Your Computer and the Climate

Make a change today – Save the planet tomorrow

A Report by TCO Development
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TCO Development
Technology for you and the planet

www.tcodevelopment.com

About this Report

The potential to decrease the direct climate impact of IT products and their use are the focal point of this report. The purpose of this report is to illuminate the impact IT use has on the climate, outline available new products and practices, and to present the effects of "climate optimizing" equipment. This document presents an executive summary of the report. A full-text version is available by e-mail at development@tco.se

The Author

The author, Håkan Nordin, has extensive experience working on environmental issues in the IT industry. In the early 1990s, he raised the question regarding toxic flame retardants in electronic products. Since 1995, Håkan Nordin has been actively engaged in setting environmental criteria for the TCO certification program. In his work with the Swedish Administrative Development Agency (Verva), he helped formulate the environmental requirements for public procurement of IT equipment.

TCO Development

The TCO certification system makes it easy to choose IT and office equipment that is designed for the benefit of both the user and the environment. For over 20 years, the TCO certification system has influenced product design and development in an environmental and human-centered direction. Since 1992, the TCO labelling system for displays has contributed to improved picture quality and visual ergonomics, reduced electromagnetic fields, lower energy consumption and a reduction in the use of environmentally hazardous substances.

The quality of the TCO label is guaranteed to have the highest standards world-wide and strict testing procedures conducted by independent test laboratories. The standards are developed in consultation with users, manufacturers, researchers and other experts. The TCO certification is internationally recognized and products bearing the TCO label can be found throughout the world. Approximately half of all displays in the world are TCO-certified. Dealing with climate change is a logical step in the continued development of the TCO program. For more on TCO certification, log onto www.tcodevelopment.com.

Executive Summary

The Invisible Threat

Many environmental problems are invisible. It is difficult to see the connection between an environmental threat and our daily life. For example, electronic equipment contains environmentally hazardous components that are not visible or even easily identifiable.
Even as we become aware of this connection, it is easy to believe that each individual contribution to the environmental impact is too small to make a difference. However every contribution adds to the total sum.

Each computer monitor or notebook that is unnecessarily switched on is in itself not a problem. However, when we consider that worldwide computer sales in 2007 totaled 268 million[1] units, it becomes clear that the difference between optimal operation of an energy efficient product and sub-optimal operation of an eco-deficient product can create vast differences in CO_2 emissions. Every hour of unnecessary usage of these 268 million PCs amounts to 340 million kWh[2] of energy consumption, and 17,000 tons of CO_2[3].

The one billion computer monitors in use around the world today result in an annual 53 million tons of CO_2 emissions. PCs, printers, servers, hubs and switches, routers, wireless networks, wireless mice and keyboards, and running the Internet create additional emissions.

Based on these statistics, we can conclude two things. Firstly, IT usage is the source of a significant amount of climate changing CO_2 emissions. Secondly, our IT usage can also be a part of the solution. Simple actions, such as switching on computers only when in actual use, can collectively make a significant reduction in IT-related CO_2 output.

Technology Development and Climate Impact

IT hardware and software development has been explosive during the past 15 years. The development of better quality computer monitors has been synonymous with a reduction in environmental impact, a unique phenomenon.

TCO Development started working on energy saving functions for computer displays in the early 1990's by promoting the value of the automatic power save or sleep mode function. Today's displays in active mode, with twice the size and higher resolution, use as much energy as the energy save mode did 15 years ago.

The table below outlines the evolution of energy efficiency in computer monitors since the early 1990's. As a benchmark, the TCO environmental standards have been used to outline power efficiency improvements to date.

[1] IDC Worldwide Quarterly PC Tracker, March 2008
[2] Estimated average PC power consumption = 150 watt
[3] Based on a EU-mix of 25 countries

Computer Monitors - 15 Years of Increased Energy Efficiency*

	TCO92/ TCO95	TCO99 CRT display	TCO03 Flat Panel display	TCO06 Media Display
Energy Saver Mode (watts)	30	15	4	2
Size (inches)	14	17	17	19
Resolution (pixels)	800 x 600	1024 x 768	1280 x 1024	1680 x 1024
Average Operating Power (watts)	100	70	40	40

According to TCO standards

Source: TCO Development

Monitors available today use less than half the energy during operation and less than one-tenth the power while in power save mode than the best displays did ten years ago. During the same time period, the size of the average monitor has increased from 14 to 17 inches, and the image quality (measured as increased resolution) has tripled.

There is a large difference between the best available and worst technology in use today. An old energy-gobbling computer with a “thick-screen” display can consume more than 300 watts while an Energy Star/TCO certified unit may use only 80 watts, while additionally providing better performance. Therefore three energy efficient computer displays produce less CO_2 than one old display.

Desktop and notebook PCs provide an interesting comparison. Notebooks are energy optimized so as to increase battery life, and they therefore consume considerably less energy while performing the same tasks as a desktop. See table on next page.

Comparison: Energy Efficiency PCs Alternatives (excluding displays)

Autumn 2007

	Maximum	Idle*	Average
”High End” used for gaming or Cad/Cam	380	320	350
Standard Desk Top PC	130	70	100
Energy Efficient Desk Top PC	60	40	50
Energy Saving Notebook	40	20	30

**Idle defined: the computer is operational but not active*

Source: Technical specifications from largest manufacturers

There are significant environmental savings to be made by investing in the most energy efficient equipment and choosing the appropriate display size for a specific application. The TCO ‘03 certification demonstrates that good quality can be combined with energy efficiency.

Usage Patterns and the Climate

According to EuP[4] estimates, a desktop computer in a normal usage pattern is in active mode approximately 2,279 hours annually. It is reasonable to say that our computers are used efficiently for about four hours on an average workday and for 200 days per year, equal to 800 hours. Based on an average workday, this means that every computer is in active mode for 1,479 hours per year while not utilized - or roughly half the year! The potential to improve our user habits is enormous, and it translates directly into both CO_2 reduction and cost savings. Decreasing the active computer time to an average of 4 hours daily can lead to potential savings of approximately 65 percent.

Table: Possible Energy Savings - Office Usage

	Current User pattern (hours per year)	Possible Decrease Active Mode* (hours per year)	Decrease as %
Desktop	2279	1479	65
Laptop	2613	1813	69
Monitor	2586	1786	69

* estimated active usage as maximum 4 hours daily and 200 workdays yearly

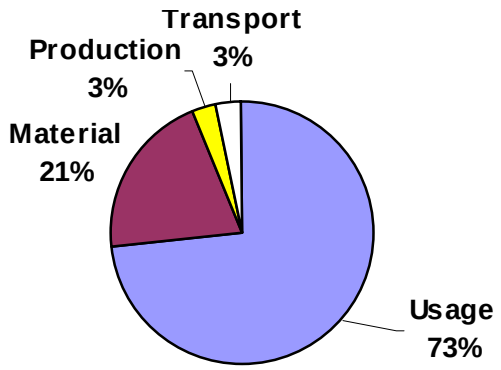
Source: Preparatory Study, TREND/D1/40-2005, Lot 3, Computers & Computer Monitors

[4] **Directive 2005/32/EC on the Eco-design of Energy-using Products(EuP)**

Climate Impact throughout the Product Lifecycle

From sourcing product components to manufacturing and processing, usage, recycling and waste, all products have an environmental impact. A computer's main environmental impact occurs during the use phase. This is due to the fact that a computer usually consumes electricity almost daily throughout its lifecycle. If the electricity is sourced from coal power plants for example, the resulting CO_2 emissions are significant. A large share of the planet's electricity originates from coal power plants. Therefore all measures that lead to less consumption of electricity during the use phase are essential.

Diagram: Lifecycle CO_2 Emissions of a Notebook Computer



Source: EUP preparatory study, TREND/D1/40-2005, Lot 3, Computers and Computer monitors.

The diagram shows that 73% of the CO_2 emitting from a notebook computer is from usage and 21% from material content. As a comparison, for a flat screen, the corresponding figures are 78% and 14% respectively.

Solutions for Reducing the Climate Impact of IT

There are many solutions available for reducing the impact our use of IT on the climate. This report shows that many of the products and the way we use them are not optimized to minimize CO_2 emissions. With efficient usage patterns of existing technologies, there is real potential to lower energy consumption to around 80-90% of today's levels.

Products

By investing in the most energy efficient IT products, we are able to cut our IT energy consumption to at least half of current levels. This is a rough estimate but serves to show that there are energy efficient alternatives on the market.

Examples of Energy Efficient Products Currently Available

”Standard” Desktop PC	100 -150 watts
Energy Efficient Desktop PC	50 watts
Energy Efficient Notebook PC	20 watts
Energy Efficient Monitor	30 watts

This estimate could be pushed even further if built in energy efficiencies typically found in notebook PCs were also employed in desktop PCs. A notebook computer connected to a separate monitor typically uses about 50 watts, which is around 67% lower than a typical desktop PC.

Usage Patterns

EuP estimates show that, on average, only thirty five percent of the total energy consumption of computer equipment is used during the use phase. Sixty five percent of the electricity consumption, and therefore 65 percent of the CO_2 emissions, are attributed to computers that are not switched off, or where energy save functions are not activated. It is vital that our usage patterns of IT reflect the need to reduce overall energy consumption and subsequent impact on the climate.

Climate Friendly Changes You Can Make Today!

1. Choose computer equipment based on power consumption in active mode

For regular office use, there is only a small difference between an energy efficient computer and a computer that uses a bit more energy. But there is a measurable difference when energy consumption is measured over the entire lifecycle of the computer!

2. Activate energy settings on your computer

You can select when your monitor or hard disk goes into sleep mode, or energy saving mode, and when it should switch to active mode. The simplest solution is to choose notebook computer energy saving settings, even when using a desktop.

3. Be climate smart!

When not using your computer, switch it completely off! Leaving your computer on, even in sleep mode, during breaks, meetings or overnight wastes energy.

4. Check your electric bill!

A computer has an invisible effect on the climate. Check your electric bill – seeing how many kilowatt hours and dollars spent can be a motivating factor.