



Energy and Sustainability--

Green IT in a holistic approach to slashing energy use, emissions and the impact to the environment

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January, 2013

AGENDA

Agenda

A focus on how Energy and Sustainability relate to Data Center Design and Implementation

- Holistic Framework
- Green IT
- Sustainable Built Environment
- IT & the Built Environment in a Synergistic Approach
- Certification
- Closing



“Green IT is about more than just power consumption. It incorporates the entire environmental impact of technology, from the paper we load in our high-end networked printers to the hazardous e-waste we throw away.”

Michael Healey, President and CTO,
Yeoman Technology Group



Holistic Framework

Understanding the Guiding Principles / Green Governance

Policy

Universal

- Triple Bottom Line
 - People, Planet, Profits
 - Equity, Environment, Economy

Built Environment

Green Building

- Sustainable Sites (Land Use & Ecology, Transport)
- Water Efficiency
- Energy & Atmosphere
- Materials & Resources (Waste)
- Indoor Environmental Quality (Health & Wellbeing)
- Management
- Pollution
- Innovation

Product, Process, or Service

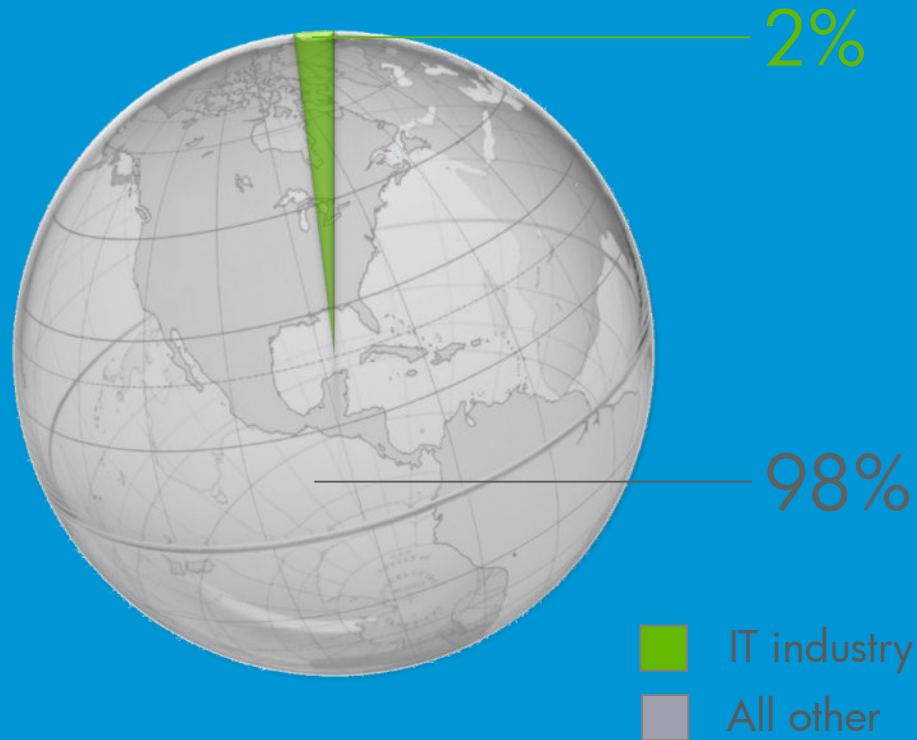
Life Cycle Assessment

- Energy
 - Process
 - Transportation
 - Embodied
- Water
- Atmospheric Emissions
- Waterborne Wastes
- Solid Waste
- Raw or Intermediate Materials
- Transportation



Technology's Footprint

ICT's impact



Source: Gartner, Green IT: The New Industry Shockwave, presentation at Symposium/ ITXPO conference, April 2007

Green IT

Areas of Opportunity

“Greening of IT” - Reduce IT Impact

Cutting Energy Consumption – Sustainable procurement - EPEAT/ENERGY STAR labeled equipment

Saving Paper – IT network-level control over printing functionality

Digitizing Documents - Electronic Documents, Workflow & EDI

Recycling Responsibly – print cartridges, hardware, etc.



“Greening by IT” - using IT to address the other 98% of emissions

Smart city planning

Smart buildings

Smart appliances

Smart industry

Smart grid

Integrated renewable solutions

Smart work

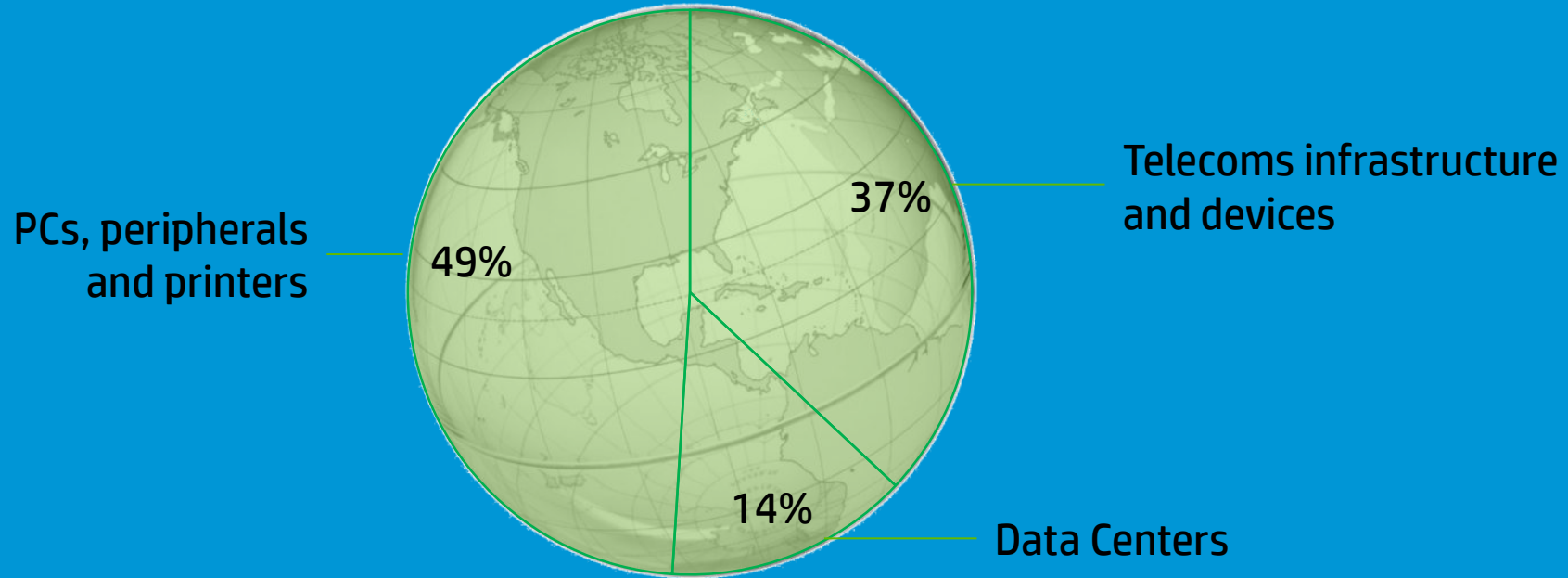
Intelligent transport



Technology's Footprint by Subsector

Where do we focus our efforts to reduce ICT's impact?

Global Footprint



Source: Report, "SMART 2020: Enabling the low carbon economy in the information age," The Climate Group on behalf of the Global e-Sustainability Initiative (GeSI), 2008.

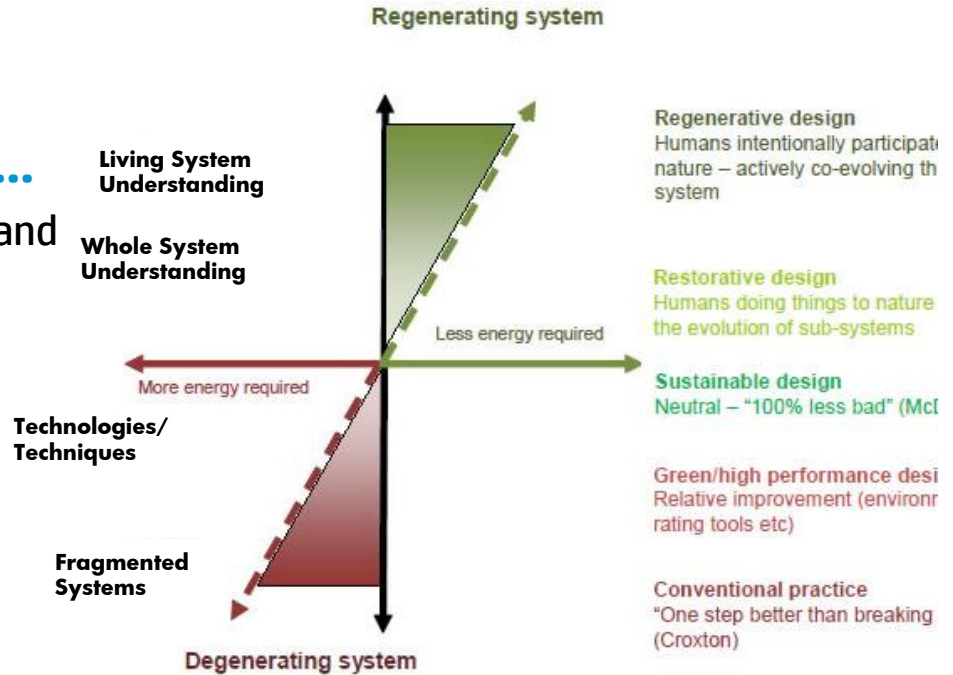
Sustainable Built Environment

Green Data Center Design

Moving Towards Sustainable, Restorative and Regenerative Design...

Current State – Split between Conventional and Green/High-performance Design

- Sustainable Strategies/Techniques
- Sustainable & Synergistic Strategies
- Integrated Design process required to move towards Whole System Understanding
- Competing Requirements - Use of Guiding Principles in Evaluating Trade-offs



Source: Web Publication “Rethinking our built environments” Sarah Jenkin, URS New Zealand Limited and Maibritt Pedersen Zari, Victoria University, October 2009.



Sustainable Built Environment

Sustainable Technologies and Strategies

Energy Consumption/ Greenhouse Gas Emissions

Site Selection - Take advantage of local geography and climate

Innovative HVAC systems:
Direct/Indirect Air Systems,
Thermal Storage, etc.
Industrial Symbiosis

DALI lighting control systems

Onsite renewable energy generation

Green power purchasing for 100 percent of grid power demand

Materials

No VOC's on building interior

Drastic reduction in PVC usage throughout building (as close to zero as possible)

FSC Certified, sustainably forested wood products

LED lighting -- mercury free, good color rendition and light quality, ultra-low power use

Recycled, re-used and local building materials

No hydrochlorofluorocarbons (HCFCs) in building equipment

Process/Implementation

Integrated Design

True building commissioning – design, construction and operations phases

Design for deconstruction

CO2 neutral for all stages of the project – Design, Construction and Operations:

- People, Use & Transportation
- Embodied carbon in supplies
- Operating energy of office/workplace
- Embodied carbon in building materials
- Landscape & Site
- Operating energy of equipment



Sustainable Built Environment

HVAC Systems

It begins with the site and climate:

DX + Direct Evaporative Cooling

DX + Indirect Evaporative Cooling

Heat transfer wheel - Kyoto Cooling

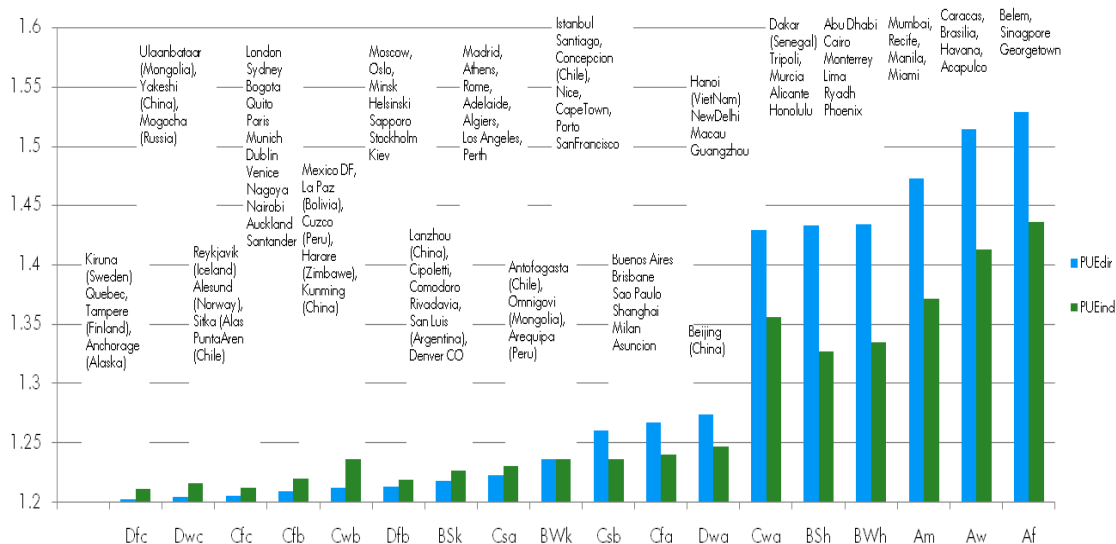
Air-to-air heat exchanger with DX

Thermal Storage

Water Sources

Heat Recovery

- Heat transport via heat carrier



GLOBAL PUEs WITH FREE COOLING (AIR) - Preliminary results

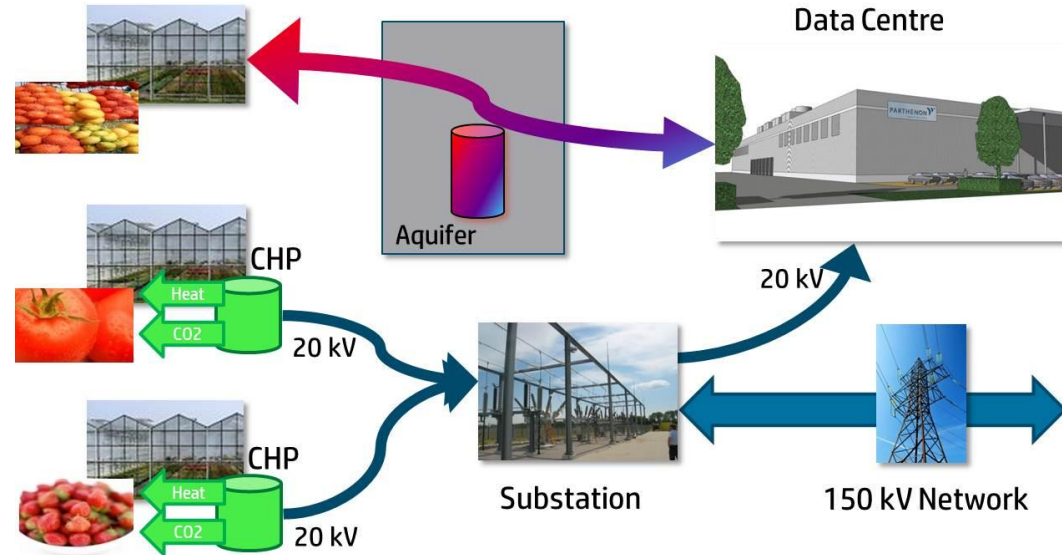


Sustainable Built Environment

Industrial Symbiosis – Data Center

What diverse “industrial” actors could benefit from the by-product resources of a Data Center?

- Agriculture – Greenhouses
- Housing
- Compressed Air Energy Storage
- Swimming Pools
- Fish Farms
- Algaculture
- Museums
- Archives
- Libraries



How do we focus our efforts?



Green IT and the Sustainable Built Environment

Synergistic Approach

OPTIMIZE
RESOURCES

Applying IT

to reduce waste and increase the efficiency of current processes and systems

Embedding IT
to monitor conditions and align supply with demand in real time

BUILD INTELLIGENT
INFRASTRUCTURE

DRIVE SUSTAINABLE
TRANSFORMATION

Innovating IT

to replace carbon-heavy behaviors and industries with sustainable and productive alternatives

What can we use as a holistic benchmark with the lack of consistent tools and metrics?

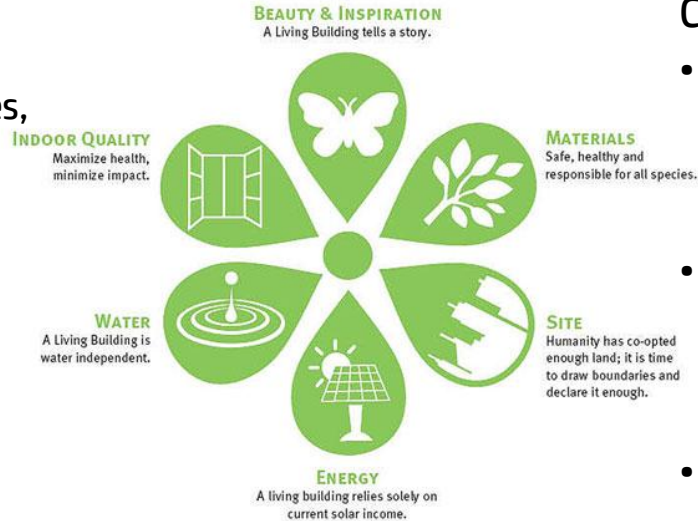


Certification

Built Environment

Green Building Certification

- Many Programs
 - BREEAM, LEED, Green Globes, etc.
- Varying Levels
 - Platinum, Gold, Silver, Certified, etc.
- Various Schemes
 - Data Center, Office, New Construction, Existing Building, etc.
- Prerequisites/Minimum Standards



Product

Certification Programs

- Multiple-Attribute Certifications
 - Green Seal, EcoLogo, MBDC Cradle-to-Cradle, EU Ecolabel, etc.
- Building Materials
 - GREENGUARD, Forest Stewardship Council (FSC), etc.
- Energy Efficiency
 - ENERGY STAR
- Renewable Energy
 - Green-e, EKOenergy

**We need a tool that makes this
very complex subject simple.**



DREAM Project

HP in Collaboration with London South Bank University

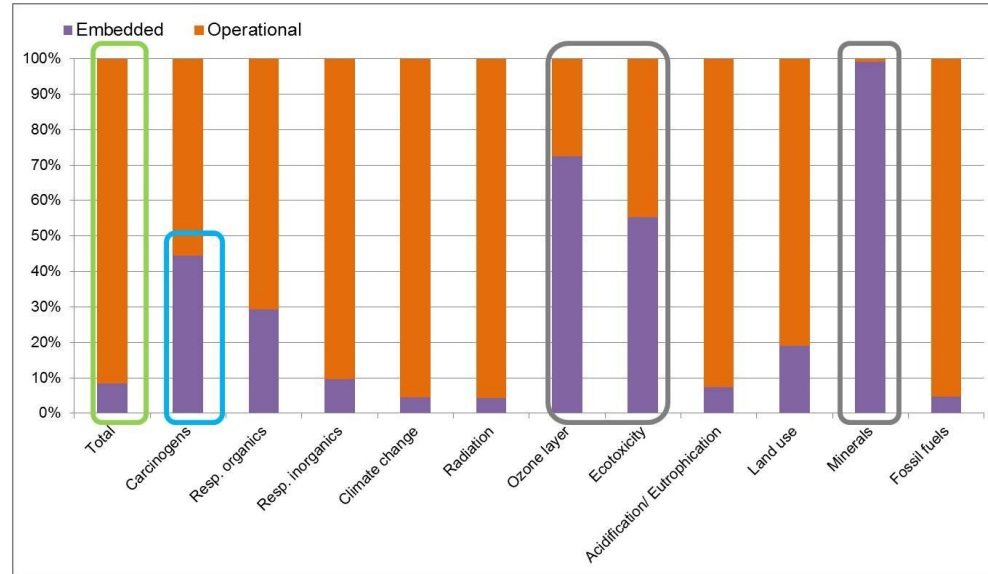
Project Objectives

Establish the life cycle impact of a data center

Find environmental hotspots within the data center

Establish a methodology that can be replicated on other data centers, and which can be improved as LCI data improves

Establish a tool that allows for non-environmental impact experts to apply the methodology



Total embodied and operational environmental impacts for the whole data centre



Sustainable Built Environment

Opportunities for existing or new Data Centers

Services

Strategy & governance

Assessments & Audits

Modeling & Planning

Thermal analysis & assessments

Energy Efficiency analysis

CFD modeling



HP Critical Facilities

Data Center Design and Consultancy

Industry leader in the design of energy-efficient , “green” Data Centers

- 400 staff worldwide
- LEED Accredited Professionals and Qualified BREEAM Assessors
- Consultants to the EPA and LBNL for energy standards in data centers
- Designed 1st LEED Certified and 1st Greenfield LEED Gold data centers
- Instrumental in the EU Code of Conduct for Data Centers



**“We shall require a substantially new
manner of thinking if mankind is to survive.”**

Albert Einstein



Thank you

