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## **A FIVE-STEP-PLAN FOR A LOW CARBON URBAN DEVELOPMENT**

Understanding and implementing low carbon ICT/telecom solutions that help economic development while reducing carbon emissions

**THE EARLY 21<sup>ST</sup> CENTURY** is faced with dramatic challenges. Failures of large financial institutions resulted in a crash of stock markets around the world with a severe effect on many national economies. At the same time, there is increasing and dramatic evidence from leading scientific bodies of the effects of climate change and a growing understanding of the likelihood of them becoming a reality much sooner than previously anticipated.

Both of these challenges have become top political issues, and today there is a strong commitment of governments, industry and civil society to address them both. It is generally recognised that by 2050, global CO<sub>2</sub> emissions need to be reduced by some 80%, but the roadmap for getting there is uncertain and today focus is largely on incremental emission reductions. In order to reach the significant levels of reductions, large scale transformative changes are needed in the way that we live and work.

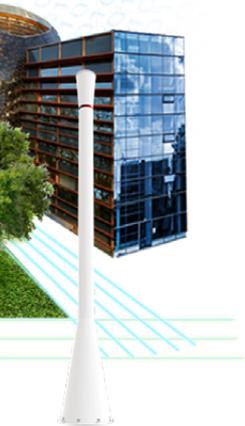
This paper is written to inspire action and to increase understanding of one technology that can deliver the needed transformative change. For too long the need for CO<sub>2</sub> reductions has been seen as a trade off between economic development and care for the planet, this does

not have to be the case. By using the 21<sup>st</sup> century communication infrastructure that already exists, it is possible to deliver transformative reductions that dramatically reduce emissions.

With increased knowledge about the potential of low carbon Information and Communication technologies (ICT) solutions, combined with an understanding that reductions in the realm of 50-80% are needed in the medium-term,<sup>1</sup> ICT solutions should be at the centre of the climate discussion. Today ICT is noticeably absent.

This paper is written to promote action and increase understanding of how the existing ICT infrastructure can deliver immediate and transformative solutions to policy makers. It presents a five step plan to accelerate the uptake of low carbon services that can transform societies, based on current technologies. With an existing global infrastructure that has only just begun to demonstrate its potential, the opportunities are almost unlimited.<sup>2</sup>

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1 July 2009 G8 leaders agreed to cut emissions by 80% by 2050, [http://news.xinhuanet.com/english/2009-07/09/content\\_11678940.htm](http://news.xinhuanet.com/english/2009-07/09/content_11678940.htm), <http://news.bbc.co.uk/2/hi/europe/8141715.stm>

2 The opinions expressed in this discussion paper are those of the author(s) and do not necessarily reflect those of WWF Sweden. Any inaccuracies in the report remain the responsibility of the author(s). The material and the geographical designations in this report do not imply the expression of an opinion whatsoever on the part of WWF Sweden, concerning the legal status of any country, territory, or area, or concerning the delimitation of its frontiers or boundaries.

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# LOW CARBON OPPORTUNITIES IN THE 21<sup>ST</sup> CENTURY

Major cities in OECD countries generate almost one third of their nations' production while in some countries more than half national output is produced by one city.<sup>7</sup> Cities and urban areas consume 75% of the world's energy and produce up to 75% of its greenhouse gas emissions. Cities are their nation's innovation hubs, producing almost all patents.<sup>8</sup> As such they will be at the epicentre when the actual work to significantly reduce CO<sub>2</sub> emissions begins.



**SOLVING THE CLIMATE CHALLENGE** is very much tied to infrastructure and urban development. Last year marked a shift in human history with more than half of the world's population living in urban, not rural, areas for the first time. This trend will continue. In 40 years' time 70% of the global population will live in cities.<sup>6</sup> This trend will result in massive investments and shape the global resource use.

Most of the focus in climate discussions so far has been on how to incrementally reduce the emissions from big polluting industries, without negatively impacting the economy. Such a focus on emission reductions is of course necessary. But there is an untapped opportunity to drive economic growth while

at the same time making transformative emissions reductions by focusing on cities and urban infrastructure development.

## **Innovations and opportunities**

By shifting from a product to a service perspective we can use the connectivity of a 21<sup>st</sup> century infrastructure to provide many of the services people and businesses need, instead of only replacing products with marginally better ones. Economic development and carbon reductions can not only go hand in hand, they can also strengthen each other. What is needed in order for this to happen is an innovation driven approach which can deliver measurable savings and "smarter" ways

of doing things. This can increase quality of life while dramatically reducing emissions.

Cities are close to business, the research community and citizens. The sheer volume of people, cars, buildings and other infrastructure makes it possible to develop leadership in the low carbon innovation field through the promotion of digital technologies which can support the development of more intelligent and sustainable cities. Cities, in collaboration with rural areas, should be able to demonstrate how they can use, and are using, ICTs to achieve new and innovative ways to deliver services through transformative solutions that support a low carbon urban living.

6 <http://www.un.org/esa/population/publications/wup2007/2007wup.htm>

7 [http://www.oecd.org/document/2/0,3343,en\\_2649\\_33735\\_37801602\\_1\\_1\\_1\\_1,00.html](http://www.oecd.org/document/2/0,3343,en_2649_33735_37801602_1_1_1_1,00.html)

8 [http://www.oecd.org/document/2/0,3343,en\\_2649\\_33735\\_37801602\\_1\\_1\\_1\\_1,00.html](http://www.oecd.org/document/2/0,3343,en_2649_33735_37801602_1_1_1_1,00.html) [http://images.businessweek.com/ss/09/04/0422\\_inventive\\_cities/index.htm](http://images.businessweek.com/ss/09/04/0422_inventive_cities/index.htm)

# A THREE PRONGED CLIMATE STRATEGY FOR 21<sup>ST</sup> CENTURY LOW CARBON CITIES

## REDUCING THE DIRECT EMISSIONS

i.e. reducing emissions from cars, buildings and energy production within the city's boundaries. This can be done both by making current solutions less carbon intensive and by finding new innovative ways to provide the same services.



**STRATEGIES TO SUPPORT** low carbon cities must include at least three aspects of development, all of which can include ICT use as a crucial component.

### Direct emissions

The first aspect is the direct emissions from a city. This is where almost all focus on reducing carbon emissions is today. Cities should develop strategies and set targets to reduce the direct emissions from buildings, transport and all other significant sources of emissions without shifting the problem elsewhere.

Interesting initiatives with a strong focus on direct emissions, include the Green Shift Europe initiative,<sup>9</sup> the Low Carbon City Initia-

tive<sup>10</sup> and the Climate Positive Development Program.<sup>11</sup>

Ensuring continued focus on energy efficiency and new smart system solutions instead of only looking at decreased use of coal and oil is important. A lot of discussion has focused on technologies that might start delivering reductions by 2020 and beyond. With only a fraction of the amount of effort that's being put into improving the current fossil based supply system, low carbon ICT solutions could potentially deliver more reductions than any other supply-side solution.<sup>12</sup>

### Embedded emissions

The second area that must be addressed, not the least to ensure that emissions are not just moved, are the embedded emissions. Embedded emissions are those emissions that have occurred in order to produce something. If a city is moving a steel plant because it emits too much carbon, but continues using the same amount of steel as before (or more) the problem has not been solved, only moved.<sup>13</sup>

Many leaders of cities in the developed part of the world who talk about low carbon development often overlook their cities' import of goods, which can contain significant amounts of embedded carbon. Research

9 This initiative is being developed by EUROCIITIES, coordinated by the Knowledge Society Forum (KSF), with the idea of the 'Green Digital Charter' at its core <http://www.greenshifteurope.eu/> and <http://eurocitiesksf09.eventbrite.com/>

10 This initiative is being developed by WWF in collaboration with cities in China. Shanghai, with Shanghai Research Institute of Building Science, has a strong focus on smart buildings using ICT [http://www.wwfchina.org/english/sub\\_loca.php?loca=1&sub=96](http://www.wwfchina.org/english/sub_loca.php?loca=1&sub=96)

11 This is a joint venture between the Clinton Climate Initiative and the U.S. Green Building Council will try to establish real estate developments that reduce the net amount of on-site CO2 emissions to below zero. <http://www.usgbc.org/Docs/News/Climate+%20FINAL%20Press%20Release%205-19.pdf>

12 If current targets for improving and eliminating coal fired plants and CCS are met, by 2020 global CO2 could be reduced by less than 5%. In contrast, smart deployment of ICT could reduce global CO2 emissions by more than 20% by 2020. The potential for ICT has been presented in a number of studies including: WWF (2008): "Outline for the first global IT strategy for CO2 reductions" [http://assets.panda.org/downloads/1bt\\_printversion\\_final.pdf](http://assets.panda.org/downloads/1bt_printversion_final.pdf) GeSI (2008): "SMART 2020" <http://www.gesi.org/LinkClick.aspx?fileticket=tbp5WRTHUoY%3d&tabid=60>

13 A number of governments have discussed different ways to address this challenge including China and the UK.

<http://www.carbon-financeonline.com/index.cfm?section=lead&action=view&id=11929> [http://randd.defra.gov.uk/Document.aspx?Document=EVO2033\\_7331\\_FRP.pdf](http://randd.defra.gov.uk/Document.aspx?Document=EVO2033_7331_FRP.pdf)

## REDUCING THE EMBEDDED EMISSIONS

i.e. reducing the emissions needed to produce the products and services imported or exported from a city.



## HELPING REDUCE EMISSIONS IN THE REST OF THE WORLD THROUGH EXPORT

i.e. supporting export of solutions that reduce emissions when used in the rest of the world, including other cities, e.g. energy efficient buildings, renewable energy production and low carbon ICT solutions.

from some countries show that the emissions would double if the import and export were included.<sup>14</sup> The reason is that Sweden, as many other western countries, exports less carbon intensive goods than it imports.

A focus on deployment of smart ICT solutions can result in true emission reductions by providing services to people without requiring much CO<sub>2</sub> to be emitted. The opposite approach is when high emitting industries are moved to other countries and then the product and services from these industries are imported. Moving steel factories to other countries and then import steel is not a way of solving the problem; it is only moving the problem.

### Export of low carbon solutions

A third, and still not well known, aspect of reducing emissions from city development is export of low carbon solutions. Low carbon solutions for export could be anything that helps reduce the emissions in other parts of the world., e.g. equipment for renewable energy production or low carbon ICT solutions such as virtual meetings, teleworking, smart homes, smart grids, m-banking and dematerialisation services. A city is an active part in the global economy and with the urgent need for low carbon solutions cities must support companies that export low carbon solutions.

Including an export perspective opens new growth opportunities for cities. Focusing

on companies which provide solutions that promote low carbon development can also create jobs. For example, the promotion of a 21<sup>st</sup> century broadband infrastructure has had positive effects on employment, according to a number of studies.<sup>15</sup>

Obviously there is a link between the direct emissions and the export of solutions. If a market is created in the city for new smart solutions, the companies that provide these solutions can first grow on the domestic market and become important exporters of low carbon solutions.<sup>16</sup>

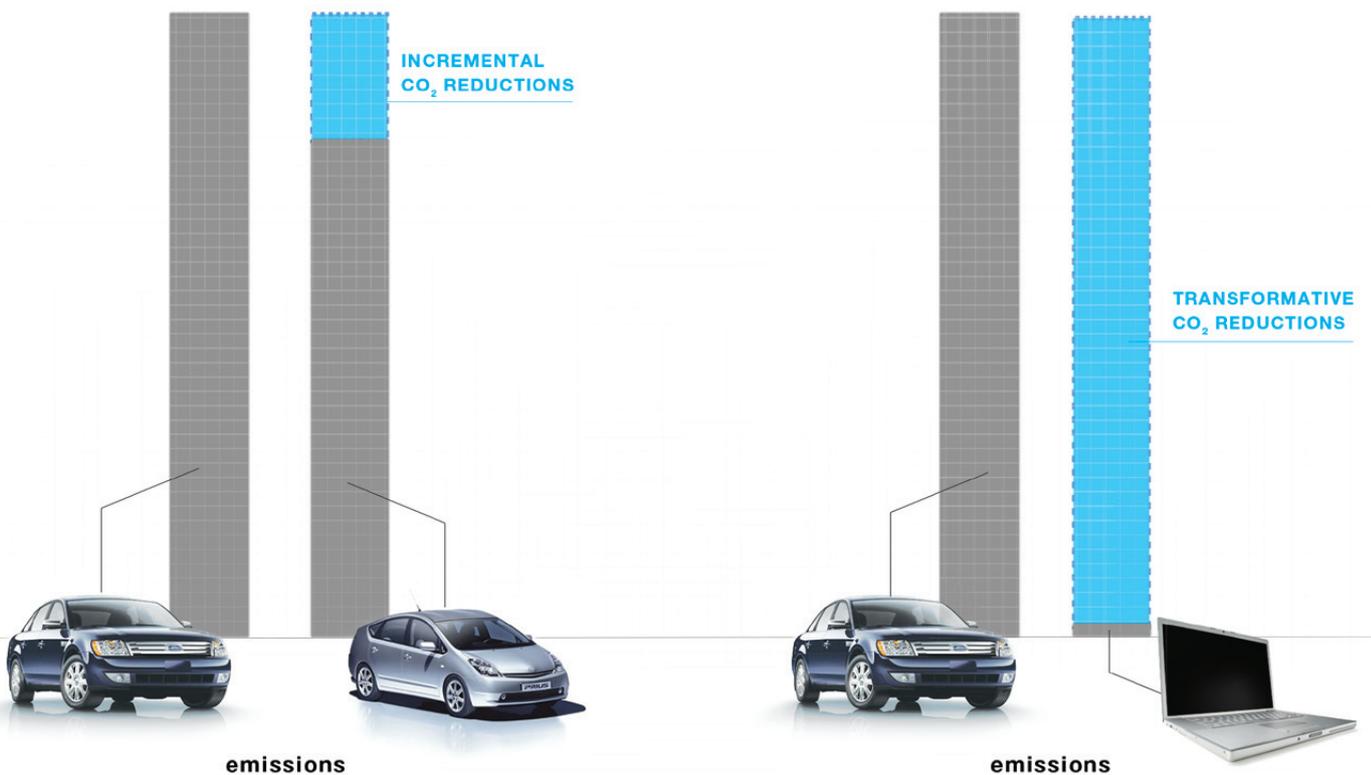
<sup>14</sup> <http://www.sei.se/eipot/resources/EIPOT-literature-list-070ct08.pdf> [http://www.ima.kth.se/eng/respublic/CO2\\_utslaapp\\_import\\_konsumtion.pdf](http://www.ima.kth.se/eng/respublic/CO2_utslaapp_import_konsumtion.pdf)

<sup>15</sup> An American study by Brookings Institution (2007) based on state level data found that for every one percentage point increase in broadband penetration in a state, employment is projected to increase by 0.2-0.3% per year. For the entire US private non-farm economy, this suggests 300 000 additional jobs. [http://www.brookings.edu/~media/Files/rc/papers/2007/06labor\\_crandall/06labor\\_crandall.pdf](http://www.brookings.edu/~media/Files/rc/papers/2007/06labor_crandall/06labor_crandall.pdf) Based on broadband growth of 3.8% over the next several years, the Sacramento Regional Research Institute says that California could see a cumulative 10-year gain of 1.8 million jobs and USD 132 billion in payrolls. [http://www.benton.org/initiatives/broadband\\_benefits/action\\_plan/economic\\_development](http://www.benton.org/initiatives/broadband_benefits/action_plan/economic_development)

<sup>16</sup> The government in Denmark has showed leadership in this area and developed a strategy for low carbon ICT that also includes export of low carbon ICT solutions, with a specific focus on emerging countries such as China and India. [http://www.itst.dk/filer/Publications/Action\\_plan\\_for\\_Green\\_IT\\_in\\_Denmark/html/chapter04.htm](http://www.itst.dk/filer/Publications/Action_plan_for_Green_IT_in_Denmark/html/chapter04.htm) Hopefully cities in Denmark will follow and set supporting targets.

# ICT IS CRUCIAL FOR A LOW CARBON DEVELOPMENT

## TRADITIONAL AND TRANSFORMATIVE REDUCTION PERSPECTIVES



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**OVER THE LAST YEARS** experts in academia, governments, companies and NGO's have produced studies that have demonstrated the significant potential of ICT solutions in reducing CO<sub>2</sub> emissions.<sup>17</sup> Studies indicate that about 15% of global CO<sub>2</sub> emissions can be reduced with low carbon ICT solutions by 2020. Much larger reductions can however be achieved with an innovation driven agenda that focuses on transformative solutions.<sup>18</sup>

There are two important characteristics of low carbon development based on ICT:

1. ICT solutions often deliver transformative CO<sub>2</sub> reductions;
2. A 21<sup>st</sup> century infrastructure can deliver a multitude of low carbon solutions

### Transformative CO<sub>2</sub> reductions

One main reason behind the lack of ICT solutions in most climate strategies is that the potential is not that well known. Most businesses and policy makers have been looking for emission reductions between 5-10% (guided by the Kyoto agreement, under which most countries had reduction targets of 6%, 7% or 8% by 2012 compared to 1990 levels.<sup>19</sup>) and focused on incremental reductions from the major emitters.

Unsustainable use of cars, airplanes and paper can be replaced by low carbon ICT solutions that can deliver transformative reductions of 50% and more. Quite often 90-99% reductions can be achieved when ICT solu-

tions provide similar services in completely different ways, e.g. virtual meetings, teleworking, m-banking and m-newspapers.<sup>20</sup> In order to achieve this level of reductions ICT should feature as a core element of climate strategies.

Today companies are looking for smarter solutions that save money and reduce CO<sub>2</sub>. Smart power meters and grids can help households and buildings to better regulate energy use; Intelligent Transport Systems (ITS) can reduce overall transport needs; e- or m-health can deliver remote monitoring and physical parameters transmitted wirelessly to health professionals.<sup>21</sup> These are just a few examples, and increasing evidence is being

17 WWF (2008): "Outline for the first global IT strategy for CO2 reductions", [http://assets.panda.org/downloads/1bt\\_printversion\\_final.pdf](http://assets.panda.org/downloads/1bt_printversion_final.pdf) GeSI (2008): "SMART 2020", <http://www.gesi.org/LinkClick.aspx?fileticket=tbp5WRTHUoY%3d&tabid=60> WWF/ETNO (2005): Saving the Climate at the speed of light, [http://www.pamlin.net/written/documents/WWF\\_ETNO-Climate%20Change%20Road%20Map.pdf](http://www.pamlin.net/written/documents/WWF_ETNO-Climate%20Change%20Road%20Map.pdf) WWF/Bell Canada (2008): Innovating Toward a Low-Carbon Canada: Using Technology to Transform Tomorrow, <http://www.pamlin.net/written/documents/WWF%20Canada%20ICT%20Report%2019June2008.pdf> WWF/Telstra (2009): Using ICT to Drive your Sustainability Strategy, <https://secure.wwf.org.au/publications/telstrasustainabilityictwhitepaper.PDF> Vodafone/Accenture (2009): Carbon Connections: Quantifying mobile's role in tackling climate change, [http://www.vodafone.com/etc/medialib/cr\\_09/carbon.Par.76396.File.tmp/carbon\\_web\\_2009.pdf](http://www.vodafone.com/etc/medialib/cr_09/carbon.Par.76396.File.tmp/carbon_web_2009.pdf)

18 WWF (2008): "Outline for the first global IT strategy for CO2 reductions", [http://assets.panda.org/downloads/1bt\\_printversion\\_final.pdf](http://assets.panda.org/downloads/1bt_printversion_final.pdf)

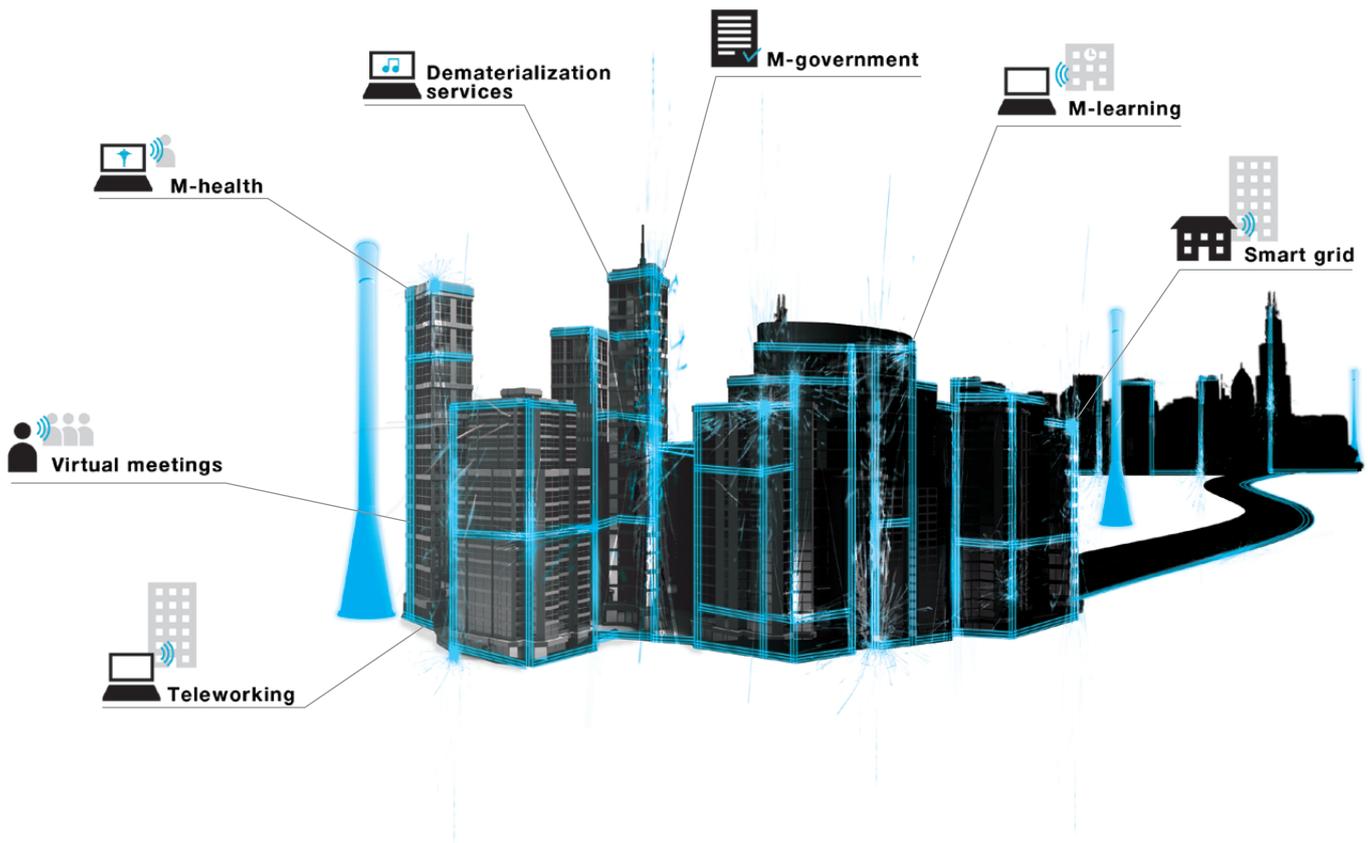
f19 [http://unfccc.int/kyoto\\_protocol/items/3145.php](http://unfccc.int/kyoto_protocol/items/3145.php)

20 See footnote 17

21 See footnote 17

## A 21<sup>ST</sup> CENTURY INFRASTRUCTURE — DELIVERING A MULTITUDE OF SERVICES

Many low carbon ICT solutions strengthen each other. A person teleworking gets used to participate in virtual meetings and will continue to also dematerialise paper to be able to access them from the mobile device that is used as an office. The same device is then also a meeting place and a reading device. Even though these services look different from a user perspective they depend on the same infrastructure — an infrastructure where the connectivity will increase over time. Some estimates have shown that by 2020 there could be tens of billions of connected devices. This opens up new opportunities for machine-to-machine (M2M) technology to enable ICT to collect, assemble and distribute the right information to the right place in real time.



presented to illustrate economical low carbon benefits of ICT use.

### A multitude of low carbon solutions

Many ICT solutions not only substitute an old way of providing services, but also help to create, and are part of, a low carbon 21<sup>st</sup> century infrastructure. Today broadband is at the turning point with infrastructure already widely available in most parts of the world. However, we have not realised the full impact and potential that it will bring to society. Over the next 20 to 30 years, it will stimulate innovation across society and will lead to the deployment of completely new solutions.<sup>22</sup> This should be of particular interest to emerging markets as it presents numerous opportu-

nities to leapfrog development and at the same time move faster towards a low carbon economy. This could happen in a way that strengthens the economy and supporting innovation, not constraining it and hindering development.

The wide spectrum of solutions has made discussions about low carbon ICT solutions difficult, because ICT is often a service enabler, as opposed to a specific product. It is only from 2008 that ICT has begun to feature as a mainstream solution in policy processes in key fora.<sup>23</sup> Before 2008, with whom the responsibility for development and promotion of low carbon ICT solutions should be was often unclear. Since then an increasing

number of initiatives has taken place where ICT experts and climate experts have worked together to begin formulating concrete plans, both in governments and international bodies.<sup>24</sup>

Over the coming decade, the 21<sup>st</sup> century digital communication infrastructure will play an increasingly important role in enabling many of the basic services such as commuting (teleworking), health and education in a low carbon way.

<sup>22</sup> <http://www.wired.com/epicenter/2009/08/broadband-is-this-generations-highway-system-fcc-director-says/>

<sup>23</sup> From business events such as B4E and World Business Summit on Climate Change where ICT arrived late, but is not integrated as a mainstream solution, to policy events where The European commission, OECD, the Japanese government and US administration all have ICT as part of their low carbon agenda now. <http://www.unep.org/Documents/Multilingual/Default.Print.asp?DocumentID=579&ArticleID=6138&=en> [http://www.mm.dk/filer/climate/Summit\\_report.pdf](http://www.mm.dk/filer/climate/Summit_report.pdf) [http://ec.europa.eu/information\\_society/events/ict4ee/2009/index\\_en.htm](http://ec.europa.eu/information_society/events/ict4ee/2009/index_en.htm) <http://www.meti.go.jp/english/policy/GreenIT/initiative/Japan.pdf> [http://news.cnet.com/8301-13578\\_3-10143738-38.html](http://news.cnet.com/8301-13578_3-10143738-38.html) <http://en.itst.dk/the-governments-it-and-telecommunications-policy/green-it/conference-on-icts-the-environment-and-climate-change>

<sup>24</sup> Japan helped move the agenda forward by including ICT and climate change in the preparations for the G8 meeting in Hokkaido 2008, [http://2050.nies.go.jp/sympo/S-3\\_LCS\\_sympo\\_WS\\_2009/S-3\\_LCS\\_sympo\\_2009/S-3\\_LCS\\_sympo\\_2009\\_index\\_e.html](http://2050.nies.go.jp/sympo/S-3_LCS_sympo_WS_2009/S-3_LCS_sympo_2009/S-3_LCS_sympo_2009_index_e.html) The EU moved ICT and low carbon solutions into the mainstream discussion in March 2009 at the ICT4EE "High level event on ICT for Energy Efficiency", [http://ec.europa.eu/information\\_society/events/ict4ee/2009/index\\_en.htm](http://ec.europa.eu/information_society/events/ict4ee/2009/index_en.htm) ITU have worked actively on the issue since WISIS in 2003, but increased the activity during 2008, <http://www.itu.int/themes/climate/>

# BEYOND IMMEDIATE EMISSIONS

## AN INFRASTRUCTURE APPROACH

Together with Ericsson, WWF Sweden have developed an infrastructure approach to assess CO<sub>2</sub> savings from implementing low carbon ICT services. This allows savings related to infrastructure to become visible.<sup>25</sup>

### Immediate emissions:

from the product used to deliver the service, e.g a car or a laptop.

### Other life-cycle emissions:

from the production and end-of-life treatment, e.g for a car this would include both the emissions from producing and recycling the car, as well as the fuel used by that car

**OFTEN THE TOTAL CO<sub>2</sub> EMISSIONS** of the ICT sector has been compared to airlines. This however is an unscientific comparison. The 2% of total global CO<sub>2</sub> emissions attributed to ICT is based on a life-cycle figure, accounting not only for the use of all products, but also the full life-cycle emissions from production to end-use and also the infrastructure needed. The 2% for the airline industry on the other hand is only accounting for the fuel emissions from the airplanes.<sup>26</sup> If a comparison would be made using a similar scope for the airline industry as the ICT sector is using (including a full life-cycle and the infrastructure needed), their emissions would be approximately 6-10%. This example highlights the need to move beyond the immediate emissions from products, to also look at the underlying infrastructure.

### A service perspective can help make infrastructure visible

As long as we keep looking at emission comparisons at a product level, we will at best replace more emitting products with less emitting ones, achieving incremental emission reductions, but still within the existing system. An infrastructure approach allows us to compare the CO<sub>2</sub> impact of systems of different nature that deliver the same service. Such an approach from a service perspective allows for a shift towards a low carbon infrastructure and encourages transformative solutions.

Including emissions from infrastructure when reporting emissions from different services allows transformative solutions to become visible. Today the major emissions are often

linked to the use of a product or the emissions related to the manufacturing of the product. As services can be delivered in transformative ways, including the underlying infrastructure of products in the calculation can expose major differences to emission savings. The fact that a lot of the current high carbon infrastructure has been with us for a long time makes it easy to forget.

In order to reach the reductions required to avoid dangerous climate change, real low carbon benefits must be exposed to give a better understanding of which solutions that can actually deliver low carbon services. The emissions related to cars are one example where a shift towards teleworking or even public transport can result in very large savings due to a less carbon intensive underlying

<sup>25</sup> The details of this approach are described in the report: "Emission reductions from transformative solutions - Using an infrastructure approach to assess CO<sub>2</sub> savings from implementing low carbon ICT services" by WWF Sweden and Ericsson [Forthcoming, fall 2009]

<sup>26</sup> Emissions from flying should be multiplied with approximately 2.7. The reason for this is that aircrafts have greater climate effects than just the CO<sub>2</sub> emissions from burning the fuel. The additional effects include contributions from nitrous oxides and ozone. Because of this, the CO<sub>2</sub> emissions from aviation should be multiplied by an appropriate factor. The size of the factor is often taken to be 2.7 <http://www.ipcc.ch/ipccreports/sres/aviation/index.php?idp=86>

**Emissions of infrastructure operations:**

from the supportive infrastructure that is needed to deliver a service. This can be traffic lights, heating/cooling of airports, operation of parking houses, fuelling stations, etc.

**Other life-cycle emissions of infrastructure:**

from the production and the decommissioning of the infrastructure, e.g. construction of parking, building of roads and supporting infrastructure for new exploration of oil.

**Dynamic impacts on emissions:**

from investing in and using a solution in a specific context. Investments and use can reinforce a high or low carbon development outside the direct flow and use of resources.



infrastructure. When products such as cars become more and more energy efficient, the emissions from the underlying infrastructure will become increasingly important to include in calculations to be able to capture the true climate impact.

**Emission reductions from transformative solutions**

WWF Sweden and Ericsson have studied a number of services and also calculated the savings from existing solutions in China and Sweden.<sup>27</sup> This work has indicated that the savings from broadband services can be 50-150% higher when the life-cycle emissions and the underlying infrastructure is included, compared to a situation when only the “tail-pipe” emissions are included.

The same work also indicates that, without any significant promotion, the savings from just two applications, a logistic transport system and teleworking, have already delivered about five million tonnes of CO<sub>2</sub> reductions in China.<sup>28</sup> By 2020, these savings could become significantly higher with only minor support from business and policy makers. Initial estimations show that increased use of five existing ICT applications could add up to more than 30 million tonnes in China alone.<sup>29</sup>

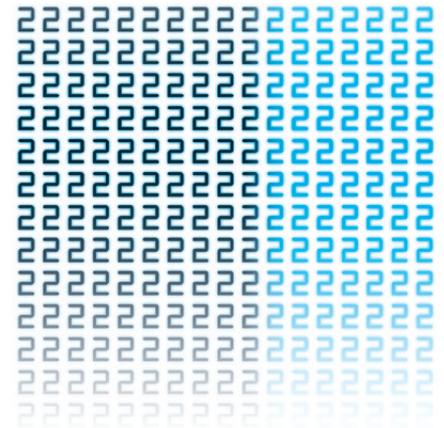
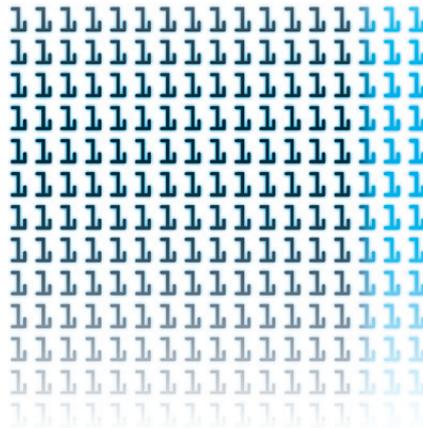
It is also important to understand how emission distribution will change over time. This requires dynamic effects, that include the impact of future emissions, to be included.<sup>30</sup> By analysing the dynamic effects it is possible to identify drivers of increased invest-

ments in unsustainable infrastructure that in turn triggers further use of unsustainable services (cars and road investments in cities are classical examples of two unsustainable investments that often reinforce each other).

Similarly, taking dynamic effects into account can help identify investments in infrastructure that trigger further use of sustainable services. This can accelerate emission reductions by improving low carbon infrastructure and strengthening other services (e.g. investments in broadband can support increased use of teleworking, which can support increased use of virtual meetings, m-paper, m-banking, a smart grid and smart houses).

27 This work has been in collaboration with the project WWF has with China Mobile in China and earlier collaboration that both WWF Sweden and Ericsson have had with TeliaSonera.  
 28 See the report: “Emission reductions from transformative solutions - Using an infrastructure approach to assess CO2 savings from implementing low carbon ICT services” by WWF Sweden and Ericsson [Forthcoming, fall 2009]  
 29 The services are: logistic systems, m-paper, teleworking, virtual meetings and smart street lights. These are described in the report: “Emission reductions from transformative solutions - Using an infrastructure approach to assess CO2 savings from implementing low carbon ICT services” by WWF Sweden and Ericsson [Forthcoming, fall 2009]  
 30 Dynamic effects are described in the report: “Emission reductions from transformative solutions - Using an infrastructure approach to assess CO2 savings from implementing low carbon ICT services” by WWF Sweden and Ericsson [Forthcoming, fall 2009]

# FIVE-STEP-PLAN FOR LOW CARBON DEVELOPMENT



**IN THE RUN UP TO** the global climate negotiations in Copenhagen, most of the global policy focus has been on sectors with high emissions and on incremental improvements. This paper has made the case for why it is also important to direct attention to ICT and telecom, sectors that provide low carbon solutions that can create transformative reductions with low carbon feedback. A five-step-plan is proposed in order to help policy makers make this shift.<sup>31</sup>

## 1. Make ICT a central part of national and city strategies and targets for reducing CO<sub>2</sub> emissions

Identify a number of areas where low carbon ICT will be supported, and where dynamic, reinforcing effects from the use of the same underlying infrastructure can be realised.

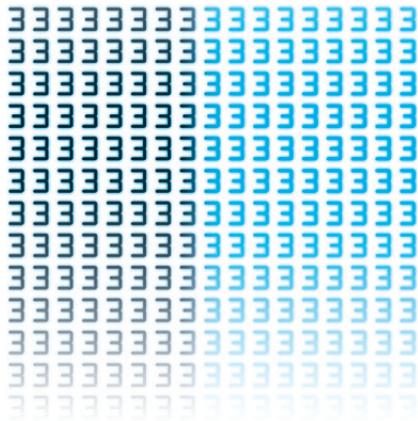
- Targets for emission reductions should include medium-term targets in order to encourage transformative solutions and provide a clear direction for investments. Targets should be based on actual emission reductions (not from moving emitting companies elsewhere), and also consider embedded and export emissions.
- In order to move beyond incremental CO<sub>2</sub> improvements to transformative savings, the positive potential of ICT services should be acknowledged in all key policy documents, e.g. transport policies should include the use of Intelligent Transport Systems and telework, not just focus on improved transport. Energy policies should include smart grids, not only focus on energy supply.
- Encourage universal access to ICT for all citizens. Mobile broadband can enable a multitude of low carbon services, including an inclusive and collaborative approach to travel substitution that allow for connectivity of rural areas. Support for solutions that enable synergies between rural and urban development are crucial.

## 2. Shift focus from a 20<sup>th</sup> century physical infrastructure to a 21<sup>st</sup> century low carbon information infrastructure

A 21<sup>st</sup> century infrastructure will require a well-functioning broadband network in order to enable services such as telework, virtual meetings, smart buildings, intelligent transport and dematerialisation of products.

- ICT/telecom investments should be an integrated part of all major infrastructural investment plans. Governments should stimulate the uptake of broadband services that enable dematerialisation, i.e. when goods can be provided in a digital form instead of a physical form.
- The possibility for new wireless solutions that do not depend on parallel infrastructure should always be explored, e.g. a new tower infrastructure for road safety and security might be unnecessary if wireless 3G networks could be used for the same purpose.
- The introduction of broadband enabled services should be incorporated in city planning, including control instruments to prevent low carbon solutions e.g., smart housing projects, from being penalised through higher taxes and complex administrative procedures.

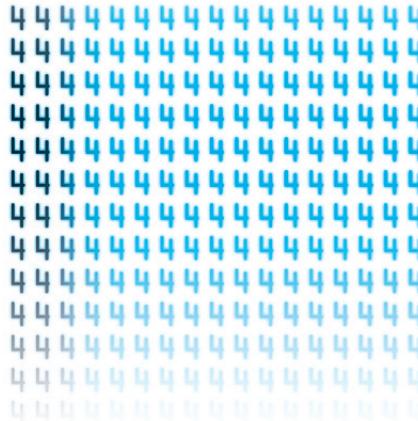
<sup>31</sup> The structure is based on the "Green Digital Charter" that will be launched at the Eurocities AGM in Stockholm in November. Many of the concrete suggestions have been developed in dialogue with a number of stakeholders. A web survey was sent out to a selected number of thought leaders in the area of ICT and low carbon development. 30 people provided input and the suggestions based on this. The survey questions can be found on [www.panda.org/ict](http://www.panda.org/ict)



### 3. Encourage cross-sectoral partnerships with a focus on developing new and innovative services

Partnerships between industry sectors and other stakeholders to promote a green digital agenda should be promoted.

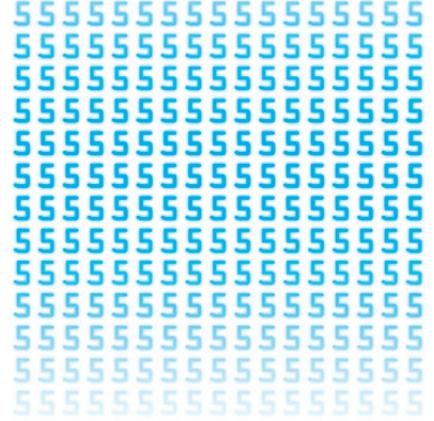
- Encourage solutions that provide CO<sub>2</sub> reductions of 90% or more in order to highlight transformative solutions. Focus on technology deployment that will deliver widespread economies of scale and promote collaboration between nations. Developing countries should consider leap-frog possibilities from ICT.
- Support a common approach to measure the positive impact that transformative solution providers, like ICT companies, can have. The actual development of the approach should take place in international bodies. Interoperability and standardisation issues should also be considered between sectors as well as the opportunity for machine-to-machine (M2M) technology to deliver low carbon solutions.
- Motivate companies through public procurement processes. Ask companies how they can help reduce emissions in society through the solutions they provide, in addition to reducing emissions from their products and operations.



### 4. Lead by example and create a level playing field

Policy makers should provide positive examples of low carbon ICT use and ensure a level playing field where decisions in one policy area do not negatively impact emission reduction opportunities in other areas.

- Incentives to reduce CO<sub>2</sub> emissions should be based on an understanding of how different policies can affect the scope for providing low carbon services. For example, when the goal is to reduce emissions from commuting all measures, from tax rebates for biofuel for cars to investment in broadband that enables telework, should be assessed together.
- Luxury taxes on ICT that slow uptake of sustainable solutions should be avoided. For many years, a digital divide was created because the poor could not afford access to mobile phones. The same mistake should not be made with smart work and other low carbon solutions that also increase productivity and drive innovation.
- Public procurement should focus on shifting from products to services. For instance, a meeting service could be purchased instead of travel services.



### 5. Open innovation for low carbon solutions

The development of low carbon solutions should be promoted through innovative research and development activities.

- Increase financial support and incentives for research and development between different types of stakeholders that traditionally may not work together, such as ICT companies, health providers and city-planners to deliver low carbon solutions for society.
- Support innovative systems that result in more energy efficient goods.<sup>32</sup> Such support could include the opportunity to purchase low carbon services such as e-reading subscriptions, video on demand, m-health and m-banking.
- Demonstration projects where low carbon solutions are implemented are needed. Stimulate innovative initiatives that encourage uptake of ICT services that enable transformative solutions such as smart buildings, m-health and smart grids. Deployment projects could include initiatives to develop interactive smart meters that could enable buildings becoming net producers of renewable energy.<sup>33</sup>

32 An interesting example is the Japanese initiative with Eco-points, bonus points from purchasing energy efficient equipment that can be used to pay for more energy efficient goods, <http://eco-points.jp/EP/index.html>  
33 <http://www.infodev.org/en/Article.392.html>, <http://www.ideaewicket.com/>

**A 20<sup>th</sup> century physical infrastructure (often supporting high carbon solutions)**

Airports, roads, tunnels, bridges, street lamps, parking lots, fueling stations and so on, represent a 20<sup>th</sup> century infrastructure. It principally delivers high carbon services and investments in this infrastructure can deliver more of the same, or at best marginally improved, high carbon infrastructure. In order to reach the emission reductions needed to prevent climate change, we need to compare systems of different nature that deliver the same service and include the emissions which may be hidden in infrastructure so that true carbon impacts become visible.

**A 21<sup>st</sup> century information infrastructure (often supporting low carbon solutions)**

Fiber optic cables, mobile network radio base stations and servers constitute some elements of a low carbon 21<sup>st</sup> century infrastructure. This is the most energy efficient infrastructure ever created as it provides connectivity and moves information instead of atoms. In addition, fixed and mobile broadband allow information to flow at the speed of light around the planet. Investments in this infrastructure can reinforce several different low carbon solutions that all depend on the same infrastructure such as virtual meetings, smart grids, m-governance, m-health, e-paper, etc. Even though these services might look very different from a user perspective they are all depending on the same 21<sup>st</sup> century infrastructure. An infrastructure that within ten years will allow tens of billions of connected devices to communicate also enabling a multitude of machine-to-machine (M2M) solutions.

**THIS PAPER IS A RESULT OF THE JOINT WORK BETWEEN ERICSSON AND WWF SWEDEN**

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WWF is the world's largest and most experienced independent conservation organisation, with almost 5 million supporters and a global network active in more than 90 countries

WWF's mission is to stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature, by:

- conserving the world's biological diversity.
- ensuring that the use of renewable natural resources is sustainable.
- promoting the reduction of pollution and wasteful consumption.



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