OPPORTUNITIES FOR MOBILE AND WIRELESS COMMUNICATIONS IN A LOW CARBON ECONOMY

From a 20th century high carbon infrastructure to a 21st century low carbon infrastructure

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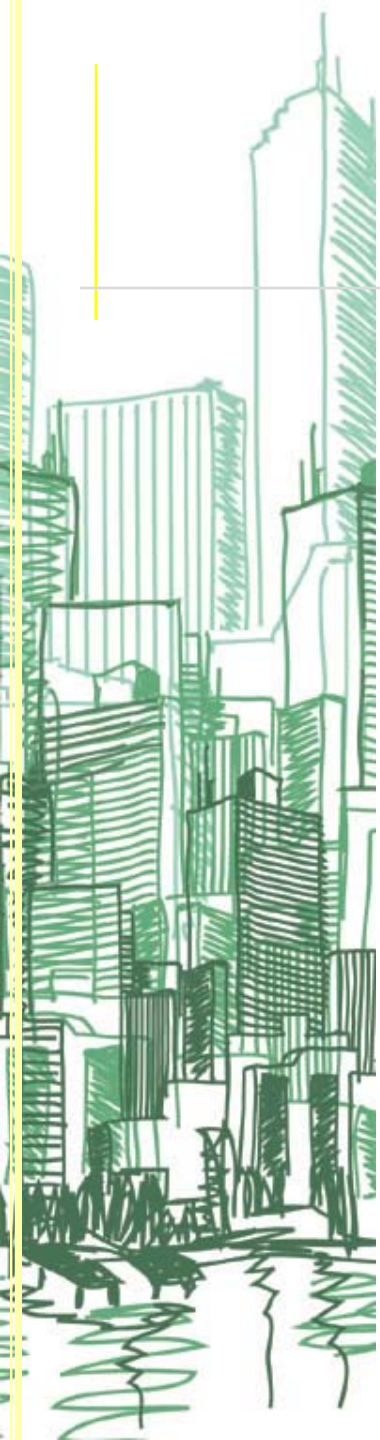
Outline

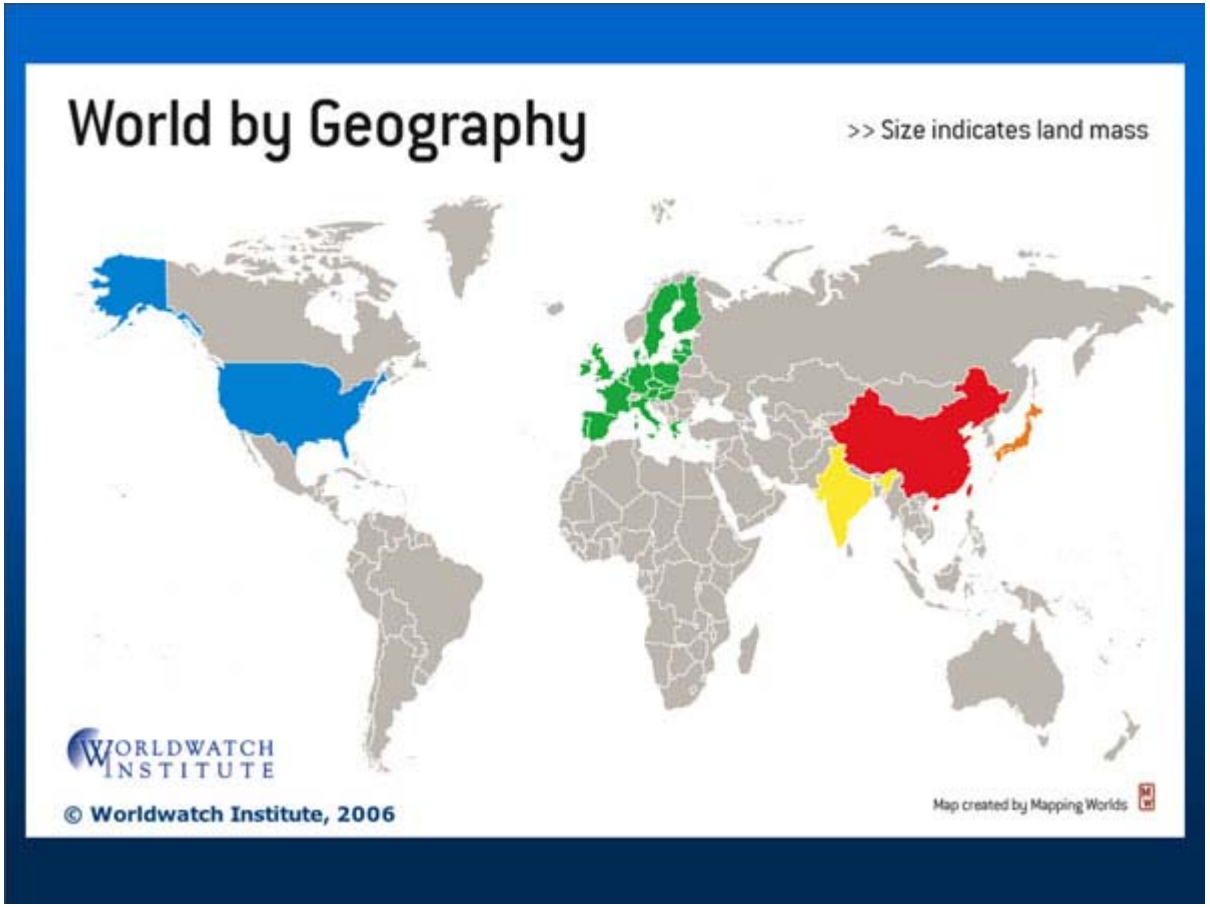
- Opportunities for ICT
  - Brief summary of trends
    - Where are we headed?
- Role of ICT in a low carbon economy
  - 2% vs. 98%
- Strategic areas of implementation
- A 21st Century infrastructure



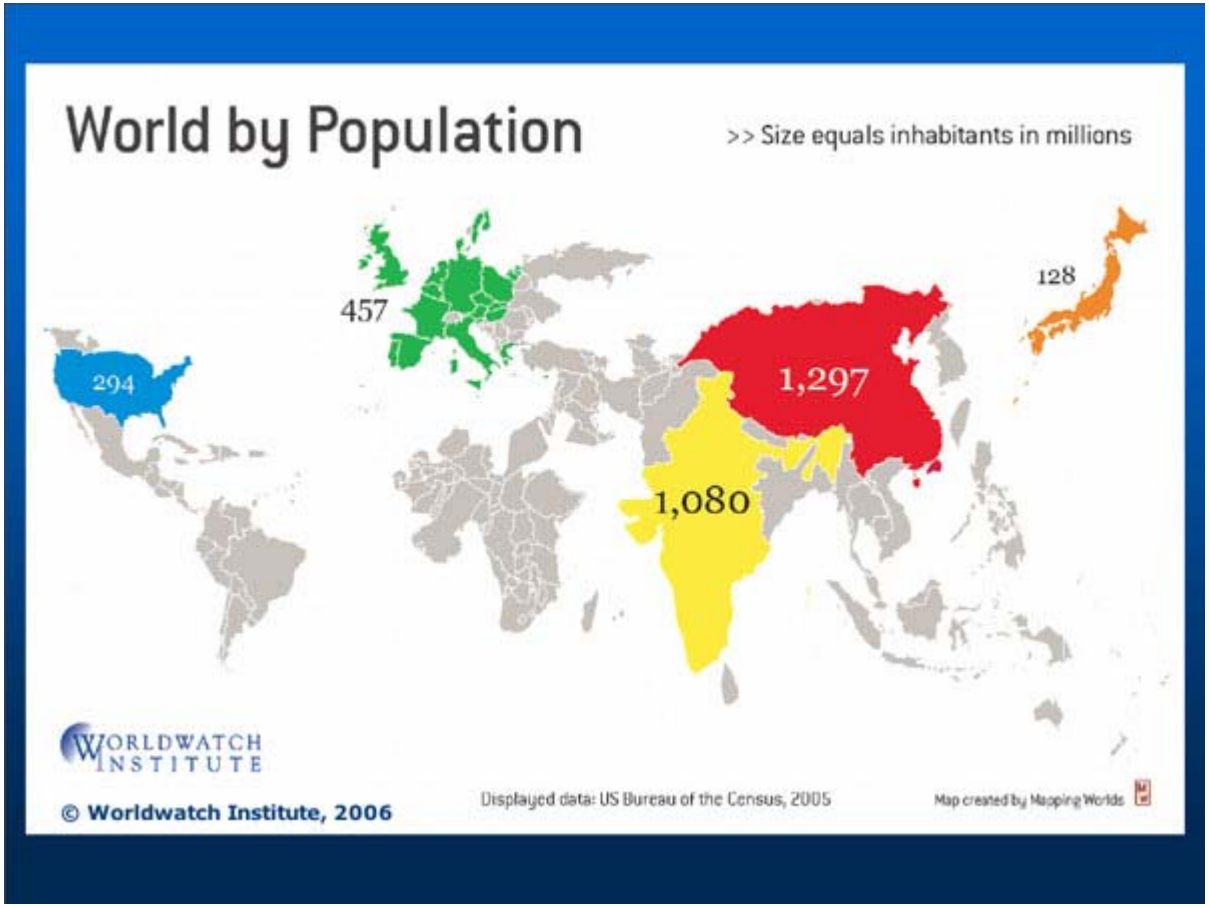
” Over the next 30 years more than $200 trillion will be invested globally in urban areas to provide us with basic services, such as transportation, heating, cooling and lighting. ”

Booz & Company and WWF, 2009

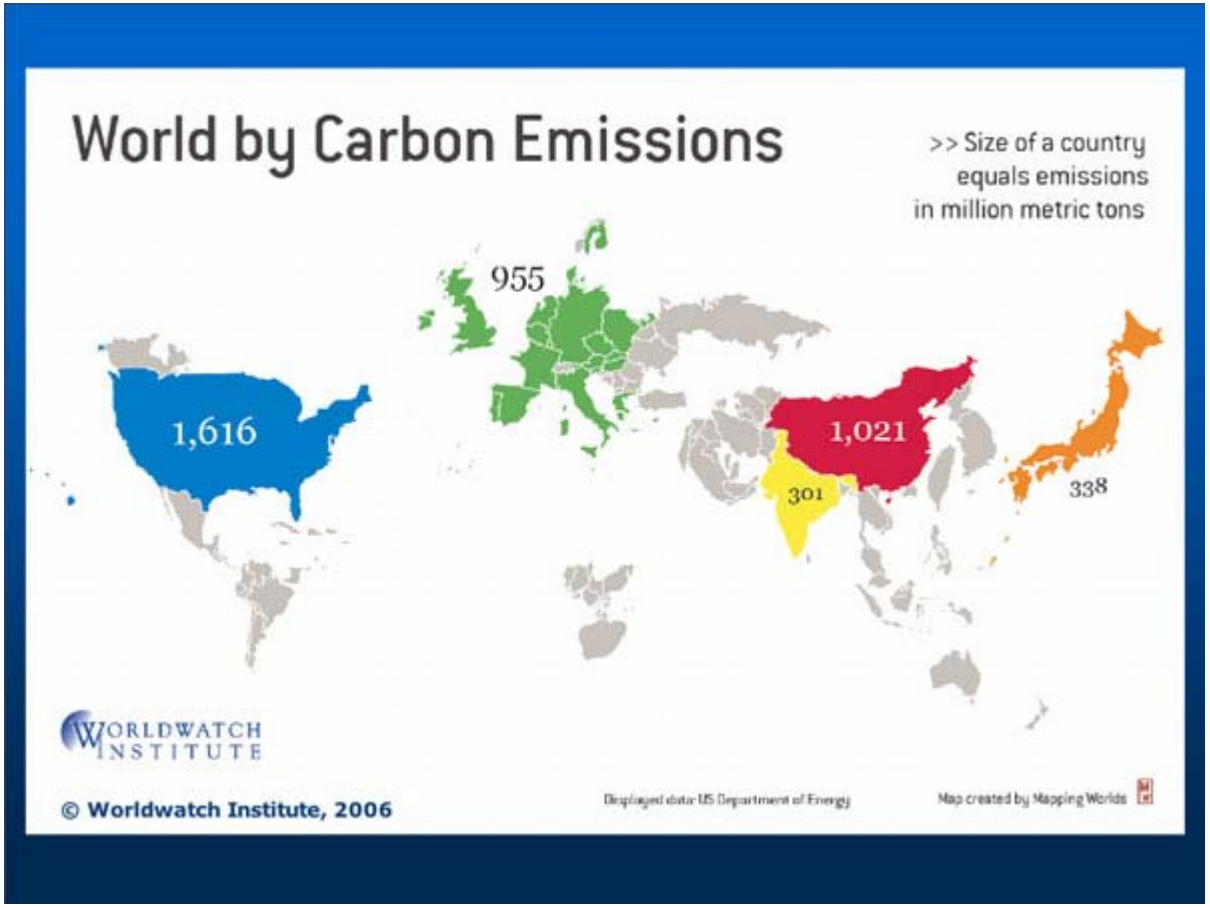
Country size



Size relative to population



Size relative to carbon emissions

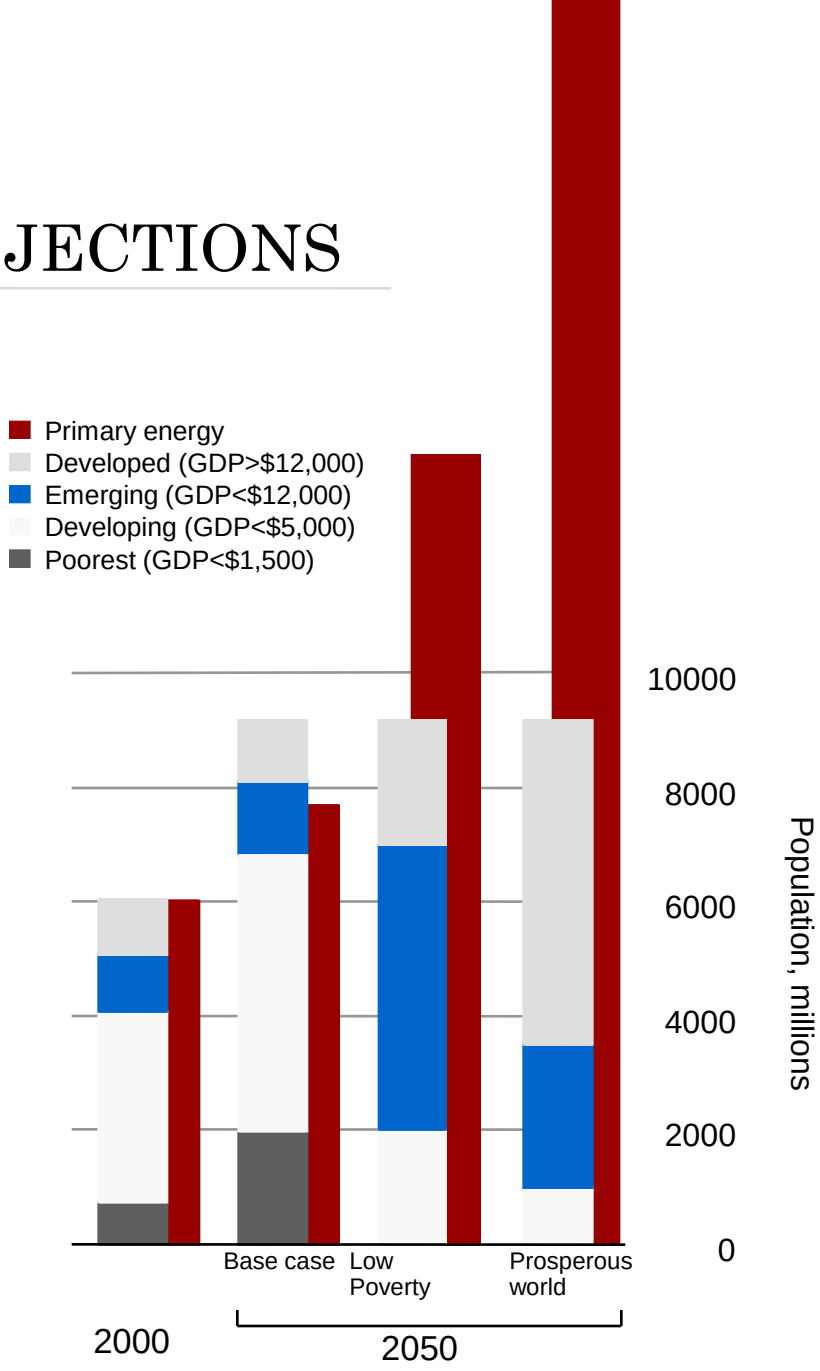


Future energy projections

Population expected to rise to 9 billion by 2050, mainly in poorest and developing countries.

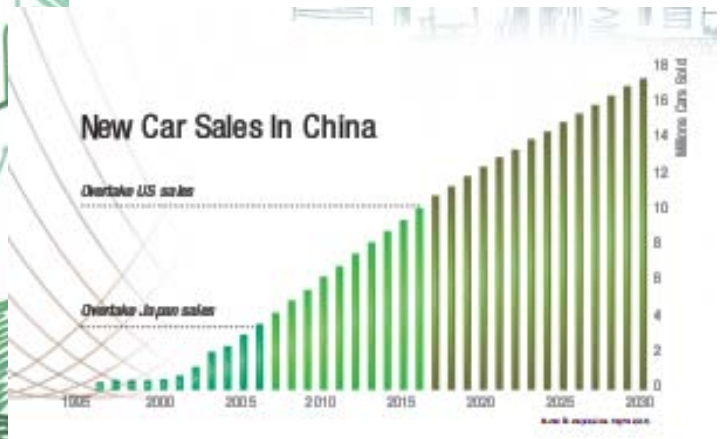
Shifting the development profile to a "low poverty" world means energy needs double by 2050

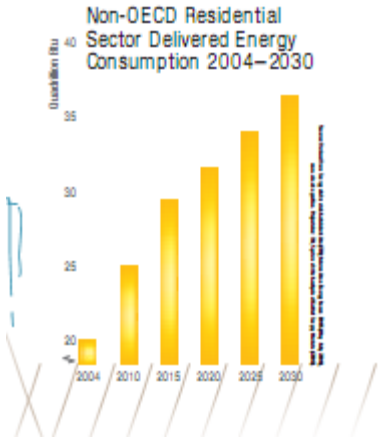
Shifting the development profile further to a "developed" world means energy needs triple by 2050

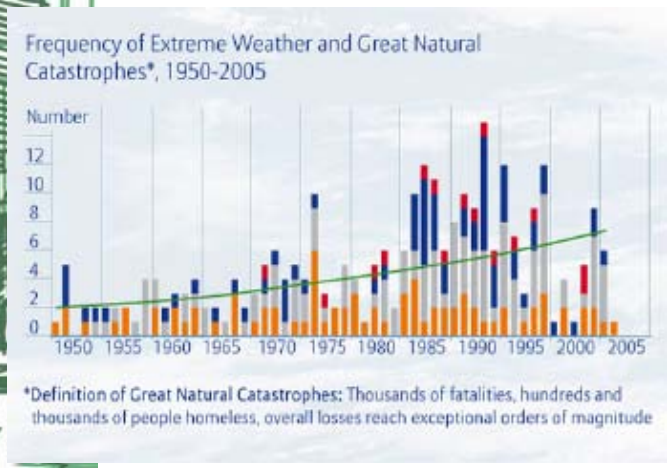


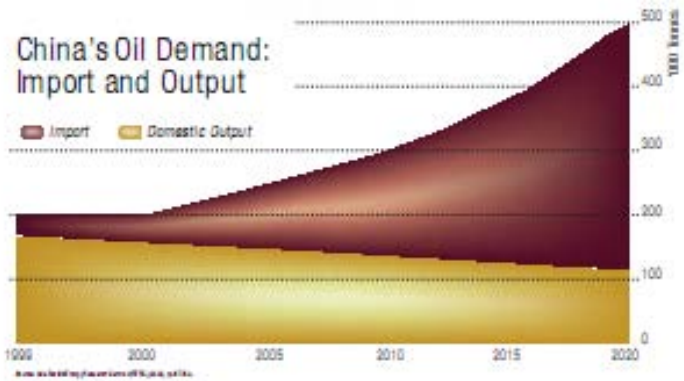
Source: *WBCSD adaptation of IEA 2003*

”GROWING” GRAPHS

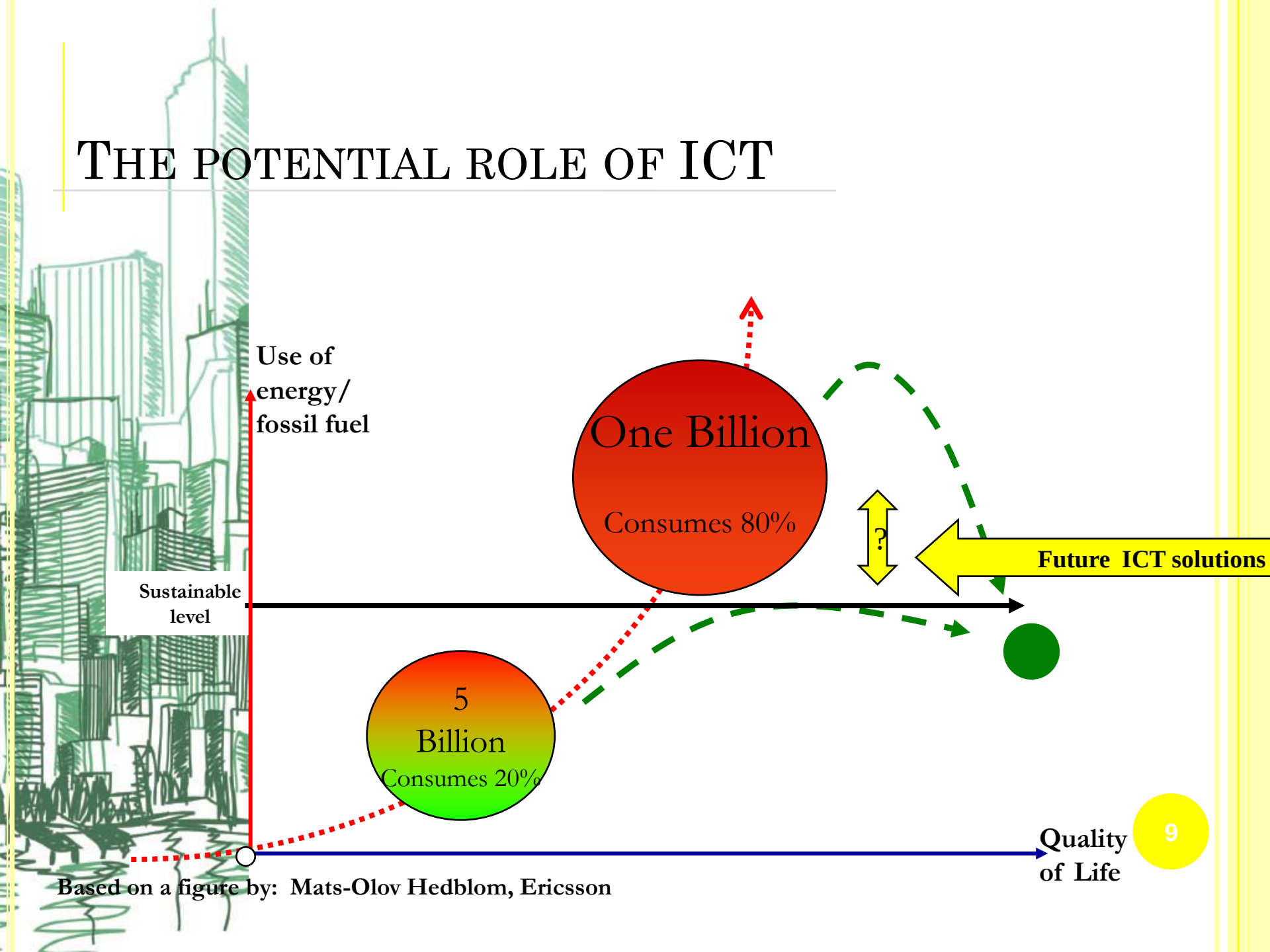








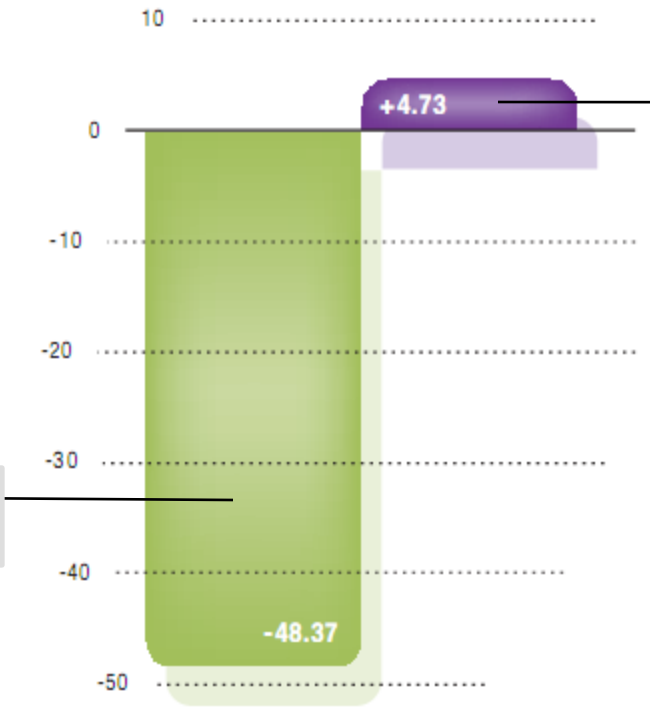
THE POTENTIAL ROLE OF ICT



Based on a figure by: Mats-Olov Hedblom, Ericsson

From product to service

- ICT's effect on CO_2 (reduction potential in million tonnes)

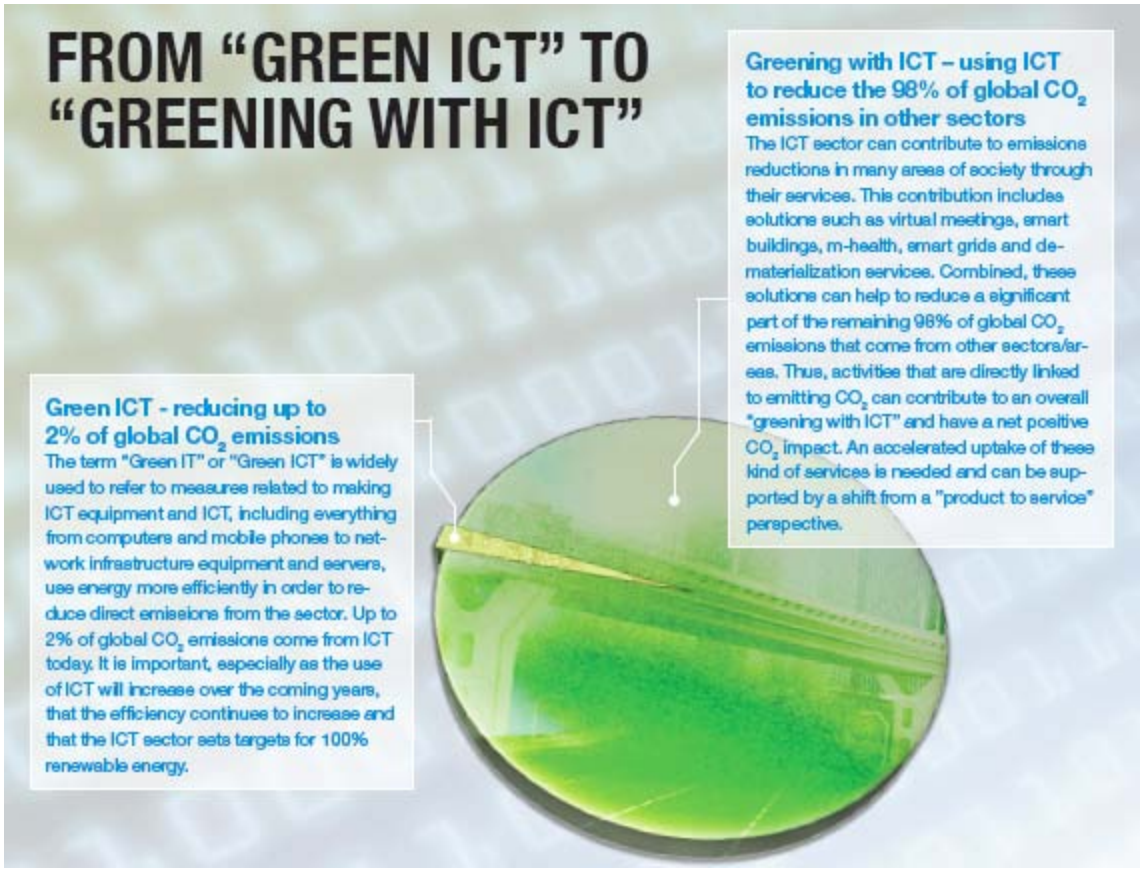


Impact of 16 telcos

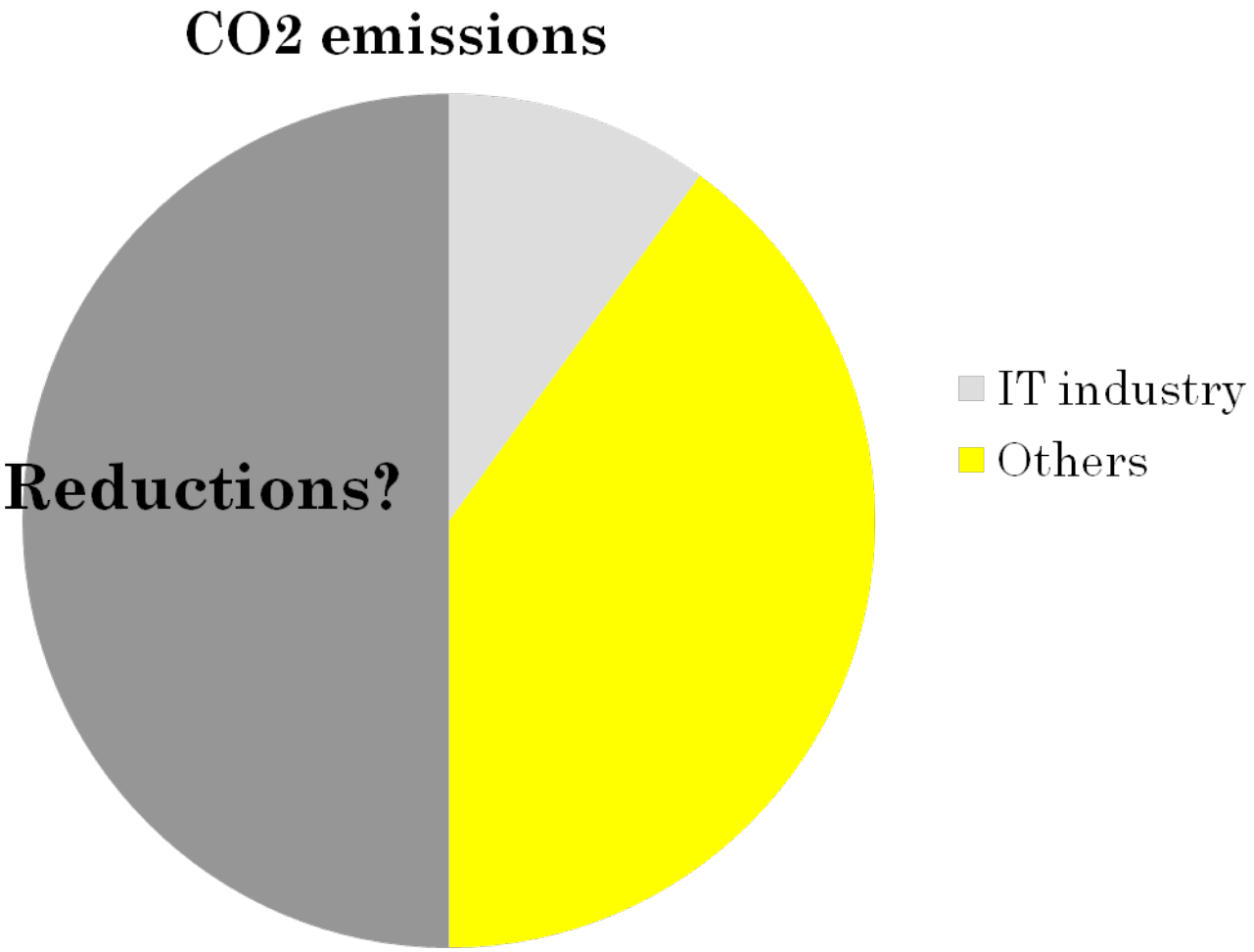
6 ICT services' potential reductions

Source: WWF and ETNO

GLOBAL EMISSIONS



ICT IN A LOW CARBON ECONOMY?



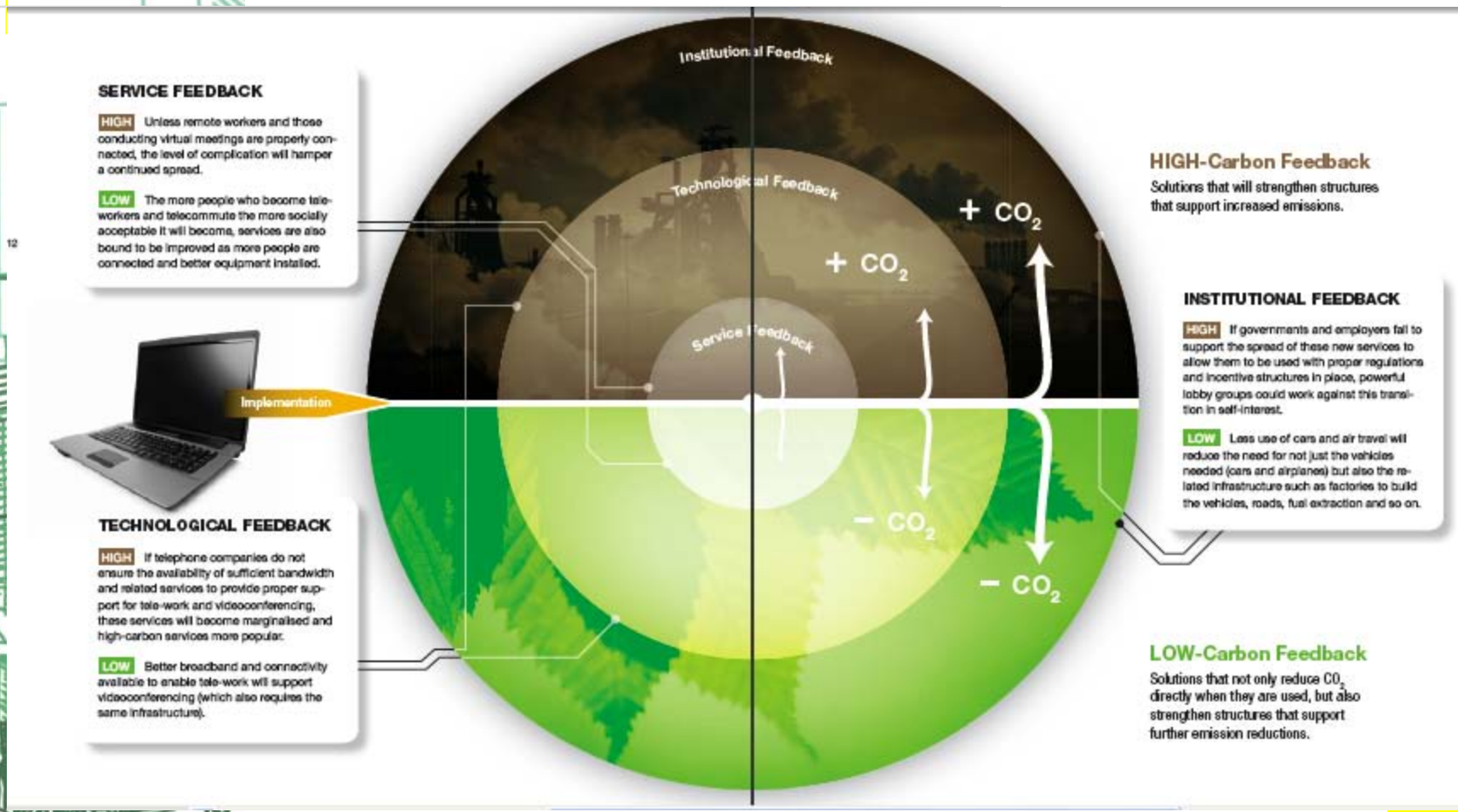
REDUCING ONE BILLION TONNES OF CO2

SOLUTION	ACTION	1 GT CO_2 EMISSION REDUCTIONS	SERVICE FEEDBACK • Will more users use a service or make it more attractive to other users (network economy)? • Will more users of the service accelerate reductions of CO_2?	TECHNOLOGICAL FEEDBACK • Will the service support an infrastructure which would support other sustainable services/increase connectivity to enable CO_2 reductions? • Will the service help to develop technology that can also be used in other sustainable solutions to reduce CO_2?	INSTITUTIONAL FEEDBACK • Will the service support a shift from goods to service? • Will the service help to create interest groups that support a low-carbon development path?
1 Smart City Planning	*Deploy modern simulation and analysis software to improve urban design and planning to optimise energy efficiency*	*Reduce the CO_2 emissions from buildings and infrastructure by 2.3%.*	More design software for smart buildings could help reduce prices of such software. If the software is very expensive and/or difficult to use only a few will probably use it and they will be seen as "alternative" while most others will instead use software that will result in carbon-intensive buildings.	Software development that targets high-carbon areas becomes mainstream among software developers and the interface between different software allows for integrated solutions. Only a few companies develop software for low-carbon solutions as a "nice" product but not as part of their core business portfolio.	Lobby groups promote rules and regulations that will support the uptake of low-carbon software and can also support open source and freeware in areas where the result contributes to CO_2 reductions. Most software developers focus on helping high-emitting companies to become more efficient and thereby run the risk of contributing to increased emissions instead.
2 Smart Buildings	*Use sensors and controls in buildings to improve efficiency and tailor energy use to energy needs.*	*Reduce the CO_2 emissions from buildings being built by 4.5% in the coming decade.*	More use of sensors and controls could reduce their cost and enable further uptake. Unique sensors and controls without a standardised interface would not allow for an increased spread and use in other applications.	A strategic implementation of sensors would contribute to an increased connectivity and thereby also enable the uptake for appliances to become "smart". Sensors and controls can also be used to support a smart grid (see below) to make the grid even "smarter". Different interfaces and protocols that require different kinds of supporting infrastructure would be used, creating a system that would not support other use of low-carbon solutions in need of connectivity.	Groups that deliver solutions for smart buildings work together to provide low-carbon solutions in ways that the current power companies have been unable to do as their business models are based on selling as much electricity as possible instead of ensuring optimal energy use. Traditional construction companies and power companies keep on providing high-carbon solutions in new buildings being built so that most houses remain energy inefficient and continue to require a lot of external energy supply.
3 Smart Appliances	*Utilise IT components (Microprocessors and ASICs) within appliances to improve efficiency and tailor appliances use with actual needs.*	*Reduce about 1% of average CO_2 emissions from energy use in existing buildings.*	As more connected appliances are sold, the cheaper they can become and allow for wider uptake. If smart appliances are sold only as exclusive top end products without a mainstreaming strategy, this could result in isolated use and continued sales of unintelligent appliances.	A wide spread use of smart appliances could result in increased connectivity that could support further use of smart appliances and also support smart buildings. Even "smart use" during peak hours could lead to more or the same electricity consumption unless appliances are connected to each other as well as to a smart grid to ensure optimal use.	An increased number of companies ask for service-based regulations (instead of product-based). This could contribute to a significant shift towards a low-carbon economy. If smart appliances are only provided by a small group of companies as isolated products, those with business models based on increasing sales of inefficient products will profit instead and could lobby for smart appliances to be seen as useless.
4 Dematerialisation Services	*Use IT as a form of "service delivery", substituting physical products and interactions – i.e. 'use bits instead of bricks'.*	*Reduce current paper use by 19%.*	The more e-governance with e-taxation and online access to key documents and corporate services (such as on-line billing) that are implemented, the better economy of scale and lower administration costs can be achieved. If the dematerialised services are not as good as (or better than) their paper equivalent, a high-carbon feedback can happen where people use both the dematerialised service and then also the physical version. Printing of an email is a good example of this.	Uptake of one type of online service to minimise paper use will spur further social acceptance of virtual services (governmental or corporate) and allow for accelerated uptake and acceptance of substituting physical products. Implementation of services will create a more resource inefficient society if they require more IT goods and a supporting infrastructure that is more resource intense than the products that are replaced (including their production line and seen over time). Implementation of dematerialisation can also result in new opportunities for high-carbon consumption that can increase CO_2 emissions. For example, more people getting computers for e-billing might also start looking on the web for cheap flights and thereby achieve a high-carbon lifestyle instead.	The more governments, companies and citizens that promote resource-efficient living in a global economy, the stronger support for a dematerialised economy we are likely to see. If companies that have their core business in high-carbon areas are the main providers of solutions for dematerialisation it is likely that these will only be marginal. These companies have strong incentives to protect their existing core business and therefore support an overall high-carbon agenda.
5 I-optimisation	*Use IT-based controls and knowledge management systems within individual production processes to improve operations, save energy and increase efficiency.*	*Reduce 1% of total CO_2 emissions generated by industry.*	More use of IT-based controls and knowledge management systems could reduce prices of these solutions. Increased use within individual production processes allow for connections between different processes (part of the same system) which can create added value. The same software also enables optimisation of investments i.e. low investment costs, at the cost of increased energy use.	Modern IT developments enable improved controls that not only optimise energy use in individual processes, but also across a site or plant. Improved controls and better understanding of complex processes and operations could also help to develop more low-carbon solutions and help to spread the use of these to processes/sites of all capacities. Improved controls will reduce production and energy costs. This could lead to (although very unlikely) products becoming cheaper and hence consumption may increase. This could also lead to a situation where outdated plants are kept open longer.	Property operating controls in complex processes can increase the profit among those using them and make these companies more influential in policy development. They could then support regulations that favour smart industry solutions rather than those provided by traditional heavy industries that focus on lower energy prices. If a few software solutions would be market leaders, this may generate more dependence on a few suppliers. This could negatively impact the speed of innovation in further developing these solutions.

REDUCING ONE BILLION TONNES OF CO2

SOLUTION	ACTION	100 MT CO_2 EMISSION REDUCTIONS	SERVICE FEEDBACK • Will more users use a service or make it more attractive to other users (network economy)? • Will more users of the service accelerate reductions of CO_2?	TECHNOLOGICAL FEEDBACK • Will the service support an infrastructure which would support other sustainable services/increase connectivity to enable CO_2 reductions? • Will the service help to develop technology that can also be used in other sustainable solutions to reduce CO_2?	INSTITUTIONAL FEEDBACK • Will the service support a shift from goods to service? • Will the service help to create interest groups that support a low-carbon development path?
6 Smart Industry	*Deploy design tools and software to forecast, simulate and analyse energy use in production processes to ensure low carbon design of plants and processes.*	*Reduce 1% of total CO_2 emissions generated by industry.*	More use of IT-based design tools and software to forecast, simulate and analyse energy use could reduce prices of these solutions. Increased use of single systems allow for connections between systems that can create added value when a new generation of companies can work in similar ways. If sub-optimisation continues to occur despite having installed modern control systems this will impair process operation.	Increased experience with design tools will lead to new applications in and beyond industry. Further integration of processes, may make the control and start-up of these processes more complex and more vulnerable for failures in some part of the system. Hence, improved process integration will also demand more sophisticated controls to avoid this scenario.	Companies that from the beginning can design their production from a service perspective (and with a full "lifecycle" perspective) could grow strong and establish networks that can deliver innovative solutions. Together, they could influence policy makers in order to ensure that rules and regulations support this development. If the new smart solutions are primarily used by the old industries there is a risk that oil companies, car companies, power companies, etc will only change marginally and use their already strong position to lobby against policy changes that would encourage innovative low-carbon solutions.
7 Smart Grid	*Deploy smart meters and communication technologies within electricity networks to enable two way communication between energy users and energy producers and to deliver advanced services such as "time of use metering" or "remote demand management".*	*Reduce about 1.25% of the CO_2 emissions associated with electricity use in buildings within a decade.*	More use of systems that use intelligent meters could allow connections between different systems and make them more efficient. If smart meters are introduced that only allow for energy use to be linked to price fluctuation over time, and without also controlling the energy consumption, this could lead to users keeping the same emissions and only adjusting to cost optimisation.	Improving the intelligence of buildings with smart meters require them to be better connected and would encourage key appliances to also include smart controls, thereby ensuring that larger parts of the buildings' energy needs can be managed. If this development is driven by power companies, focusing on the supply side, this development could result in a situation where the focus is on optimisation of the current system instead of supporting new decentralised energy solutions.	Smart grids would shift power away from high-carbon stakeholders with interests in a fossil infrastructure. To support this, rules and regulations for a less carbon intensive, and also less vulnerable, electricity grid would need to be put in place. Power companies could work against this transition to keep a centralised structure as it lies in their vested interest.
8 Integrated Renewable Solutions	*Utilise simulation, analytical and management tools to enable a wide deployment of renewable energy, for example removing existing bottlenecks present in transmission infrastructure or enabling a wider use of distributed generation.*	*Add 75 GW renewable energy capacity to the global energy system.*	IT tools can be created for those looking for energy efficiency solutions, these can be solutions for markets that are expanding fast, such as urban construction in emerging markets, and could enable accelerated uptake of smart renewable solutions. If the IT tools supporting new renewable energy solutions are only sold as an "add-on" feature, they are likely to be sold as expensive solutions for a small target group.	Adding renewable energy to a smart grid/decentralised energy system will support both further use of renewable energy solutions as well as energy efficiency (which is inherent in such a grid structure). Renewable solutions that are only sold as additional features to the traditional energy system could strengthen the current centralised infrastructure. With companies investing only to make the energy system "look" cleaner, no investments will be done to really move away from a centralised fossil fuel infrastructure.	If IT tools are used to launch and support integrated renewable energy systems, and if these are used by influential companies such as architects and construction companies, this could enable a creation of both national and international rules to support sustainable energy solutions. If traditional power companies use IT tools to launch renewables as a marginalised power option and use the profits to invest further in fossil fuel extraction (as is the case today by many power companies) this will spur further high-carbon lock-in.
9 Smart Work	*Leverage the internet and other advanced communication tools to work remotely and avoid business trips or physical commuting.*	*About 5% of car commuters become tele-commuters and 15% of airplane business trips are substituted by virtual meetings.*	The more people who become tele-workers and telecommute the more socially acceptable it will become, services are also bound to be improved as more people are connected and better equipment installed. Unless remote workers and those conducting virtual meetings are properly connected, the level of complication will hamper a continued spread.	Better broadband and connectivity available to enable tele-work will support videoconferencing (which also requires the same infrastructure). If telephone companies do not ensure the availability of sufficient bandwidth and related services to provide proper support for tele-work and videoconferencing, these services will become marginalised and high-carbon services more popular.	Less use of cars and air travel will reduce the need for not just the vehicles needed (cars and airplanes) but also the related infrastructure such as factories to build the vehicles, roads, fuel extraction and so on. If governments and employers fail to support the spread of these new services to allow them to be used with proper regulations and incentive structures in place, powerful lobby groups could work against this transition in self-interest.
10 Intelligent Transport	*Deploy advanced sensors and controls, analytical models, management tools, and ubiquitous telecommunications to provide relevant information to enable less polluting forms of transport (such as public transport).*	*Substitute less than 6% of all km travelled by light-duty vehicles' with public transport.*	Better understanding of how public transport can be planned makes it easier for continued uptake and cities to follow each other (and quick implementation). If implemented against public opinion, or if the system does not work well, a backlash is likely with commuters boycotting use.	More intelligent transport systems make it easier for people to use flexible ways of communication, from bikes to electric plug-in cars in car pools. If only poor parts of a population will use the system, most new research and product development will focus on those who are not using the public transport.	With more people engaged in public transport and significant resources invested in the interest of those who are using it, the better institutionalised public transport will become. Rules and regulations will support a move towards more resource efficient societies. If the transition is not happening in dialogue with traditional vested interests, such as the car lobby, these groups could begin campaigning against public transport.

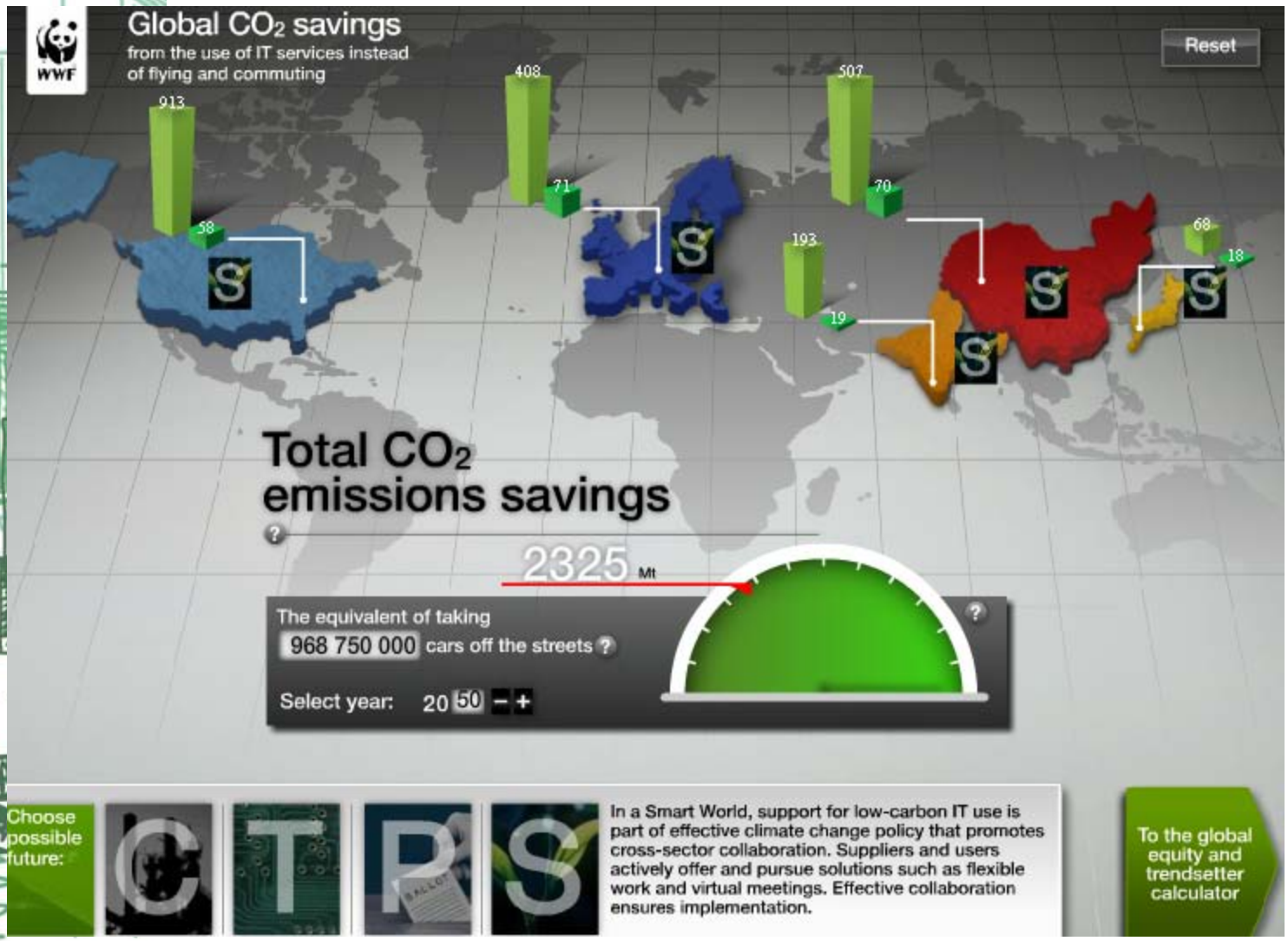
A STRATEGIC BILLION TONNES OF CO2



SUBSTITUTING FLYING&COMMUTING 2010

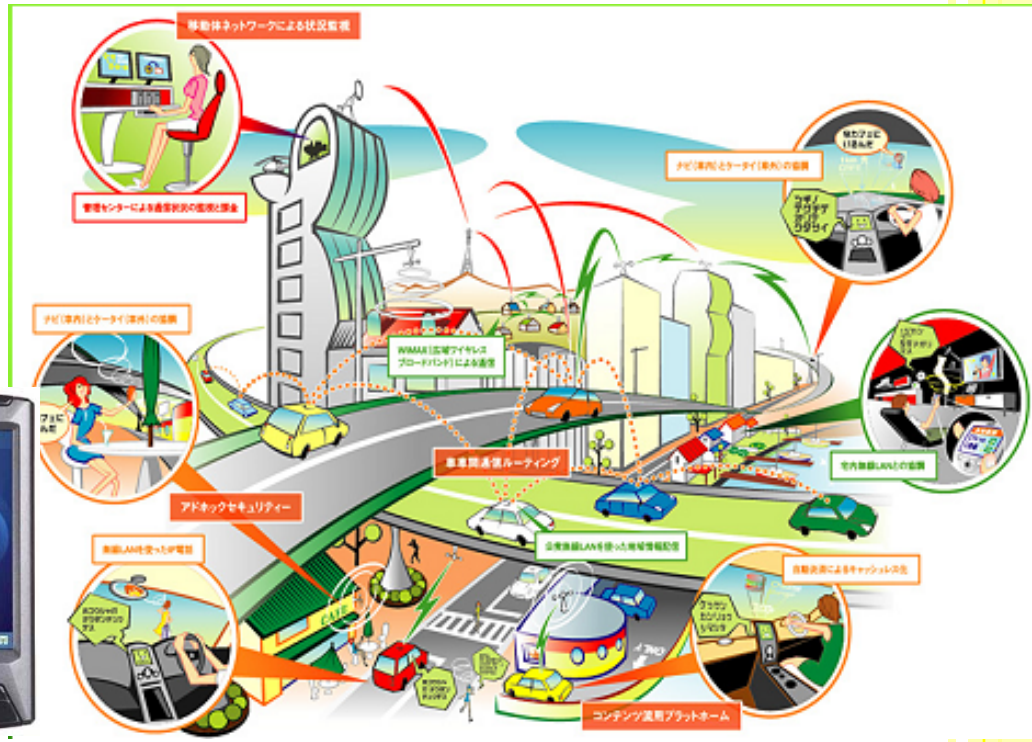
Substituting Flying&Commuting 2050

Alternative scenario 2050

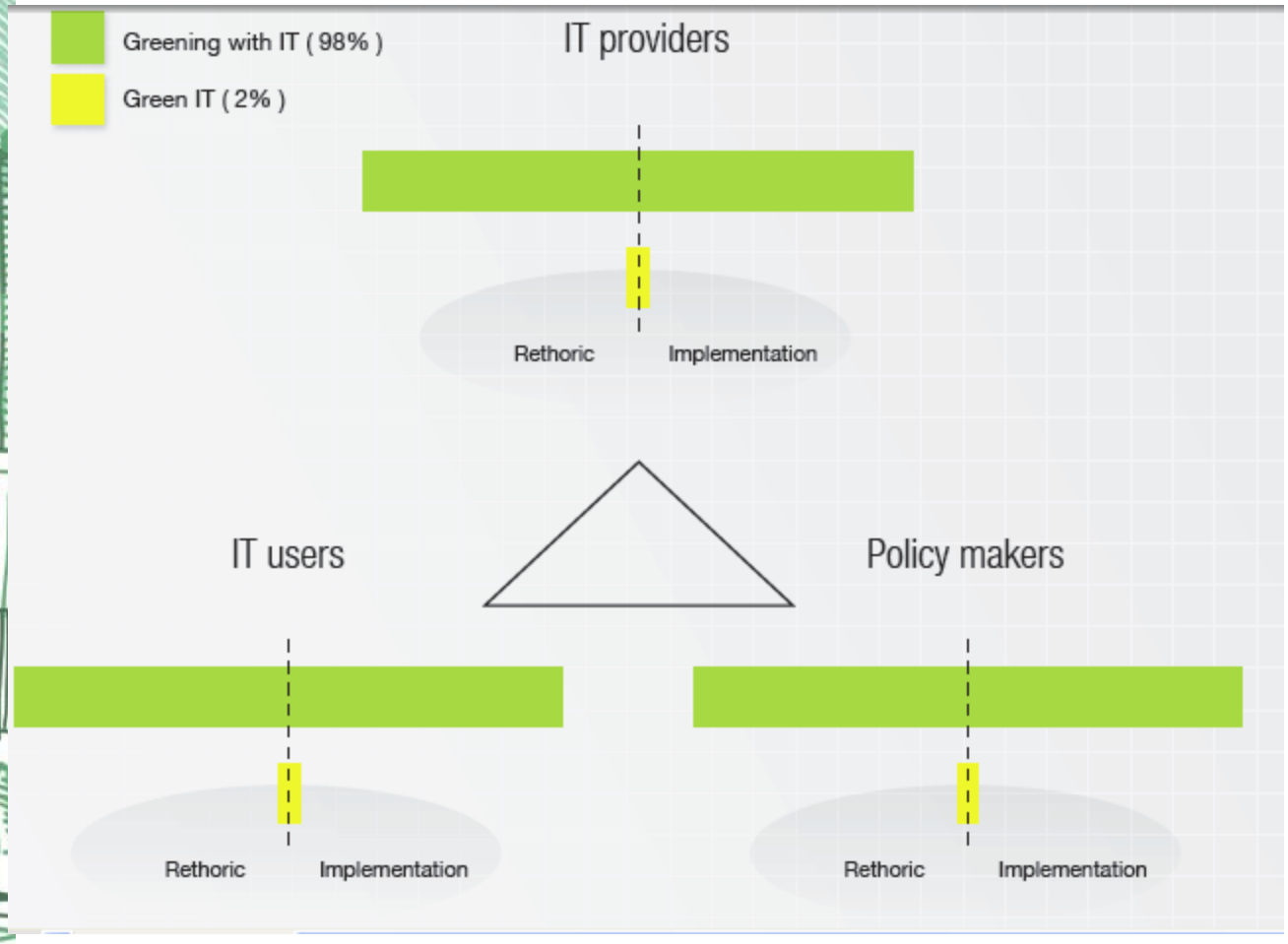


Becoming climate positive

A VISION FOR THE 21ST CENTURY



Achieving A 21st century infrastructure



Questions to consider

- Could you expand your approach to CO2 emissions?
  - Energy consumption/Internal emissions (2/%)
  - Potential to help customers reduce their emissions (98%)
  - Moving from risk to profit
- How could your ICT services help deliver overall CO2 reductions?
  - Shifting perspective from product to service
  - Systemic approach (low- and high- carbon feedback)
- How can you position your company in a low carbon economy?
  - Opportunities for climate positive

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THANK YOU