Downscaling of landuse and landcover from the Global Change Assessment Model for coupling with Earth System and Agricultural models.

Supplementary Material

DOWNSCALING OF LANDUSE AND LANDCOVER FROM THE GLOBAL CHANGE ASSESSMENT MODEL FOR COUPLING WITH EARTH SYSTEM AND AGRICULTURAL MODELS. 1

A. GCAM OVERVIEW 1
B. ALTERNATIVE CONFIGURATIONS FOR THE SENSITIVITY ANALYSIS 2
C. ALTERNATIVE CONFIGURATIONS FOR THE SENSITIVITY ANALYSIS ERROR! BOOKMARK NOT DEFINED.

A. GCAM overview

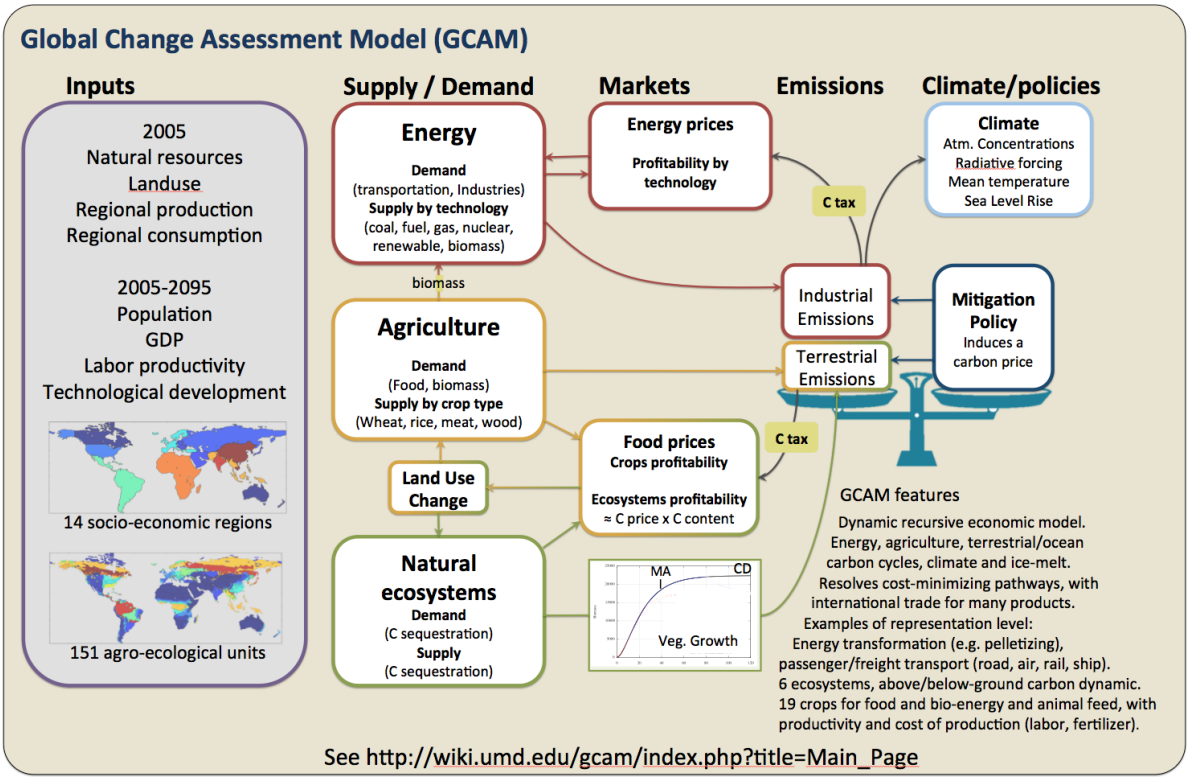

Figure S1. GCAM diagram.

B. Alternative configurations for the sensitivity analysis

Tables S 1. Configurations of the treatment order for the sensitivity analysis.

a) Common land types	Treatment order
forest	5
shrub	7
grass	6
crops	4
urban	1
snow	2
sparse	3

b) Common land types	Treatment order
forest	2
shrub	4
grass	3
crops	1
urban	5
snow	6
sparse	7

c) Common land types	Treatment order
forest	1
shrub	3
grass	2
crops	4
urban	5
snow	6
sparse	7

d) Common land types	Treatment order
forest	4
shrub	6
grass	5
crops	7
urban	1
snow	2
sparse	3

e) Common land types	Treatment order
forest	3
shrub	2
grass	1
crops	4
urban	5
snow	6
sparse	7

f) Common land types	Treatment order
forest	2
shrub	1
grass	3
crops	4
urban	5
snow	6
sparse	7

Tables S 2. Configurations of the FLT transition priorities for the sensitivity analysis.

a) Common land types	Common land types for downscaling						
	forest	shrub	grass	crops	urban	snow	sparse
forest	0	1	2	3	4	6	5
shrub	5	0	4	6	1	3	2
grass	6	5	0	4	1	3	2
crops	4	3	2	0	1	6	5
urban	5	3	2	4	0	6	1
snow	6	5	4	3	2	0	1
sparse	6	4	2	3	5	1	0

b) Common land types	Common land types for downscaling						
	forest	shrub	grass	crops	urban	snow	sparse
forest	0	1	2	3	4	6	5
shrub	5	0	4	6	1	3	2
grass	6	5	0	4	1	3	2
crops	3	2	4	0	1	6	5
urban	5	3	2	4	0	6	1
snow	6	5	4	3	2	0	1
sparse	6	4	2	3	5	1	0

c) Common land types	Common land types for downscaling						
	forest	shrub	grass	crops	urban	snow	sparse
forest	0	1	2	3	4	6	5
shrub	5	0	4	6	1	3	2
grass	6	5	0	4	1	3	2
crops	2	3	4	0	1	6	5
urban	5	3	2	4	0	6	1
snow	6	5	4	3	2	0	1
sparse	6	4	2	3	5	1	0

d) Common land types	Common land types for downscaling						
	forest	shrub	grass	crops	urban	snow	sparse
forest	0	3	2	1	4	6	5
shrub	6	0	5	4	1	3	2
grass	4	5	0	6	1	3	2
crops	4	3	2	0	1	6	5
urban	5	3	2	1	0	6	4
snow	6	5	4	3	2	0	1
sparse	6	4	2	3	5	1	0

e) Common land types	Common land types for downscaling						
	forest	shrub	grass	crops	urban	snow	sparse
forest	0	3	1	2	4	6	5
shrub	4	0	6	5	1	3	2
grass	6	4	0	5	1	3	2
crops	4	3	2	0	1	6	5
urban	5	4	1	2	0	6	3
snow	6	5	4	3	2	0	1
sparse	6	4	2	3	5	1	0

f) Common land types	Common land types for downscaling						
	forest	shrub	grass	crops	urban	snow	sparse
forest	0	3	2	1	4	6	5
shrub	6	0	5	4	1	3	2
grass	4	5	0	6	1	3	2
crops	2	3	4	0	1	6	5
urban	5	3	2	1	0	6	4
snow	6	5	4	3	2	0	1
sparse	6	4	2	3	5	1	0

C. Regional-scale sensitivity analysis

Figure S2. Results of the sensitivity analysis at the GCAM region scale.

D. Configuration to downscale 4 types of forests, instead of one single forest type

Table S3: User-defined aggregation of the spatial data to downscale 4 types of forests separately.

Spatial land types (MODIS PFTs)	Common land types for downscaling									
	ENF	EBF	DNF	DBF	shrub	grass	crops	urban	snow	sparse
ev. needl. (ENF)	**1**	0	0	0	0	0	0	0	0	0
ev. broad. (EBF)	0	**1**	0	0	0	0	0	0	0	0
dec. needl. (DNF)	0	0	**1**	0	0	0	0	0	0	0
dec. broad. (DBF)	0	0	0	**1**	0	0	0	0	0	0
shrub	0	0	0	0	**1**	0	0	0	0	0
grass	0	0	0	0	0	**1**	0	0	0	0
crops	0	0	0	0	0	0	**1**	0	0	0
urban	0	0	0	0	0	0	0	**1**	0	0
snow	0	0	0	0	0	0	0	0	**1**	0
sparse	0	0	0	0	0	0	0	0	0	**1**

Table S4: User-defined aggregation of the GCAM data to downscale 4 types of forests separately.

GCAM land types	Common land types for downscaling									
	ENF	EBF	DNF	DBF	shrub	grass	crops	urban	snow	sparse
Corn	0	0	0	0	0	0	**1**	0	0	0
Wheat	0	0	0	0	0	0	**1**	0	0	0
Rice	0	0	0	0	0	0	**1**	0	0	0
Root_Tuber	0	0	0	0	0	0	**1**	0	0	0
OilCrop	0	0	0	0	0	0	**1**	0	0	0
SugarCrop	0	0	0	0	0	0	**1**	0	0	0
OtherGrain	0	0	0	0	0	0	**1**	0	0	0
FiberCrop	0	0	0	0	0	0	**1**	0	0	0
FodderGrass	0	0	0	0	0	0	**1**	0	0	0
FodderHerb	0	0	0	0	0	0	**1**	0	0	0
Biomass	0	0	0	0	0	0	**1**	0	0	0
MiscCrop	0	0	0	0	0	0	**1**	0	0	0
OtherArableLand	0	0	0	0	0	0	**1**	0	0	0
PalmFruit	0	0	0	0	0	0	**1**	0	0	0
Pasture	0	0	0	0	0	**1**	0	0	0	0
UnmanagedPasture	0	0	0	0	0	**1**	0	0	0	0
UrbanLand	0	0	0	0	0	0	0	**1**	0	0
willow	**1**	**1**	**1**	**1**	0	0	0	0	0	0
Forest	**1**	**1**	**1**	**1**	0	0	0	0	0	0
UnmanagedForest	**1**	**1**	**1**	**1**	0	0	0	0	0	0
Shrubland	0	0	0	0	**1**	0	0	0	0	0
Grassland	0	0	0	0	0	**1**	0	0	0	0
Tundra	0	0	0	0	0	**1**	0	0	0	0
RockIceDesert	0	0	0	0	0	0	0	0	**1**	**1**

Table S5: User-defined treatment order to downscale 4 types of forests separately. ENF: Evergreen needle-leaf forest; EBF Evergreen broadleaf forest; DNF: Deciduous needle-leaf forest; DBF: Deciduous broadleaf forest.

Common land types	Treatment order
ENF	5
EBF	6
DNF	7
DBF	8
shrub	10
grass	9
crops	4
urban	1
snow	2
sparse	3

Table S6: User-defined transition priorities to downscale 4 types of forests separately.

Common land types	Common land types for downscaling									
	ENF	EBF	DNF	DBF	shrub	grass	crops	urban	snow	sparse
ENF	0	1	2	3	4	5	6	7	8	9
EBF	1	0	2	3	4	5	6	7	8	9
DNF	1	2	0	3	4	5	6	7	8	9
DBF	1	2	3	0	4	5	6	7	8	9
shrub	5	6	7	8	0	4	9	1	3	2
grass	6	7	8	9	5	0	4	1	3	2
crops	4	5	6	7	3	2	0	1	9	8
urban	5	6	7	8	3	2	4	0	9	1
snow	6	7	8	9	5	4	3	2	0	1
sparse	6	7	8	9	4	2	3	5	1	0