Usage of Earth observation for DRR, CCA and SDGs in German international cooperation

Antje Hecheltjen, Markus Steinich, Timm Walker, Sebastian Wigele, Stéphane Henriod, Olaf Neußner, Anja Hoffmann, Tobias Landmann, Alexander Erlewein, Matthias Hack, Stephan Krall

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
GIZ, Friedrich-Ebert-Allee, Bonn, Germany

United Nations/Germany international conference on “International Cooperation Towards Low-Emission and Resilient Societies”
Working Group 3.2 “Requirements Agenda2030 and development cooperation”

Earth Observation at GIZ is embedded into global and national agendas

Source: BMZ 2017

- **Project level:** Survey on the use of EO in GIZ projects

- **Global level:** Environmental and development agendas focussing increasingly on availability of and access to data.
- **National level:** Digital agenda of German government including big and open data for development.
- **Institutional strategic level:** GIZ and DLR executive boards working for closer cooperation.
- **Institutional operational level:** Recently founded Forum on Earth Observation at GIZ.

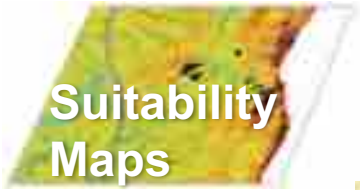
Space-based information for Agenda 2030

Space-based information for:

- Monitoring and Reporting
- Planning and Implementation

1 2 3 4 5 6 7 8 9 10

Earth Observation in German international cooperation



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4

GI:DRM

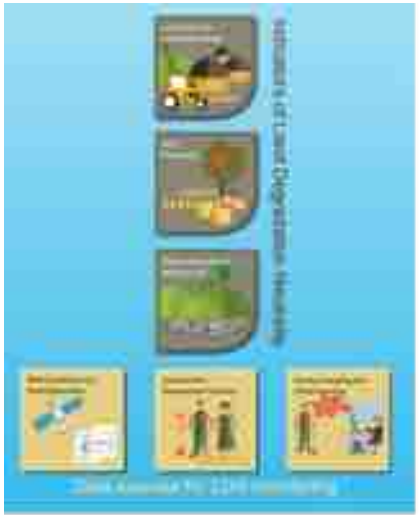
NSDI

Source: GEO 2017
(https://www.earthobservations.org/documents/publications/201703_geo_eo_for_2030_agenda.pdf)

- 2nd phase of GIDRM: 02/2018-01/2021 (pending approval by BMZ)
- Disaster Risk Management as Cross-Sectional Task
- Objective: National planning, implementation and reporting of DRM is coherent with Sendai framework, Paris agreement, Agenda 2030, Habitat III, and other international agreements

GIZ integrated approach towards „Land degradation neutrality“ (LDN – SDG 15.3)

LDN Monitoring and Reporting



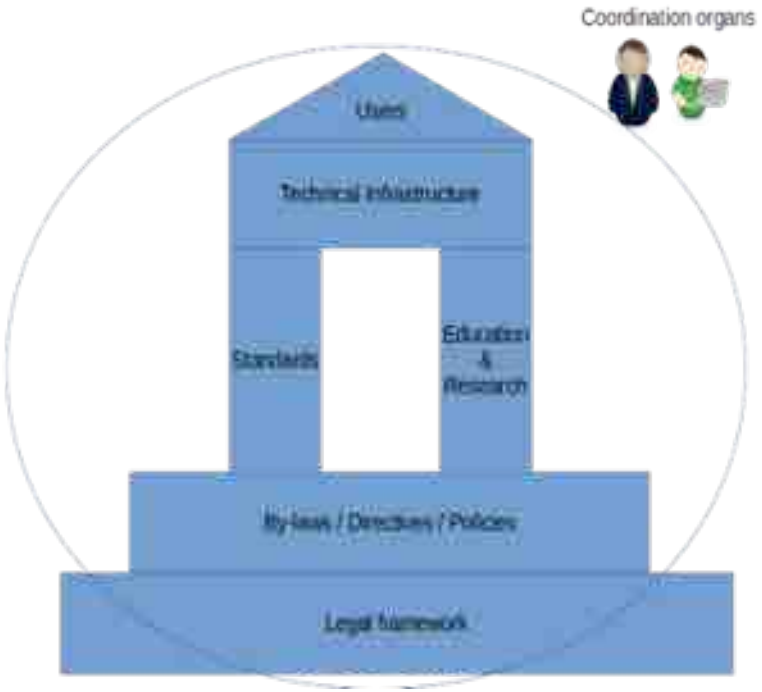
Source: UNCCD 2017

LDN Planning and Implementation

National Spatial Data Infrastructure (NSDI)

„What gets measured, gets done.“

- Problem: SDGs are not monitored because geodata are lacking. Use of existing geodata is hindered by lack of coordination and cooperation.
- GIZ approach in Kyrgyztan: Support the development of a national spatial data infrastructure.
- Benefits: transparency, accountability, timeliness, empowerment, overcome gaps



Source: GIZ 2017

Points for discussion

- Agenda 2030 needs integrated approaches.
- Institutions (governments, the UN, development agencies…) are organized sectorally. Incentives to work on cross-sectoral approaches are low.
- How to tear down the silos and work together on integrated approaches to create synergies and reach the global targets? How to link the agendas?
  - National Spatial Data Infrastructures as a vehicle for inter-ministerial cooperation.
  - Overlapping target systems (NDCs, Aichi targets, AFR100, LDN, SDGs, SFDRR): Integrated land use planning as common denominator.
- Earth observation is not an aim in itself. Identify relevant existing processes and gaps to dock on.
  - EO not limited to monitoring and reporting. Support processes to use EO for planning and implementation.

Thank you very much for your attention!

Any questions?

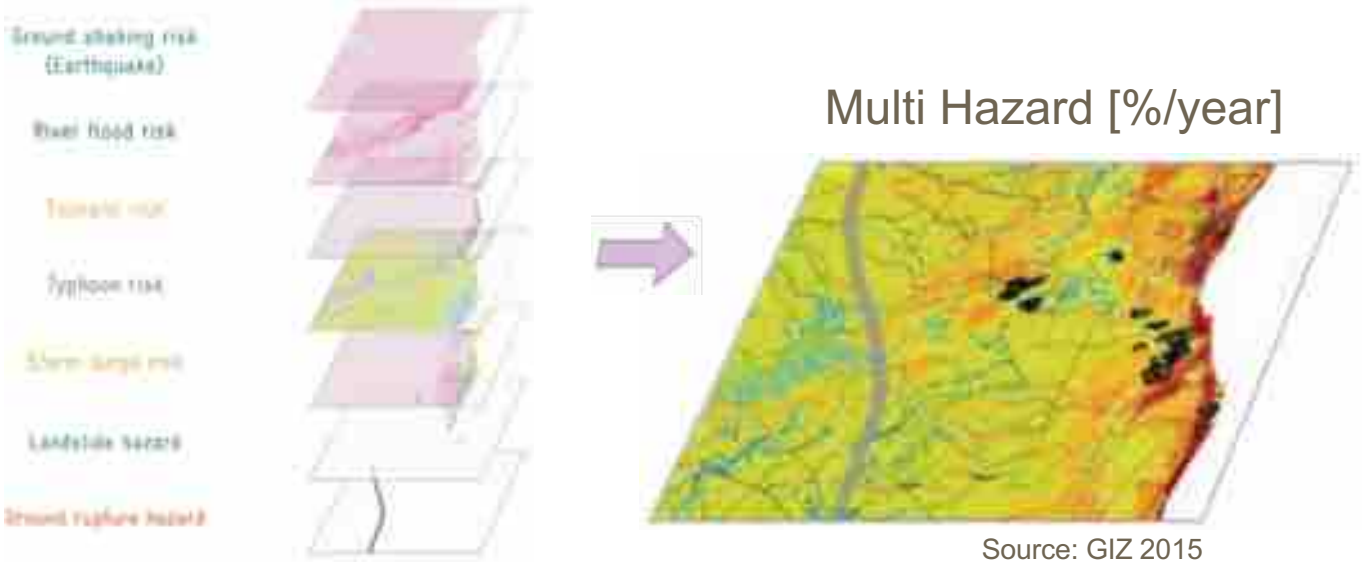
Antje Hecheltjen
Sector Project
Soil Protection, Desertification,
Sustainable Land Management

Tel.: +49 228-44 60 3817
Antje.hecheltjen@giz.de

Additional slides:

Examples from German international cooperation

Suitability Map Method: Integrating DRM and CCA



Source: GIZ 2015

GIDRM supports its partners in their adaptation efforts by integrating DRM and climate change adaptation. By improving the interfaces between users and providers of climate information and the use of new information collection methods, such as in the context of the collaboration with DLR and GFZ or the suitability map method, the competences required for adaptation processes are strengthened.

Contact: Stephan Huppertz, Timm Walker, giz Vietnam

Flood Proofing in Vietnam, Mekong Delta

Example: City center of Long Xuyen, An Gian Province, Vietnam

Elevation from WorldDEM (ca. 2012)
Height in meters above sea level.

Elevation from WorldDEM minus ground subsidence for 2040

- Digital Surface Model (DSM)-data of WorldDEM (Tandem-X) → Generation of Digital Terrain model (DTM) for flood modelling
- ALOS-Palsar interferograms to quantify ground subsidence → prediction of estimated elevation
- Use: Estimation of future flood hazard and flood events

Contact: Olaf Neußner, giz Vietnam

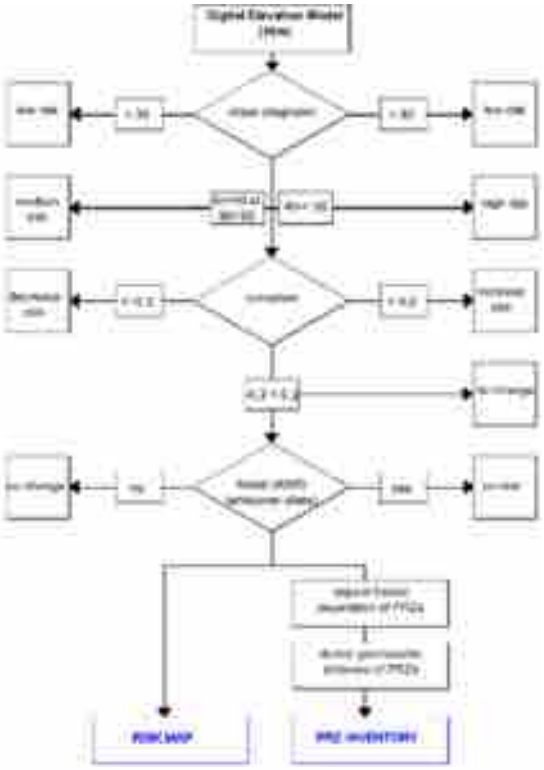
Disaster Risk Mapping in Badakhshan, Afghanistan

Hazards:

Avalanches

Landslides

Floods



Avalanch risk map

Source: GIZ 2011

Contact: Sebastian Wigele, GIZ

UAV mission in Tajikistan in Support of Disaster Risk Reduction

https://vimeo.com/180872071
https://drones.fsd.ch/en/uav-mission-in-tajikistan-in-support-of-disaster-risk-reduction/

- Mapping of two villages in the Pamir Mountains and their watersheds of about 23km^2
- resolutions of 15 and 10cm each
- using professional mapping UAVs
- Use: to inform future and current remediation activities, disaster risk reduction training and risk maps in the communities.

Contact: Stéphane Henriod, giz Tadjikistan

Prevention, Control and Monitoring of Fires in the Brazilian Cerrado

Brazilian-German Cooperation Project

Por ordem do

Ministério Federal do Meio Ambiente, Proteção da Natureza, Construção e Segurança Nuclear

da República Federal da Alemanha

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Ruraltins

NATURATINS

INSTITUTO NATUREZA DO TOCANTINS

Secretaria do Meio Ambiente e Recursos Hídricos

TOCANTINS

CAIXA

ICMBio

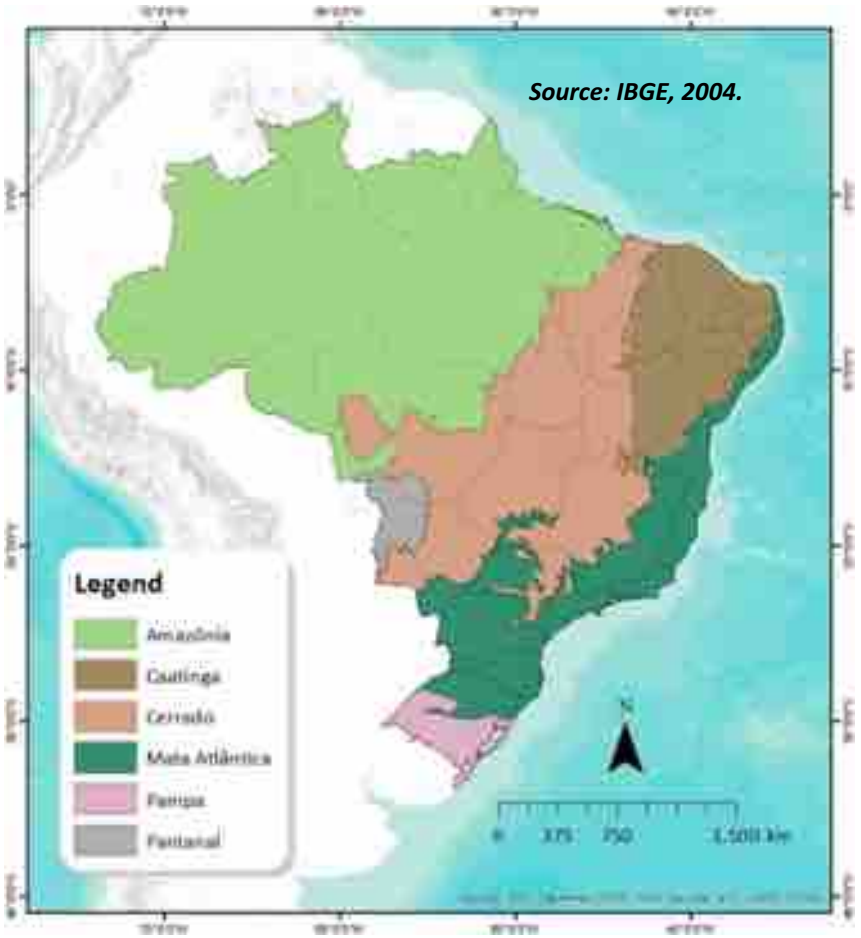
MINISTÉRIO DA CIÊNCIA, TECNOLOGIA, INOVAÇÕES E COMUNICAÇÕES

MINISTÉRIO DO MEIO AMBIENTE

BRASIL

Contact: Anja Hoffmann, giz Brazil

The Brazilian Cerrado



- Cerrado covers ~ 24 % of Brazil (2,036,448 km²) and hosts 5% of the world's biodiversity
- 12,000 native plant and animal species; 1,629 terrestrial and freshwater species classified by IUCN as globally threatened
- Source region of the three largest river basins in South America
- Great socio-economic importance to the local inhabitants, including many indigenous and traditional population groups
- Complex vegetation typified as a fire prone/-depending ecosystem considered as important natural carbon sink

Por ordem do
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The challenges in the Cerrado

- **Major threats to the Cerrado: unsustainable practices of…**
  - cattle-rearing,
  - industrial crop and mono-species wood plantation,
  - biofuel (sugar cane),
  - Charcoal production,
  - Mining,
  - Invasive species
  - Uncontrolled fire

Deforestation & degradation & GHG emissions

- **By 2013, Cerrado lost approximately 50% of its natural coverage** *(Source: TerraClass, MMA)*
- **3.266.725.086 t CO2 in the years 2000-2010** *(Source: FREL Cerrado 2017)*
- **Protected areas in the Cerrado: 8.4% (+ 5% of ILs), aim 17%** *(Source: Ecosystemprofile Cerrado)*



Fire in the Cerrado

- Fire has shaped and influenced the Cerrado savannah and its biodiversity for centuries
- Vegetation has adapted to fire to minimize the effect of burning
- Fire frequency and severity has intensified drastically due to human actions
- Zero-Burning Policy led to accumulation of large quantities of biomass
- Current fire regime is characterized by intense large-scale destructive late season wildfires
- Small scale agriculture burning in and around protected areas has led to conflicts
- Impact on biodiversity on species and landscape level and GHG emissions

The Project Cerrado

Prevention, Control and Monitoring of Fires in the Cerrado

Main goal: Contribute to (i) the preservation of the Cerrado as a globally significant carbon sink, (ii) the reduction of GHG emissions and (iii) the conservation of the biodiversity

- by promoting Integrated Fire Management in selected areas and improving fire and deforestation monitoring systems

Duration:

11.2011 – 03.2018 (TC/FC)

BMUB resources:

- Technical Cooperation (GIZ): 6.491.171,92 €
- Financial Cooperation (KfW): 6.000.000 €

Counterpart resources:

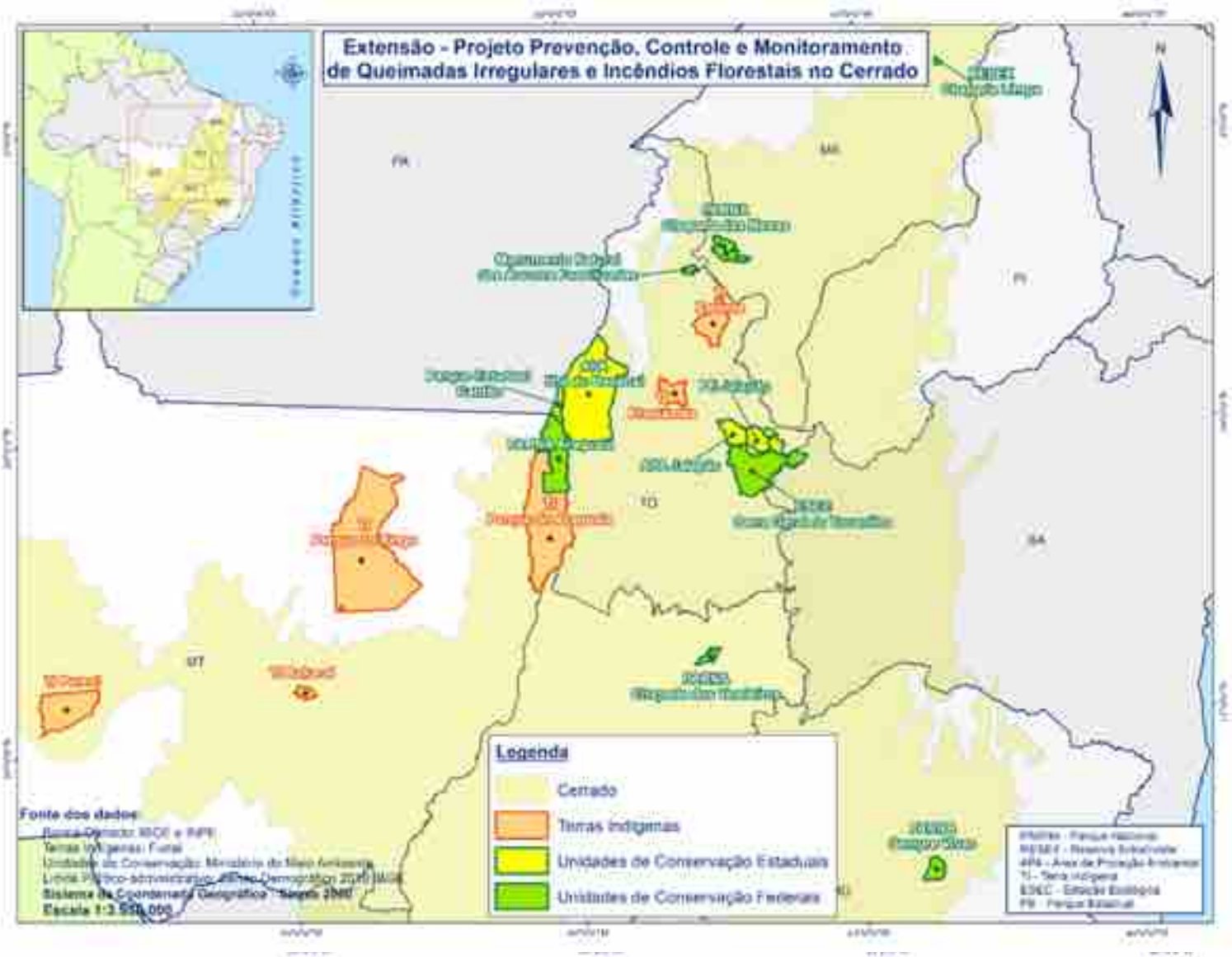
- 2.170.000 €




The Cerrado-Jalapão Project – Our Partners

- Brazilian Ministry of the Environment (MMA)
- Institute for the Preservation of Biodiversity Chico Mendes (ICMBio)
- Brazilian Institute for the Environment and Renewable Natural Resources (Ibama, Prevfogo)
- National Institute for Space Research (INPE)
- Secretariat for the Environment and Water Resources of Tocantins (SEMARH)
- Nature Institute of Tocantins (Naturatins)
- Institute for Rural Development of Tocantins

The Project Area



The Approach

- Open end early burning techniques (fuel load management)
- Environmental Education
- Alternatives to the use of fire
- Equipment and training

- Exchange, systematization and dissemination of experiences
- Project website, publications and newsletters
- Communication of key results

Biodiversity conservation and climate protection

1. Integrated Fire Management

2. Improved protected area management and knowledge building

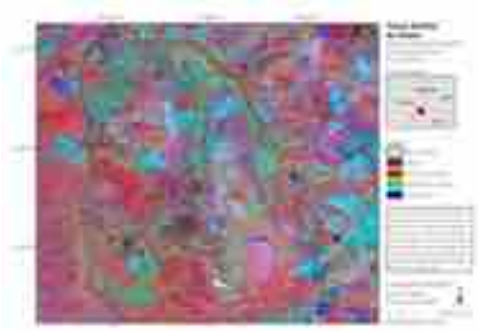
- Participative land and resource management
Research of wildfire impacts vs. Early burning on biodiversity

3. Satellite based Monitoring

- Burned area & deforestation mapping
- Vegetation mapping
- Fuel load mapping
- GHG emissions

4. Knowledge Management and dissemination

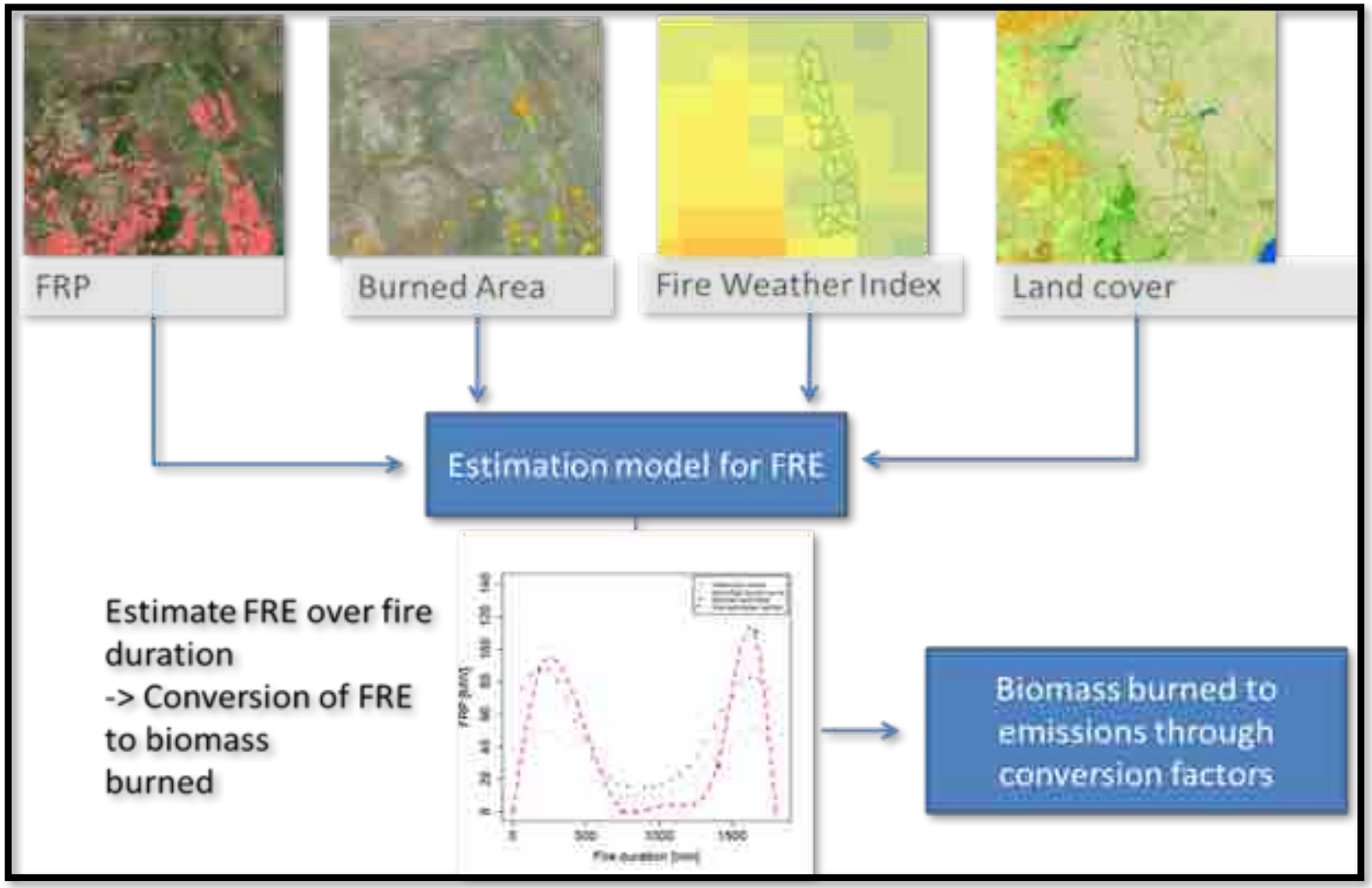
Project Component 3



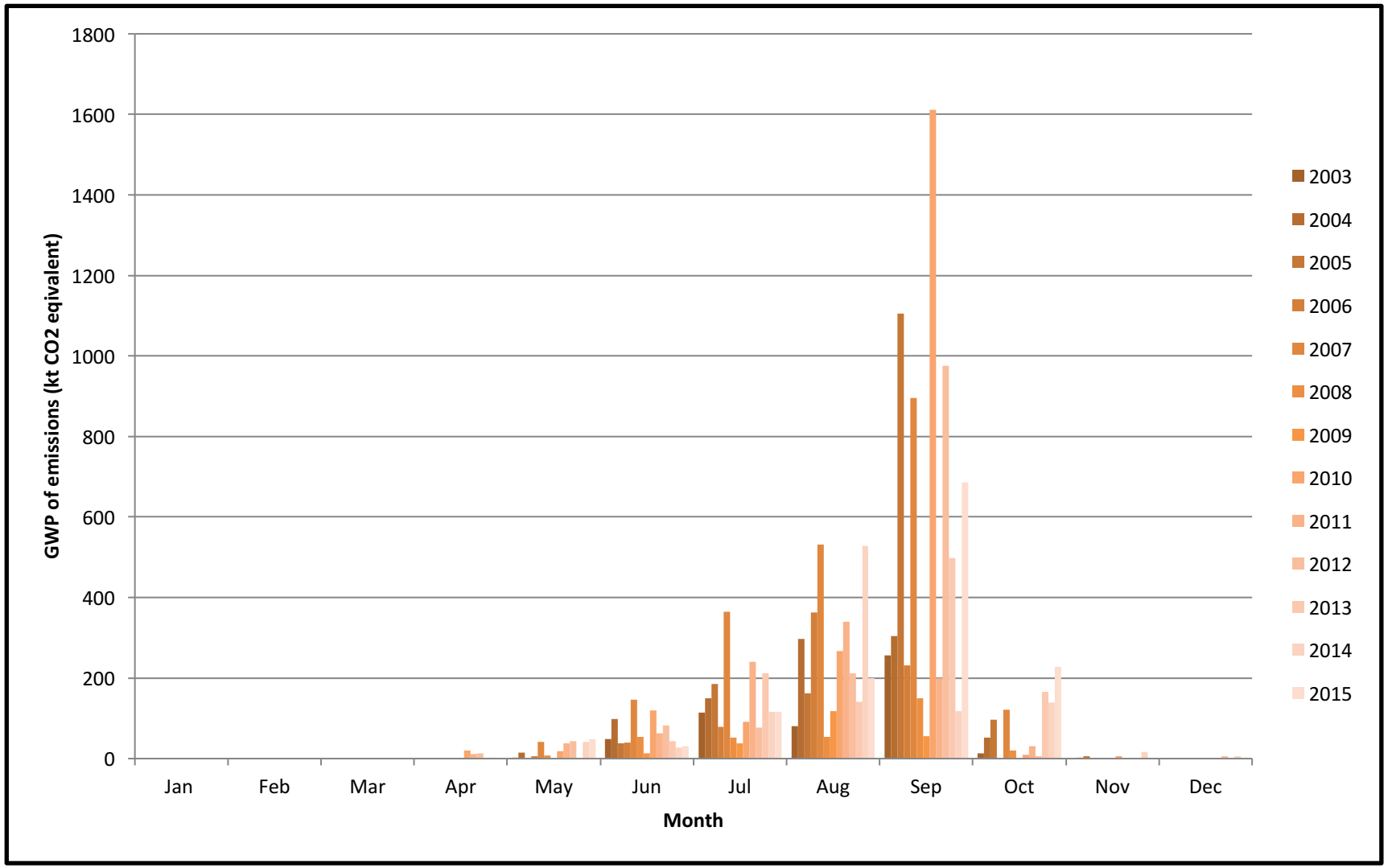
Development and improvement of methodologies for monitoring of burned areas, deforestation, fuel load and fire emission calculations in the Cerrado

- Burned area mapping based on Landsat by INPE (http://www.inpe.br/queimadas/)
- REDD baseline map of the Cerrado by INPE
- Fuel load mapping based on Landsat (cell phone app for field use)
- Vegetation mapping based on Rapid Eye
- Calculation of fire related GHG emissions
- Scientific and technology cooperation between Brazilian and German institutions (INPE / DLR and UnB)

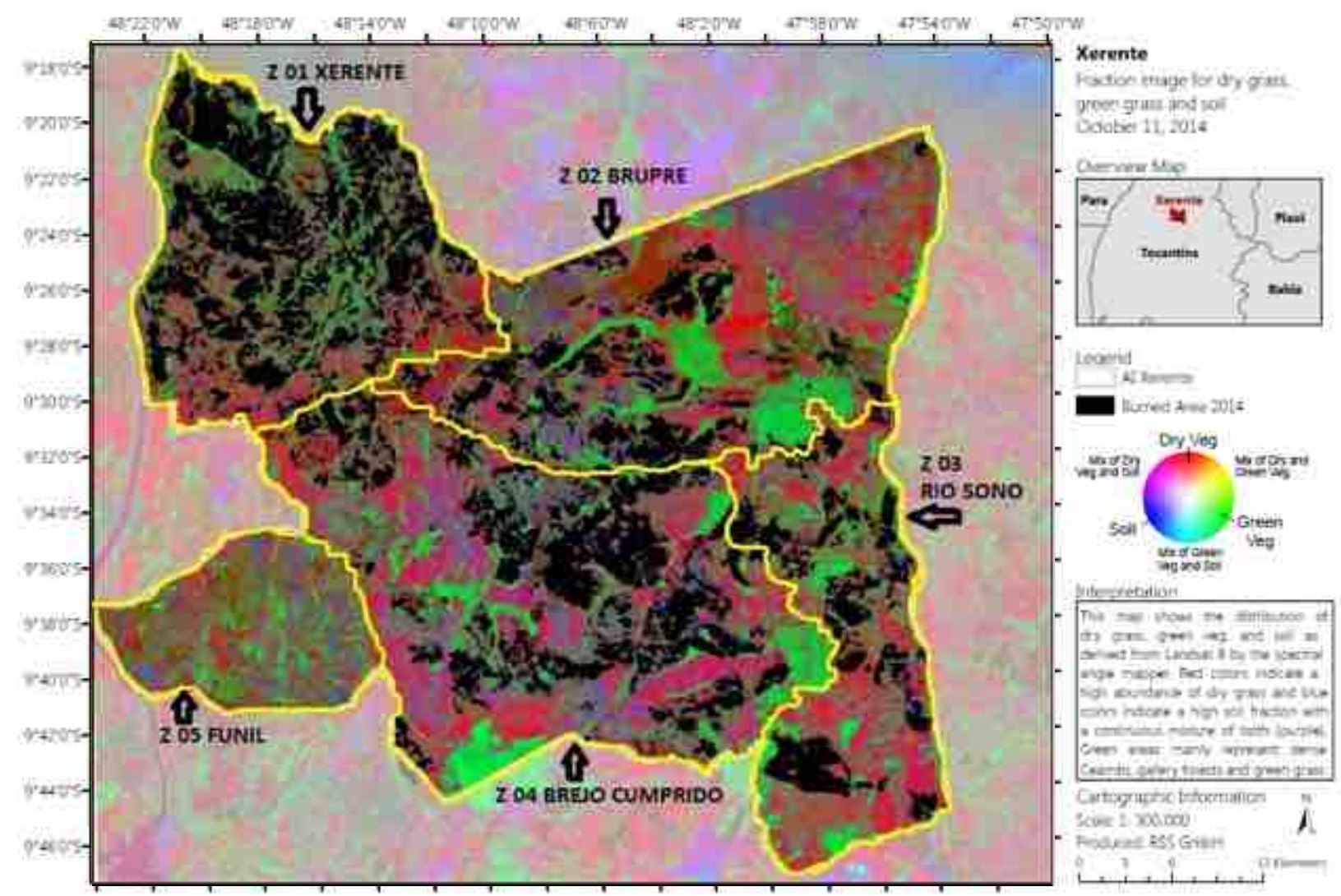
Algorithm for Fire Emission Calculations



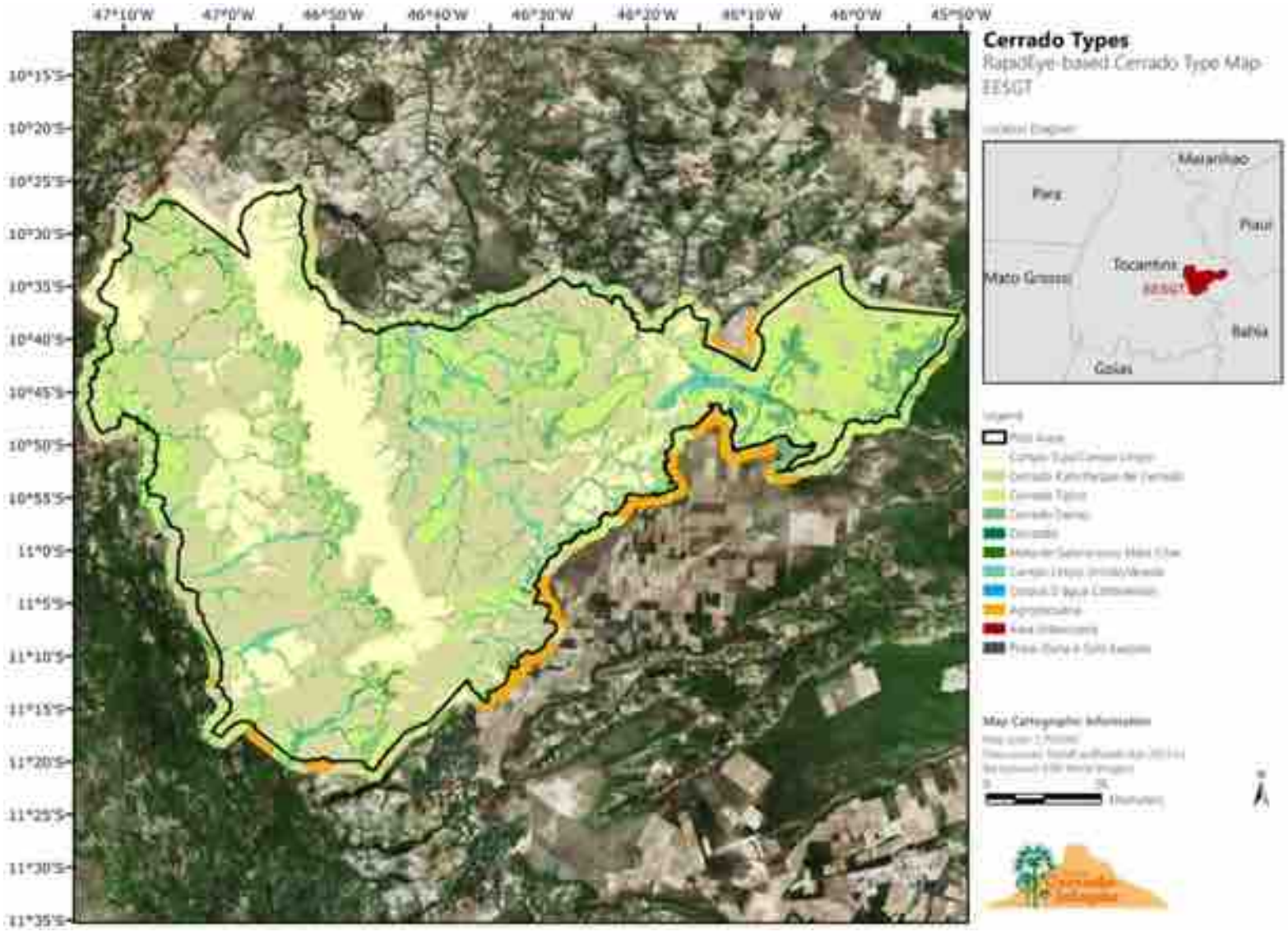
Monthly GWP of emissions (kt CO2 equivalent) for years 2003 through 2015 in Selected PA

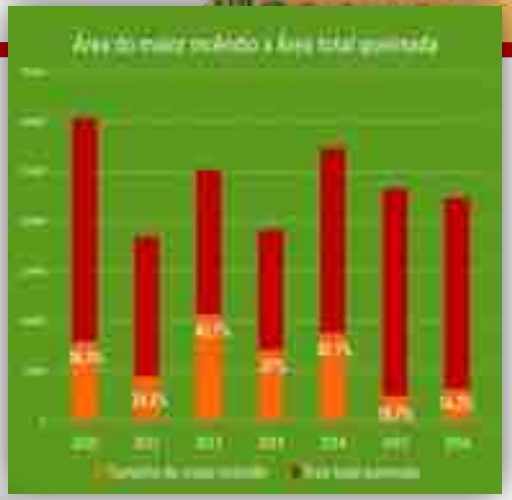


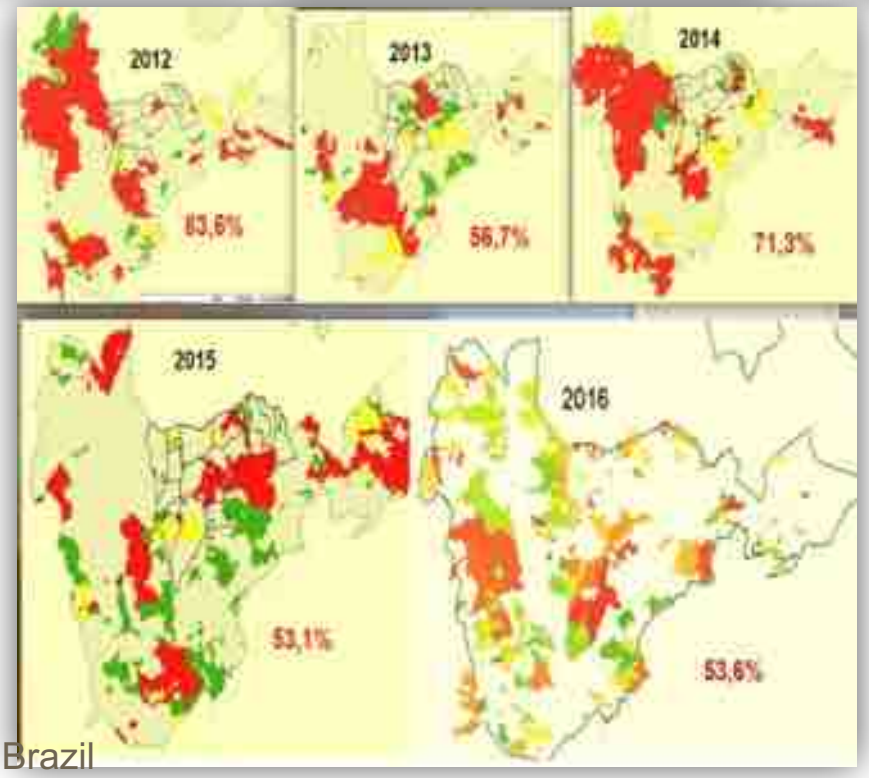
Fuel load mapping using Spectral Mixture Analysis



Vegetation maps based on Rapid Eye







Contact: Anja Hoffmann, giz Brazil

icipe

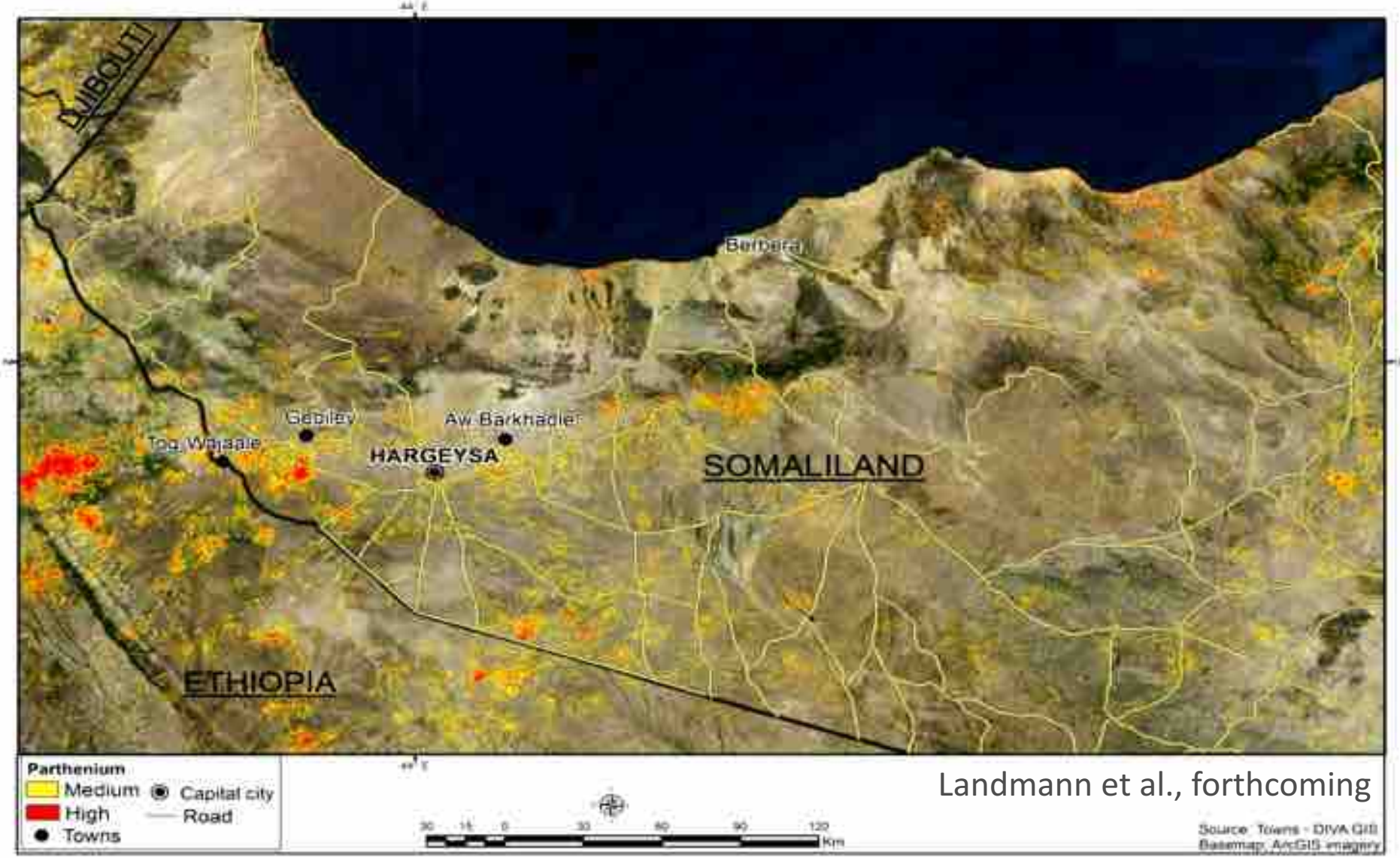
African Insect Science for Food and Health

Invasive weeds (plants) and food security in Africa

Tobias Landmann[1],

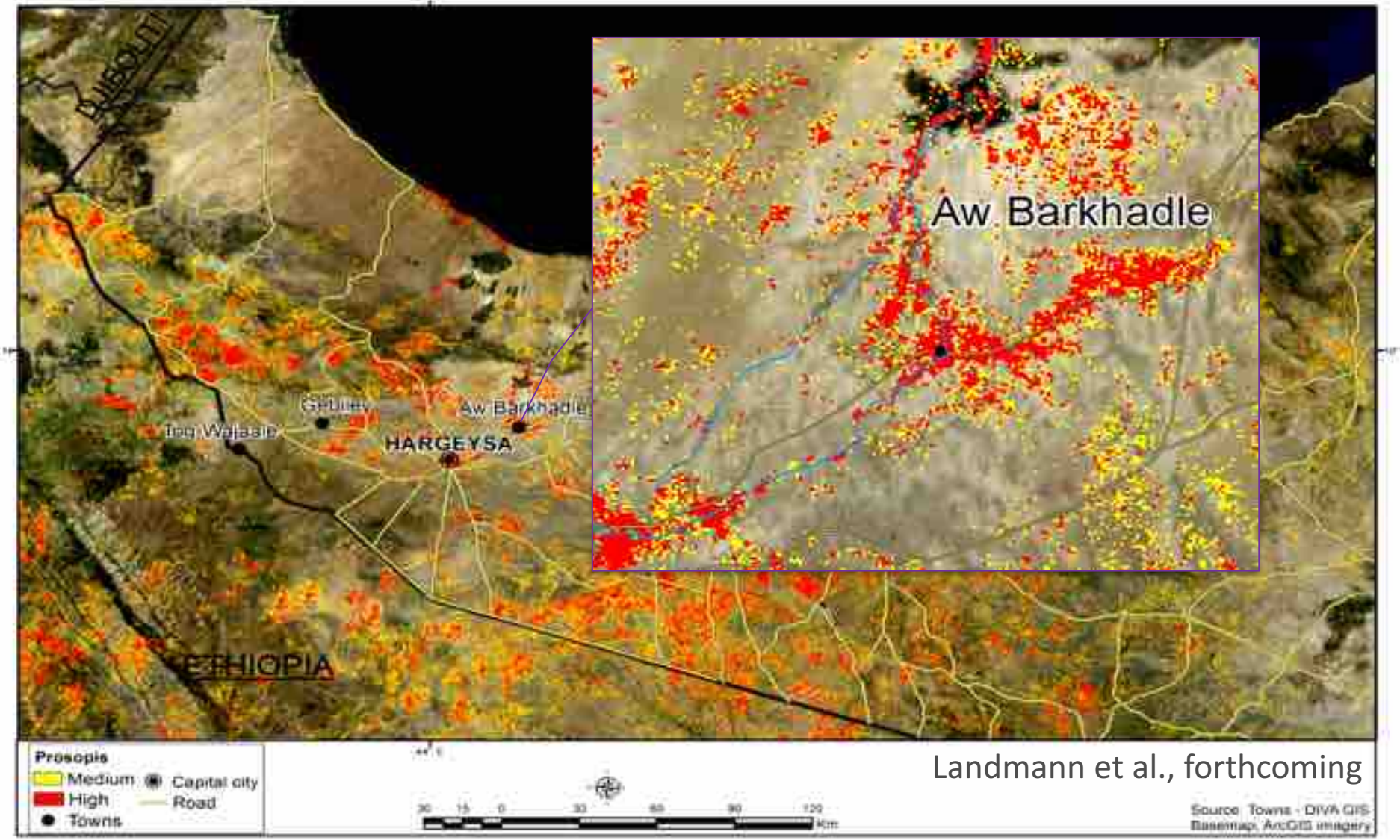
1 Geo-Information Unit, International Center for Insect Physiology and Ecology (ICIPE), Nairobi, Kenya

Using EO to map ***Parthenium hysterophorous*** spread and risk areas in African drylands for scaling out of crop productivity measures



Landmann et al., forthcoming

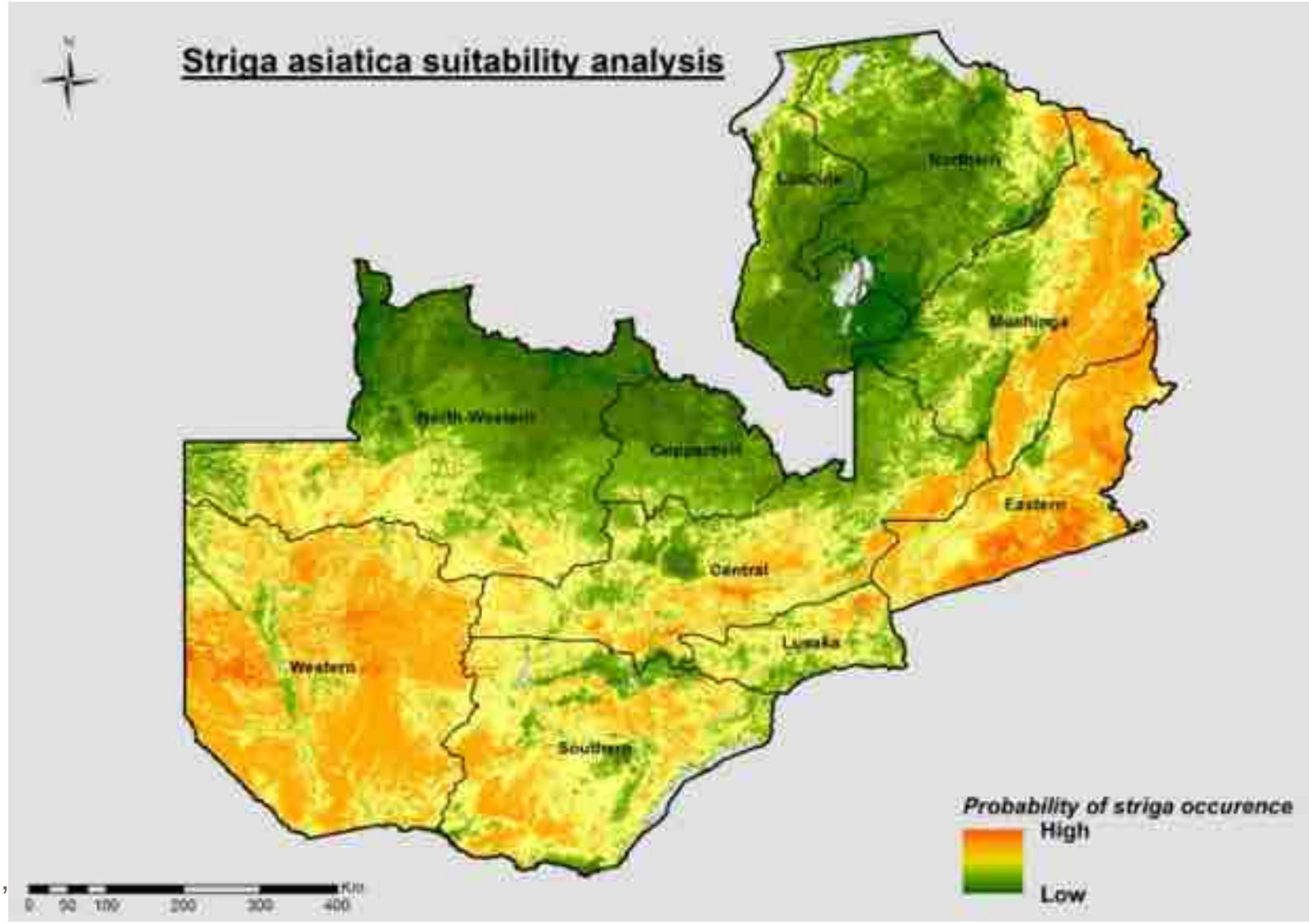
Using EO to map ***Prosopis julifora*** spread and risk areas in Africa for scaling out of rangelands rehabilitation measures



Landmann et al., forthcoming

Mapping ***Striga asiatica*** for scaling out of the 'push-pull' technology (crop intervention strategy)

e.g. Zambia



Contact:
Tobias Landmann,
giz Kenia

Invasive species - background

- ***Parthenium hysterophorous*;** up to 50% of croplands affected in Ethiopia, crop yield losses (up to 70% in i.e. India), reduction in forage material (up to 90% in ET) & milk quality

Invasive species - background

- ***Prosopis julifora* (shrub);** watercourses and rangelands severely severely affected in African drylands, constraint access to water bodies, thorns injure livestock, pasture quality & quantity decreases

Invasive species - background

- ***Striga (weed);*** affects 40 million hectares of smallholder farmland in SSA and causes yield losses ranging from 20–80% and even total crop failure.

Land Degradation Assessment in Otjozondjupa region by the Land Degradation Neutrality project for the IRLUP development

Contact: Antje Hecheltjen, Alexander Erlewein, giz, SV BoDeN


NATIONAL LDN PROCESS
SUBNATIONAL PILOT PROJECT
Outcome: Conditions for systematic and cross-sectoral implementation of sustainable land management have improved
TECHNICAL COMPONENT
PLANNING COMPONENT
UPSCALING COMPONENT
Output: LDN baseline and trend analysis are developed
Output: LDN target setting is facilitated and implementation strategies are identified
Output: Experience from pilot projects adds value to the national LDN process

Linking ELD and LDN – example Namibia

→ How to translate the global and national policy agenda to local action?

LDN baseline setting

- Baselines on land cover, land productivity, and soil organic carbon
- Additional country-specific indicator: bush encroachment

LDN integration in existing planning process

- As a legally binding plan, the Integrated Land Use Planning (IRLUP) can be used to transfer the national LDN vision into local action
- Overall project aim: Enable the planning committee to include LDN into the IRLUP

IRLUP Implementation

Action	LD assessment products produced
Phase 1: Inception	Bush Density maps
• Kick-off meeting with stakeholders	Land cover change maps
• National Revealing Workshop	Soil Organic Carbon maps
• Regional Revealing Workshop	Land Productivity Dynamics maps
Phase 2: Analysis and Planning	Land degradation Hotspots
• Focus Group Discussions	Economic assessment of restoration
• Stakeholder Discussions	Land use policy recommendations
• Sub-regional Planning	
• Regional Planning Workshop	
• Draft IRLUP and SEA	
Phase 3:Finalisation and ommunication	
• Presentation of final IRLUP / Public Meeting	
• Closing Workshop	

Otjozondjupa LD Products

Data collection:

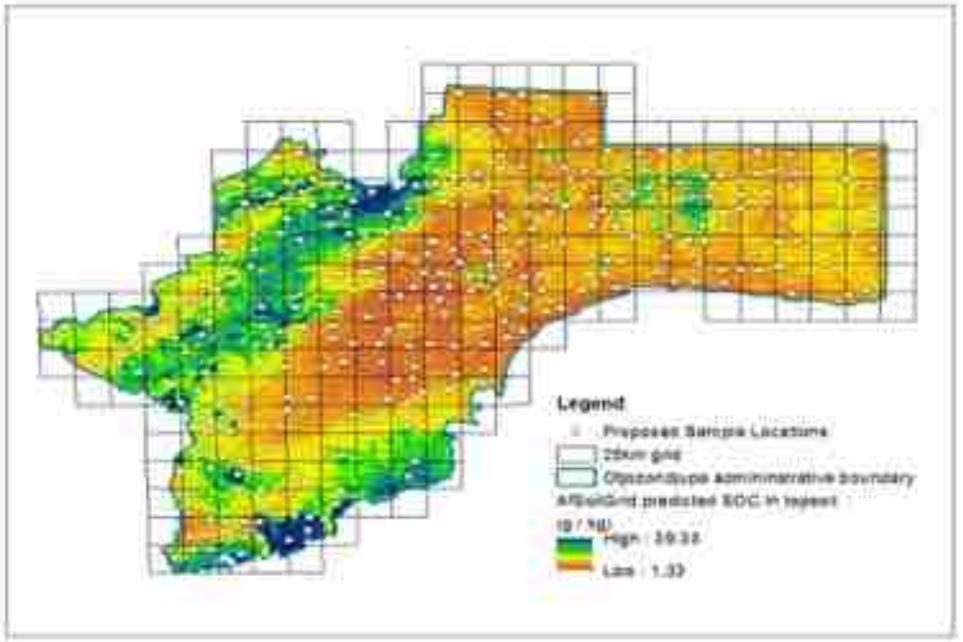
1) soil samples (bulk density cores plus two samples at depths from 0-30cm and 30-100cm), 25km grid and 325 sampling locations

2) identified and counted bush encroachment species within a set area, and

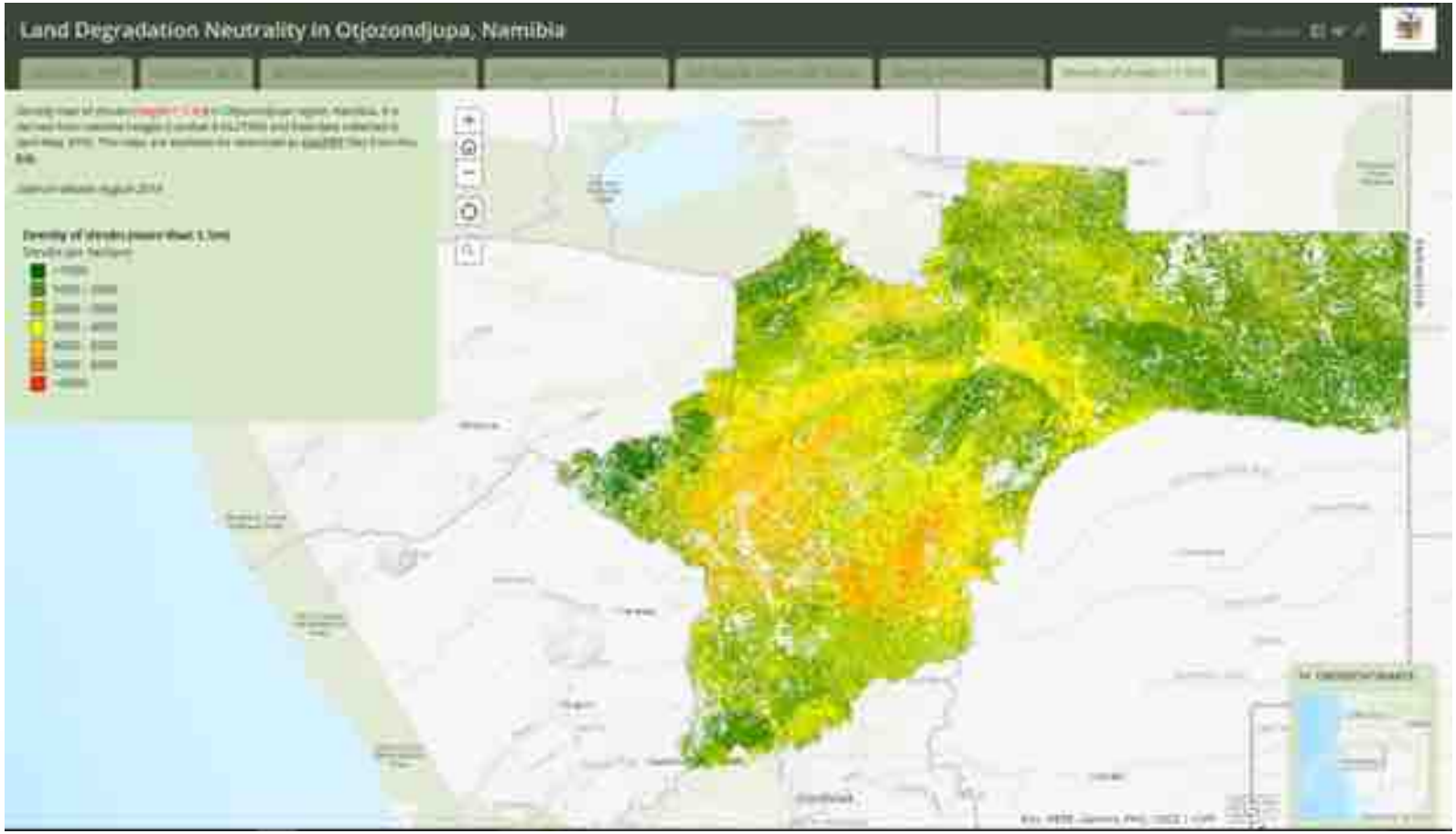
3) identified the correct land cover type in pre-determined LUC sampling plots.

Data:

http://arcg.is/2bxvCHo



Data portal LDN in Otjozondjupa, Namibia



Link to the data portal:
https://csi.maps.arcgis.com/apps/MapSeries/index.html?appid=b00fa0610c3741bd9ca3318a5a557535

Land cover Changes

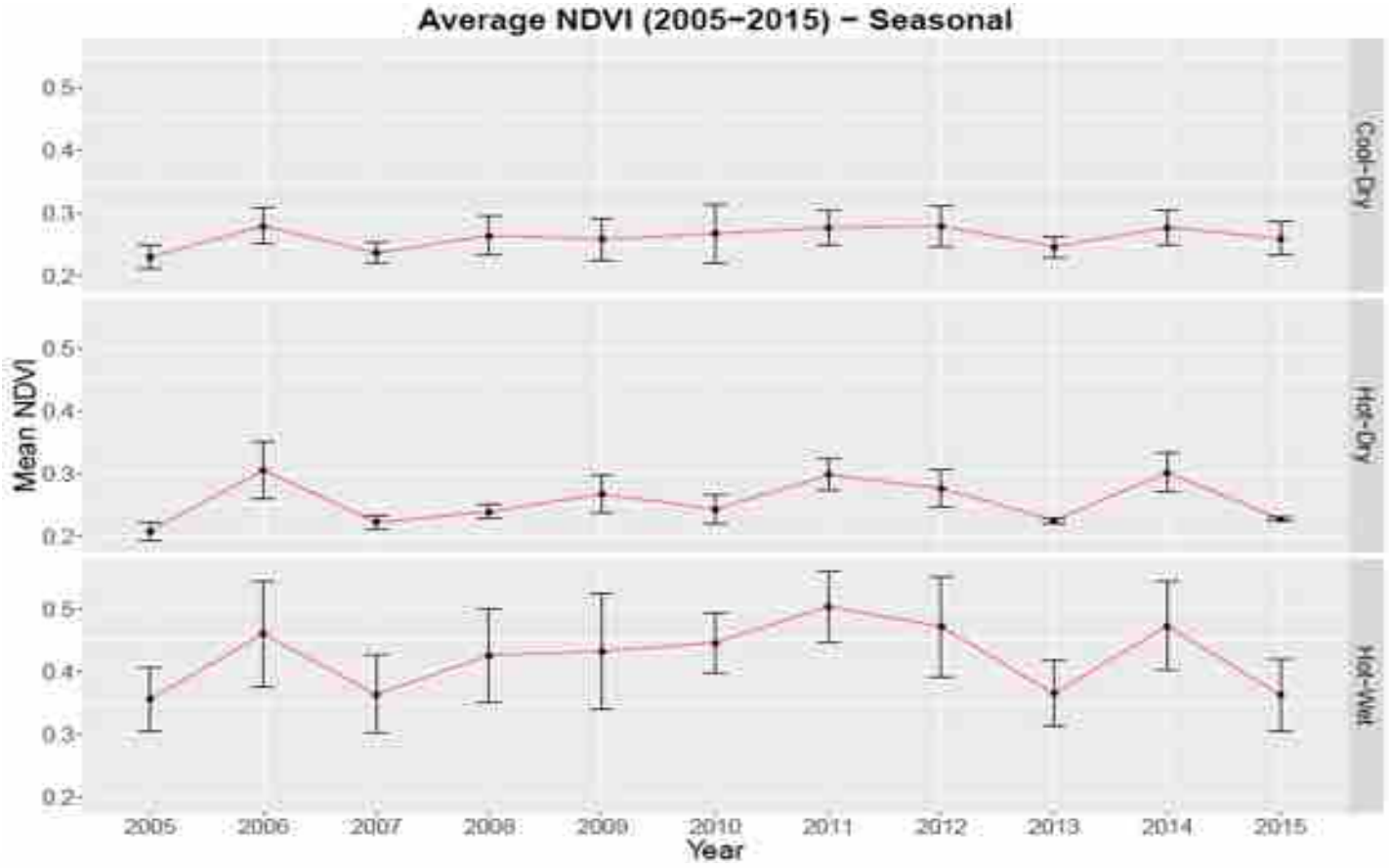
Table 1. Change in land cover class from 2000 to 2016.

LULC class	% area (2000)	% area (2016)
Forestland/Woodland	3.27	4.64
Bush land	85.63	82.42
Grassland	9.82	10.83
Cultivated Land	0.33	0.65
Water body/Wetland	0.07	0.01
Artificial Surface	0.01	0.03
Bareland	0.86	1.42

Table 2. Direction of land cover change between classes.

Year 2000	Year 2016	% change
Forestland/Woodland	Forestland/Woodland	0.76
Forestland/Woodland	Bush land	2.39
Bush land	Forestland/Woodland	3.54
Bush land	Bush land	72.35
Bush land	Grassland	8.44
Bush land	Cultivated land	0.42
Bush land	Bare land	0.85
Grassland	Bush land	7.13
Grassland	Grassland	1.97

Annual mean NDVI variability by season



"Hot-Wet" = December to May; "Cool-Dry" = June to August, "Hot-Dry" = September to November.

Training

Field data collection training:

- DAY 1 (April 7) Morning – Soil Sampling
- DAY 1 (April 7) Afternoon – Sampling Design and Sampling Calendar

- DAY 2 (April 8) Morning – GPS Units and Sampling Design
- DAY 2 (April 8) Afternoon – Test run of all sampling

Data analysis "training":

- All stakeholders involved in the process
- Showing everyone the complete picture from field data collection. Lab analysis to map creation
- Introducing participants to the "Power" of using R as a GIS analysis tool

Proposed linkages between IRLUP & LDN

3 major elements for integrating LDN into IRLUP

- LDN assessments
- LDN as a broad vision for IRLUP?
- Regional LDN targets?

1) LDN assessments

- Using the 3 UNCCD indicators (land cover/land cover change, land productivity, soil organic carbon) in a flexible way
- Complementing or replacing indicators with other local relevant indicators
- Capacity building for assessments is key
- Ensuring that data is actually being used. Also within other processes and institutions (e.g. „data using strategy“ for soil carbon data)

2) LDN as a vision for IRLUP?

- LDN means neutrality/no net loss -> maintain or improve land health
- LDN reponse hierarchy:
  - (1) avoid degradation
  - (2) reduce degradation
  - (3) rehabilitate degraded land

➢ Can this serve as a broad and general vision for land use planning?

3) Regional LDN targets?

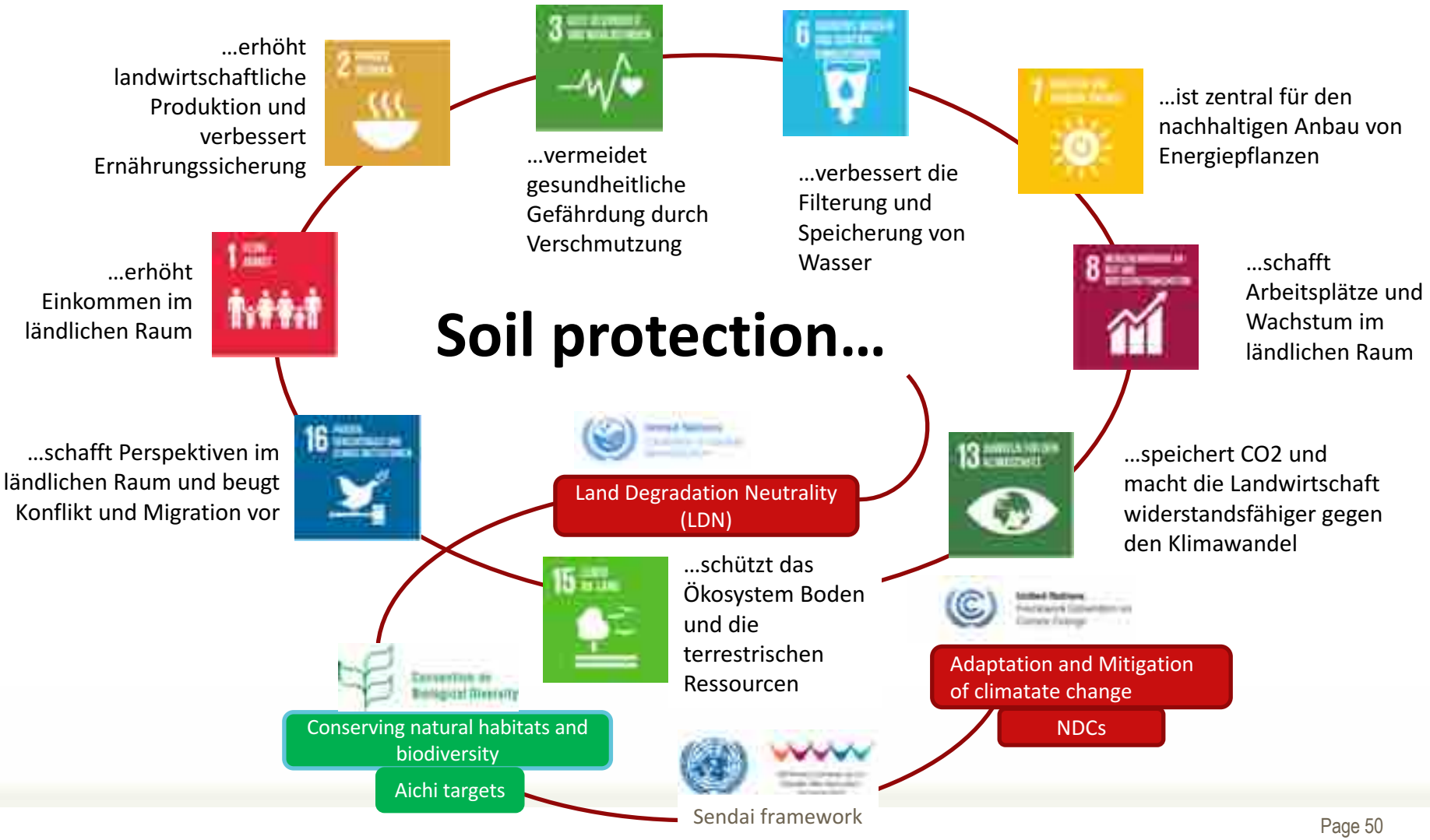
- Is there scope for defining quantitative targets in IRLUPs?
- For example:
  - rehabiliate XY ha of degraded land until 20xx
  - halt bush encroachment by 20xx

Integration of LDN into IRLUP…

- adds value to the IRLUP by addresing the key challenge of land degradation
- contributes to the implementation of national LDN targets
- contributes to the implementation of NAP3
- provide an innovative example for the intenational discussion on LDN implementation (presentation at COP13?)

➢ Which regulatory/prodecural steps are required for LDN integration?

Soil protection links environmental and development agendas



SDG 15.3:
„Land degradation neutrality“ (LDN)

- Adoption of “The 2030 Agenda for Sustainable Development”, including SDG 15 and target 15.3
- Direct linkages between LDN and SDGs in the area of poverty, food security, environmental protection and sustainable use of natural resources
- Implementing LDN creates multiple benefits and will make a direct contribution to achieving these and other SDGs

RIICE Philippinen - Remote Sensing-based Information and Insurance for Crops in Emerging Economies (PN 2013.2061.3)

Forest Inventory / Forest Management Information System Tadjikistan (Stephane Henriod)

SDGs and Earth Observation