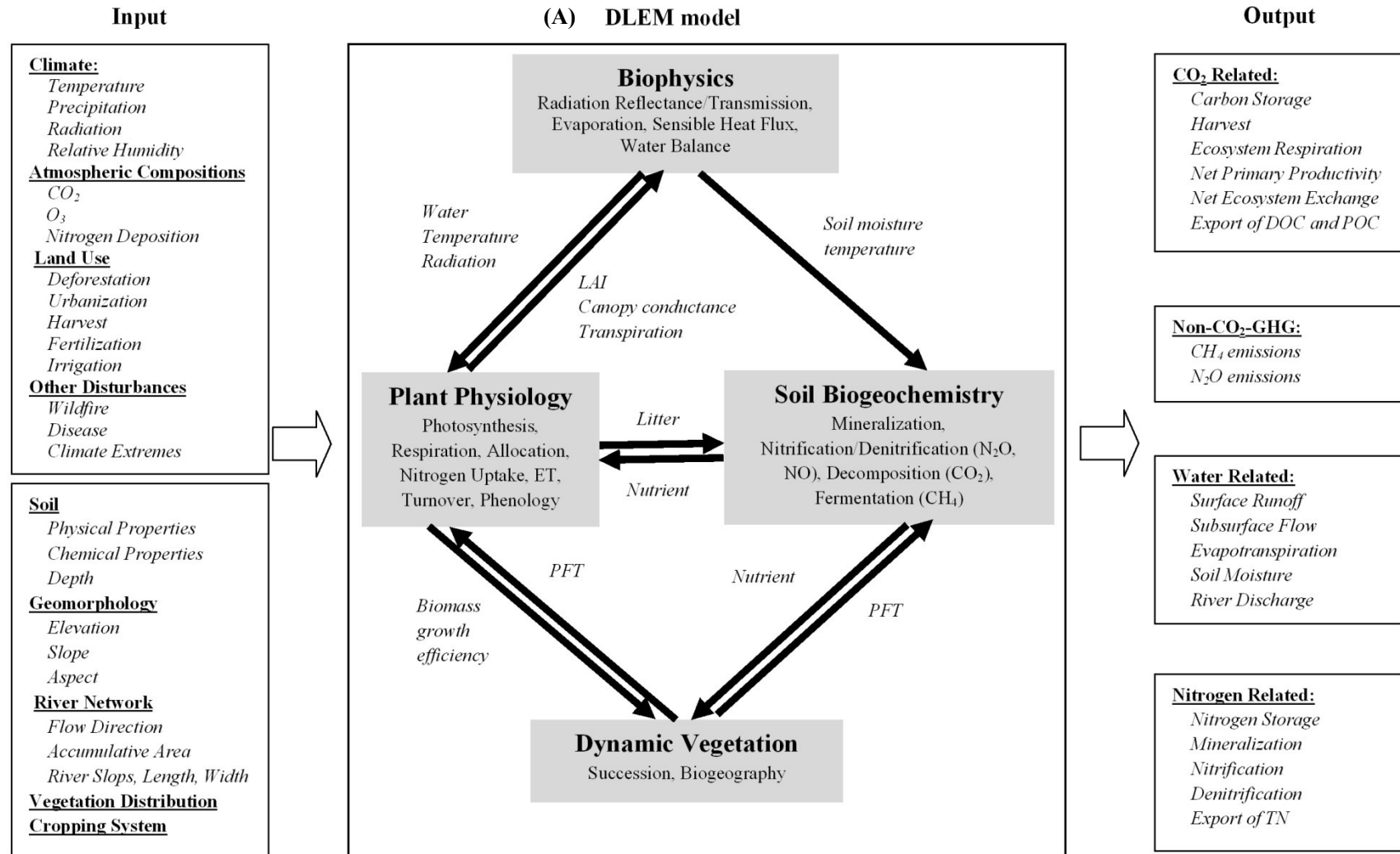
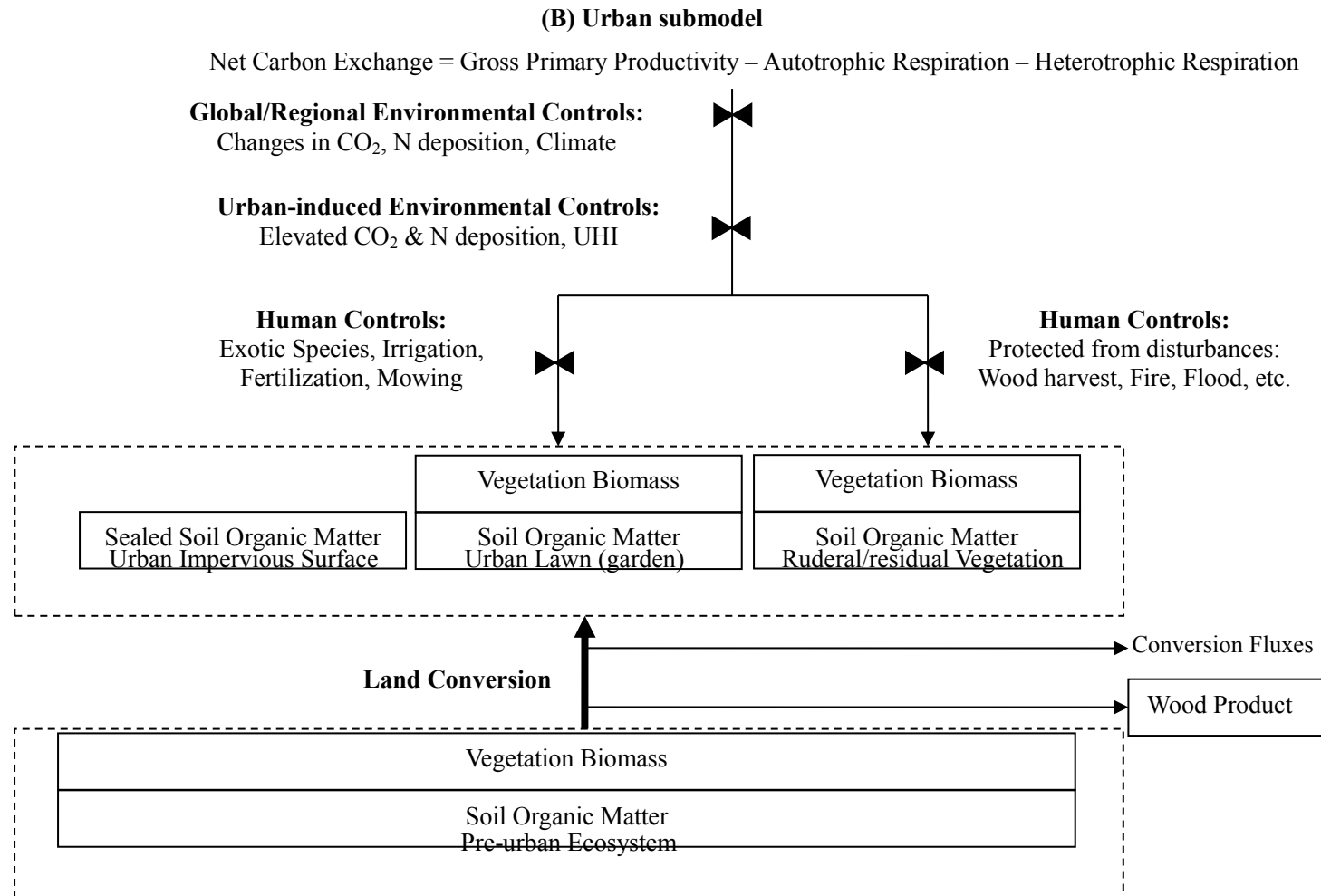


Supplemental material

- Figure S1, Illustration of the Dynamic Land Ecosystem Model (DLEM).
- Figure S2, The boundary of the SUS and the location of urban/developed lands
- Table S1, Input data sets for model simulation





1
2 Figure S1 Illustration of the Dynamic Land Ecosystem Model (DLEM). (a) the overall structure of DLEM; (b) the structure and controls
3 of urban submodel in DLEM (Zhang et al., 2012).
4

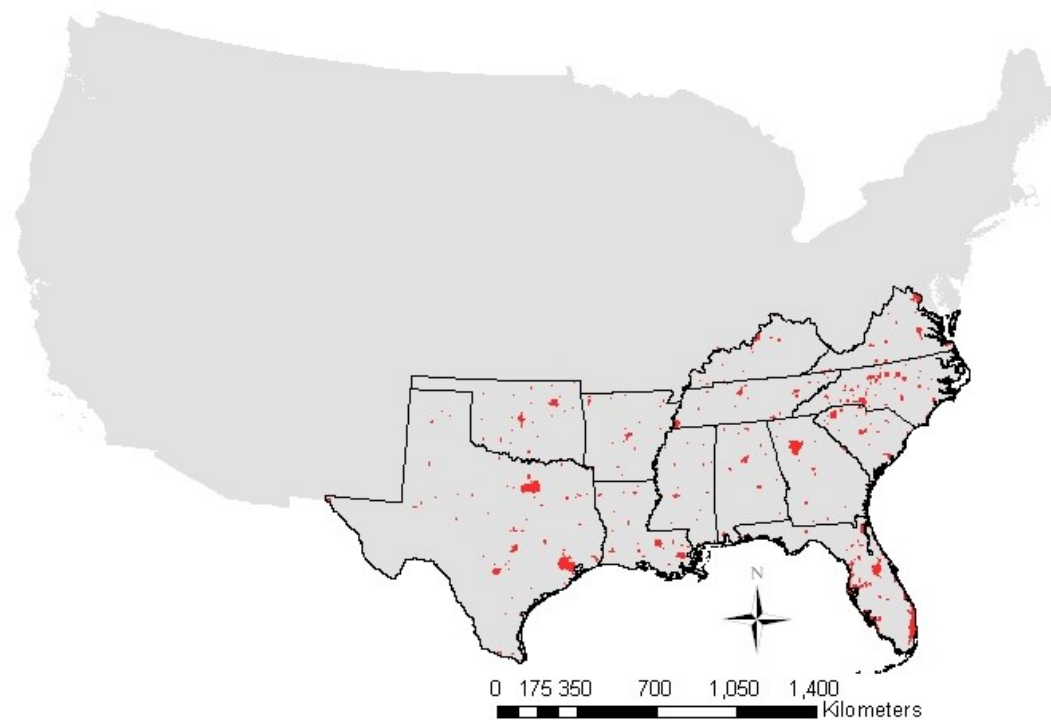


Figure S2 The boundary of the SUS and the location of urban/developed lands (in red) (Zhang et al., 2012). The urban and developed lands were derived based on the study of Homer et al. (2007).

Table S1 Model inputs for the case study — the background environmental drivers

Inputs	Unit	Temporal Resolution	Methods and Data Sources
Potential/native vegetation	8 [#] categories	Non-transient maps	Aggregated from the NLCD 2001 land cover dataset (Homer et al., 2007).
Soil clay content	%		Based on the 1 km resolution digital general soil association map (STATSGO) developed by USDA Natural Resources Conservation (NRC) (Miller and White, 1998).
Soil sand content	%		
Soil silt content	%		
Soil acidity	pH		
Soil bulk density	g/cm ³		
Elevation map	m	Daily	Generated from the 7.5 minute USGS National Elevation Dataset (NED). Data available online: edcnts12.cr.usgs.gov/ned/ned.html
Aspect map	Degree		From an Irrigated Area Map of the World developed by Thenkabail et al. (2006)
Slope map	Degree		
Irrigation map	1/0		By integrating the daily climate pattern of the North American Regional Reanalysis (NARR; 32 km resolution) dataset (Mesinger et al., 2006) into the monthly PRISM (Parameter-elevation Regressions on Independent Slopes Model; 4 km resolution; 1895-present) climate data (Daly et al., 2008). See page 92-95 in Zhang (2008) for detailed description of the methodology.
Precipitation	mm		
Maximum, minimum, and average temperature	°C		
Ozone index AOT40 [@]	ppb-hr	Annual	Dataset developed by Felzer et al. (2004)
CO ₂	ppmv		National Oceanic and Atmospheric Administration (NOAA) (www.esrl.noaa.gov)
Nitrogen deposition ^{\$}	g N/m ² /yr		Retrieved from a global data set that was extrapolated from a three-year dataset (Dentener, 2006).
Cropland fertilization ^{&}	g N/ m ² /yr		Based on the county-level fertilizer consumption records (Alexander and Smith, 1990; Ruddy et al., 2006)
Cropland conversion	0/1		1: urban or cropland; 0: natural vegetation types. Developed by combining the contemporary land-use map that was derived from NLCD2001 (Homer et al., 2007) with historical census dataset for cropland, urban, and population (Waisanen and Bliss, 2002)
Urbanization	0/1		

[#] The 8 potential plant functional types: deciduous broadleaf forest, coniferous broadleaf forest, mixture forest, shrubland, C3 grassland, C4 grassland, grass wetland, and forest wetland.

[@] AOT40 (ppb-hr) is the accumulated exposure over a threshold of 40 ppb during daylight hours. Before 1940 the ozone index was 0. After 1994 the ozone concentration was assumed to be stable.

^{\$} Nitrogen deposition includes NH_x (NH₃ and NH₄⁺), and NO_y (oxidized nitrogen except N₂O).

[&] Available fertilization data extends from 1945 to 2002. We assumed no changes before 1945 and after