

Chapter 2

Environmental Burden Reduction and Local Revitalization via Green ICT

This chapter will examine the ways in which Green ICT can contribute to the realization of a sustainable society, and introduce best practice examples of the use of Green ICT to revitalize local communities.

Section 1

Why is Green ICT Important?

We will introduce the concept of Green ICT and the ways promotion of Green ICT can be effective in mitigating environmental burden, based on the latest available data. In addition, we will examine the importance of Green ICT policies by giving an overview of Green ICT related policies enacted in various developed countries.

1. What is Green ICT?

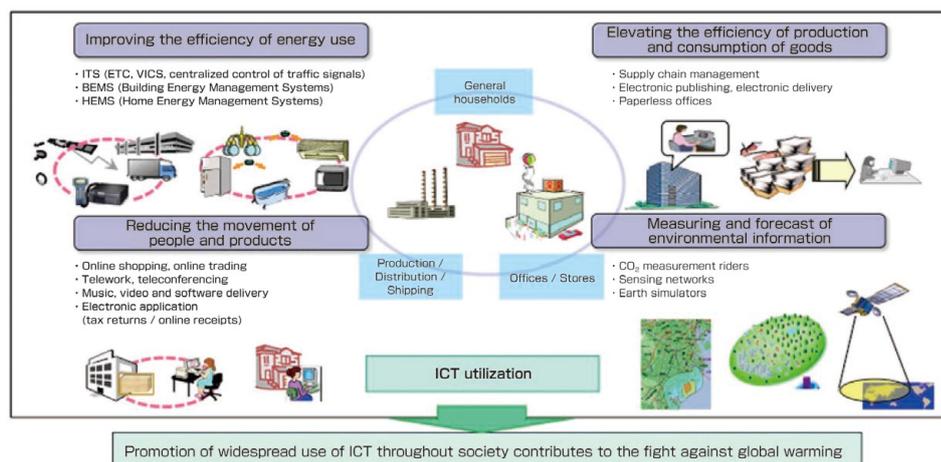
The problem of global warming is a worldwide one requiring urgent action, and high expectations are placed on Green ICT, which contributes to drastic reduction of CO₂ emissions through promotion of expanded ICT use.

Green ICT refers to two concepts, “Green by ICT” (using ICT to reduce environmental burden) and “Green of ICT” (improving the environmental performance of ICT itself.)

(1) Using ICT to reduce environmental burden (Green by ICT)

In corporate and general household activities, ICT can be used to measure and forecast environmental information, as well as improving the efficiency of energy consumption, reducing the volume and elevating the efficiency of production and consumption of goods, and reducing the need for movement of people and products, all of which reduce the volume of CO₂ emissions. Widespread use of ICT throughout society, leading to such CO₂ emission reductions, is known as “using ICT to reduce environmental burden (Green by ICT)” (Figure 2-1).

Figure 2-1 Using ICT to reduce environmental burden (Green by ICT)



(Source) Ministry of Internal Affairs and Communications “Report from Study Group on ICT Policy for Addressing Global Warming”

(2) Improving the environmental performance of ICT itself (Green of ICT)

If the use of ICT to reduce environmental burden (Green by ICT) progresses, while CO₂ emissions can be reduced drastically in the directly affected fields and sectors, the volume of data and traffic involved in environmental measurement and forecasting will increase above that of conventional methods, leading to an accelerating rise in power consumption and CO₂ emissions from ICT itself⁶. In addition, henceforth the wider use of cloud computing technology will lead to increasing centralization in data centers of information and communications facilities previously dispersed at individual companies. This could potentially lead to a rise in

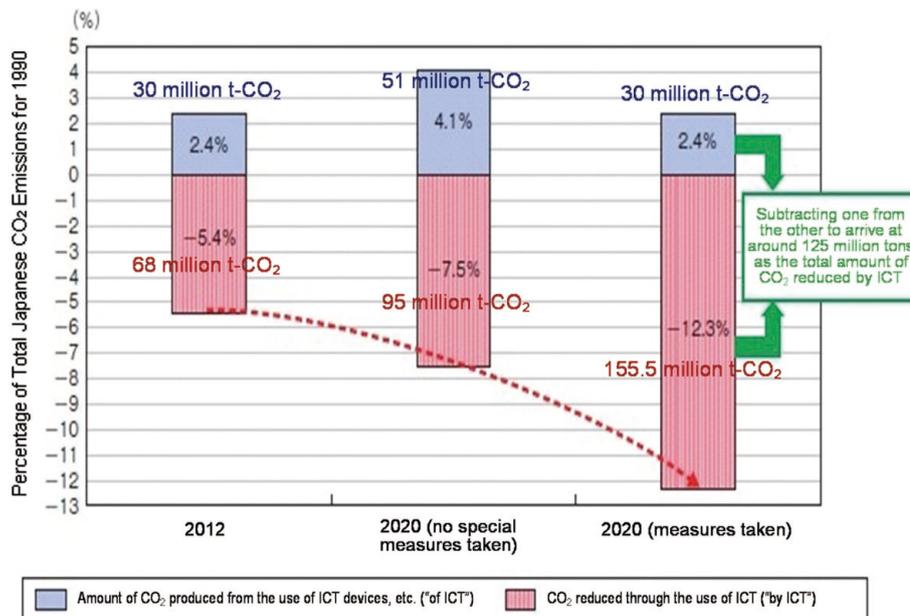
electric power consumption and CO₂ emissions at these data centers (for lighting, heating and cooling, etc.) In order to resolve this state of affairs, it is necessary to build on technological innovations to reduce the electricity consumption and environmental burden of ICT itself (Green of ICT) and halt a potential rise in the volume of CO₂ emissions.

2. Effect of Green ICT on CO₂ Reductions

In terms of the CO₂ emissions reductions accompanying Green by ICT (use of ICT to reduce environmental burden), the implementation of various ICT-dependent measures such as introduction of smart grids, through building energy management, streamlining of distribution, and movement toward paperless operations in a wide range of sectors, could potentially reduce emissions by up to 150 million tons by 2020. This is equivalent to a 12.3% reduction in CO₂ emissions compared to 1990 levels. As for the CO₂ produced from the use of ICT itself, if no particular measures are taken, by 2020 the electricity consumption in various sectors and the continued society-wide penetration of ICT will have produced a major jump in emissions. However, if measures including research and development (R&D) and testing of optical fiber networks and technology for efficient use of frequency resources, more energy-efficient ICT devices and data centers, and promotion of the cloud paradigm are taken, it is possible to keep 2020 emissions more or less equivalent to 2012 levels⁷, or approximately 30 million tons.

The net reduction in CO₂ emissions through Green ICT thus comes to approximately 125 million tons (Figure 2-2), equivalent to around 10% of Japan's 1990 CO₂ emissions, indicating that Green ICT has a major contribution to make in achieving the target of 25% cut in greenhouse gas emissions.

Figure 2-2 CO₂ emissions reductions through Green ICT



*Electrical power consumption rate: 0.41 kg-CO₂

**"No special measures taken": If ICT utilization proceeds in the current manner and no new measures are taken to curb CO₂ emissions resulting from ICT equipment

**"Measures taken": In addition to expanding the sectors in which ICT is utilized, accelerating promotion of its use to the greatest possible extent, and taking effective measures to curb CO₂ emissions resulting from ICT equipment

(Source) Compiled from Ministry of Internal Affairs and Communications "ICT Policy Task Force for a Global Era, 5th Global Issues Study Group materials", and Year 2020 CO₂ Reductions through ICT (Environmental Issues Working Group)

⁶ Equipment and facilities to be targeted for "Green of ICT" include fixed line phones, fax machines, cellular phones, routers, LAN switches, servers, mainframes, PCs, storage devices, printers, and air conditioning in data centers, etc.

⁷ Deviation values estimated by the MIC Study Group on ICT Policy for Addressing Global Warming (http://www.soumu.go.jp/main_sosiki/joho_tsusin/policyreports/chousa/ict_globalwarming/index.html)

3. Green ICT-related policies of various countries

Currently, the US, the EU and other developed countries and regions have been launching Green ICT-related policies as a part of national strategy. Here, we will introduce the Green ICT policies of the US and the UK, which are seen as being particularly forward-thinking in terms of Green ICT policy implementation.

(1) The US

A. The Green New Deal Policy

Recognizing that the US is the world's largest emitter of greenhouse gases, the Green New Deal stimulus package seeks to turn efforts to reduce environmental burden into a means of revitalizing industry. In January 2009, a 150 billion dollar (approximately 13.5 trillion yen), ten-year investment in renewable energy and the creation of five million "green jobs" were publicly announced, and at the end of 2010, a package providing for 2.5 million jobs related to improving the energy efficiency of public facilities was announced as well. The Green New Deal Policy has attracted widespread interest around the world for its declaration of enormous sums of money toward the government-led effort to create jobs out of environmental business.

B. The Smart Grid concept

In the US, the existing electrical infrastructure is becoming increasingly decrepit, and the construction of a highly reliable, efficient and clean next-generation Smart Grid is being pursued, incorporating proactive utilization of ICT, optimization of transmission networks and resources, introduction of advanced electrical storage technology such as electric vehicles, timely supply of electric power information and electric power management capabilities to consumers. The Smart Grid concept was first advocated in the December 2007 Energy Independence and Security Act, and 11 billion dollars (approximately 990 billion yen) are set aside for smart grid-related projects in the American Recovery and Reinvestment Act of February 2009.

In addition, President Barack Obama in October 2009 announced that about 3.4 billion dollars (around 306 billion yen) in grants would be earmarked for 100 smart grid projects administered by electric companies and city governments, among others. In concrete terms, this entails subsidization of the introduction of 200,000 of the smart transformers essential to electric power companies' administration of transmission and distribution networks, 850 transmission grid sensors, and 700 automated substation systems, as well as 18 million smart meters that help manage electricity consumption in homes, one million home-use displays, 170,000 smart thermostats, and 175,000 load control units. With around 200 American companies and communities involved in the project, it is expected to generate tens of thousands of jobs⁸.

C. Save Energy Now (in Data Centers)

Save Energy Now in Data Centers is a US Environmental Protection Agency (EPA) program building on the recognition that while data centers are a rapidly growing segment of the US economy, they consume massive amounts of energy and are in need of improved energy efficiency. The program contains a wide range of supportive measures to this end. Specifically, these include providing electricity consumption measurement devices free of charge, providing best practice examples of power consumption reduction methods, honoring data centers achieving major reductions in power consumption with awards, paying grants to state governments that support the program, and implementation of a Data Center Certified Energy Practitioner Program.

Through these support measures, the EPA aims to reduce annual power consumption at US data centers by 10 billion kWh by 2011.

⁸ Refer to NTT Data Corporation in "Digital Government US Monthly News (2010) Smart Grid Trends in the US" (http://e-public.nttdata.co.jp/f/repo/685_u1003/u1003.aspx)

(2) The UK

A. SOGE (Sustainable Operation on the Government Estate) and Greening Government ICT

SOGE is an umbrella term for initiatives to reduce consumption of energy at government facilities and owing to government activities, targeting all UK governmental institutions. It aims to reduce CO₂ emissions of governmental institutions to 12.5% below 2007 levels by fiscal 2010. To this end, the goal of making all governmental ICT carbon neutral⁹ by 2012 has been set, and the Greening Government ICT program is being promoted, aiming to boost the energy efficiency of ICT used in UK governmental institutions. In concrete terms, this entails ongoing day-to-day efforts to reduce energy consumption under the guidance of governmental CIOs (chief information officers). These efforts are measured and evaluated with a Green ICT Scorecard featuring over 300 evaluation criteria.

B. CRC (Carbon Reduction Commitment)

A “CRC” is a mandatory emissions trading scheme governing energy consumption during operation of institutional buildings such as office buildings, commercial buildings, hotels and hospitals run by corporations and groups in the UK private and public sectors. After a three-year trial period starting in April 2010, it is scheduled to have a full-fledged launch. Specifically, organizations with an annual electric power consumption of 6,000 MWh or more (converted to the monetary amount of an electric bill, this comes to around one million pounds, or about 150 million yen). Emissions allowances for each corporation or group are determined by annual bidding. As for the prices of credits¹⁰, they are fixed at 12 pounds (around 1,800 yen) per ton of CO₂ for the three-year trial period, but thereafter will also be determined by annual bidding. The profits from bidding are estimated at around 755 million pounds (around 113 billion yen) per year, all of which will be returned to the participants.

⁹ Refers to achieving net zero carbon emissions from production activities, etc. by balancing a measured amount of carbon released with an equivalent amount offset through afforestation or introduction of natural energy sources

¹⁰ A carbon credit is a generic term meaning that a value has been assigned to a reduction or offset of greenhouse gas emissions. In general, the value of a credit is a unit of volume of emissions reduction compared with the baseline, or estimated volume of emissions if improvements are not made.

Section 2

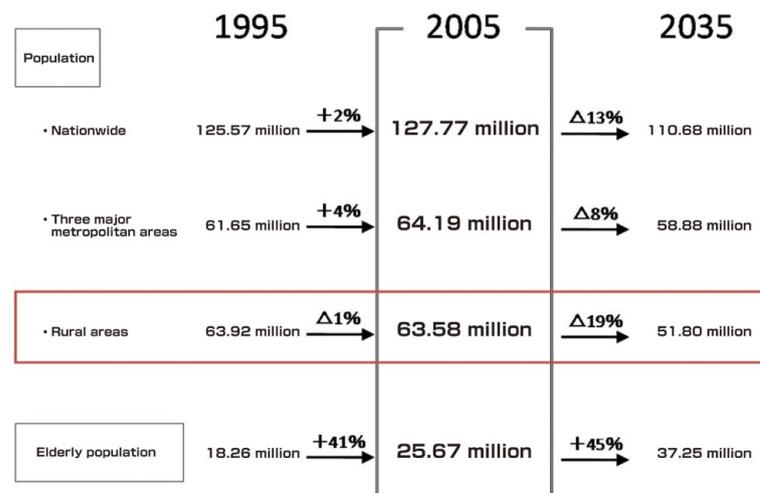
The Road to Local Revitalization via Green ICT

This section will examine the necessity of leveraging Green ICT to revitalize local communities, and give best practice examples of the use of Green ICT in the agriculture, forestry and fisheries sectors.

1. How Green ICT contributes to revitalization of local communities

The total population of Japan is expected to shrink drastically over the next 30 years, with Japan entering an era in which populations decline both in the three major metropolitan areas and outside them. In addition, the ongoing decline of the birthrate could potentially lead to severe depopulation especially outside major metropolitan areas (Figure 2-3).

Figure 2-3 The advent of an age of nationwide population decline and accelerated aging of society



(Source) Compiled from the "Haraguchi Vision"

Particularly when it comes to environmental aspects, Japan is a nation structured so as to sustain and protect its urban areas, in terms of disaster prevention, cultivation of water resources, safe and secure food supply, absorption of carbon dioxide by forests, and so on. For this reason, if rural areas degenerate and their environments are devastated, there is great risk of ensuing damage to the environment not only of urban areas but also of the country as a whole. To avoid such a situation, it is necessary for each rural region to make maximum use of its local resources (rich natural environment, renewable clean energy, safe and plentiful food supply, cultural and historical resources, investors with vision). This can be accomplished through cooperation and joint efforts by residents, local governments, NPOs to construct the necessary frameworks and promote the revival of community ties.

2. Examples of revitalization of local communities through utilization of Green ICT in the agriculture, forestry and fisheries sectors

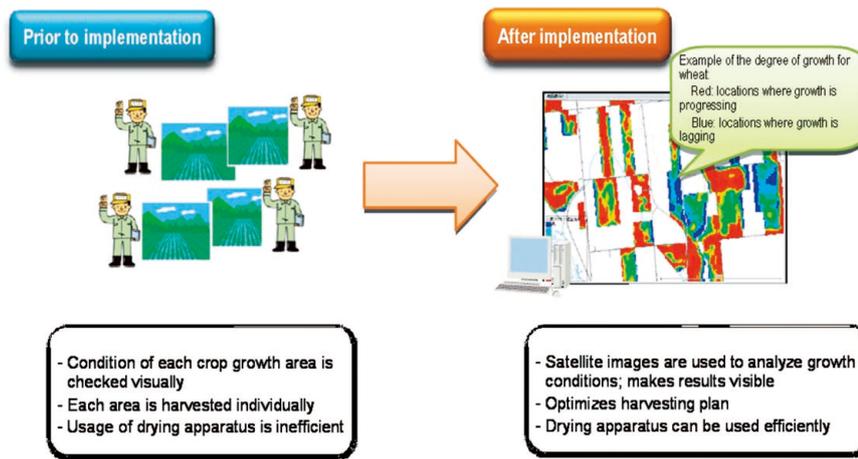
Agriculture, forestry and fisheries are key industries for Japan's rural regions, and require that local resources such as soil, air, water and forests be used with maximum effectiveness. At the same time, recent increases in environmental awareness have led to calls for sustainability. Here we will give an overview of the initiatives of JA Shihoro, which aim not only to reduce CO₂ emissions but also to combine promotion of industry with revitalization of the local community.

Equipment such as large-scale combines and drying facilities are shared in JA Shihoro, meaning that previously farmers had to visit fields in person and check the progress of barley growth (or drying), after which the order of harvesting would be determined based on the progress of growth.

However, a system was introduced in which satellite imaging was used to analyze the growth conditions, and the results of the analysis displayed as a different color for each field (Figure 2-4). Further, the system determines the optimal time of harvest and order in which field should be harvested based on this analysis, achieving reductions in the amount of energy needed to dry crops after the harvest and improvements in the efficiency of harvesting labor.

It is credited with reducing annual CO₂ emissions by 10,090 kg (Figure 2-5), with mitigating the competition and inequality among residents that accompanied the determination of harvesting order, and with fostering a revived sense of community. Reasons this initiative has been successful is that it was developed from the start through unified efforts by all stakeholders (farmers, JA, system development enterprises, and so on), that it was made so that the system's operation reflects the viewpoint of farmers on the front lines, and that ICT technology appropriate to the characteristics of the area was used (in that the vast Tokachi plains are suited to satellite imaging).

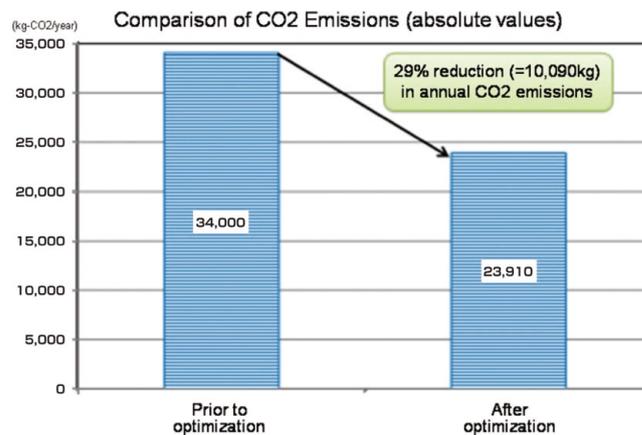
Figure 2-4 Satellite imaging analysis of wheat fields



(Source) Compiled from report on Local Information Portals, Ministry of Internal Affairs and Communications

Figure 2-5 CO₂ emissions reduction through barley harvesting optimization based on satellite imaging analysis

Item	CO ₂ emissions reduction (kg- CO ₂ / year)
Reduction in consumption of energy (fuel)	10,100
Increase in energy consumption due to ICT equipment	-10 (increase)
total	10,090



(Source) Compiled from report on Local Information Portals, Ministry of Internal Affairs and Communications