# Current experiences in the use of satellite information in development aid activities from Germany

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Earth Observation at GIZ is embedded into global and national agendas

- **Project level:** Survey on the use of EO in GIZ projects
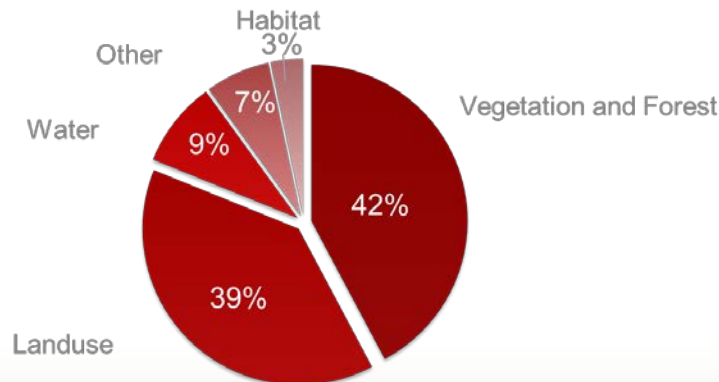
- **Global level:** Environmental and development agendas focussing increasingly on availability of and access to data.

- **National level:** Digital agenda of German government including big and open data for development.

- **Institutional strategic level:** GIZ and DLR executive boards signed cooperation agreement.

- **Institutional operational level:** Recently founded Forum on Earth Observation at GIZ.

Field of application and information products

Forest (i. e. REDD+ Projects)
- Assessment of forest areas (forest type mapping)
- Monitoring of deforestation processes (FLC-Change maps)
- Calculation of carbon storage
- Recording and prediction of pest infestation (risk maps)

Land and pasture management
- Monitoring of crops (crop mapping, post-disaster maps, harvest forecast models)
- Planning of cultivation areas (suitability maps, farmland fragmentation)

Land Governance
- Land use planning (LULC-maps)
- Assessement of land degradation (erosion maps)
- Cadastre map for the registration of land ownership and land use rights

Water
- Water management (mapping of watersheds/river catchment areas)
- Flood control (flood risk mapping/modelling)

Biodiversity
- Habitat management (habitat mapping, habitat fragmentation)

Analysis and end users of the EO-data

- Governmental administration: local authorities (planning offices, land registry, cadatser offices), ministries (Environment, Agricultur, Forest…)

- Policy makers

- Reporting to the World Heritage Commission

- Private sector, i. e. retailer, insurances

- Civil society, i. e. disaster relief organisations

- Research institutes/ Universities

- NROs, civil society

- GIZ-internal

Others: e. g. Students or no further use of data

Partner organisations: Reseach institutes Universities National comitees Public authorities

External service providers: RS-provider Consulting-companies

35%

30%

25%

10%

GIZ-internal

Earth Observation in German international cooperation

SUSTAINABLE DEVELOPMENT GOALS

	1	2	3	4	5	6	7	8	9	10
	Population distribution	Cities and infrastructure mapping	Elevation and topography	Land cover and use mapping	Oceanographic observations	Hydrological and water quality observations	Atmospheric and air quality monitoring	Biodiversity and ecosystem observations	Agricultural monitoring	Hazards, disasters and environmental impact monitoring
1 No poverty										
2 Zero hunger										
3 Good health and well-being										
4 Quality education										
5 Gender equality										
6 Clean water and sanitation										
7 Affordable and clean energy										
8 Decent work and economic growth										
9 Industry, innovation and infrastructure										
10 Reduced inequalities										
11 Sustainable cities and communities										
12 Responsible consumption and production										
13 Climate action										
14 Life below water										
15 Life on land										
16 Peace, justice and strong institutions										
17 Partnerships for the goals										

Suitability Maps 2, 3, 10

Flood Proofing 2, 3, 10

Fire Monitoring 4, 10

Disaster risk mapping 3, 4, 10

Land Degradation Neutrality 4, 8, 9

Bush encroachment 4

National Parks 4
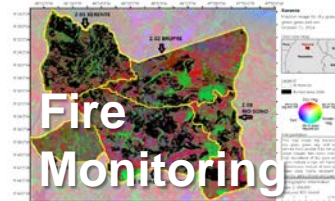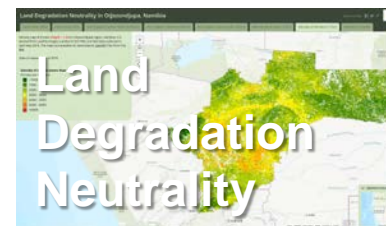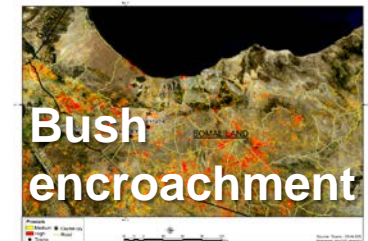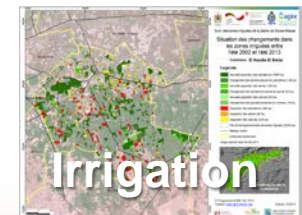
Irrigation 4, 6, 9

Invasive species in African drylands

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

Parthenium
- ☐ Medium ⊙ Capital city
- ▣ High — Road
- ● Towns

Source: Towns - DIVA GIS
Basemap: ArcGIS imagery
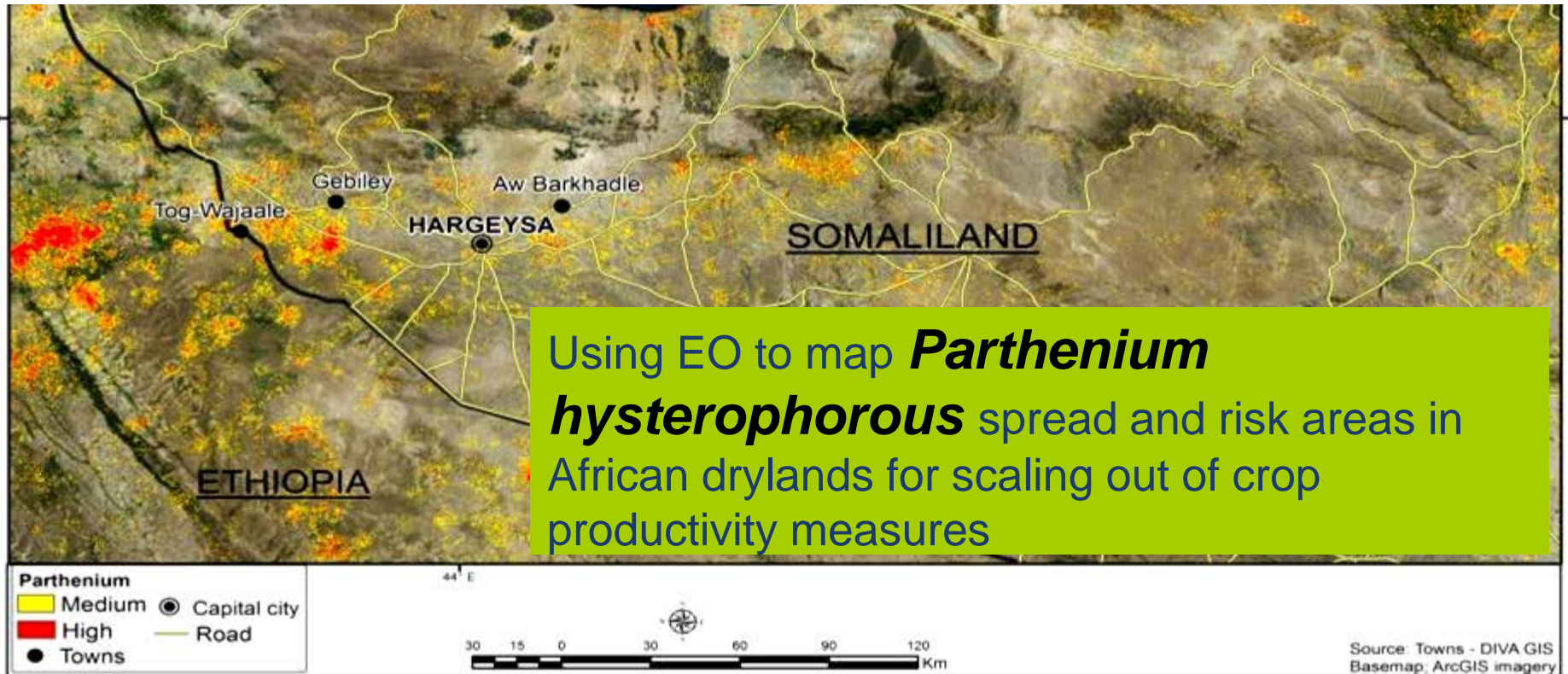
- Landsat-based classification used as „training" data for modelling areas of propagation of invasive species based on MODIS-EVI time series.
- User: Ministry of Livestock in Somaliland used risk maps to identify risk zones and plan measures.

Source: Landmann et al., forthcoming

Land Degradation Neutrality (LDN): Example Namibia

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
- Usefulness of data: Bush encroachment was integrated, but assessments of other indicators were only partially taken up (LUC, productivity) or not at all (SOC).

Land Degradation Neutrality (LDN): Example Namibia

Link to the data portal:
https://csi.maps.arcgis.com/apps/MapSeries/index.html?appid=b00fa0610c3741bd9ca3318a5a557535
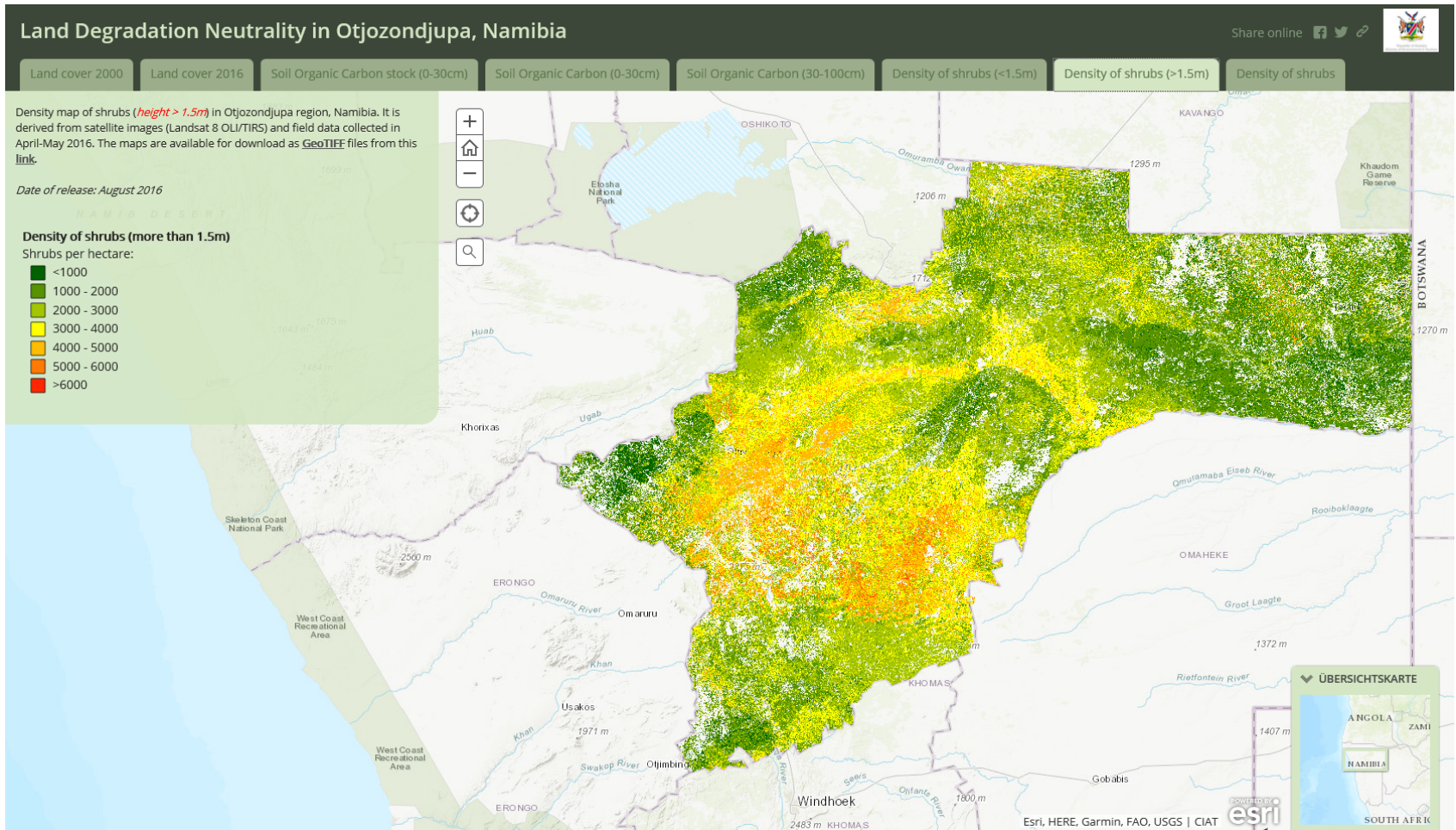
# Monitoring and Planning of National Parks, Cameroon/Chad
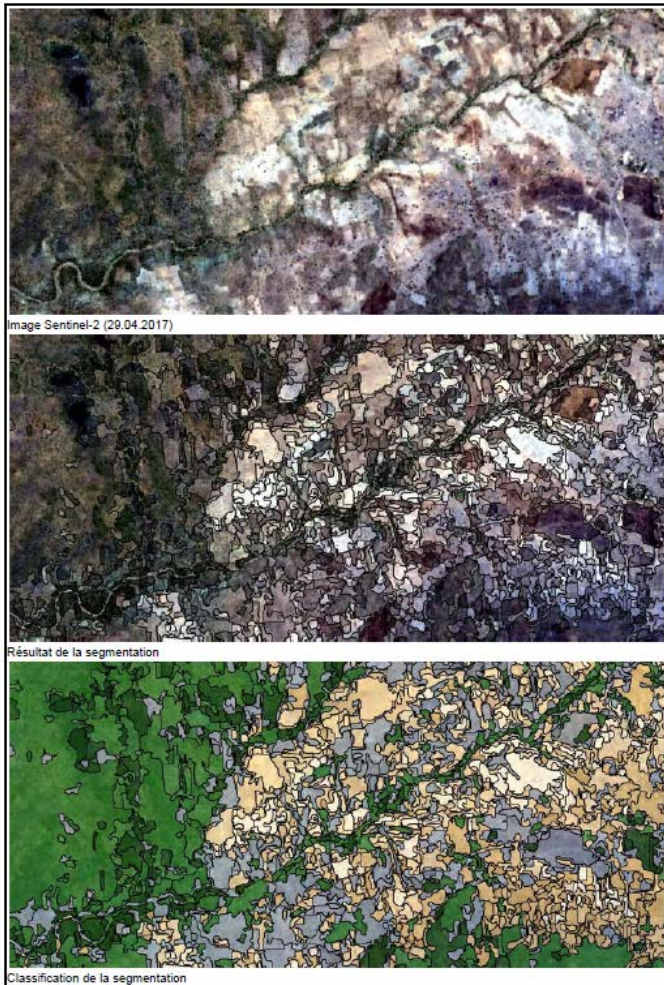
Figure 3: Exemple de segmentation d'une image Sentinel-2

Analysis of satellite images: Current land use and land use trends in BSB Yamoussa (*Mission report 2017*)
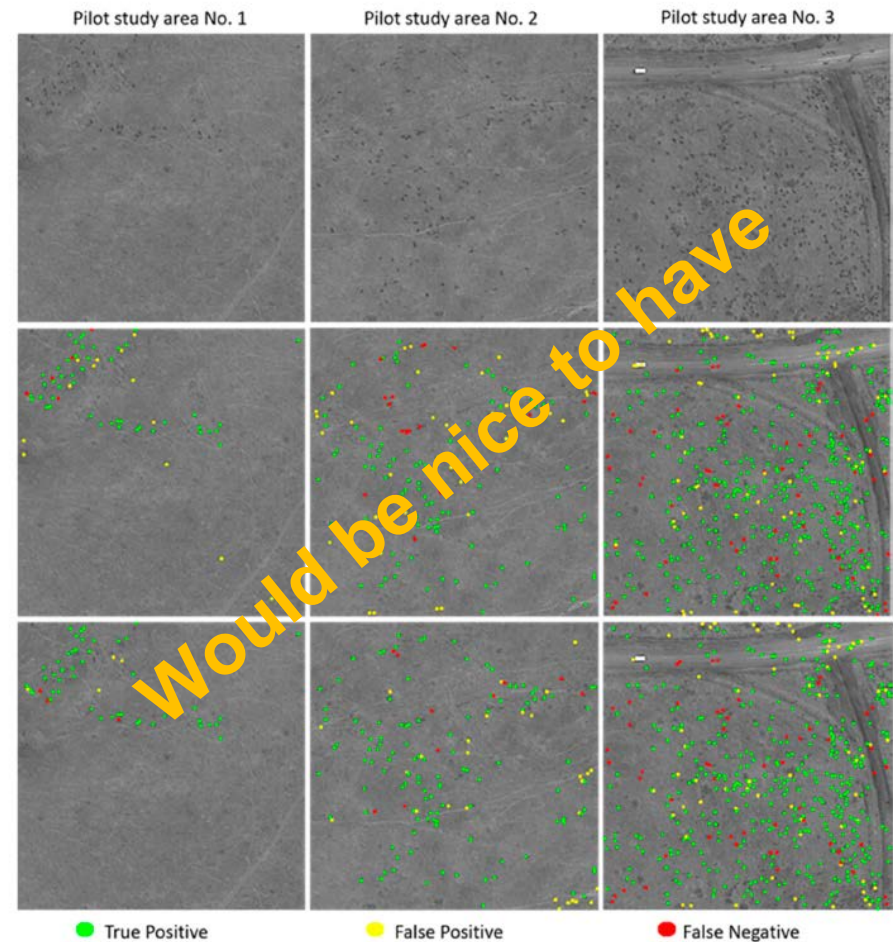
Automatic Counting of Large Mammals from Very High Resolution Panchromatic Satellite Imagery
http://www.mdpi.com/2072-4292/9/9/878

Monitoring of irrigation areas and water use for agriculture (Souss-Massa, Morocco)
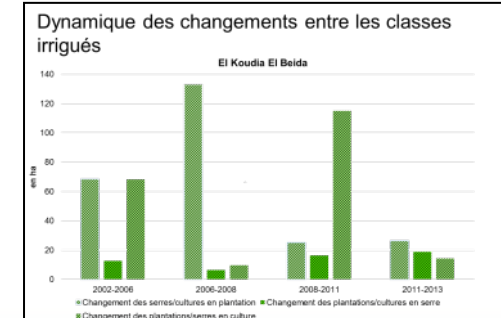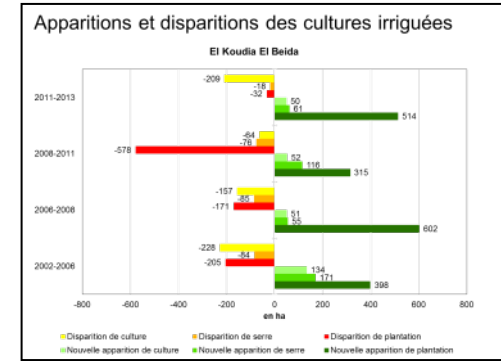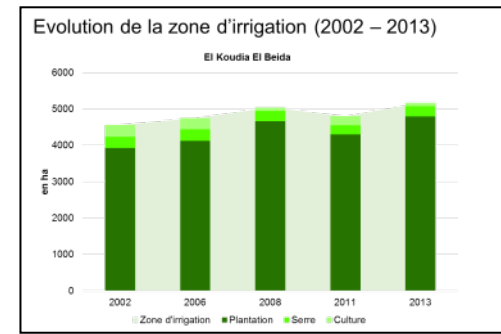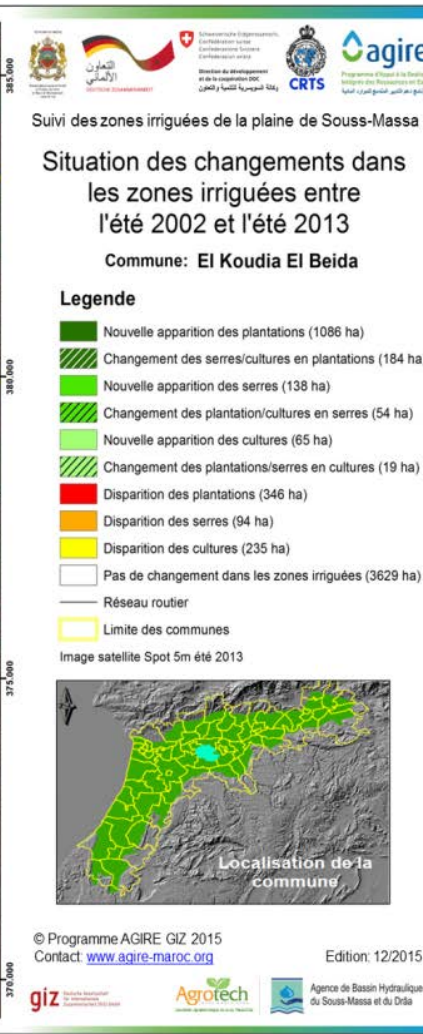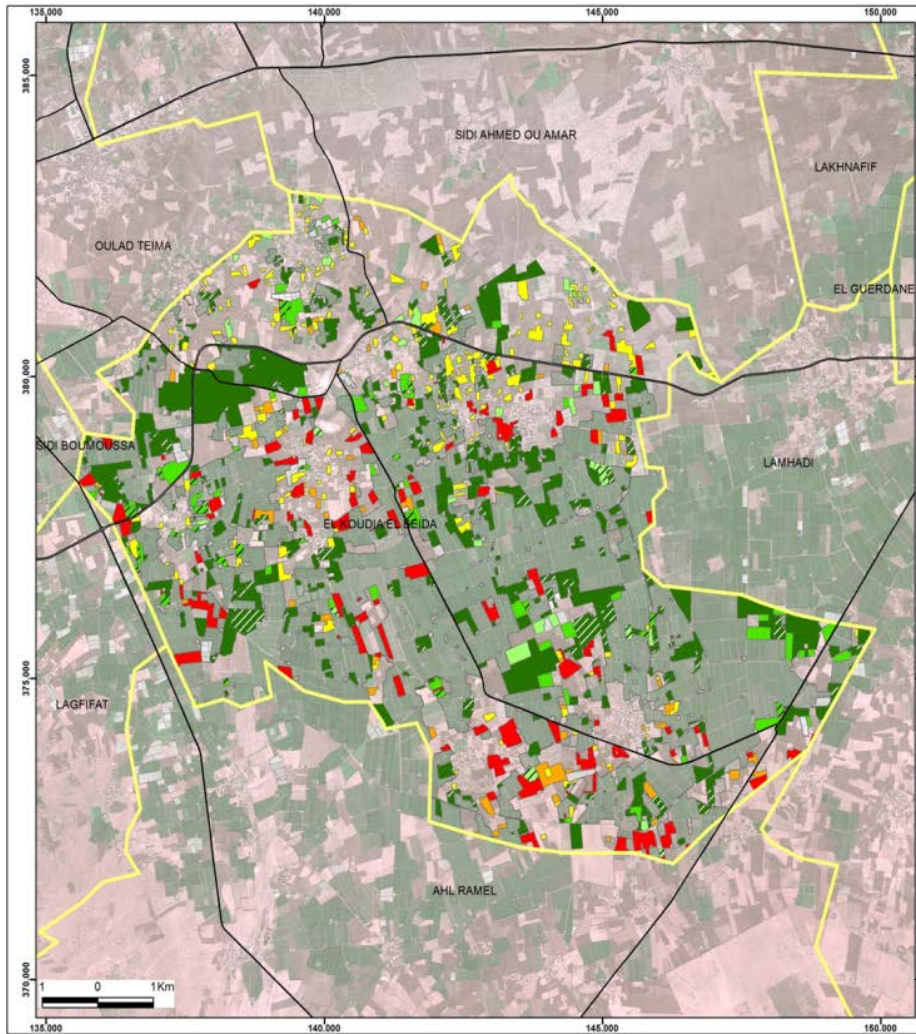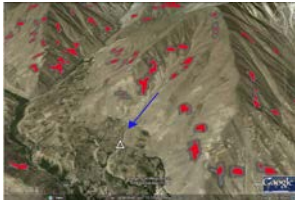

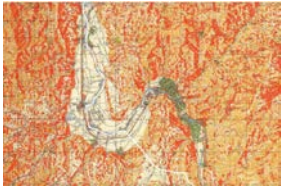Development of land use change maps (2002-2013)

Statistical evaluation of maps for community level

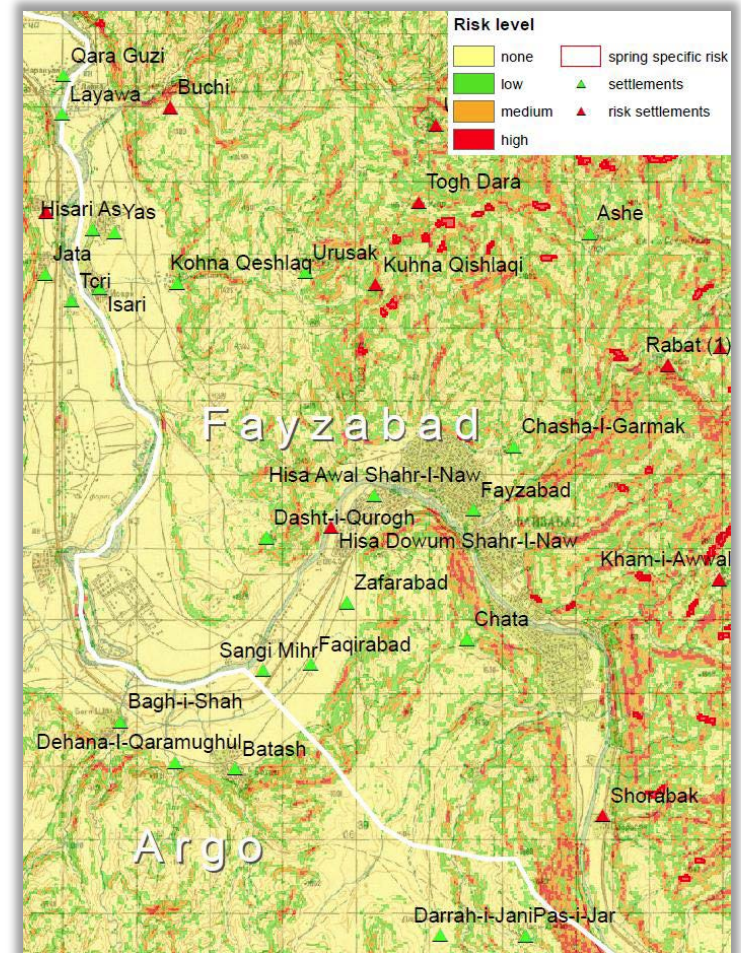# Disaster Risk Mapping in Badakhshan, Afghanistan
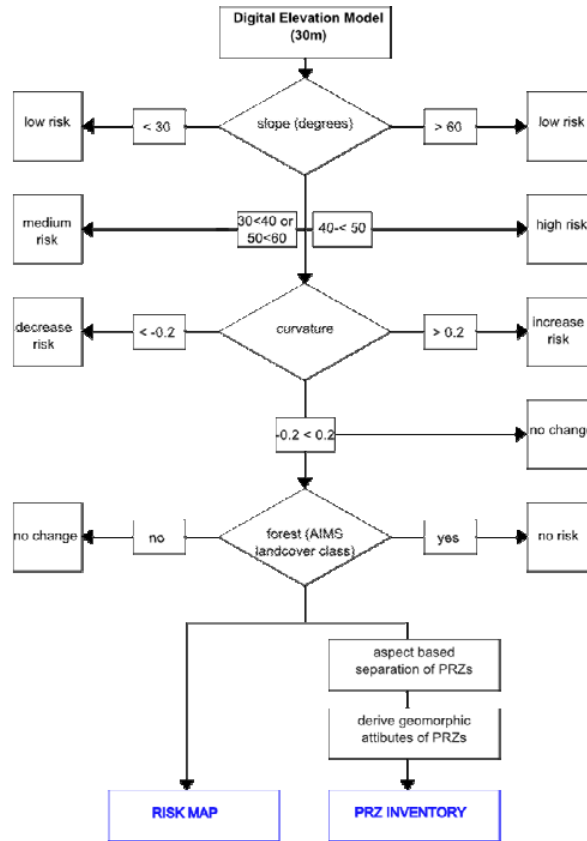
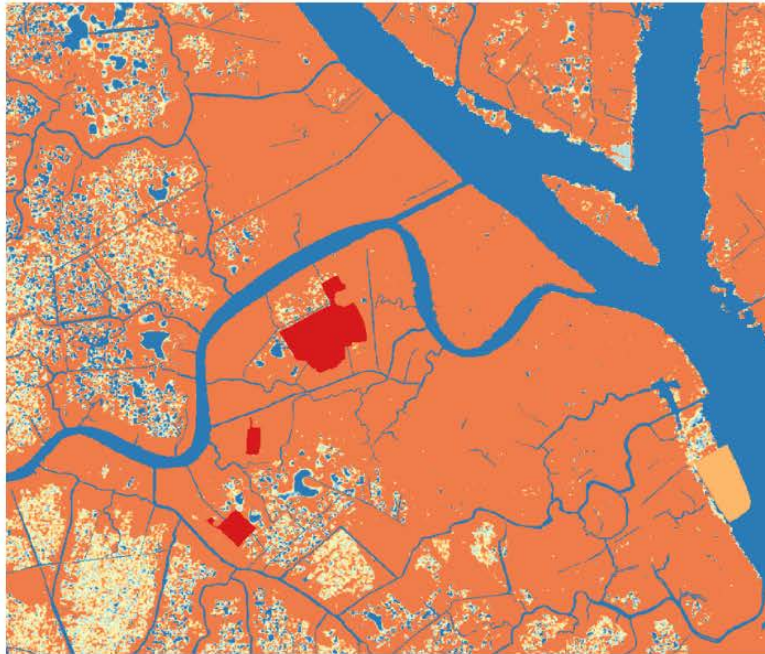**Hazards:**

Avalanches

Landslides

Floods

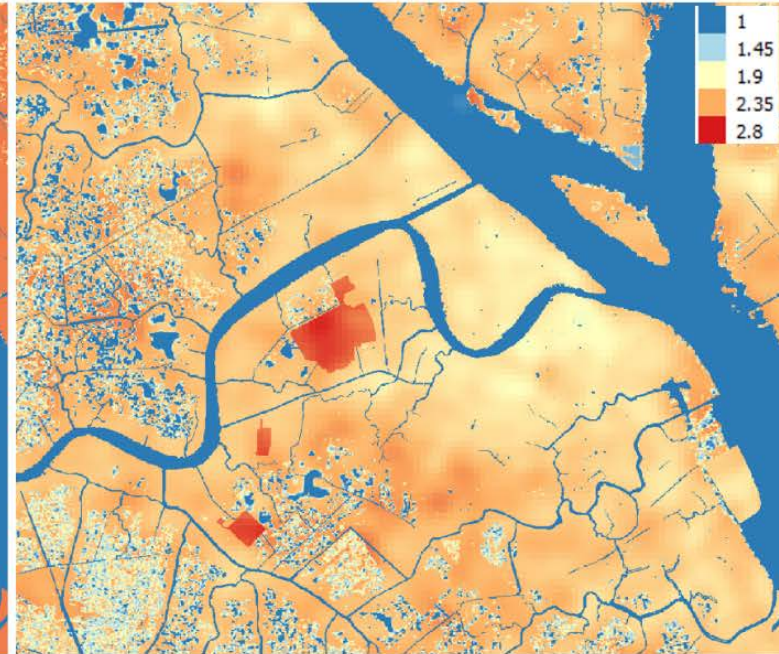Avalanch risk map

Source: GIZ 2011

- Accuracy of ASTER DEM limited the accuracy of the results (2011).

Flood Proofing in Vietnam, Mekong Delta

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

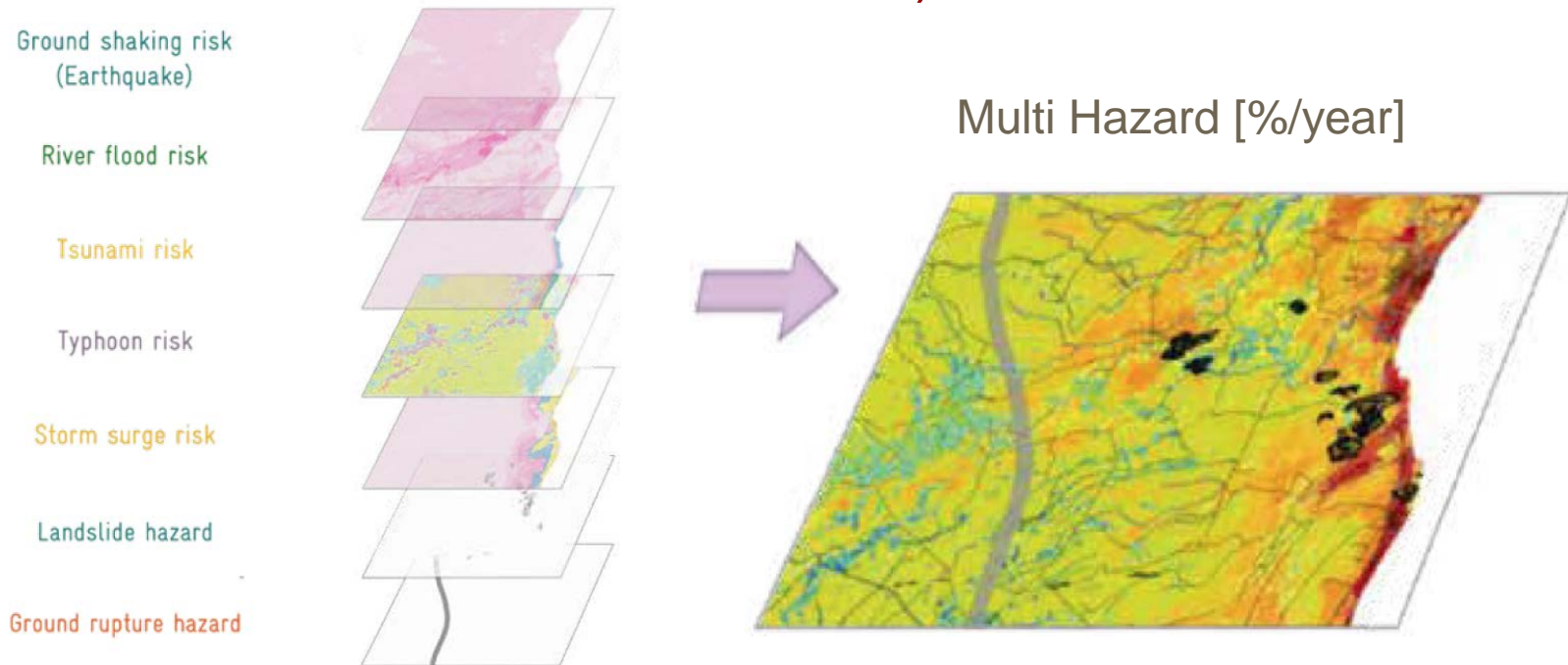Elevation from WorldDEM (ca. 2012)
Height in meters above sea level.

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

Suitability Map Method: Integrating Disaster Risk Management (DRM) and Climate Change Adaptation (CCA) (Philippines, Vietnam)

Ground shaking risk (Earthquake)

River flood risk

Tsunami risk

Typhoon risk

Storm surge risk

Landslide hazard

Ground rupture hazard

Multi Hazard [%/year]

Source: GIZ 2015

- Problem: Hazard maps do not provide the likelihood or probability of the occurrence of a certain type of hazard in a certain area

- Users: Local government units of Leyte. land use planners are able to quickly assess the risks for normal residential buildings anywhere in Leyte as well as to assess risks for future projects and structures. Application to improve climate change adaptation.

- Now being piloted in Vietnam.

Prevention, Control and Monitoring of Fires in the Brazilian Cerrado

Fuel load mapping using Spectral Mixture Analysis (SMA)
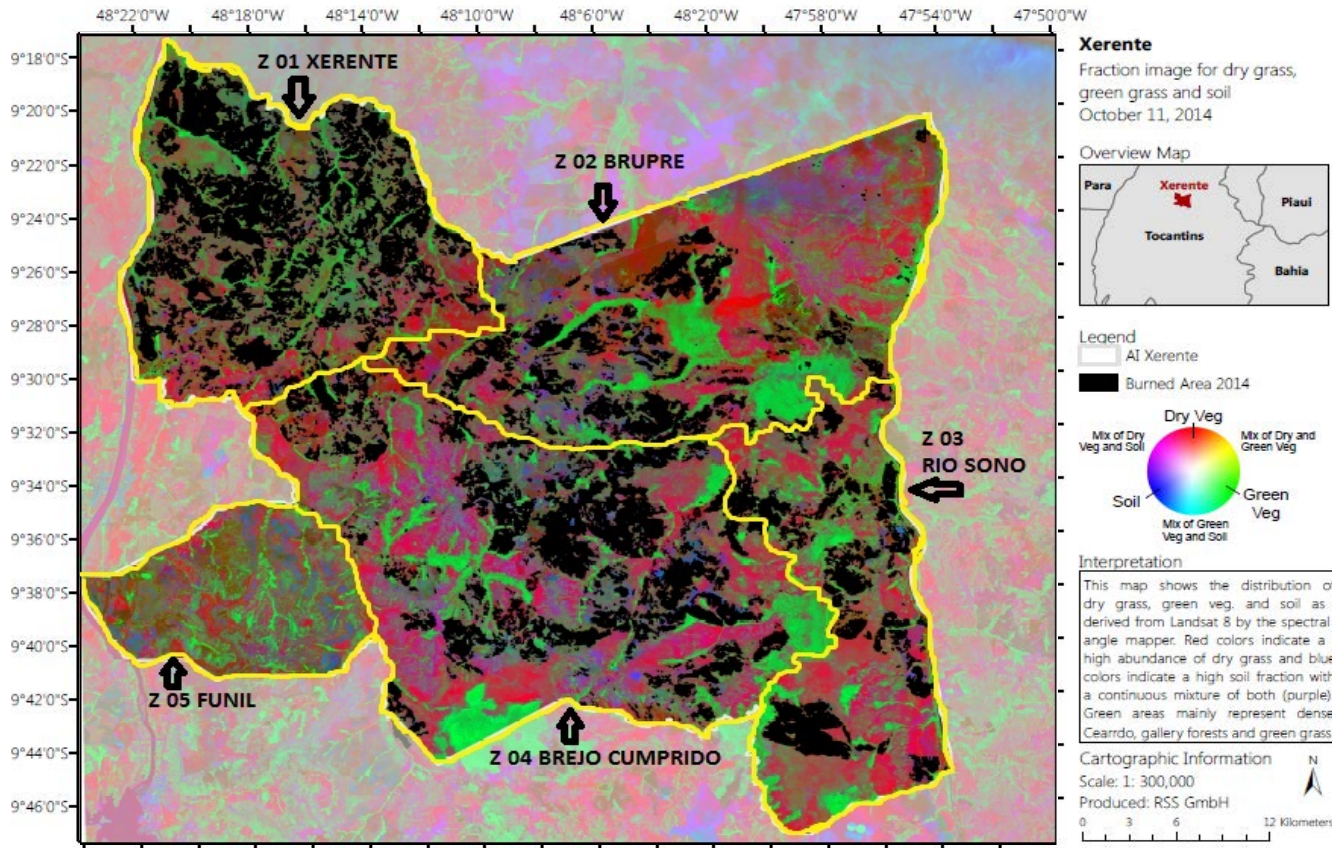
- Data: Landsat-8 and Sentinel-2

- Fuel load mapping and SMA as an effective tool in support of Integrated Fire Management (IFM).

- Useful to identify areas with high fire risk, assess the fuel load variation, assess the remaining fuel load after a fire, evaluate fire management activities and to better understand fire behavior.

Points for Discussion

- Do not only export solutions but build capacities

- Too much information is slowing decision processes down. Need standardized information products (e.g. SOC, soil moisture, hazard maps…)

- End-users of data need to be involved from the beginning to create ownership and to increase the potential uptake. Training end-users in using the data.

- Need to identify existing processes to dock on to, e.g. land use planning processes. Timing of information provision needs to be aligned to timing of planning processes.

- Monitoring SDGs should not be an aim in itself but it should support planning and implementation to reach the goals and targets.

- Break up silos; make information available to all relevant ministries and agencies (NSDI? – coordination needed)

Thank you very much for your attention!