i-Tree Design Notes and Links

This information is summarized from the About tab of the online i-Tree Design application

i-Tree Design allows you to calculate the approximate benefits that individual trees provide. This tool relies on average species growth equations and other geographic parameters that are generalized from city, county, state, and climate region data. Consequently, i-Tree Design is intended to be a starting point for understanding trees' value in the community rather than a scientific accounting of precise values.

Tree effects on energy use are calculated using the methods detailed in the USDA Forest Service publication, "Carbon Dioxide Reduction Through Urban Forestry: Guidelines for Professional and Volunteer Tree Planters (PSW-GTR-171)." Trees' effects on buildings from shade, evapotranspiration, and wind speed reduction (windbreak) are calculated using an applied reduction factor based on tree type, height, azimuth, and distance from the home. Shade and evapotranspiration effects are set to zero when trees are beyond 18 meters (approximately 60 feet) from defined building footprints. Windbreak effects on use are set to zero when trees are at a distance from the building equaling 35 times the tree height or greater (see: Heisler, G.M. and D.R. Dewalle. 1988. Effects of Windbreak Structure on Wind Flow. Agriculture, Ecosystems and Environment. 22/23:41-69). Because reduction factor calculations are based on data for the United States, these values for other countries should be regarded as approximations.

Past and future benefits are estimated using a forecasting model that includes calculating tree height values for each consecutive year that the model is run. In order to estimate tree height for each modeled year, annual tree diameter growth is estimated based on the length of growing season, species, tree condition, and current tree height. Annual tree height is then calculated based on the tree diameter and species and entered into the use equation.

Stormwater

The stormwater values are based on methods and models derived from the i-Tree Streets application. Refer to the US Forest Service Community Tree Guides for description of methods. See the Resources- Archives section of the i-Tree website to access the guides.

Carbon

Carbon dioxide sequestration values are derived from species-based biomass equations. Carbon dioxide avoided values are estimated by converting the savings to pounds of avoided carbon emissions. values (kWh and Mbtu) are converted to carbon dioxide using state-based EPA E-grid conversion values.

The carbon dioxide dollar value is based on the average central value estimate of the social cost of carbon as calculated by the 2010 Interagency Working Group on Social Cost of Carbon for the United States Government (see: http://www.epa.gov/oms/climate/regulations/scc-tsd.pdf).

Air Quality

Air pollutant deposition resource unit values are based on methods and models derived from the i-Tree Streets application.

Air pollutant removal resource units and monetary values for air quality benefits come from the following sources:

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Abbreviation	*Benefit Description*	*Transmission Rate - Fuel*	*Transmission Rate - Electricity*	*Monetary Value*
CO	Carbon Monoxide	EPA E-grid, 2009	Leonard Academy, 2011	Murray, 1994*
NO2	Nitrogen Dioxide	EPA E-grid, 2009	EPA E-grid, 2009	BenMap, 2010
PM10	Particulate Matter less than 10 Microns	EPA E-grid, 2009	Leonard Academy, 2011	Murray, 1994*
SO2	Sulfur Dioxide	EPA E-grid, 2009	EPA E-grid, 2009	BenMap, 2010
VOC	Volatile Organic Compounds	EPA E-grid, 2009	Leonard Academy, 2011	IMPACT, 2008

ay, F.J., L. Marsh. and P.A. Bradford. 1994. New York State energy plan, vol. II: issue reports. New York State Energy Office, Albany, NY. Values adjusted based on Produce Price Index. Note: In Canada, median US transmission rates were used and monetary values for CO and PM10 were sourced locally.

For more detailed information on urban and community forest assessments, please continue exploring the i-Tree website.

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- Significant text and graphical content was originally published by the USDA Forest Service's Center for Urban Forest Research through their Tree Guide series of publications. We credit the authors of these publications for this content.
- Facts about personal carbon production based on driving and flying courtesy of Conservation International.
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For technical questions about this tool, contact i-Tree support.