

TechnoVision & sustainability

**How TechnoVision will help you,
to become sustainable**



People matter, results count.

1 Management summary

Our vision

To provide our clients with an infostructure that is using only what is needed and still provides superior results.

Technology is becoming increasingly important in our society. All through the day we carry our cell phones and PDAs, and we are always online. For the average teenager, it is more interesting that his cell phone is of the latest model than the fact that he already owns three perfectly working (slightly outdated) phones. At the same time, the underlying technological infrastructure disappears more and more from our sight, into a sort of ubiquitous *Invisible infostructure*. Yet, all this use of pervasive technology comes at a cost: accelerating depletion of the earth's resources, massive emission of greenhouse gases, and accumulation of waste.

Therefore, we should never stop thinking about how and where we use technology. For instance, making our data centers produce less CO₂ per server will not help if we deploy tens of thousands more of those servers every day. *Technology is a tool we use when needed, and it should be used only when needed.*

For all industries, the massive push towards sustainable development is becoming a paramount driving force. It reshapes the way we do business, and it brings about new opportunities. Advances in Information Technology will play a pivotal role in this transformation, and may become an important vector for change.

TechnoVision is Capgemini's 'comprehensive perspective on the evolution of technologies,' and how that will impact the business of our clients. It brings people from business and IT together to explore how technological developments may help business on important issues.

Just how will sustainable development benefit from the progress in IT? This is where sustainability and TechnoVision meet. With this whitepaper, we want to expedite the dialogue between business and IT about the important role of technology in sustainable development.

2 Vision of Capgemini on sustainability

For Capgemini, responsible business means more than legal compliance and philanthropy.

For Capgemini sustainability is an integral part of *who we are* and *what we do*. How we impact the environment is important to us, and our initiatives in this area are closely linked to where and how we work.

We are continuously developing offerings on sustainability for our customers, not only to improve the sustainability of their IT, but also of their entire operations. Under the umbrella of 'GreenSourcing' (this term is not globally used), these offerings help our customers in finding the optimal balance between People (social responsibility), Planet (environmental responsibility), and Profit.

Examples include:

- Energy reduction of IT
- Using ICT to make business processes (more) sustainable
- Stimulating 'green' behavior from employers, customers, and business partners
- Sustainable procurement of ICT assets/services

Our GreenSourcing Maturity Model (GMM) enables our customers to determine where they stand regarding sustainability, and provides them with tailored and practical roadmaps towards improvement.

TechnoVision

Capgemini's TechnoVision asserts that the ongoing evolution of technology creates *freedom* for businesses in two different ways.

First, technology opens up vast opportunities for *new value and innovation*: it provides organizations with the freedom to choose where they want to focus their energies, helping them achieve their business objectives.

Second, as a prerequisite to being successful in this, organizations must be *liberated* from the burden of having to manage IT that does not contribute to differentiating value, yet consumes a disproportionate part of budget, time, and resources.

Our analysis of technology developments led us to identify seven technology clusters that have a profound effect on business (see graphic TechnoVision clusters). They serve the dialogue between technology and business people: mapping the business drivers of an organization to technology solutions.

Figure 1: TechnoVision clusters



The two clusters at the top (**'You experience'** and **'We collaborate'**) consist of fast moving, highly dynamic technologies. This is where predefined, predictable transactions evolve into a continually shifting, collaborative 'ecosystem' or 'smart business network' of interacting players. Potentially paradigm changing technologies are found here. Solutions in this top area help to envision future scenarios so compelling that they function as catalysts for transformation.

Organizations need the two clusters in the middle area (**'Process-on-the-fly'** and **'Thriving on data'**) to build new capabilities in flexible business process management and deep data insight. These are necessary in order to flourish in the 'network of everything.' They make organizations quickly and correctly respond to events as they occur, creating a truly 'enabled' business.

Innovation and flexibility require a proper foundation. The two clusters in the *bottom area* (**'Sector-as-a-service'** and **'Invisible infostructure'**) provide the technology solutions that help organizations run the non-differentiating or 'commodity' part of both IT and business, as a utility service. These solutions enable companies to free themselves of the burden of having to spend a disproportionate amount of time on non-differentiating technology. They also help to enforce business control and regulatory compliance.

Figure 2: World population, year 0 to near stabilization

Year	Population (in billions)
0	0.30
1000	0.31
1250	0.40
1500	0.50
1750	0.79
1800	0.98
1850	1.26
1900	1.65
1920	1.86
1950	2.52
1980	4.44
2000	6.06
2010	6.79
2020	7.50
2050	8.91
2100	9.46
2150	9.75
Near stabilization (after 2200)	Just above 10 billion

Source: United Nations Population Division

Business drivers for sustainability

It is worth reflecting on the context for sustainability...

Kenneth Arrow, Nobel winning economist reflecting on the last 100 years wrote: “During the twentieth century, the world population grew by a factor of four to more than 6 billion, industrial output increased by a factor of 40, ... energy use has increased by a factor of 16, annual fish harvesting by a multiple of 35 and carbon and sulfur dioxide emissions by a factor of 10.” (Arrow 2004: 147-148).

It’s worth coming back to that point on population, today there are currently around 6.7 billion people on the planet which is projected to increase to 9 billion by 2050. However looking backwards we see that this is a massive spike. Up until the 17th century, before the agricultural and industrial revolutions, there were no more than 200 to 300 million people on the planet. It has been argued that there are more humans alive today than have ever been alive and died in the past. Clearly this rapidly growing number of people is putting an enormous strain on the planet. Yet interestingly the population question is one rarely discussed - one might say the elephant in the room.

Alongside the issue of growing population is that of the reducing availability of the raw materials needed for economic productivity. Oil is perhaps the most obvious example, and the one which, given sky rocketing prices, has attracted media attention recently. As far back as 1980 we reach the point of discovering less oil each year than we pump out of the ground (Porritt 2008: 74). Some might consider it a little profligate that in a little over one century, we have pumped out half of the accessible oil buried underground which took some 500 million years to form.

But it is not just oil which will run out. An article in 2007 in Scientific American (Cohen 2007) argued that ‘without more recycling, antimony, which is used to make flame retardant materials, will run out in 15 years, silver in 10 and indium in under five.’ The article continues to report the findings of one scientist who ‘estimates that zinc could be used up by 2037, both indium and hafnium - which is increasingly important in computer chips - could be gone by 2017, and terbium - used to make the green phosphors in fluorescent light bulbs - could run out before 2012.’ (Cohen 2007)

Another constraint will be water. The Economist ran a piece arguing that water is the oil of the 21st century. It reports that “Goldman Sachs, an investment bank, estimates that global water consumption is doubling every twenty years, which it calls an ‘unsustainable’ rate of growth. [Furthermore] water, unlike oil, has no substitute. Climate change is altering the patterns of freshwater availability in complex ways that can lead to more frequent and severe droughts.” (Economist 2008)

Climate change

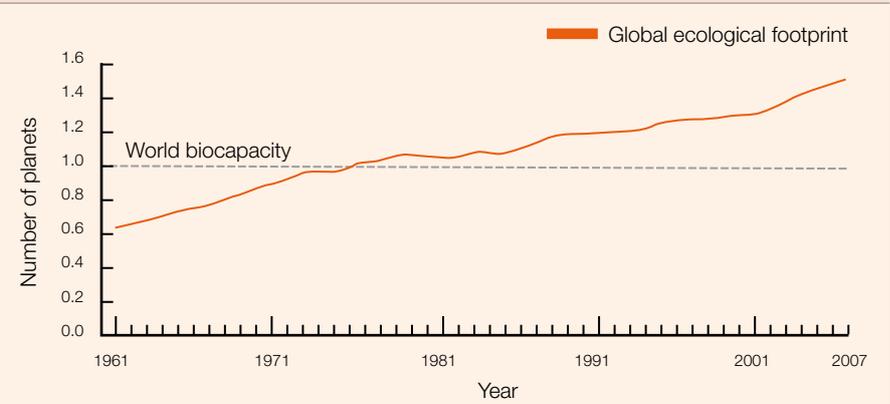
So having discussed some of the inputs to our industrialized economic system, we come onto the outputs. Perhaps the most obvious and widely reported output is carbon dioxide (CO₂). Thanks to the International Panel on Climate Change’s (IPCC) Fourth Assessment Report in February 2007 we know (taken from Porritt 2008: 13-14):

- CO₂ levels are at their highest for 650,000 years;
- Climate change is unequivocally happening;
- We are 90% certain that it is due to man-made emissions;
- We have 10 to 15 years to put in place serious measures to start reducing CO₂;
- Best guess is that global temperature will rise by 1.8°C to 4°C by 2100;
- Worst case indicates up to 6.4°C.

One way of bringing all these factors together is by considering the following chart which compares the ecological footprint of humanity against the earth’s carrying capacity, or put another way: the number of earths of resources required to support human kind.

The chart (WWF 2010) shows that since the mid-1980s the human race has been essentially consuming at a rate greater than the earth’s ability to provide. Today we are at about 1.25 earths, however, this figure hides enormous inequality across different nations - we have heard it argued that if everyone had the same footprint as the average American, we would need nine earths to sustain us.

Figure 3: Global ecological footprint



Source: WWF, 2010

Essentially, sustainability can be visually represented as needing to get the red line back below the carrying capacity of the earth, and the challenge will be in achieving this transformation in a controlled manner. In this context corporate responsibility is no longer a mere differentiator in the market; it has become a true precondition to do business. Customers and business partners demand it, governments require it.

When we map the key sustainability challenges for business we identify the following key sustainability business drivers.

Key sustainability business drivers	Key sustainability business drivers
<p>Reducing carbon emissions</p> <ul style="list-style-type: none"> Legislation such as the EU ETS and the UK 2008 Climate Change Act are building incentives for business to cut carbon emissions. The US government is currently considering new, tougher legislation and a cap and trade system for businesses. 	<p>Increasing need for waste management</p> <ul style="list-style-type: none"> Waste itself represents <i>inefficient</i> use of resources. Landfill is running out in the UK and other countries – so the cost of waste disposal is set to rise. New <i>regulations</i> such as the EU WEEE legislation is increasingly forcing businesses to improve waste management.
<p>Increasing scarcity and cost of raw materials and energy</p> <ul style="list-style-type: none"> As basic resources run out, businesses will need to innovate to identify alternatives. Increasing scarcity will lead to <i>increasing cost</i>, which will force businesses to adapt their business models. 	<p>Compliance</p> <ul style="list-style-type: none"> Formal legislation and also new methods of self regulation are being introduced to govern areas such as: <ul style="list-style-type: none"> Waste management. Carbon emissions. Corporate ethics and human rights.
<p>Changing consumer trends</p> <ul style="list-style-type: none"> Consumer demand for sustainable goods and services has grown very strongly over the past few years. Many B2B clients are starting to request <i>sustainability credentials</i> of potential service providers as part of the tendering process. 	<p>Changing attitudes amongst workers</p> <ul style="list-style-type: none"> Many staff are taking an increasing interest in the environmental and social policies of their employer. In particular, businesses are finding that they need to show strong sustainability credentials in order to <i>attract and retain talent</i>.

Figure 4: Business drivers on the TechnoVision matrix

		Technology clusters					
		You experience	We collaborate	Process on-the-fly	Thriving on data	Sector-as-a-service	Invisible infostructure
Sustainability business drivers	Increasing need for waste management and recycling		Late customization reduces packaging requirements ^H	Tailored lean processes reduce waste production Lifecycle management, 'closing the loop'	Waste audit and recording waste and recycling flow data ISO 14000 ^M	Outsourcing closed-loop production systems ^H	Green IT ^H
	Increasing scarcity and cost of raw materials	Mobile consumer support	Innovative product development with partners and informed option assessment ^H	Dynamic procurement and brokering networks ^H	Inventory tracking and costing analysis Lifecycle management ISO 14000 ^M	Outsourced marginal costing estimates or software ^H	Green IT Sustainable datacenter ^H
	Compliance				Waste and emissions audit and data capture Tracking compliance ^M	Tracking large scale processes to meet specific legislation Audits & reporting ^H	
	Changing worker attitudes	Personal tooling for new ways of working	Make the customer do your work for you! ^H	New ways of working, e.g. role-share Flexible workspaces Teleworking ^H	Better data improves problem identification/resolution. Reducing man-hours required ^H	Buying in services will reduce headcount ^H	Flexible working will decentralize employment, empowering those previously excluded ^C
	Changing consumer trends	Green branding ^M Mobile consumer support	Prove sustainability ^M Community presence	On-line tools influence consumer decisions and provide market intelligence ^H	Manufacturer/dealer collaboration providing effective retail integration & lead management ^M		
	Reducing carbon emissions	Customizable, multifunctional devices will reduce volume of devices needed ^H	Leverage long tail ^H	Freight sharing New ways of working ^H	Carbon emission tracking ^M	Energy brokering Smart energy grids Carbon trading ^H	Specialist 'cloud' providers will be much better placed to implement 'Green IT' systems ^H

KEY ● Available now
 ● Next early adopters using it
 ● Later usable in 6-12 months
 C = Cause or trigger for the driver
 M = Must for the driver
 H = Help supportive element

Applying the power of TechnoVision

By mapping the identified key sustainability priority areas onto the TechnoVision technology clusters we can unlock the power of TechnoVision. The business drivers on the TechnoVision matrix represents the playing field where IT and business development work together to identify how technological innovations can be applied to aptly respond to business drivers.

Each of the rows in this matrix represents one sustainability business driver, and each column represents a technology cluster. A cell links a sustainability business driver with a technology cluster. In the cells are laid down the opportunities brought about by a particular technology cluster to respond to a particular business driver. In the following sections we'll delve deeper into the more promising of those: opportunities offered by technology for sustainable business development.

3 The You experience and We collaborate

Time Magazine named 'You' as the person of the year in 2006.

In Time the focus was on the fact that “It’s about the many wresting power from the few and helping one another for nothing and how that will not only change the world, but also change the way the world changes.” Now, in 2011, this ‘You’ has become even more influential by taking part in communities and connecting closely to the surroundings.

These communities offer companies the ability to communicate effectively with large numbers of people, and provide them with an enormous potential to reach into the market. By delivering specially tailored services to the masses, large volumes of minimal individual returns can be accumulated into solid and stable revenues, or indeed, savings.

This is where implementing the *You experience and We collaborate* makes the difference. By continuously communicating personalized, tailored services directly to individual consumers it becomes possible to leverage *the long tail* and to amass millions of small contributions into significant returns. This is what, for example, Seattle utility Puget Sound Energy tries to achieve as it communicates to its customers how their energy consumption compares to that of their neighbors, prompting them into accumulating enough energy savings to forestall investments in additional power plants.

Tailored mobile consumer support services will abound, and will be delivered to people wherever necessary to help them find their most economical way through life: be it in finding the cheapest gas, or the most economical route, or most suitable venue, or finding the cheapest (or most sustainable) energy for their home or office space, and of course to make sure they always buy *responsibly*.

Consumers and customers alike will demand sustainable products, produced in a sustainable way, and collaborative technology provides them with the means to enforce it. It augments the individual knowledge of the single ‘You’ with the combined experience of many other connected peer ‘You(s).’ Technology brings an instantaneous abundance of targeted information to all, anywhere. Information that is pervasive, unstructured, and, above all, uncontrollable.

Therefore, companies will have to do more than just saying they are ‘green’, they will have to prove it. Fortunately, technology aids in answering these demands by providing transparency through directly accessible websites, mobile (web) applications, and providing companies with the metrics and standards to routinely supply sustainability benchmarking information along with their products.

Technology helps sustainability by facilitating new ways of work and travel

Each day, hundreds of millions professionals travel for their work. The resulting demand for transportation is enormous, and burdens the transportation systems far beyond their capacity. A huge percentage of the available time of the entire workforce goes to waste in traffic. Time lost in traffic jams is rapidly becoming a negative factor to business.

More than plain bad economics in itself, the depletion of resources and the pollution that these billions of daily traffic miles bring about are huge and irreversible. A few percentage reductions in time taken for travel would amount to enormous savings.

How might technology help to attain these few percents? Let's consider a simple technical extension to electronic diaries.

Electronic diaries are everywhere: everyone has them in their office systems and smart phones. Imagine an electronic diary that knows where you will be, and knows all the possible workplaces and venues available to you. Naturally, the people you work with and all your customers have similar diaries. This makes it possible to schedule all meetings and work in the venues that require the least travel from all who are involved.

Scheduling meetings to times that the attendees happen to be in each other's neighborhood will become the standard. Similarly, the major part of the workforce will do their work where it is convenient, and will only travel when required. In this way, office space can become a shared commodity, a service to be used on an ad hoc basis; and our enormous offices, partially filled but completely heated and lighted, may well become obsolete.

4 Process-on-the-fly

Sustainability is about minimizing depletion of non-renewable resources, optimizing resource use, avoiding spill, cutting emission, and recycling waste.

All of these represent considerable value, and as sustainability becomes a business prerogative, a whole industry emerges which provides tailored services in this area. 'Process-on-the-fly' implies that these service offerings are highly dynamic: tailored processes are assembled and brought to market in rapid response to constantly shifting industry needs. The main role of IT is in the orchestration and delivery of these processes, joining the capabilities of possibly many suppliers. This is basically a brokering business.

The concept of 'freight sharing' may serve as an example. In freight sharing many transporters (road, train, ship alike) join forces to find the best transportation mode for any given shipment, minimizing cost and time (and, for sustainability, also fuel consumption and emission). To curb emission and consumption, empty hauls should be avoided at all times. The optimal route and schedule for each shipment must be found, as well as the best mode and the most suitable transporter for each leg along that route. Of course, all vehicles must run fully loaded. This is basically a major scheduling task which is successful only if many transporters and many customers can be integrated into a huge virtual logistics network.

The requirement that vehicle occupation must be kept very high, say, above 85% (currently it is about 60% in the Netherlands) is fulfilled by making the scale of the operation very large. The more transporters and customers are brought together, the higher the efficiency of the whole operation. A typical freight sharing broker might broker in real time the capacity of a dynamic network of many transporters to find the optimal route and schedule for each transport. Moreover, by combining many such requests, the broker makes sure that all transporters maintain a well-loaded capacity all the time and none travel empty. This ensures that emission and fuel consumption are kept to a minimum.

This is where IT comes in. The service depends on many transporters announcing their schedules, routes, and available capacity; and on many customers declaring their transportation requirements. At present, IT can readily handle the massive communication and advanced planning processing required, making sustainable freight sharing a viable (and profitable) business.

5 Thriving on data

Sustainability is like any business driver: it is all about gauging, accumulating intelligence and acting accordingly.

This applies to travelers reacting to traffic information as much as to brokers trading cheap excess power in real time. Information is essential to efforts to curb waste and spill. Likewise, it is essential to find and leverage transient surpluses whenever they pop up.

Sustainable supply chains depend on certified tracking and tracing of materials and biomass. Renewably produced raw materials need to be tagged so that the sustainable production chains, further downstream, can use them faithfully. This involves massive labeling, tracking and tracing of goods, and this depends heavily on the viability of information processing technology. Likewise, industrial scale recycling of waste and of used products requires close monitoring of waste streams, which is only feasible with appropriate secure information processing power in place.

Governments, setting increasingly ambitious sustainability targets, will impose stringent regulations, and will introduce stricter requirements on business data processing and reporting. Customers demand full insight in supply networks, necessitating seamless collection and disclosure of massive amounts of data. More than that, enterprises are urged to ensure that they deal with suppliers who maintain a high standard of corporate responsibility.

This is where the technological developments towards *Thriving on data* will provide the necessary strategic freedom to act accordingly, without being heavily imposed by stagnant legacy technology.

Master Data Management will be paramount to keep track of rapidly transforming information streams and of their significance to the enterprise. Data Warehousing will enable rapid on-demand provision of tailored information to all those who require this information. Business Intelligence will provide for compiling a consistent view on the state of the business from the many dispersed data sources in the enterprise. E-forms will extend the company to wherever information exchange is vital to business: be it in the homes or mobile phones of consumers, or in the offices of procurers, or in the sales rooms of suppliers.

6 Sector-as-a-service

Progressing towards Sector-as-a-service, enterprises can offload their non-differentiating processing to commodity service providers specialized in sustainability.

Specialized business alliances of brokers and utilities will offer sector-specific sustainability services like energy brokering, intelligent metering, and energy clearing to enterprises as commodity services.

Likewise, the extensive administrative processing required from companies for evidencing their regulatory compliance and sustainable production is typically something to be outsourced to specialized, certified service providers. Technology will be crucial to safely and flexibly connecting such service providers to core company processes.

'Vanilla flavored,' 'uncustomized' sector-specific applications have known performance characteristics and can be run anywhere, which makes them particularly suited for standardized cloud computing, enabling the full leverage of economies of scale and utilization of spare capacity. Sensing networks will make it possible to operate smart energy grids, which include many distributed and renewable (domestic) energy sources.

7 Invisible infostructure

To run business applications, a technical infrastructure of computing power, storage and networking is needed.

Most companies still maintain their own technical infrastructure in the form of their own data centers and equipment. Typically, these data centers are run at 10% efficiency at best, which means that 10% of all energy consumed is used for computing, and 90% is wasted (for office desktops, the efficiency is similar). Due to the ever progressing standardization of IT, technical infrastructures become more and more uniform and standard. As a result, IT infrastructure has become commercially available as a commodity service, and the need for companies to keep their own data centers is disappearing. From a business perspective, technical infrastructure, therefore, becomes a utility service comparable to electricity, gas, or water. In TechnoVision, this is referred to as the 'Invisible infostructure.' In reality we have built this datacenter and called it 'Merlin'.

Dismantling their own data centers and reverting to commercial IT services opens up the possibility for companies to drastically reduce their energy spill for IT. It frees them from the burden of running their own IT gear at increasingly higher efficiencies. Rather, they can procure IT infrastructure and platform services from highly specialized utility providers, which by their sheer size are perfectly equipped to run their IT operations at maximum efficiency, with minimal energy spill, minimal waste, and minimal emission.

By assuming the role of the customer, companies can demand that their IT providers operate with minimal environmental impact. The specialized IT providers can comply with these demands. They can devise their data centers to run sustainably, locate them where renewable energy is at hand (for example, near hydropower plants) and the excess heat can be put to good use (like the data center which heats parts of the Helsinki city center).

Specialized IT infrastructure service providers have far better opportunities to perform proper capacity management than most other companies. They can trade their spare computing capacity, just like airways trade their spare airplane seats: in discounts. Already, Amazon auctions its spare computing power to the public in the form of so called 'Spot Instances.' These are time slots when spare computing power is available, and cheap. Developments like these allow companies to offload their applications to IT providers with the smallest environmental impact. They allow the providers to spread their load for the highest operational efficiency. As business applications can be run anywhere, companies are freed from technology provider lock-ins. With a choice of 'infostructure providers,' choosing the greenest computing becomes easy.

Likewise, workplace computing will move from millions of power hungry idling desktops to specialized data centers, leaving thin, lean client machines in the offices. This way, the freedom to choose the most sustainable providers becomes available for workplace computing as well.

Having all your basic business services run in the 'invisible infostructure' makes them available wherever you need them. When millions of workers can do their work wherever appropriate, the need for them to spend the start of their day in traffic jams evaporates.

8 Liber Architecture

The glue that binds everything together is standardization.

It is the everything of infrastructure, of platforms, of applications, of communication, of information services, and of business processes. The adoption of IT to support sustainable development is very much dependent on shared standards, metrics, regulations, and governance structures. These streamline the move towards sustainable biomass and raw materials production, towards efficient, monitored, and certified supply chains and towards really effective waste control, recycling and emission management. All players in the production, consumption, and recycling chains must be confident of their ability to profit and prosper in a global business environment; while this rapidly progresses towards responsible and sustainable ways of business. In brief, sustainable business must be fair and controlled.

IT standardization is itself progressing very rapidly, providing the mechanisms to establish all technology clusters, from the 'You' experience to Invisible infostructure. This amalgam of standards and common mechanisms is what TechnoVision refers to as 'Liber Architecture.' In addition to IT standardization, sustainable business hinges on easy and massive exchange of highly standardized information, intelligible to all. It requires appropriate measures and indicators to assess performance, savings and indeed, profitability. Sustainable development needs mechanisms to enforce compliance, and all the information we can muster to spot business opportunities.

Fortunately, many programs are well under way to establish such standards and instruments. These must enable sustainable production of renewable goods and recycling of waste on a massive, global scale. For example, ISO (and in the US, NIST) are driving standardization initiatives with respect to product tracking, labeling, and life cycle assessment (ISO 14000/40), Restriction of Hazardous Substances (RoHS), Registration, Evaluation and Authorization of Chemicals (REACH), and Waste Electrical and Electronic Equipment (WEEE). Similar initiatives abound in Europe and Asia.

Most governments refer to standards for sustainability in their requirements specifications for their suppliers (like, Energy Star® for hardware).

Similarly, 'Carbon credits' is a European effort to trade emission reductions through the Joint Implementation (JI) and Clean Development Mechanisms (CDM) of the Kyoto Protocol. The total contracted volume for a small country like the Netherlands alone is 17.4 million tons of CO₂ equivalent. The required information processing has only been possible through standardization of utility reporting, and massive information consolidation.

Global Reporting Initiative (GRI) Guidelines are gaining global adoption. From January 2009, more than 1,500 organizations from 60 countries use the GRI Guidelines to produce their sustainability reports. These guidelines apply to corporate businesses, public agencies, smaller enterprises, non-governmental organizations (NGOs), industry groups, and others. For municipal governments, they have generally been subsumed by similar guidelines from the UN International Council for Local Environmental Initiatives (ICLEI).

The European Commission has started the SmartGrids research initiative for the European Supergrid: an intelligent energy grid that will allow for the integration of millions of local installations for production of renewable energy. This initiative will devise solutions (and set standards) for (AO) Intelligent Metering (including consumer involvement), grid operation/control, cross borders distributed generation, energy trading, integration of stand-alone (renewable energy) systems in SmartGrids, Vehicle to Grid (V2G) and the very promising ICT Infrastructure and Automation of SmartGrids.

Initiatives like these abound and are vital to sustainable development. They offer companies an excellent opportunity to render their operations more sustainable, and in the same process - more profitable. Their importance, therefore, cannot be overstated; and at the core of sustainable development is information technology.

9 Final thought

Let technology be a tool for mankind, not a goal to reach.

Our world is filled with technology that is there to support us. We can let our lives be led by technology, but it is better to embrace it and use it to improve our lives. Sustainability starts with the mindset to be so. The first thing we have to determine is *where* to use technology, *what* is the need for this technology, and what will happen if it *fails*. From the sustainable point of view: is there, within this technology, an option to help you become more sustainable? There are several roads you can travel.

First, when you start using the 'Invisible infostructure' you can make it accessible *wherever* you want. This eliminates the need to travel only to access your business systems. When the 'where' ceases to matter, you can start placing your systems where power is green, and/or cooling is free because you can use natural air. When more people share this 'Invisible infostructure,' running it at an optimum becomes feasible. When people use the 'shared' facilities offered by the 'Invisible infostructure' only what is really needed has to be turned on/used. Capacity management will be run for you so that when more computing power is needed there is always a cloud nearby that can provide it. Sustainability is all about putting technology to good use; but even more about *using only what you need*. If people truly share and use only what they need, and 'turn off the light when they leave the room,' there is an abundance of 'infostructure' to use. We just need to *share*.

There are times when things fail; so does technology. In a world that is ruled by technology, we seem to be unable to survive a situation without technology. Being sustainable is also about the balance between what we really need and what we can do without (for a short amount of time). In the 19th century the only means of communication a policeman had, apart from his voice, was a whistle to call a colleague who was in the vicinity. Nowadays, the police cannot operate without mobile communication. On the other hand, do you *really need* to know by Internet or any other communication *what your canteen is serving at noon*? We have to share our world with one another and use the available technology *together*.



About Capgemini

Capgemini, one of the world's foremost providers of consulting, technology and outsourcing services, enables its clients to transform and perform through technologies. Capgemini provides its clients with insights and capabilities that boost their freedom to achieve superior results through a unique way of working, the Collaborative Business Experience™. The Group relies on its global delivery model called Rightshore®, which aims

to get the right balance of the best talent from multiple locations, working as one team to create and deliver the optimum solution for clients.

Present in 40 countries, Capgemini reported 2010 global revenues of EUR 8.7 billion and employs over 112,000 people worldwide. More information is available at www.capgemini.com

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Colophon

For more information:

Alex van Hout
Consultant ICT infrastructure
Tel. +31 (0)30 689 42 40

Bert Schaapsmeeders
Managing Consultant
Tel. +31 (0)30 689 15 96

James Robey
Group CSR & Sustainability Director
Tel. +44 (8)70 904 57 61

Richard Bredero
Senior IT architect
Tel. +31 (0)30 689 80 96

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