Nanotechnologies: Benefits and Risks for Developed and Developing Countries

The Great Nanotechnology Debate:

There is lots of discussion about how Nanotechnology has enormous **technological** and **economical** potential for the world.

• Alongside this there is a debate about which countries will **benefit** most from the **Nanotech** revolution.

• Also there are concerns about the new **risks** that Nanotechnology could bring for humans and the **environment.**

People are concerned that Nanotechnology may increase the gap between Developed countries and Developing countries.

Similar to the debate around the 'digital divide'.

So far it seems that most NT applications do have a Western bias, eg sun creams, sports equipment and computers.

However it is not inevitable that this trend will continue. Applied the right way NT could benefit all. Particularly in the areas of Medicine, Energy and Resources and Information and Communication technology.
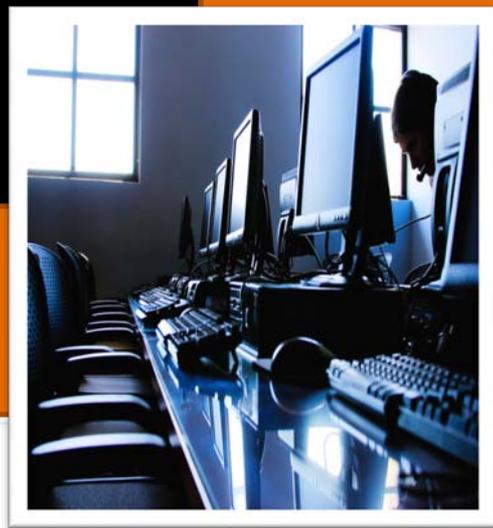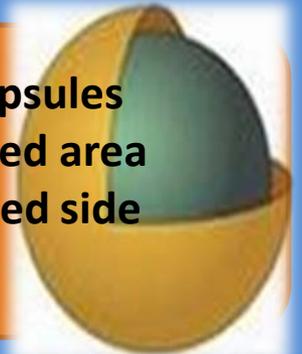
Nanomedicine: advances in this area could obviously benefit all as long as they are available to all.
Advances such as:

Biocompatible: Nano-structured surfaces on replacement body parts eg hip joints or heart valves make them accepted by the body.

Nanostructured material for bone,tissue and even nerve regeneration.

Targeted drugs: Nano-sized capsules which go straight to the infected area of the body. Reducing unwanted side effects.

Nano-sized sensors which can analyse our blood for viruses and give back results almost immediately. So called a 'lab-on-a-chip' this tiny device could be especially useful in developing countries to save on time and personnel.

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There are <u>concerns</u> that these kind of medical advances may only be available to Developed Countries or to people that can afford it.

However Nanotechnologies often have the advantage of being relatively <u>cheap</u> to produce once they have been designed.

For example a nanotechnology–based Tuberculosis diagnostic kit is being developed in India which is highly efficient and compact but will eventually only cost 30 rupees. (which is less than 1 US $)

NANO *you*

Medical breakthroughs are always **exciting** but also bring new **risks** that need to be researched and managed.

For example some nano-medical devices are 100 to 10 thousand times smaller than human cells. Therefore we need to know how they behave within the body before we can use them **safely**.

Of course it's being so small that gives them the unique potential to deliver **targeted treatment**. But we need to manage this potential.

ENERGY AND RESOURCES: climate change and diminishing resources are global concerns. NT is often cited as possibly having the solutions to some of the worlds biggest problems.

Solar Cells which are much smaller yet more efficient and cheap to manufacture. Could make solar power a credible alternative energy source.

1 cm
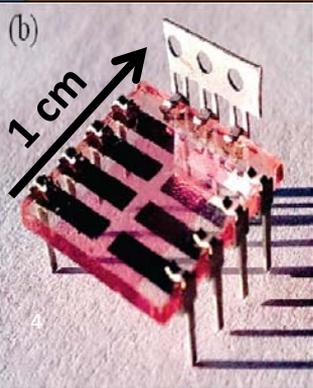
Light: a Nanocrystal bulb that would use 100% of it's energy for light , with nothing wasted in heat.

Carbon Nanotubes:
10x stronger than steel, a sixth of its weight these tiny tubes could revolutionise the materials we use and the energy we consume.

Water: nanoparticles used to remove toxins from water to make it drinkable and save many lives.

Finding answers to energy problems is something that hopefully will benefit everyone. However there is still the concern that some of the NT solutions may be more tailored to Western needs Solutions which work for an already Developed society with an infrastructure in place.

Another issue is that of manufacturing. Developing countries want to ensure that they become producers of NT as well. Not solely importing the technology from Developed countries.

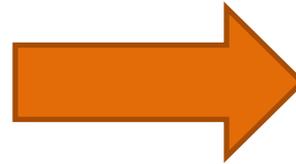Any waste needs to be managed correctly to avoid polluting our world.

Waste from NT needs to be managed also except that some parts are so small that they cannot be dealt with by conventional methods.

New ways of disposal need to be devised so our environment is not threatened and NT can develop safely.
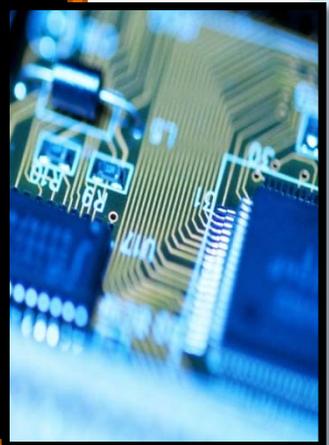
Information and Communication Technology:

NT is creating smaller microprocessors. This means that devices are more compact, more portable, faster, more powerful and contain many more applications.

NT could one day use single electrons to work processors. This would make computers <u>100x faster</u>, with huge memories and many more applications.

Nano-sized ID tags could, in the future be attached to everything we buy. Giving information about what and where we consume. In theory this could cut down on waste and theft. But it could also raise concerns about an individual's privacy.

Nanotechnologies & the Digital Divide

As predicted by Moore's laws; computer hardware is doubling it's capabilities every 2 years. Nanotechnology plays a big part in this progression.

The 'digital divide' refers to the gap between people with access to digital and information technology and those with very limited or no access at all. This creates an imbalance in skills and resources.
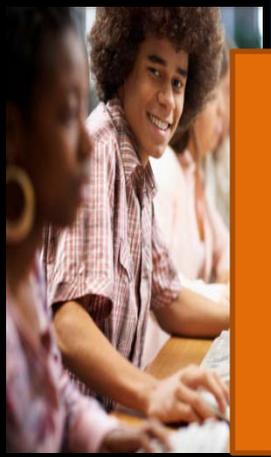
People are concerned that this 'divide' may get worse as technology gets more advanced. This divide can be seen as a global issue and also locally, within communities in Developed countries.

This divide can be seen as a positive with the notion of 'Leapfrogging'.
This refers to when an area has poorly developed technology or economic bases it can learn from the mistakes of more developed areas and miss out certain stages of development which didn't work. Thus saving on resources.

E.g. In India the use of mobile phones has far exceeded the use of land line phones. This missed out the expensive process of laying land lines everywhere first.

Nanotechnology is giving scientists the ultimate opportunity to optimally design and create new materials.
 With these new opportunities comes responsibilities and it is up to all of us to use them safely yet still allow technology to develop and be useful.

Of course Governments play a big role in ensuring that Nanotechnologies progress in a safe way. They can do this by commissioning research projects and passing laws which can protect health, safety and the environment while still allowing scientific advancement.

Also the producers of Nanotechnologies have the responsibility of making sure their products are both beneficial and safe.

If you are interested in these issues and would like to know more have a look at these other EU projects websites which focus on this topic:

www.nanocap.eu
www.observatory-nano.eu
www.framingnano.eu
www.etui-nanotechnologies

We have a responsibility too. By keeping informed and engaged about the progression of Nanotechnologies we can make educated contributions to future decision-making regarding the use of Nanotechnology.

If you are interested why not check out:

www.nanologue.net
www.cordis.europa.eu and search for Nanodialogue.

Images:

1. - www.dragonflybiofuel.com/images/fotolia_94808

2.http://www.globalaid.net/wordpress/wp-content/uploads/2008/08/clean-water-393x393.jpg

3. radio.weblogs.com/.../images/lab_on-a_chip

4. Credit-Natalie plank. Cambridge University.