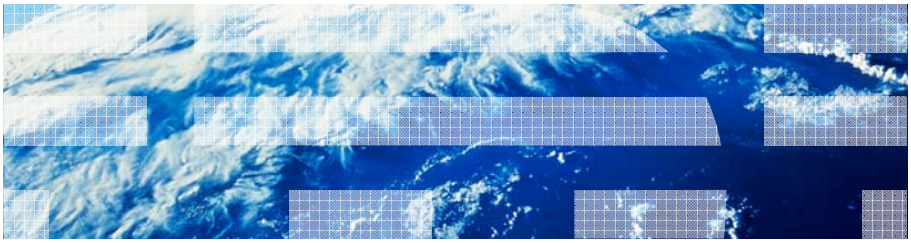
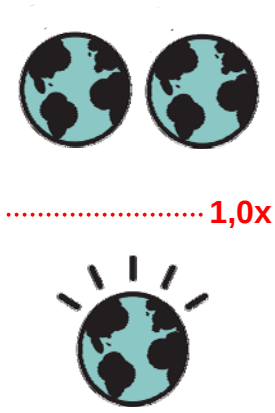
IBM Austria Site & Facilities Services / Martin Chaloupek
Vienna, 2010 02 22

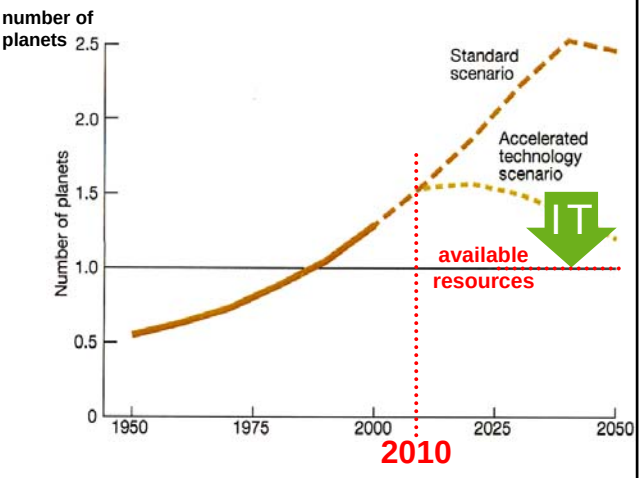
Green ICT: Consistent Actions to Reduce Energy Consumption

Input to Conference “Energy Efficiency Chances of Green ICT and Electronics”
Vienna, 2010 03 05



Is it really smart to utilize more resources than we have available on our planet?





Source: WWF Climate Group Österreich, 2008

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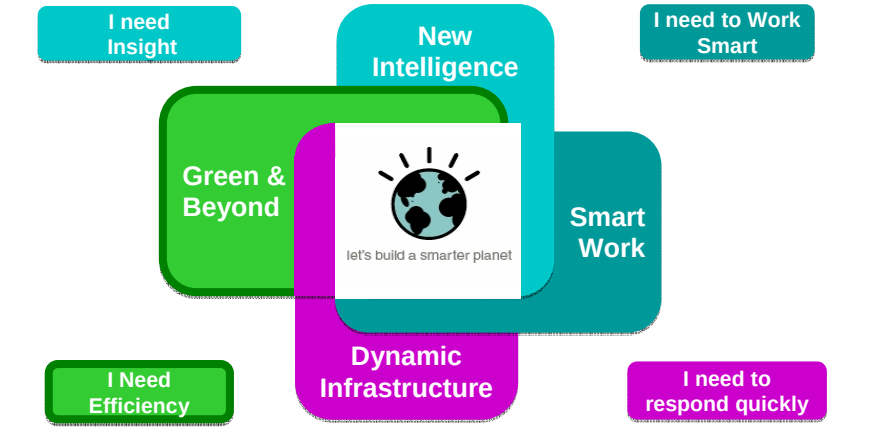
Introducing: The IBM Smarter Planet Initiative

"Explosion of amount of data"

"New business and process requirements"



"Our resources are limited"

"My infrastructure is expensive and not flexible"

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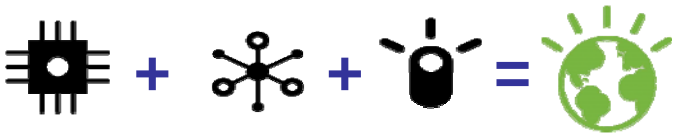
Green & Beyond: A dogma of NGO's only? No! It is all about economical competitiveness.



INSTRUMENTED

We now have the ability to measure, sense and see the exact condition of everything.

INTERCONNECTED

People, systems and objects can communicate and interact with each other in entirely new ways.

INTELLIGENT

We can respond to changes quickly and accurately, and get better results by predicting and optimizing for future events.

Lower costs while overcoming operational barriers.

Strengthen reputations while meeting regulations.

Create products and services that give rise to new markets.

An opportunity for smarter organizations to find value in 'Green'.

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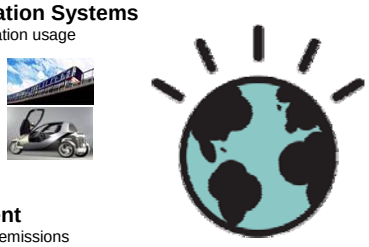
Call to Action: Innovative information technology and services that really matter to businesses, governments, people and the planet.

Intelligent Transportation Systems
Measure & improve transportation usage
- Reduce traffic congestion
- Reduce CO2 emissions
- Increase mass transit usage
- Reduce energy usage
- Improve environment



Intelligent Utility Networks
Measure & improve energy mgmt
- Improve efficiency usage,
- Reduce outages
- Improved grid management
- Mange distributed energy

Carbon Management
Measure & reduce carbon emissions
- Carbon Mgmt Strategy
- Carbon Mgmt Intelligence
- Supply chain management
- Property, buildings, workplace

Energy Efficient Technologies & Services
Create &manage efficient IT
- Active energy management
- IT facilities infrastructure efficiency
- IT operations efficiency
- Monitoring and verification of efficiency goals
- Demand-side efficiency

Advanced Water Management
Measure and manage water systems usage and quality with real-time knowledge
- Weather event mgmt; flood management
- Real-time monitoring and analytics for water usage and water quality

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Leading by example: IBM's environmental tradition and leadership

1971
T.J. Watson Jr. issued IBM's first corporate policy on environmental protection

1976
Think, the company magazine, devoted an entire issue to IBM's energy conservation and environmental programs

1989
IBM offers its first product take-back program

1990
Think devoted an entire issue to IBM's environmental programs – beginning IBM's annual Corporate Environmental Reporting

1990-2006
44%
Between 1990 and 2006, IBM's global energy conservation actions reduced or avoided CO2 emissions equal to 44% of its 1990 emissions.

1991
Established IBM's Product Stewardship Program

1992
IBM becomes charter member of Energy Star program

1994
Established Global Materials Recovery Center Network for product re-use and recycling

1997
IBM became the first major multi- national to earn a single global registration to the ISO 14001 environmental management system standard

1987-2006
95%
Reduction in hazardous waste generation since the 1987 base year of this pollution prevention metric

2005
2005: Global Innovation Outlook 2.0

2006
96%
Amount of IT product and product waste processed by IBM's Product End-of-Life Management operations that was reused or recycled

2006
IBMers "jam" on innovations for a better planet, and IBM invests $20M
- Big Green Innovations
- Intelligent Utility Network

2007
Intelligent Utility Network
Intelligent Transportation Systems; Project Big Green

Collaborating to develop solutions…

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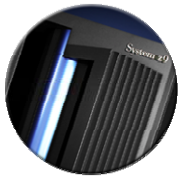
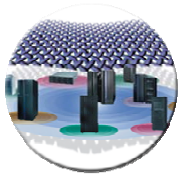
IBM's holistic approach to Green ICT with focus on the Data Center

Diagnose

Facilities



Compute Resources



Virtualization

Active Energy Management

Cooling Innovations

Responsible Disposal

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We listen to our customers and know their challenges …

Increasing IT demand

54% growth in storage shipments due to explosion of information[1]

85% of distributed computing capacity sits idle[1]

Continued cost pressure

14% of CIO's time is spent removing costs from the technology environment[2]

75% of CIO's anticipate a strongly centralized infrastructure in 5 years[2]

Responsive to change

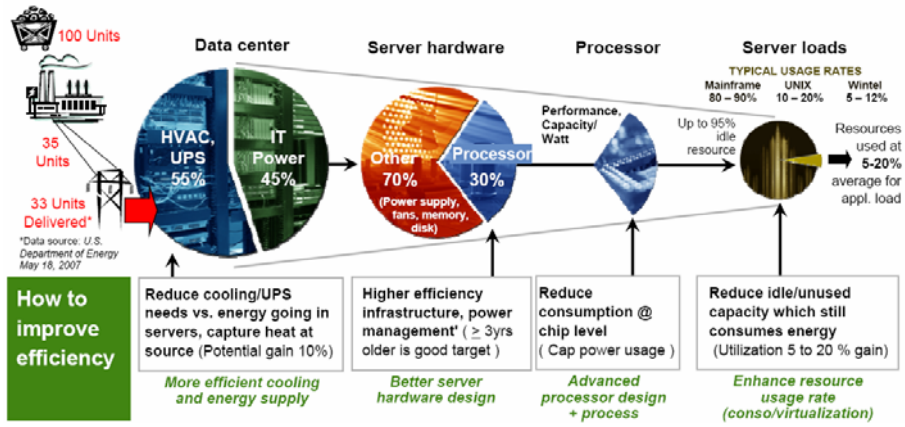
64% of CIO's expect significant change ahead[2]

70% of every $1 is spent to maintain and manage the existing infrastructure[1]

5-60% of IT workloads may be cloud-enabled[3]

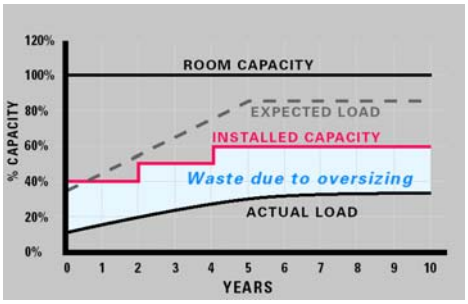
1. IBM Dynamic Infrastructure client presentation, July 2009
2. IBM Global CIO study, September 2009
3. IBM research, September 2009

... and we know all the common inefficiencies.



Some inefficiencies are even too big to spot at first glance!

Scenarios for typical high-availability DC, life cycle >10 yrs	Saving TCO %
Equipment with efficiency factor +2%	1,1
Electricity prices reduced by 1 Cent per kW/h	2,3
No raised floor in the DC	3,1
No rental payments	8,9
50% discount on procurement of equipment	11,7
Rightsizing of systems to actual capacity requirements throughout life cycle	58,3



Source: APC

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IBM offers to cut cost and improve effectiveness in the DC in three simple ways…

Extend the life of an existing data center infrastructure.

Double IT capacity or reduce operational expenses by 50%.

Rationalize the data center infrastructure across the company.

Improve operational efficiencies while reducing operational expenses by 50%.

Design new infrastructure to be **responsive** to change.

Pay as you grow by deferring 40-50% of capital and operational costs.

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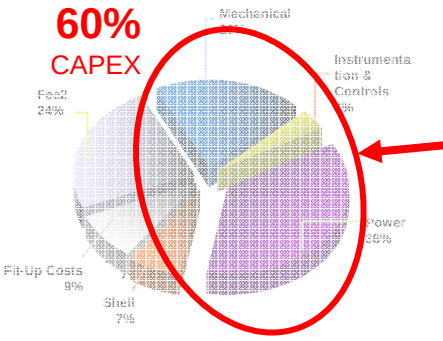
Learning from 2008 and 2009 reference projects: Design new infrastructure to optimize lifecycle costs.

Data center capital costs

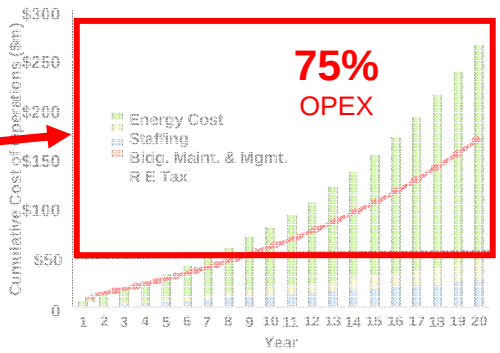
60% costs from mechanical / electrical systems



Source: IBM Estimates

Data center operating costs

75% costs from energy use



Source: IBM engineering estimates, 2008

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Extend the life of your data center adressing energy efficiency, both the IT and physical infrastructure uses of energy.

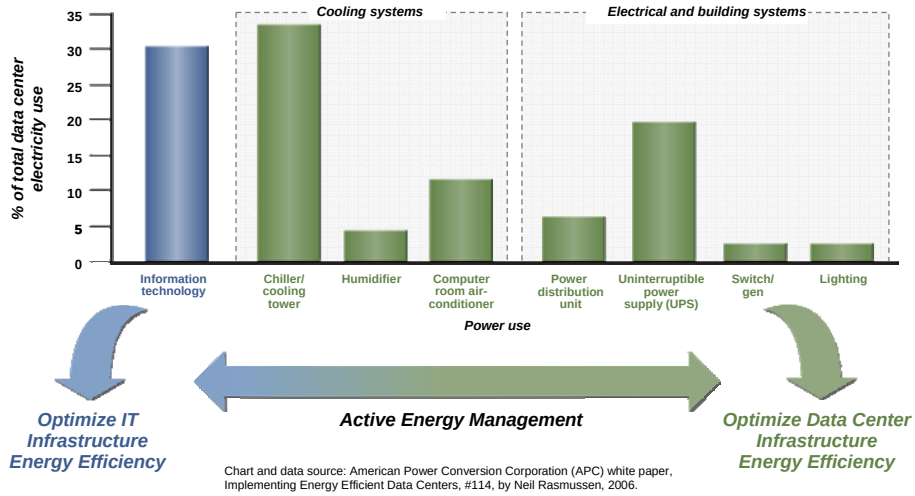

Chart and data source: American Power Conversion Corporation (APC) white paper, Implementing Energy Efficient Data Centers, #114, by Neil Rasmussen, 2006.

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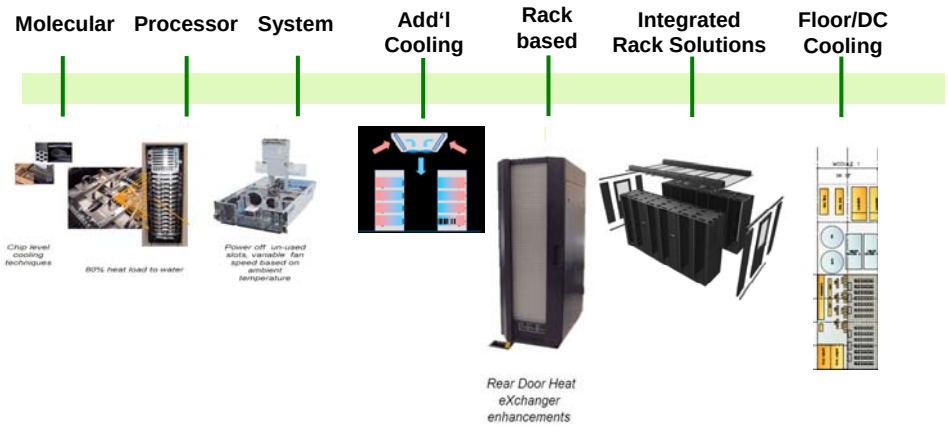
From α to Ω: Innovative cooling technologies allow a true leap forward in energy efficiency and operating cost savings.



Sources: Emerson, IBM, APC

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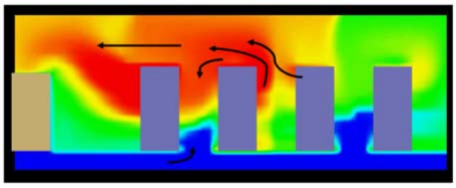
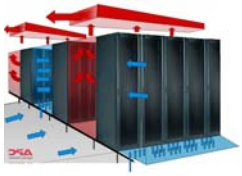
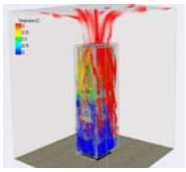
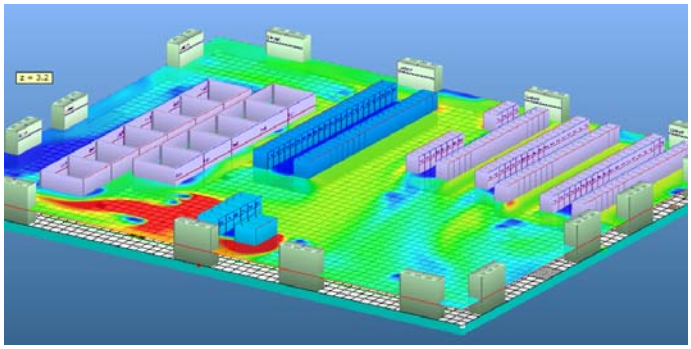
Thermal Analysis: Starting point for critical questions in the DC









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Where does all the energy go?
Re-use excess heat in the DC for indoor swimming pool.

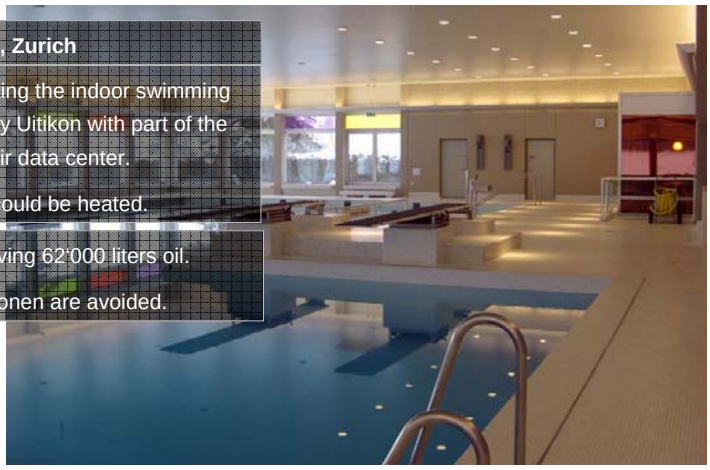
Data Center Uitikon, Zurich

GIB Solutions is heating the indoor swimming pool of the community Uitikon with part of the excess heat from their data center.

Additional buildings could be heated.

The community is saving 62'000 liters oil.

130 tons CO_2-emissionen are avoided.



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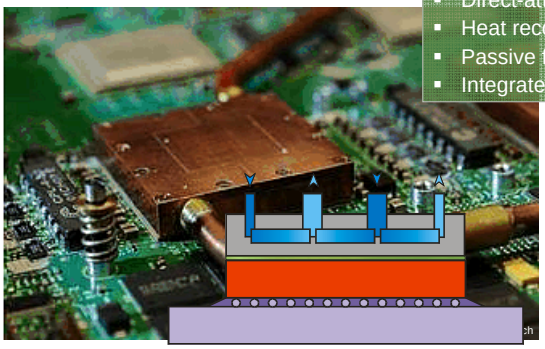
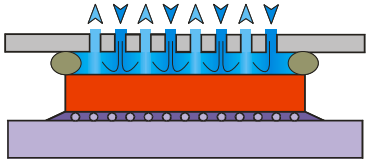
*Hot water is even more **cool**:* Future generation cooling technologies go up to 60 degrees Celsius.

- Direct-attach micro-channel cooling
- Heat recovery increased with heat collector
- Passive fluid coupling through the mid-plane
- Integrated micro-channel cold plate





Thermal energy in water is simple to be elevated to higher temperature and delivered for second use (e.g. heating, warm water, processes)

Cooperation of IBM Research and ETH Zurich on testing chip cooling with project Aquasar

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Kika/Leiner: Green Data Center transformation supports expansion plans of one of Europe's top 5 furniture businesses.

Client requirements

- Business expansion across Europe and Middle East
- Need for IT services to support business has grown significantly
- Aging data center threatens growth due to out dated air conditioning, fire-protection and building issues
- Need for a rapidly deployable DC concept on limited floor area
- Want a green data center to support corporate sustainability goals

Solution

- Implemented an IBM Scalable Modular Data Center solution with advanced InfraStruXure® architecture from IBM Alliance Partner APC for 120 square meter data center
- Standardized on IBM BladeCenter®
- Uses "green" design concepts such as free cooling, separate high density computing area, flexible expansion area for future growth
- Fulfils all state-of-the-art technical security requirements

Benefits

- Supports corporate sustainability "Grüne Linie" (Green Line)
- Reduce electric power consumption by up to 40%
- Uses energy efficient servers which require 24% less energy than competition
- Improved security and reliability of the data center, lowered TCO

"In IBM we have an IT partner who meets our ideal expectations for sustainable business"

Dr. Herbert Koch, manager of the kika/Leiner group

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Lord Kelvin: "If you cannot measure it, you can not improve it.„
PUE factor as key measurement for energy efficiency in the DC.

Power Usage Effectiveness (PUE) by The Green Grid =

$$= \frac{\text{Annual delivered Power to Data Center}}{\text{Annual delivered Power to IT}} = \frac{\text{P mech + P elect}}{\text{P IT}} = \text{PUEm + PUEe}$$

- Power Mechanical (PUEm>0)
  - Cooling systems (Chillers, pumps, cooling towers, CRAC compressors)
  - Air movement in Data Hall (CRAC/CRAH fans)
  - Ventilation (FA AHUs)
  - Humidification (AHUs, CRAHs)
- Electrical Power (PUEe>1)
  - IT power (P IT)
  - UPS losses
  - Generator
  - Lights

Energy Rating	Power Usage Effectiveness (PUE)
Excellent	< 1.5
Very Good	1.5 - 2
Good	2 - 2.5
Fair	2.5 - 3
Poor	> 3

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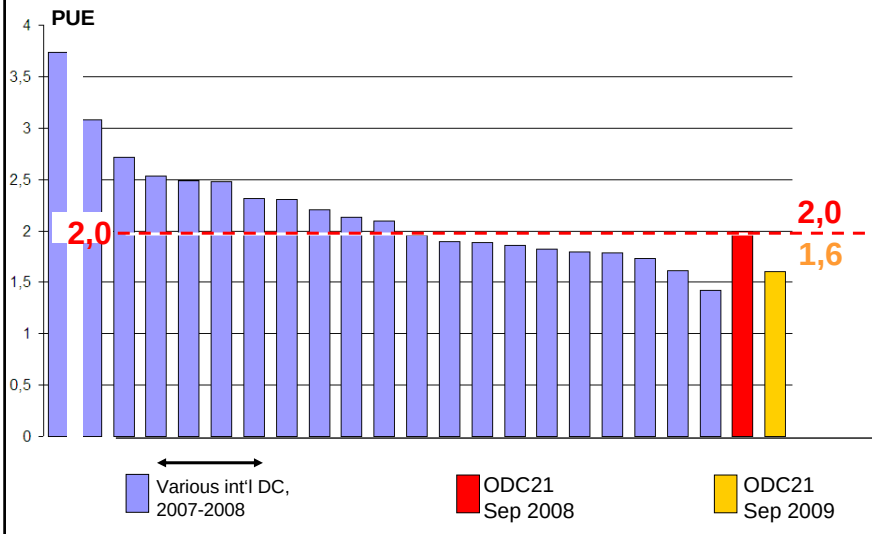
PUE Benchmarking:
IBM Austria ODC21 in international comparison



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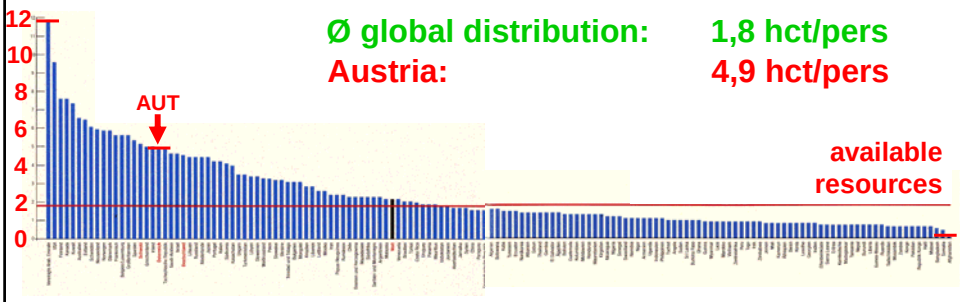
Smarter Planet here and now?
Global footprint of 150 countries

hectare / person



Ø global distribution: 1,8 hct/pers
Austria: 4,9 hct/pers

available resources

Source: Footprint, Plattform Footprint, Wien, Stand 2003

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Mag. Martin Chaloupek

Leader
Site & Facilities
Services

IBM Österreich GmbH
Obere Donaustraße 95
A-1020 Wien

Tel: +43 1 21145 2948
Mobil: +43 664 618 7268
Martin_Chaloupek@at.ibm.com