



Environmental Sustainability in the Public Sector: *Take Advantage of the Network*

What You Will Learn

The IP network can significantly enhance environmental sustainability in government and education. Progress has been hampered by murky definitions and confusion about priorities. Is the main goal of environmental sustainability in the public sector to reduce energy consumption in the data center? Recycle? Reduce carbon emissions?

In fact, environmental sustainability requires a three-pronged approach:

- Making purchase decisions that increase energy efficiency
- Adopting business practices that increase operational efficiency
- Choosing vendors committed to sustainability

This white paper summarizes an approach to environmental sustainability in the public sector and explains how governments and educational institutions around the world are using their networks to achieve their goals.

What's Different about Sustainability for the Public Sector?

"The private sector will move [to sustainable technology and practices] when it makes sense from a revenue and profit motive. The public sector has a two-pronged approach: gaining efficiencies and in its role as a public steward of resources."

Charles Thompson, CIO, Phoenix, Arizona, as quoted in *Government Technology's Public CIO* magazine, February/March 2008

Many benefits of sustainability apply equally to the public and private sectors. These include lower energy costs and economic incentives through cap-and-trade programs such as the European Union Emissions Trading Scheme (EU-ETS). The public and private sectors also share a desire to protect the environment for future generations.

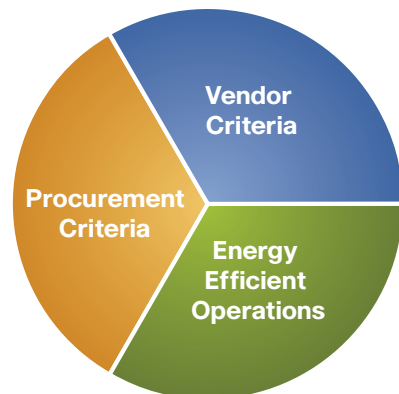
The public sector has additional incentives to adopt sustainable technology and business practices:

- **Improving service effectiveness:** Savings from more efficient power usage can be invested in government and educational services.
- **Fulfilling government's role as a public steward:** The public sector has a social and fiduciary responsibility to conserve scarce resources.
- **Enhancing employee recruitment and retention:** Public sector employees are retiring in record numbers and government needs to attract the best and brightest workers to replace them. New college graduates tend to prefer to work for employers committed to sustainability.
- **Supporting continuity of operations (COOP):** Green practices like telework and remote meeting solutions not only reduce carbon emissions, but also help to ensure COOP. With solutions like Cisco® Unified Communications, Cisco WebEx™, and Cisco TelePresence™, employees who cannot or do not have the time to meet in person can collaborate on crisis response or provide everyday services from home or any other location with a network connection.

A Three-Pronged Approach to Sustainability

The three facets of environmental sustainability in the public sector are green procurement criteria, energy-efficient operations, and green vendor criteria (Figure 1).

Figure 1. Factors in Public Sector Resource Stewardship



Green Procurement Criteria

When purchasing capital equipment, consider energy efficiency, power consumption, and use of renewable fuels. For network devices in particular, look for integrated devices that perform functions that previously required multiple devices. For example, a Cisco ASA 5500 Series Adaptive Security Appliance consolidates three devices in one: firewall, VPN concentrator, and intrusion prevention system. Similarly, a Cisco Nexus™ 7000 Series data center switch has 64 ports and can be expanded to 128 ports, enabling public sector organizations to power and cool fewer switches. Integrated devices have a smaller environmental footprint because they:

- Use less power and cooling
- Require fewer manufacturing resources and energy
- Reduce electronic waste

Operational Efficiency

IP networks enable operational efficiencies that reduce public sector energy consumption and carbon emissions. A report by The Climate Group on behalf of the Global e-Sustainability Initiative, with independent analysis by McKinsey & Company, estimates that energy efficiencies from information and computer technology (ICT) could enable five times more carbon savings than all emissions from ICT in 2020¹. The carbon savings result from:

- Enabling business processes that reduce travel requirements, including telework, remote meeting solutions, mobility solutions, and distance learning
- Making public buildings more energy efficient
- Reducing data center energy consumption
- Providing virtualized services in the data center

With today's budget constraints, the challenge is to find the opportunities that will yield the most energy savings for the least cost. This varies by organization. Most IT departments have only recently begun considering energy consumption when planning solutions that increase operational efficiency. Therefore, many IT groups can benefit from education on the range of available solutions and how best to implement them. Some

¹ The Climate Group, "SMART 2020: Enabling the Low Carbon Economy in the Information Age," June 2008, www.smart2020.org



resources for learning how to improve energy efficiency using networking technology are available on the Cisco Efficiency Assurance Program website: www.cisco.com/go/efficiency.

"...ICT's largest influence will be by enabling energy efficiencies in other sectors, an opportunity that could deliver carbon savings five times larger than the total emissions from the entire ICT sector in 2020."

The Climate Group, June 2008

Vendor Criteria

The public sector encourages environmental sustainability by preferring suppliers with sustainable product designs and business practices. Assessing a supplier's manufacturing practices is essential for maintaining a green practice strategy. Assessing a company's corporate commitment to a green agenda is more subjective. Factors to consider include whether a vendor:

- Has executives who are focused on green issues
- Has made credible public commitments to reducing the organization's environmental impact and is delivering on those commitments
- Provides energy efficiency programs and services
- Demonstrates a history of innovation in its product offerings

Steps That the Public Sector Can Take Today

Here are some concrete actions that governments and educational institutions are taking today to take advantage of their IP networks for environmental sustainability.

Consolidate Network Devices

Consolidating to fewer network devices reduces data center energy consumption for power and cooling. Ways to consolidate include:

- **Deploy multipurpose devices:** Many public sector organizations use separate appliances for firewall, intrusion prevention, content security, and VPN access. For each server group in a server farm, these standalone devices can consume up to 1400 watts in a redundant configuration. Providing security functions on service modules within a single chassis instead of standalone appliances decreases power requirements by about half, and also frees up rack space and reduces cabling and cooling expense. The Cisco Adaptive Security Appliance is an example of a modular platform suitable for protecting government server farms. Similarly, the Cisco Integrated Services Router can provide a variety of services available on blades, including voice, security, WAN optimization, and integrated switching.
- **Increase port density:** Cisco, for example, is consolidating from four switches to two Nexus 7000 Series Switches at the distribution layer. The company expects this move to reduce each server's power consumption from 24 to 16 kilowatts per hour. If Cisco needs to support 9000 new servers over four years and the Nexus 7000 Series can increase the number of servers per megawatt from 1000 to 1500, Cisco can build one-third fewer data center facilities, reducing power consumption and environmental impact.
- **Virtualize storage and storage area networks (SANs):** Rather than deploying separate servers, storage devices, and network devices for each department or application, deploy one physical device that behaves as if it were multiple virtual devices. For example, each government department or application traditionally has had its own SAN

and needed its own SAN switch. Using a Cisco MDS 9500 Series director-class switch, agencies can build a single physical SAN fabric, and then build virtual SANs (VSANs) on top of it for individual departments or applications. If an agency consolidates five departmental SANs with an average utilization of 40 percent into three SANs with 70 percent utilization, it frees up 50 kW of power capacity, saving US\$38,000 annually based on \$0.10 per kW/hour. The shared SAN also enables the agency to share storage devices, for additional equipment and power savings.

- Virtualize data center services:** Deploying services in the network instead of on standalone appliances reduces energy usage. The top portion of Figure 2 shows today's typical configuration, with three redundant appliances (six in total) needed for each department's server cluster. Total load is 1200 watts, multiplied by the number of server clusters. For 100 clusters, the total load would be 120 megawatts. The bottom portion shows a more energy-efficient solution: redundant devices with service modules that provide virtual services to up to 250 logical service groups. Whether the organization has 1, 10, or 1000 server clusters, the total energy consumption is still just 800 watts.

Figure 2. Data Center Virtual Services Reduce Load from 1200 to 800 Watts



- Consolidate agency IT infrastructure:** Organizations decrease their power consumption when they consolidate the servers used for departmental application, print, and file services into a centralized data center. Agency infrastructure consolidation not only reduces power requirements, but also strengthens government COOP plans by enabling consistent practices for security, business continuance, and backup. The prerequisite for agency IT infrastructure consolidation is enabling employees to access applications, print, and file services over the LAN just as quickly as if the services were hosted locally. Cisco wide-area application services (WAAS) technology provides LAN-like performance over the WAN, using a variety of application-acceleration techniques. Mobile employees can use Cisco WAAS Mobile software on their laptops for fast application performance from the field, empowering the government workforce.

Conserve Energy with Intelligent Power Allocation

Communications devices that use the Power-over-Ethernet (PoE) standard, including IP phones, often allocate energy based on maximum power usage rather than actual requirements. The Cisco Discovery Protocol allows Cisco Unified IP Phones to intelligently collect information about power consumption and communicate that information to the Cisco switches supplying the power. With this information, Cisco switches and routers can reduce the power they allocate to a port connected to a Cisco Unified IP Phone by 50 percent.

More than 70 percent of electricity consumed in the United States is used in office buildings. Within the office, lighting and office equipment account for almost 46 percent of consumption. Furthermore, the U.S. Department of Energy estimates suggest that PCs left on are in use only 9 to 15 percent of the time.

Minimize Greenhouse Gas Emissions from Buildings

Buildings worldwide generate 50 percent of all greenhouse emissions. Cisco EnergyWise, a new technology in the Cisco Catalyst switching portfolio, enables government agencies to minimize greenhouse gas emissions by measuring, reporting, and reducing energy consumption across the entire agency building or campus—not just the IT infrastructure. The network discovers Cisco EnergyWise manageable devices from Cisco and other vendors, ranging from IP phones to elevators, and from lighting systems to air conditioning. Then it monitors the devices' power consumption and takes action based on business rules to reduce power consumption. It's an example of how IT, which consumes around 2 percent of the world's energy, can help to intelligently manage the other 98 percent.

Use the Network Platform for Unified Communications Applications

Rather than using servers as the platform for applications such as unified communications, governments and educational institutions can use the network as the platform, reducing power and cooling requirements. Examples of applications that can be deployed on network routers that the organization would need anyway include Cisco Unified Communications Manager Express for IP telephony, Cisco Unified Contact Center Express, and Cisco Unified MeetingPlace® Express for voice, video, and web conferencing.

Case Study: ITDZ Berlin, Germany

The central service provider for city administration, ITDZ Berlin is responsible for ensuring efficient communications within city government and with citizens. ITDZ Berlin is currently consolidating five separate voice and data networks into one Cisco network that delivers Cisco Unified Communications services to city administration as well as police, fire, and other local authorities. ITDZ Berlin expects that consolidation will reduce capital and operational expense, some of that related to power consumption, by approximately 30 percent.

Increase Buildings' Energy Efficiency

The public sector can further increase sustainability by using the network to make buildings more efficient. According to the U.S. Green Buildings Council, buildings in the U.S. account for:

- 62.5 percent of total electricity consumption
- 36 percent of total primary energy use
- 30 percent of total greenhouse gas emissions
- 136 million tons of construction and demolition waste
- 40 percent (3 billion tons annually) of raw materials used globally

Confirming these findings, The Climate Group estimates that better building design, management, and automation could reduce buildings emissions in North America by 15 percent and eliminate 1.68 gigatons of carbon dioxide emissions.

Governments are making their buildings more efficient using the Cisco Connected Real Estate framework. All building automation system (heating, ventilation, and air conditioning, physical security access, lighting, and so on) are connected to the same IP network used for voice, video, and data instead of to their own proprietary networks. Having a common framework enables centralized monitoring and control and automated adjustment of building controls based on policy. If nobody is in a particular area of the building during certain hours, for example, buildings can be left at higher or lower temperatures than if people are present.



Case Study: State of Missouri, United States

Reduced total energy consumption by 17.5 percent

With almost 28 million square feet of office space in 3800 different buildings, the State of Missouri can save large amounts of energy with even small efficiency increases. However, each facility previously had a proprietary building management system that could not communicate with the others to reveal trends or comparative information. This made it difficult to determine which equipment upgrades—boilers, chillers, lighting, and the like—would produce the biggest energy savings.

Now the State of Missouri Facilities Management organization can centrally monitor energy consumption and costs for all buildings, helping it to identify which equipment to upgrade, and when, for the highest long-term savings. Every 15 minutes, the system uses the state's existing Cisco network to retrieve information from 250,000 building sensors that report on room temperatures, utility meter readings, whether elevators are turned on, and more. The information is stored centrally for viewing and analysis. The system automatically sends an email when something unexpected occurs, such as when an air handler begins operating 24 hours a day. The state reduces consumption by finding out right away instead of months later when the bills are analyzed.

For just one building, the Truman Building in Jefferson City, Cisco Connected Real Estate plus other projects resulted in the following energy savings between May 2007 and May 2008:

- 17.5 percent reduction in total energy used
- 25.4 percent reduction in weather-independent daily load
- 9 percent reduction in electric demand
- 4.5 percent reduction in cost of energy
- 13.6 reduction in cost per square foot
- \$118,440 annual cost avoidance, for just one of the state's 3800 buildings

Case Study: Ave Maria University, Florida, United States

Saved US\$600,000 annually from campus energy efficiencies

A private university in Florida, Ave Maria University, constructed 500,000 square feet of new building space in 2006 and 2007. To conserve energy and reduce capital and operational costs, the university built a single IP network instead of separate networks for heating, ventilation, and air conditioning; energy and power management systems; security and access control including video surveillance; interior and exterior lighting control; water chiller plants; campus fire and emergency systems; and voice, video, and data.

Thousands of network-connected sensors monitor the environment in every building on campus. The sensors communicate with automated building systems, including temperature controls, valves, and air dampers, to ensure the comfort of building occupants while conserving energy. For example, lights turn on and off automatically depending on whether a motion sensor detects a person in the room. And classrooms monitor the number of people who have entered and adjust the climate appropriately.

Ave Maria University estimates that its network-based solution saves US\$600,000 annually on energy costs. Additional savings include \$1.5 million in building costs and \$350,000 in salary avoidance because the university only needed enough people to manage one network, not multiple networks.



Adopt Business Practices that Avoid Travel

The public sector can decrease both operational costs and greenhouse gas emissions by replacing travel with network-based collaboration solutions:

- **Mobility solutions for field employees:** Field employees such as inspectors and caseworkers can retrieve documents and submit reports from the field, using handheld devices and the government's wireless networks. This reduces round trips to the office.
- **Videoconferencing and Cisco WebEx:** The ability to collaborate with video and web sharing reduces travel requirements for team meetings. Seeing other team members helps provide the trust essential for interagency collaboration.

Case Study: North Wales Police

Reduced carbon emissions by 2.8 tons in six months

The North Wales Police force serves more than 660,000 residents with a team of 1600 police officers and 850 support personnel. The district's unique geography, 5600 square miles, including the highest mountain range in England and Wales, poses unusual challenges for everyday business processes. For example, driving 140 miles to and from the Crown Prosecution Service to determine if a case is prosecutable can take up to four hours, keeping officers off the street.

Now officers meet face to face with solicitors without the time, expense, and environmental impact of travel, using Cisco Unified Video Advantage and Cisco Unified Videoconferencing. Reducing long car trips is helping North Wales Police meet its goal to be carbon neutral by 2015. The western district reduced carbon emissions by 2.8 tons in the first six months of the pilot program. The same solution helps North Wales Police to provide a more visible police presence and reduce costs.

Personnel in the western divisional headquarters have eliminated 30 hours in weekly travel time by meeting remotely using Cisco Unified Communications video solutions, saving US\$68,000 (£39,913) annually. Savings could potentially triple when North Wales Police introduces the solution to its other two divisions.

- **Cisco TelePresence:** With ultra-high-resolution images, fluid motion, and CD-quality sound, Cisco TelePresence rivals face-to-face meetings for high-level decision making and crisis response. Travel needs decrease and decisions can be made sooner when participants can avoid travel. Governments can set up dedicated Cisco TelePresence meeting rooms or deploy smaller systems in executives' offices.

Case Study: Cisco

Reduced emissions from air travel by 10 percent, or 82,000 metric tons

Business travel accounts for 27 percent of Cisco's greenhouse gas footprint. As part of its commitment to the Clinton Global Initiative, Cisco has already decreased emissions from air travel by at least 10 percent per employee, using a combination of Cisco Unified Communications, Cisco WebEx, and Cisco TelePresence.

To date, Cisco employees have avoided 38,000 trips by using Cisco TelePresence, for a savings of US\$150,000 in travel costs and 82,000 metric tons of carbon emissions.

- **Cisco Virtual Office:** With secure access to government applications and unified communications services from home, employees can telework one or more days a week, reducing travel time, costs, and carbon emissions. Other benefits of telework include supporting COOP during planned and unplanned events, including pandemic, increased employee satisfaction, and a recruitment advantage.
- **Distance learning:** Rather than requiring employees to commute to a training session, government and educational institutions can offer online, interactive training that employees can take from their homes or offices, at any convenient time.



“Improved retention and morale and increased productivity were cited as the greatest benefits among firms that allow telecommuting.”

Robert Half International, Citing Results of a 2007 Survey

Consider Shared Services

When public sector organizations share services such as Cisco Unified Communications, they avoid power and cooling costs for redundant infrastructure.

Case Study: Rijksgebouwendienst, Netherlands

Reduced carbon dioxide by 90,000 kilos annually

The Rijksgebouwendienst (Government Buildings Agency) manages approximately 2000 buildings in the Netherlands with a combined floor space of 7 million square meters. Multiple government tenants reside in the Beatrixpark building, which provides shared services and bills by hourly use. Each building occupant has its own secure VLAN for delivering applications, avoiding the expense and energy consumption of the governments' previously separate network infrastructures. Examples of shared services include Cisco Unified Communications and digital signage. The agency is saving EURO€35,000 annually for electricity used by the network alone and has reduced carbon dioxide emissions by 90,000 kilos annually.

Select Vendors with a Commitment to Environmental Sustainability

Cisco and its ecosystem of partners are committed to green business practices and advocacy. Since 2005, Cisco's annual Corporate Responsibility Report has included Cisco's environmental sustainability commitments and performance. The report outlines annual targets, a governance process for holding employees accountable, how Cisco performed against those targets, and what the company expects to achieve in the coming year.

In June 2008, Cisco announced its goal to reduce greenhouse gas emissions from worldwide operations by 25 percent by 2012. Strategies include:

- **Responsible operations:** Cisco will use power in a more sustainable manner; reduce greenhouse gas emissions associated with business operations; better manage resources and waste; and select supply chain partners that are committed to Cisco's environmental goals.
- **Product stewardship:** Cisco is committed to optimizing product performance while reducing power requirements. Cisco has also instituted strong recovery and recycling programs.
- **Architecture:** Cisco is developing networking architectures and solutions to enable customers and employees to mitigate their environmental impact and achieve their sustainability goals.
- **Advocacy:** Cisco is committed to acting as a catalyst for change with partners in industry, government, and among influencers.

Conclusion

Governments and educational institutions have compelling motivations for environmental sustainability, including reducing costs, freeing up taxpayer dollars to invest in citizen services, fulfilling the public trust for stewardship, and setting an example for citizens and the private sector. To harness the potential of the IP network for sustainability, governments can:

- Consolidate network devices to reduce energy consumption
- Conserve energy used by IP phones, with intelligent power allocation
- Use the network as the platform for unified communications applications
- Increase the energy efficiency of buildings
- Adopt telework and remote meeting solutions to reduce travel
- Introduce shared services
- Select vendors with a commitment to environmental sustainability

For More Information

To read about Cisco solutions and programs for government, visit: www.cisco.com/go/government.

To get ideas for how to improve energy efficiency using networking technology, visit the Cisco Efficiency Assurance Program website: www.cisco.com/go/efficiency.



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