Hydrological and Ecological Modelling

capacity building through applied research and education.

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Hydrological and Ecological Modelling

- What is Alterra?
- What kind of cooperation are we looking for?
- Example: Hydrological modelling
- Example: Fire risk assessment
- Example: Ecological modelling
- Example: decision support system

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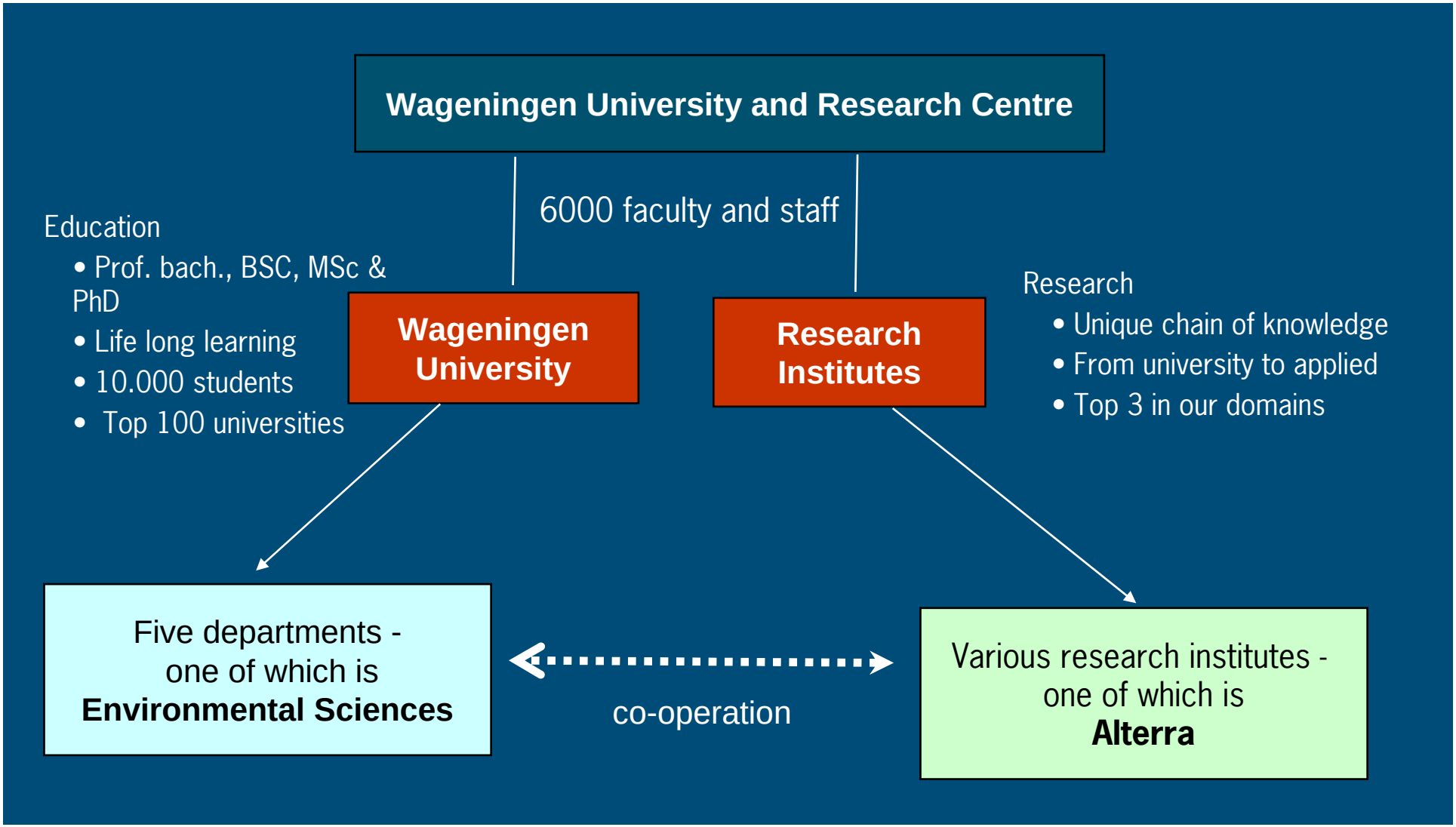
Wageningen University and Research Centre



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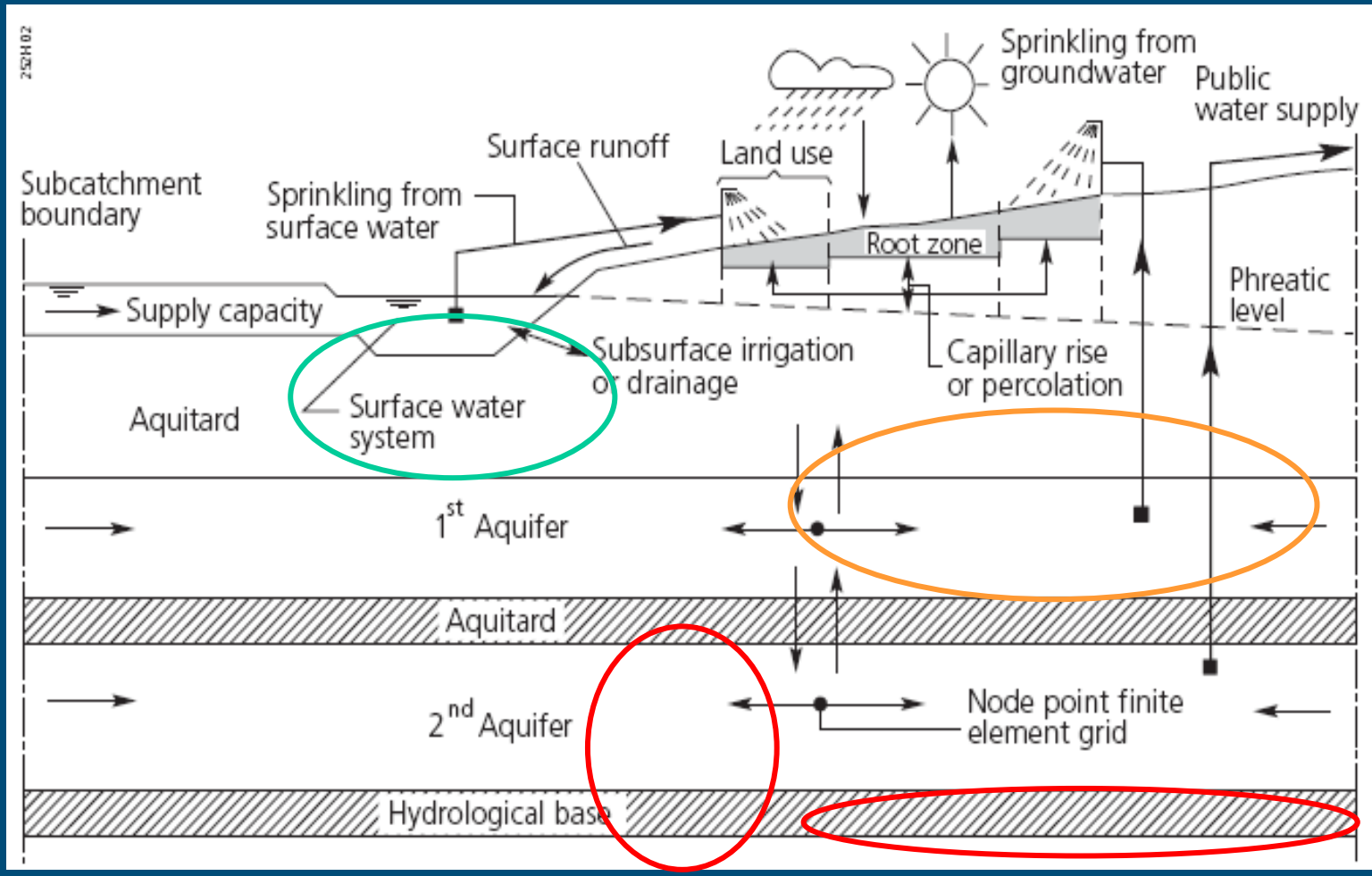
Hydrological model: SIMGRO, a hydrological model used in combination with a GIS environment



Surface Water

Unsaturated Zone

Saturated Zone

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Model Applications: tropical peatlands

- Land & Water Management
- Fire risk assessment (too dry)
- Vegetative restoration potential assessment (too wet)

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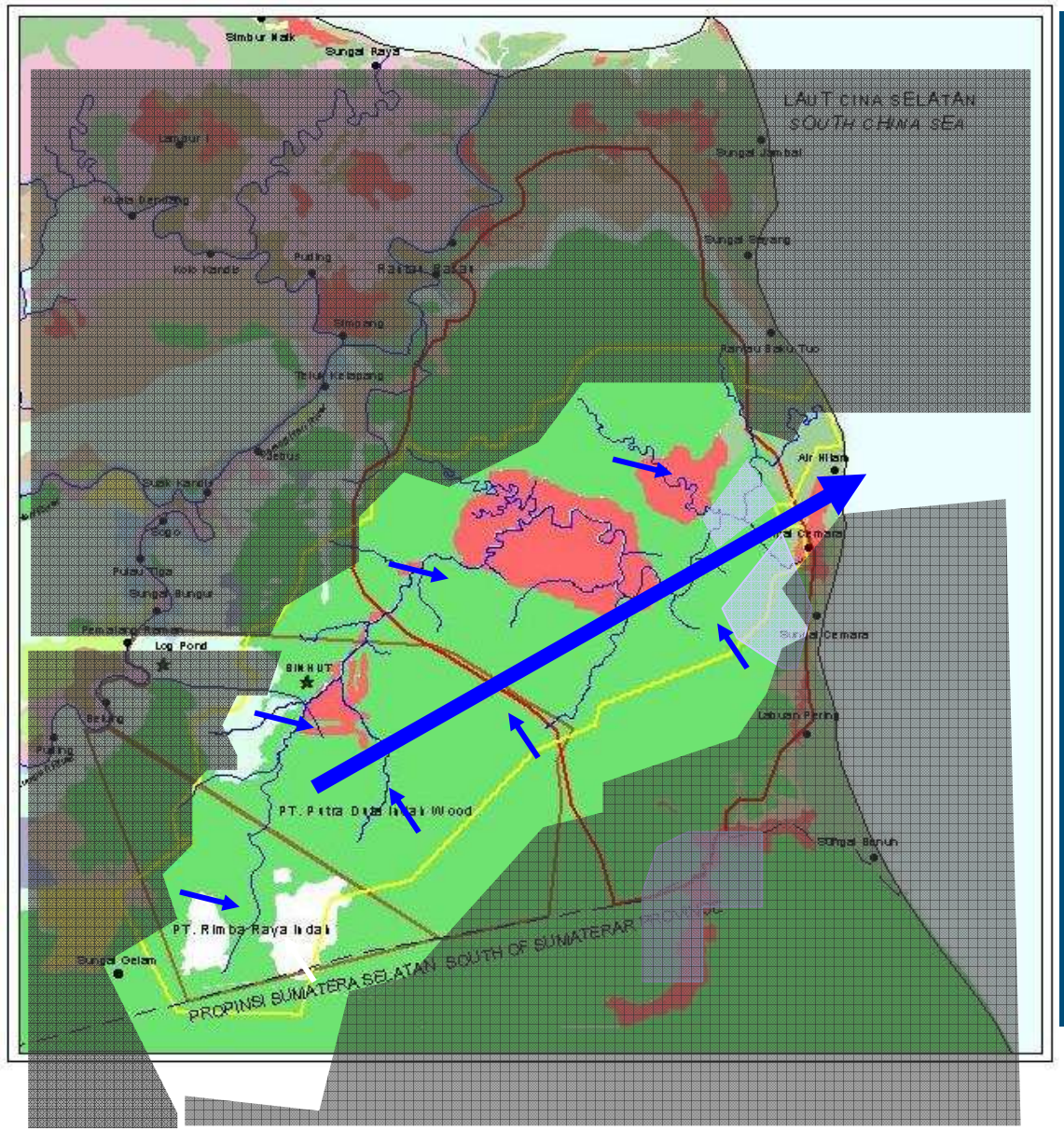
Example: Land Management

Air Hitam, Jambi, Sumatra, Indonesia:

Oil palm plantations in the upper part of a peatland catchment



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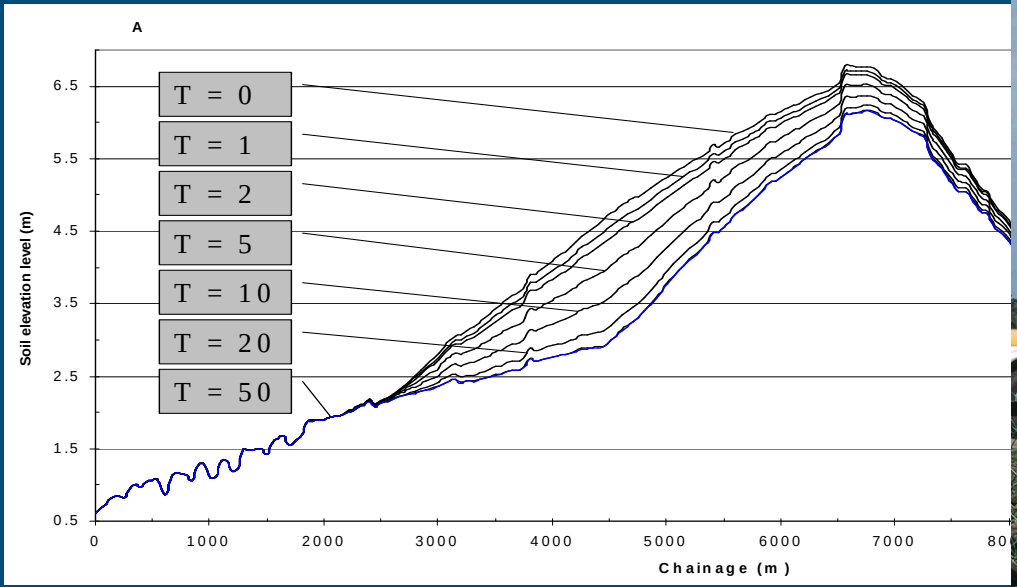
Example: Land management

Expanding oil palm cultivation ➔ induces subsidence



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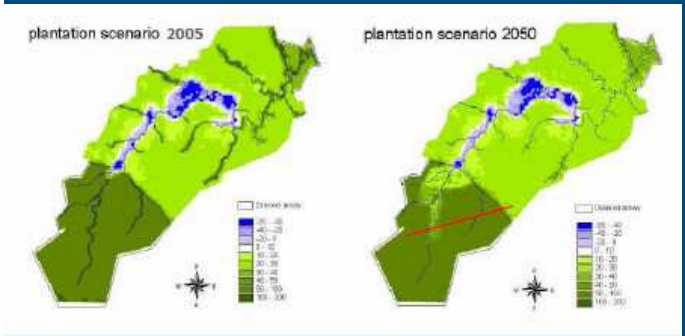
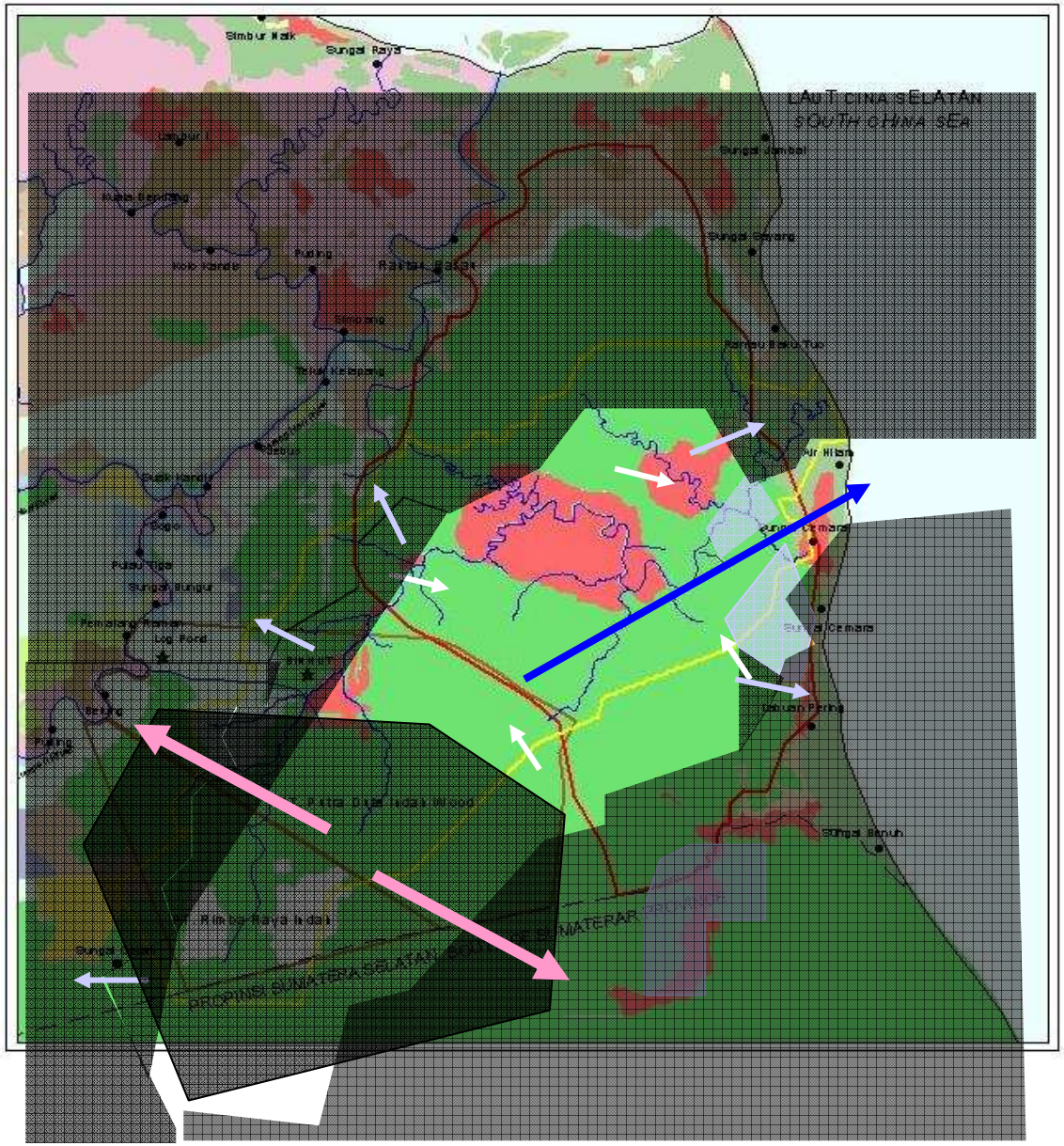
Example: Land management

Upstream catchment drainability will reduce and directions of flow change ➔

changes in river flows





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Model Applications

- Land & Water Management
- **Fire risk assessment (too dry)**
- Vegetative restoration potential assessment (too wet)

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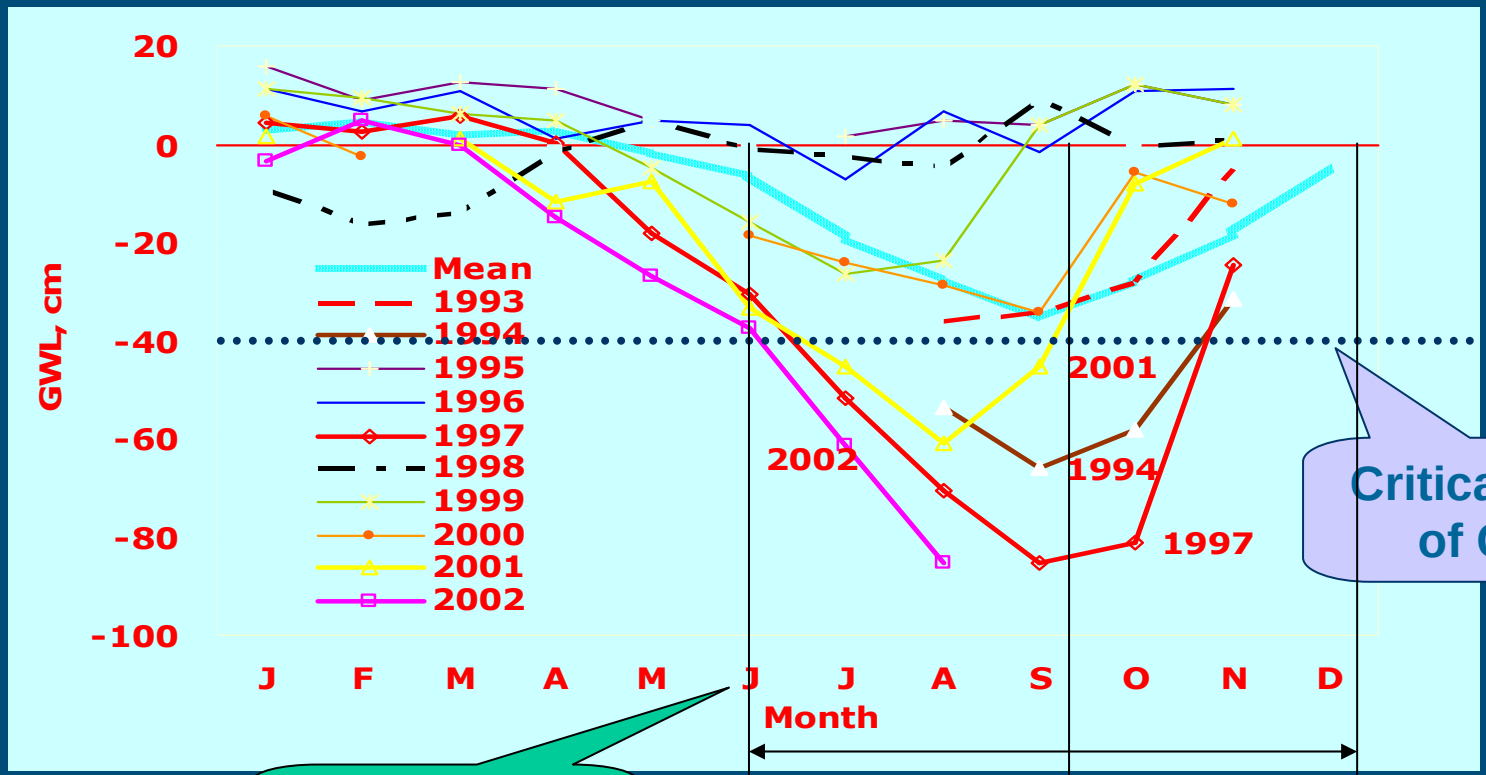
Example – Fire risk management

Sebangau, Central Kalimantan, Indonesia: critical groundwater level for fires



Takahashi et al, 2003

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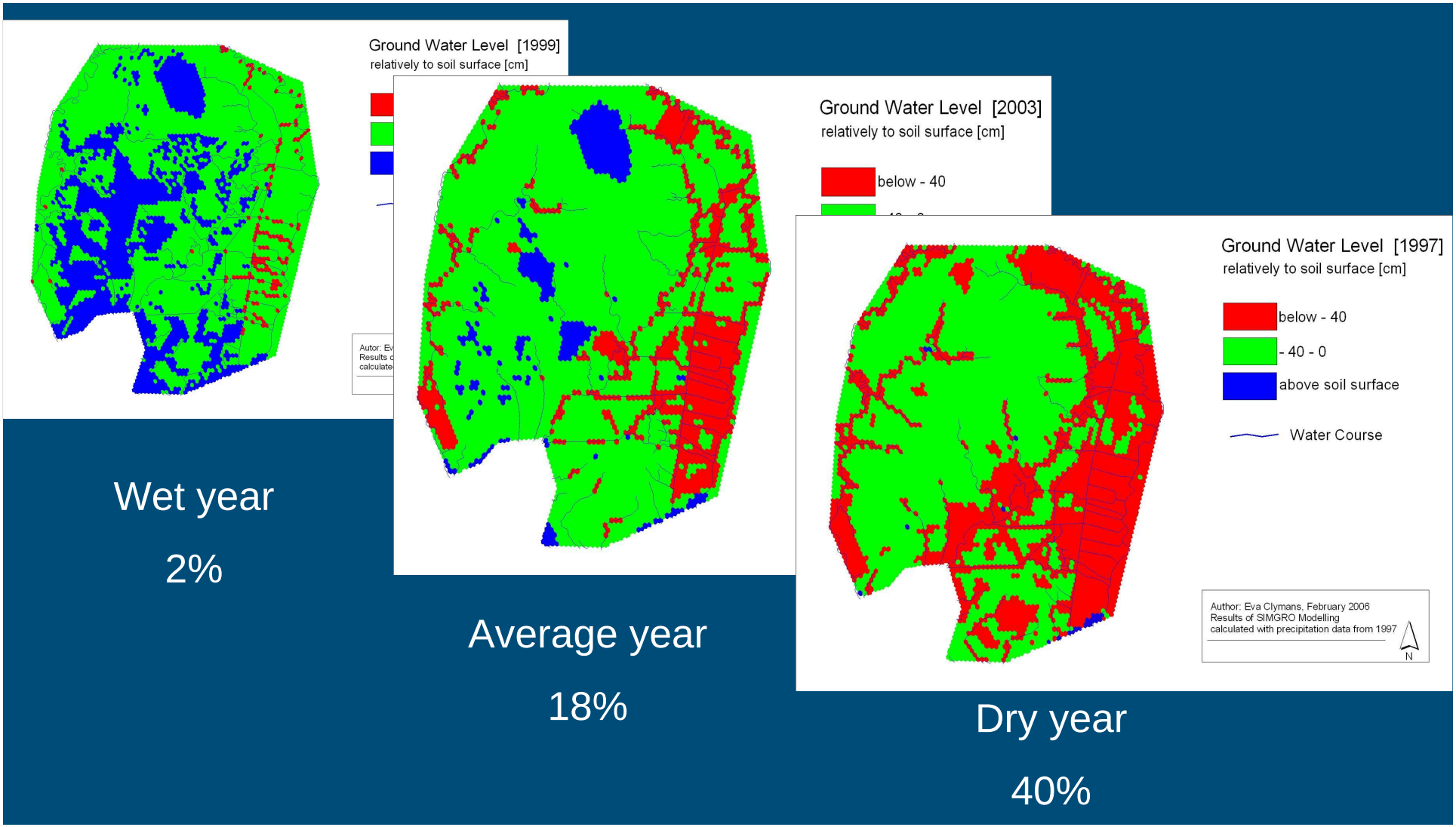
Modeling depth of the watertable: yearly variations



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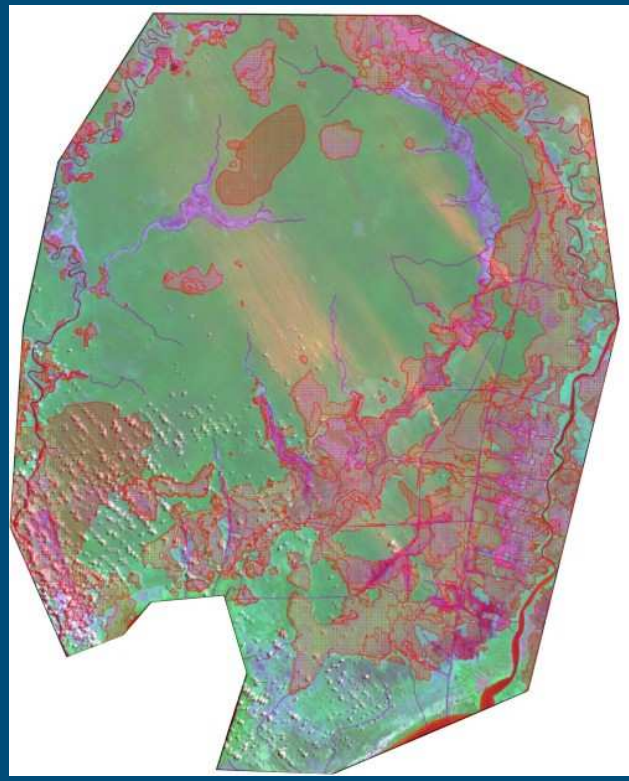
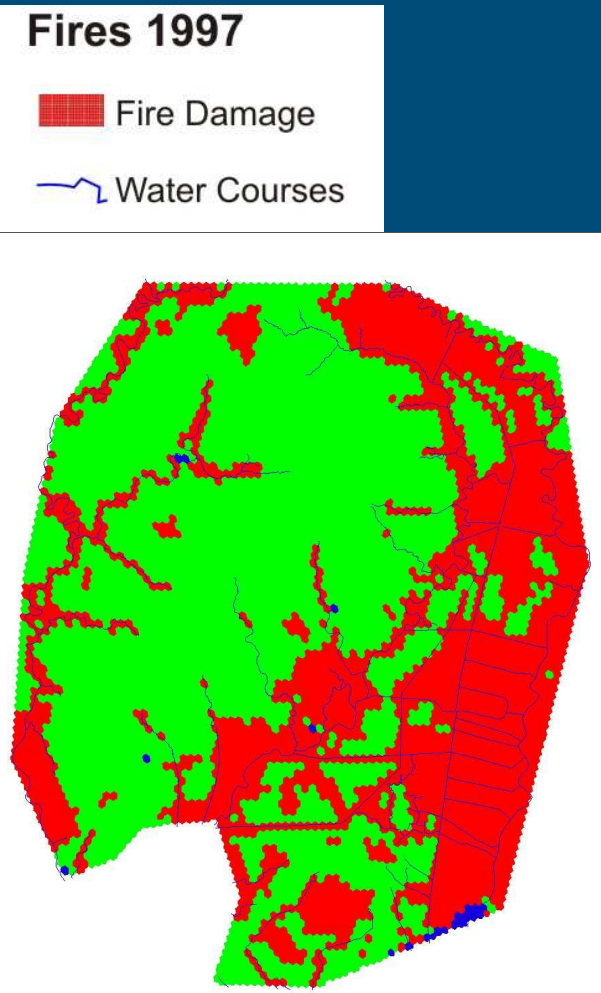
Fire risk: comparison



Groundwater level < **-40** cm

⇨ very **high chance** on fire



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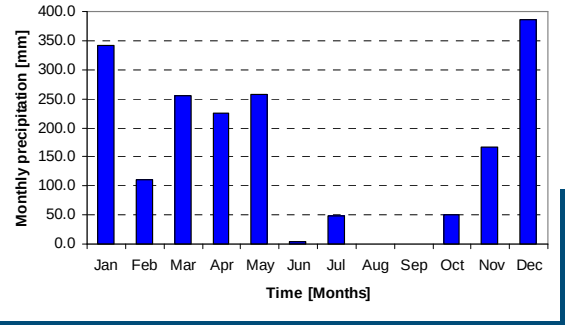
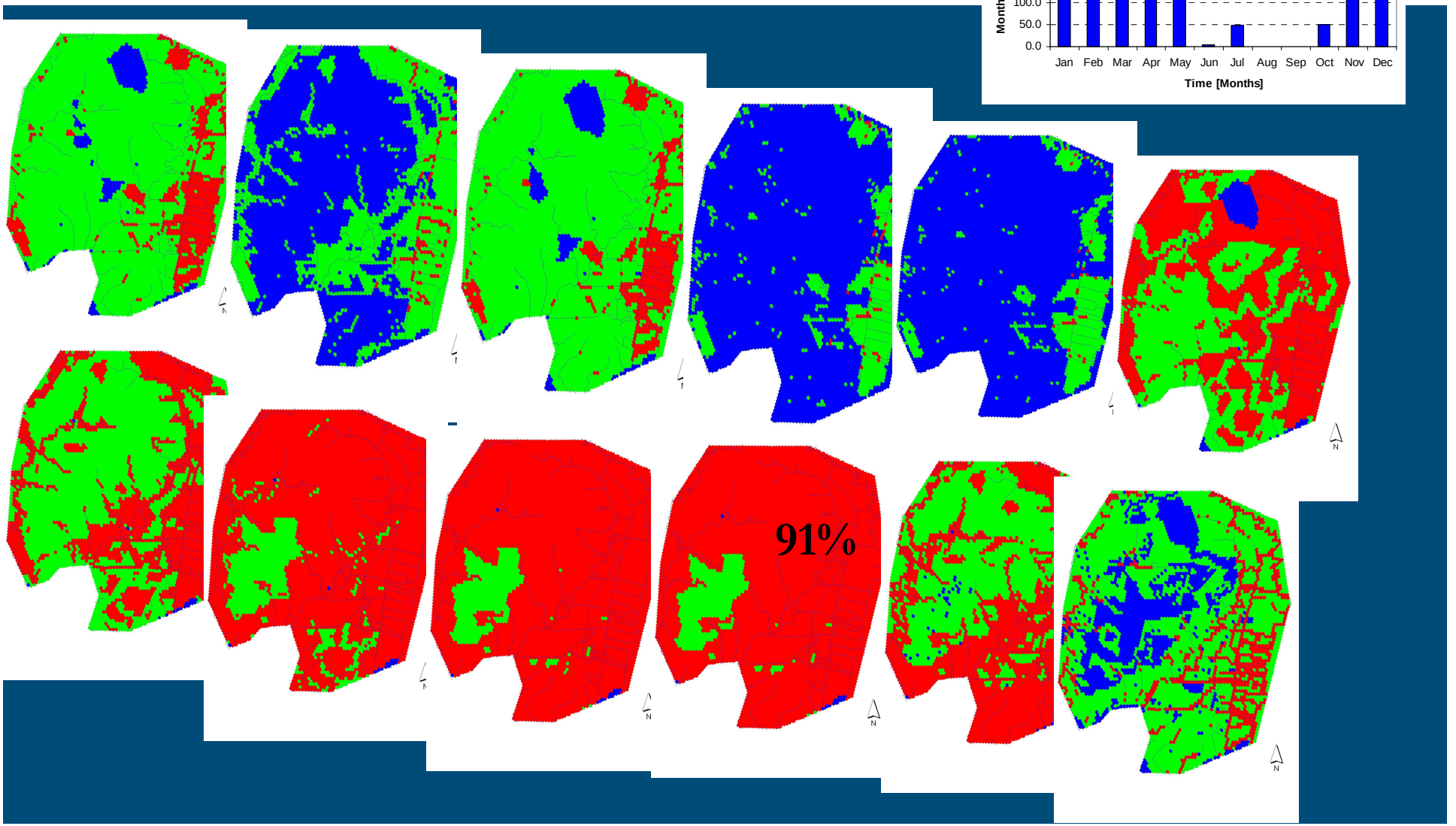
Monthly variations





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Model Applications

- Land & Water Management
- Fire risk assessment (too dry)
- **Vegetative restoration potential assessment (too wet)**

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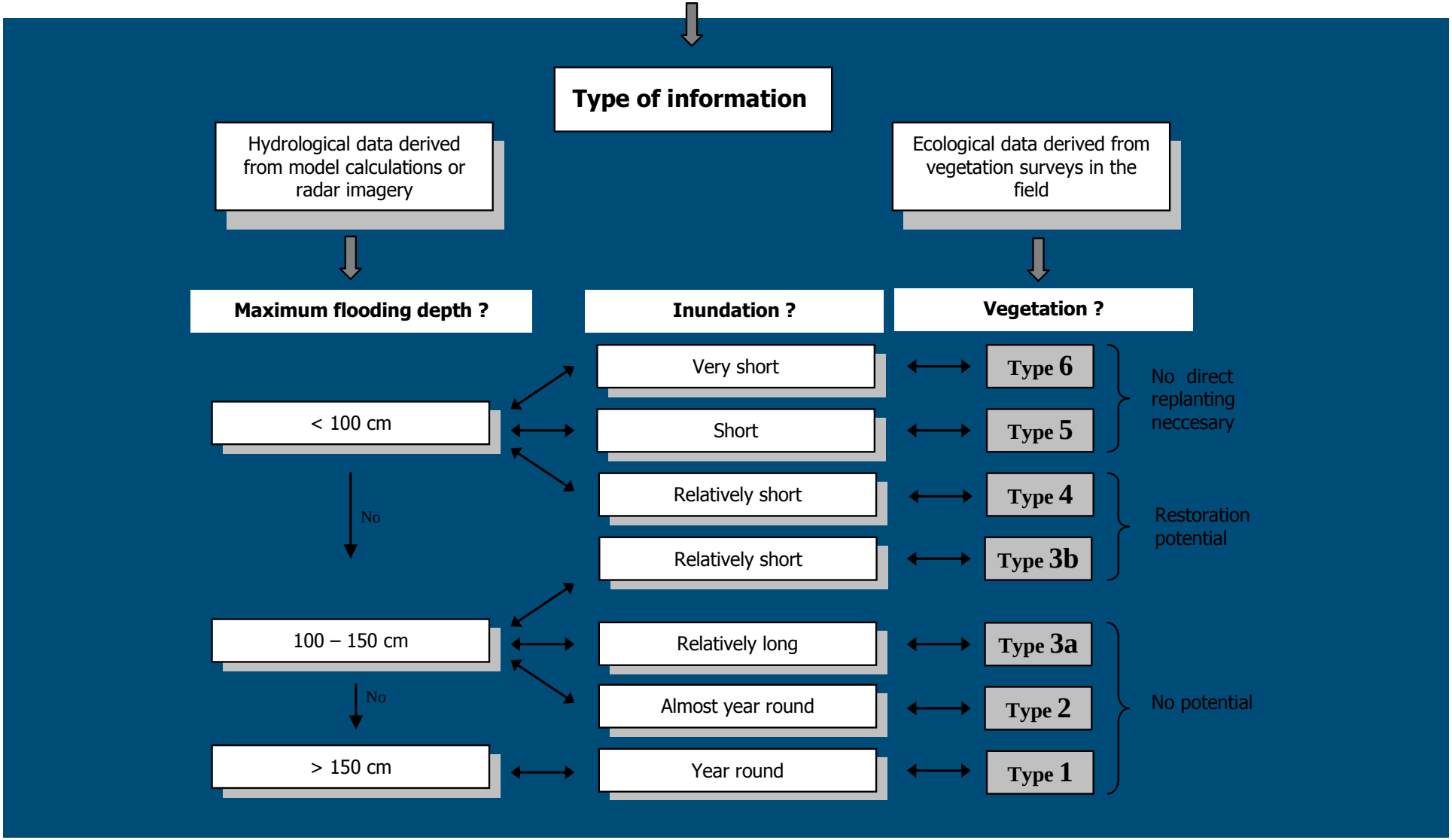
Critical groundwater level for restoration



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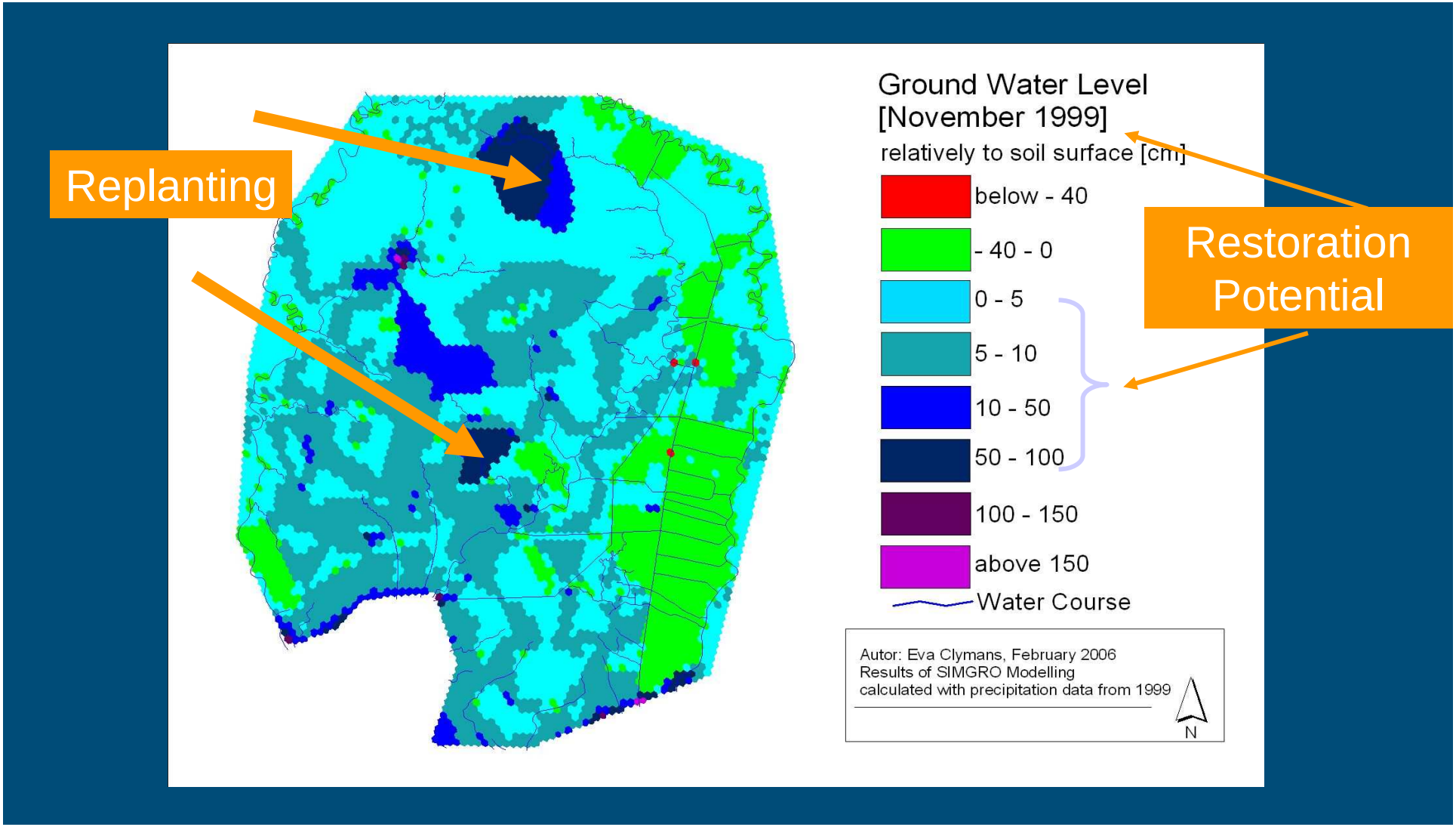
Restoration Potential



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Model Applications: tropical peatlands

- Land & Water Management
- Fire risk assessment (too dry)
- Vegetative restoration potential assessment (too wet)
- **Decision support system**

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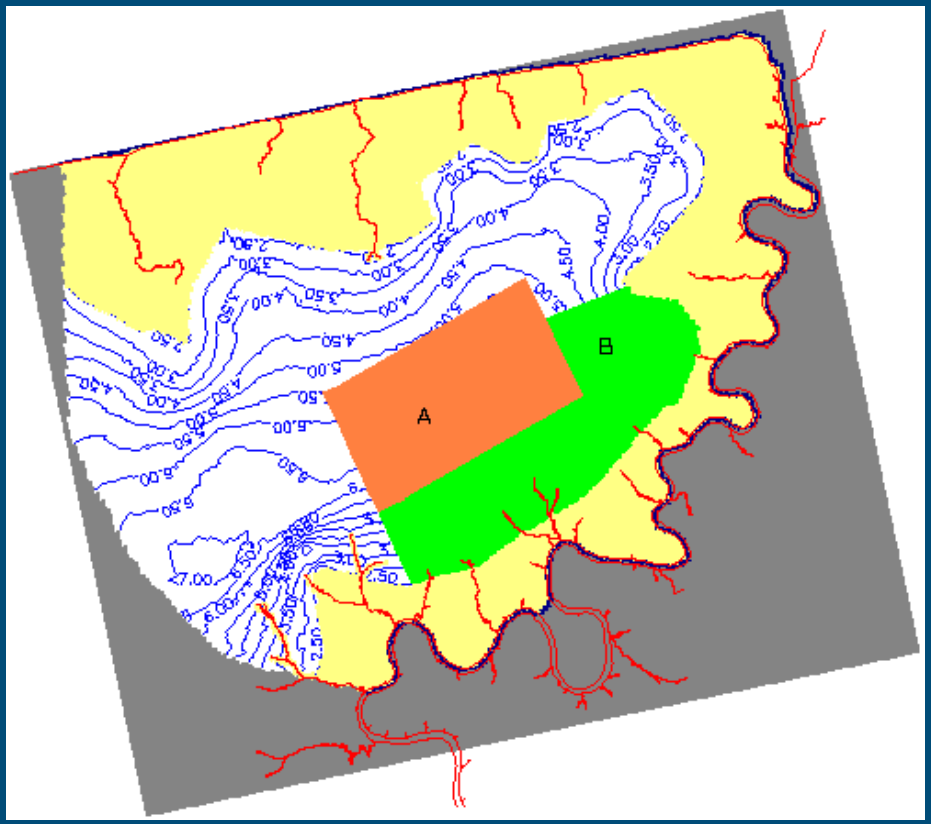
Management: Decision Support System

- Groundwater model (PMWIN)
- GIS based (ArcView)
- Expert Knowledge on:
  - Agriculture
  - Water Management
  - Subsidence
  - etc.



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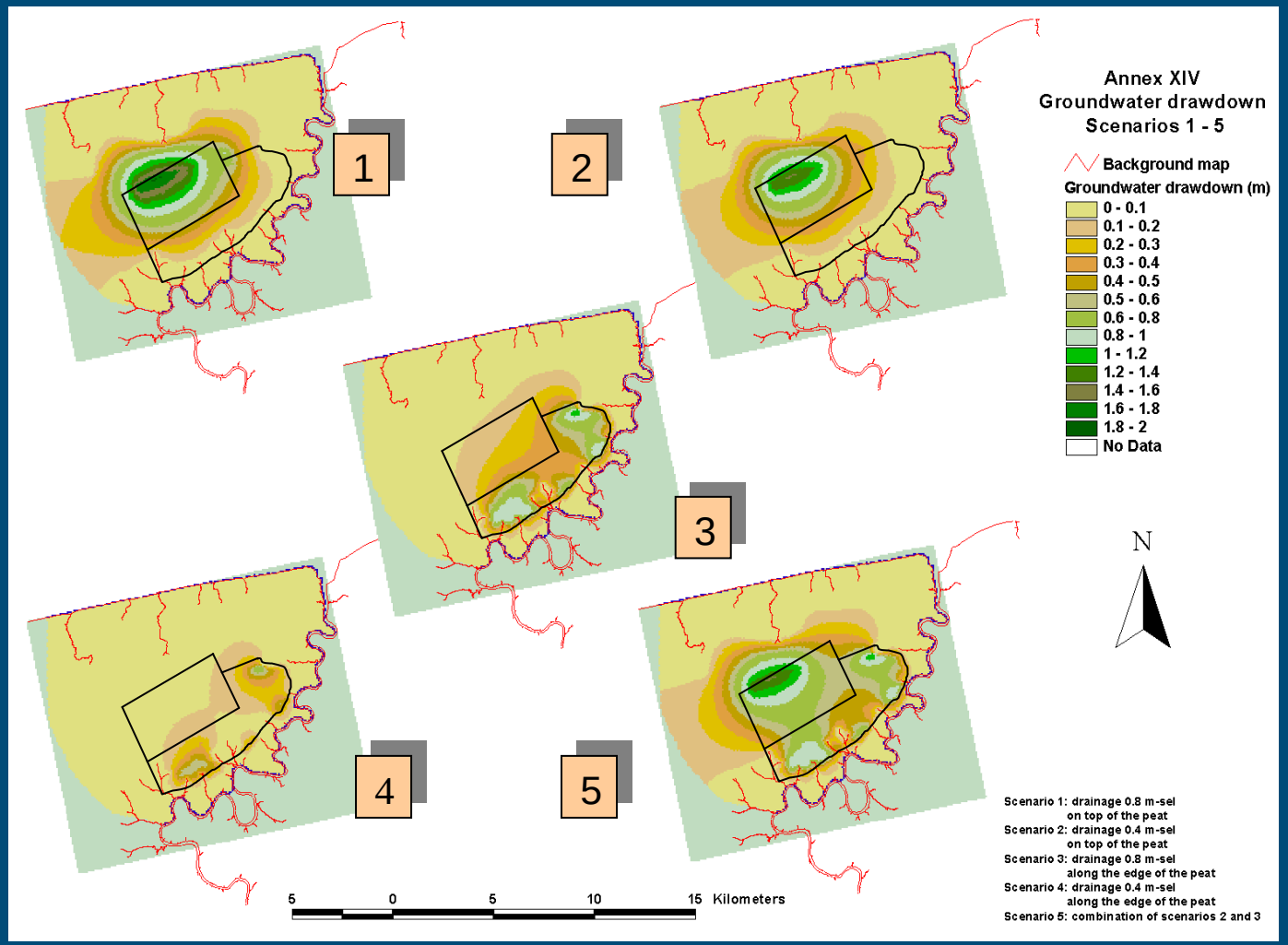
Scenarios: Different types of agricultural land use

1. Deep drainage (0.8 m) on top of peat dome
2. Shallow drainage (0.4 m) on top
3. Deep drainage at edge
4. Shallow drainage at edge
5. Combination



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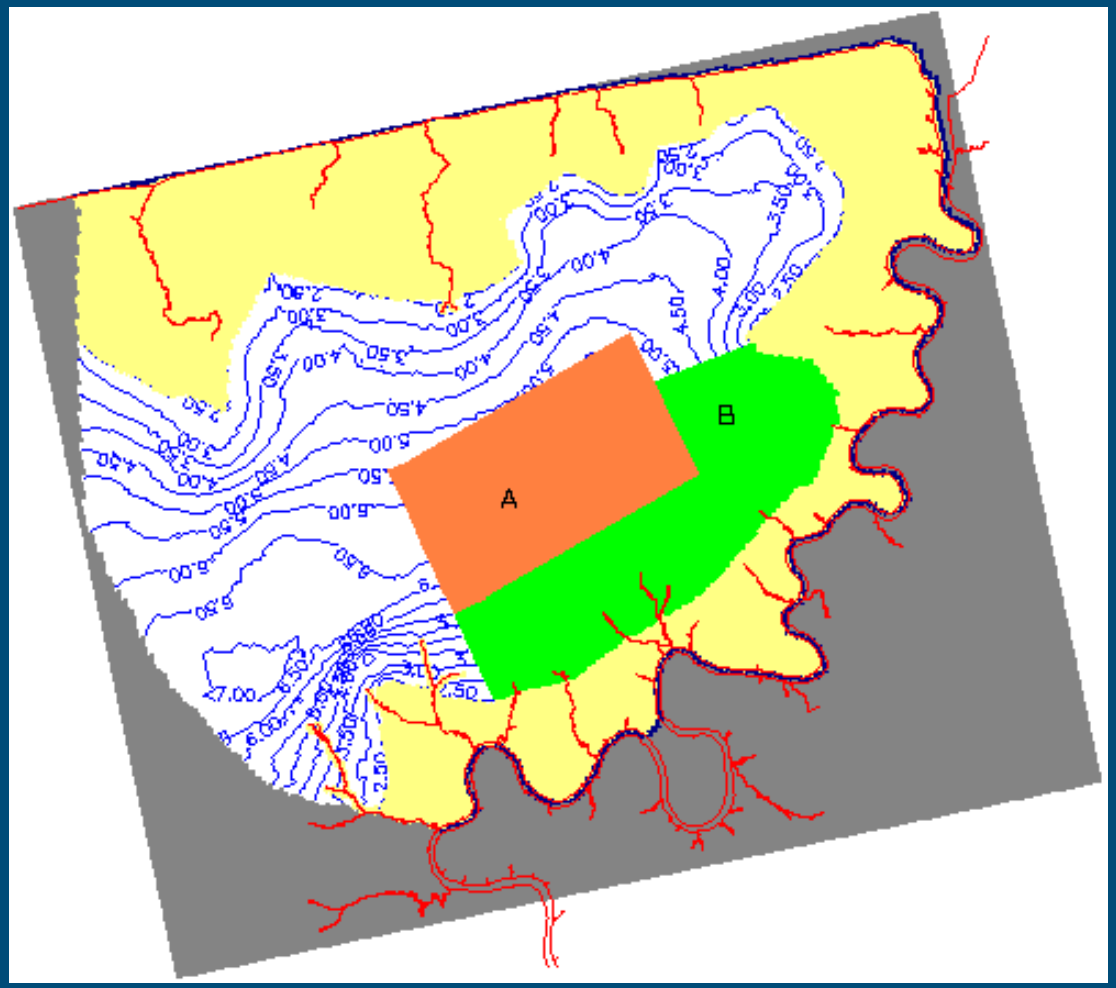
One catchment and one or two crops



A : Oil palm

B: Vegetables

Conclusion:

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Do not mix different types of land use in a peat catchment

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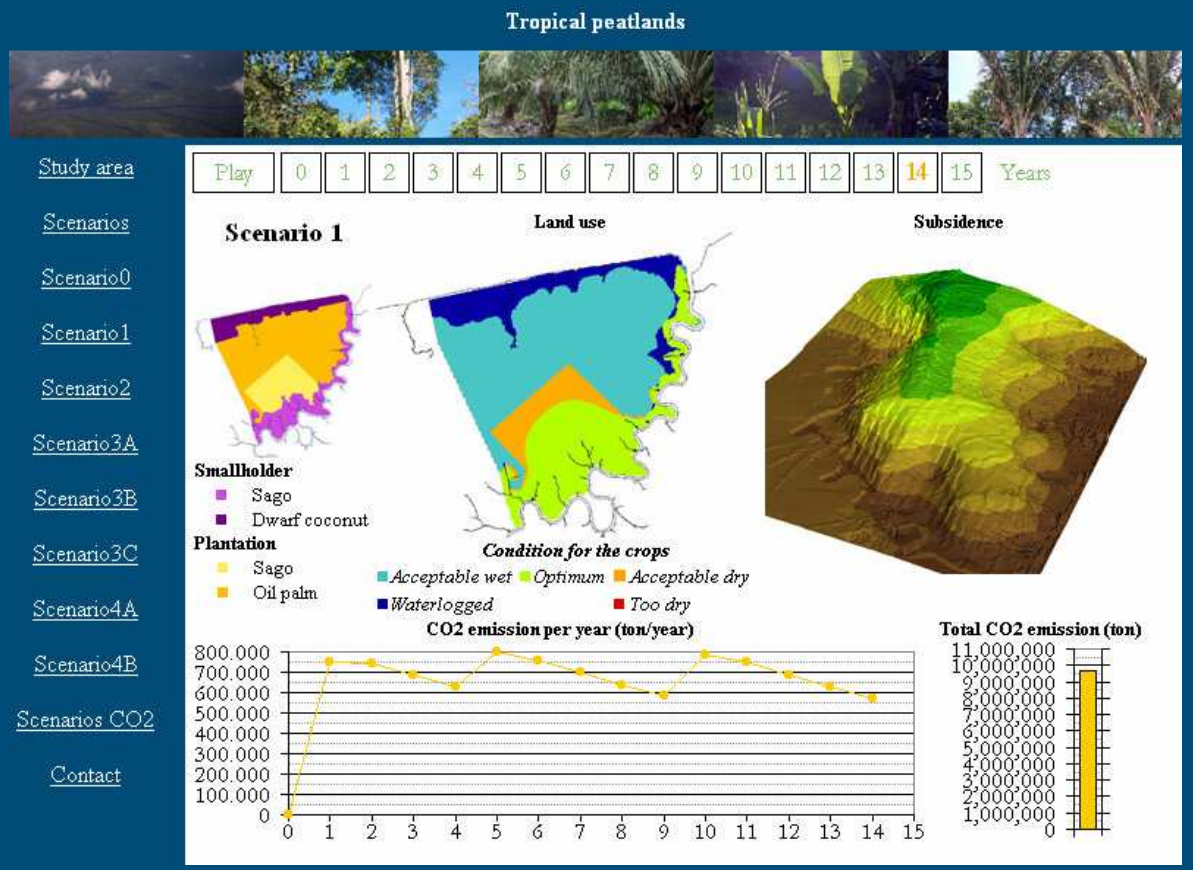
Modelling as management tool: decision support system



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Conclusions

- Hydrological models extrapolate groundwater levels in time and space
- GIS & Remote Sensing: a tool to overcome limited input data
- GIS: enables the use of expert knowledge, e.g. subsidence, agriculture, ecology, etc.

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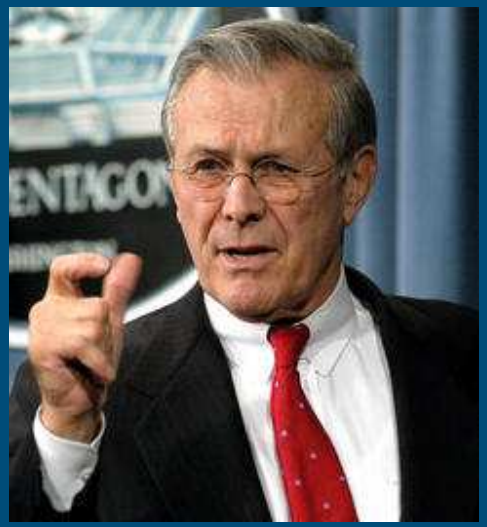
capacity building through applied research and education

"... as we know, there are known knowns; there are things we know we know. We also know there are known unknowns; that is to say we know there are some things we do not know. But there are also unknown unknowns - the ones we don't know we don't know."



terima kasih

Source and image BBC News website, July 2007

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