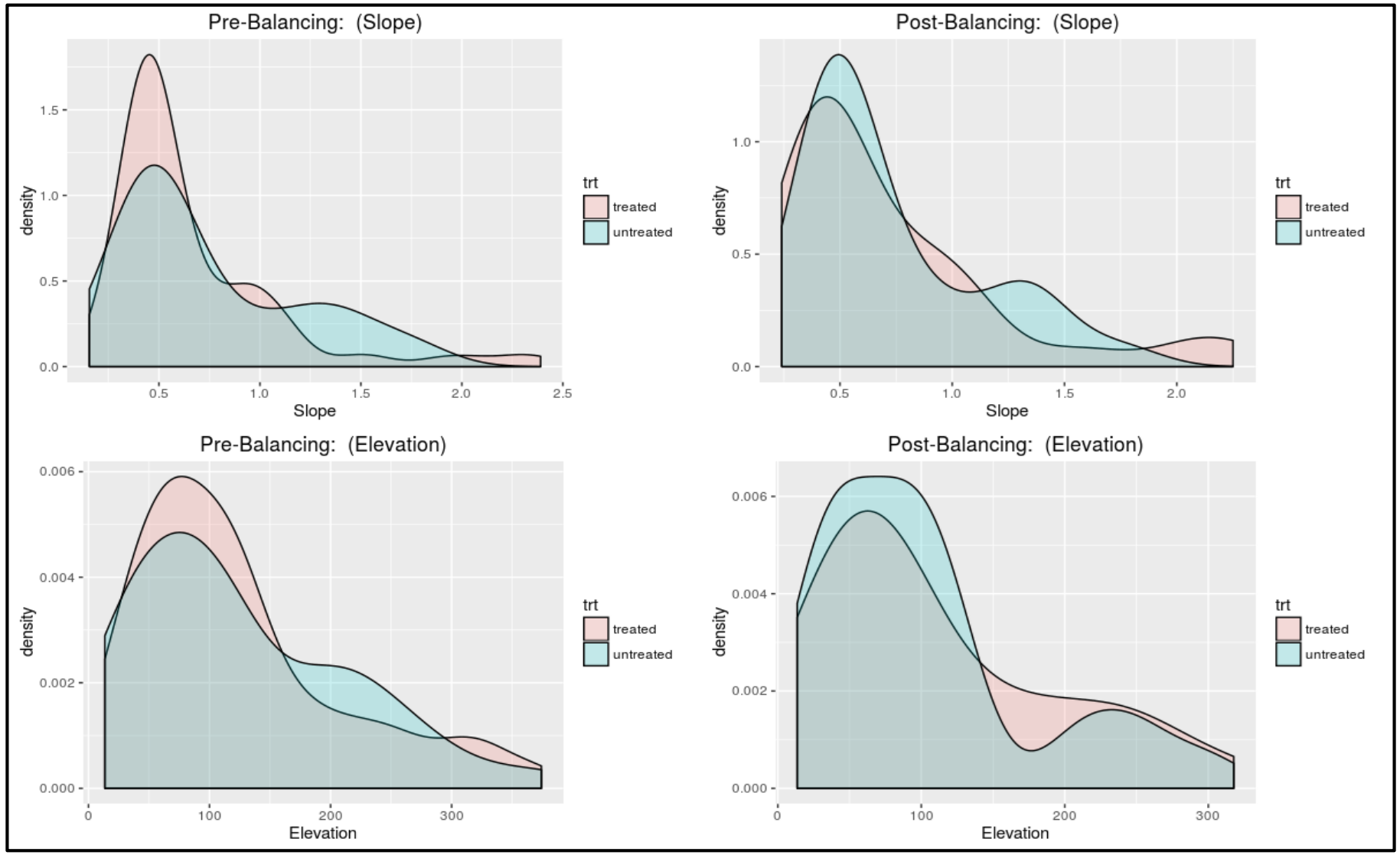
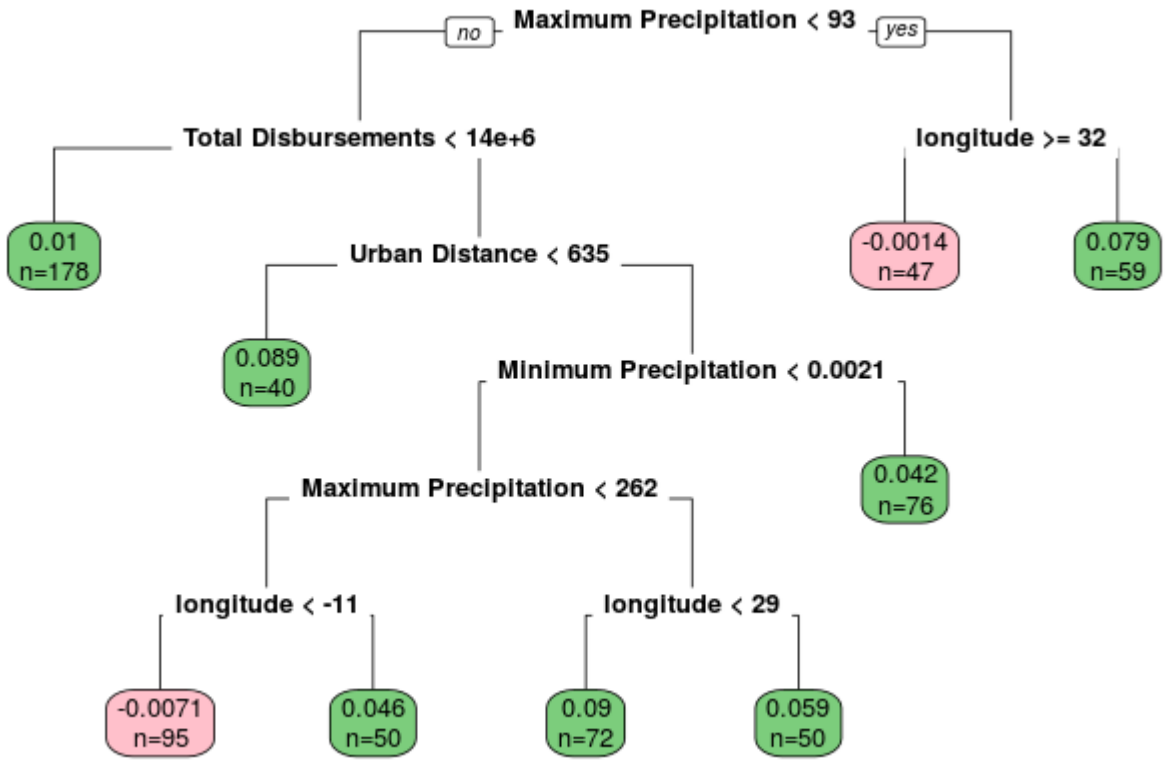
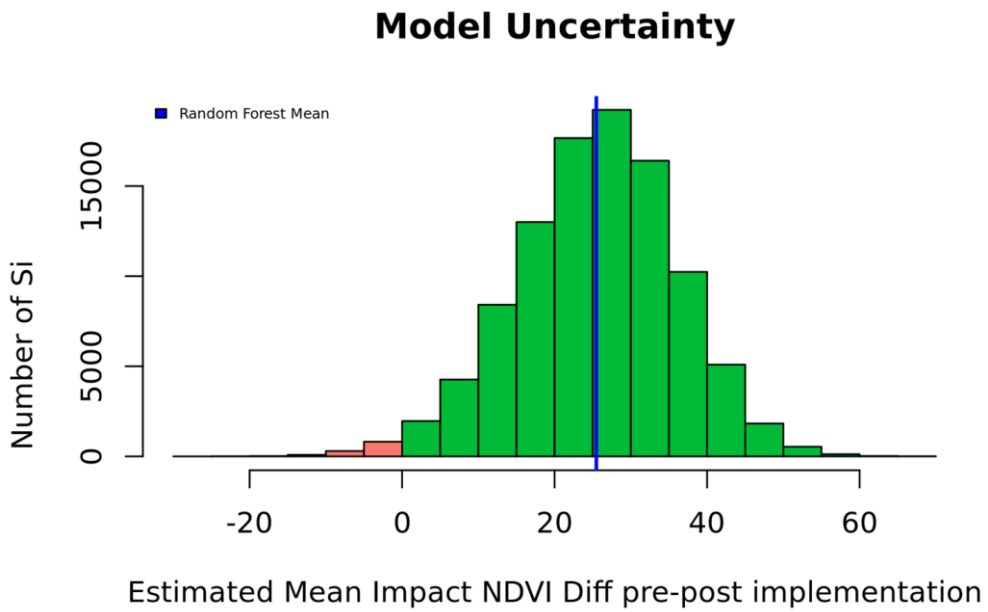
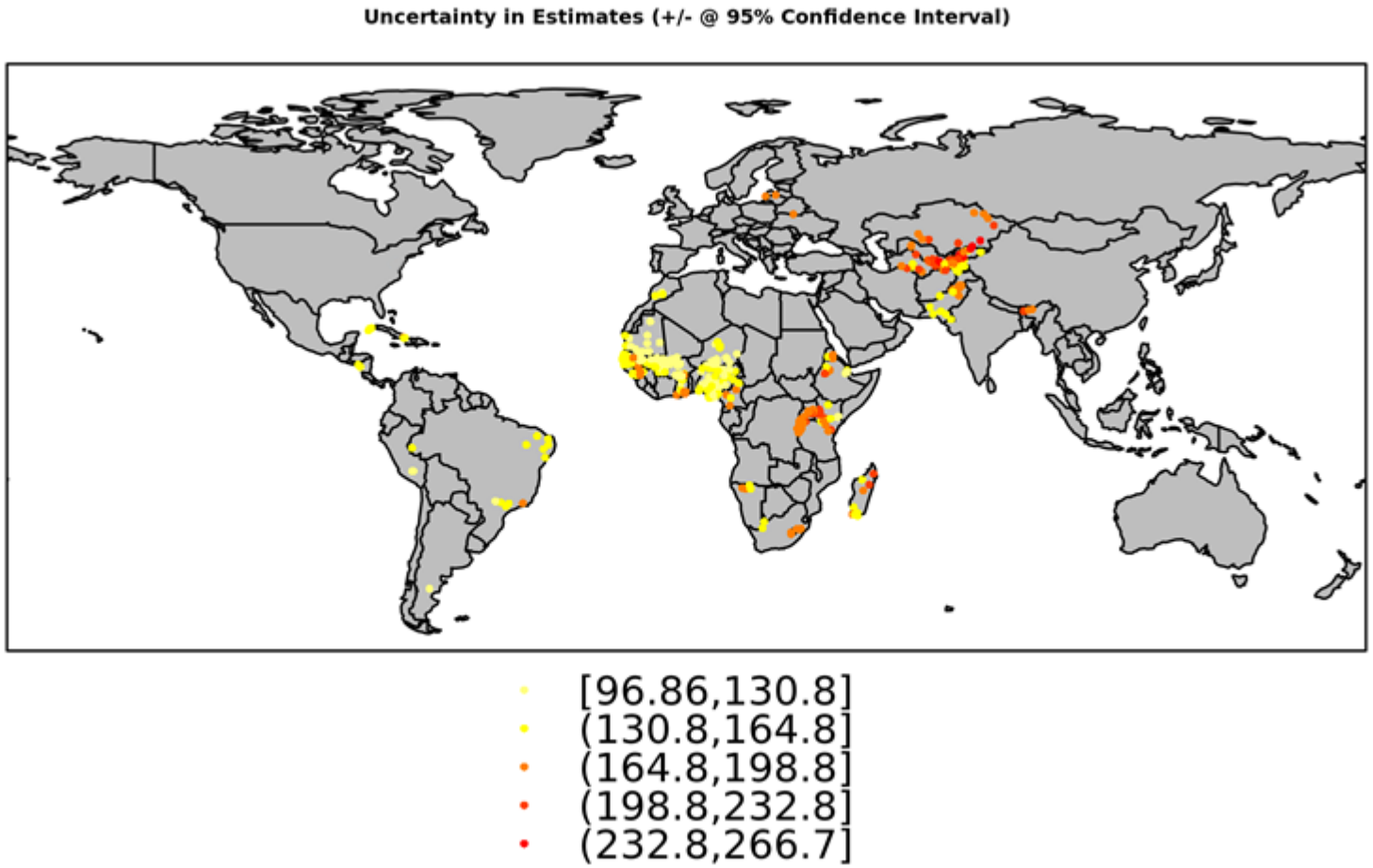

Pre-Balancing: (Slope)
density
Slope
trt
treated
untreated
Post-Balancing: (Slope)
density
Slope
trt
treated
untreated
Pre-Balancing: (Elevation)
density
Elevation
trt
treated
untreated
Post-Balancing: (Elevation)
density
Elevation
trt
treated
untreated



Machine learning, causal tree method for assessing factors influencing outcomes and influencing outcomes and impact.

Model simulation done numerous times to account for model Uncertainty



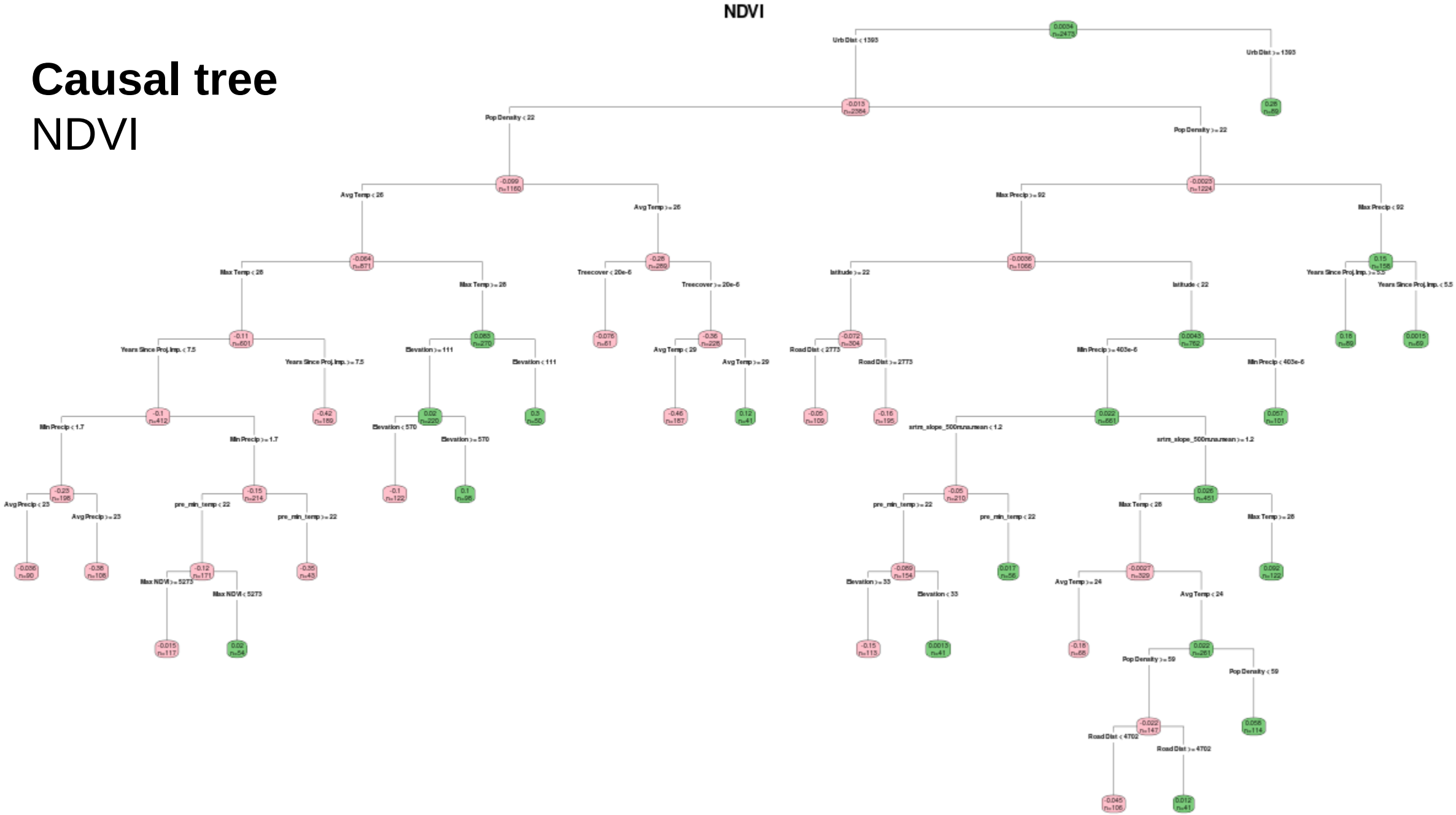


Matched Model: SFA Land (Treated), Null Case Comparisons (Control)

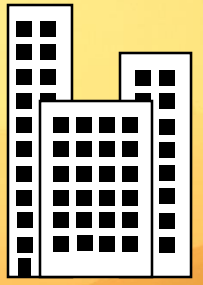
	Dependent variable:
	NDVI Diff pre-post implementation
treatment	0.08*** (0.03, 0.14)
Dist. to Rivers (m)	-0.04 (-0.14, 0.07)
Dist. to Roads (m)	0.06* (-0.01, 0.12)
Elevation (m)	-0.18*** (-0.31, -0.06)
Slope (degrees)	-0.11** (-0.21, -0.02)
Urb. Dist. (rel)	-0.01 (-0.08, 0.07)
Pop. Density (2000)	0.06 (-0.04, 0.17)
Protected Area %	0.09*** (0.03, 0.14)
Treecover (2000, %)	0.05 (-0.04, 0.13)
Latitude	-0.09* (-0.18, 0.003)
Longitude	-0.13*** (-0.22, -0.03)
Max Precip. (2002, mm)	-0.42*** (-0.58, -0.27)
Min Precip (2002, mm)	-0.08* (-0.17, 0.01)
Mean Precip (2002, mm)	0.27*** (0.08, 0.45)
Max Temp (2002, C)	0.004 (-0.33, 0.34)
Min Temp (2002, C)	-0.28 (-0.78, 0.22)
Mean Temp (2002, C)	-0.23 (-0.98, 0.52)
Nightime Lights (2002, Relative)	-0.02 (-0.10, 0.06)
NDVI (2002, Unitless)	0.01 (-0.07, 0.10)
Urb. Dist. (rel) *Treatment	-0.004 (-0.08, 0.07)
Dist. to Rivers (m) *Treatment	-0.04 (-0.14, 0.07)
Dist. to Roads (m) *Treatment	-0.03 (-0.10, 0.04)
Pop. Density (2000) *Treatment	-0.06 (-0.17, 0.04)
Latitude *Treatment	0.03 (-0.06, 0.12)
Longitude *Treatment	0.08 (-0.02, 0.17)
NDVI (2002, Unitless) *Treatment	0.07* (-0.01, 0.15)
Elevation (m) *Treatment	0.25*** (0.12, 0.37)
Slope (degrees) *Treatment	-0.12** (-0.22, -0.02)
Treecover (2000, %) *Treatment	-0.03 (-0.11, 0.06)
Max Temp (2002, C) *Treatment	0.57*** (0.24, 0.90)
Mean Temp (2002, C) *Treatment	-1.05*** (-1.80, -0.31)
Min Temp (2002, C) *Treatment	0.80*** (0.30, 1.30)
Max Precip. (2002, mm) *Treatment	-0.06 (-0.21, 0.10)
Mean Precip (2002, mm) *Treatment	0.06 (-0.12, 0.25)
Min Precip (2002, mm) *Treatment	-0.12*** (-0.20, -0.03)
Nightime Lights (2002, Relative) *Treatment	0.01 (-0.06, 0.09)
Protected Area % *Treatment	-0.02 (-0.07, 0.04)
Constant	-0.01 (-0.06, 0.05)
Observations	966
R^2	0.30
Adjusted R^2	0.27
Note:	*p<0.1; **p<0.05; ***p<0.01

Causal tree

NDVI



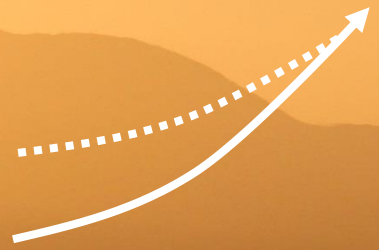
Findings: NDVI



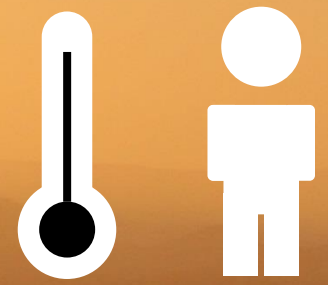
Less effective near urban areas

Time required

Multifocal

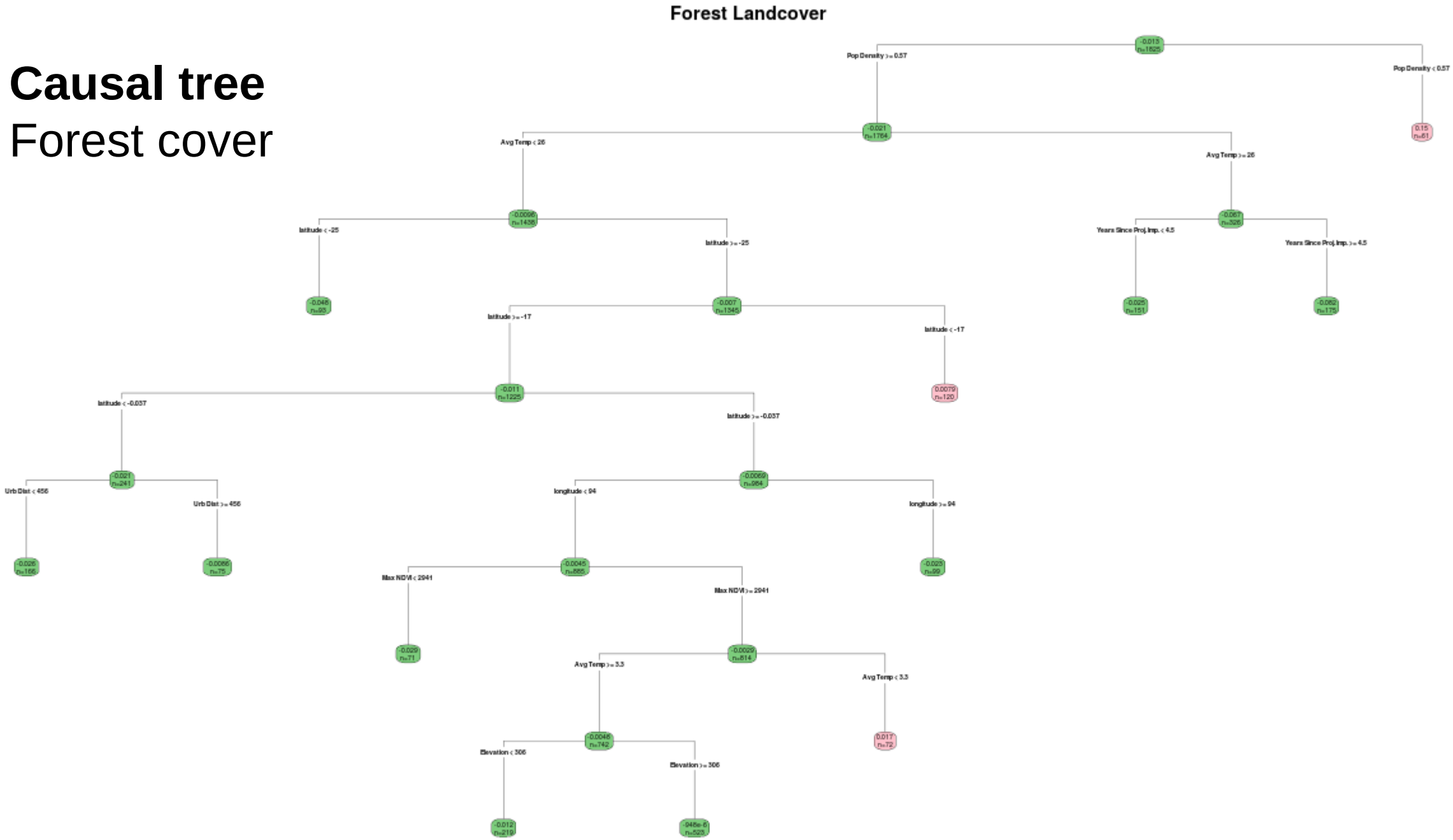


Initial conditions



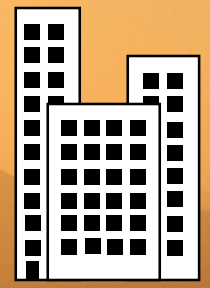
Environmental and social characteristics

Causal tree
Forest cover



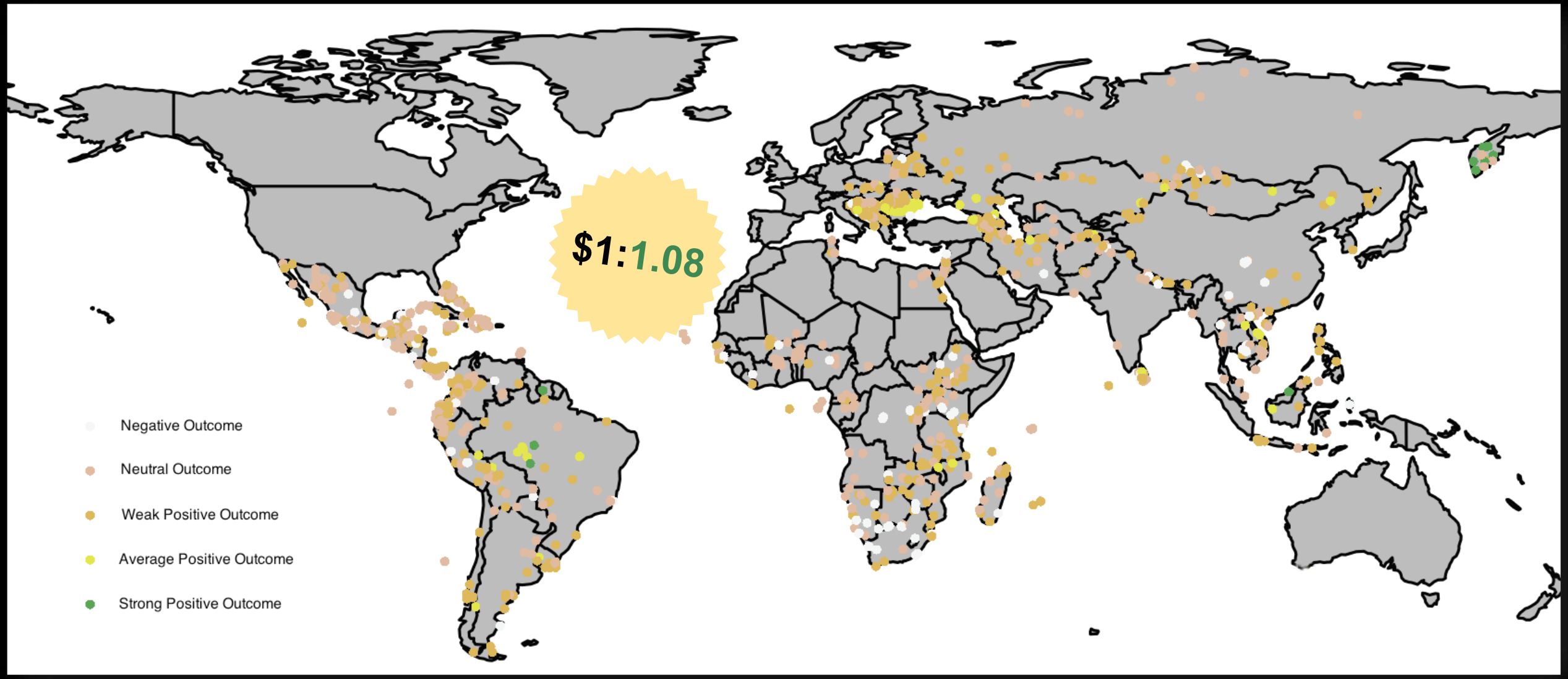
4.5 years after

Population density



More effective near urban areas

Findings: Forest cover



GEF land degradation project valuations

43.52

tons of carbon sequestered per hectare

108,800

tons of carbon sequestered per project location

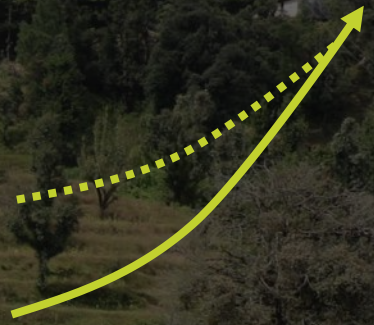
$7,500,000

contributed by sequestration alone

Findings

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

Findings

International Waters

296
projects

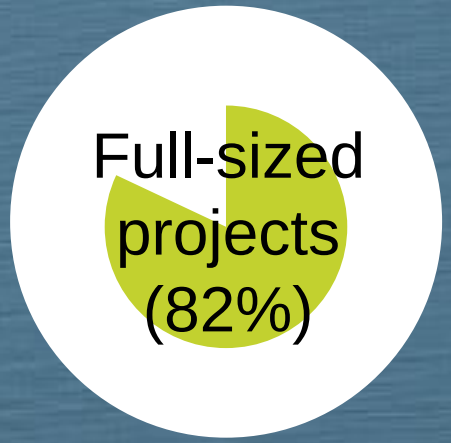
$1.68 billion
In grant funding

$10.38 billion
via co-financing

Portfolio

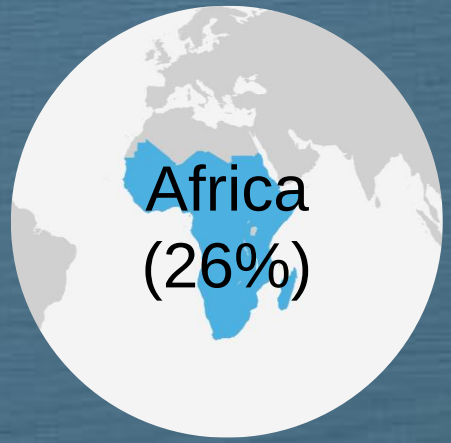
THE MOST COMMON…

Project modality



Agency

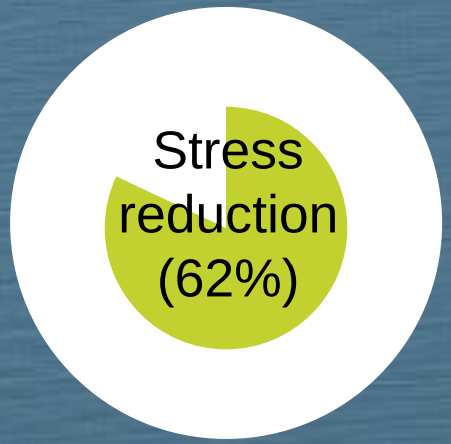
Region



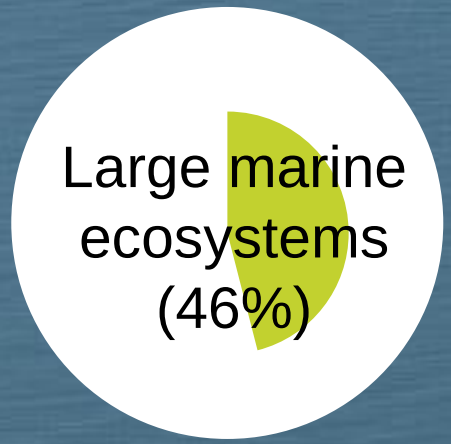
Findings

THE MOST COMMON…

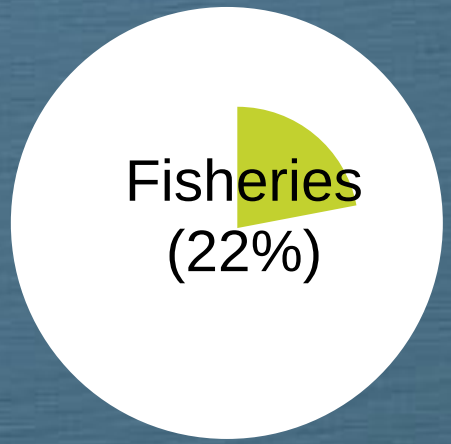
Goal



Water body



Theme



Portfolio

Contributions

Rehabilitation of the Black Sea Northwest Shelf dead zone

Support the process leading to the Stockholm and Minamata Conventions

Adoption of the Ballast Water Convention on Alien Species, the Pacific Tuna Treaty, the Guarani Aquifer Agreement

Establishment of the Benguela Current Commission

The Most Comprehensive GEF Web Toolkit Available

News

Read the latest news from International Waters Projects

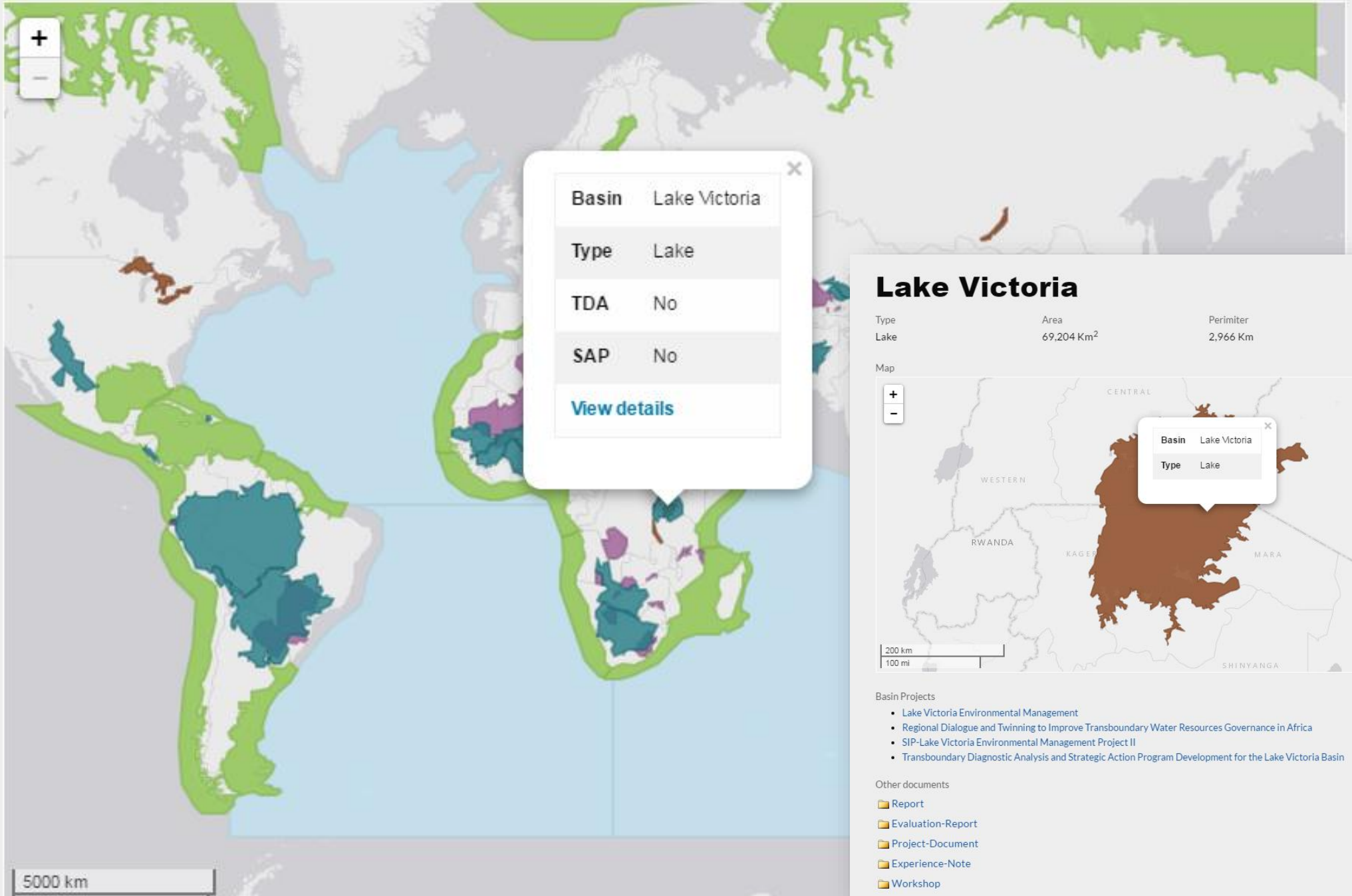
Map

Browse and search our catalogue of projects via the waterbodies map

Resources

Explore IW:LEARN's resources including Documents, Images and Videos

http://iwlearn.net/iw-projects



BASEMAPS

- (•) Grayscale
- ( ) Aerial Imagery

IW LAYERS

- [x] LMEs

Lake Victoria

Type	Area	Perimiter
Lake	69,204 Km^2	2,966 Km

Map

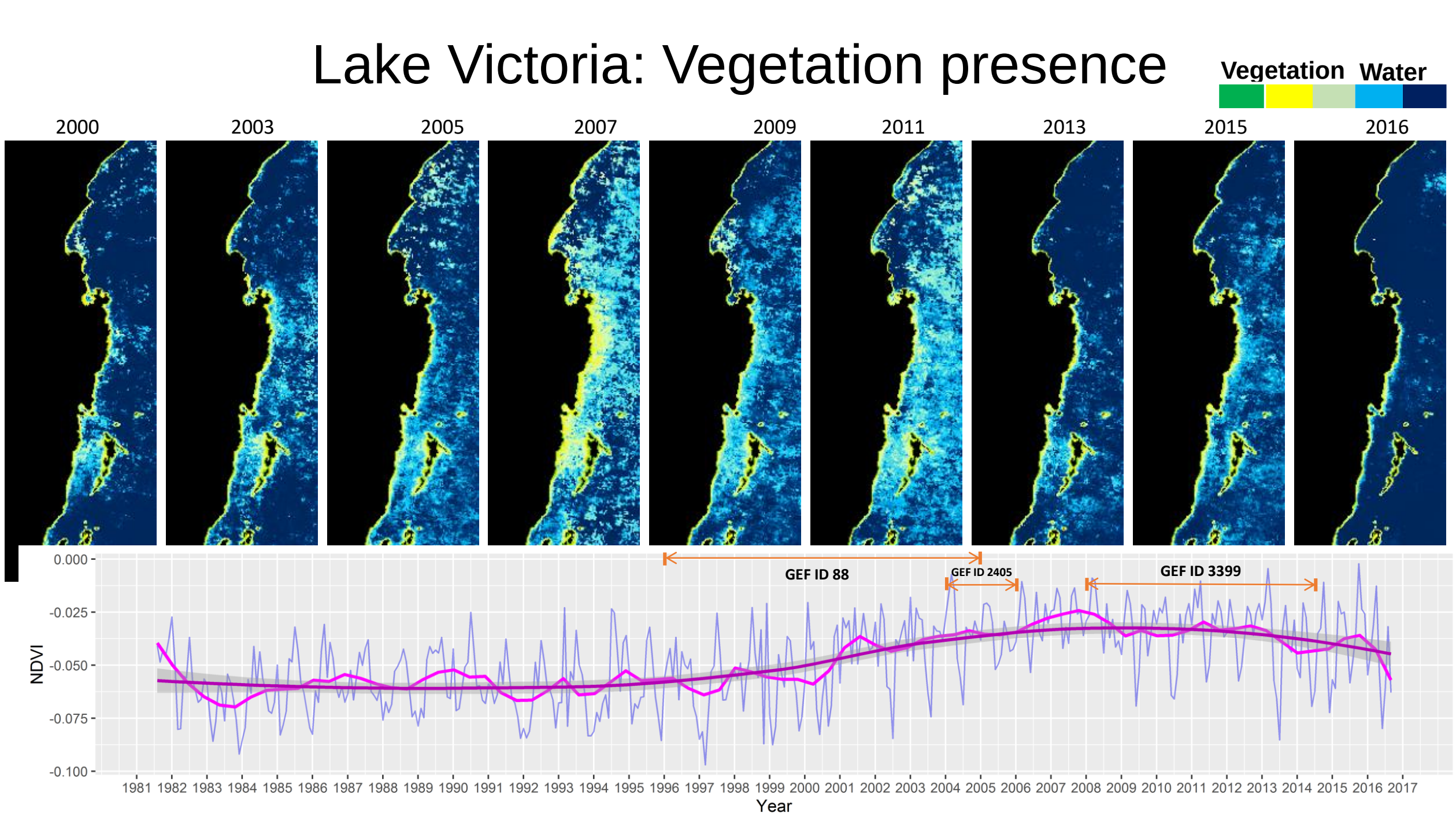
Basin Projects

- Lake Victoria Environmental Management
- Regional Dialogue and Twinning to Improve Transboundary Water Resources Governance in Africa
- SIP-Lake Victoria Environmental Management Project II
- Transboundary Diagnostic Analysis and Strategic Action Program Development for the Lake Victoria Basin

Other documents

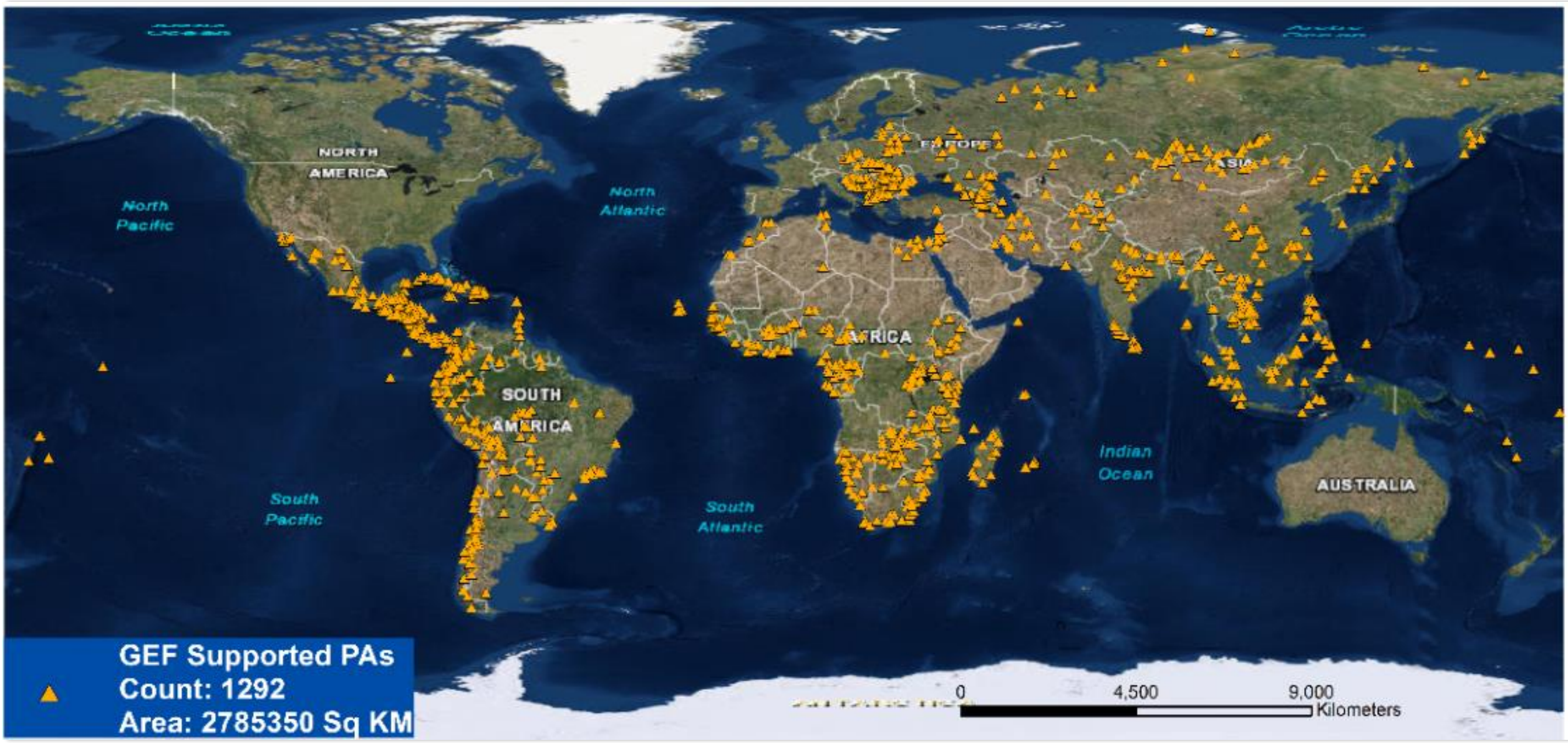
- Report
- Evaluation-Report
- Project-Document
- Experience-Note
- Workshop

Lake Victoria: Vegetation presence



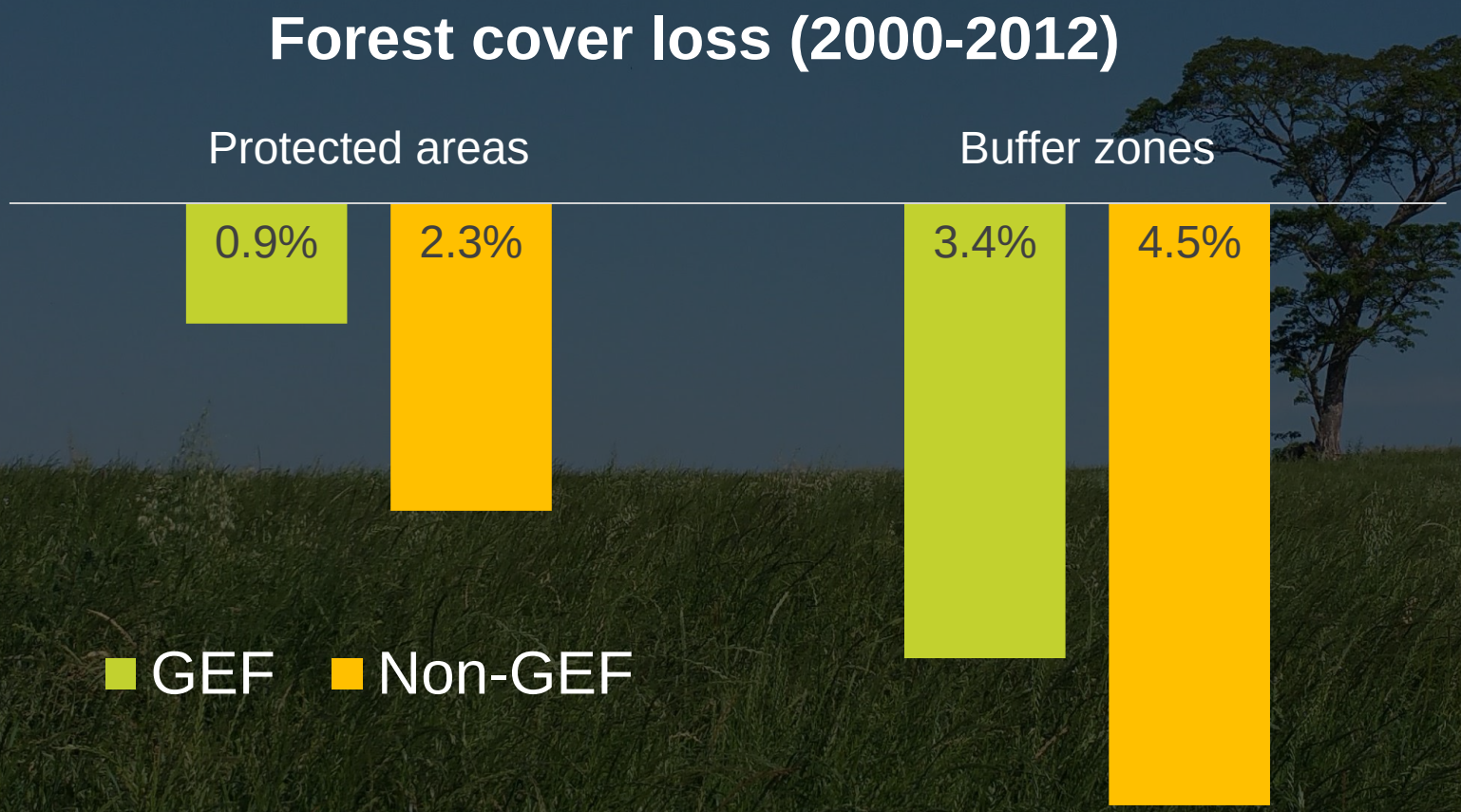

Biodiversity

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



DEMONSTRATING IMPACT

Global Protected Area



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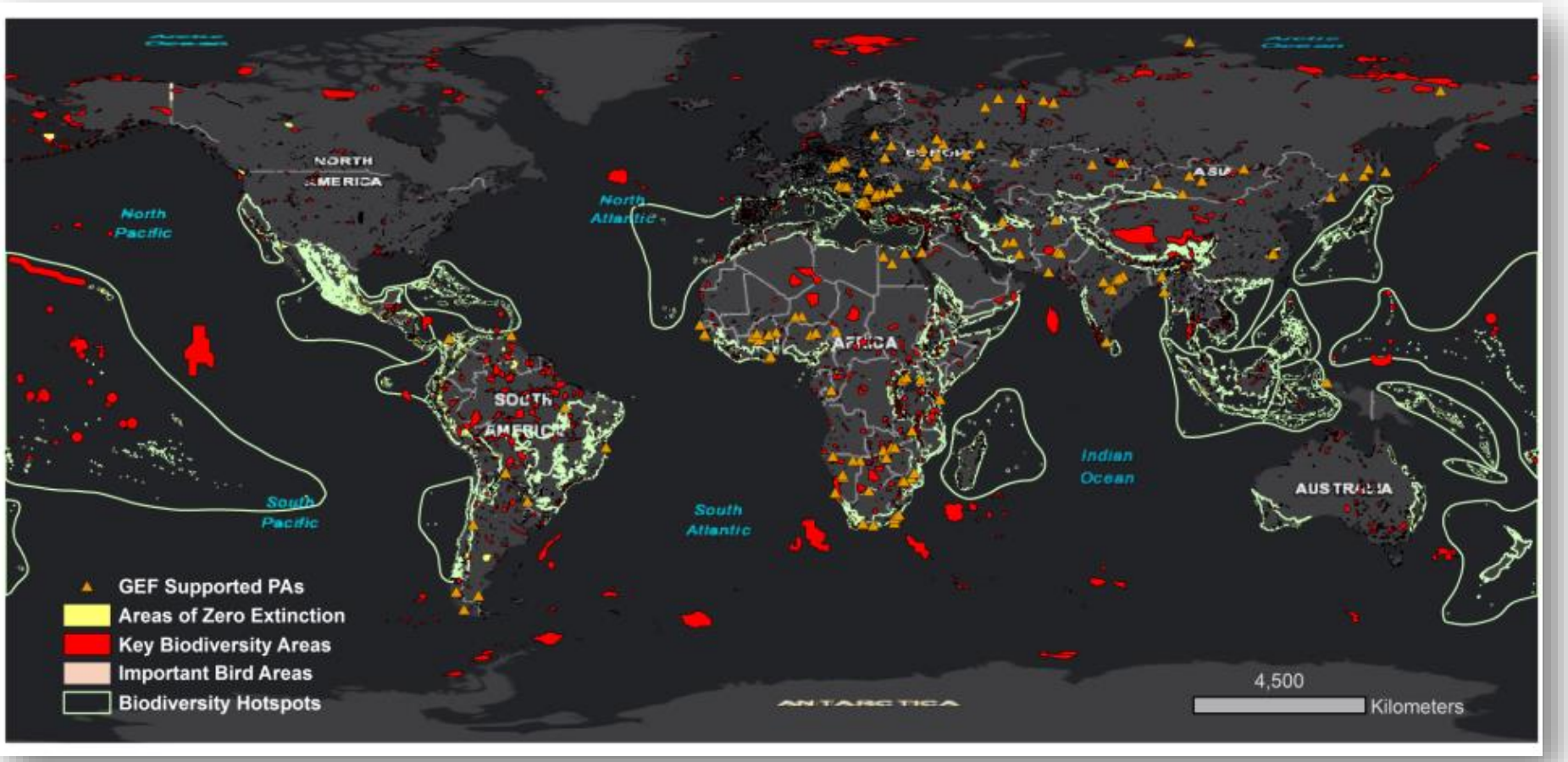
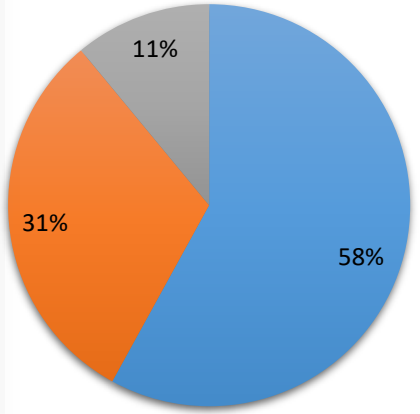
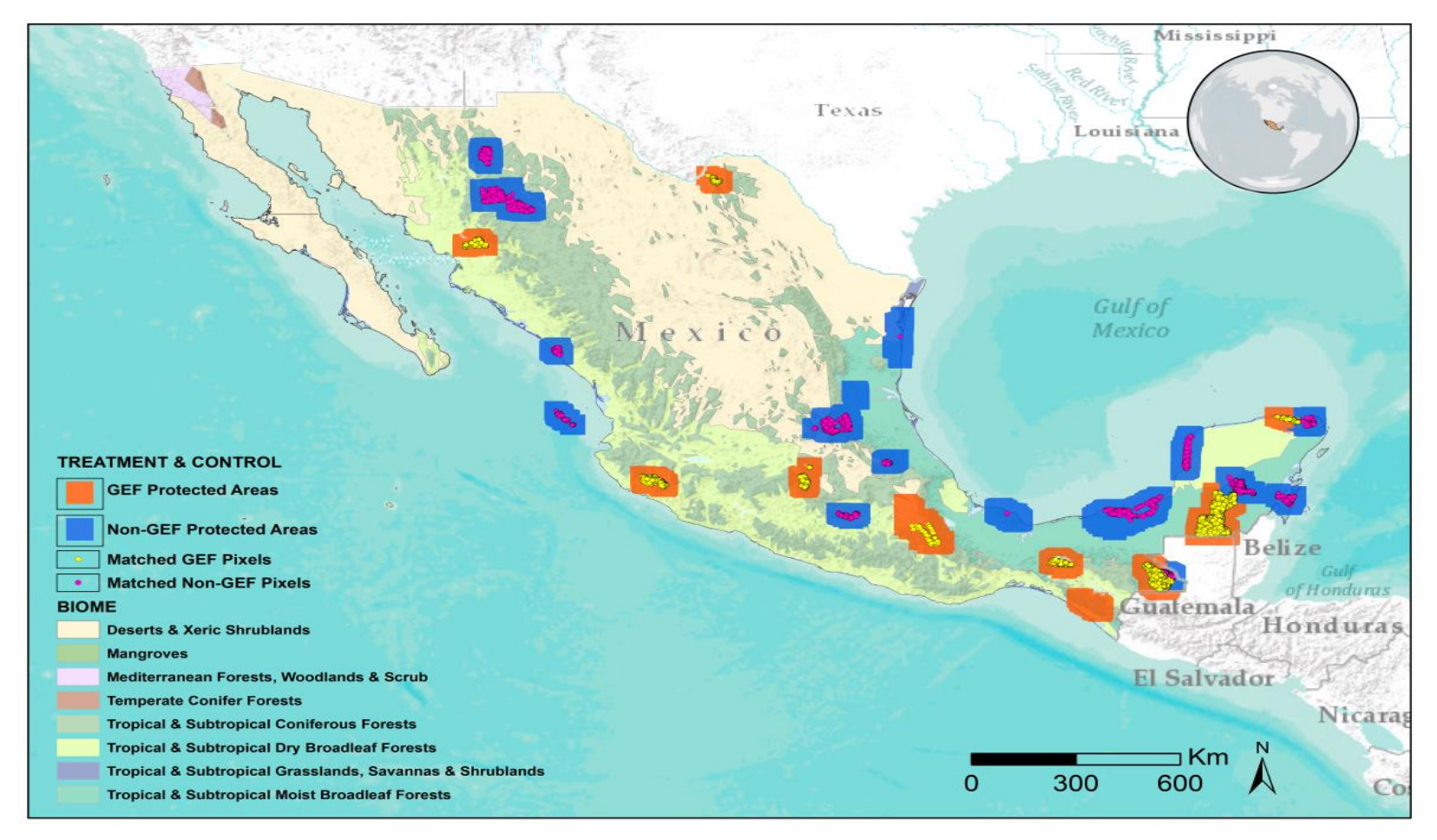
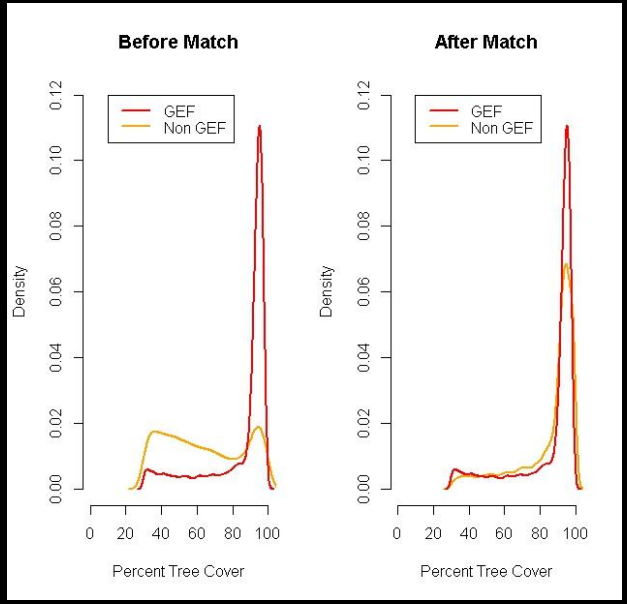


KEY BIODIVERSITY AREAS, highest scientific designation of global biodiversity significance



KBA International Designation National Importance



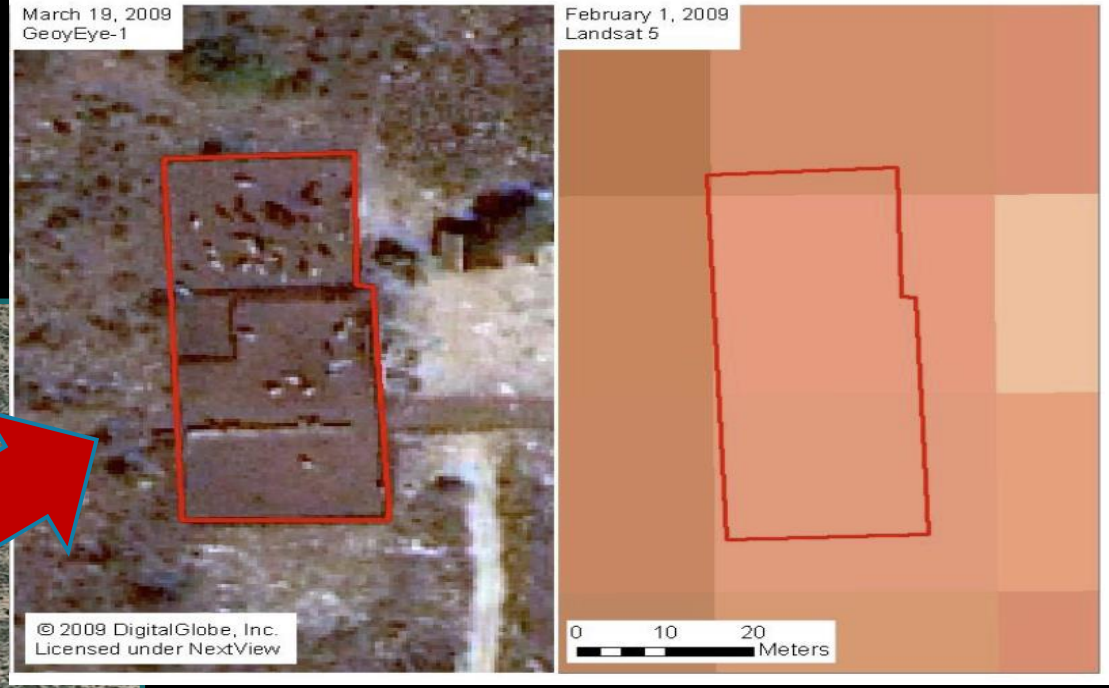


GEF-supported PAs have 23% less forest loss

Did the intervention cause the change?

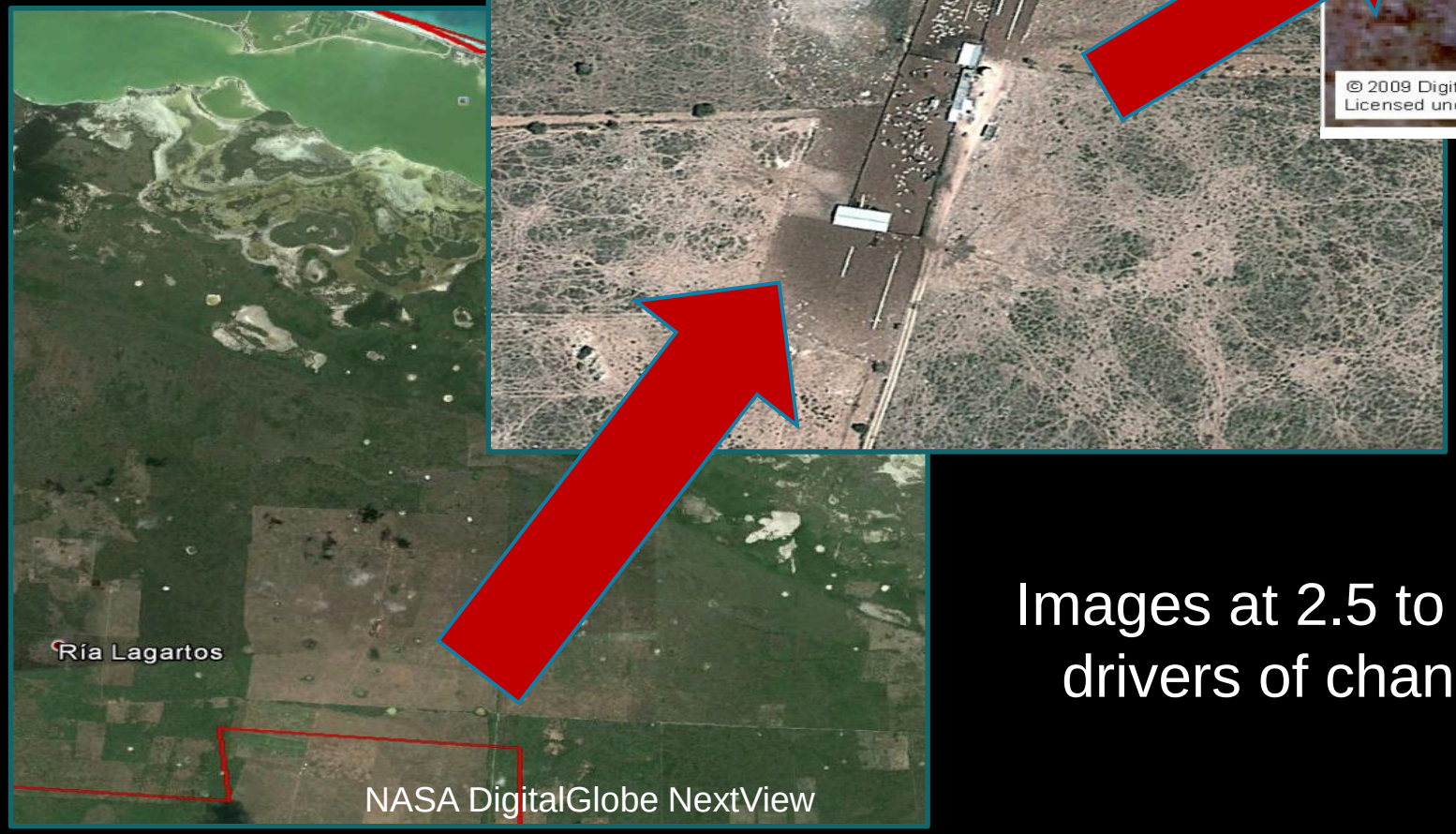
Quasi-experimental evaluation design based on Propensity score matching

Identify the drivers



2.5 m

30 m zoomed in to 2.5 m



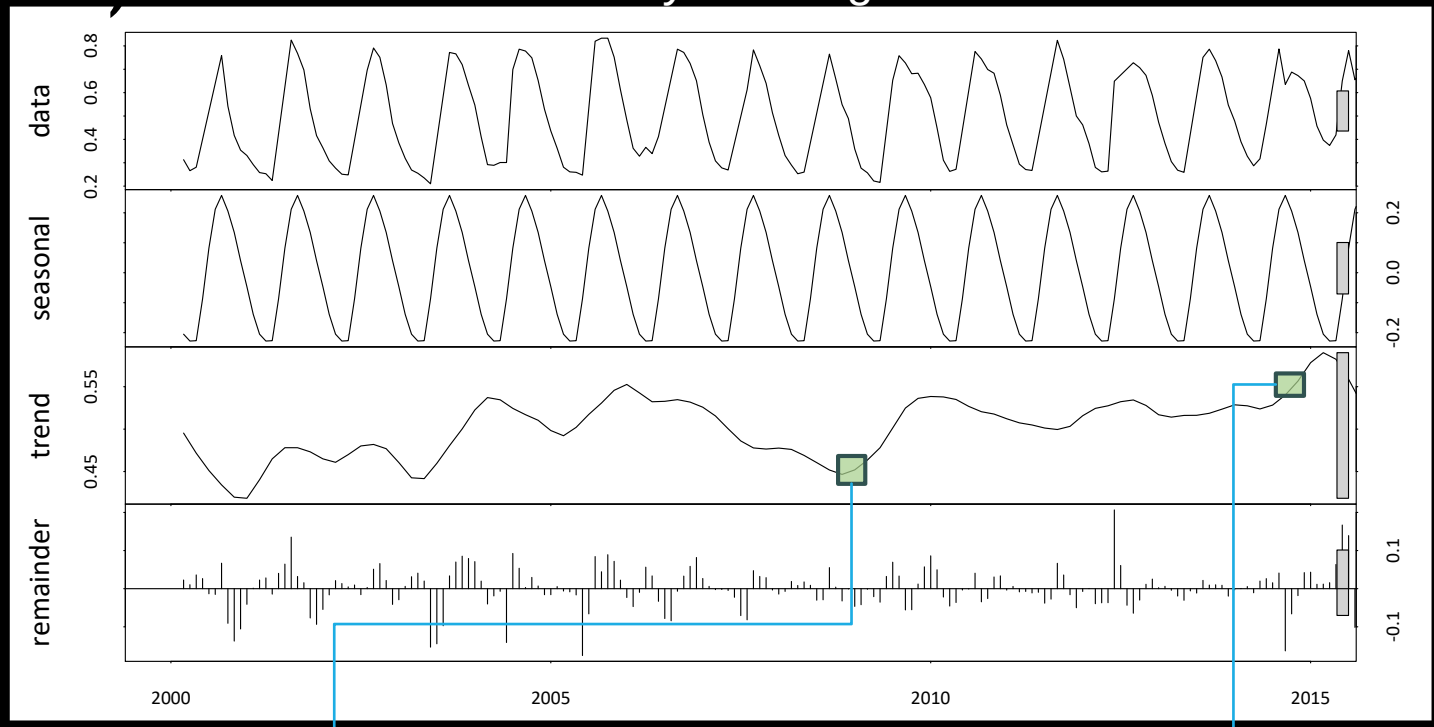
Images at 2.5 to 0.5 m resolution used to identify drivers of change that hinder success of GEF support

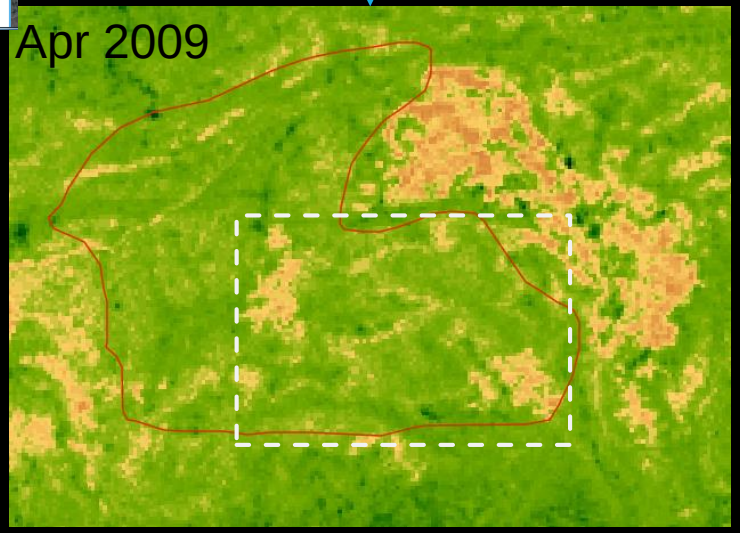
Triangulating Across Methods

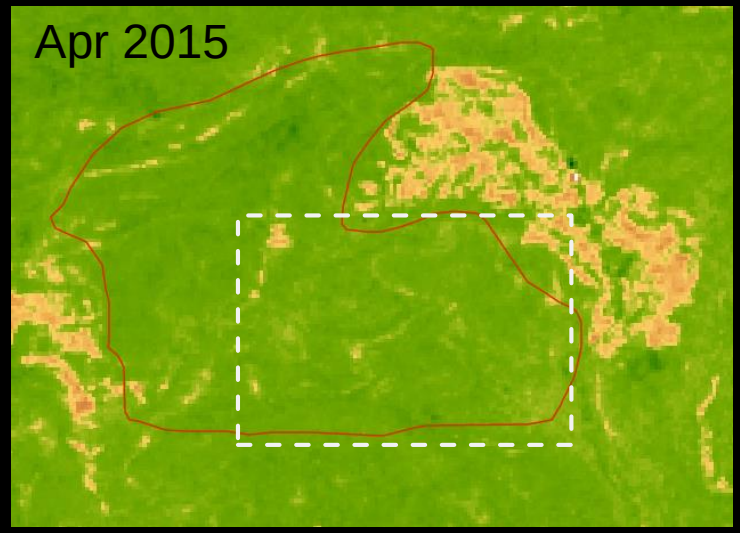
Beneficiary survey

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_

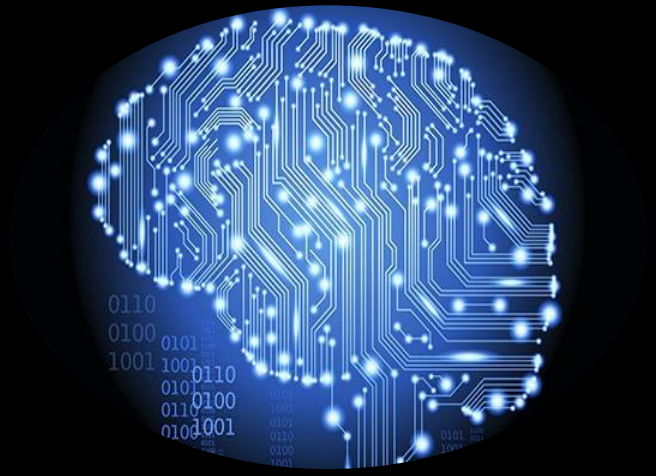
Time series analysis using Satellite data



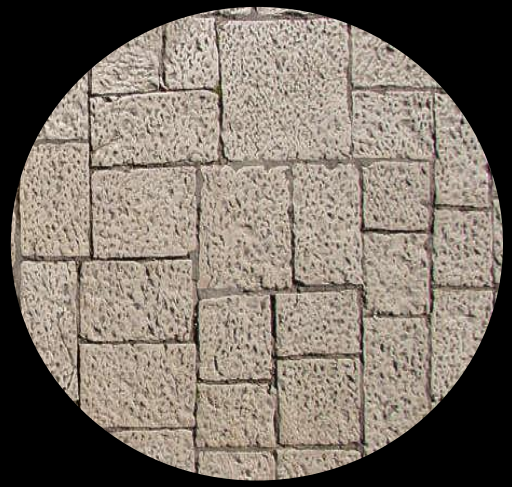




Challenges and Limitations



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

Solutions and Lessons

Partner

with global institutions

Use mixed approaches and methods

Continue exploring

new technology

Approach geospatial science as dynamic learning process

Thank you

aanand2@thegef.org

GEF-UNDP SLEM, India