INTERFACE FEATURES | **INPUTS** | **OUTPUTS**

Column headers (Interface Features): Normalized text output, Normalized text input, Predictive, Text/Spreadsheet-Based, 3D Modeling, GIS-Based, 2D CAD/BIM-Based, Scripting Language

Column headers (Inputs): Location/Climate, Land Use/Building Type, Demographics, Building Footprint/Area, Transportation Parameters, Materials/Assemblies, Impervious/Pervious Surfaces, Precipitation/Storm Events, Vegetation Types/Land Cover, Soil Type

Column headers (Outputs): Water Use, Runoff Volume/Hydrograph, Evapotranspiration, Sewage Volume, Water Quality/Pollution Load, Habitat/Vegetation, Energy Use, GHG Emissions/Air Pollution, Embodied Energy/LCA, Solid Waste, Demographic trends, Land Use

TOOL NAME	Scripting Language	Outputs/Export Formats Notes	Inputs/Import Formats Notes	Scale (min & max)	Scope/Application	Website	Additional Sources:
Athena Impact Estimator for Buildings	C++	Embodied energy, GHG, consequences, solid waste emissions, and pollutants to air and water; Spreadsheet, .csv	project description, location, typical (comparable) design type, floor areas, working loads, spans, etc.	Building	Single-sector; building energy on a lifecycle basis	www.athenasmi.org/tools/impactEstimator/index.html	Condon, 2009 & BESTD
Community Viz	C++	Environmental, economic, and social impacts, GHG; .kmz, .csv, XMP, excel	Land use, building footprint/type, transportation volumes, jobs, density, vegetation, water; .shp, .skp, .3DS, XML, .csv, Excel	Neighborhood to mega-region	Multi-sector; various user-selected sustainability indicators	www.communityviz.com	Condon, 2009
EnergyPlus / ECOTECT Analysis	Fortran 2003	ECOTECT's own analysis functions use a wide range of informative graphing methods which can be saved as Metafiles, Bitmaps or animations. Tables of data can also be easily output. For more specific analysis or validation you can export to; RADIANCE, POV Ray, VRML, EnergyPlus, AIOLOS, HT82, CheNATH, ESP-r, ASCII Mod files, XML. .def, .bmp, and .csv	Intuitive 3D CAD interface allows validation of the simplest sketch design to highly complex 3D models; 3ds, .dxf, XML .	Shading models to full-scale cityscapes	Environmental design, environmental analysis, conceptual design, validation; solar control, overshadowing, thermal design and analysis, heating and cooling loads, prevailing winds, natural and artificial lighting, life cycle assessment, life cycle costing, scheduling, geometric and statistical acoustic analysis	http://usa.autodesk.com/adsk/servlet/pc/index?id=12602821&siteID=123112	BESTD
EnergyPlus / OpenStudio	C		Synced with SketchUp (OpenStudio). Building details/types; csv, txt, dxf, svg, and many others	Building (possibly to campus)	EnergyPlus models heating, cooling, lighting, ventilation, other energy flows, and water use. EnergyPlus includes many innovative simulation capabilities: time-steps less than an hour, modular systems and plant integrated with heat balance-based zone simulation, multizone air flow, thermal comfort, water use, natural ventilation, and photovoltaic systems		BESTD
FEDS (Facility Energy Decision System)		Fuel-neutral analysis with full life-cycle costing of retrofit options (ECMs) for the on-site buildings. Output data includes energy and cost savings, emissions reductions, and a wide range of economic measure; txs, .txd, .csv	Location, building types, operating hours, age, square footage, fuels used by facility and energy price data are required. Numerous detailed engineering parameters are optional	Buildings to campus	This is a retrofit software-single buildings, multibuilding facilities, central energy plants, thermal loops, energy simulation, retrofit opportunities, life cycle costing, emissions impacts, alternative financing	www.pnl.gov/feds/	BESTD
HolisticCity		Parametric calculation of variables (parking spaces, energy use, GHG emissions, etc.); .xls, .csv (data outputs), .dwg (layouts, inputs), .jpg (output diagrams)	Street networks, building footprints, parking lots/spaces, building density, energy use by development type, carbon equivalents; .dwg	1 to 200 ha	Conceptual urban master planning - Quickly sketch and edit your masterplan, and watch as your floor areas, densities, car parking and other numerical data are calculated automatically. Reduce project costs, and free up more time for exploring options and enhancing design quality	www.holisticcity.co.uk/	
IES VE-Toolkit, VE-PRO		Graphically based information on solar, light/daylight, wind (internal and external), energy, carbon; XML/HTM, spreadsheet with PRO version only	Building locations/types (via SketchUP, Revit, AutoDesk, ArchiCad, Graphisoft), contains a database of "typical" values to be used in early analysis with the ability to tweak things in later iterations	Single and multiple buildings	Prides itself on being able to help make decisions about "what analysis at which stage of development". Undertake energy performance snapshots to assess impact of design decisions • Develop building loads and impact of conservation strategies • Develop carbon Footprint reduction strategies • Assess passive/hybrid/renewable strategies • Assess the impact of daylight and solar • Incorporate bulk airflow, ventilation and indoor air quality into the equation • Assess compliance with a range of worldwide regulations and voluntary codes	www.iesve.com/	
INDEX and Cool Spots		Energy use, costs, air pollution, GHG emissions, and other indicators; GIS shapefiles and	Existing Conditions (buildings, vehicle miles traveled)	Building to mega-region	Multi-sector; various sustainability indicators including building and transportation energy and emissions	www.crit.com	Condon, 2009
i-Tree suite (Eco, Streets, & Hydro)	Visual Basic	Urban forest structure, environmental benefits, "value" to communities, management needs, (Hydro, coming soon, changes in tree co; .csvver on stream flow and water quality)	Tree inventories, air pollution and meteorological data; MS Access, .csv	Sample of tree inventory to entire city	Provide urban forest managers and advocates with tools to quantify ecosystem services and benefit values of community trees at multiple scales.	www.itreetools.org/	
i-Tree Green Roof Tool (GBO Mini-model)	Visual Basic	Runoff, .csv	Tree cover, green roof cover, pervious surfaces; .csv		Calculate the effective reduction in runoff based on the introduction of trees and green roofing material		
UPlan	Python	Runoff, h20 quality, habitat, GHG emissions; maps (ArcGIS) & spreadsheets (Excel)	Land use, demographics, attractions and discouragements/exclusions to land development	District to mega-region	Multi-sector; urban growth model; emissions	http://ice.ucdavis.edu/doc/uplan	Condon, 2009
UrbanSIM		Population dist., households by type, business by type, land use by type, units of housing by type, non-residential square footage, densities of development, prices of land; maps, animated maps, database (SQL), GIS, .csvd	Population, employment, land use, transportation plans, land development policies, economic forecasts	County to city	Planning and analysis of urban development, incorporating the interactions between land use, transportation, the economy, and the environment.	www.urbansim.org/Main/WebHome	
HydroCAD	Excel	Hydrographs, culvert calcs, pollutant loading, pond storage; .txt, .csv, .emf, .jpeg	Storm event info, land use types, conveyance mechanisms, water detention/storage; .txt, .csv,		all types of drainage projects from small runoff studies to complex detention pond designs	www.hydrocad.net/	
Andrew Edwins Water Balance Model		Water usage, sewer usage, runoff, water storage, evapotranspiration, sublimation, infiltration	Land use types, building uses, occupancy, land cover, roof type, ecosystem type, soil type	Single building	Calculates water input and output based on geographic location, building usage, and surrounding land cover		

Note: The information in this table was gleaned from the website of the tool developer or as noted from (Condon, 2009) or the Building Energy Software Tools Directory (BESTD) http://apps1.eere.energy.gov/buildings/tools_directory/subjects.cfm (accessed November 2010)