ICT Enabling Greener Society

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Building A Smarter Planet
Energy & Environment Focus

The Bad News: ICT accounts for 2% of global CO₂ emissions

The Good News: ICT can significantly contribute to control and reduce the 98% of CO₂ emissions caused by other activities and industries

“…you can’t make a product greener, whether it’s a car, a refrigerator or a traffic system, without making it smarter — smarter materials, smarter software or smarter design.” - Thomas L. Friedman

Tackling climate change is good for the climate and economy

Information and Communications Technology (ICT) can significantly improve energy efficiency and reduce GHG emissions, driving potentially $1 Trillion in energy savings per year by 2020 and 7.8 Gigatons CO$_2$e abatement

Smart Logistics: $442B/year

Smart Industrial Automation: $107B/year

Smart Buildings: $341B/year

Smart Grids: $125B/year

What does it mean to become Smarter?

Our world is becoming **INSTRUMENTED**

Our world is becoming **INTERCONNECTED**

Virtually all things are becoming **INTELLIGENT**

**Measuring, Monitoring, Modeling and Managing**

- **Sensing**
- **Metering**
- **Real Time Data Integration**
- **Real Time + Historical Data**
- **Data Modeling + Analytics**
- **Visualization + Decisions**

- **Data collection**
- **Data Integration**
- **Comparison of historical data, with newly collected data**
- **Data modeling and analytics to create insights to optimize smarter decisions**

*Source: IBM Corporate Strategy*
Instrumentation increasingly captures more data... now to make it into real intelligence to enable smarter decisions for a greener society

<table>
<thead>
<tr>
<th>Change in information collection over the past three years (Percent responses)</th>
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<tbody>
<tr>
<td>Energy management</td>
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<td>Waste management</td>
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<td>Carbon management</td>
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<td>Water management</td>
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<td>Sustainable procurement (ethical or environmental)</td>
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<td>Ethical labor standards</td>
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<td>Product composition</td>
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<td>Product lifecycle</td>
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Source: IBM Institute for Business Value 2009 CSR Study
IBM addresses energy & environment challenges

Smarter ICT Infrastructure
- Energy Efficient, Virtualized, Dynamic IT/DC
- Monitoring & verification of efficiency goals
- Cloud computing,
- Intelligent Site Operations
- *IBM and client case studies: Up to 40% to 80% energy use reduction, up to 85% less floor space*

Smarter Transportation Systems
- Reduce traffic congestion
- Reduce CO₂ emissions
- Increase mass transit usage
- Improve environment
- *Stockholm case study: Reduced traffic congestion 25%, Carbon emissions 15%*

Sustainable Business Solutions & Services
- Strategy
- Corporate Social Responsibility
- Green Sigma TM
- Green SNOW - Supply Chain Network Optimization Workbench
- Smarter Cities
- Smarter Buildings
- Cap and Trade Systems

Mobility Services
- Reduce traffic and pollution
- Retain and attract talent
- Cut facility costs/impact

Smart Grid
- Improve energy usage
- Improve grid management, reduce outages
- *U.S. case study: 10% energy use reduction, up to 50% reduced load on electric grid*

Smarter Water Management
- Flood avoidance
- Reduce water usage
- *IBM case study: 27% reduced water usage, with 30% increase in manufacturing output, saving $M in energy and water cost*

Alternative Energy Research
- IT to ET: Applying IT cooling technologies to concentrator PV
- IBM know-how in thin films, advanced photovoltaic materials
- Nanomembranes for desalination
- *Energy storage, modeling and analytics for optimization in energy efficiency and renewable energy, etc.*
Smart Cities Bring it All Together – with intensive use of information technologies for sustainable development

**Intelligent Transportation Systems**
- Road Usage Charging/Congestion Pricing
- Integrated Fare Management
- Traffic Information Management

**Energy Management**
- Smarter Building Management
- Automated Meter Management
- Smart Grid – Demand Management
- Energy Network Monitoring & Stability
- Proactive management of the alternative energy mix

**Water Management**
- Water purity monitoring
- Water use optimization
- Waste water treatment optimization

**Public Safety**
- Smarter Surveillance Systems
- Emergency Management Integration
- Micro-Weather Forecasting
- Cyber-security

**Telecommunications**
- Fixed and mobile operators
- Media Broadcasters

**Environmental Management**
- City-wide Measurements
- Key Performance Indicators (KPI’s)
- Energy, Water, Waste, CO₂ Management
- Scorecards
- Reporting
Thank You

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IBM has a long history of 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

1991: Established IBM’s Product Stewardship Program

1992: IBM becomes charter member of Energy Star Program

1994: Established Global Materials Recovery Center

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

1987–2006: Reduction in hazardous waste generation since the 1987 base year of this pollution prevention metric

1990–2008: Between 1990 and 2008, IBM’s global energy conservation actions reduced or avoided CO₂ emissions equal to 50% of its 1990 emissions

2006: 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 innovation for a better planet, and IBM invests in Big Green Innovations

2007: Invested in Intelligent Utility Networks, Intelligent Transportation Systems, Project Big Green

Collaborating to develop solutions...
Energy Efficient Technologies and Services

- Energy efficient solutions:
  - Green IT and Green Datacenters
  - Servers and storage continually more energy efficient
  - New and retrofit equipment
  - Rear Door Heat Exchanger
  - Measurement & Management Technology
  - Monitoring & verification of efficiency goals through Energy Efficiency Certificates
  - Virtualization, consolidation

- Benefits and studies:
  - 40% to 80% energy use reduction
  - Up to 85% less floor space
Intelligent Transportation Systems

- Integrated transportation solutions:
  - Road user charging
  - Congestion pricing
  - Integrated fare management

- Benefits:
  - Reduce traffic congestion
  - Reduce CO$_2$ emissions
  - Increase mass transit usage
  - Improve environment

- Stockholm case study with clear results:
  - Reduced traffic congestion 25%
  - Reduced carbon emissions 15-40%
  - $120M/yr in revenue to City, 4 yr payback
  - Congestion charges fund transit improvements
Intelligent Utility Networks

- **Smart Grid Solutions:**
  - Smart grid management
  - Smart meters
  - Smart appliances
  - Smart integration
  - Real-time energy market
  - Dynamic response to constraints on the grid

- **Benefits in PNNL case study**
  - Reduced peak load demand on the energy grid 15% to 50%
  - Reduced consumer energy bills by 10%
Smarter Buildings

The interconnection of physical assets and information technology can optimize efficiency, production and consumption in many types of buildings.

**Smarter Commercial Building**
- Provides integrated facilities operations information for owners/operators in order to optimize energy usage and services based on tenant’s needs.

**Smarter Airport**
- Provides efficient passenger and cargo services, climate control, wi-fi access, track maintenance tasks and help achieve security and safety compliance.

**Smarter Network Operations**
- Integration of active and passive network management enables optimized operations, reduces truck rolls and reduces energy while improving network performance.

**Smarter Data Center**
- Integrated facilities and IT insight to energy efficiency of datacenter and the correlation of IT and facilities information.
Smarter Water Management

- Strategic Water Information Management Solutions – SWIM
  - Sensing and Monitoring
  - Data Integration, Workflow, Management
  - Deep Thunder – Advanced Micro-weather prediction
  - Storm Impact and Response Prediction
- IBM Advanced Water Management Centers of Excellence
  - Amsterdam, Netherlands
  - Dublin, Ireland
- Benefits
  - Flood forecasting, predictive modeling
  - Environmental analysis & prediction
  - Reduced water usage and costs
  - IBM case study: 27% reduced water usage, 30% increase in manufacturing output, saving $M in energy and water
Looking toward the future...
IBM Energy and Environment Research

• **IT to ET:** Leveraging Information Technology as Energy Technology
  - Cooled concentrator photovoltaic system from 1600°C to 85°C
  - Thin membranes for photovoltaic materials

• **Energy Storage Research – Lithium/Air**

• **Nanomembranes for filtration of salts and toxins from water for desalination**

• **Modeling analytics for optimization in energy efficiency and renewable energy**

• **Cyber-security research and development**