



Recent Improvements to the State Inventory Tool Land-Use Change and Forestry Module

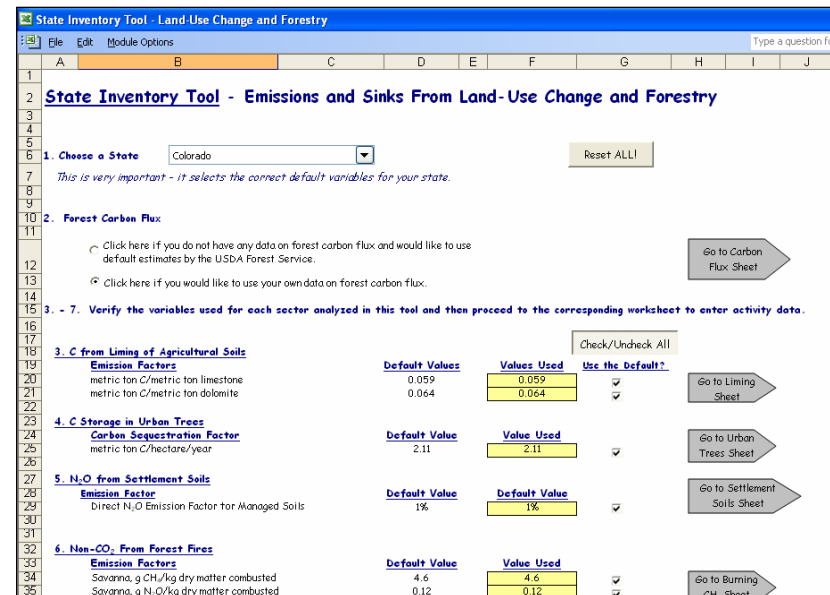
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- Introduction to the State Inventory Tool
- Overview of the Land-Use Change and Forestry (LUCF) Module
- Recent LUCF Improvements
- Future LUCF Improvements



State Inventory Tool - Land-Use Change and Forestry

File Edit Module Options

State Inventory Tool - Emissions and Sinks From Land-Use Change and Forestry

1. Choose a State: Colorado

This is very important - it selects the correct default variables for your state.

2. Forest Carbon Flux

Click here if you do not have any data on forest carbon flux and would like to use default estimates by the USDA Forest Service.

Click here if you would like to use your own data on forest carbon flux.

3. - 7. Verify the variables used for each sector analyzed in this tool and then proceed to the corresponding worksheet to enter activity data.

3. C from Liming of Agricultural Soils

Emission Factors	Default Values	Values Used	Use the Default?	
metric ton C/metric ton limestone	0.059	0.059	<input checked="" type="checkbox"/>	<input type="button" value="Go to Liming Sheet"/>
metric ton C/metric ton dolomite	0.064	0.064	<input checked="" type="checkbox"/>	

4. C Storage in Urban Trees

Carbon Sequestration Factor	Default Value	Value Used		
metric ton C/hectare/year	2.11	2.11	<input checked="" type="checkbox"/>	<input type="button" value="Go to Urban Trees Sheet"/>

5. N₂O from Settlement Soils

Emission Factor	Default Value	Default Value		
Direct N ₂ O Emission Factor for Managed Soils	1%	1%	<input checked="" type="checkbox"/>	<input type="button" value="Go to Settlement Soils Sheet"/>

6. Non-CO₂ from Forest Fires

Emission Factors	Default Value	Value Used		
Savanna, g CH ₄ /kg dry matter combusted	4.6	4.6	<input checked="" type="checkbox"/>	<input type="button" value="Go to Burning CH<sub>4</sub> Sheet"/>
Savanna, g N ₂ O/kg dry matter combusted	0.12	0.12	<input checked="" type="checkbox"/>	



Purpose of the State Inventory Tool (SIT)

- States typically address climate change following a three-phase approach:
 - ❖ Inventory development
 - ❖ Mitigation planning
 - ❖ Implementation of actions
- The SIT aims to increase efficiency of the inventory process to reduce the time and resources required to get states to the third phase



SIT Capabilities

- Cover all sources included in Emission Inventory Improvement Program (EIIP) guidance
- Utilize the U.S. national inventory report (NIR) methodologies, which follow international GHG inventory preparation guidelines
- Structured as Excel® workbooks that use macros and user-friendly displays to facilitate calculation
- Prompt users to input state-specific data or select default data and emission factors, where available
- Emphasize transparency in calculations, allowing modifications by states where appropriate
- Standardize estimation methodologies across states



SIT Modules

Energy Modules

- CO₂ from Fossil Fuel Combustion
- CH₄ and N₂O from Stationary Combustion
- CH₄ and N₂O from Mobile Combustion
- Natural Gas and Oil Systems
- Coal Mining

Other Modules

- Industrial Processes
- Agriculture
- LUCF
- Municipal Solid Waste
- Wastewater

- Synthesis Tool
- Projection Tool



Land-Use Change and Forestry (LUCF) Module

Sources Covered in LUCF Module	GHG Estimated
Forest Carbon Flux	Carbon
Liming of Agricultural Soils	CO ₂
Urban Trees	Carbon
Non-CO ₂ Emissions from Forest Fires	N ₂ O, CH ₄
Landfilled Yard Trimmings and Food Scraps	Carbon



Overview of LUCF Module Improvements

- Updated activity data
- Incorporated newly available state-level annualized forest carbon flux data from USFS
- Updated emission factors and methodologies
 - ❖ Liming of Agricultural Soils
 - ❖ Urban Trees
 - ❖ Landfilled Yard trimmings and Food Scraps
- Added new source category
 - ❖ N₂O from Settlement Soils



Forest Carbon Flux

- Incorporated state-level annualized data from USFS
- Covers 1990-2005 for all states except Alaska and Hawaii
- Includes estimates of carbon stock and flux for the 5 forest carbon pools included in the NIR:
 - ❖ Aboveground Biomass
 - ❖ Belowground Biomass
 - ❖ Dead Wood
 - ❖ Litter
 - ❖ Soil Organic Carbon

State Inventory Tool - Land-Use Change and Forestry

2. Forest Carbon Flux in Colorado

Two methodologies are used to calculate carbon emissions/storage (flux) from forest carbon using USDA Forest Service estimates of each state's forest carbon stocks.

(1) The first methodology applies to aboveground biomass, belowground biomass, dead wood, forest floor litter and soil organic carbon. USDA Forest Service estimates for each state's forest carbon stocks are provided for 1990-2005. These estimates are outputs of the Carbon Calculation Tool (CCT) which produces state-level annualized estimates of carbon stock and flux. The total carbon storage is presented in the first table below, and the second table calculates the annual changes in carbon storage. No defaults are available for Alaska, Hawaii, or the District of Columbia.

(2) The second methodology used applies to wood products and landfills (i.e. harvested wood products). Since the CCT does not produce estimates for the entire time series, default carbon emissions/storage from forest carbon flux are calculated by using USDA Forest Service estimates of each state's harvested wood stocks in 1987, 1992, and 1997. Changes from 1987-1992 and from 1992-1997 are each divided by 5 (the number of intervening years) to determine the average annual change. This average annual change is then applied for each year, giving total annual change. For the years 1998-2005, the average annual change for 1992-1997 is used as proxy data.

Users may also enter their own data. This may be done by selecting the appropriate option in Step 2 on the Control worksheet. For more information, please consult the Land-Use Change and Forestry chapter of the User's Guide.

Default data for Aboveground and Belowground Biomass, Dead Wood, Litter, and Soil Organic Carbon

		1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	20	
		Total Carbon Storage (million metric tons carbon)													
Aboveground Biomass		419.19	422.13	425.07	428.01	430.95	433.89	436.83	439.78	443.09	446.64	450.18	453.72	457.26	
Belowground Biomass		84.46	85.23	85.99	86.75	87.51	88.27	89.03	89.79	90.63	91.51	92.39	93.27	94.15	
Dead Wood		89.53	90.14	90.74	91.35	91.96	92.57	93.18	93.79	94.43	95.10	95.77	96.44	97.11	
Litter		246.96	247.79	248.61	249.44	250.27	251.09	251.92	252.75	253.95	255.37	256.79	258.22	259.64	
Soil Organic Carbon		274.43	275.65	276.87	278.08	279.30	280.52	281.73	282.95	284.61	286.54	288.46	290.39	292.32	
Total		1,114.57	1,120.92	1,127.28	1,133.63	1,139.99	1,146.34	1,152.70	1,159.05	1,166.71	1,175.16	1,183.60	1,192.04	1,200.48	
		Changes in Carbon Storage (million metric tons carbon)													
Aboveground Biomass		2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	3.32	3.54	3.54	3.54	3.54	
Belowground Biomass		0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.84	0.88	0.88	0.88	0.88	
Dead Wood		0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.65	0.67	0.67	0.67	0.67	
Litter		0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	1.20	1.42	1.42	1.42	1.42	
Soil Organic Carbon		1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.66	1.92	1.92	1.92	1.92	
Total		6.36	6.36	6.36	6.36	6.36	6.36	6.36	6.36	7.64	8.44	8.44	8.44	8.44	





Liming of Agricultural Soils

- Updated emission factors based on recent research (West and McBride 2005) on the fate of carbon in limestone (CaCO_3) and dolomite ($\text{CaMg}(\text{CO}_3)_2$)
- Updated activity data

	IPCC Default Emission Factor	New Emission Factor used in SIT and NIR
Limestone (metric ton C/metric ton limestone)	0.120	0.059
Dolomite (metric ton C/metric ton dolomite)	0.130	0.064

West, T.O.; McBride, A.C. "The contribution of agricultural lime to carbon dioxide emissions in the United States: dissolution, transport, and net emissions," *Agricultural Ecosystems & Environment*. 2005, 108, 145-154.



Methodological Changes

Landfilled Yard Trimmings & Food Scraps

- Revised methodology to make it consistent with the NIR
 - ❖ Adjusted carbon storage factors to attain a perfect mass balance on total carbon
- Included newly available generation and disposal data

Urban Trees

- Included 2000 U.S. Census data on urban area
- Annualized estimates of carbon storage across the entire inventory time series from 1990 through 2005 now available



N₂O Emissions from Settlement Soils

- Newly added to the SIT LUCF module
- Follows methodology used in the NIR
- Assumes about 10 percent of the fertilizers applied to soils in the US are applied to lawns, golf courses, and other landscaping occurring within settled areas
- Estimates emissions based on the amount of fertilizer applied to settlement soils multiplied by an emission factor and conversion factors



Future Improvements

- 2006 IPCC Guidelines for National Greenhouse Gas Inventories
 - ❖ Possible reorganization of SIT to include agriculture and LUCF sources in a combined Agriculture, Forestry and Other Land Use (AFOLU) module
 - ❖ Methodological changes as necessary to comply with international inventory guidelines and national inventory practices
- State-level estimates of carbon flux and N₂O emissions resulting from management of agricultural (cropland and grassland) soils



For More Information

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