



for a living planet®



BECOMING A WINNER IN A LOW-CARBON ECONOMY
IT SOLUTIONS THAT HELP BUSINESS AND THE PLANET

An inspirational guide that can support you in developing your business and join the work to reduce the first billion tonnes of CO₂ emissions with IT solutions based on the WWF publications: "The potential global CO₂ reductions from IT use: Identifying and assessing the opportunities to reduce the first billion tonnes of CO₂" and "Outline for the first global IT strategy for CO₂ reductions: a billion tonnes of CO₂ reductions and beyond through transformative change"

Letter to IT users

2

In a time when responsible and forward-looking companies are searching for ways to reduce CO₂ emissions, some of the best solutions might already be so useful in day to day operations that few think of them as measures to reduce carbon emissions. This is the case with many Information and Communication Technology (ICT or IT) solutions. Companies that use them usually implement them because they increase productivity, increase customer satisfaction and help employees in their work. What is needed in order to accelerate use of low-carbon IT solutions most of the time is not major investments, but a degree of innovation and capacity to think outside the box.

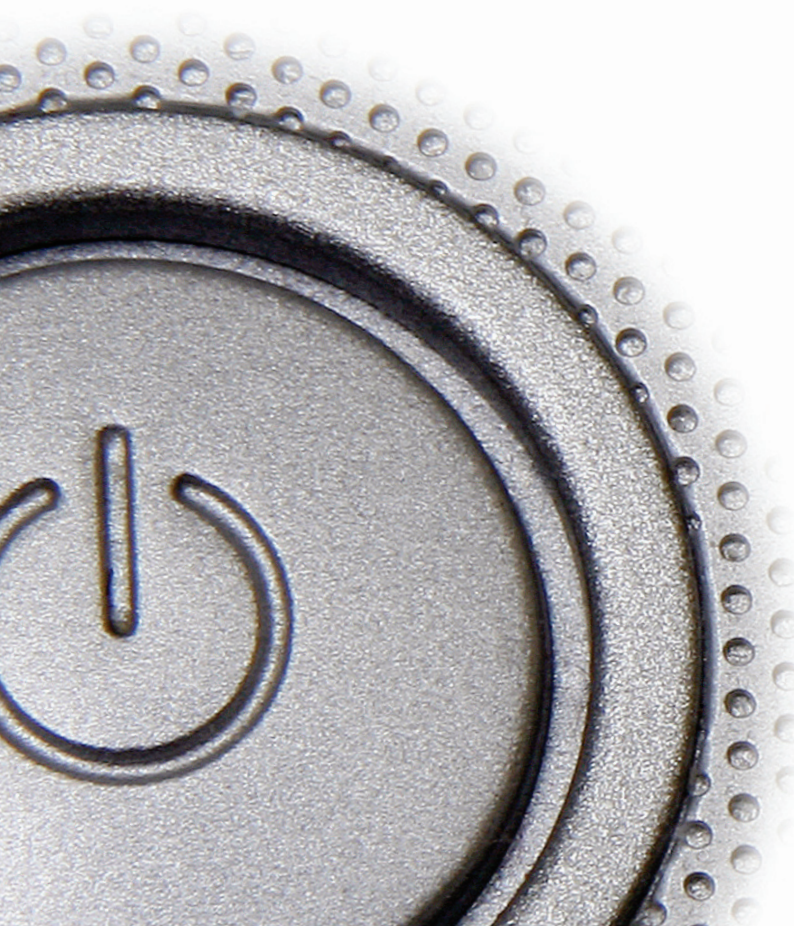
So far, IT solutions have largely been ignored in most companies' climate strategies. We believe that it is time to change this and have put together this document as an inspirational guide for companies who want to be winners in a low-carbon economy.

This guide is based on two previous WWF documents; an academic study that identifies the first billion tonnes of CO₂ reductions through the use of IT¹ and a policy report that outlines the first global strategy to implement the IT solutions that could deliver the first billion tonnes of CO₂ reductions.² This work is the first that has made a global assessment of the potential and identified the strategic IT solutions that can help us to achieve not only direct emission reductions but also help to trigger further reductions, i.e. support a "low-carbon feedback". The identified IT solutions are based on existing technologies that can be scaled up to deliver significant CO₂ reductions. They have the potential to provide the same, or better, services compared to what carbon intensive solutions provide today.

Guidance on specific products is not the purpose of this document, nor is it meant as a concrete handbook for the implementation of low-carbon solutions. Rather it can help you as IT customers to better understand what kind of IT solutions might be important and what you can ask IT providers, or other IT experts, to help you with.

This document is a result of an innovative private sector-NGO partnership where WWF and HP have worked together to identify the first billion tonnes reduction of global CO₂ emissions.³

Hopefully this document can help those companies that want to be winners in a low-carbon economy to make concrete changes that deliver concrete CO₂ reductions. The time for action is now ■



From 2% to 98%

3

ONE CHALLENGE IS to ensure that “Green IT” is not only about energy efficient products (production and use) but that the main focus is on the use of IT solutions that can support a low-carbon business development. Today the concept of “Green IT” is often limited to energy labeling schemes, green procurement of energy efficient equipment, consolidation of server parks and virtualisation of office environments. These are obviously good things for reducing climate impact, but without a focus on the use of the IT solutions we risk to miss the “98% window of opportunity”⁴ (where IT could contribute to overall CO₂ reductions).

In 2007, Gartner released a study which showed that the total amount of CO₂ emissions from the IT industry could amount to 2% of global carbon emissions.⁵ Even if many media outlets used this number only to continue discussing the IT products themselves, the study provided a language to discuss the remaining percentage of CO₂ gains to be made where IT solutions could play an important role for transformative change and overall reductions – a part that now could be called “the 98% window of opportunity”.⁶

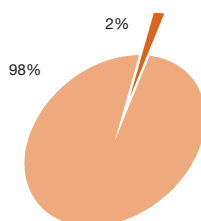
So far, being “green” has mainly been connected to traditional reactive environmental work and “doing something good”; a philanthropic or risk minimising/compliance effort. Dealing with the environment has been something a company approaches in an “end of pipe”

manner when everything else is already in place – resulting in a situation where “green” has been far away from the core business development and KPI's. To become a leader in a low-carbon economy, companies, both providers and users, need to rethink the entire notion of “Green IT”. Green IT of the 21st Century is not only green in terms of a healthy planet but green in terms of money – not just in savings to be made, but potential business opportunities – and should be part of core business strategy and planning.

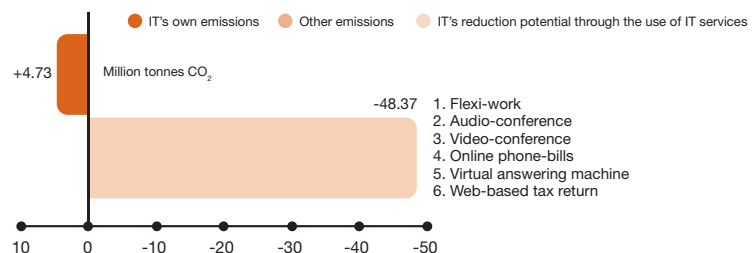
This is the shift in perspective that is needed from business to re-focus from incremental improvements and the purchasing of ‘IT products’ to transformative change and buying ‘low-carbon services’. Companies must also support governments who need to re-focus legislation and regulations from problems with IT’s own emissions to opportunities that low-carbon IT solutions can provide.

The solutions in this document are approached from this 98% perspective. They require less investment in physical infrastructure and more re-thinking on how different needs in society are approached. All the solutions included already exist and are implemented on a small scale. The only thing we need to do is to remove the barriers and create (and support) incentives for these kind of solutions – in order for them to be used more widely. Business and governments will be key in this transformation ■

IT's own emissions and the 98% window of opportunity⁷



Example of IT's incremental reduction potential in the EU⁸



Global potential for strategic IT solutions

THE FIRST BILLION TONNES OF CO₂ REDUCTIONS TO ACHIEVE TRANSFORMATIVE CH.

Accelerated reductions
of CO₂ emissions due
to low-carbon feedback

CO₂

4

IT TECHNOLOGIES DO not offer one 'killer application' to combat climate change. Instead, a variety of IT applications can provide a valuable contribution to the global effort to reduce CO₂ emissions when implemented in the right way with supporting structures. Opportunities exist in developed countries, as well as developing countries, to benefit from the potential of IT to combat climate change. Emerging economies could also leapfrog carbon-intensive development by avoiding the "CO₂-heavy-IT-poor" societies, already created in developed parts of the world, and implementing innovative IT technologies to reduce CO₂ emissions.

In the first comprehensive global assessment of strategic climate opportunities for IT, Ecofys and WWF have identified one billion tonnes of CO₂ reductions that can help accelerate further reductions of CO₂ emissions.⁹ These reductions are equivalent to more than one quarter of EU's total CO₂ emissions.¹⁰

The report focuses on the opportunities offered by IT to reduce CO₂ emissions by:

- Analysing and comparing existing literature on the same topic

- Leveraging off existing literature when calculating impact
- A quantitative assessment of individual solutions and qualitative analyses to include synergies and "low-carbon feedbacks"¹¹
- Proposing short term action to achieve one billion tonnes of reductions by 2020 (at the latest) while promoting feedbacks to achieve even deeper emission reductions through transformative change.

The analysis of existing literature showed that a general and shared approach is still missing on how IT can contribute to CO₂ reductions. Existing studies should be considered pioneering in nature and are best at raising awareness on opportunities and issues. They provide different insights on some of the benefits (typically the most direct impacts) of different IT applications. However, they are not able to fully capture the multiple influences that IT applications can have on CO₂ emissions, especially when seen over a longer period of time. In this analysis projections from the IPCC, WEO and WBCSD¹² have been utilized, and adapted, to estimate IT's CO₂ emission reduction potential by the year 2030. It is an attempt to systematically map the potential impact of a broad set of IT solutions at a global scale, including developing countries.

Estimated incremental potential for CO ₂ emissions reductions enabled by IT by 2030 MtCO ₂	LOW	MEDIUM	HIGH
Smart buildings – IT in existing buildings	121	545	969
Smart buildings – IT for planning and operating new buildings	46	439	832
Transport mode switching enabled by smart urban planning	38	190	380
Telecommuting and virtual meetings (smart work)	68	159	404
In vehicle IT and intelligent transport infrastructures (smart vehicles and intelligent transport)	581	1,486	2,646
E-commerce and dematerialisation	198	927	1,822
IT for energy efficiency in industry (improving day by day operations: smart industry and plant and process design: I-optimisation)	100	815	1,530
IT in energy supply systems (Removal of network constraints – 2020)	17	59	128
Estimated total potential for CO₂ emission reduction	1,168	4,620	8,711

CHANGE AND ACCELERATED REDUCTIONS

Time →

- Smart city planning
- Smart buildings
- Smart appliances
- Dematerialisation services
- I-optimisation
- Smart industry
- Smart grid
- Integrated renewables
- Smart work
- Intelligent transport

The level of uncertainty of these estimates is high due to the limited availability of existing data (with high uncertainty) and literature on this topic. Despite these shortcomings the analysis suggests that significant opportunities exist to reduce CO₂ emissions if IT solutions would be systematically implemented – even in the “Low potential” scenario. (See table on previous page)

The first billion tonnes and beyond

Based on the trajectories for emission reductions calculated for 2030, we believe that an appropriate target date for achieving the first billion tonnes of CO₂ emission reductions with ten strategic IT solutions would be 2020. Faster results are possible if public policies and corporate strategies are properly in place to support structural developments that allow for these solutions to contribute to further reductions.

These ten solution areas are a good indication for companies where to start looking for CO₂ cuts in their operations. In the current shift away from high resource and energy dependency towards low-carbon societies, the increased importance for companies to shift perspective and see new climate-smart business opportunities will determine tomorrow's winners and losers. The solutions outlined could be incorporated into core business practices and service delivery to customers as part of strategic choices to position a company as a winner in a low-carbon economy.

To ensure that the IT solutions are also implemented in the right context is fundamental to minimise negative rebound effects. The matrix to the right presents ten strategic IT solutions that given the right circumstances, will help to not only reduce one billion tonnes of CO₂ emissions, but also support accelerated reductions due to “low-carbon feedback” (help to trigger further emissions reductions). The same solutions could, under the wrong circumstances, contribute to “high-carbon” scenarios (support structures that lead to increased CO₂ emissions) ■

Ten IT solutions that will reduce one billion tonnes of CO₂ emissions by 2020 or sooner ¹³

Solution	Action	100 Mt CO ₂ emission reductions
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%.
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.
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.
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 13%.
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.
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.
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.
8 Integrated Renewable Solutions	Utilise simulation, analytical and management tools to enable a wide deployment of renewable energy, e.g. removing existing bottle-necks present in transmission infrastructure or enabling a wider use of distributed generation.	Add 75 GW renewable energy capacity to the global energy system.
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 telecommuters and 15% of airplane business trips are substituted by virtual meetings.
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.	Substitute less than 6% of all km travelled by ‘light-duty vehicles’ with public transport.

Ways forward

6

THE OPPORTUNITIES OFFERED by IT will not be harvested automatically. There is a growing awareness of the opportunities offered by IT to reduce CO₂ emissions. IT may enable re-ductions in a variety of sectors and through many different channels, yet a conscious deployment is still in its early days. IT can be used to reduce businesses' and their customers' impact on the climate, but also contribute to the opposite. The outcome will depend on which climate strategies and policies that will be pursued – those that strengthen or those that weaken structures that allow further reductions of CO₂ emissions?

Businesses need to re-focus from incremental improvements and the purchasing of IT products to transformative change and buying low-carbon services. IT generates new solutions that allow for existing needs to be met in completely new ways (see table below), and these new low-carbon solutions should be encouraged. Procurements and contracts should be reviewed, both generally and especially in particularly relevant areas, since this change in perspective will cause the focus to shift from physical space and products to virtual space and services.

It is important to go as far back as possible in the value chain. For example, once a building is built there are only a limited amount of measures that are possible to improve design features like energy efficiency, optimal lighting and so on. Going all the way back to the software that is used to design the buildings or even city planning allows for much more significant improvements if services instead of products are in focus.

The role of IT can play a key part in combating climate change and the success relies on our ability to capitalise on the potential of IT use in the “98% window of opportunity”.¹⁴ The companies who do would be those who aim to be winners in a low-carbon economy ■

Companies should provide support in order for governments to:

- Promote awareness building and education campaigns targeting business communities and the broader public
- Collect and disseminate information about best practices on IT use to minimise CO₂ emissions
- Fund technology development initiatives to improve critical IT solutions or to tailor them to the needs of countries or sectors that are critical for the global CO₂ emission reduction effort (e.g. the creation of tailored IT tools for the design and planning of energy efficient buildings in developing countries with high growth and booming construction sectors)
- Implement capacity building and technology transfer policies designed to benefit developing countries or sectors that are lacking in critical knowledge and expertise, but that are key to reduce CO₂ emissions (e.g. with designers within the building industry, to further increase the use of IT to reduce the CO₂ footprint of new buildings)
- Remove regulatory barriers that hinder the offer of innovative IT based services with CO₂ benefits (e.g. in the energy sector: removing rigid dispatching or price regulations that do not allow real-time differentiation based on CO₂ emissions)
- Use public procurement, and public services in general, to spur the adoption of IT applications that reduce CO₂ emissions
- Introduce climate policies that ensure that negative rebound effects are minimised when IT solutions are introduced

Shifting perspective		Could result in a shift	
From	To	From	To
Travel	Meetings	Airplanes	Videoconferencing equipment
Office work with a fixed amount of hours	Delivery of results	Office space	Laptops and IT solutions that allow people to work wherever they are, as long as they can deliver
Constructing buildings	Provision of smart living	Cement and coal	Servers and smart appliances so that people get services, such as comfortable in-door temperature, adequate light and delivery of fresh air in the most resource efficient way

Three laws for green IT in the 21st century

1

The first law: Sustainable IT solutions need to be purposely used for CO₂ reductions to take place

“Every object in a state of uniform motion tends to remain in that state of motion unless an external force is applied to it.”

No change will take place unless people actually start to use sustainable IT solutions. A force is needed to set something in motion and governments must ensure that they use IT solutions to pursue CO₂ reductions and not just talk about them. Companies, in turn, need to ask for these solutions and effectively use sustainable IT if they are to be part of the solution and not the problem when it comes to combating climate change and creating a successful low-carbon economy.

2

The second law: The amount of support that is needed to implement sustainable IT solutions depends on how much old companies and policy makers are obstructing necessary change (due to fear of losing influence and money)

“The relationship between an object’s mass m , its acceleration a , and the applied force F is $F = ma$.”

A society heavily influenced by companies that do not want to see anything beyond incremental change (as they see the transition to a low-carbon economy as a threat) becomes more resistant to change. These companies can become a very powerful force against sustainable IT for transformative change. The more conservative a system is, the more structural support for sustainable IT solutions will be needed. Demonstrating use and the creation of structures to support low-carbon solutions in society will be critical to make these forces move. In order to achieve substantial CO₂ reductions with IT, a critical mass of stakeholders to push these solutions forward must be created to balance out heavy influence from old and opposing stakeholders.



As we need to move forward to implementation and action it might be worth remembering Sir Isaac Newton and his three laws of motion. These laws have been used to illustrate a rough guide outlining a way forward for Green IT in the 21st century. They are meant as reminders of some fundamental issues that all too often get lost in today’s Green IT debate.

3

The third law: For each IT solution used, there is a counter effect that can either strengthen or weaken the momentum towards a low-carbon society

“For every action there is an equal and opposite reaction.”

In order to ensure accelerated reductions of CO₂ emissions, those IT solutions that enable further reductions are the most important to implement. To treat IT solutions as if they exist in a vacuum is not realistic when engaging in discussions on solutions for climate change. All climate policies and strategies implemented by governments and companies must include a thorough assessment of feedback effects.

¹ “The potential global CO₂ reductions from IT use: Identifying and assessing the opportunities to reduce the first billion tonnes of CO₂”, available for download on <http://www.panda.org/ict>

² “Outline for the first global IT strategy for CO₂ reductions: a billion tonnes of CO₂ reductions and beyond through transformative change”, available for download on <http://www.panda.org/ict>

³ Inspired by the collaboration with WWF, HP has published a first customer eco-solutions guide. This white paper documents existing IT solutions to reduce carbon dioxide emissions to help HP customers identify products and services that support a low-carbon economy, <http://h41111.www4.hp.com/globalcitizenship/uk/en/pdf/1billiontonnessolutionsfinal.pdf>

⁴ “The 98% window of opportunity” refers to the fact that the opportunity is limited in time in two ways. First, and most important, that we need the solutions very soon as we only have 8 years to reverse a more than 150 year old trend of accelerated CO₂ emissions. Second, because the IT sector very soon needs to ensure that it is part of the solution to climate change and not the problem. Otherwise the sector risks getting stuck in a reactive mode mainly focusing on the need to reduce increasing energy use from IT equipment.

⁵ <http://www.gartner.com/it/page.jsp?id=503867>

⁶ In presentations and material WWF has used the “98% window of opportunity” as a way to highlight the “other part”. The Gartner study also inspired the joint project between

WWF and Gartner where leading IT companies’ climate performance is measured, both with regards to the 2% and the contribution to reductions of the 98%.

⁷ For a more detailed discussion on IT’s own emissions and the 98% window of opportunity see WWF’s paper “From fossil to future with innovative ICT solutions”, available for download on www.panda.org/ict

⁸ http://assets.panda.org/downloads/road_map_speed_of_light_wwf_etno.pdf

⁹ “The potential global CO₂ reductions from IT use: Identifying and assessing the opportunities to reduce the first billion tonnes of CO₂”, available for download on <http://www.panda.org/ict>

¹⁰ http://reports.eea.europa.eu/technical_report_2007_7

¹¹ Solutions that contribute to “low-carbon feedback” not only reduce CO₂ directly when they are used, but also strengthen structures that support further emission reductions.

¹² Intergovernmental Panel on Climate Change (IPCC), World Energy Outlook (WEO) and World Business Council for Sustainable Development (WBCSD)

¹³ For a comprehensive overview of these solutions including an analysis of how they can either strengthen structures that support further emission reductions or structures that support increased CO₂ emissions, see “Outline for the first global IT strategy for CO₂ reductions: a billion tonnes of CO₂ reductions and beyond through transformative change”, available for download on www.panda.org/ict

¹⁴ See discussion on page 3

TOGETHER WWF AND HP HAVE DESIGNED AND LAUNCHED AN INNOVATIVE PRIVATE SECTOR-NGO PARTNERSHIP



This paper is based on WWF's work with IT/ICT, particularly a joint initiative with HP where the key objective is to identify the first billion tonnes of CO₂ reductions through the use of IT. The paper is also a contribution to the collaboration between WWF and the World Economic Forum. The calculations and graphics in this document come from the two previous WWF publications "The potential global CO₂ emission reductions from ICT use: identifying and assessing the opportunities to reduce the first billion tonnes of CO₂ emissions" and "Outline for the first global IT strategy for CO₂ reductions: a billion tonnes of CO₂ reductions and beyond through transformative change". The text is written by Dennis Pamlin, Global Policy Advisor, WWF and Suzanne Pahlman, Strategy and Innovation Consultant (www.spahlman.com).

