Analysis of carbon sequestration sensitivity to recent changes in land use patterns over Belgium using a combination of models and remote sensing techniques

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OBJECTIVE

- Quantifying and assessing changes in terrestrial biomass due to land use change using a dynamic vegetation model run at high resolution (1 km^2).

DATASETS

- Climate data – CRU (*Climate Research Unit*)
  - CRU TS Version 4.03 interpolated at 1 km2 resolution using World Clim
  - Year 1901-2018
  - Gridded Data
- Satellite Based datasets

Data Set	Product	Temporal Domain	Spatial Res.	Temporal Res
Landsat	5	1984-2012	30 meter	16 days
Landsat	7	1999-present	30 meter	16 days
Landsat	8	2013-Present	30 meter	16 days

METHODOLOGY

Main Model Inputs

- **Climatic Data**
- **Soil Data**
- **Elevation**
- **Land Use –** In this study we are using two sets of land use data

  -Static – Year 2000

  -Dynamic- Year 2000-2018

Main Model Outputs

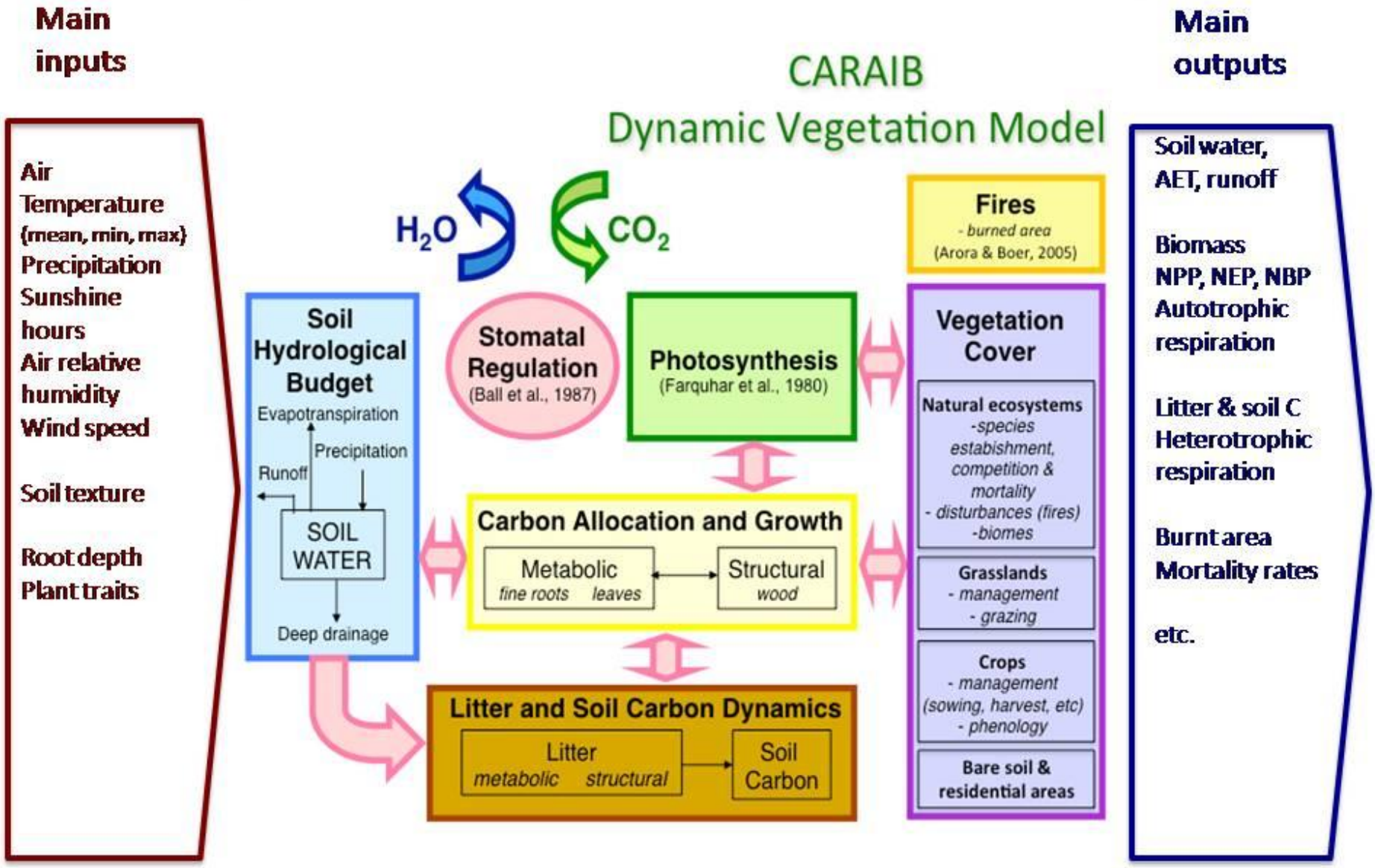
- **Vegetation(monthly)- GPP,NPP,NEP,LAI**
- **Vegetation (annual per plant type)**

  - NPP, GPP, LAI, biomass, soil carbon

  - burned area, probability of fire

  - 13C discrimination
- **Soil hydrology (monthly)**
- **Surface energy budget (monthly)**

Dynamic vegetation modeling: CARAIB



Land use fraction of pasture and urban year 2000-2018

RESULTS

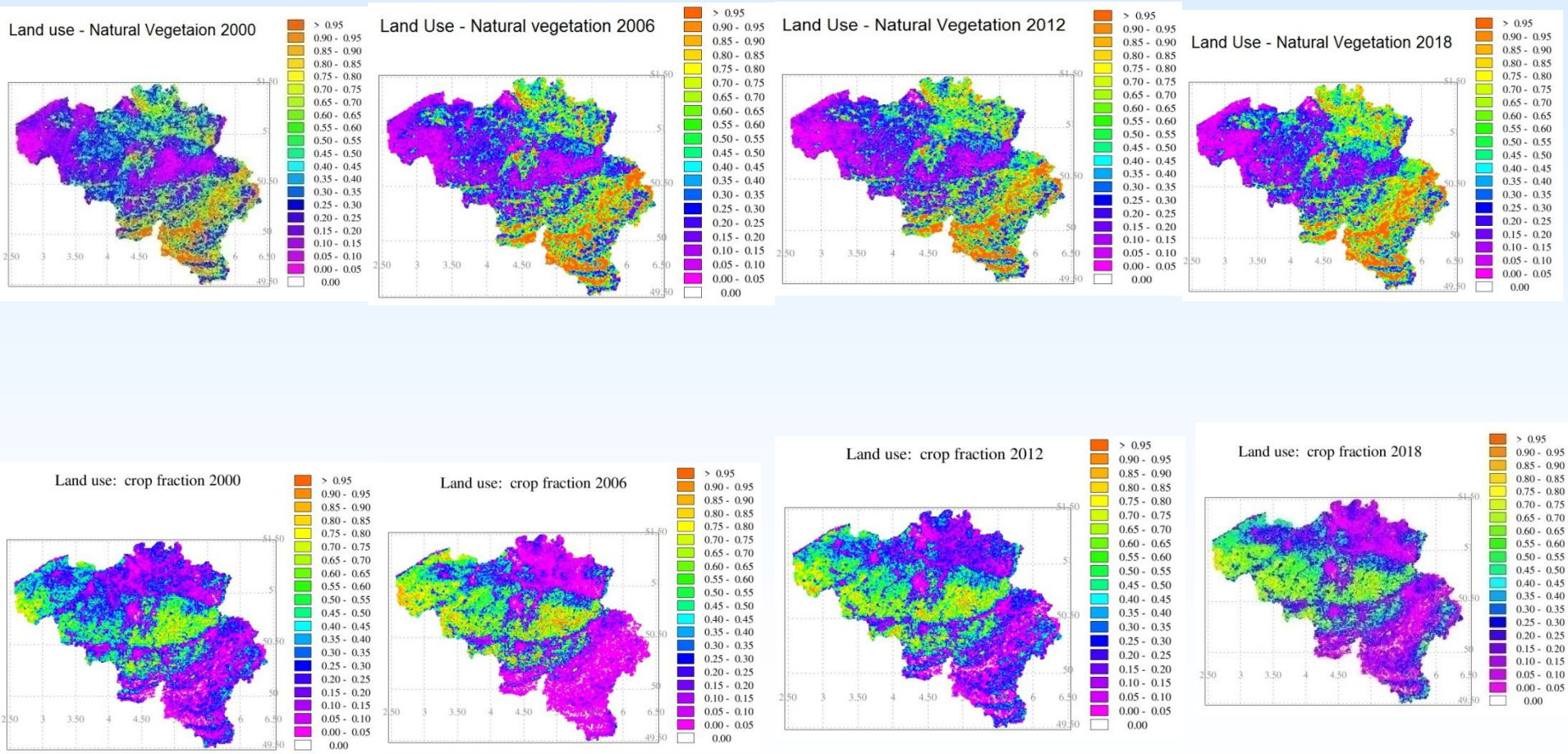


Figure 1 : Land use – natural Vegetation and crop fraction 2000-2018

Land use fraction of pasture and urban year 2000-2018

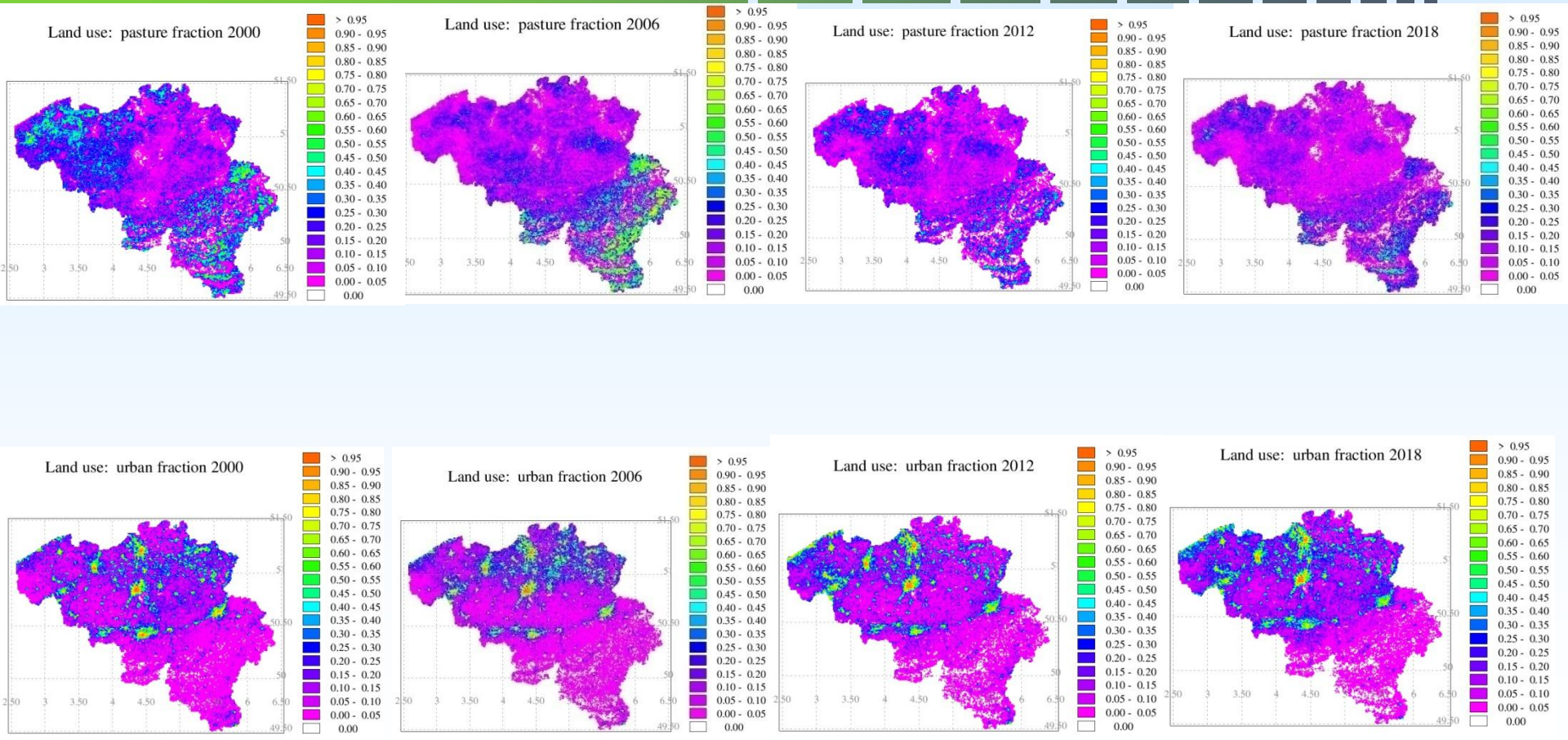


Figure 2 : Land use Fractions- Pasture and Urban

Land use fraction of water bodies and rocks year 2000-2018

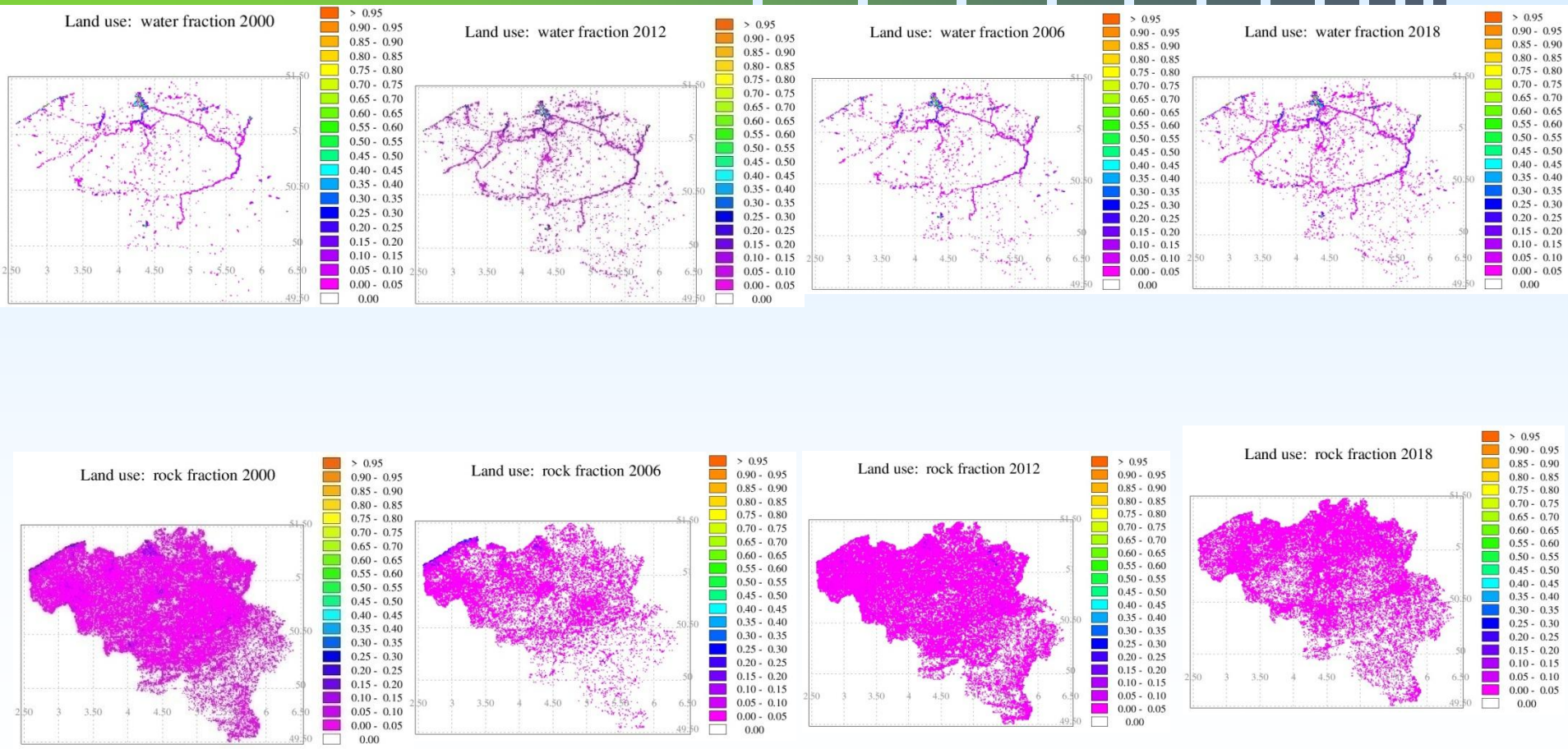


Figure 3: Land use – water bodies and Rocks fraction 2000-2018

Variation of Biomass over the period 2000-2018

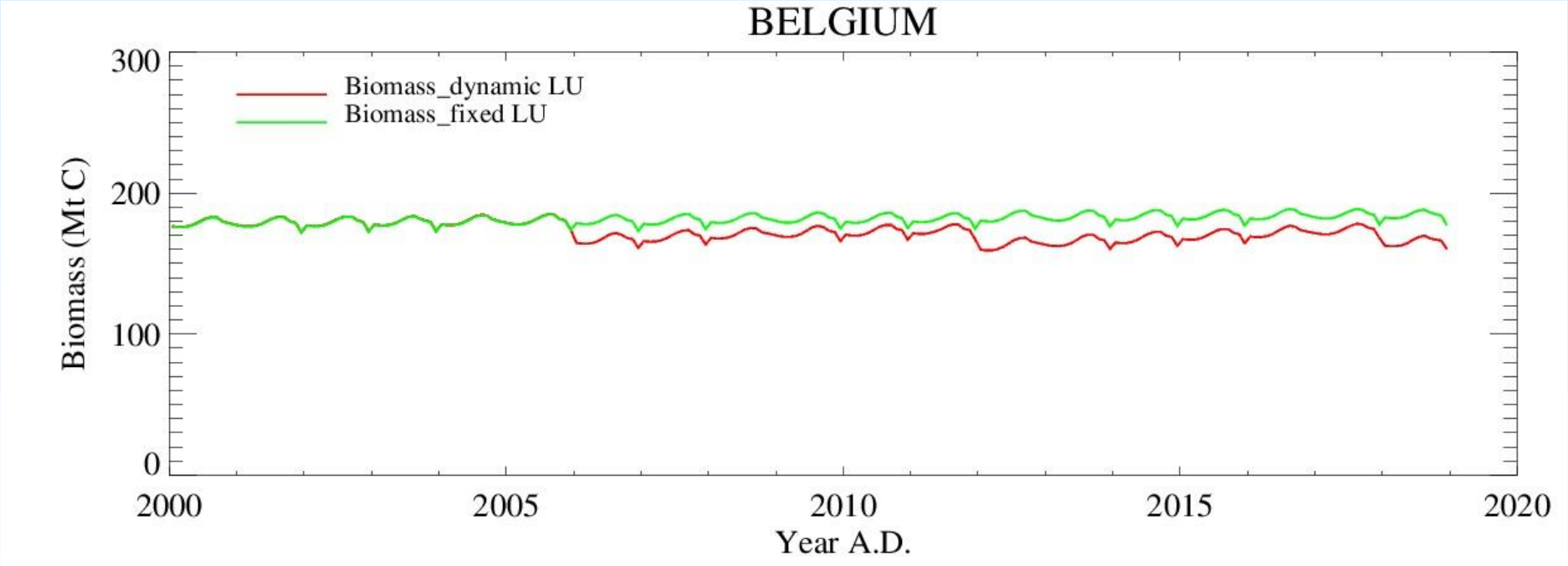
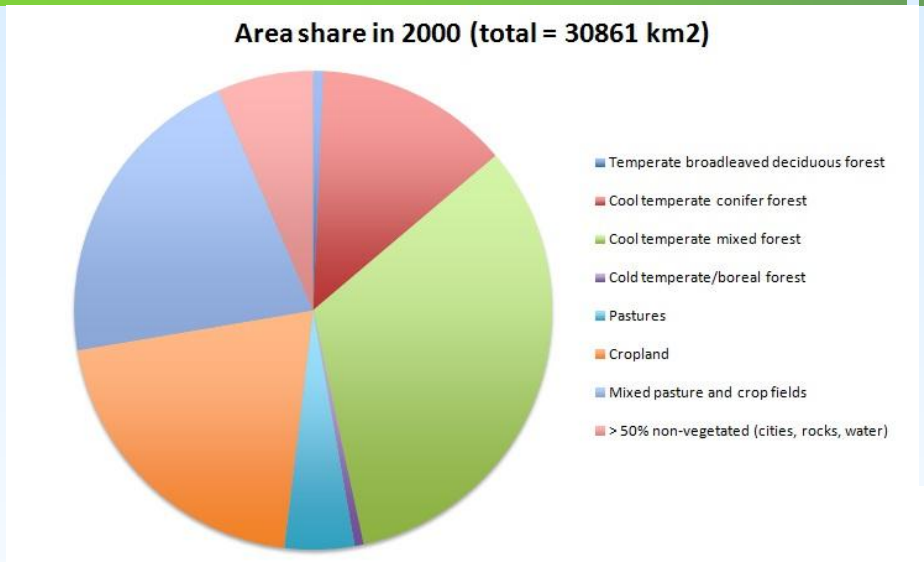


Figure 4:Variation of biomass over the period 2000-2018 by using static and dynamic (satellite) Land use data over Belgium. The dynamic land use simulation is initiated with 2000 land use and then, land use evolves by steps in 2006, 2012 and 2018.

Distribution of Land use Total Area and Biomass Over Belgium Year 2000



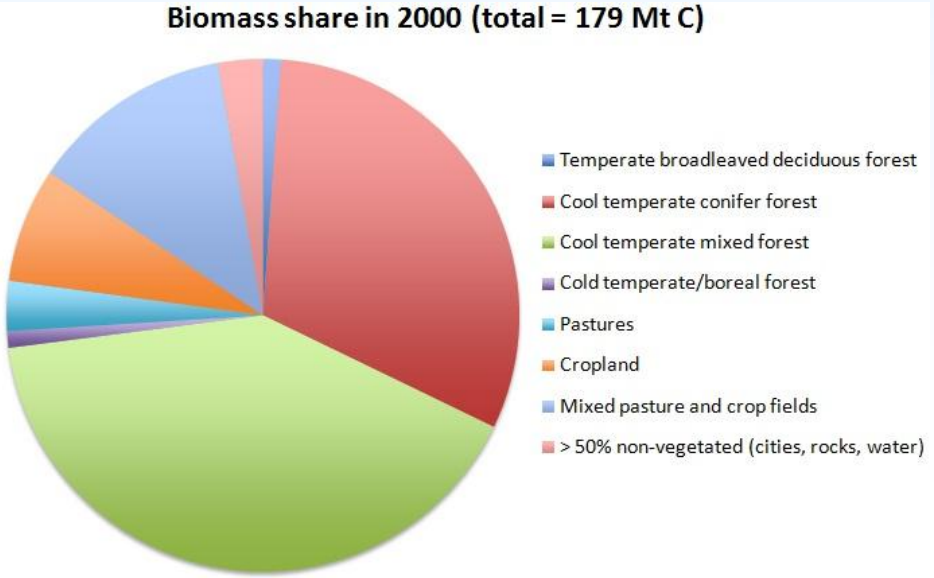


Figure 5: Satellite based land use data

Distribution of Land use Total Area and Biomass Over Belgium Year 2018

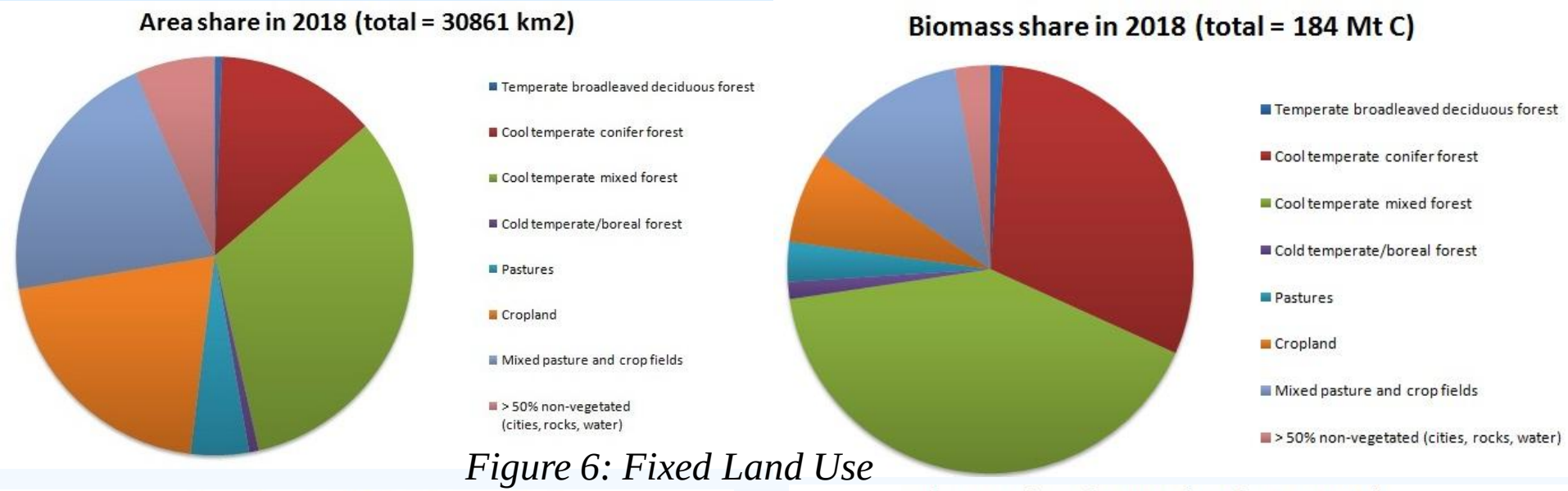


Figure 6: Fixed Land Use

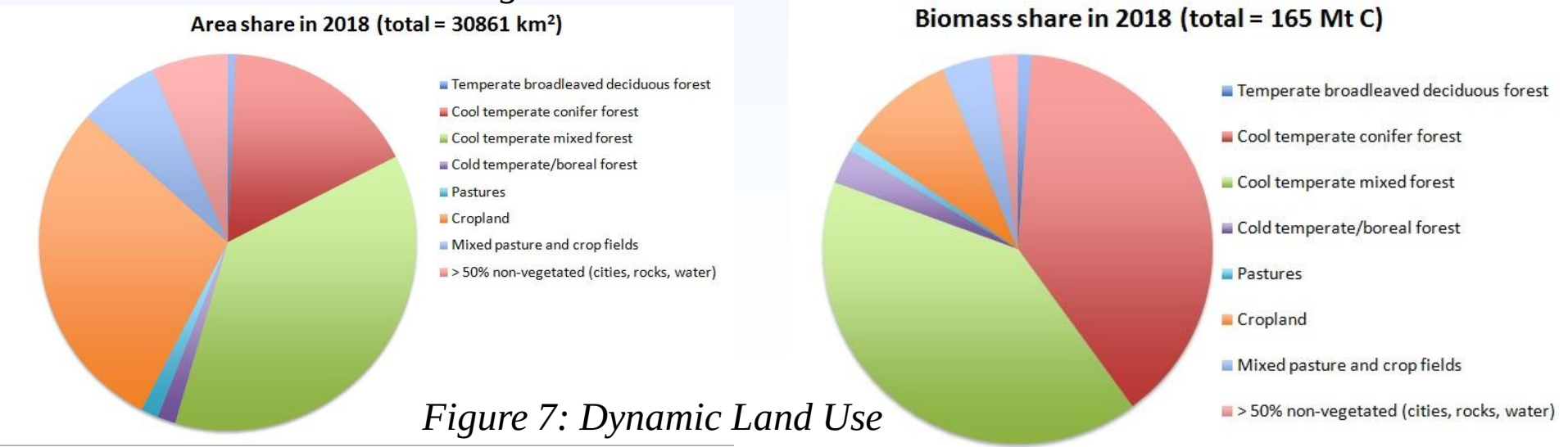


Figure 7: Dynamic Land Use

CONCLUSION

- The time series analysis of global biomass over Belgium from dynamic vegetation model strongly vary with the land use change for the year 2000-2018.
- In the static land use simulation, biomass increased between 2000 and 2018 from 179 Mt C to 184 Mt C.
- While in dynamic land use , biomass decreased between 2000 and 2018 from 179 Mt C to 165 Mt C.
- This results shows that the terrestrial carbon change is highly influenced by land use change.
- Addition of more years could provide more precise results.


THANK
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