



Environmental Impact

- In this section you will learn about:
- Energy use
- Disposal of IT equipment
- Carbon footprint



Energy Use



- **How do Computers use energy?**
- The factories making computers use lots of energy, especially electricity much of which is produced using fossil fuels.
- All our computing equipment uses energy: desktops, laptops, supercomputers, smartphones, servers, cooling systems, local-area networks, the Internet, and printers.



Energy Use

- Our computers use up lots of energy.

Computers	
Desktop Computer	60-250 watts
On screen saver	60-250 watts (no difference)
Sleep / standby	1 -6 watts
Laptop Computer	15-45 watts
Monitors	
Typical 17" CRT	~80 watts
19" LCD	17-31 watts
20-24" LCD	18-72 watts

Energy Use

- Top end gaming desktops draw 1000 watts of power.



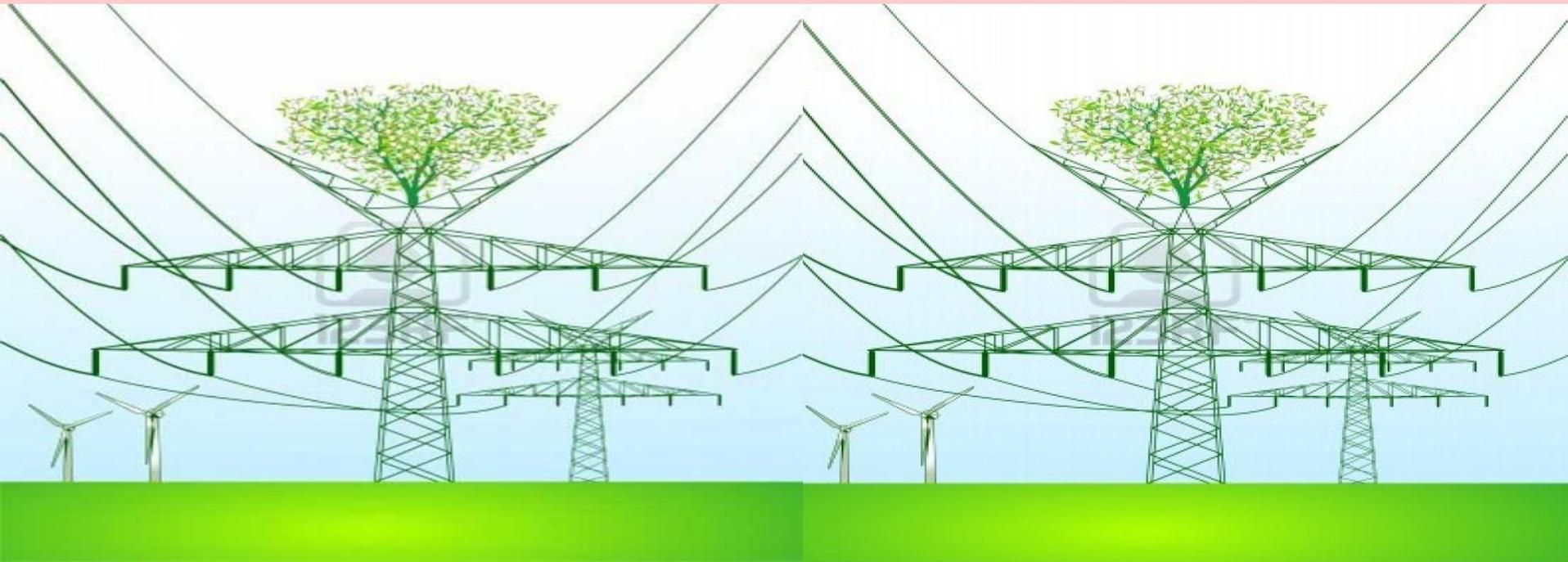
Internet Use & Co2

- The servers and equipment needed to keep the internet running use lots of energy
- A minute spent on the Internet causes 1.2 grams of carbon dioxide to be emitted into the environment. = same as driving a kilometre in a modern car.



Saving energy

- **We can save energy use by using desktops and laptops that use:**
 - low power processors
 - Lower power memory chips(DDR3)



Processor power use

Compare these High power use processors

Model	Core	Clock Speed	Thermal Design Power
Core i7-980X Extreme Edition	Gulftown (32 nm)	3.333 GHz @ 6 Cores	130 W
Core i7-2600	Sandybridge (32 nm)	3.4 GHz @ 4 Cores	95 W
Core i7-2600S	Sandybridge (32 nm)	2.8 GHz @ 4 Cores	65 W

With these low power use processors

Model	Core	Clock Speed	Thermal Design Power
Atom 230	Diamondville (45 nm)	1.6 GHz	4 W
Atom 330 (Dual-Core)	Diamondville (45 nm)	1.6 GHz	8 W
Atom N270	Diamondville (45 nm)	1.6 GHz	2.5 W
Atom N280	Diamondville (45 nm)	1.67 GHz	2.5 W
Atom D410	Pineview (45 nm)	1.66 GHz	10 W
Atom D510 (Dual-Core)	Pineview (45 nm)	1.66 GHz	13 W

Low Power memory

The amount of power used by memory units is important especially when used by large scale super computers and servers which have terabytes of memory

There are two main types of memory units in common use: DDR 2 and DDR3

DDR 3: memory units have lower power consumption and faster data transfer rates. { it is more expensive though }



Laptop energy use comparison

Compare the energy use of these laptops



HP Pavilion DV4 Intel
2.2 GHz Laptop
From **£899** [Compare prices](#)

Sleep: 1W
Idle: 12.74W
Off: 0.72W

20.66 kgCO₂

🔌 **Power Consumption:** 38.14 kWh/year (?)



Packard Bell EasyNote LS44
17.3 inch 2.3 GHz Intel Core i7 Laptop
From **£468** [Compare prices](#)

Sleep: 1.09W
Idle: 7.19W
Off: 0.89W

13.28 kgCO₂

🔌 **Power Consumption:** 24.53 kWh/year (?)



Apple MacBook Air (MC504)
13.3 inch 1.83GHz Intel Core2 Duo Laptop
From **£879** [Compare prices](#)

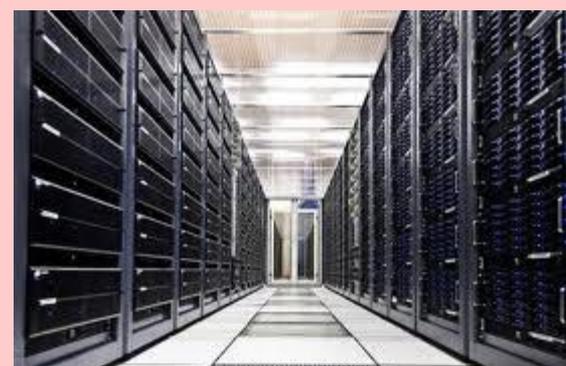
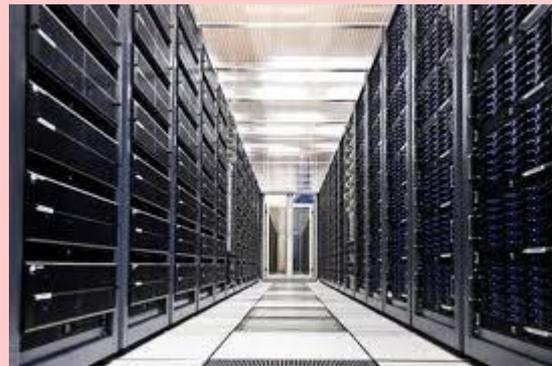
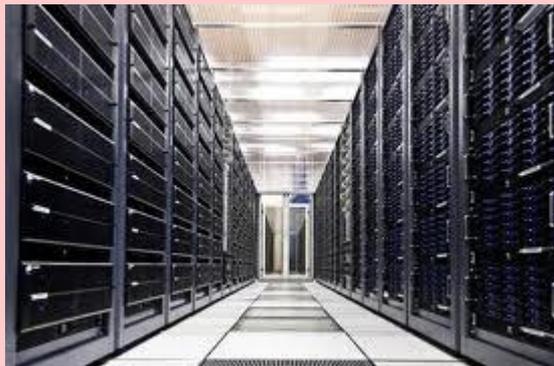
Sleep: 0.71W
Idle: 4.09W
Off: 0.24W

6.84 kgCO₂

🔌 **Power Consumption:** 12.63 kWh/year (?)

Server energy use

- A typical server uses 80 -100 watts of power
- Google uses around 1,000,000 servers world wide.
- Facebook uses 180,000 servers
- The energy to run the servers costs more than the actual servers themselves!





Servers: Energy use



- Servers are powerful computers that store the information on the internet that help us communicate across the internet that send our e-mails and search for web pages for us.
- They use lots of energy and this produces lots of CO₂.
- All of the companies that make and run servers are now designing and using servers that are smaller and more energy efficient so that they will emit less carbon and cost less.

Reducing Server energy use

- HP has launched the Gemini servers that use a very small amount of power, based on an Intel Atom chip called Centerton and more efficient use of memory resources
- A Gemini server will consume 6 watts of power, compared to the more typical 80-watt to 100-watt server



Carbon footprint



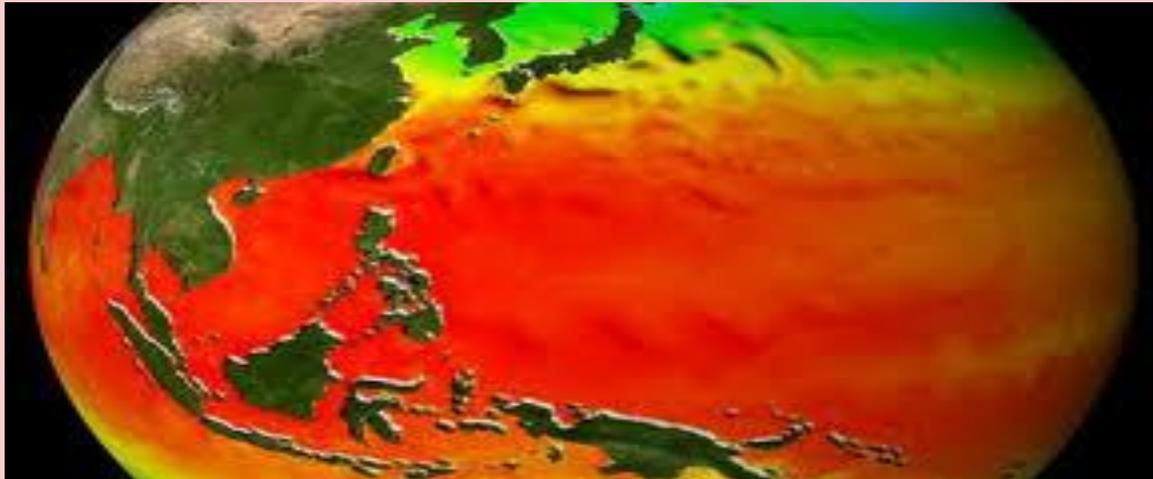
- **The carbon footprint** is a measure of the impact that the manufacture and use of computers has on the environment by calculating the amount of greenhouse gases produced.



Energy use & Greenhouse Gases



- Using energy can add to the amount of greenhouse gases that we release into the atmosphere, so, running our computers does add to Global warming!

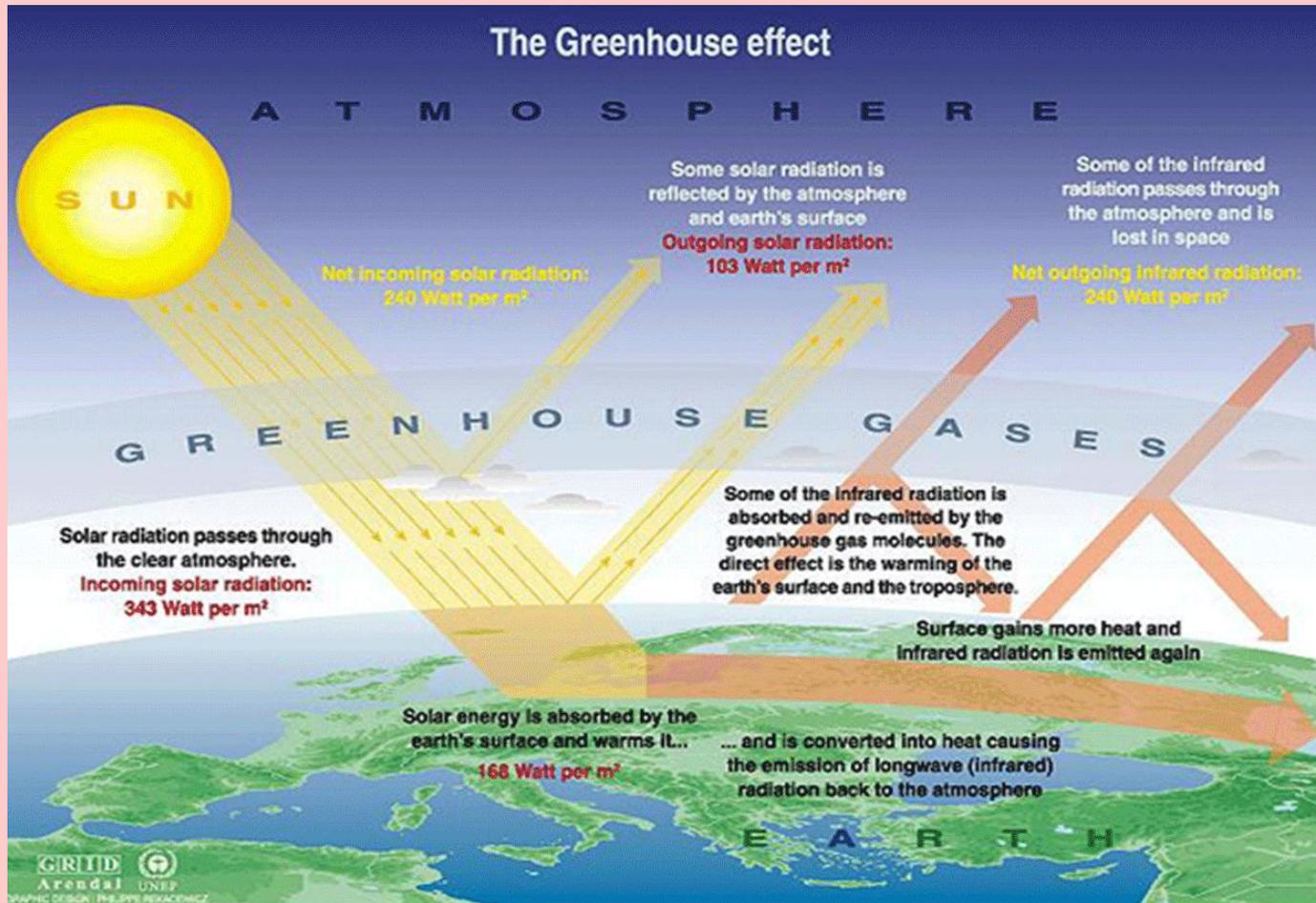


Energy use = Greenhouse Gas

- On the negative side Computers use lots of energy
- This = more greenhouse gases produced = larger carbon footprint.
- Computer systems contribute about 2 per cent of global greenhouse gas emissions, nearly the same amount as the
airline industry.



Greenhouse Gases



Reducing Carbon footprint

- You can reduce your carbon footprint by making sure you use a low power system with low power processors & low power memory units.

Tranquil PC's Sleek ixL i3 Power PC



Carbon footprint

You can compare the carbon emissions of computers before you purchase them e.g:

Ranked by estimated annual power consumption >		Power used	kgCO ₂ /year	Cost /day	Cost /year	More info
1	 <p>Apple MacBook Air (MC504) 13.3 inch 1.83GHz Intel Core2 Duo Laptop From £879 Compare prices</p>	Sleep: 0.71W Idle: 4.09W Off: 0.24W	6.84 kgCO ₂	< £0.01	£1.81	»
2	 <p>Apple MacBook Air (MC969) 11.6 inch 1.6GHz Intel Core i5 Laptop From £775 Compare prices</p>	Sleep: 0.95W Idle: 4.21W Off: 0.17W	6.93 kgCO ₂	£0.01	£1.83	»
3	 <p>Apple MacBook Air (MC966) 13.3 inch 1.7GHz Intel Core i5 Laptop From £1,000 Compare prices</p>	Sleep: 0.97W Idle: 4.28W Off: 0.17W	7.04 kgCO ₂	£0.01	£1.86	»
=	 <p>Apple MacBook Air (MC965) 13.3 inch 1.7GHz Intel Core i5 Laptop From £998 Compare prices</p>	Sleep: 0.97W Idle: 4.28W Off: 0.17W	7.04 kgCO ₂	£0.01	£1.86	»

Computers: helping to reduce energy use & Carbon footprint

- Computers can help decrease the carbon footprint of businesses and organisations by increasing their efficiency and reducing the demand for air travel, and electricity



Using the Internet to help the environment

- Other ways of using the Internet to help the economy and the environment are telecommuting, teleconferencing, e-commerce, telemedicine and distance learning.
- These all reduce the need for travelling and so reduce energy use.



Working from home

Working from home reduces the need for travelling, reduces transport energy use.



Disposal of ICT equipment

- The disposal of ICT equipment is governed by the the **Waste Electrical and Electronic Equipment Regulations 2006** (the **WEEE Regulations**).



Disposal of IT equipment

- This means that
 - businesses that produce and sell electrical and electronic equipment are responsible for taking back and recovering or disposing of **waste electrical and electronic equipment (WEEE)** from businesses and householders.





Disposal of IT equipment



- Businesses and organisations **must**
 - Store, collect, treat, recycle and dispose of WEEE separately from other waste;
 - Obtain and keep proof that WEEE was given to an authorised waste management company, and was treated and disposed of in an environmentally sound way.



Disposal of IT equipment by re-cycling

- A good way to dispose of IT equipment is to Re-cycle.
- Use this website to find out where you can recycle equipment:
- <http://www.recycle.co.uk/>



Re-cycling sites in Glasgow from <http://www.recycle.co.uk/>

The image shows a screenshot of the website www.recycle.co.uk/. On the left, there is a search bar containing the word "computer" and a "GO" button. Below the search bar is a "Select Recycling Category" dropdown menu with 13 options, each with a right-pointing arrow:

- Mobile Phones
- Gadgets
- CD's & DVD's and Games
- Batteries
- Composting
- Construction And Demolition
- Glass
- Liquids And Chemicals
- Metals
- Miscellaneous
- Paper And Cardboard
- Plastic

The right side of the image shows a map of Glasgow and its surrounding areas. The map is overlaid with 17 green circular markers, each containing a white number from 1 to 17, representing recycling sites. The markers are distributed across the city, with a concentration in the central and eastern parts. Major roads like the M80, M74, and A74 are visible on the map.