Green Growth

From LEED-ND to Smart Environments for Resource Saving

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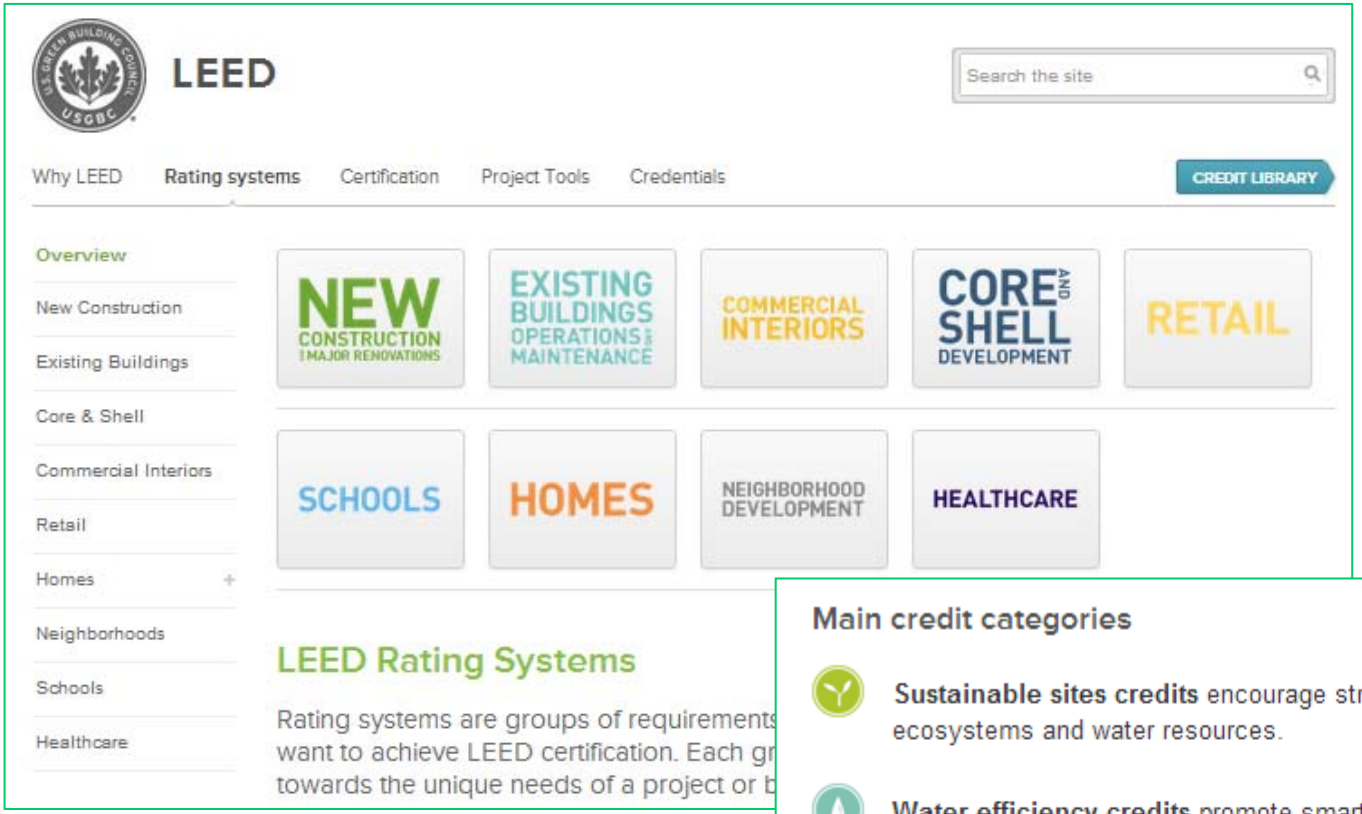
Contents

LEED: Leadership in Energy and Environmental Design

A standard for the design and assessment of green growth



- Started in 1998, LEED standards have been applied to more than 7000 projects in the United States and 30 countries worldwide.
- The pilot version, LEED NCv1.0, led to LEED NCv2.0, then LEED NCv2.2 in 2005, and v3 in 2009.

- LEED 2009 has placed a relatively greater emphasis on "the reduction of **energy consumption** and **greenhouse gas** emissions associated with building systems, transportation, the embodied energy of water, materials and solid waste."

Main credit categories

Sustainable sites credits encourage strategies that minimize the impact on ecosystems and water resources.

Water efficiency credits promote smarter use of water, inside and out, to reduce potable water consumption.

Energy & atmosphere credits promote better building energy performance through innovative strategies.

Materials & resources credits encourage using sustainable building materials and reducing waste.

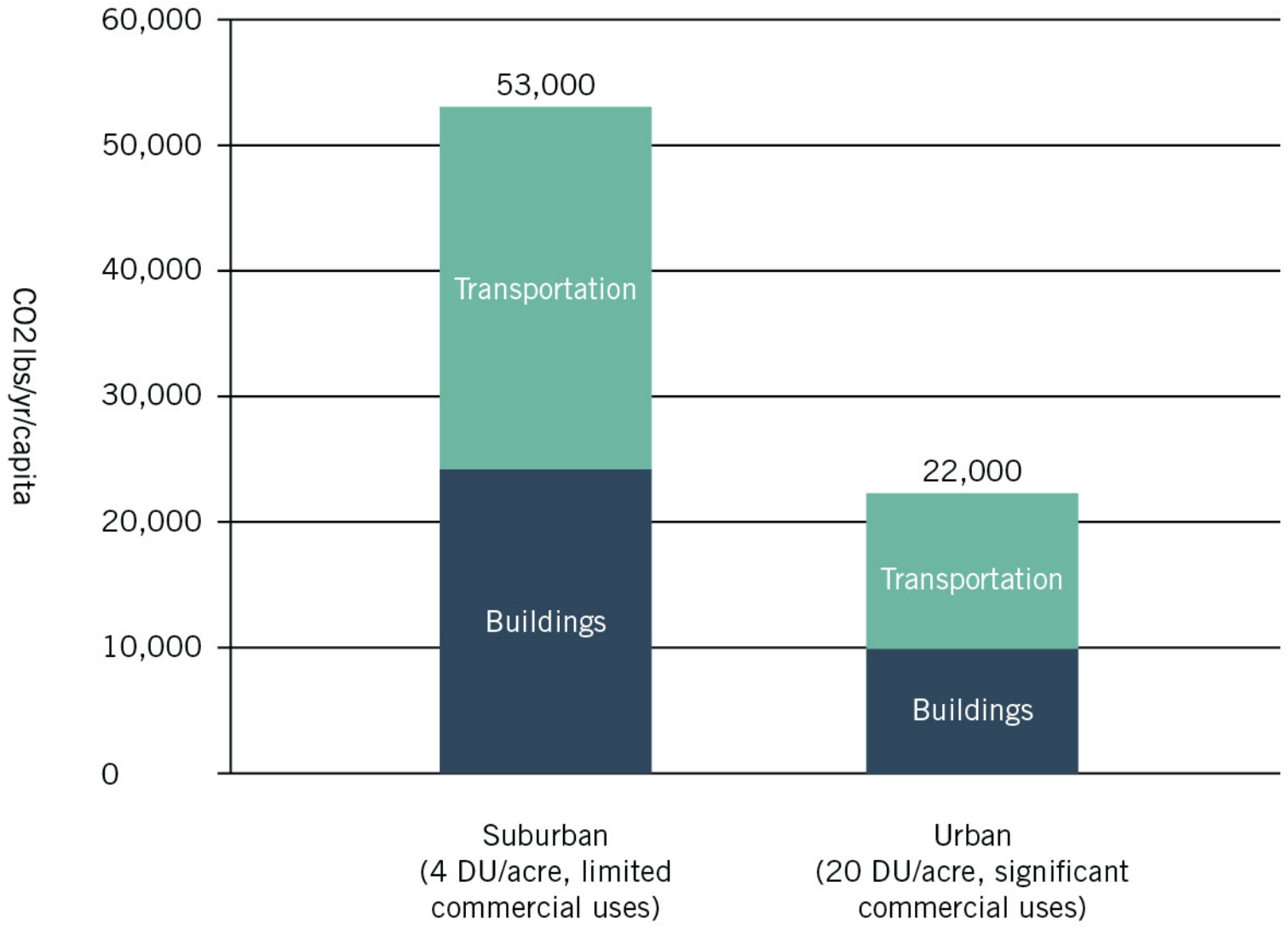
Indoor environmental quality credits promote better indoor air quality and access to daylight and views.

LEED-ND Neighborhood Development

Sprawl as main cause of high energy use & CO2 emissions

Source: LEED for Neighborhood Development - 2009 Pilot Version

LEED ND for green growth planning
Residential CO2 emissions with respect to density



Slide information from Criterion Planners

Source: LEED for Neighborhood Development - 2009 Pilot Version

LEED ND planning
3 blocks of principles

Source: LEED for Neighborhood Development - 2009 Pilot Version

Block 1: Smart growth

Smart Growth is well-planned development that protects natural ecosystems, imperiled species, and farmland, revitalizes communities, offers affordable housing, keeps jobs close to housing, and reduce automobile dependence.

Source: LEED for Neighborhood Development - 2009 Pilot Version

Smart location credits

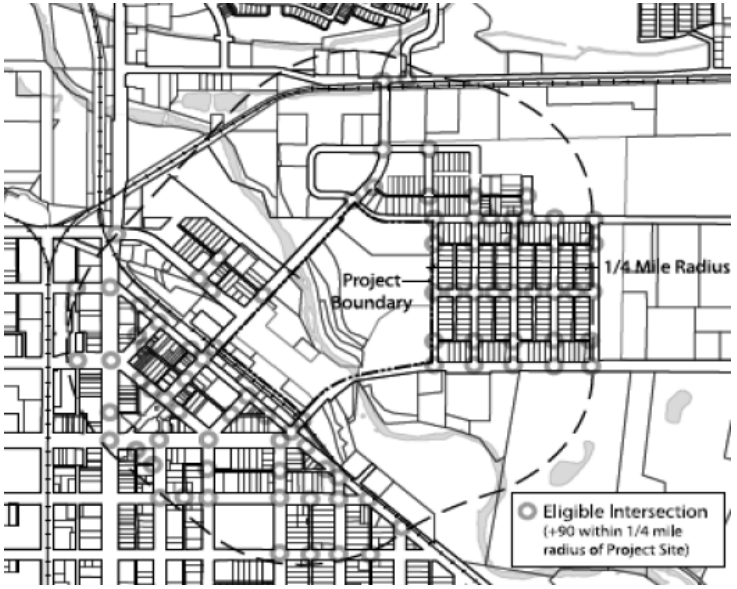
			Smart Location and Linkage	27 Points Possible
0	0	0		
Y			Prereq 1 Smart Location	Required
Y			Prereq 2 Imperiled Species and Ecological Communities	Required
Y			Prereq 3 Wetland and Water Body Conservation	Required
Y			Prereq 4 Agricultural Land Conservation	Required
Y			Prereq 5 Floodplain Avoidance	Required
			Credit 1 Preferred Locations	10
			Credit 2 Brownfield Redevelopment	2
			Credit 3 Locations with Reduced Automobile Dependence	7
			Credit 4 Bicycle Network and Storage	1
			Credit 5 Housing and Jobs Proximity	3
			Credit 6 Steep Slope Protection	1
			Credit 7 Site Design for Habitat or Wetland and Water Body Conservation	1
			Credit 8 Restoration of Habitat or Wetlands and Water Bodies	1
			Credit 9 Long-Term Conservation Management of Habitat or Wetlands and Water	1

Source: LEED for Neighborhood Development - 2009 Pilot Version

Block 2: New urbanism

Principles of the New Urbanism

- Compact, walkable neighborhoods
- Mixed-use urban form
- Highly connected street networks
- Sufficient density
- Building design that emphasizes human-scale
- Range of housing to serve diverse populations



Connected and open community

Compact development

Neighborhood pattern and design credits

0	0	0	Neighborhood Pattern and Design	44 Points Possible
Y			Prereq 1 Walkable Streets	Required
Y			Prereq 2 Compact Development	Required
Y			Prereq 3 Connected and Open Community	Required
			Credit 1 Walkable Streets	12
			Credit 2 Compact Development	6
			Credit 3 Mixed-Use Neighborhood Centers	4
			Credit 4 Mixed-Income Diverse Communities	7
			Credit 5 Reduced Parking Footprint	1
			Credit 6 Street Network	2
			Credit 7 Transit Facilities	1
			Credit 8 Transportation Demand Management	2
			Credit 9 Access to Civic and Public Spaces	1
			Credit 10 Access to Recreation Facilities	1
			Credit 11 Visitability and Universal Design	1
			Credit 12 Community Outreach and Involvement	2
			Credit 13 Local Food Production	1
			Credit 14 Tree-Lined and Shaded Streets	2
			Credit 15 Neighborhood Schools	1

Source: LEED for Neighborhood Development - 2009 Pilot Version

Block 3: Green infrastructure and buildings

GREEN BUILDINGS

"Green buildings" emphasize environmental excellence and sensitivity in their design, incorporating strategies like energy and water efficiency, high indoor air quality, and sustainably sourced (or recycled) materials. LEED-ND contains prerequisites and credits for energy efficiency, water efficiency, and certified green buildings—underscoring their foundational role for a sustainable neighborhood.

In addition to water efficiency inside buildings, **water used outside buildings** for landscaping and street trees determines a neighborhood's overall water use. Planting native species is preferable as they are less disruptive to natural ecosystmes; in arid climates they tend to be drought-tolerant and require less irrigation. For plants that require irrigation, using efficient irrigation equipment, capturing rainwater, or recycling wastewater can reduce overall water consumption.

Source: A Citizen's Guide to LEED for Neighborhood Development

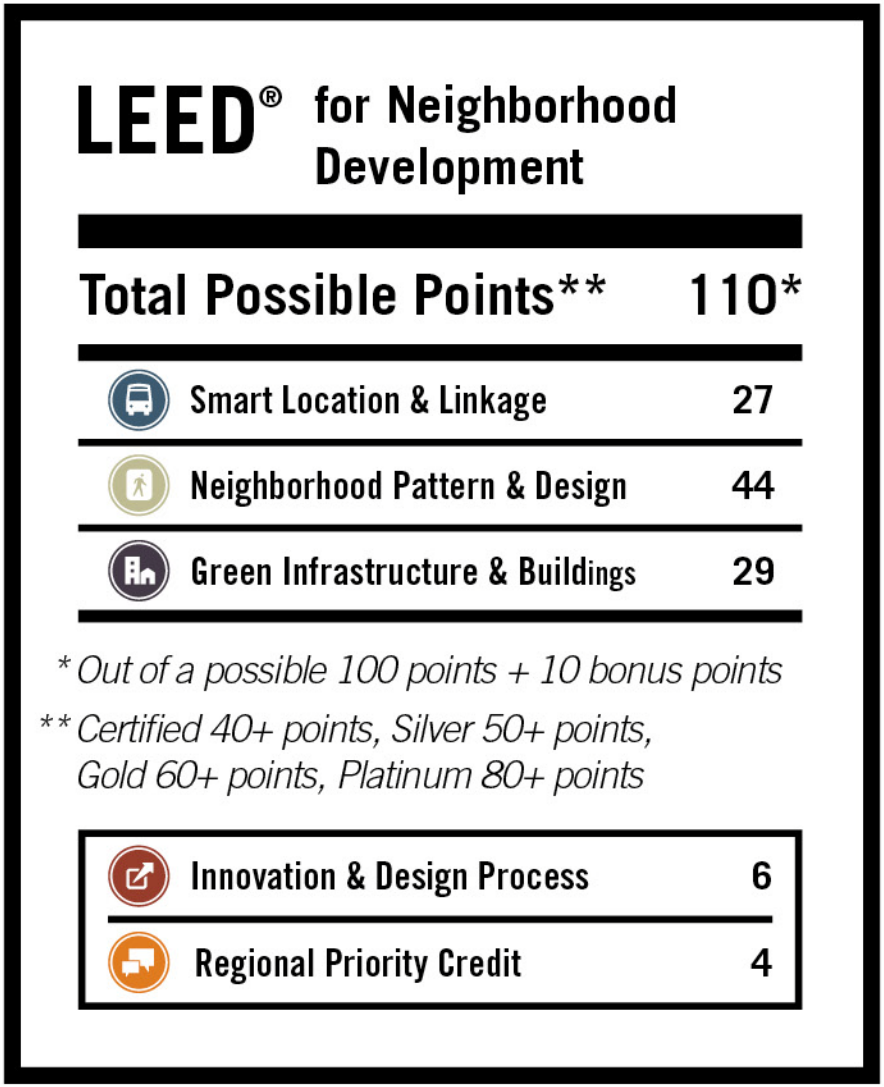
Green infrastructure and buildings credits

Green Infrastructure and Buildings, Continued

Yes	?	No			
			Credit 1	Certified Green Buildings	5
			Credit 2	Building Energy Efficiency	2
			Credit 3	Building Water Efficiency	1
			Credit 4	Water-Efficient Landscaping	1
			Credit 5	Existing Building Use	1
			Credit 6	Historic Resource Preservation and Adaptive Reuse	1
			Credit 7	Minimized Site Disturbance in Design and Construction	1
			Credit 8	Stormwater Management	4
			Credit 9	Heat Island Reduction	1
			Credit 10	Solar Orientation	1
			Credit 11	On-Site Renewable Energy Sources	3
			Credit 12	District Heating and Cooling	2
			Credit 13	Infrastructure Energy Efficiency	1
			Credit 14	Wastewater Management	2
			Credit 15	Recycled Content in Infrastructure	1
			Credit 16	Solid Waste Management Infrastructure	1
			Credit 17	Light Pollution Reduction	1

Source: LEED for Neighborhood Development - 2009 Pilot Version

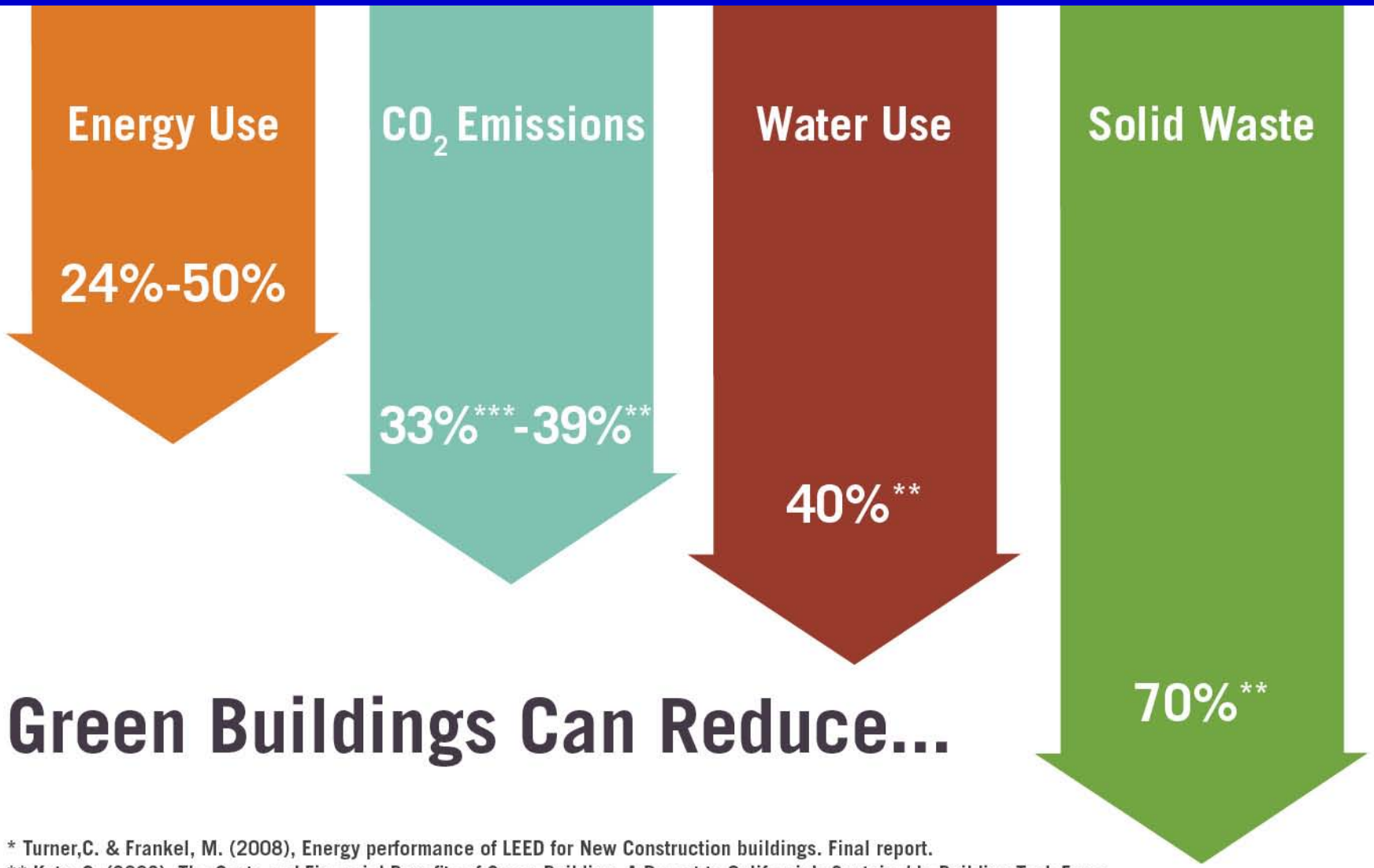
LEED ND
Design, Appraisal and Certification



Source: LEED for Neighborhood Development - 2009 Pilot Version

LEED ND

Expected impact



* Turner,C. & Frankel, M. (2008), Energy performance of LEED for New Construction buildings. Final report.
** Kats, G. (2003). The Costs and Financial Benefits of Green Building. A Report to California's Sustainable Building Task Force.
*** GSA Public Buildings Service (2008). Assessing green building performance. A post occupancy evaluation of 12 GSA buildings.

Source: LEED for Neighborhood Development - 2009 Pilot Version

2. Green growth: Bottom-up smart environments

Intelligent Environments for Green Growth

Open smart platforms + User-driven innovation

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Will 'intelligent cities' put an end to suburban sprawl?

By Haya El Nasser, USA TODAY Updated 1/28/2011 4:08:27 PM | 12 | 2 Share

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When the economy was roaring and housing booming, reining in suburban sprawl dominated the development debate under the name of "smart gro

By Ric Francis, AP

Suburban sprawl communities like the one here in

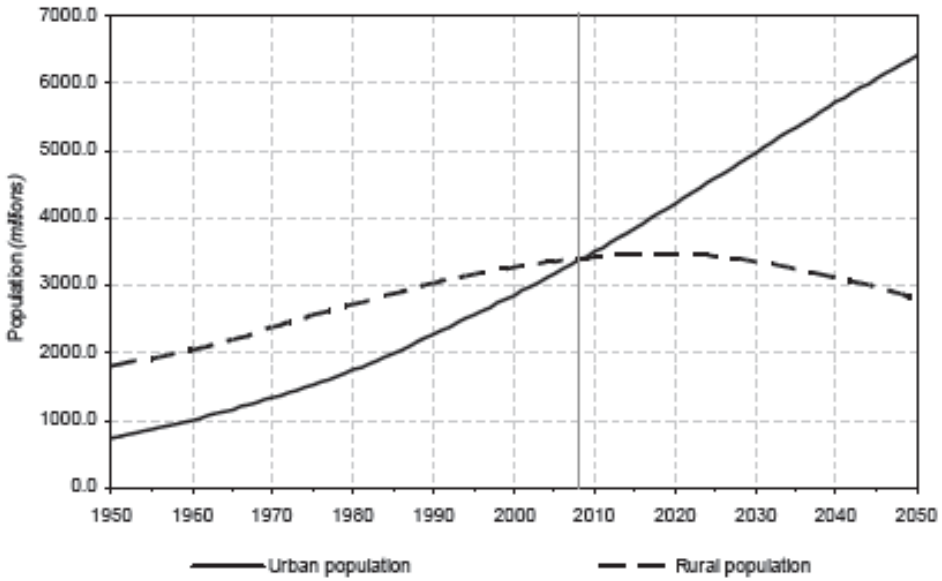
Now that the economy and h
prompting more people to sta
back seat. But smarts still ma
"intelligent cities."

"There's a 15- to 20-year cyc
terms," says Robert Lang, ur
University of Nevada-Las Veg
renewal'? Smart growth is ne

VALET BIKE PARKING: Easi
COMMUTING: Cities tackle t
STREET CARS: Transformin

That's not to say the principl
On the contrary, he says, the
widely accepted that they've
Urbanism, the design movem
of smart growth, encourages
businesses in a pedestrian-fr

Figure I.1. Urban and rural populations of the world, 1950-2050



	Population (billion)				
	1950	1975	2007	2025	2050
Urban population					
World	0.74	1.52	3.29	4.58	6.40
More developed regions	0.43	0.70	0.91	0.99	1.07
Less developed regions	0.31	0.82	2.38	3.59	5.33

Intelligent / Smart Environments
How it works

http://www.iot-a.eu/arm/120613%20IoT-A%20ARM%20Book%20Introduction%20v7.pdf/view

Smart environments

- "is a small world where all kinds of smart devices are continuously working to make inhabitants' lives more comfortable",
- Environments "able to acquire and apply knowledge and also adapt to its inhabitants in order to improve their experience".
- "Inhabitants may wish to ensure the safety, or reduce the costs of maintaining the environment, or automate tasks typically performed".

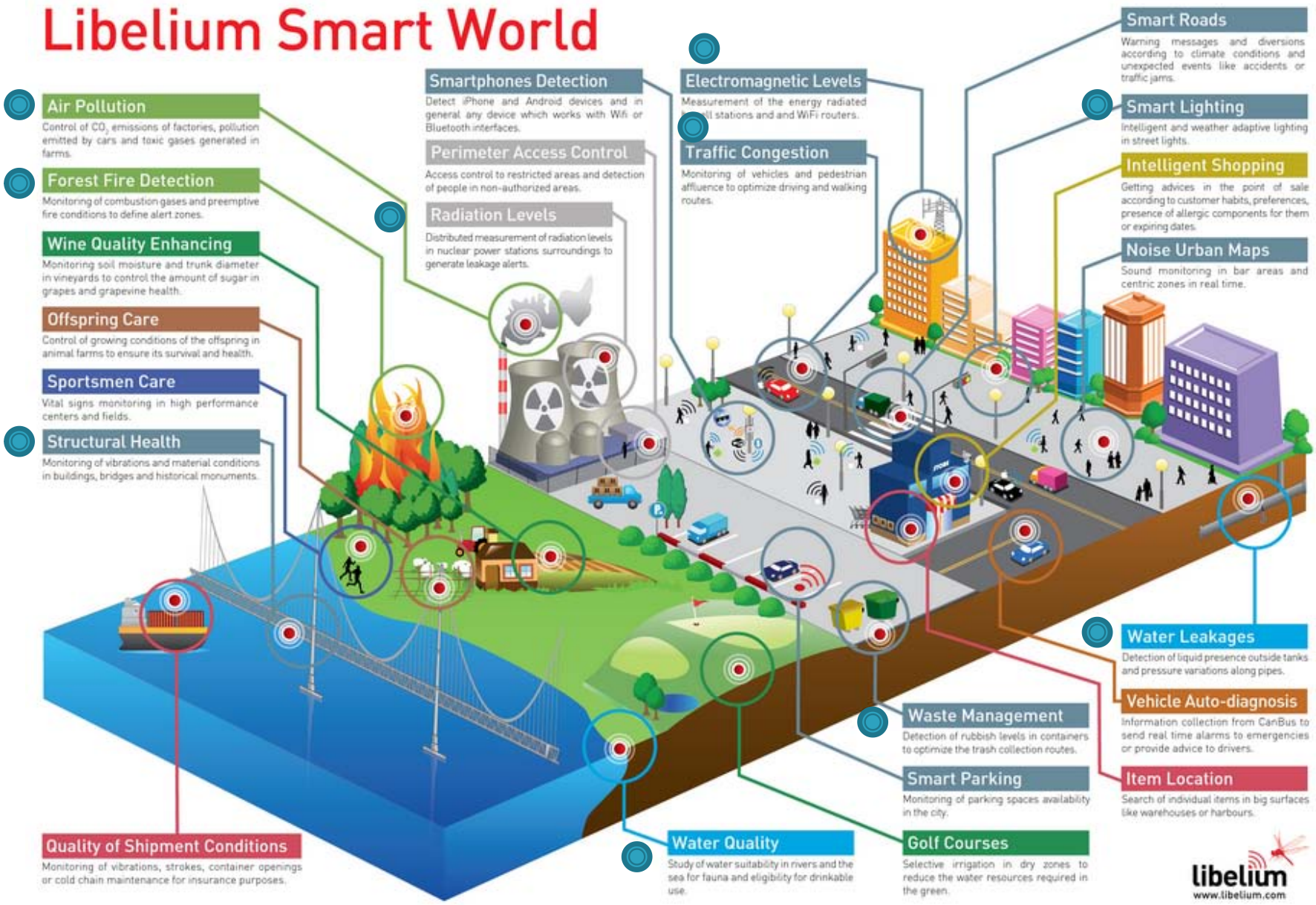
(Cook, D.J. and Sajal. K.D. (2005) Smart Environments: technology, protocols and applications, Wiley)

Broad layers of SE

- Communication: Networks and Sensors
- Applications: Software, data bases, info processing, visualization, optimization
- User involvement / benefit: Content, decision making, crowdsourcing, societal applications, social innovation.

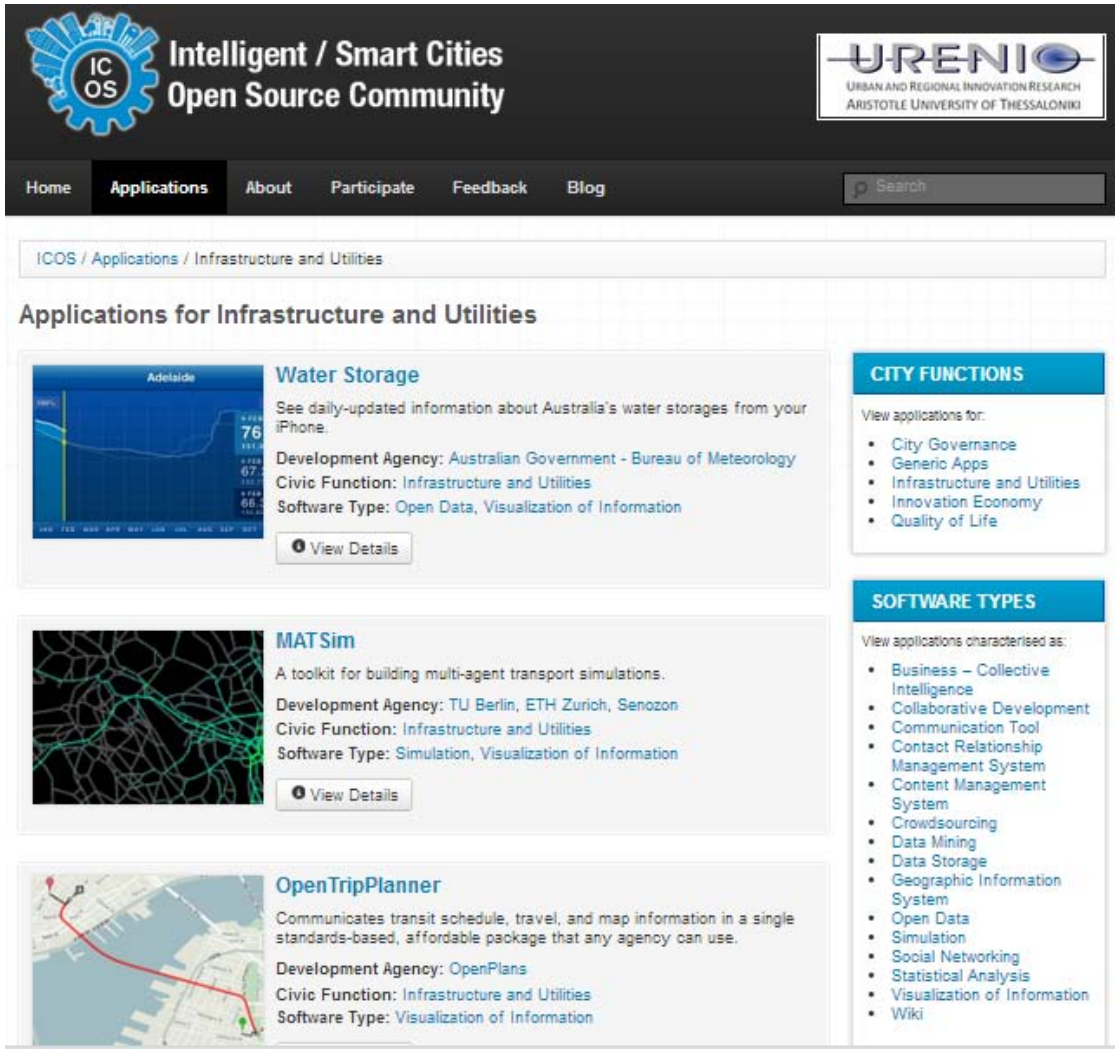
Intelligent / Smart Environments

Sensor networks – Open data – Web 2.0 data



Intelligent / Smart Environments
Applications for optimization

Crowdsourcing



Open source / Open data

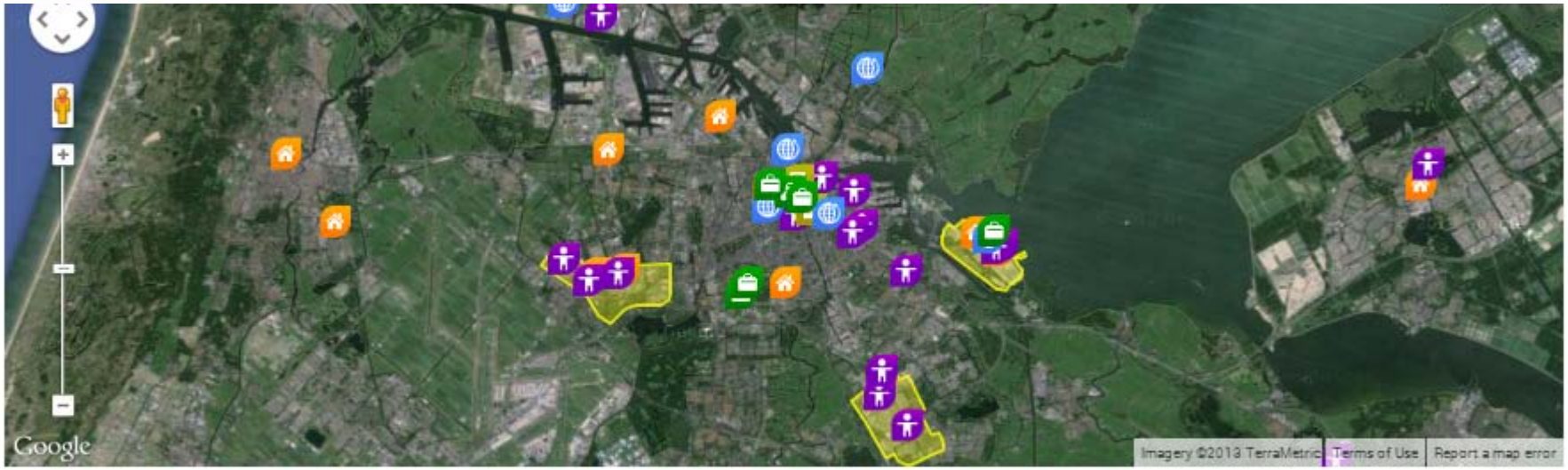
Smart Amsterdam

43 projects for energy, environment, mobility

amsmartcity Projects News Knowledge centre

Theme Area Project Partner

Show all Living Working Mobility Public Facilities Open Data



Amsterdam Smart City is...

5 Themes →

Amsterdam Smart City (ASC) is a unique partnership between businesses, authorities, research institutions and the people of Amsterdam. Together, our goal is to develop the Amsterdam Metropolitan Area into a smart city. We focus on the themes living, working, mobility, public facilities and open data.

3 Areas →

Amsterdam Smart City has established the Amsterdam Metropolitan Area as an urban living lab that allows businesses the potential to both test and demonstrate innovative products and services. Three areas in the Amsterdan Metropolitan region play a significant role.

43 Projects →

Partners of ASC initiate en deploy various of projects focussing on energy transition and open connectivity.

Smart Santander
A testbed for energy, mobility, environment

Figure 1: Outdoor parking and Environmental Monitoring deployed architecture

The Santander testbed is composed of around 3000 IEEE 802.15.4 devices, 200 GPRS modules and 2000 joint RFID tag/QR code labels deployed both at static locations (streetlights, facades, bus stops) as well as on-board of mobile vehicles (buses, taxis).

Open Call from the FP7 SmartSantander project for innovative applications and services, experimenting with the IoT in the context of the city

3. Hotel Energy Efficiency Solutions Platform

HOTEL ENERGY SOLUTIONS

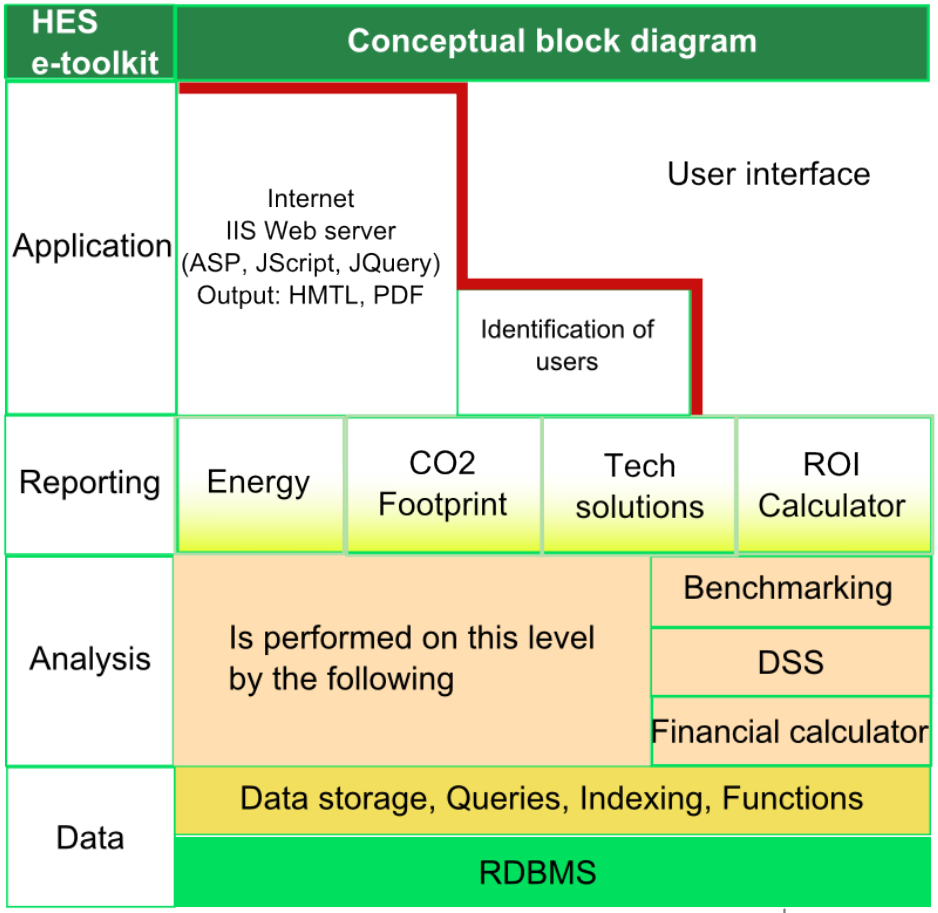
A web platform developed for UNWTO (World Tourism Organization) and UNEP (United Nations Environment Programme)

www.hotelenergysolutions.net

www.hes-unwto.org

HES e-toolkit

HES Platform



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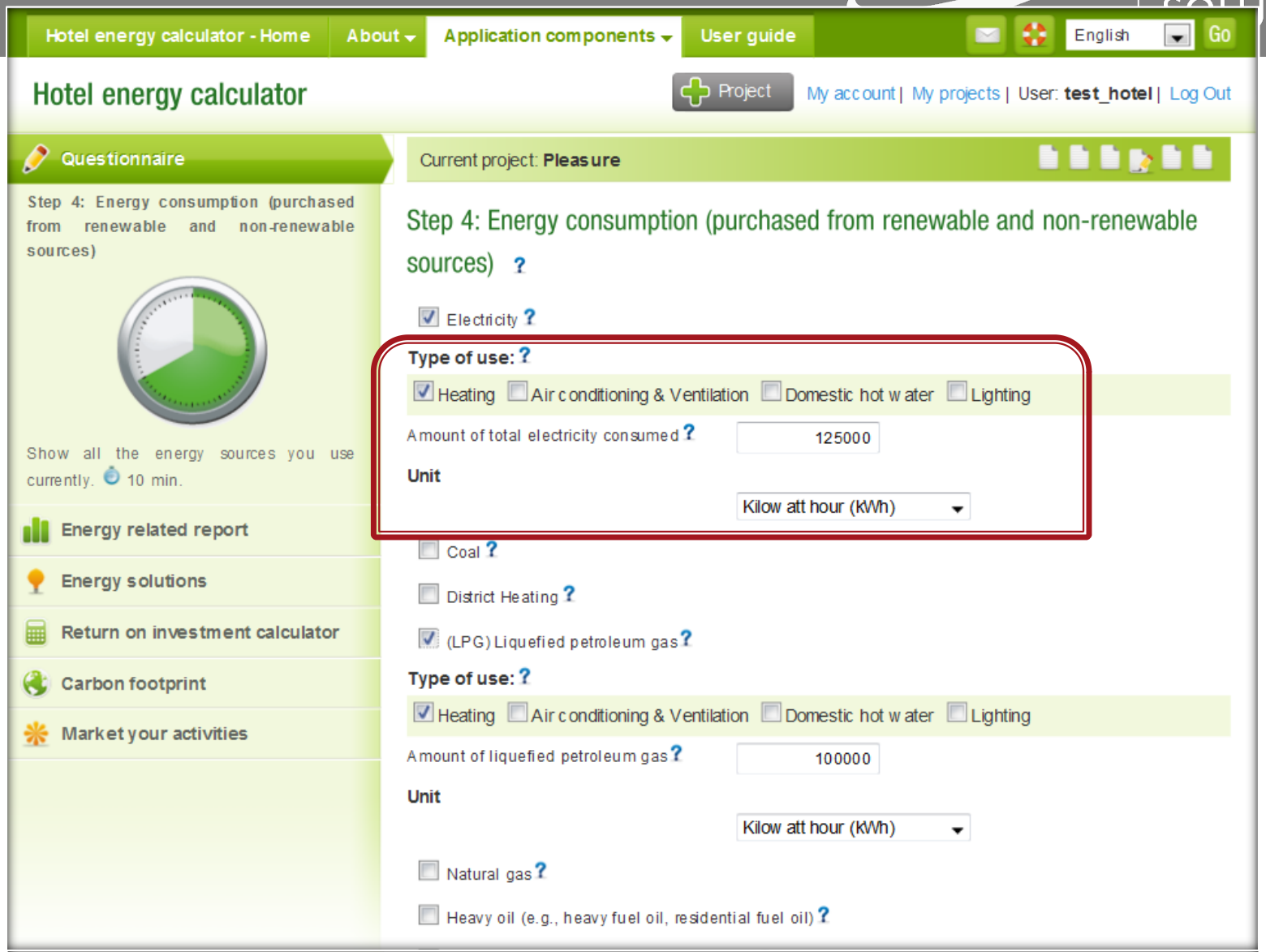
(1) Data - Questionnaire and / or smart meters

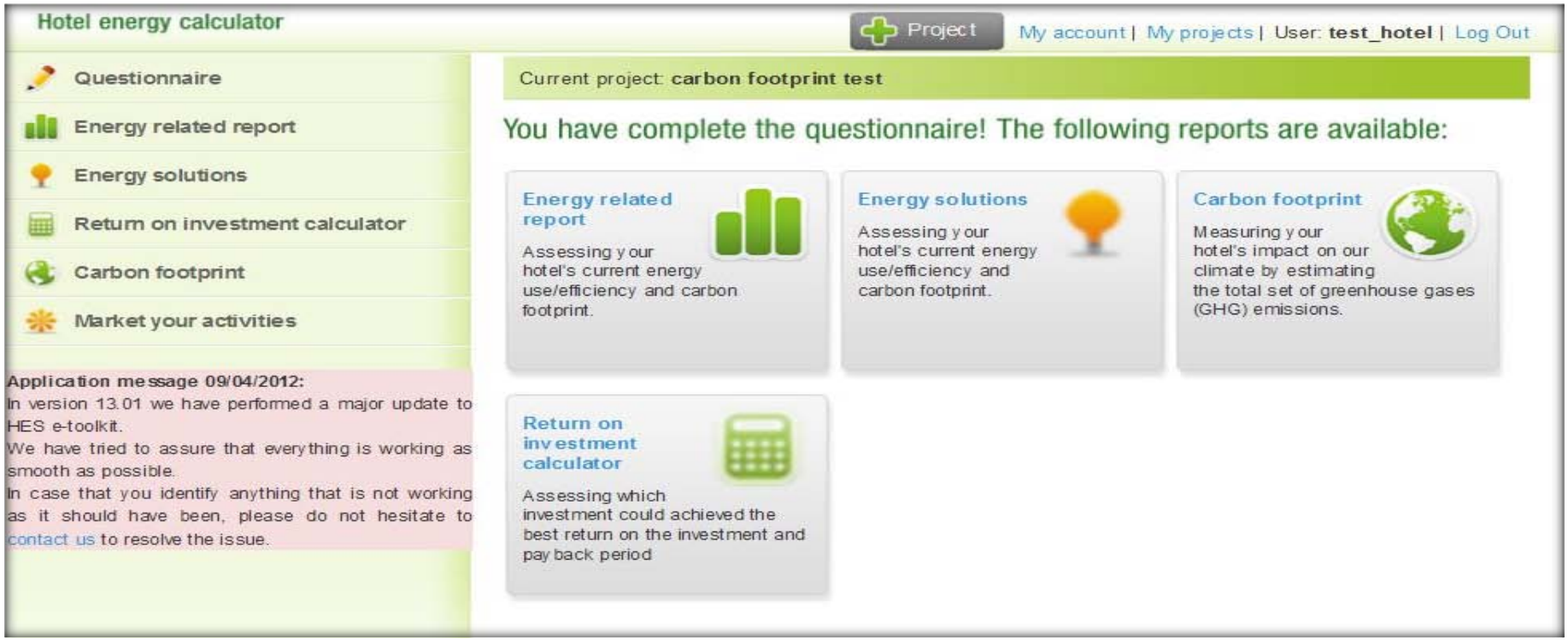
6 fields:

- General data
- Hotel type, occupancy and staff
- Hotel description
- Energy consumption (purchased and non-renewable sources)
- Renewable energy produced by the hotel
- Energy efficiency measures

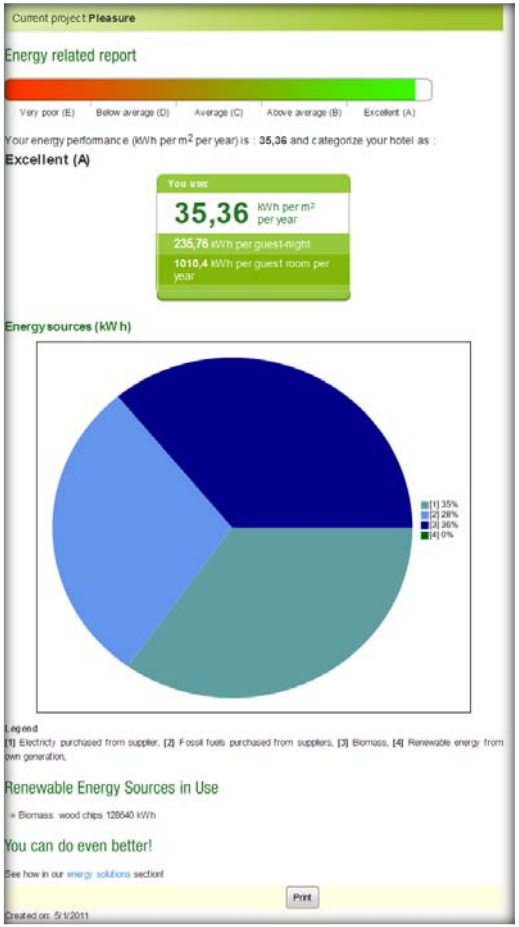
Data: User interface



Following data entry ->Reporting



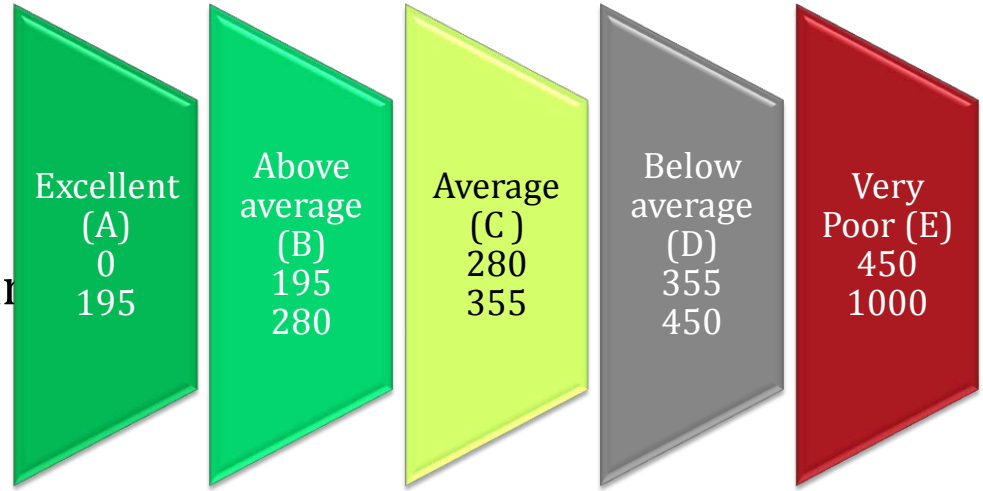
(2) Energy report



- Energy benchmark
- Energy indicators
- Percentages of energy sources to total energy use
- Renewable energy sources in use
- Link to energy solution report

Energy report: Indicators and Benchmarking

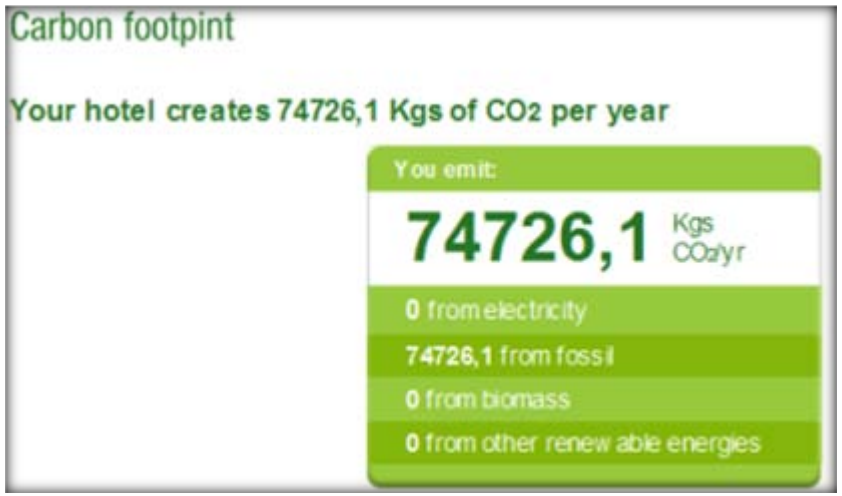
- kWh per m^2 per year
- kWh per guest-night
- kWh per guest room per year



- Energy sources (kWh)
  - Electricity purchased from supplier
  - Fossil fuels purchased from suppliers
  - Biomass
  - Renewable energy from own generation

(3) Carbon footprint

31 different types of fuel emissions are taken into account



Fossil (9)

+

Biomass (10)

+

Other Renewable energies (12)

→ CO2 emissions

HOTEL ENERGY SOLUTIONS

(4) Energy solutions - Decision support system

Energy Solutions

Recommendations based on the data entered in the questionnaire

According to your answers the following are the proposed solutions to be implemented at your hotel

	Reduce your energy consumption!		Use renewable energy!
	No / small investment	**High investment**	
Heating / Cooling	Prevention of air infiltration and of unnecessary outdoor air supply Read more ... 	Efficient solutions for active space cooling Read more ... 	Aerothermal heat pumps Read more ... 
General electricity	Energy saving light bulbs Read more ... 	Key card systems to switch off electricity in guestrooms Read more ... 	Solar Photovoltaic Read more ... 

How to go further

Obtain in-depth recommendations: ask for an energy audit of your hotel

Involve your staff: see how to train them on energy issues

Information to guests: For your energy efficiency policy to be successful, it is essential to involve your guests.

The EU Eco-label for tourist accommodation has been created to identify and highlight tourism companies that respect the environment. As an official certification from the European Union, it has gained European-wide recognition and can be effectively integrated into your marketing strategy.

Tell your guests about your concern for the environment: see how in our dedicated section

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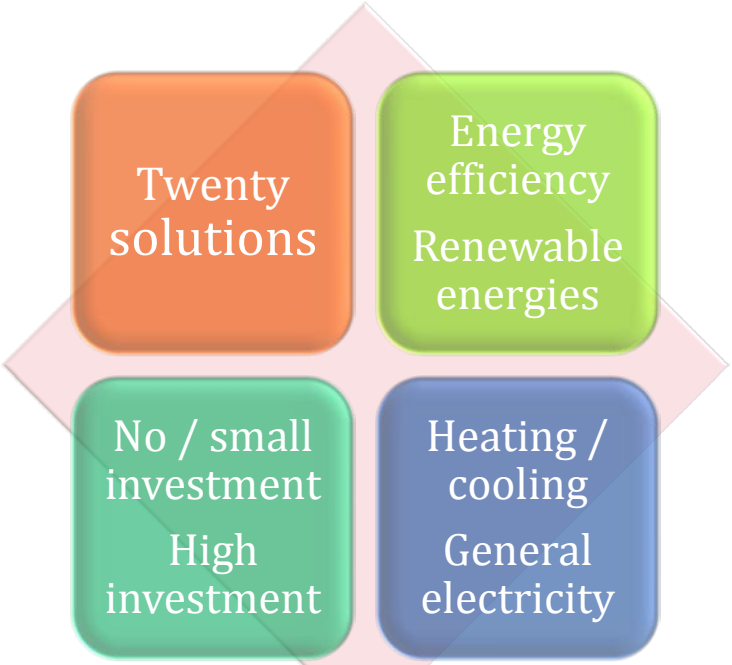

(4) Energy solutions - Decision support system

- Twenty (20) Energy Efficiency (EE) solutions are evaluated. Solutions a hotel has already installed or would be unsuitable for it, are excluded

- Lighting (Energy efficient lights, automated controls)
- Sun-shading devices
- HVAC (Energy efficient motors, insulation of water systems, automated heating and ventilation controls)
- Insulation (Walls, windows, roofs)
- Monitoring and auditing energy use
- Staff training

- Solar heating and cooling
- Solar Photovoltaic
- Heat pumps (ground source, air)
- Wind power
- Biomass
- Geothermal energy
- Small Hydropower

(5) ROI Calculator

Current project: **Pleasure**

Summary of investments and income

Energy efficiency

	Normal Energy tariff (EUR/KWh)	Total Investment (EUR)	Annual Maintenance and Operation cost (EUR)	Potential Annual Energy Savings (EUR)
Window insulation	0	0	0	0
Building insulation	0	0	0	0
Prevention of air infiltration and of unnecessary outdoor air supply	0	0	0	0

Cash flow from investment

Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
(-) Equity Investment	-3610	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subtotal (1)	-3610	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net income after taxes	-3610	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Cash flow from Operation

Summary of ROI Metrics

Total Equity (EUR)	3610
Total Debt (EUR)	3000
TOTAL INVESTMENT	6610

Total Investment	3610
IRR	-0,76
Net Present Value	-3610
Discounted Payback Period (years)	0

Investment is beneficial when :
IRR>discount rate
NPV>0

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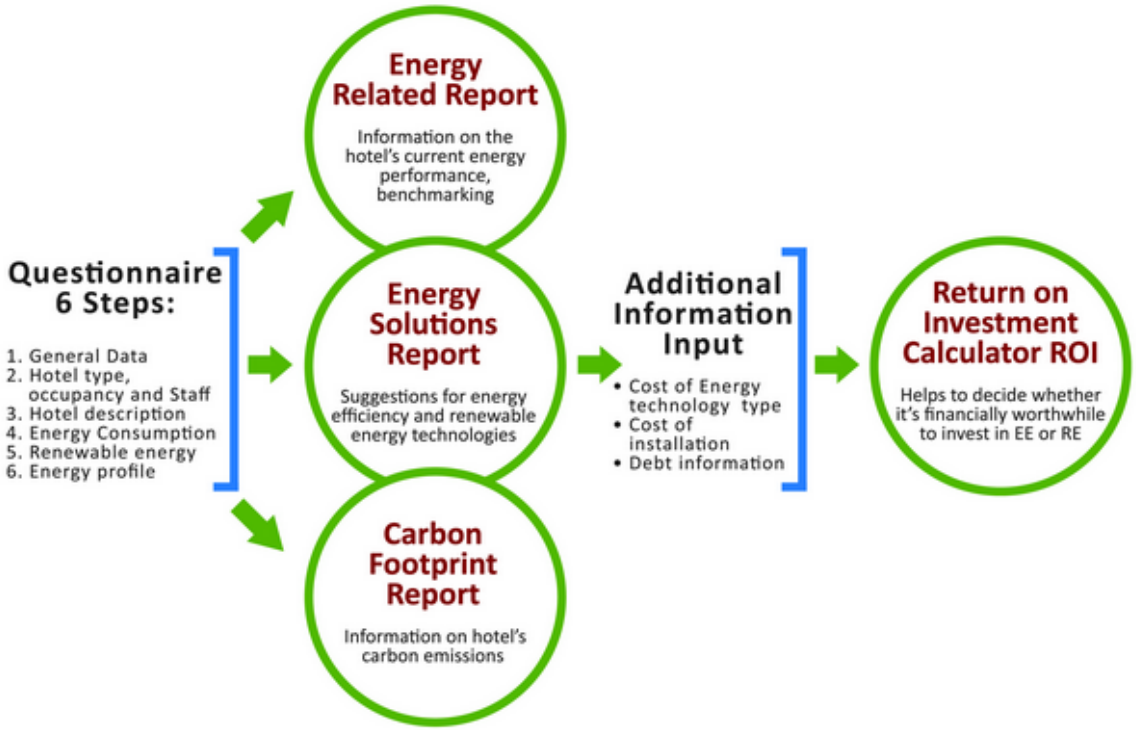
From top-down planning -> bottom-up platforms

For Hotels

- **Simplify** the adoption of green growth solutions
- Understand the current energy use and emissions
- Calculate margins of improvement
- Get ideas about solutions for improvement
- Calculate ROI and benefit of alternative solutions

For Regions

- Move from top-down planning (LEED-ND) to bottom-up **collaborative platforms f**or energy and environmental improvement



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