Towards a global high resolution peatland map in 2020

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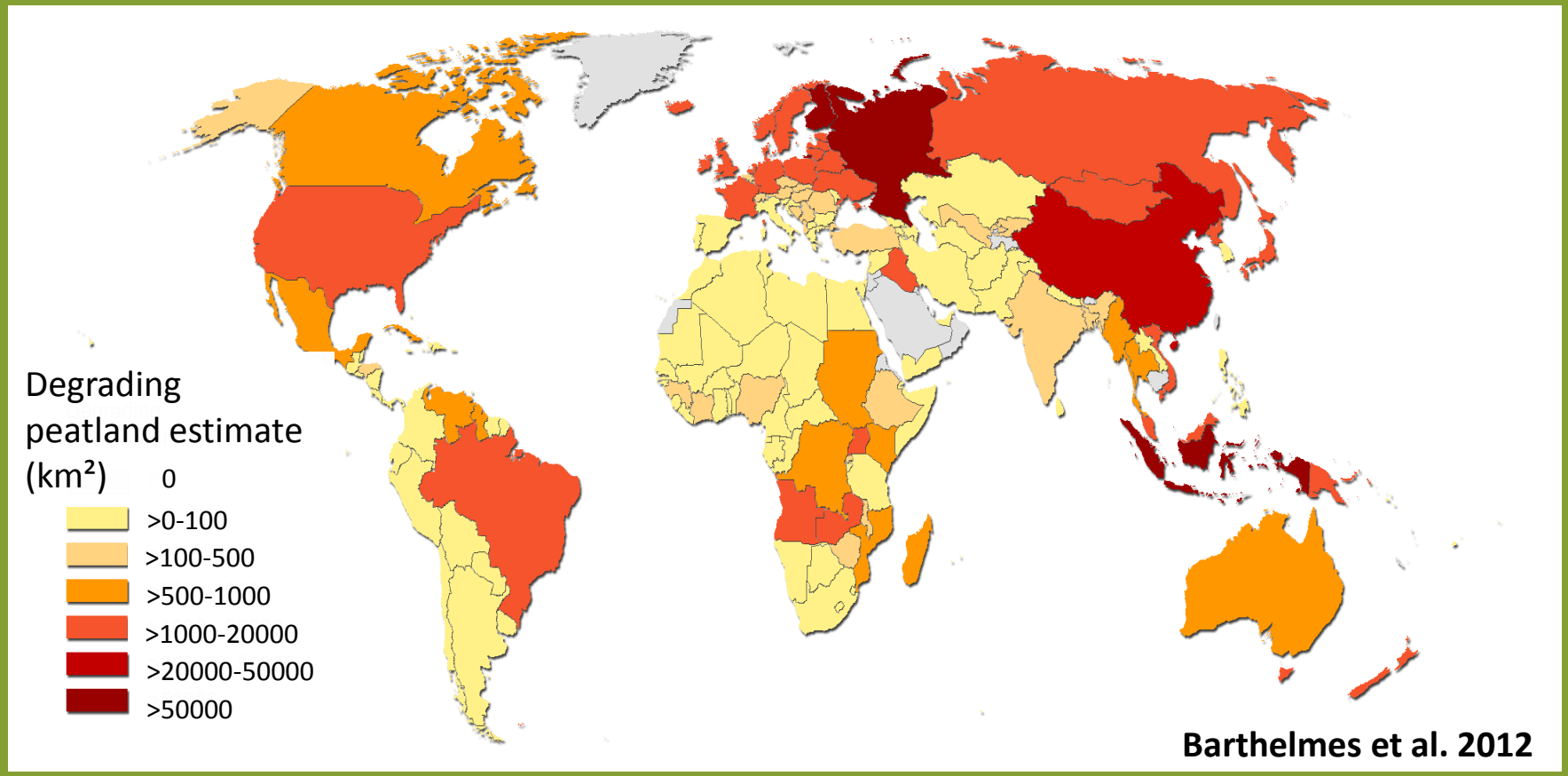
Towards a global high resolution peatland map in 2020



Peatlands occur all over the World and large areas are drained.

Drainage has severe environmental effect:

GHG emissions:

Global CO_2 emissions from drained peatlands: ~ 2 Gt/yr

= 5% of all anthropogenic CO_2,
but drained peatlands cover only 0.3% of the global land area

Land use emission Hot Spot!

Recently recognized in international policy
(e.g. UNFCCC, EU, FAO, RAMSAR, ...)

Mitigation of peatland GHG emission requires data...

- ... on the extent of peatlands (including abandoned areas)
- ... differentiated for drainage depth/intensity
- ... differentiated for land use types (forestry, agriculture, peat cutting, ...)

But this kind of peatland data is very scarce!

Peatland mapping faces several problems:

- Terms, concepts, definitions and resolution of data (very) far from being uniform across the Globe
- Available maps often lack detailed information on survey methods
- Peatlands are fragmented by land use: high resolution mapping needed
- Peatlands are diverse - extrapolation of approaches often difficult
- properly analysed & geo-referenced soil profiles from peatlands are rare
- ...

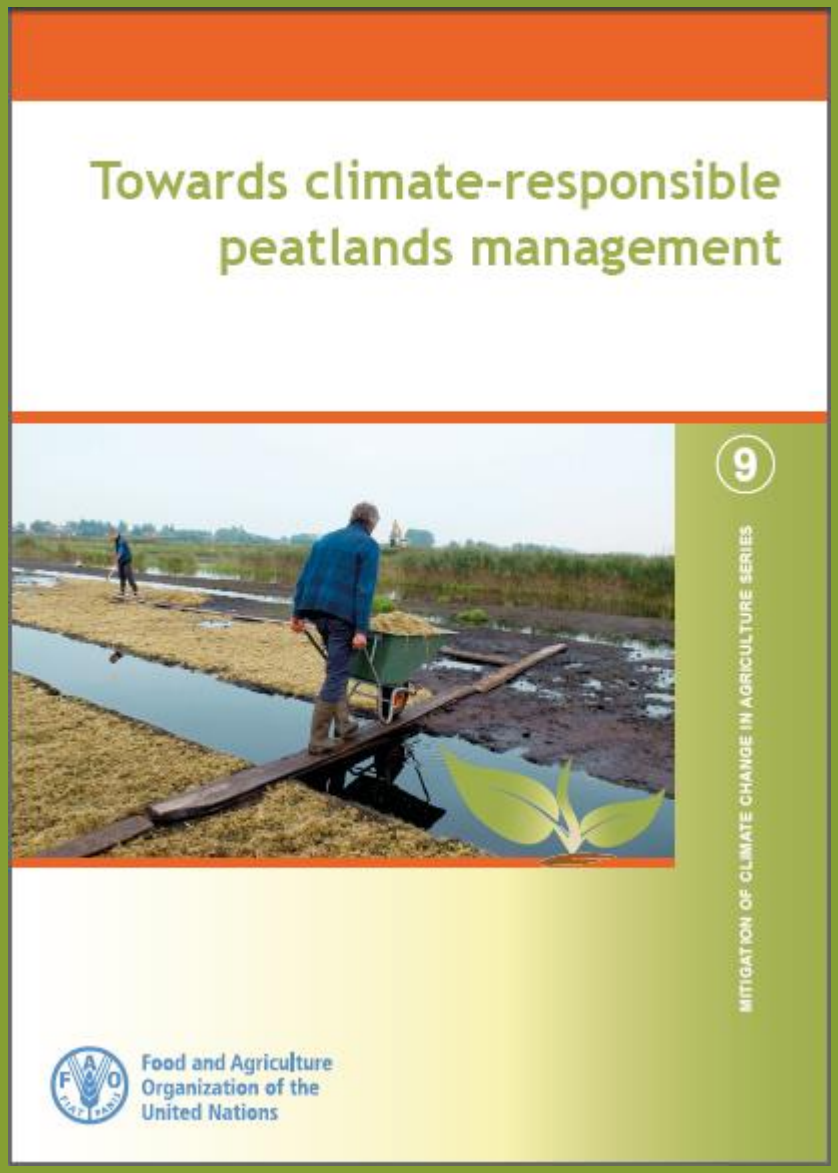
Peatland mapping faces several problems:

Flooded lowlands of Africa

- Hydromorphic soils often not separated into mineral and organic in soil mapping
- Especially in remote areas with difficult access, or the exposure to diseases or predators

- Still fragmentary ecological knowledge for vast areas

FAO (2014): summarized the future of peatland mapping



'Future global peatland mapping systems should be based on aggregated data from local and national peat information (...).'

'The first step (...) would be a complete inventory of the available national and global peatland information.'

L. Montanarella

Such an inventory started several years ago: in the IMCG Gobal Peatland Database.

The IMCG Global Peatland Database...

GREIFSWALD MIRE CENTRE

... coordinated by the Greifswald Mire Centre (Greifswald, NE-Germany)

... largest database of distribution and status of peatlands for all countries of the World.

... is a continuously developing & improving database of digital peatland, organic soil and peatland proxy data per country or region.

... has a broad variety of data collected, incl. regional GIS data.

(AFRICA: currently ~8,000 digital files in ~ 600 folders ~ 20 GB)

Global Peatland Database - mapping related activities

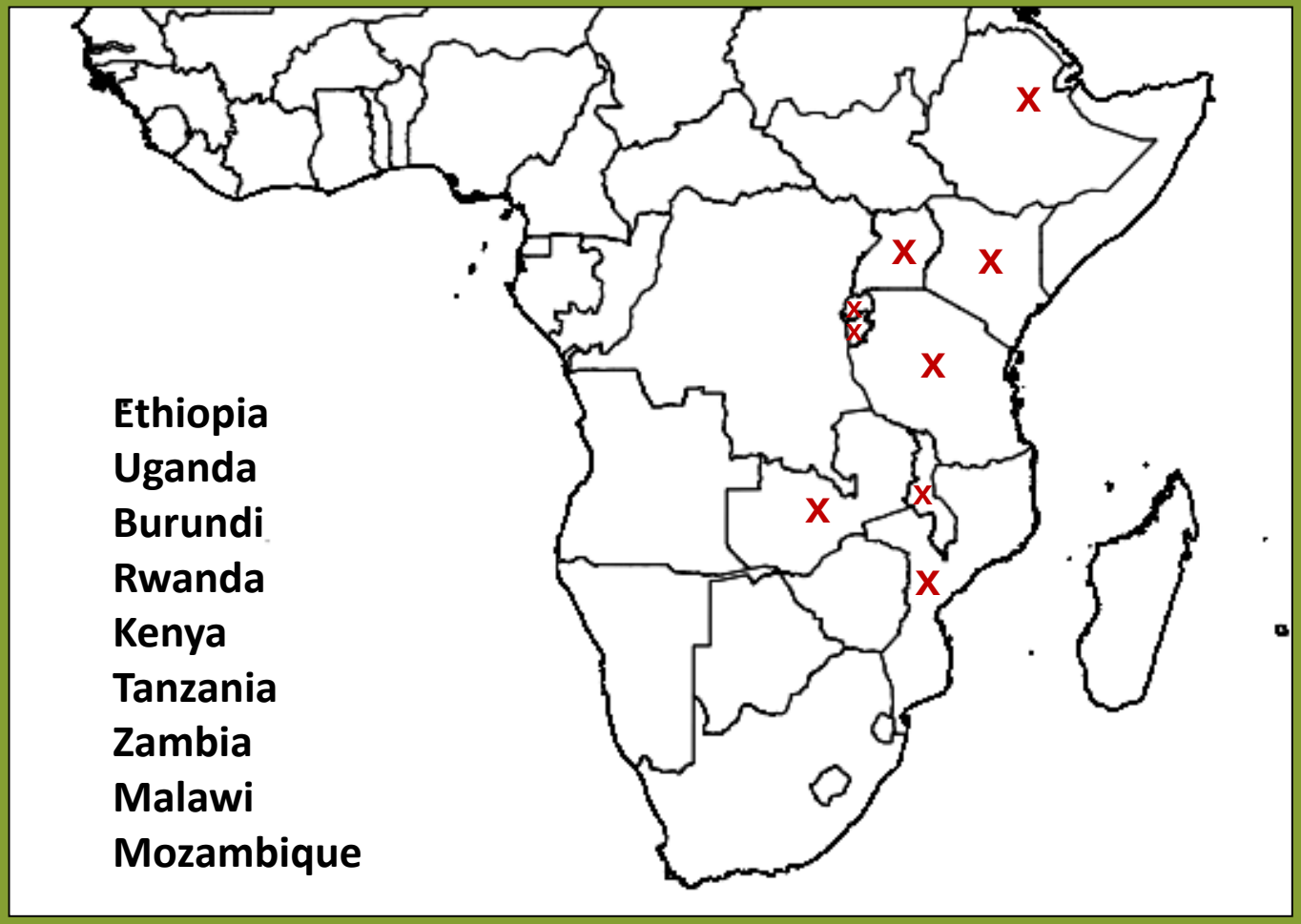
A. Collection of available geospatial peatland or proxy datasets
(e.g. organic and hydromorphic soils, wetlands, vegetation, geology, ...)

- evaluation of completeness and accuracy
- evaluation of underlying terms, definitions and concepts
- identification of restrictions and conflicts within and between datasets

B. Peatland mapping for countries without geospatial peatland data

Global Peatland Database - peatland mapping

Countries of East Africa with considerable amount of peatlands



Global Peatland Database - peatland mapping

- **Vector GIS** (1:25,000) and **Raster GIS** (1 x 1 km grid cells)

- **mapping of '*confirmed*', '*probable*', *and* ,*possible*' peatland areas** (depending on the reliability of the integrated data)

- **assessment of drainage/degradation status based on satellite images** (no, low, heavy drainage/degradation)

- **attached database with additional information** (e.g. peat depth, peat carbon content, vegetation, peatland type, ...)

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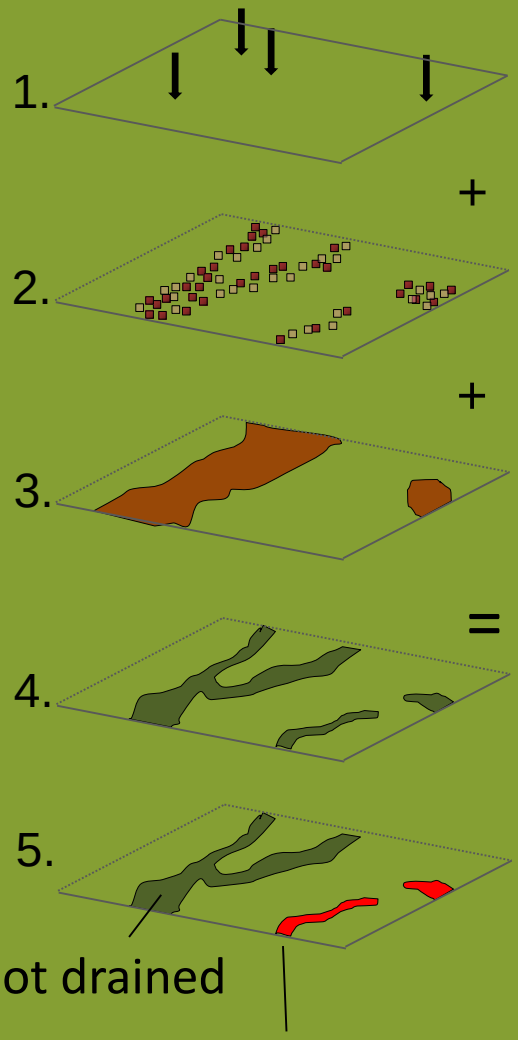
Global Peatland Database - data integration scheme



Diverse 'ground truthing' points from scientific literature *(palaeo-ecology, pedology, geology, ...)* **and from governments, NGO's, companies, ...**

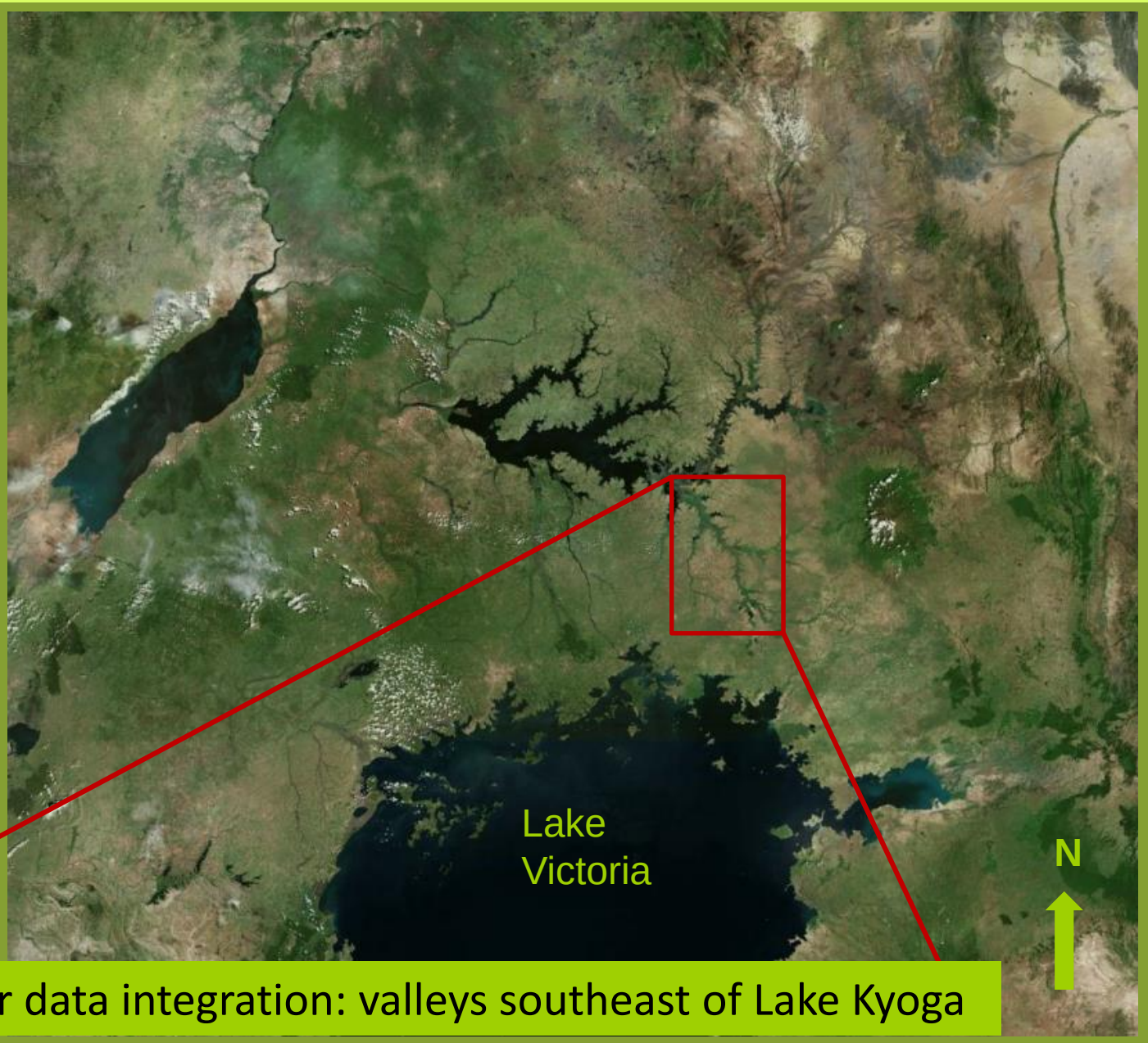
Existing models of landscape constraints *(Digital Elevation Models, Topogr. Wetness Index, Climate Phenology, ...)*

Lower resolution peatland, soil or proxy maps *(e.g. wetlands, vegetation, geology, geomorphology, ...)*

Data integration = manually drawn PEATLAND map *(using QGIS, Google Maps and Bing Aerial; balancing conflicting information, quality control)*

Status assessment for each PEATLAND polygon

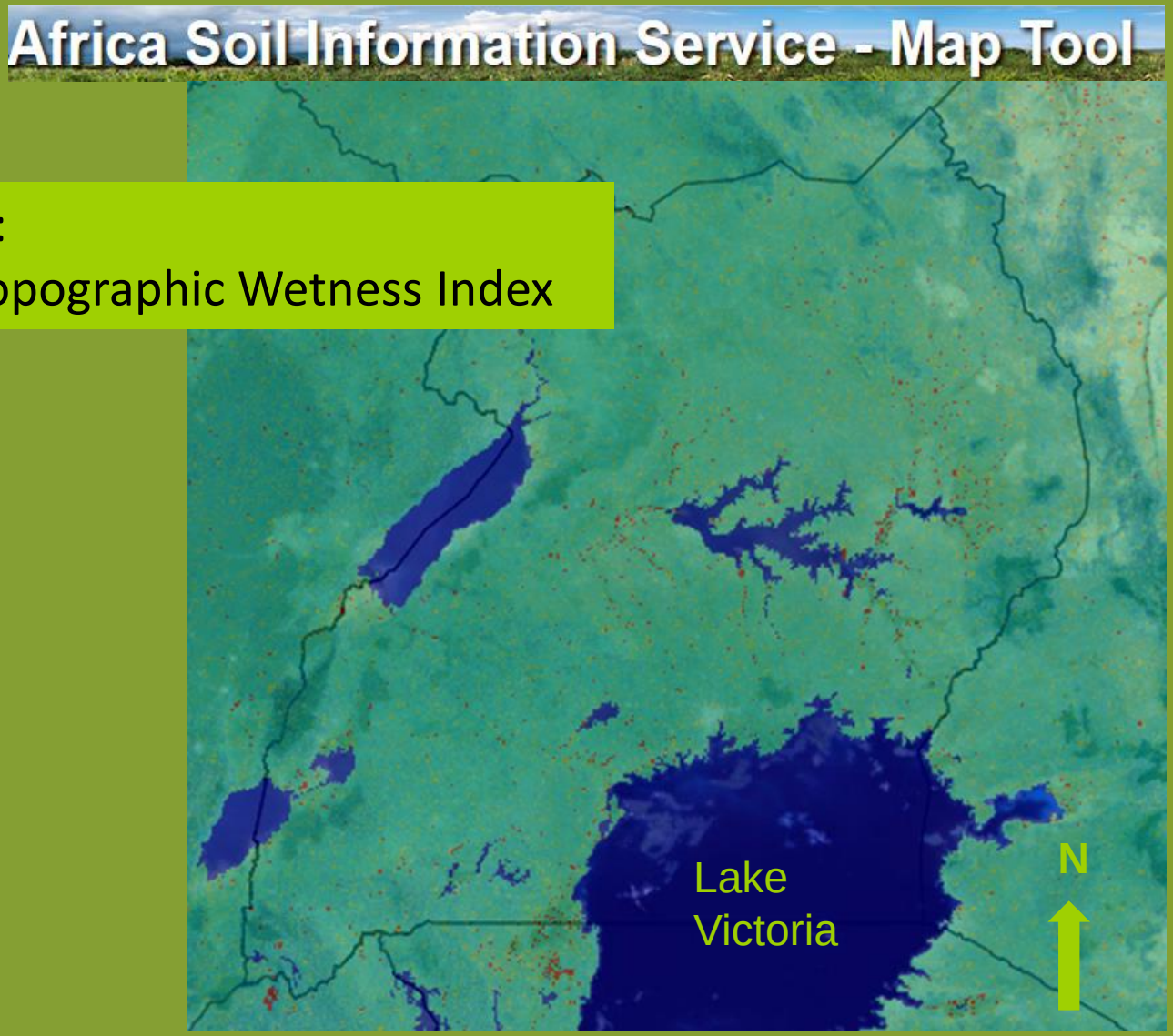
Global Peatland Database - mapping peatlands of Uganda



Example for data integration: valleys southeast of Lake Kyoga

Global Peatland Database - mapping peatlands of Uganda

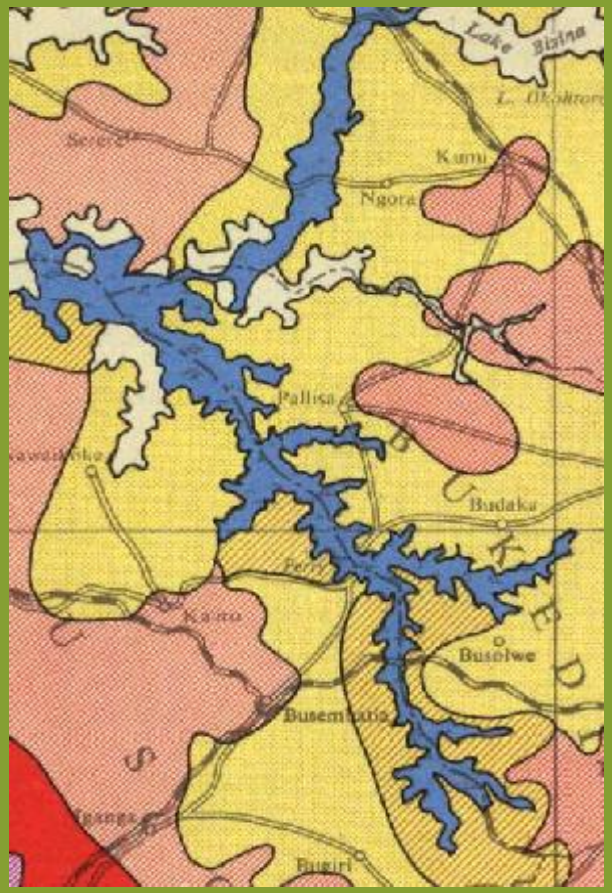
AfSIS homepage:
downloadable Topographic Wetness Index



Global Peatland Database - mapping peatlands of UGANDA

Example for data integration: valleys southeast of Lake Kyoga

Blue: *peat point data* (National Survey for Energy Peat, 2004)



Blue: available legacy soil maps indicate *Fluvisols or Gleysols*

Global Peatland Database - mapping peatlands of UGANDA

Example for data integration: valleys southeast of Lake Kyoga

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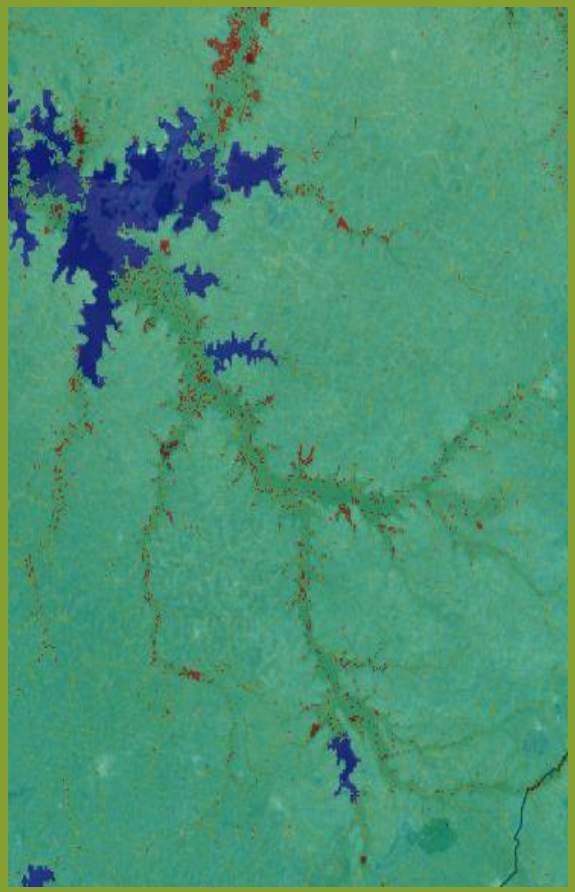

Topographical Wetness Index (AfSIS): high TWI in red & darker blue

Orange: drawn peatland polygons

Global Peatland Database - mapping peatlands of UGANDA

- peat point data (blue dots) = *confirmed*

- main valley polygons with peat point data = *probable peatland areas*

- smaller valleys without peat point data in this region, but with:
  - the same geomorphological setting
  - the same indication from landscape constraints
  - the same appearance on satellite images = *possible peatland areas*

Orange: drawn peatland polygons

IMCG Global Peatland Data Base

Reliability of peatland occurrence assessed with decision tree:
(confirmed, probable, possible)

1.	Presence of mineral soil directly and spatially explicitly designated	no peatland
1*	Not so	2.
2.	Presence of organic soil (peat, Histosol, muck soil, bog soil, organic soil) directly and spatially explicitly designated	3.
2*	Not so	8.
3.	Area represented by a separate 'peatland' mapping unit on a high quality[i] and (preferently) high resolution (≤ 1: 125.000) map	confirmed peatland[ii]
3*	Not so	4.
4.	Presence of peat near the surface spatially explicitly specified for a (few) single core(s) but not for an area	5.
4*	Not so	11.
5.	Maps (vegetation, land use, geomorphology, other) indicate that land around the peat core(s) is or has been a wetland[iii]	6.
5*	Not so	confirmed single spot peat occurrence
6.	Homogenous area surrounding and including the core locality(s) can clearly be delineated with Google Maps[iv]	probable peatland with confirmed peat occurrence

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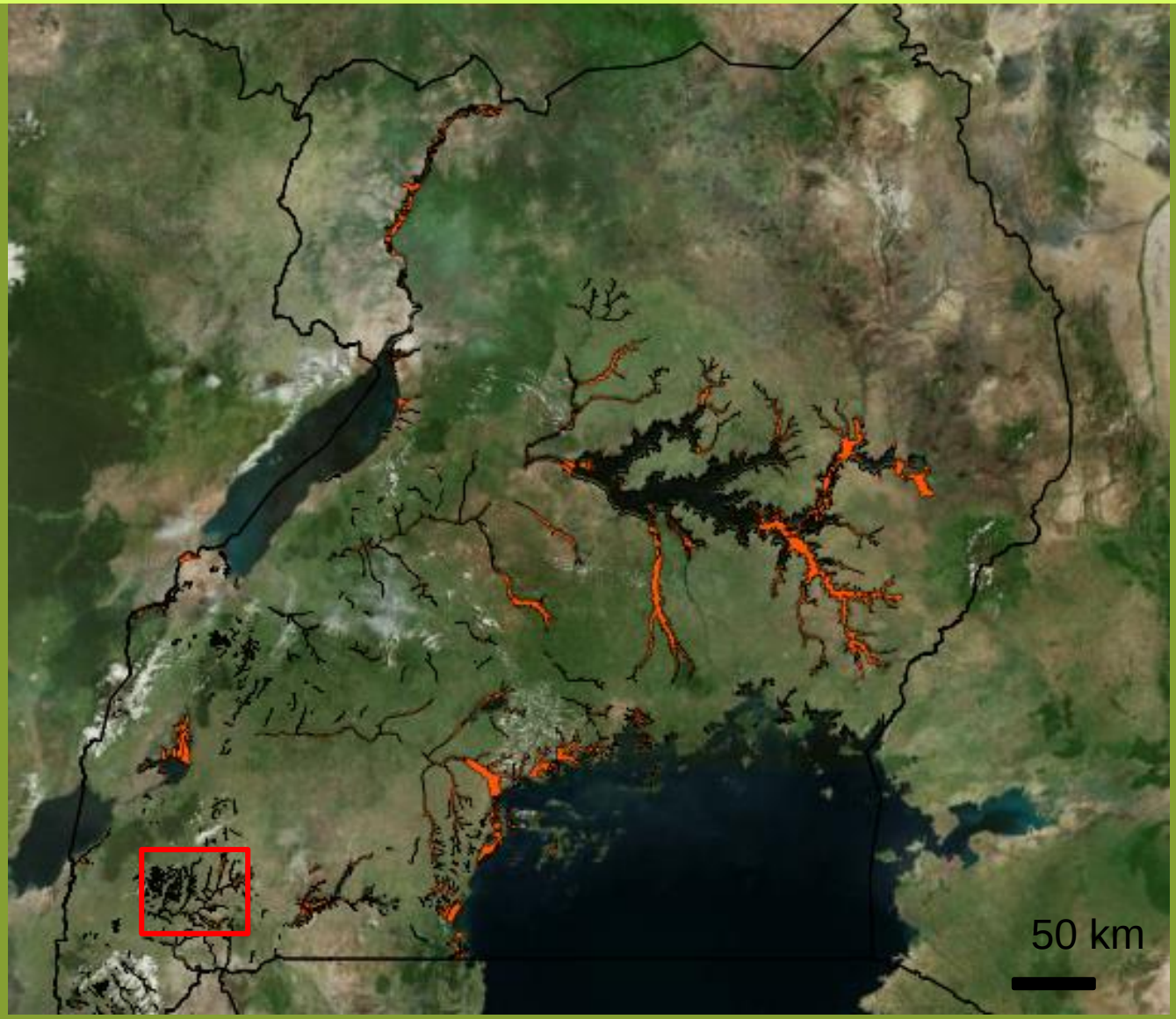
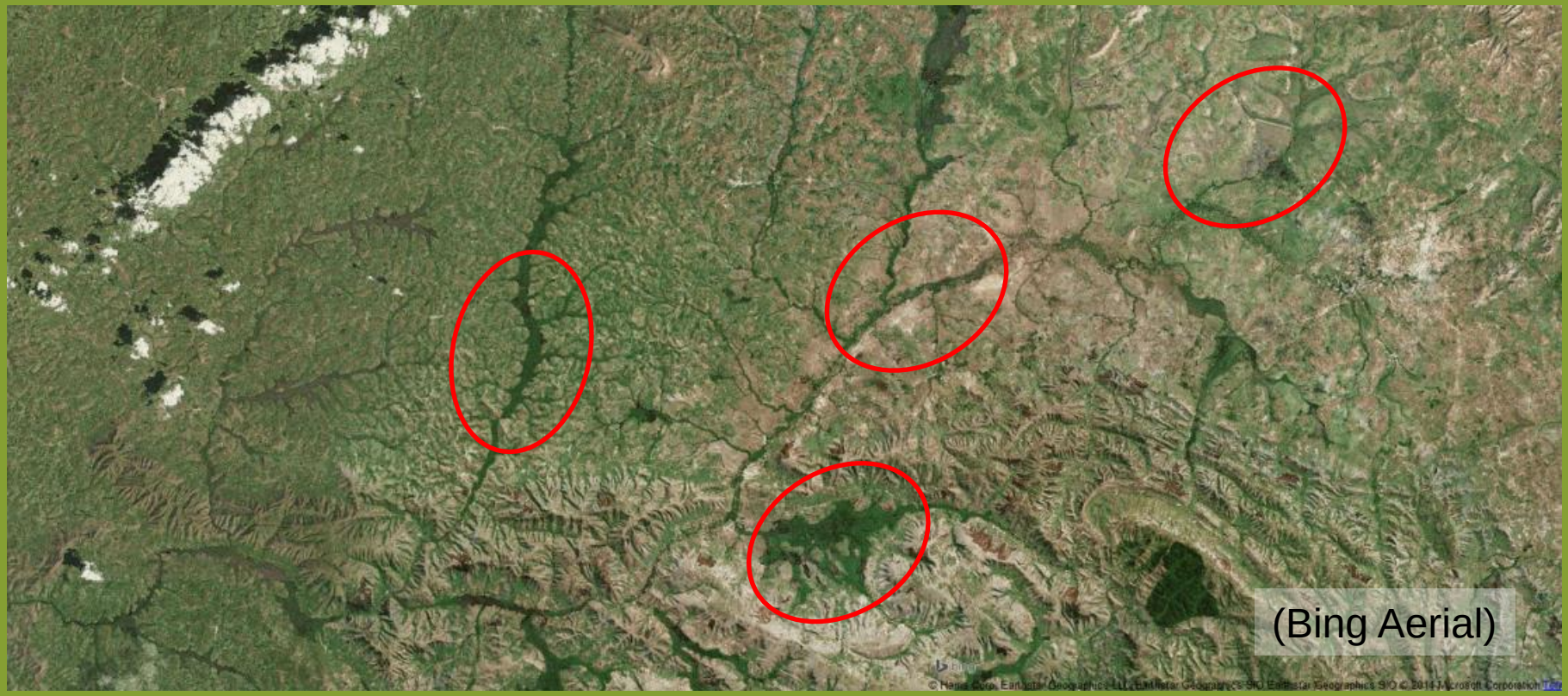
Global Peatland Database - mapping peatlands of UGANDA



Mountains of SW Uganda

Global Peatland Database - mapping peatlands of UGANDA

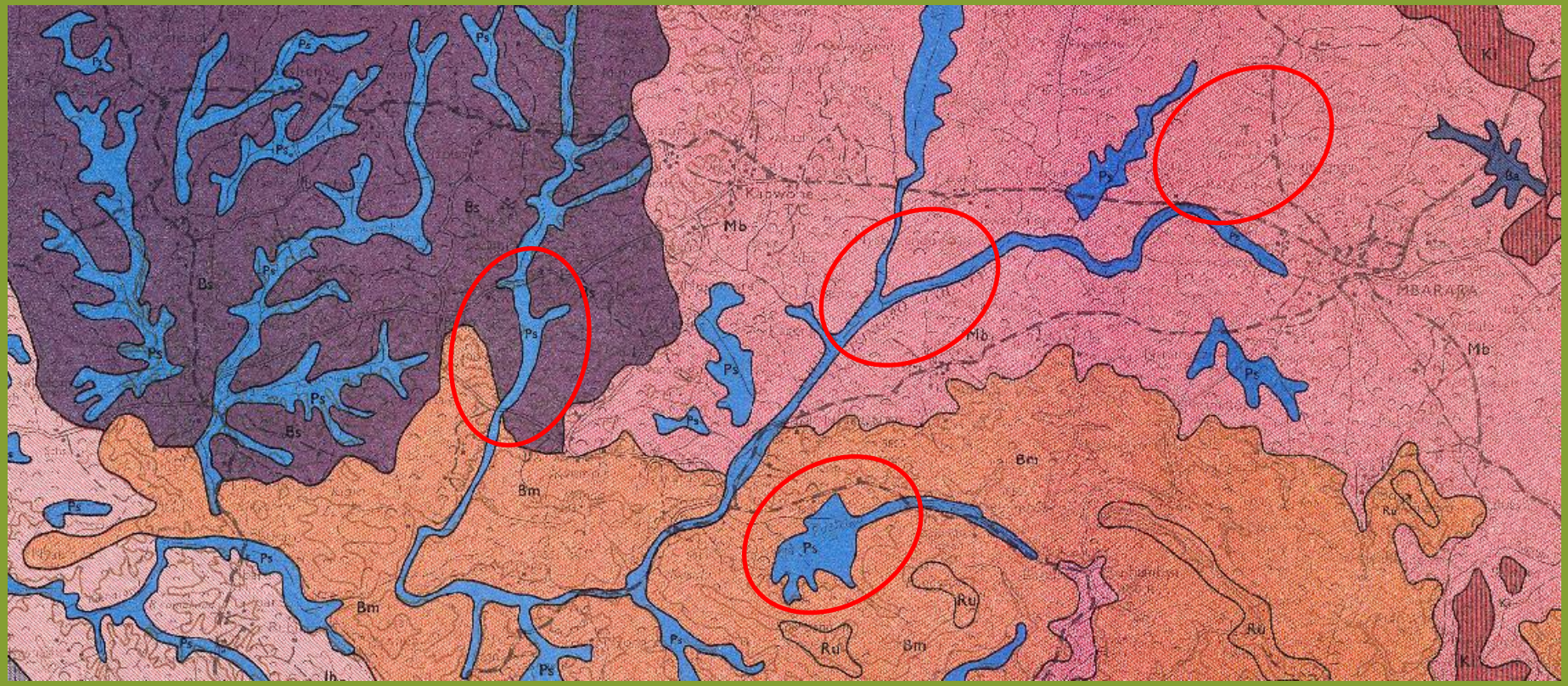


Valleys/bottomlands in SW Uganda

Global Peatland Database - mapping peatlands of UGANDA

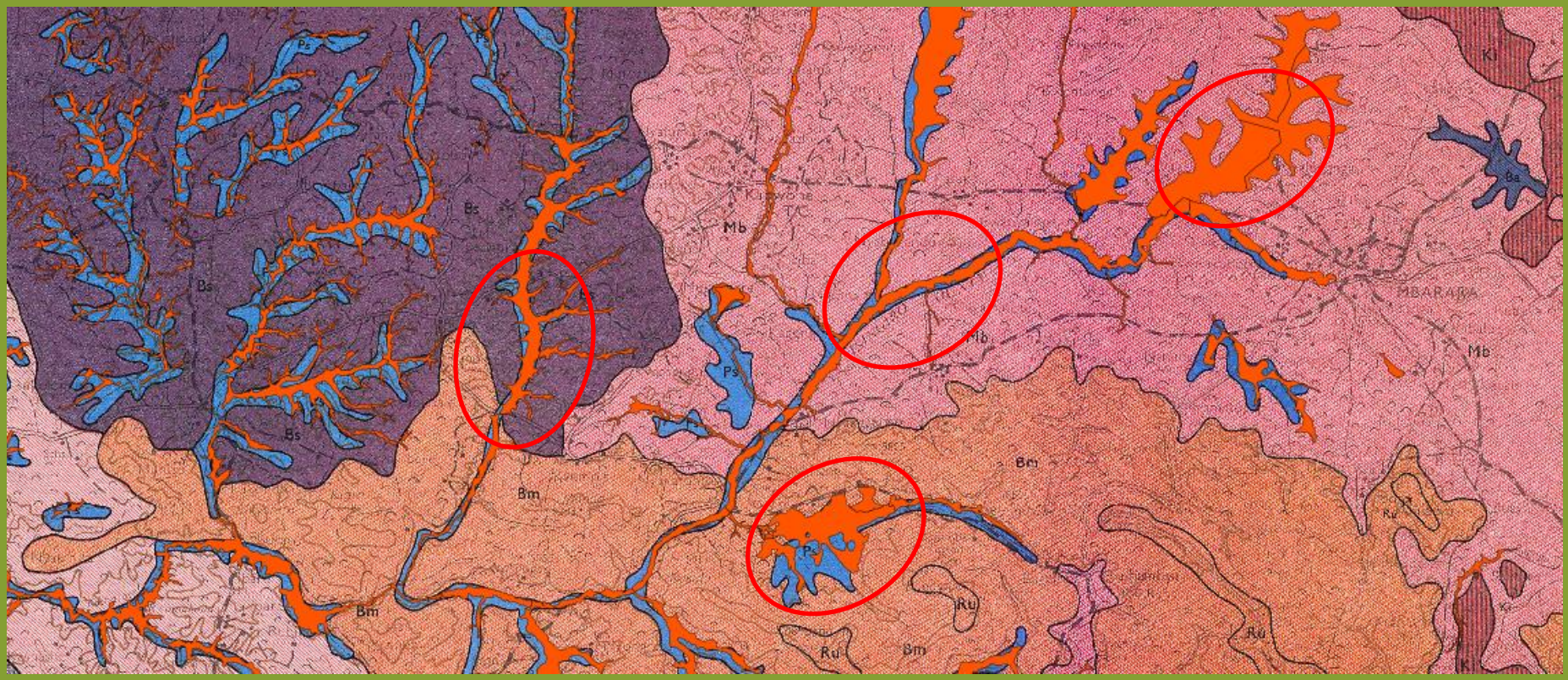
Red/darker blue: areas with high Topographic Wetness Index

Global Peatland Database - mapping peatlands of UGANDA



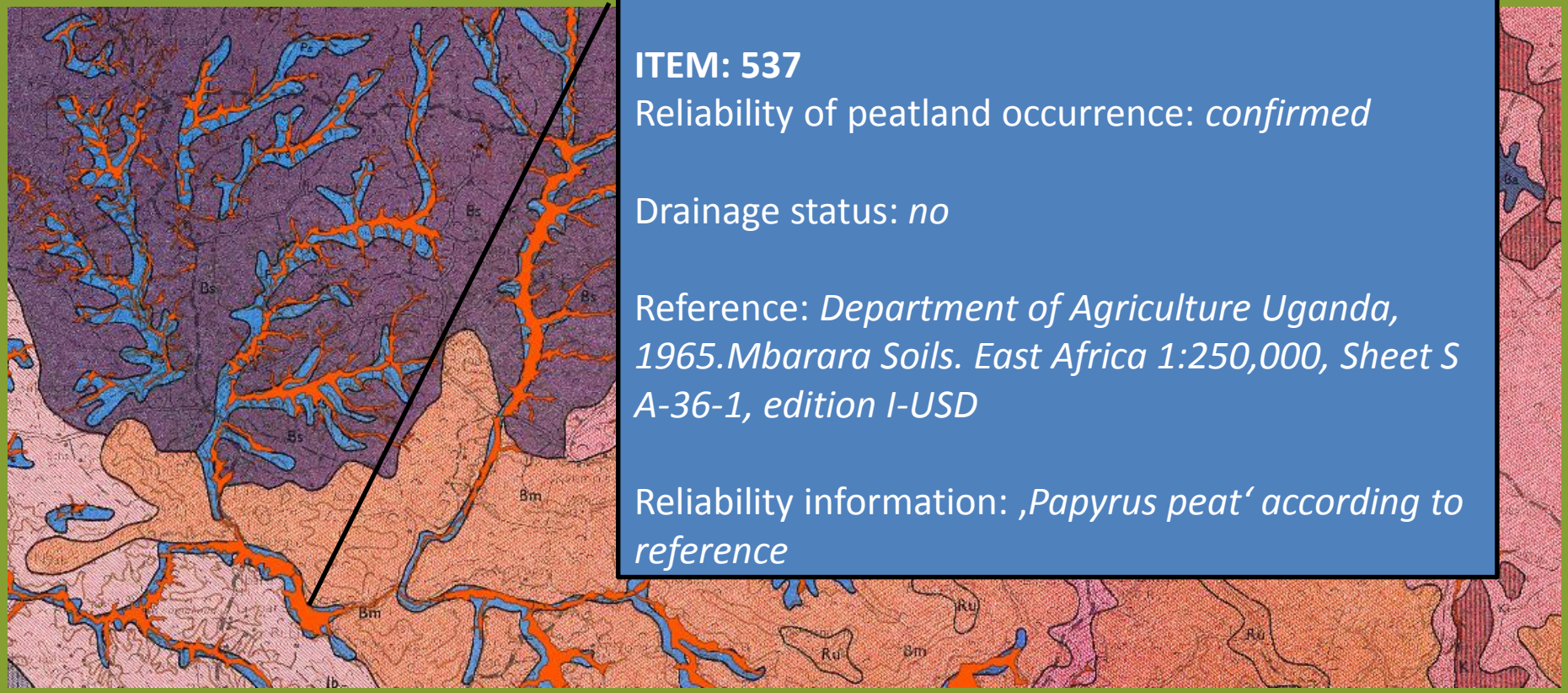
Blue: areas with ‘Papyrus peat’ (legacy soil map)

Global Peatland Database - mapping peatlands of UGANDA



Orange: Peatland areas deduced due to integration of diverse information

Global Peatland Database - mapping peatlands of UGANDA



ITEM: 537
Reliability of peatland occurrence: *confirmed*

Drainage status: *no*

Reference: *Department of Agriculture Uganda, 1965.Mbarara Soils. East Africa 1:250,000, Sheet S A-36-1, edition I-USD*

Reliability information: *‚Papyrus peat' according to reference*

Each polygon of the peatland map gets at least the entries as shown.

IMCG Global Peatland Data Base

Peatland status: „no drainage/degradation“

IMCG Global Peatland Data Base

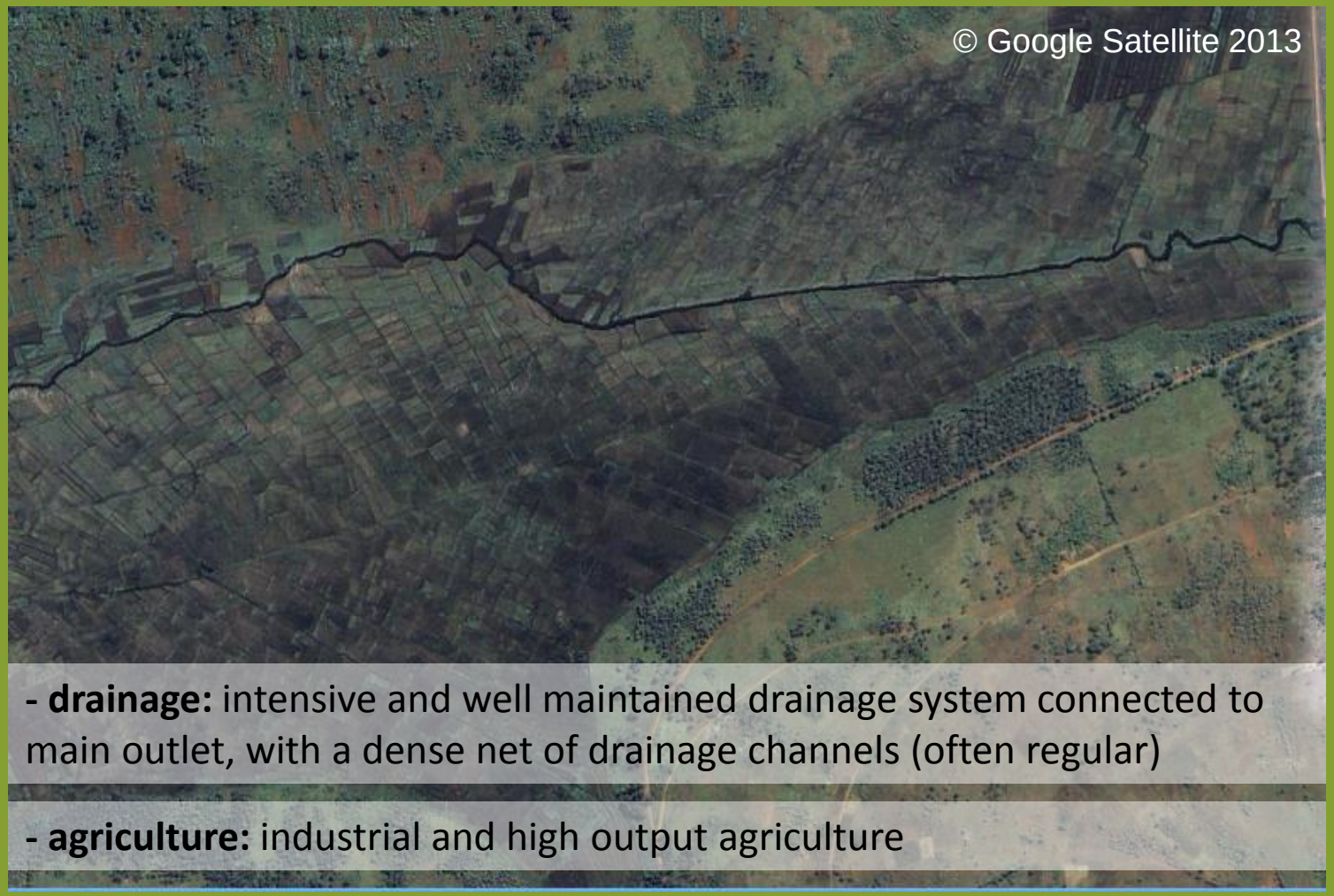
Peatland status: „low drainage/degradation“

- **drainage:** small scale drainage without connection to main outlet or only few drainage channels with connection to main outlet

- **agriculture:** predominantly subsistence fields (often irregular structures)

IMCG Global Peatland Data Base

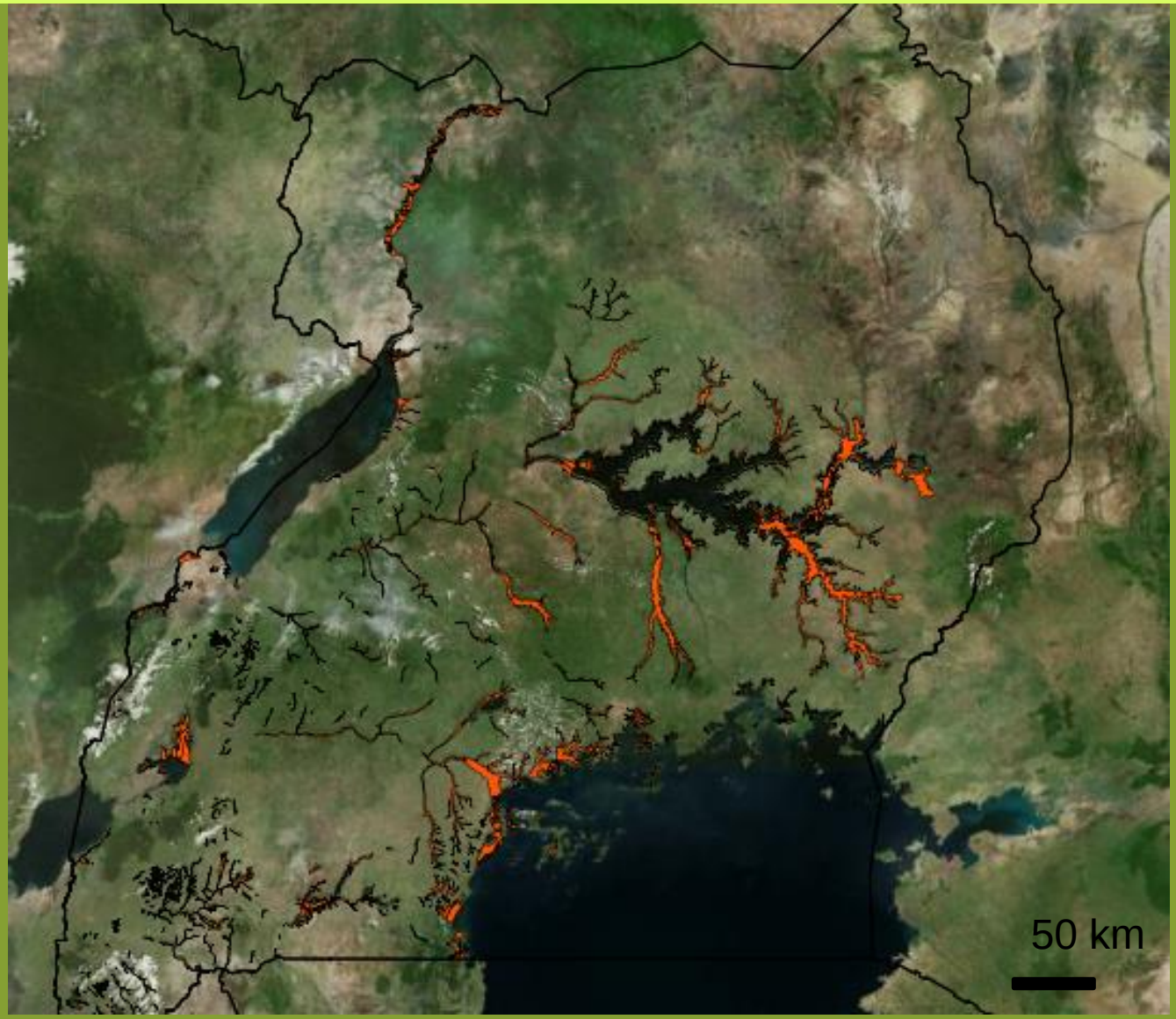
Peatland status: heavy drainage/degradation



- **drainage:** intensive and well maintained drainage system connected to main outlet, with a dense net of drainage channels (often regular)

- **agriculture:** industrial and high output agriculture

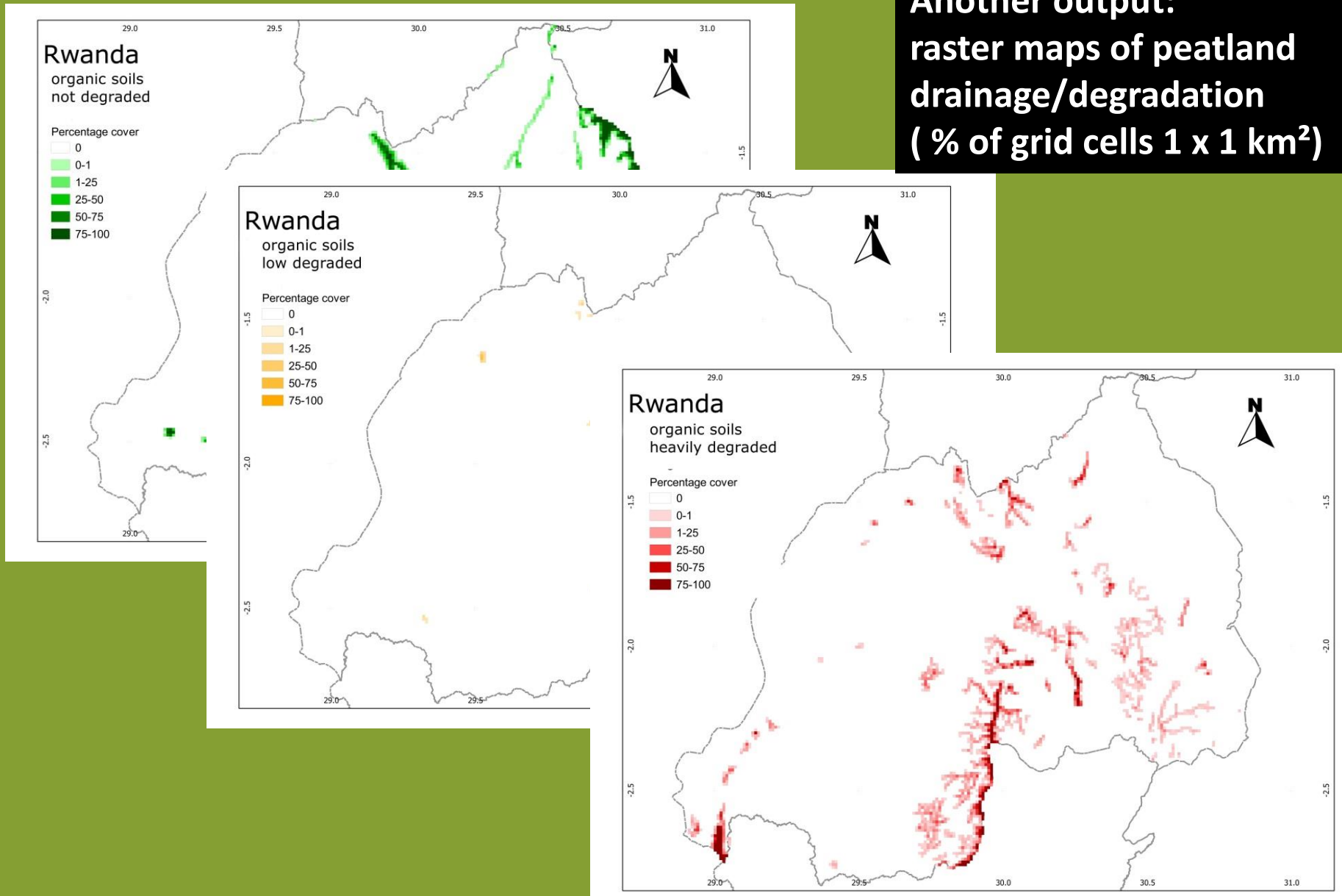
Global Peatland Database - mapping peatlands of UGANDA



~ 60% 'confirmed' and 'probable' peatland polygons

Global Peatland Database - mapping peatlands of RWANDA

Another output:
raster maps of peatland drainage/degradation
(% of grid cells 1 x 1 km²)



The aim of the Greifswald Mire Center is to produce reasonable peatland maps for all countries/regions without sufficient peatland data until 2020.

We offer our expertise,

- to develop regional and peatland type adapted models to indicate them, based on Digital Elevation Models, Topographic Soil Wetness, Climate Phenology, Landforms, Hydrology, ...

- for interpreting legacy soil maps regarding peatland occurrence

We invite you,

- to share your soil science expertise...

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... to get peatland emissions integrated in the Post-Kyoto Climate Agreement (UNFCCC)!

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