Follow-up on the Voluntary Action Plan for Global Warming in Hospitals

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Satoshi IMAMURA,[*1] Takashi HATANAKA,[*2] Yoshihito KARASAWA[*3]

Introduction

This report summarizes the Japan Medical Association (JMA) 2009 Follow-Up Report (formulated in March 2010) on the Voluntary Action Plan for Global Warming in Hospitals, which is the result of the second follow-up survey on the Action Plan formulated in 2007. It is based on a questionnaire survey of actual conditions, focused chiefly on the degree of achievement of numerical targets and the state of countermeasures against global warming over the period April 2008–March 2009, a continuation of a survey conducted in the previous year. It also has been reported to the government of Japan as a progress report on the target achievement of voluntary countermeasures against global warming by the JMA and others.

Development of Action Plan

The Kyoto Protocol Target Achievement Plan approved by the cabinet in April 2005 calls for each industry to formulate a voluntary action plan setting targets for preventing global warming and for steady implementation of such plans. For this reason, in 2007 the JMA formulated the Voluntary Action Plan for Global Warming in Hospitals, focused chiefly on private hospitals, and in August 2008 it formally approved this plan as a deciding body, as its own plan.

Furthermore, since the Japanese government requires follow-up on the achievement of this plan each year, analysis and study for purposes of such follow-up on the plan have been conducted since 2008.

In the future it will be important that each hospital and other institution voluntarily promote on its own countermeasures against global warming at a more practical level. In addition to sharing and communication of information with four hospital associations (the Japan Hospital Association, the All Japan Hospital Association, the Japanese Association of Psychiatric Hospitals, and the Association of Japanese Healthcare Corporations) and the representatives of prefectural medical associations, each organization is promoting further practical countermeasures against global warming.

Main Results of Follow-up on the Voluntary Action Plan

Carbon-dioxide emissions base units in 2008 showed a decrease of 7.9% in comparison with the previous year of 2007, which represents, as was seen in the previous year, a substantially greater reduction than the annual target of 1.0% (**Table 1**). At the same time, energy-consumption base units, which significantly impact carbon-dioxide emissions base units, also decreased in 2008 by 6.2% vs. 2006. As such, it is important to continue promoting measures to reduce these energy-consumption base units and carbon-dioxide emissions base units.

One of the main reasons behind these achievements of numerical targets has been thought to be efforts to reduce carbon-dioxide emissions, with a particularly large factor being the impacts of reductions in amounts of fossil fuel

*1 Executive Board Member, Japan Medical Association, Tokyo, Japan.
*2 Head of Research, Japan Medical Association Research Institute, Tokyo, Japan (hatanaka@jmari.med.or.jp).
*3 Past President, Japan Medical Association, Tokyo, Japan.

Table 1 Degree of achievement of targets of the Voluntary Action Plan for Global Warming in Hospitals

		2006*1 (Base year)	2007 (Actual)	2008 (Actual)	2012 Target
Target:	Year-on-year rate of reduction in carbon-dioxide emissions base units	−2.8%	−4.1%	−7.9%	1.0% reduction vs. previous year
Reference:	Carbon-dioxide emissions base units ($kg\text{-}CO_2/m^2$)	127.1 <100.0>	121.9 <95.9> (100.0)	112.3 <88.4> (92.1)	(Reference value) 119.7 <94.2>
Reference:	Scale of hospital industry (Number of hospitals)	7,604 <100.0>	7,550 <99.3> (100.0)	7,497 <98.6> (99.3)	—
Reference:	Volume of activities in hospital industry (Total floor area, 1,000 m^2)	64,271 <100.0>	65,793 <102.4> (100.0)	63,072 <98.1> (95.9)	(Reference value) 73,209 <113.9>
Reference:	Volume of energy consumption in hospital industry (TJ)*2	160,060 <100.0>	165,080 <103.1> (100.0)	149,866 <93.6> (90.8)	—
Reference:	Energy-consumption base units (MJ/m^2)*3	2,490 <100.0>	2,509 <100.8> (100.0)	2,335 <93.8> (93.0)	—
Reference:	Carbon-dioxide emissions in the hospital industry (10,000 $t\text{-}CO_2$)	817.0 <100.0>	802.3 <98.2> (100.0)	718.8 <88.0> (89.6)	(Reference value) 876.1 <107.2>

Note: For the purpose of comparison with the base year of 2006, the actual end-user emissions base unit figure of 0.410 $kg\text{-}CO_2/kwh$ for 2006, announced by the Federation of Electric Power Companies of Japan, is used for the carbon-dioxide emissions coefficient of electricity.
*1 Fiscal year.
*2 Tera Joule.
*3 Mega Joule/Square meters.

usage such as fuel oil and kerosene, and switching energy sources from fuel oil and kerosene to electricity and gas, due to promotion of construction intended to switch energy sources.

In the future as well, even if consumption of fossil fuels were to increase temporarily due to a rapid drop in crude-oil prices, when viewed from a long-term perspective, there are limits to production of petroleum resources. It is expected that reductions in consumption of fuel oil and kerosene and switching energy sources to electricity and gas will advance, so that there is a high likelihood that the targets of the voluntary action plan will be achieved.

Participating Hospitals and Follow-up Method

According to the 2008 Medical Facility (Movement) Survey/Hospital Report/Outlook, the size of the hospital industry in 2008 (private hospitals and those not established by national or local government, national universities, or independent administrative agencies) was 7,497 hospitals (100.0%). After eliminating duplication between the four hospital associations, this figure includes 5,680 hospitals (2005 survey) participating in this voluntary action plan, for a participation rate of 75.8% (**Table 2**).

Follow-up was conducted based on a questionnaire survey of actual conditions. A total of 4,632 hospitals were subject to the survey, while responses were received from 1,513 hospitals, for a coverage ratio of 26.6% of the participating hospitals. This coverage ratio in 2008 showed a marked increase from the ratios of 17.1% in 2006 and 21.5% in 2007.

Detailed Results of Follow-up on the Voluntary Action Plan

Target achievement

Target of the Voluntary Action Plan for Global Warming in Hospitals
The numerical target index is carbon-dioxide emissions base units from energy (carbon-dioxide emissions per total floor area, $kg\text{-}CO_2/$

Table 2 Participating hospitals and coverage ratios

(Numbers of hospitals)

	Scale of hospital sector overall		Scale of hospital industry		Hospitals participating in the voluntary action plan	
2008*1	Hospitals	8,794 <98.3>	Hospitals	7,497 (100.0%) <98.6>	Participating hospitals	5,680 (75.8%) <100.0%>
					Hospitals subject to questionnaire survey of actual conditions	4,632 (61.8%)
					Responses <Coverage ratio>*2	1,513 <26.6%>
					Response rate	32.7%
2007	Hospitals	8,862 <99.1>	Hospitals	7,550 (100.0%) <99.3>	Participating hospitals	5,680 (75.2%) <100.0%>
					Hospitals subject to questionnaire survey of actual conditions	3,389 (44.9%)
					Responses <Coverage ratio>	1,223 <21.5%
					Response rate	36.1%
2006	Hospitals	8,943 <100.0>	Hospitals	7,604 (100.0%) <100.0>	Participating hospitals	5,680 (74.7%) <100.0%>
					Hospitals subject to questionnaire survey of actual conditions	3,389 (44.9%)
					Responses <Coverage ratio>	973 <17.1%>
					Response rate	28.7%

Note: The number of hospitals participating in the voluntary action plan represents the number after eliminating duplication between the four hospital associations (the All Japan Hospital Association, the Japan Hospital Association, the Japanese Association of Psychiatric Hospitals, and the Association of Japanese Healthcare Corporations), as calculated in 2005 by the All Japan Hospital Association.

*1 Fiscal year.

*2 The coverage ratio represents the ratio of the number of hospitals responding to this questionnaire survey of actual conditions to the number of hospitals participating in the voluntary action plan.

(Source: 2006/2007/2008 Medical Facility (Movement) Survey/Hospital Report/Outlook, Ministry of Health, Labour and Welfare of Japan.)

m^2 (square meters)), with the goal being an annual reduction of 1.0% from the base year of 2006 through 2012.

Performance on carbon-dioxide emissions base units in 2008 showed a decrease of 7.9% vs. the previous year, and a value of 88.4 when compared to the base year of 2006 (100.0), for a decrease greater than the target of an annual reduction of 1.0%. While the carbon-dioxide emissions base unit in 2006 was 127.1 kg-CO_2/m^2 (100.0), in 2008 the figure was 112.3 kg-CO_2/m^2 (88.4). At the same time, energy-consumption base units, which significantly impact carbon-dioxide emissions base units, also decreased from 2,490 Mega Joule/m^2 (100.0) in 2006 to 2,335 MJ/m^2 (93.8) in 2008. As such, there is a need to continue promoting measures to reduce these energy-consumption base units and carbon-dioxide emissions base units.

Total carbon-dioxide emissions from the hospital industry in 2008 fell by 10.4% year on year, from 8,023,000 t-CO_2 (100.0) in 2007 to 7,188,000 t-CO_2 (89.6) in 2008.

Efforts toward target achievement

It is thought that the main reasons behind the fact that reductions greater than the plan's targets were achieved in 2008 include the contributions of the main efforts toward reduction of carbon-dioxide emissions, similar to past efforts (**Table 3**). A particularly large factor in reduction of carbon-dioxide emissions has been the impacts of reductions in amounts of fossil fuel usage such as fuel oil and kerosene, and switching energy sources from fuel oil and kerosene to electricity and gas, due to measures such as promotion of construction intended to switch energy sources.

Table 4 organizes the state of implementation of the main countermeasures against global warming implemented in years 2006–2008 across five fields, from the questionnaire survey of actual

Table 3 Main efforts thought to have contributed to reduction of carbon-dioxide emissions base units

- Reductions in amounts of fuel oil and kerosene used and switching energy sources from fuel oil and kerosene to electricity and gas, through measures such as promotion of construction intended to switch energy sources
- Improvement of insulation performance of buildings etc. through expansion and renovation construction, and adoption of high-efficiency equipment
- Adoption of appropriate operations management giving consideration to energy conservation, matched to the actual conditions of hospital management
- Promotion of multiple energy-saving activities focused on air-conditioning and lighting
- Promotion of energy-saving activities, whether organizationally or not

Table 4 Status of implementation of main countermeasures against global warming in the voluntary action plan

Category	Countermeasure	Countermeasure implementation rate (%)			
		2006* (Base year)	2007	2008	2009– (Future reference targets)
Lighting equipment etc.	Lighting matched to time of use	85.0	83.4	84.3	89.0
	Turning off lights near windows during daytime	57.8	59.0	62.9	70.4
	Use of high-efficiency lighting equipment	41.6	45.7	41.9	67.5
Air-conditioning equipment	Periodic filter cleaning	96.8	96.8	95.8	97.4
	Turning off air-conditioning at nighttime and intermediate times	79.0	77.2	76.4	80.2
	Quickly turning off air-conditioning	60.3	66.9	67.8	75.7
	Optimization of external air intake	58.3	58.7	59.1	68.8
	Controlling air-conditioning temperatures taking energy conservation into consideration	53.6	67.4	63.7	76.7
Energy	Switching energy sources from fuel oil and kerosene to electricity and gas	—	—	—	—
	Adoption of high-efficiency equipment in connection with expansion and renovation construction	—	—	—	—
	Promotion of energy-saving activities, whether organizationally or not	42.1	60.1	61.3	—
Buildings	Promoting greenification of rooftops and hospital vicinities	39.3	40.6	37.3	46.9
	Partial suspension of elevator use during off-time	27.9	26.5	26.6	29.9
	Adoption of energy-saving vending machines	24.2	29.9	32.6	52.0
Other	Use of showers with temperature-adjustment features	73.0	69.7	65.1	70.8
	Use of water-saving faucets etc.	60.3	66.0	64.6	77.3
	Promoting appropriate use of nitrous oxide	52.0	48.5	48.0	52.5
	Effective reuse of water	21.9	25.1	22.0	31.9
	Encouraging visitors to use public transportation	17.1	15.2	15.3	21.5

* Fiscal year.

conditions. Of these, in the fields of lighting equipment etc., air-conditioning equipment, and buildings, as well as other fields, reference targets have been set in the voluntary action plan, and implementation of countermeasures toward these targets is being promoted.

Together with the questionnaire survey of actual conditions, the 2008 Follow-Up Report

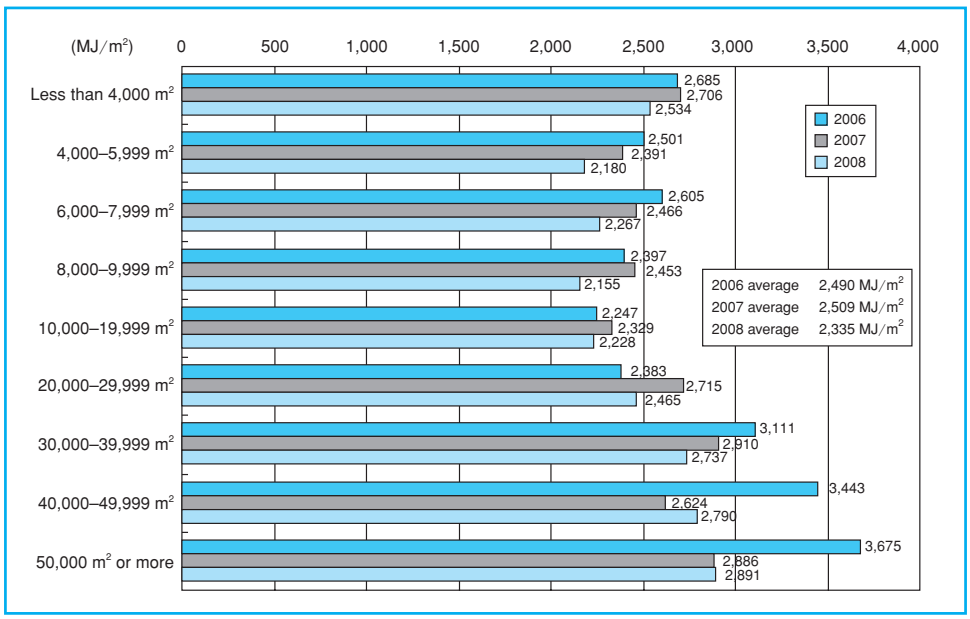

Fig. 1 Trends in energy-consumption base units by hospital size (total floor area)

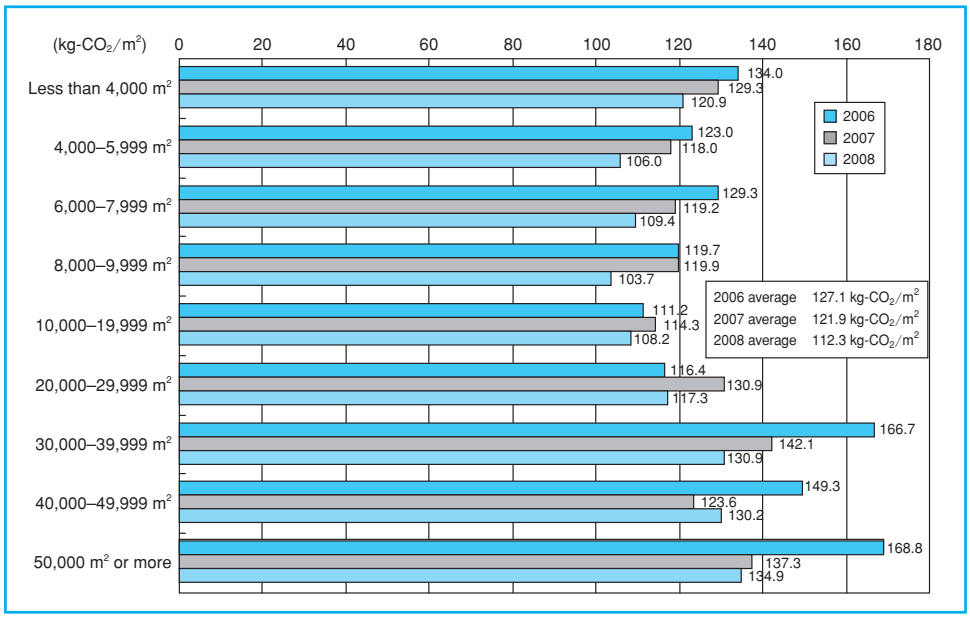

Fig. 2 Trends in carbon-dioxide emissions base units by hospital size (total floor area)

formulated in March 2009, was distributed to all 4,632 hospitals subject to the survey. Furthermore, data on actual energy consumption and data for comparisons between individual hospitals were prepared for 2007 (feedback sheets on the state of implementation of energy-saving activities) and these were provided as feedback to hospitals for use as benchmarks to promote self-directed energy-saving activities.

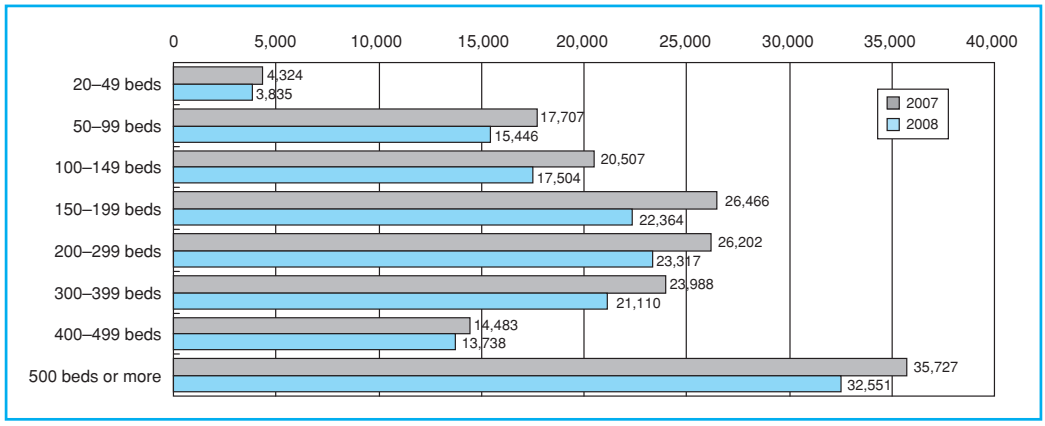

Fig. 3 Energy consumption in the hospital industry, by bed count (thousands GJ)

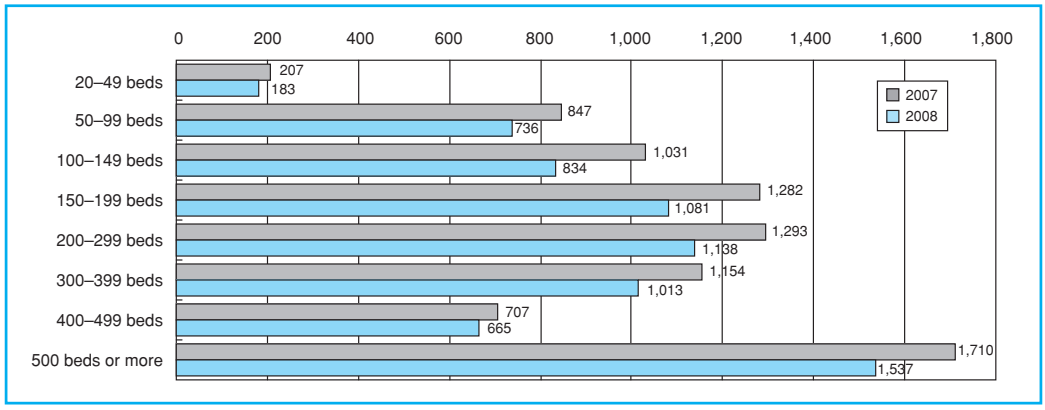

Fig. 4 Carbon-dioxide emissions in the hospital industry, by bed count (thousands t-CO_2)

Trends in energy-consumption base units and carbon-dioxide emissions base units at participating hospitals

A look at carbon-dioxide emissions base units by hospital size shows that this figure has decreased on the whole from 2007 to 2008 at hospitals except the size range 40,000–49,999 m^2, a clear indication that carbon-dioxide emissions base units have decreased regardless of hospital size (**Fig. 2**). While the same tendency is apparent from energy-consumption base units as well, hospitals of 40,000 m^2 or more showed a slight increase. Since these hospitals have large floor areas, there are concerns that this could disturb future carbon-dioxide emissions (**Fig. 1**).

A look at patterns in these energy-consumption and carbon-dioxide emissions base units by hospital size shows that the lowest values for these were those of 103.7 kg-CO_2/m^2 and 2,155 MJ/m^2, respectively, both at hospitals in the size range 8,000–9,999 m^2. These figures tended to increase for small hospitals of less than 4,000 m^2 and large ones of 50,000 m^2 or more in size. In other words, these results were characterized by a clear horizontal U-shaped pattern.

Hospital-industry energy consumption and carbon-dioxide emissions

Figures for 2007 and 2008 on energy consumption and carbon-dioxide emissions by bed count, derived by multiplying energy-consumption and carbon-dioxide emissions base units by hospital-industry activity volume (total floor area), are shown by bed count in **Figs. 3 and 4**. In both 2007 and 2008, trends in energy consumption and carbon-dioxide emissions by bed count were

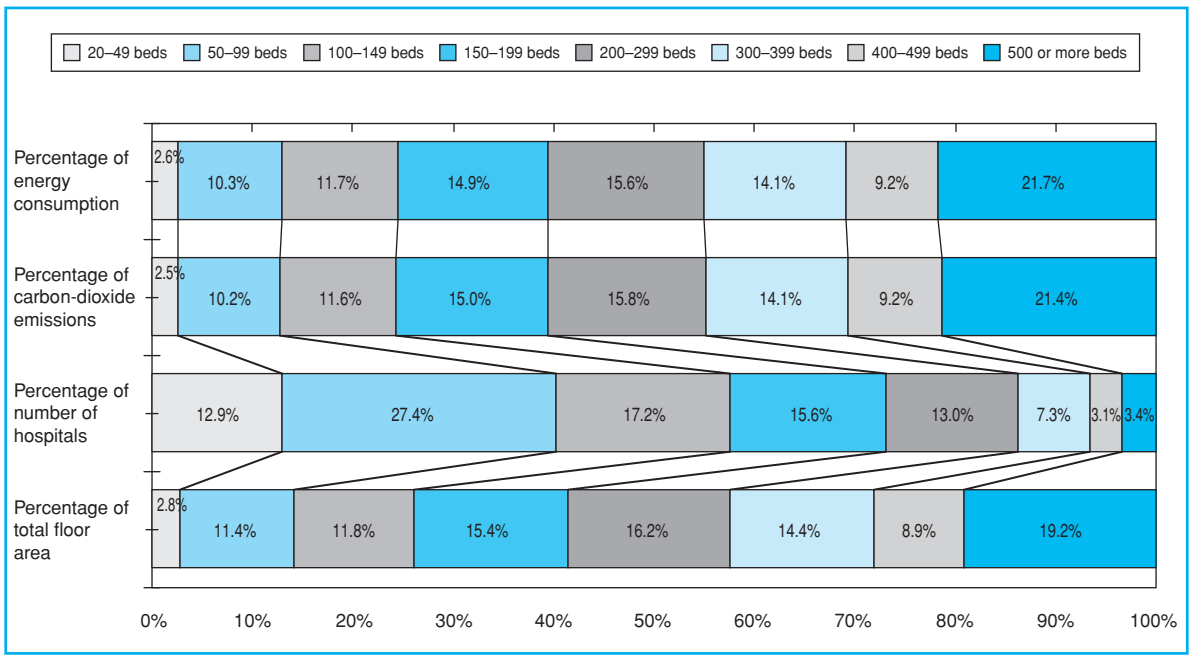

Fig. 5 Component ratios of energy consumption and carbon-dioxide emissions by bed count

the same, with hospitals of 500 beds or more showing the highest figures. In 2008, these figures were 32,551,000 GJ in energy consumption and 1,537,000 t-CO_2 in carbon-dioxide emissions.

The distribution of these results in 2008 for hospitals ranging from 20 to 499 beds shows a peak in the range 200–299 beds, with figures decreasing toward those for small hospitals in the range 20–49 beds and large ones in the range 400–499 beds, that is a distribution resembling an inverted "U" shape.

Structure of hospital-industry energy consumption and carbon-dioxide emissions

Figure 5 shows the component ratios of hospital-industry energy consumption and carbon-dioxide emissions by bed count, for comparison with numbers of hospitals and total floor area by bed count. While hospitals with 500 or more beds accounted for only 3.4% of the number of hospitals, they accounted for 21.7% of energy consumption and 21.4% of carbon-dioxide emissions, or approximately one-fifth of the total for each measure. Each of these percentages of the total has increased over the 2007 figure.

In addition, when this hospital size category is expanded to include those with 300 or more beds (total), then while such hospitals accounted for only 13.8% of the number of hospitals, they accounted for 45.0% of energy consumption and 44.7% of carbon-dioxide emissions, or just under one-half of the total for each measure. As with the category of hospitals with 500 or more beds, each of these percentages of the total has increased over the 2007 figure.

On the other hand, while hospitals with less than 99 beds (total) accounted for about two-fifths (40.3%) of the number of hospitals, they accounted for 12.9% of energy consumption and 12.7% of carbon-dioxide emissions, or just over one-tenth of the total for each measure. Also, each of these percentages of the total has decreased slightly, from the 2007 figure.

Conclusion

Carbon-dioxide emissions base units in 2008 totaled 112.3 kg-CO_2/m^2, for a decrease of 7.9% in comparison with the previous year (2007), which represents a substantially greater reduction than the annual target of 1.0%. In addition, this carbon-dioxide emissions base unit figure already has surpassed the target figure to be achieved by 2012. The main reasons behind this reduction are

thought to be the progress in switching energy sources from fuel oil and kerosene to electricity and impact of the carbon-dioxide emissions efficiency in electricity. Even if energy-consumption base units were to increase in the future due to falling crude-oil prices, when viewed from a long-term perspective, there are limits to production of petroleum resources. Since it is expected that reductions in consumption of fuel oil and kerosene and switching energy sources to electricity and gas will advance over the long term, there is a high likelihood that the targets of the voluntary action plan will be achieved.

However at large hospitals of 40,000 m^2 or more in floor area, both energy-consumption and carbon-dioxide emissions base units are increasing. Since such energy consumption and carbon-dioxide emissions accounts for very large percentages of the total figures for all hospitals, countermeasures against global warming at large hospitals are extremely important.