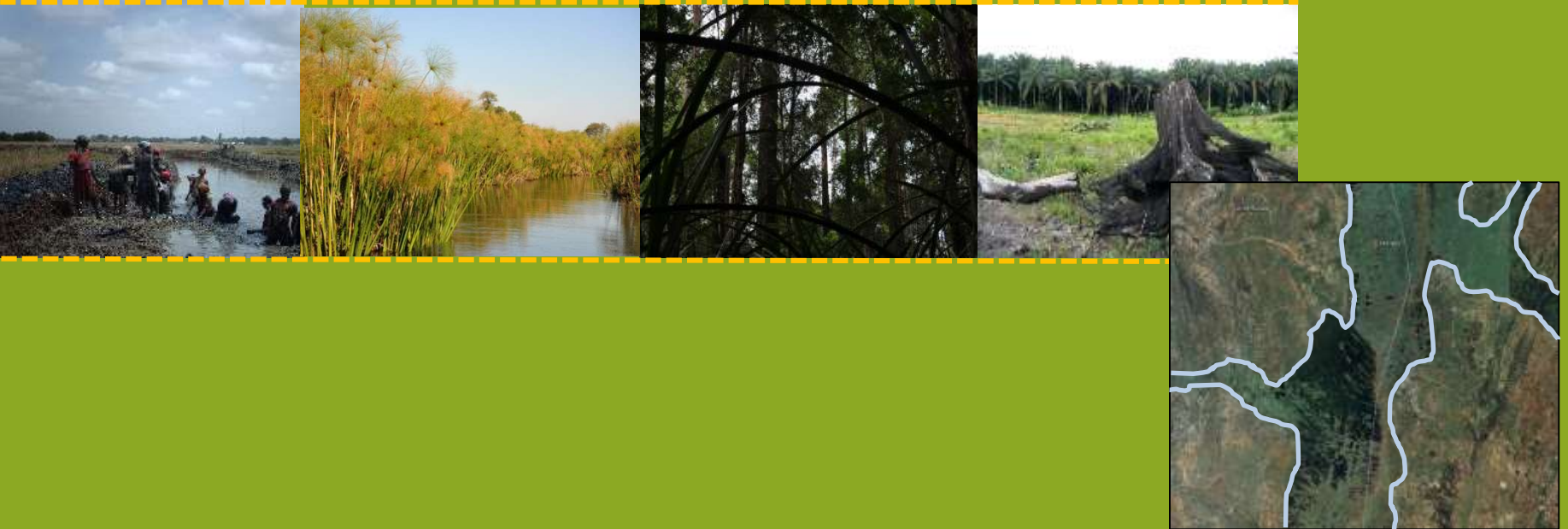


Distribution and degradation status of tropical peatland types



Alexandra Barthelmes
Cosima Tegetmeyer
Hans Joosten



**GREIFSWALD
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Tropical peatlands - a long way to accept it...

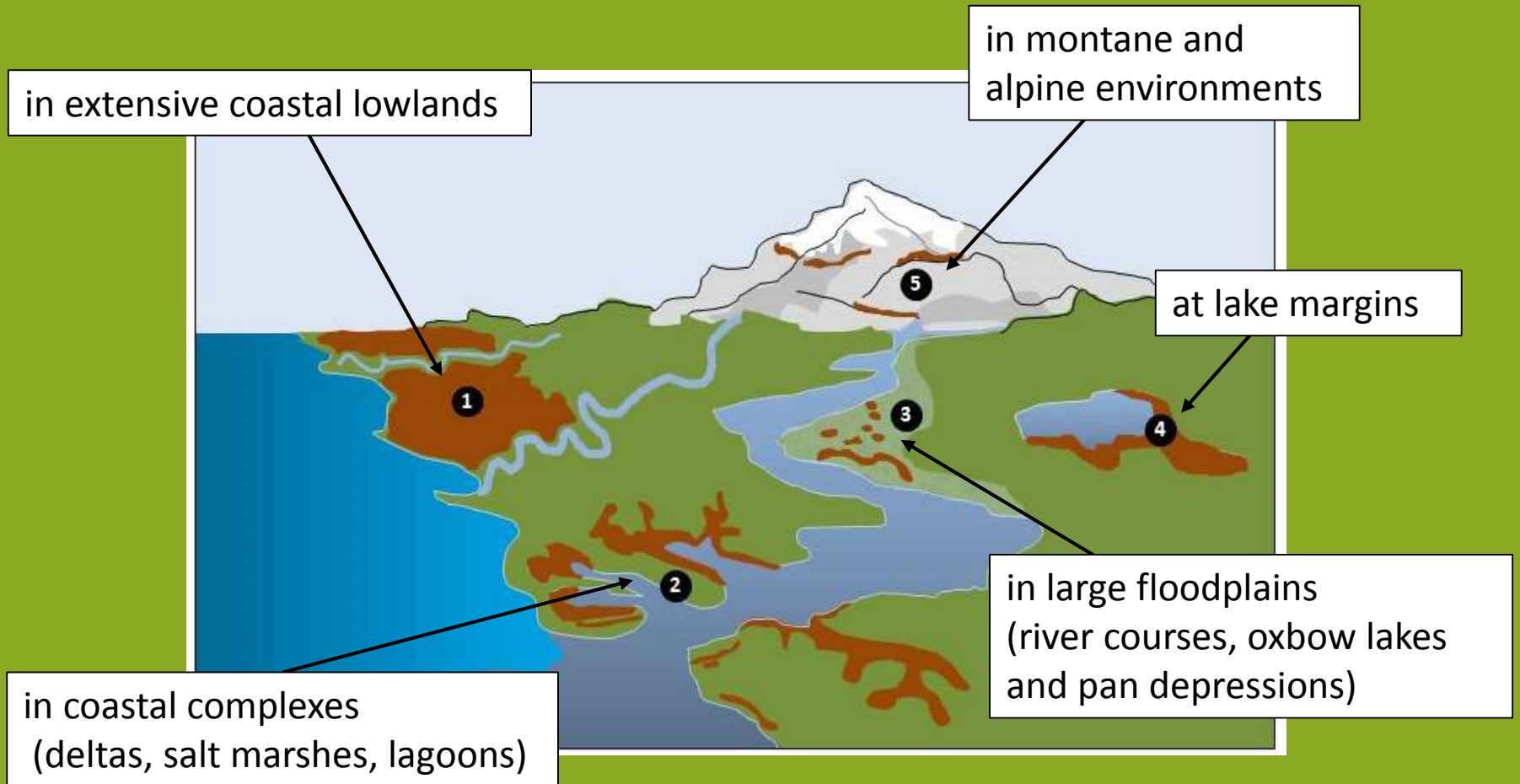
Staring (1856): “In the tropics peat formation is impossible, because the plants decompose too rapidly”

Früh & Schröter (1904): entire book chapter “On the absence of typical peatlands in subtropical and tropical climates”



...and now, we recognize the wide spread occurrence and diversity of tropical peatlands (and their use).

Where can we expect tropical peatlands?



Tropical peatlands



**Comprehensive and high resolution geospatial data
on peatlands is urgently needed...,**

**... and developing a hotspot map of peat
distribution might be a feasible first step!**

Tropical peatlands



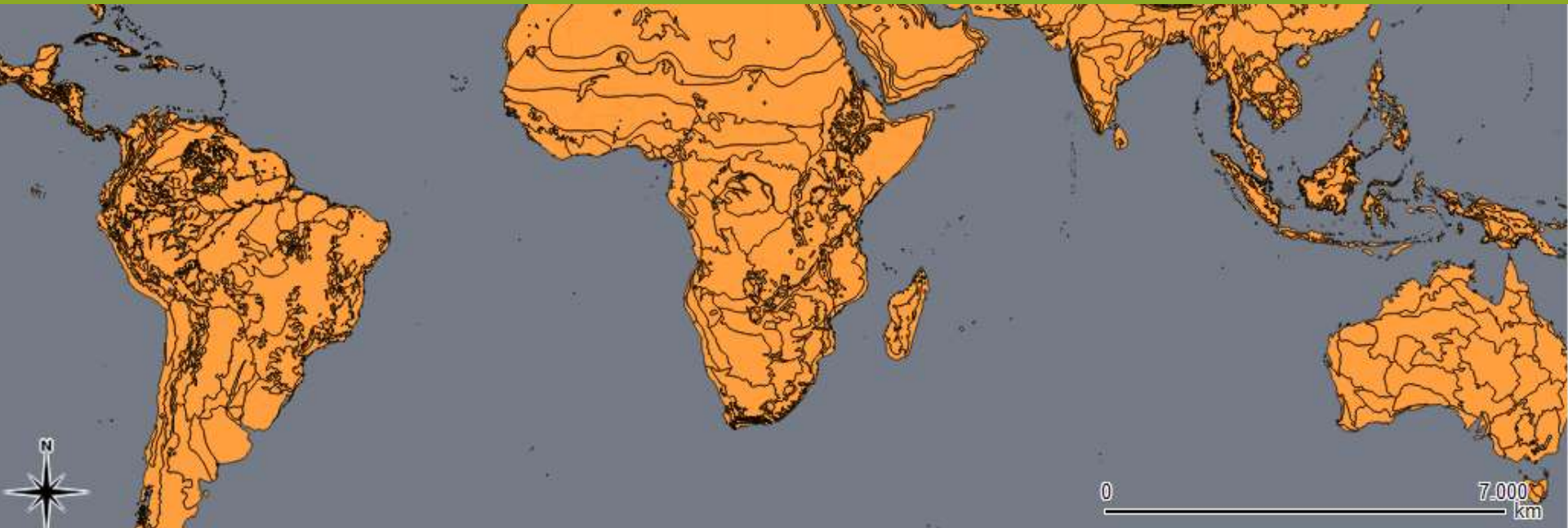
**We currently compiling a map of
tropical ecozones
with substantial peat occurrences.**



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Peat distribution in the tropics - used key datasets

1. Terrestrial Ecoregions of the World (Olson et al. 2001)

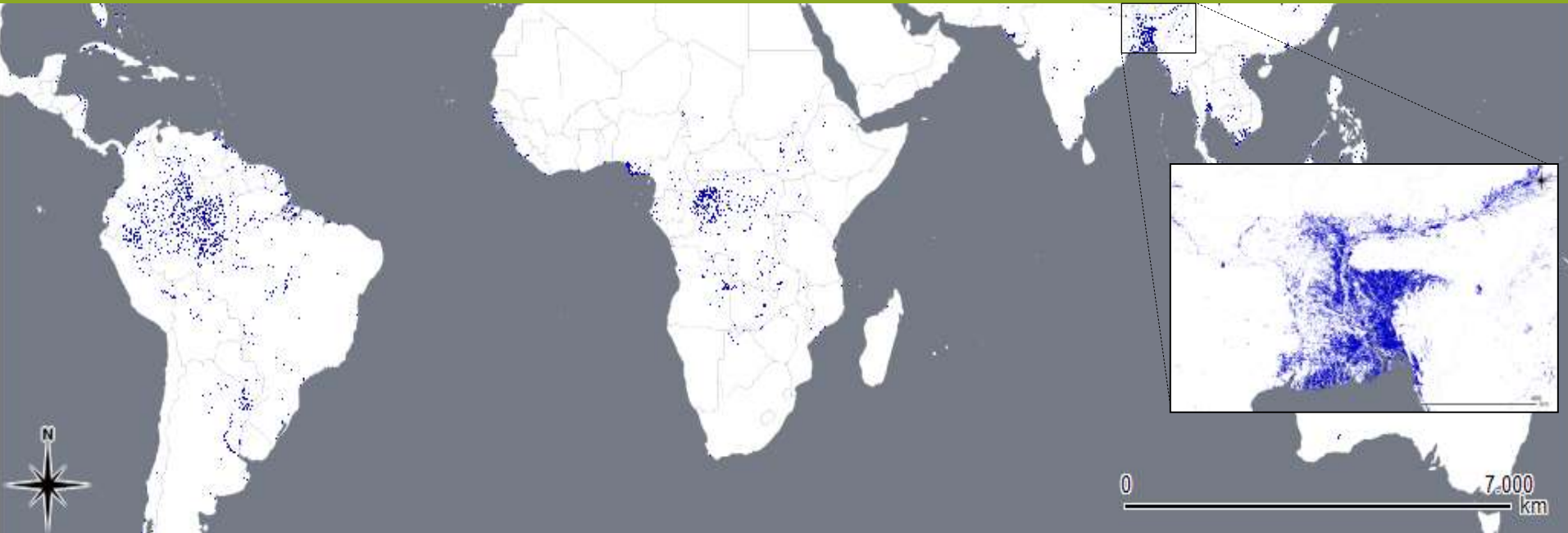


Defined ecoregions as relatively large units of land containing a distinct assemblage of natural communities and species.

A very suitable classification of 'Life on Earth' – provides information on the occurrence of wetlands, peatlands or 'moorlands' in ecozones.

Peat distribution in the tropics - used key datasets

2. GIS-data on 'peat' distribution available from CIFOR (Gumbricht et al. 2017)

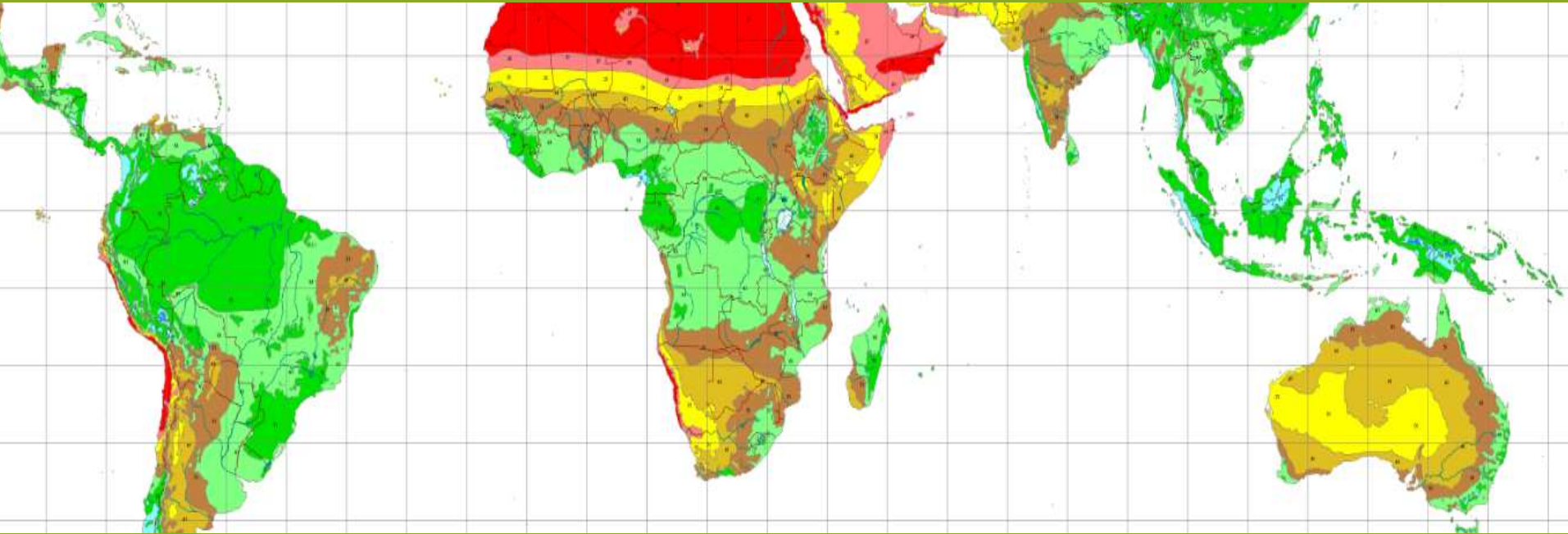


Gives valuable overview on the extent of long-term waterlogged soils in tropical lowland wetlands (one indicator for peat occurrence).

(cf. the following presentation from Rosa Maria Roman-Cuesta)

Peatland distribution in the tropics – used key datasets

3. Bioclimatic maps of the World: Ombrotypes (Rivas-Martínez et al. 2011)



Bioclimatology: Ecological science dealing with the relations between the climate and the distribution of the living species on the Earth.

We deduce the **humid tropics** with constantly high mean temperatures and excessive rainfall – obviously a good climate for peatlands to grow ;-)

Peatland distribution in the tropics – the approach

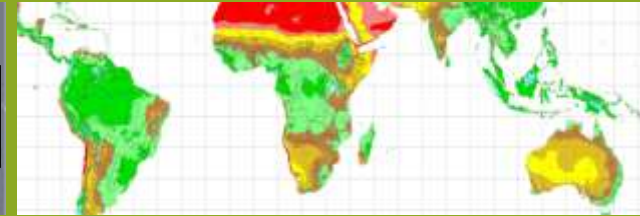
ecozones



lowland wetlands ('peat')



humid climate



cross check with regional GIS datasets, digital soil maps and supplementary information collated in the Global Peatland Database



Ecozones with substantial peat occurrences in the Tropics



Peatland types according to dominating vegetation, altitude and geomorphological features

Peatland distribution in the tropics – first results



So far, we identified 48 tropical eozones with substantial peat occurrences spread across the tropics.







Distribution centres are:

- South America from Venezuela to Uruguay**
- Sub-Sahara Africa from Ethiopia to Zambia**
- Asia (from Bangladesh to Papua New Guinea)**

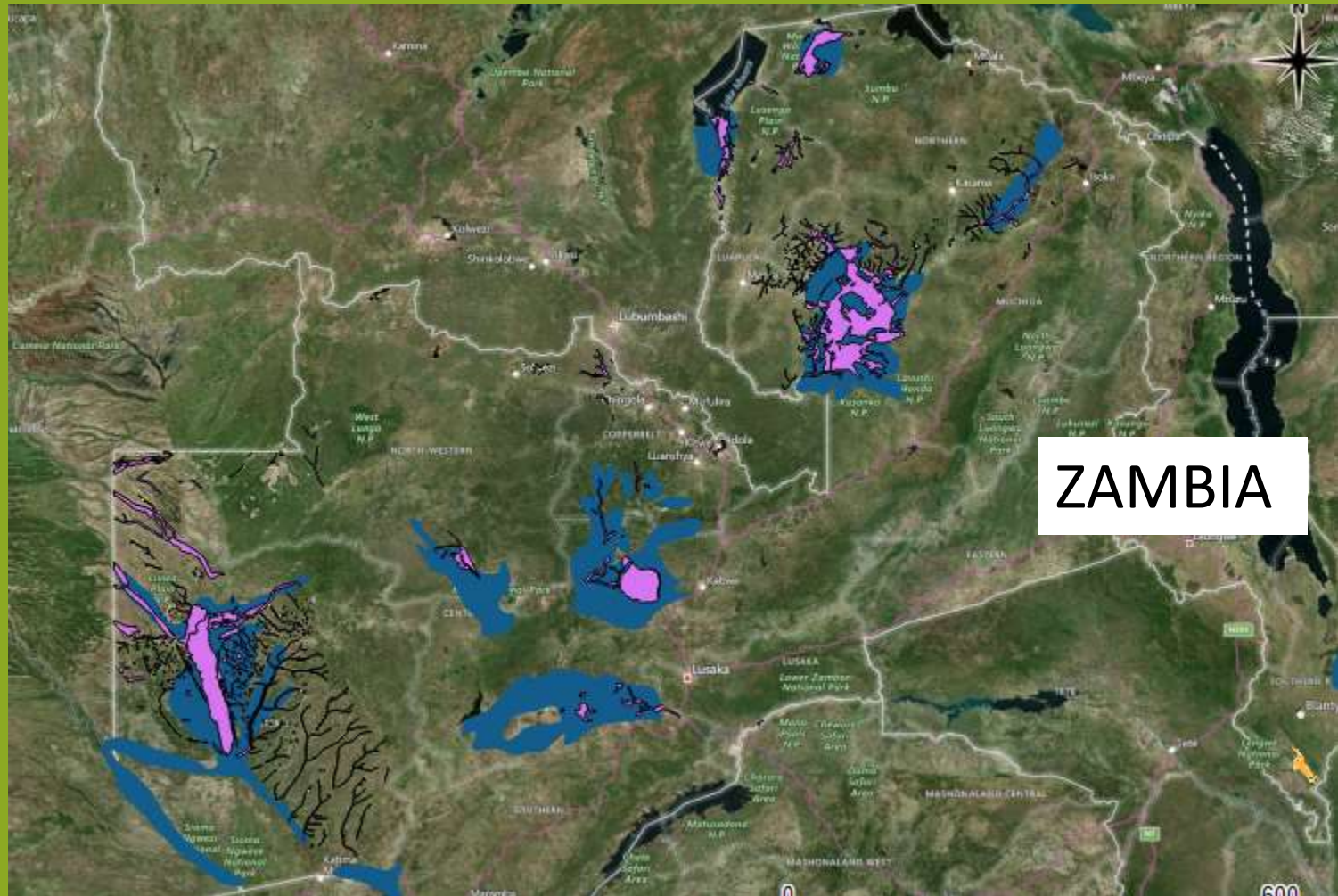
Peatland distribution in the tropics – first results



We also roughly classified 6 ‘peatland types’ in these ecozones:

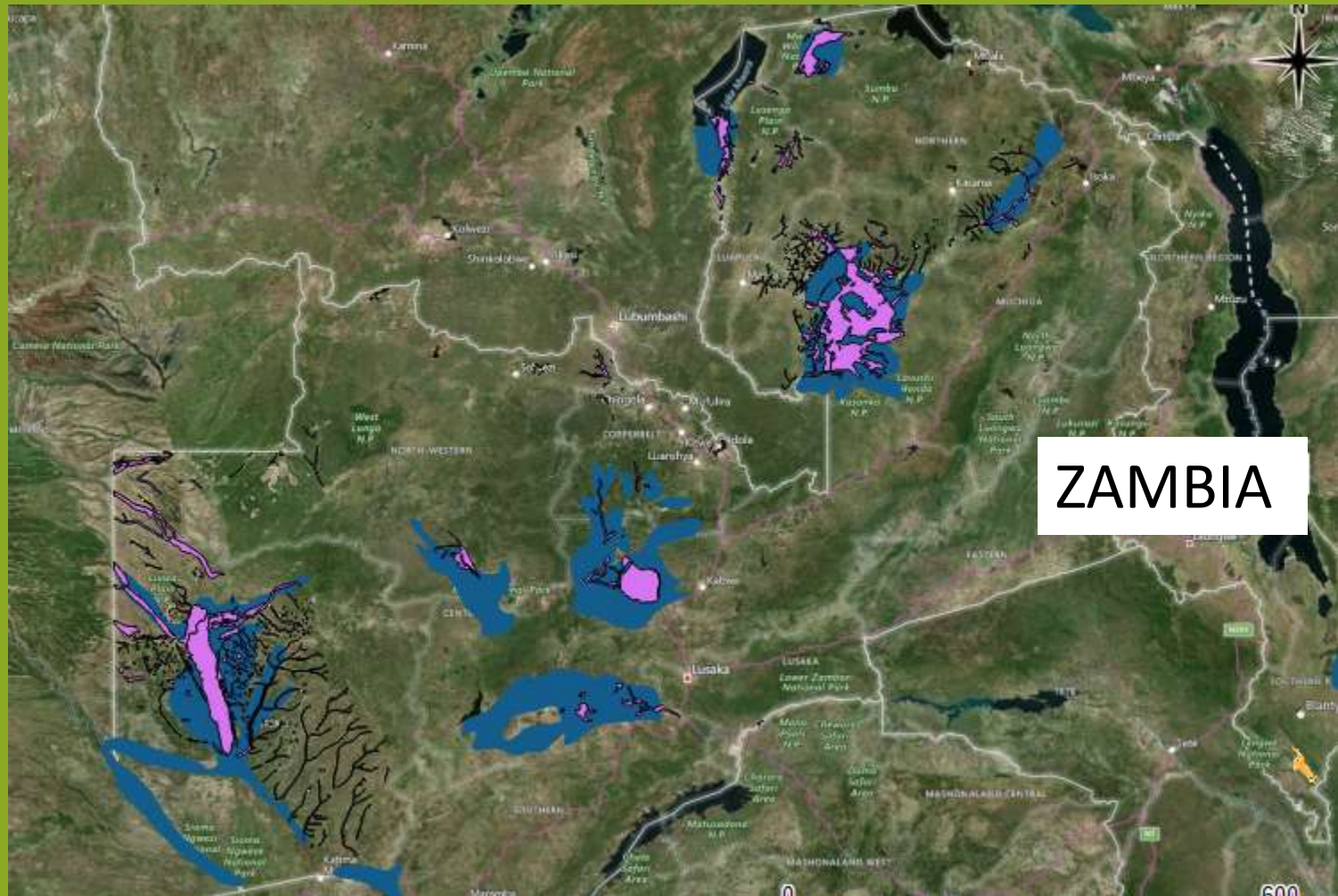
-  Flooded grassland and savanna (large floodplains)
-  Montane and alpine grassland (higher altitudes)
-  Peat Swamp Forests (extensive coastal lowlands)
-  Freshwater Forests (extensive coastal lowlands)
-  Coastal environments (mangroves, lagoons, river deltas)
-  Mixed Amazon wetland vegetation (Amazon Basin)

Peatland distribution in the tropics – first results



Relation of the ecozone 'Zambesian flooded grassland' in Zambia (blue) and soil units with peat occurrence (rose; peatland probability map from own mapping)

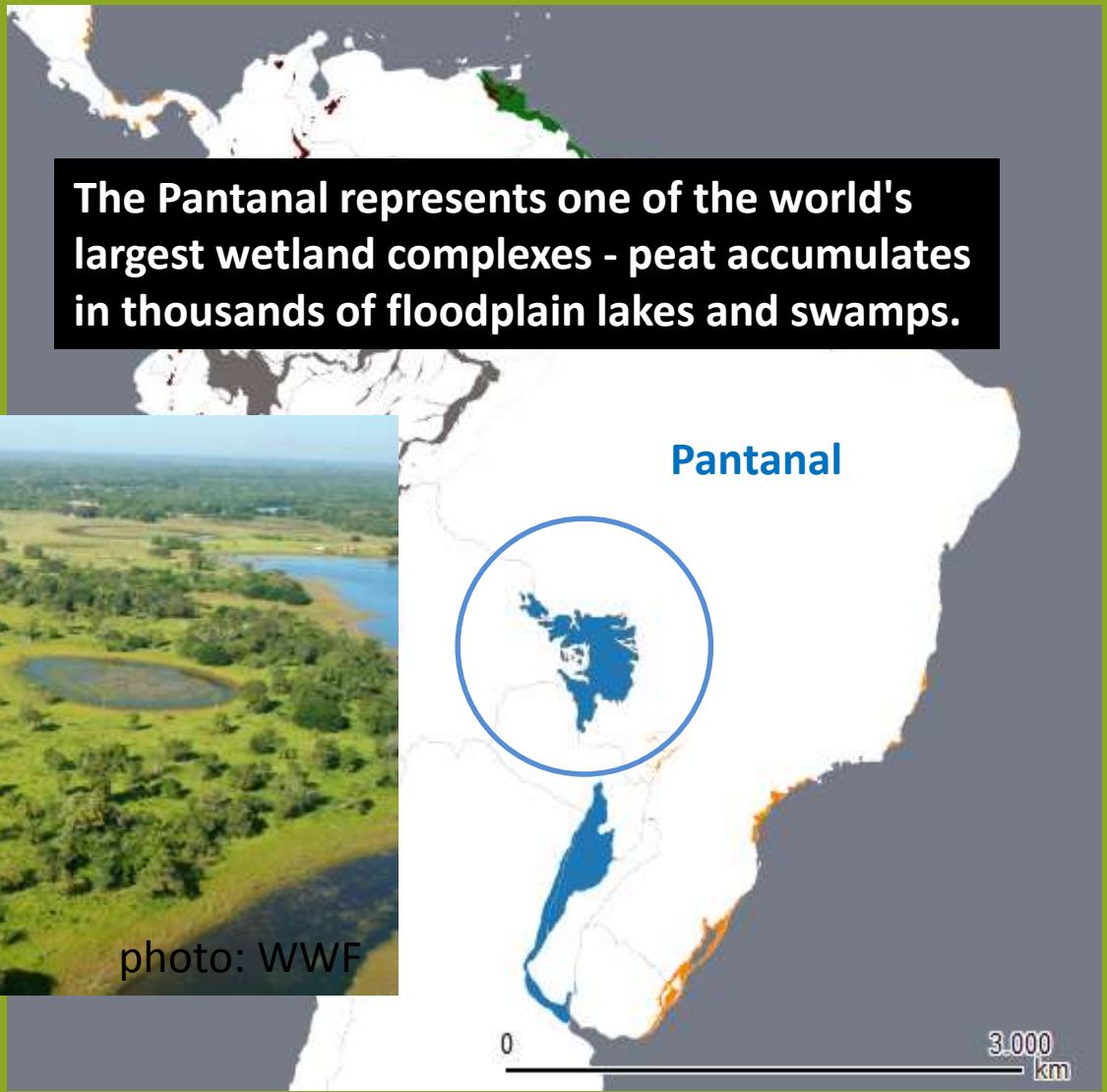
Peatland distribution in the tropics – first results



This new map of ecozones has a pantropical coverage, but a low resolution, and the available high resolution datasets on peat occurrence are very fragmentary for the tropics...

Peatland distribution in the tropics – first results

a closer look at South America



flooded grassland & savanna

Peatland distribution in the tropics – first results

a closer look at South America

Paramos/Wet Puna: high Andean peat accumulating grasslands



 montane and alpine grassland

Peatland distribution in the tropics – first results

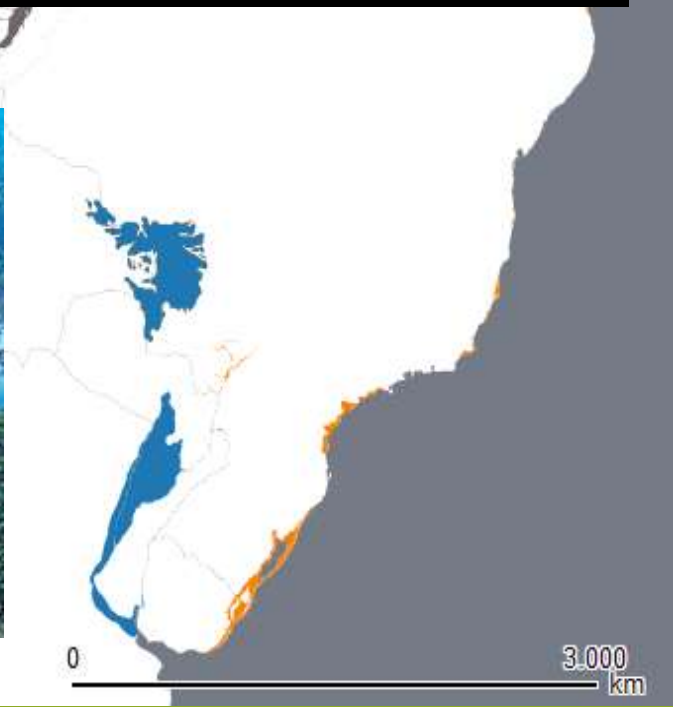
A closer look at South America



These peat swamp forest ecozones includes also marshes and oxbows lakes with abundant peat accumulation.



photo: WWF



Guyana peat swamp forest / Orinoco delta peat swamp forest

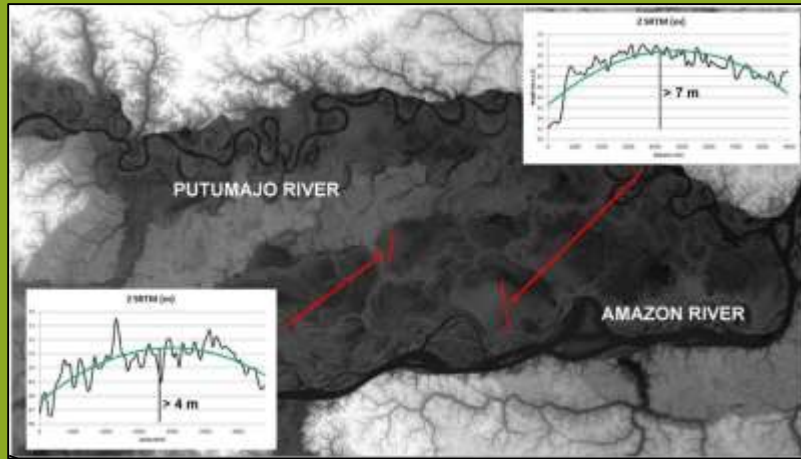
Peatland distribution in the tropics – first results

A closer look at
South America



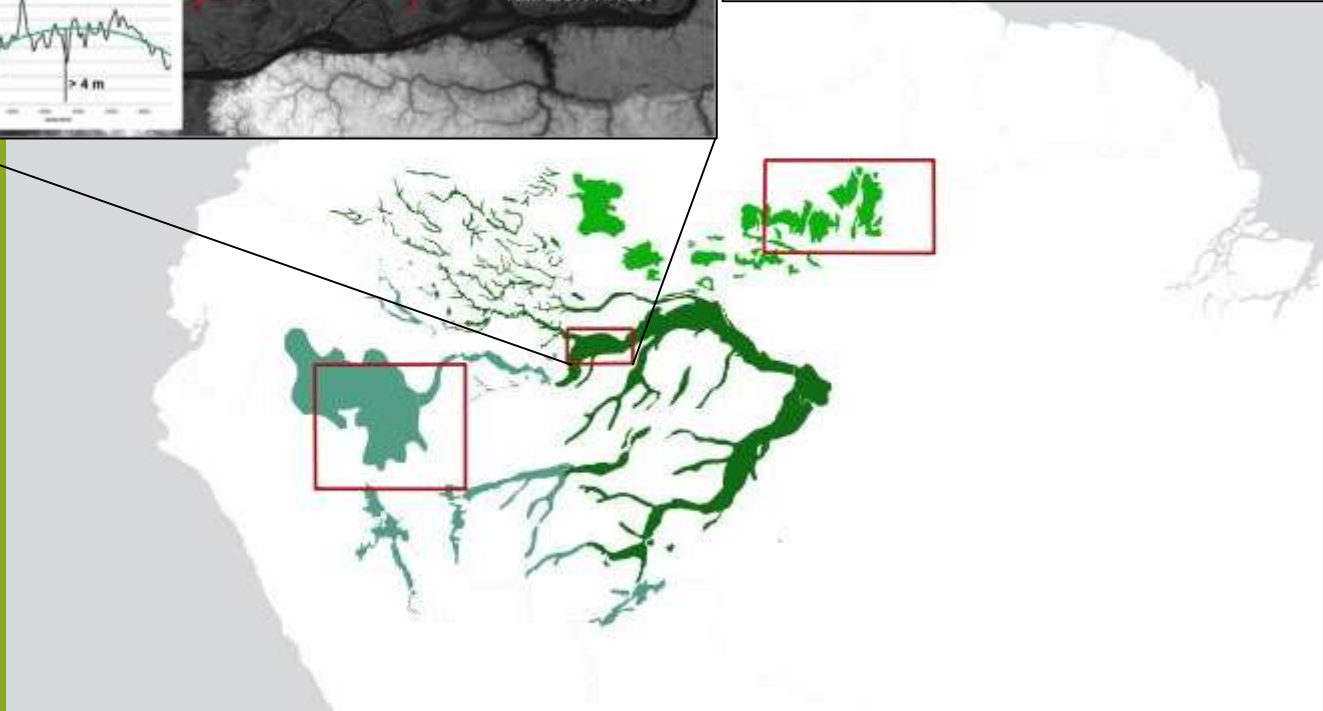
 mixed Amazon wetland vegetation

Peatland distribution in the tropics – first results



Peat domes of the Central Amazon prospected with optical satellite imagery, SRTM , and LiDAR

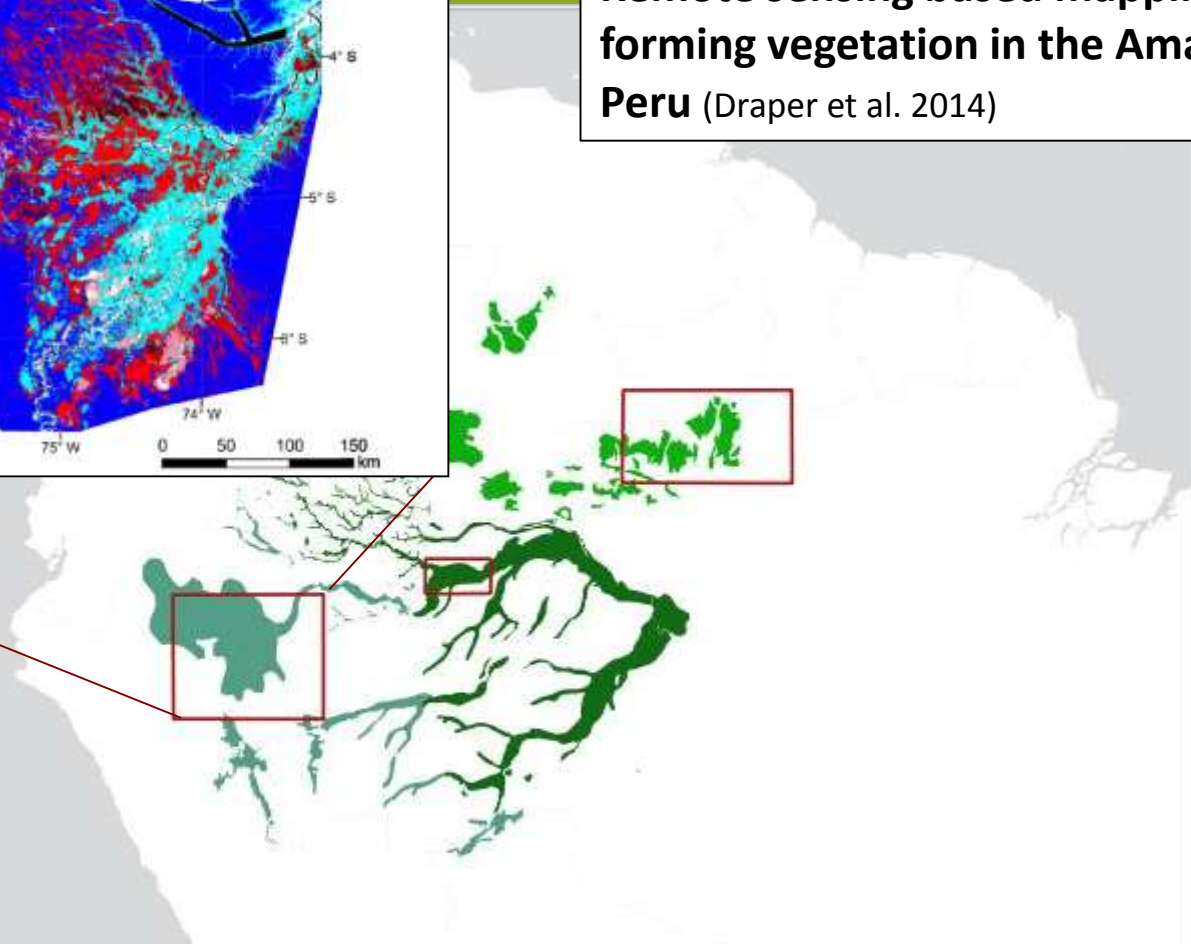
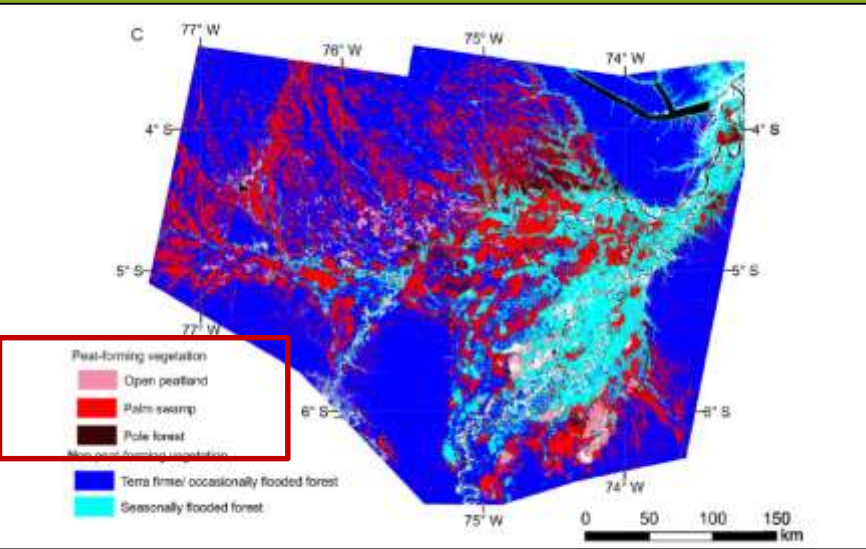
(provided by F. Siegert & U. Ballhorn, RSS - Remote Sensing Solutions GmbH, Munich)



For the Amazon basin we selected 3 ecozones for that evidence is given of larger peat occurrences.

Peatland distribution in the tropics – first results

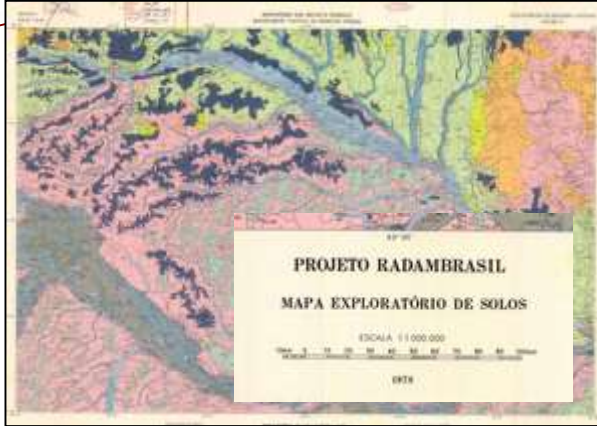
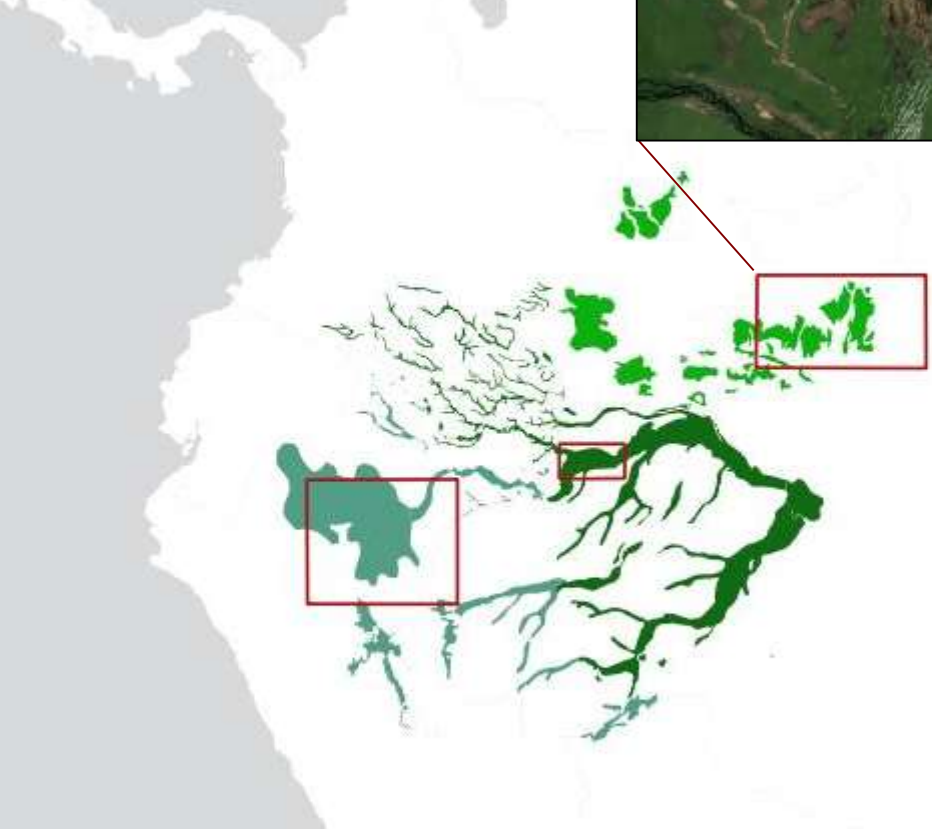
Remote sensing based mapping of peat forming vegetation in the Amazonian Peru (Draper et al. 2014)



For the Amazon basin we selected 3 ecozones for that evidence is given for larger peat occurrences.

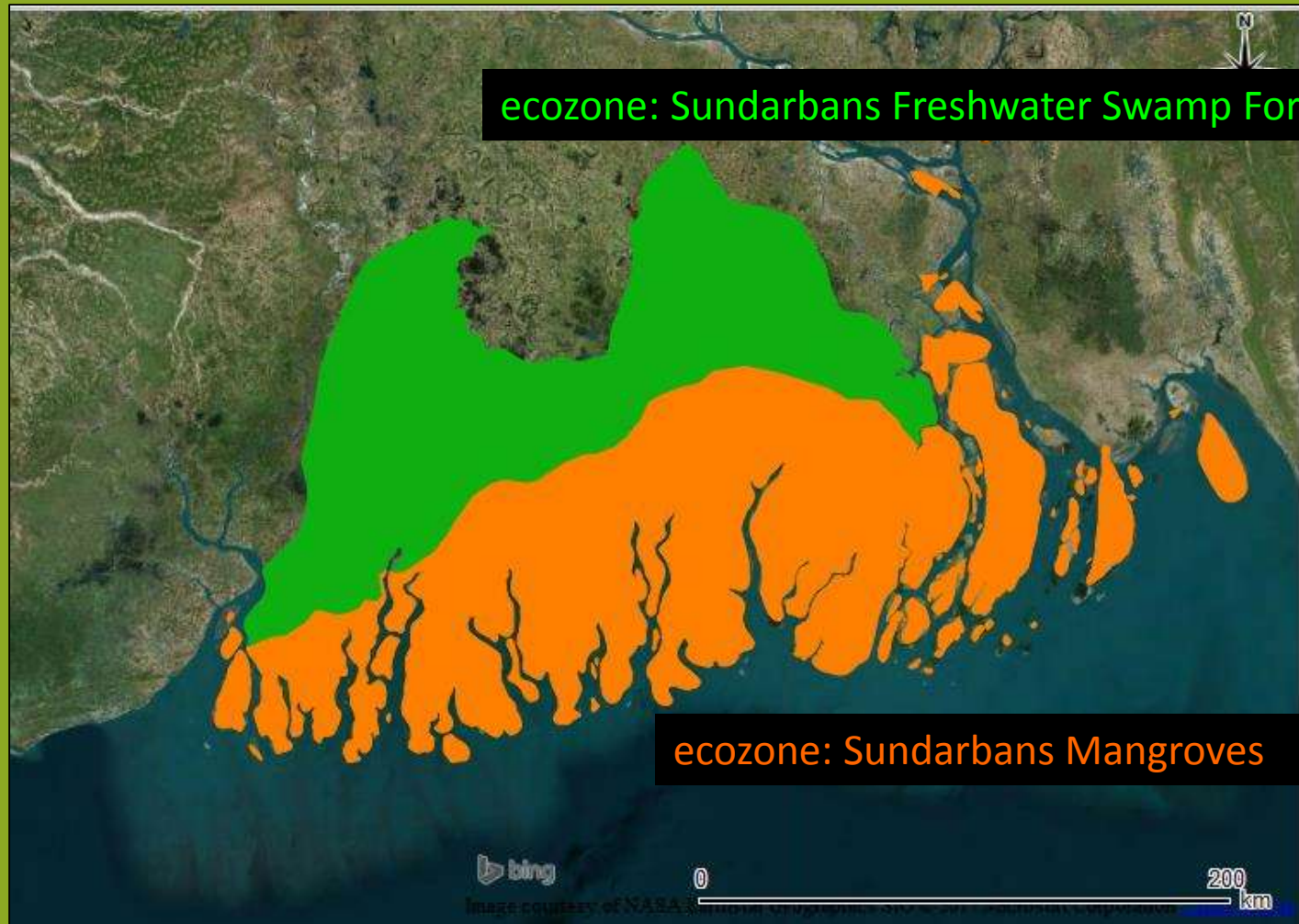
Peatland distribution in the tr

Soil map at scale 1:1,000,000 indicates soil complexes including organic soils in the northern Amazon Basin



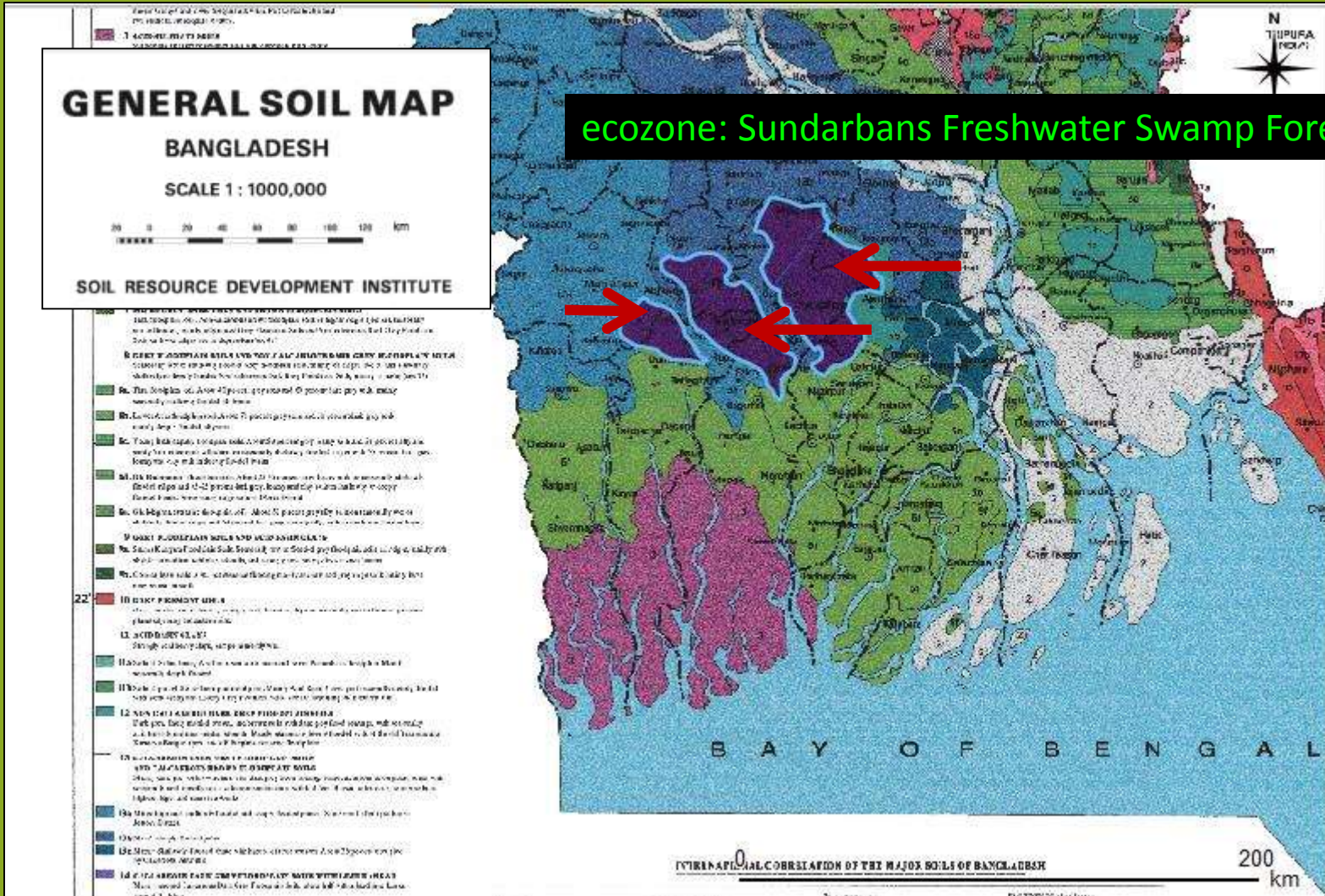
For the Amazon basin we selected 3 ecozones for that evidence is given for larger peat occurrences.

Peatland distribution in the tropics – Bangladesh



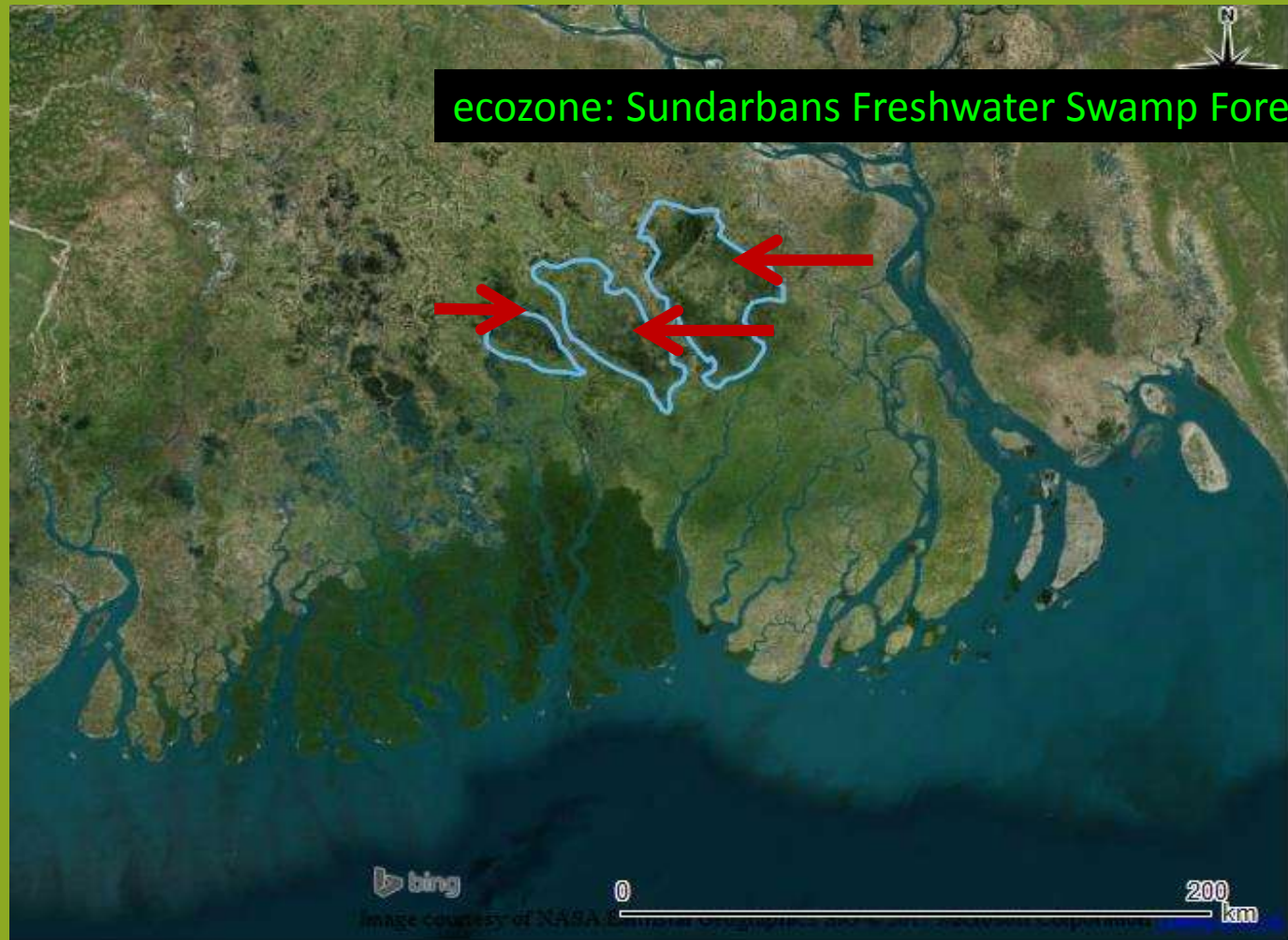
We analysed 2 ecozones of the Ganges Delta in Bangladesh on peat occurrences...

Peatland distribution in the tropics – Bangladesh



...and found a soil map that depicts peat in the Sundarbans Freshwater Swamp Forest ecozone.

Peatland distribution in the tropics – Bangladesh



...and found a soil map that depicts peat in the Sundarbans Freshwater Swamp Forest ecozone.

Peatland degradation status – example Bangladesh

For all identified peatland types we roughly assessed the degradation status using the 'Global 1-km consensus land-cover for biodiversity and ecosystem modelling' (Tuanmu & Jetz 2014).

* the sub-dataset on 'cultivated and managed land'

Global Ecology and Biogeography, (Global Ecol. Biogeogr.) (2014) 23, 1031–1045

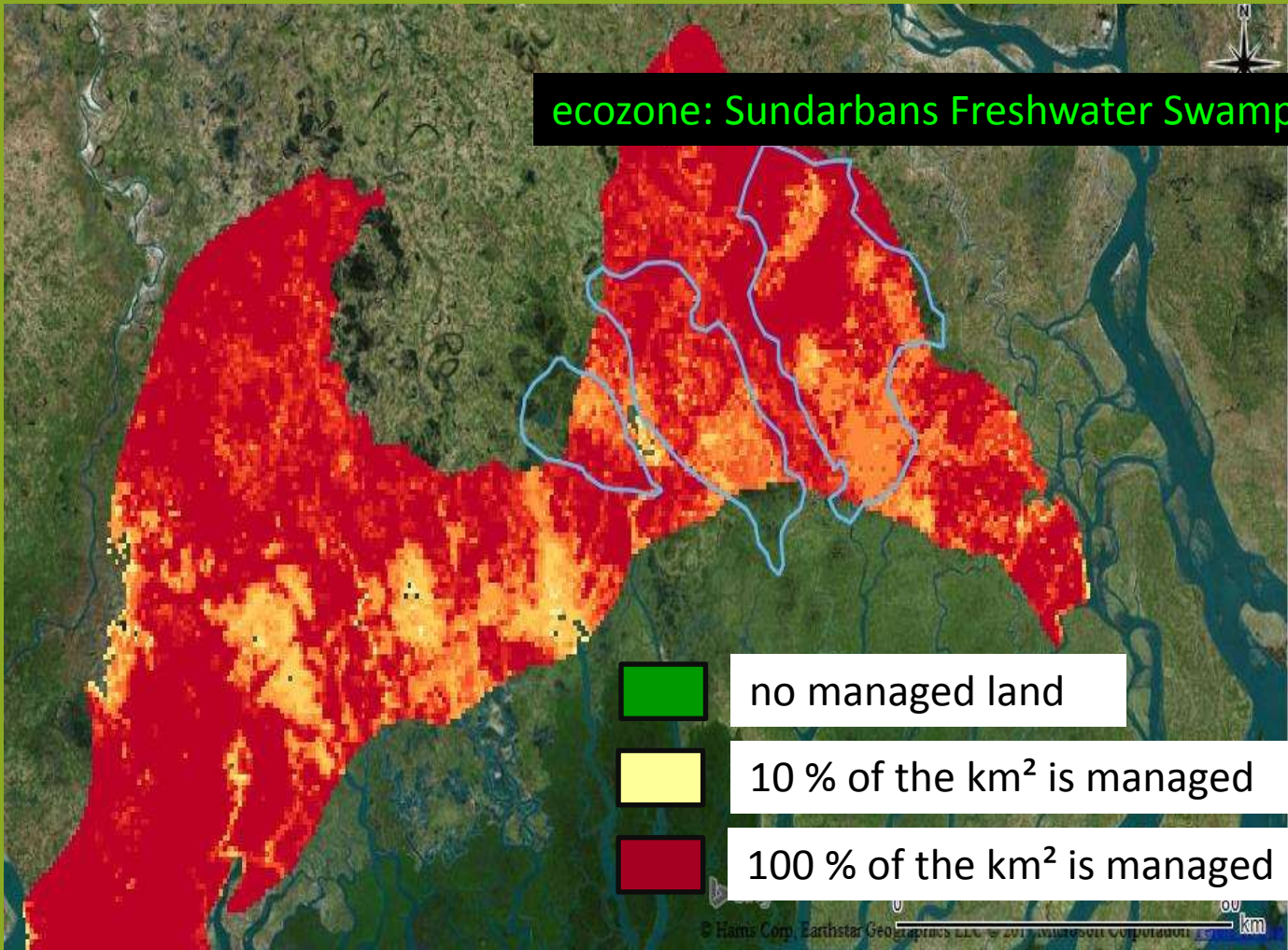


RESEARCH
PAPER

A global 1-km consensus land-cover product for biodiversity and ecosystem modelling

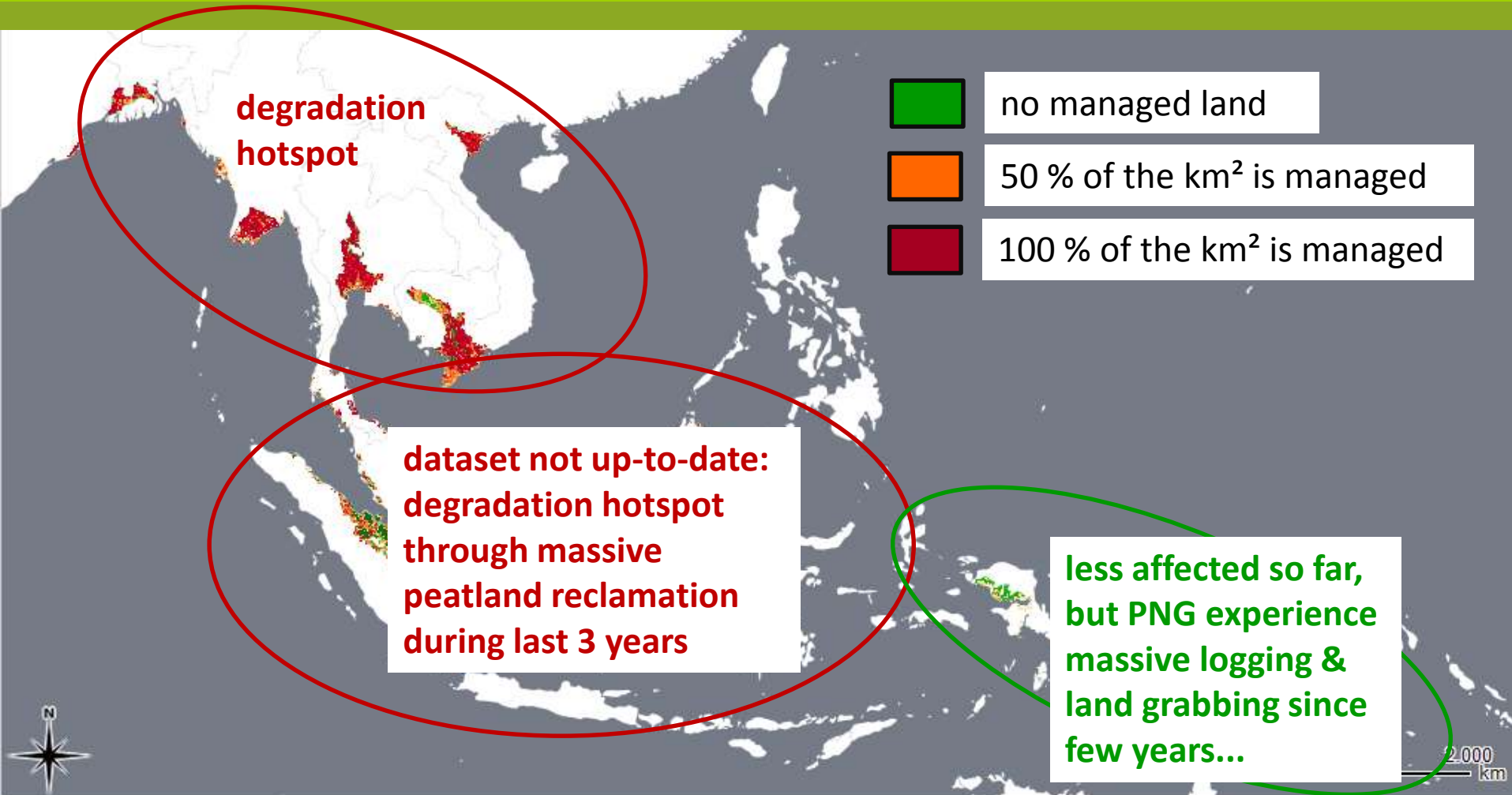
Mao-Ning Tuanmu* and Walter Jetz

Peatland degradation status - Bangladesh



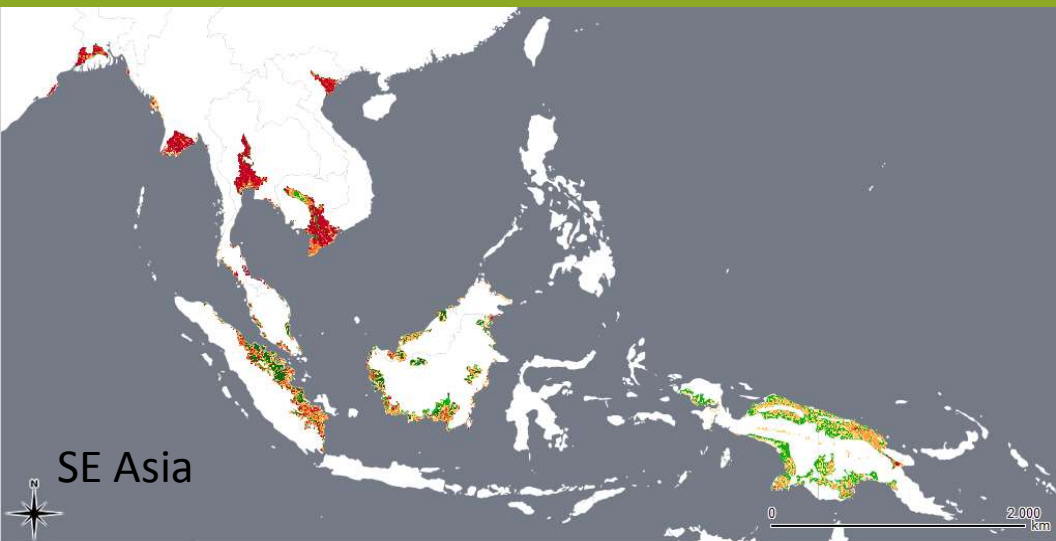
There are no unmanaged areas left in this ecozone and it seems to be completely cultivated.




Peatland degradation status - example Southeast Asia

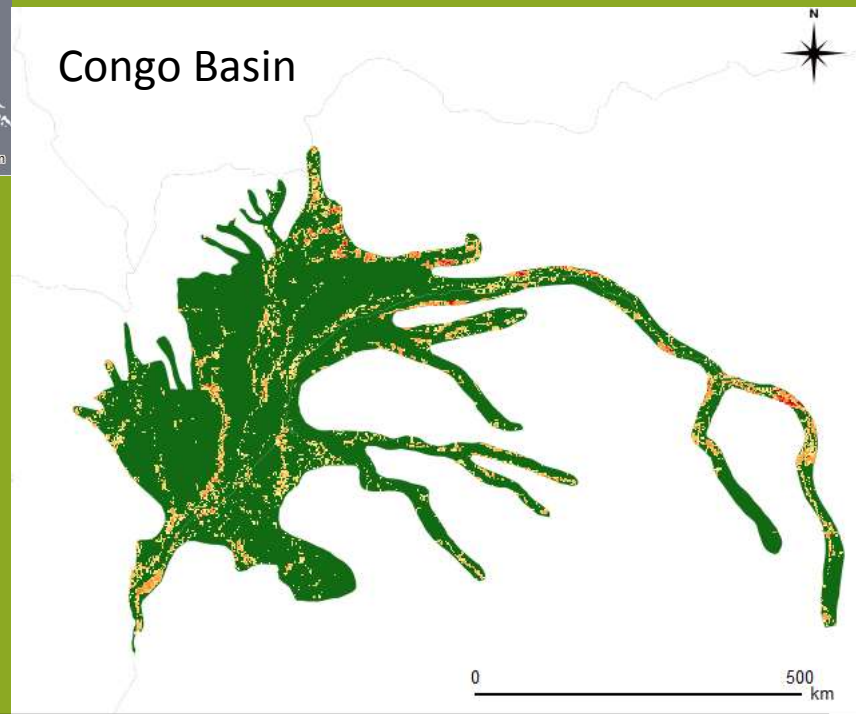


Degradation status of Peat Swamp Forests and Freshwater Swamp Forests (that almost all include peat areas)

Peatland degradation status - examples



-  no managed land
-  50 % of the km² is managed
-  100 % of the km² is managed



Degradation status of Peat Swamp Forests and Freshwater Swamp Forests (that almost all include peat areas)

Peatland degradation status - summary

- Peat Swamp Forests are heavily used and degrading in Asia, including (beside Indonesia and Malaysia) also Bangladesh, Myanmar, Cambodia and Vietnam. The Congo Basin and Papua New Guinea Peat Swamp Forests are less intensive used and degrading (so far).
- Flooded grasslands in large floodplains of Africa and South America are less affected by use and degradation (so far).
- Peatlands in coastal environments (river deltas, lagoons and salt marshes) are often intensively used and degrading.
- High altitude peatlands are largely unused at Papua New Guinea, whereas the uplifted flanks of the Rift Valley in East Africa are degradation hotspots (Burundi, SW Uganda, Rwanda).

Peatland inventory for the tropics - outlook

Main knowledge gaps (from my point of view):

- large river deltas
- large floodplains
- Amazon Basin, parts of Asia

Main tasks for tropical peatland inventory:

- collation of old and elaboration of new reference profiles in peatlands for validation of modelling results
- mapping of peatlands in the identified ecozones in high resolution (for land use planning)
- increase coverage on drained peatlands

= looks like much FIELD, MAPPING & ARCHIVE WORK ;-)

Peatland use and rehabilitation in the tropics - outlook



We need to develop sustainable (wet) land use options for peatlands and to effectively protect the pristine peatlands left.

ACKNOWLEDGEMENTS

... to many authorities and organizations that provide free and easy access to data, as e.g. universities and online archives from NASA, ISRIC, JRC, SPHAERA and FAO)

... to many dedicated scientists for the increasingly available knowledge on peatlands around the World



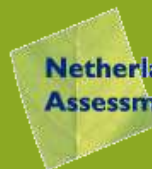
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especially to Reni Barthelmes, Felix Beer, Rene Dommain,
Olga Margalev and Christof Schaller

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