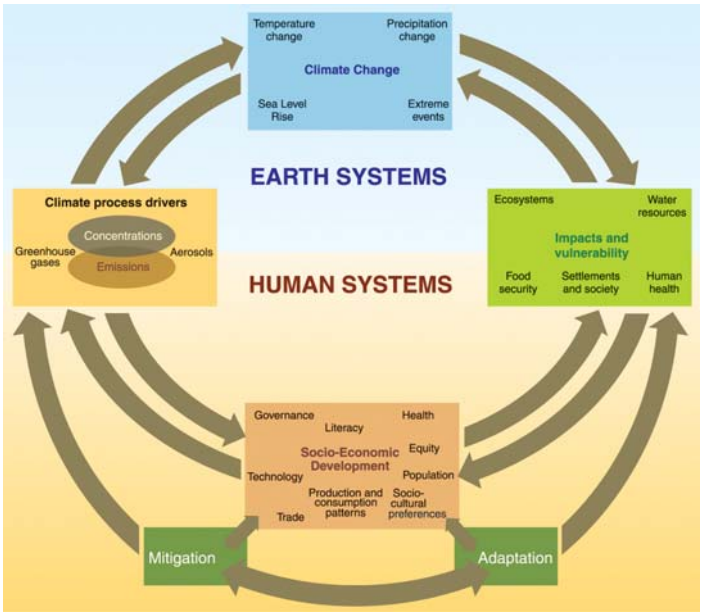
Japan's Carbon Footprint & Future Energy Sources

Introduction - Combating Climate Change

It is now widely accepted that a core part of combating the problem of global climate change is for nations to introduce policies and regulatory measures aimed at reducing their carbon footprint. Carbon emission trading schemes (ETS), policies that facilitate the replacement of fossil fuels with 'new' energy (renewable energy) and use of clean technologies are at the cornerstone of action towards combating climate change.*1*

The following diagram published by the Intergovernmental Panel on Climate Change (IPCC) shows the impacts and vulnerability of social and economic systems in relation to climate change and illustrates the interaction of the earth and human systems.

Diagram 1. 'IPCC Climate Change'



*Source: Intergovernmental Panel on Climate Change*2

The Introduction of a Carbon Tax in Australia

While the focus of this article is on Japan's carbon emission targets and its current and future energy plans given the recent unprecedented passing of highly controversial legislation aimed at imposing an economy-wide tax on carbon pollution by the Australian government, it is timely to take a brief overview of the related carbon tax in Australia, which is expected to be closely observed by other countries as they contemplate their own respective carbon emission schemes and use of energy into the future. The topic is particularly

1 The online Parliamentary Library of Commonwealth of Australia is an excellent resource for obtaining detailed information about Climate Change and related issues. See - Mitigation, Parliamentary Library of Commonwealth of Australia, 19 November, 2010, http://www.aph.gov.au/library/pubs/climatechange/responses/mitigation/mitigation.htm

2 Intergovernmental Panel on Climate Change (IPCC), **http://www.ipcc.ch/graphics/syr/figi-1.jpg**

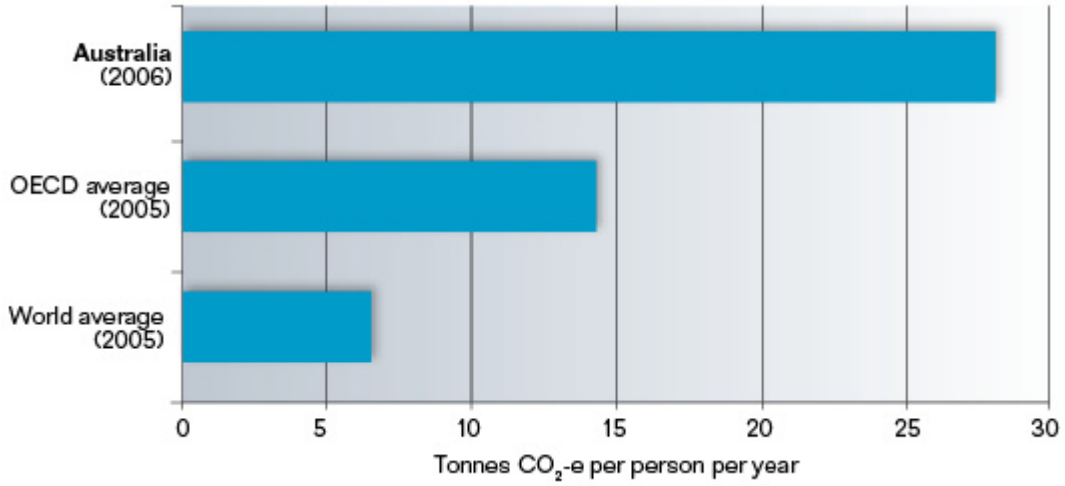
relevant considering that in May of this year the International Energy Agency (IEA) estimated that energy-related carbon-dioxide (CO2) emissions for 2010 were the highest in history.*3*

Australia's Greenhouse Gas Emissions (GHGE)

As one of the industrialised world's largest emitters on a per-capita basis, and responsible for approximately 27 tonnes per person of GHG emissions, Australia has an implicit degree of obligation to the global community to take aggressive steps towards reducing its carbon footprint. As stated in the 2008 Garnaut Climate Change Review;

> Australia's per capita emissions are the highest in the OECD and among the highest in the world. Emissions from the energy sector would be the main component of an expected quadrupling of emissions by 2100 without mitigation.*4*

Figure: Per Capita Greenhouse Gas emissions

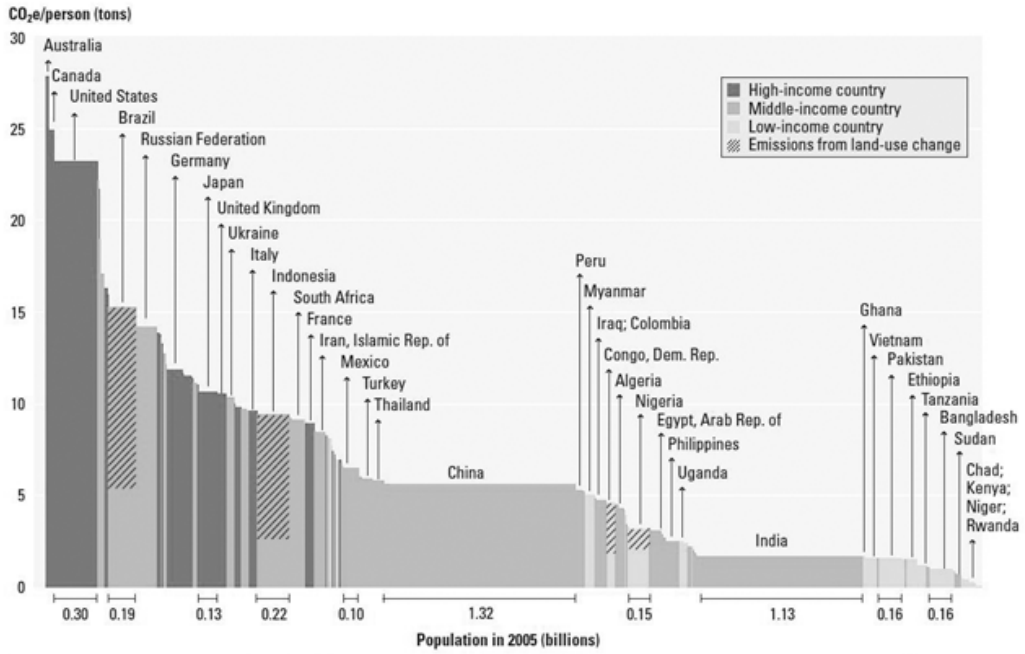


Sources: DCC (2008c); IEA (2007a)

3 Prospect of limiting the global increase in temperature to 2ºC is getting bleaker', International Energy Agency, 30 May 2011**,** http://www.iea.org/index_info.asp?id=1959

4 The Garnaut Climate Change Review "Australia's emissions in a global context", October 2008, *www.garnautreview.org.au/chp7.htm*

World Bank's Chart of Emissions Per Person in Selected Countries[5]



Note: The width of each column depicts population and the height depicts emissions per person, so the area represents total emissions. Emissions per person of Qatar (55.5 tonnes of carbon dioxide equivalent per person), United Arab Emirates (38.8) and Bahrain (25.4)—greater than the height of the y-axis—are not shown. Among the larger countries, Brazil, Indonesia, the Democratic Republic of Congo and Nigeria have low energy-related emissions but significant emissions from land-use change; therefore, the share of land-use change is indicated by the hatching.

Source: World Bank 2009, World development report 2010, p. 39.

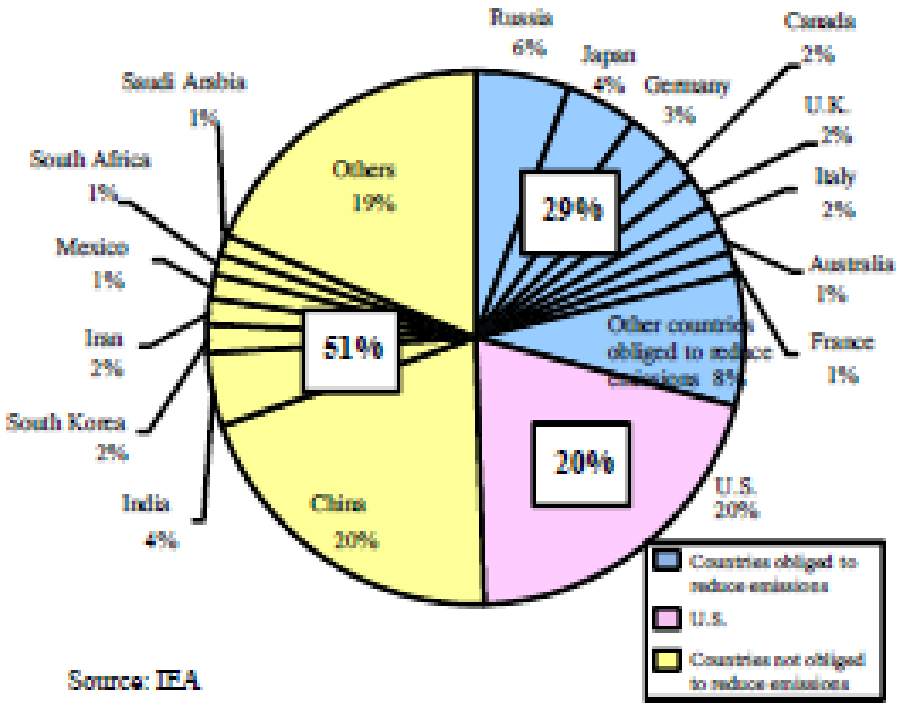
Australia's target is to reduce GHG emissions by 160 million metric tons by 2020 from 2000 levels and the current plan is to pledge an 80 percent reduction in GHG emissions by 2050 from 2000 levels.

As part of Australia's commitment to imposing an economy-wide cost on carbon pollution, against a background of fierce opposition by conservative political and industry quarters, the Australian government made the decision earlier this year to tax the country's top 500 polluters who currently produce 60 percent of national emissions, at A$23 per metric ton of carbon. The scheme will serves as a precursor to the planned introduction of a full cap-and-trade market-based emissions trading scheme in 2015.

> *"Other countries will look at one of the most carbon polluting economies on the planet that has made one huge stride forward toward putting a price on carbon," said John Connor, CEO, of The Climate Institute think tank in Sydney. "That should be a boost for those who are calling for this everywhere from Japan, South Korea, South Africa through to the United States," he said.*

5 Published in Garnaut, Ross, The Garnaut Climate Change Review—Update 2011**,** 'Australia in the Global Response to Climate Change Summary', http://www.garnautreview.org.au/update-2011/garnaut-review-2011/chapter3.html

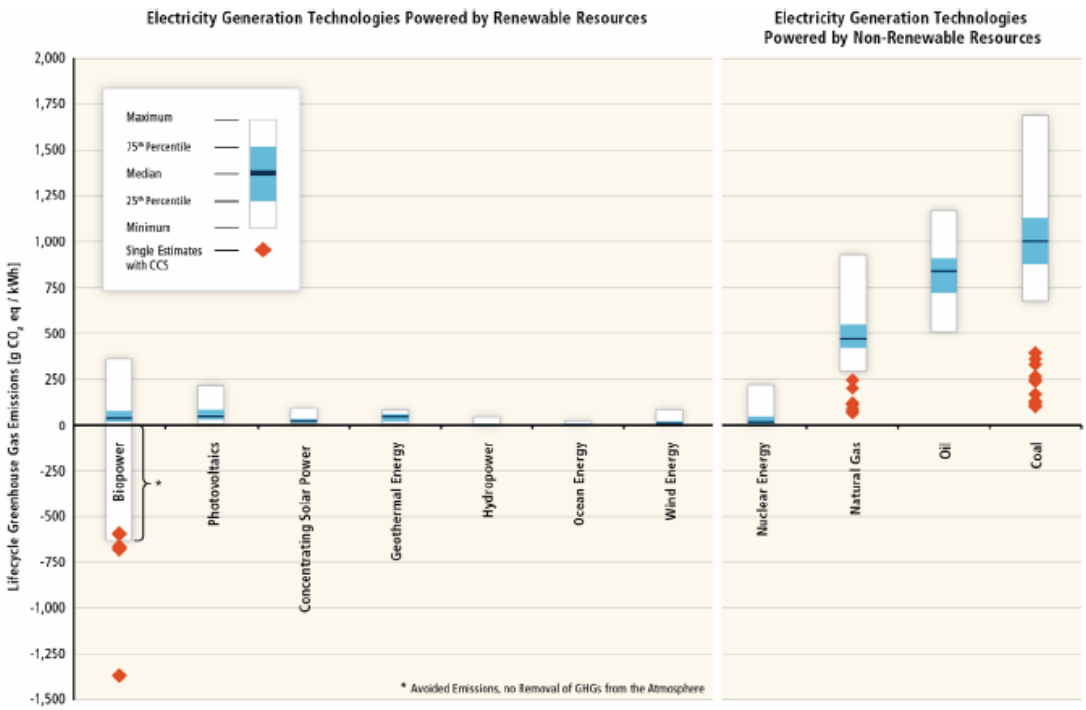
Figure 1: CO2 Emissions of Energy Origin in the World (2006)



Source: International Energy Agency (*IEA*)

Although only producing about 1% of world's total CO2, due to its relatively small population and heavy reliance on fossil fuels, particularly coal accounting for about 80 percent of electricity, Australia's pollution output is much dirtier on a per-capita basis causing emissions to be considered greater than many nations with a similar scale of GHG emissions. Australia is making its own national efforts to encourage investment in renewable energies, which in general are considerably lower in terms of their lifecycle GHG emissions than those of fossil fuel sources.

Lifecycle GHG emissions Renewable Energy Versus Fossil Fuels



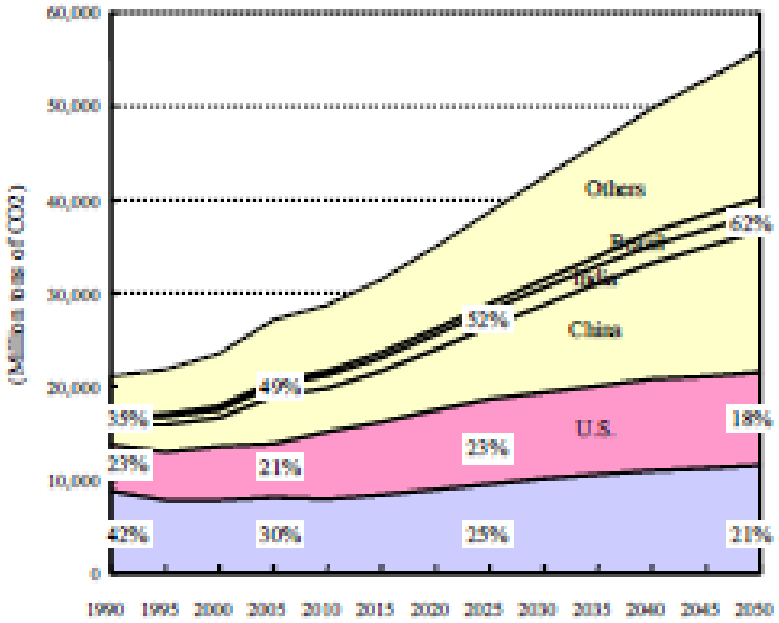
*Source: Intergovernmental Panel on Climate Change*6

6 Intergovernmental Panel on Climate Change

Japan's Carbon Footprint

With the world's third largest economy after the United States and China respectively, Japan is the fourth largest energy consumer and greenhouse gas (GHG) emitter following the United States, China, and Russia. Japan's per capita fossil-fuel CO_2 emission rate for 2008 stands at 2.59 metric tons of carbon. Japan is dependant on fossil fuels for 80% of its primary energy supply and 90% of these fossil fuels are imported.

Figure 2: Outlook for CO2 Emissions in the World



Source: Research Institute of Innovative Technology for the Earth (RITE)

While it has set targets for its reduction in GHG emissions under the Kyoto Protocol, following the recent Fukushima nuclear disaster, which led to massive electric power shortages and a rise in anti-nuclear power sentiment amongst the general public, Japan is now in the situation where the introduction of new energy and the promotion of energy conservation is more important than ever particularly if it is to achieve the level of pledged reductions in emission. Furthermore, the Japanese government has been forced to temporarily suspend recent policy planning aimed at introducing revisions to its climate policy and ETS legislation as it focuses on the reconstruction of the Tohoku region and contemplates the future of nuclear energy and how it is best to proceed with ensuring Japan will have a stable and sufficient energy supply in both the immediate and long-term. Wind power, solar power, and power generation utilizing biomass are some of the energy systems that will become the future pillars of energy for Japan.

Japan's Energy Plan Established in October 2003, Japan's energy plan is established by the government pursuant to the Basic Act on Energy Policy. It sets the basic direction of the national energy policy in line with the three fundamental principles of energy policy;

Securing of a stable supply

Environmental suitability

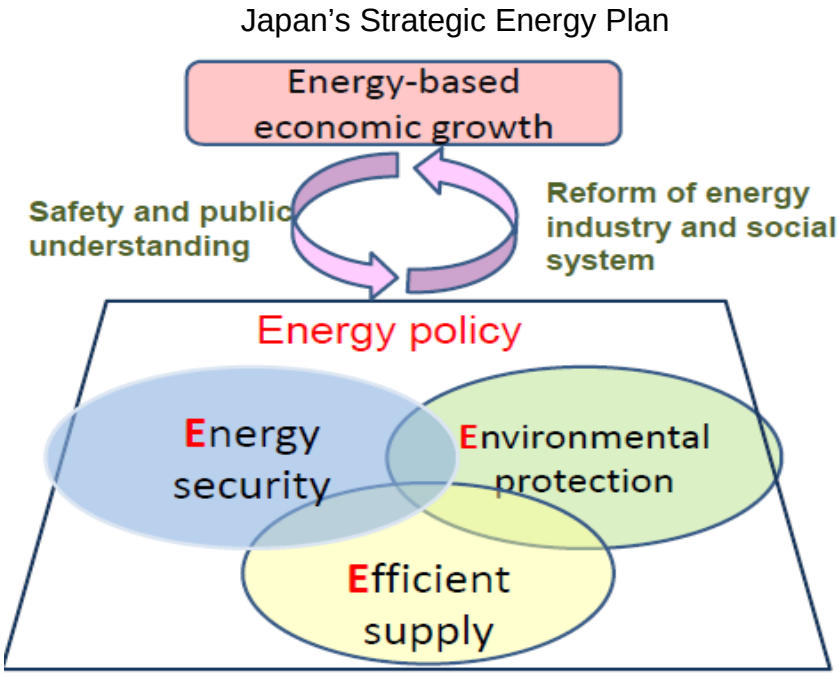
Utilization of market mechanisms

Japan's energy plans are currently reviewed at least every three years, and revised if and when needed. In light of significant changes in the situation associated with natural resources and energy over the past few years, the government fully revised the Basic Energy Plan and Cabinet approved and passed an updated 'Strategic Energy Plan' in June 2010.

The Strategic Energy Plan of Japan

In addition to the three fundamental principles of national energy policy (energy security, energy conservation, and efficient supply), the Strategic Energy Plan of Japan focuses on new perspectives: economic growth based on energy and structural reform of the energy industry and provides a framework for the fundamental change in the country's energy supply and demand system over the next twenty years (up until 2030.)

Diagram: The Strategic Energy Plan of Japan



Source: The Strategic Energy Plan of Japan-Meeting global challenges and securing energy futures - (Revised in June 2010), June, 2010, METI, Japan[7]

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7 The Strategic Energy Plan of Japan-Meeting global challenges and securing energy futures - (Revised in June 2010), June, 2010, METI, Japan, http://www.meti.go.jp/english/press/data/pdf/20100618_08a.pdf

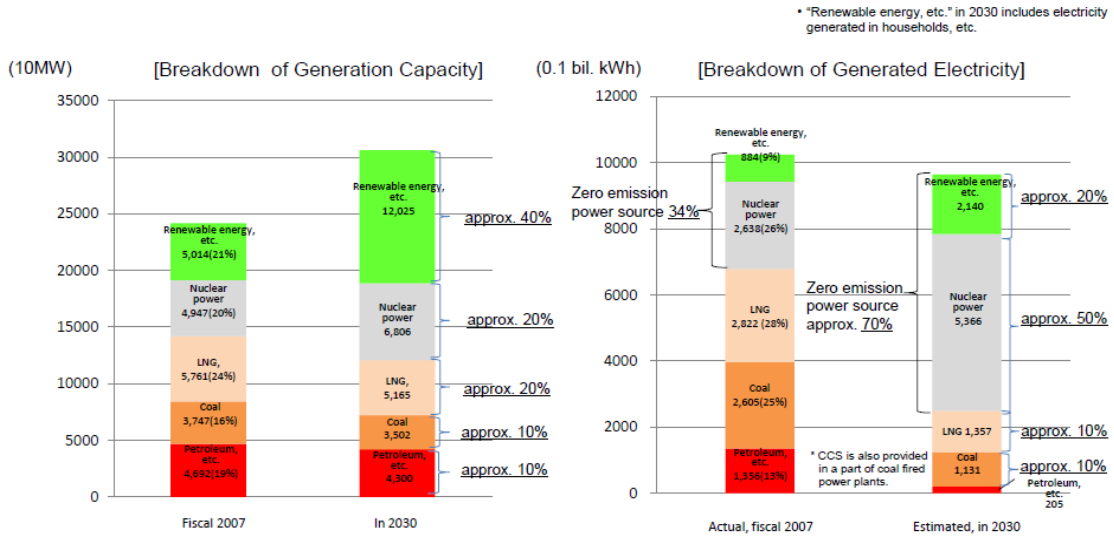
Under the guidelines of the current Strategic Energy Plan by 2030 Japan hopes to double its self-sufficiency in conventional energy and by doubling its self-developed fossil fuel supply ratio from the current 26% the government forecasts its independent energy ratio, (from zero emitting power sources such as nuclear and renewable energies), to grow to approximately 70% up from the current ratio of 38%.

Japan's Balance of Primary Energy Supply

Sector of conversion		
	○ Renewable energy	Implementation of feed-in-tariff system (depending on institutional design)
	○ Nuclear power	Building additional 14 plants, facility utilization rate 90%

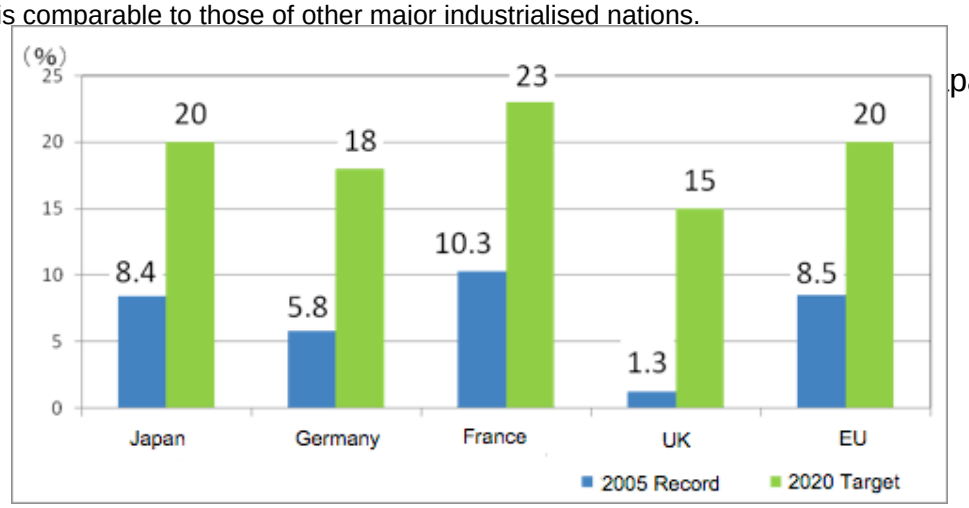
(Estimation result)

○ Zero emission power source ratio will become approx. 70%* (34% currently).



Renewable Energy in Japan

In 2005 the ratio of renewable energy to primary energy supply in Japan was 5.9%. Japan aims to increase its supply of energy from renewable sources approximately 12% by 2010. According to data compiled by METI based on documents released by each country, Japan's current and targeted introduction of renewable energy is comparable to those of other major industrialised nations.



Source: Compiled by METI on the basis of documents released by each country.

8 * Japan's renewable energy in final energy consumption in 2020 includes air thermal energy, etc
Note: The chart indicates the ratio of final energy consumption

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Japan's Greenhouse Emissions –Progress & Targets

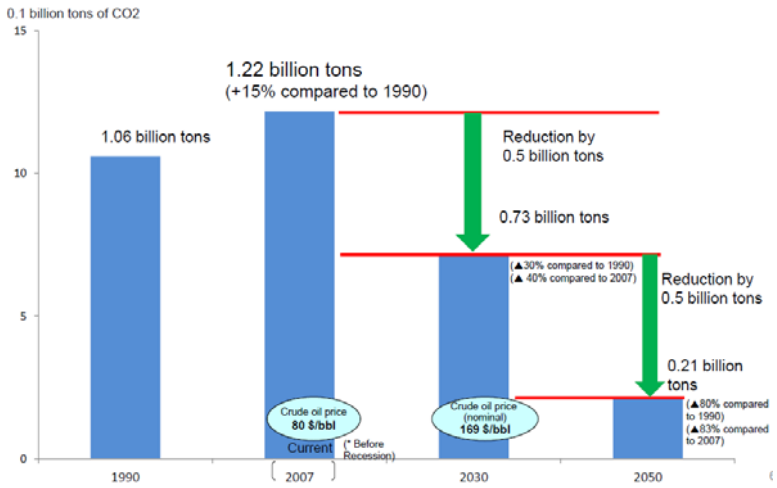
In 2010, as part of a $55 billion economic stimulus program, the Japanese government announced an official 5-year action plan aimed at reducing carbon emissions. Currently, Japan emits some 1.3 billion tonnes of greenhouse gases a year and has pledged a 25% reduction in GHG emissions by 2020 through increasing development and investment in renewable energy sources. It has also announced its aim to to reduce greenhouse gas (GHG) emissions by 60%-80% from current levels by 2050

GHG Reduction Targets toward 2030 – 2050

To help with meeting its targeted reduction goals by 2050, the Japanese government has announced the following key objectives to be realized by 2030;

- Doubling Japan's energy self-sufficiency ratio (18% at present) and the self-developed fossil fuel supply ratio (26% at present) and as a result, raising its "energy independence ratio"(※) to about 70% (38% at present)*9*.
- Raising the zero-emission power source ratio to about 70% (34% at present).
- Halving CO2 emissions from the residential sector.
- Maintaining and enhancing energy efficiency in the industrial sector at the highest level in the world.
- A 30% reduction in GHG emissions
- The estimated reduction of 30% (approximately 0.5 billion tons) in domestic energy related CO2 emissions by 2030, means that assuming policies and regulatory measures are sufficiently introduced Japan will realise about half of the targeted reduction of 60% that it has pledged to achieve by 2050 before 2030.

Long-term CO2 Emission Reduction Path



9 (※)The "energy independence ratio" is an indicator that combines the self-sufficiency energy with the self-developed energy supply divided by total primary energy sources. An average energy self-sufficiency rate among the OECD countries is almost 70%.

In order to achieve such ambitious targets the Japanese government has introduced a range of policies and measures to facilitate the promotion of new energies (including renewable energy) and clean technology.

Through the introduction of various measures and programs, including the provision of subsidies and loans, at both a national and local level the Japanese government is actively promoting a low carbon emitting society. Energy conservation schemes, investment in renewable energy systems, the adoption of clean energy technologies and 'green' procurement are all important areas of focus.

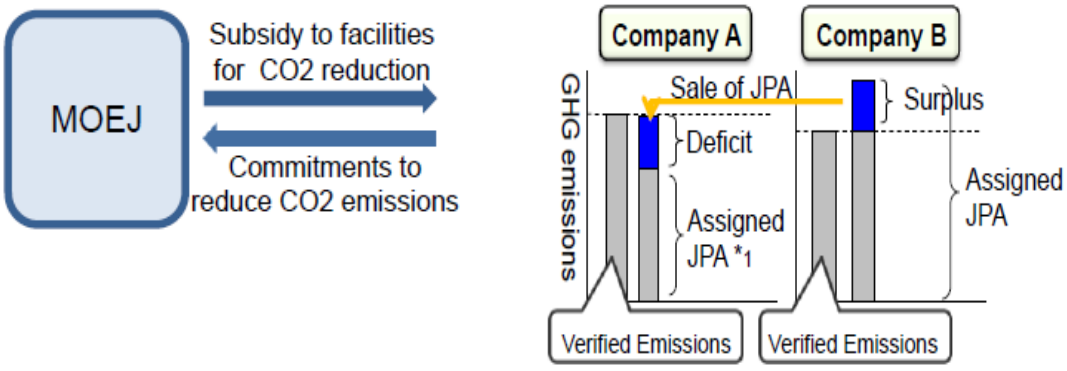
Japan's Voluntary Emissions Trading Scheme (JVETS)

Japan's response to climate change and the introduction of an effective carbon emissions trading scheme is most notable for its close collaboration between the government and industry and its Voluntary Emissions Trading Scheme (JVETS). JVETS is the first real experimental "Cap and Trade" ETS in Japan. It supports voluntary CO2 reduction activities by business operators to ensure their emission reduction targets in a cost-effective way with through access to subsidies rewarded to businesses that meet their set targets and permits trading of allowances between participants.*10*

The following outline of the scheme, its operational infrastructure and its achievements from 2006-2009 is based on information and data published in May 2011 by the Climate Change Policy Division of the Japanese Ministry of Environment's Office of Market Mechanisms as a summary overview of JVETS.

Basic Outline of JVETS

- Launched by MOEJ in 2005
- Supports voluntary CO2 reduction activities by business operators to ensure their emission reduction targets are managed in a cost-effective and smooth manner with the support of subsidy incentives and emissions trading (trading of emissions allowances)
- Participants of JVETS constitute a part of Experimental Integrated ETS (2008~).



*1：Assigned JPA = Base year emissions: an average of the actual emissions over the past three years (as verified in accordance with the rule of JVETS) e.g. 2.5 million-CO2 p.a) (An average for the past 3 years) – Committed reduction)

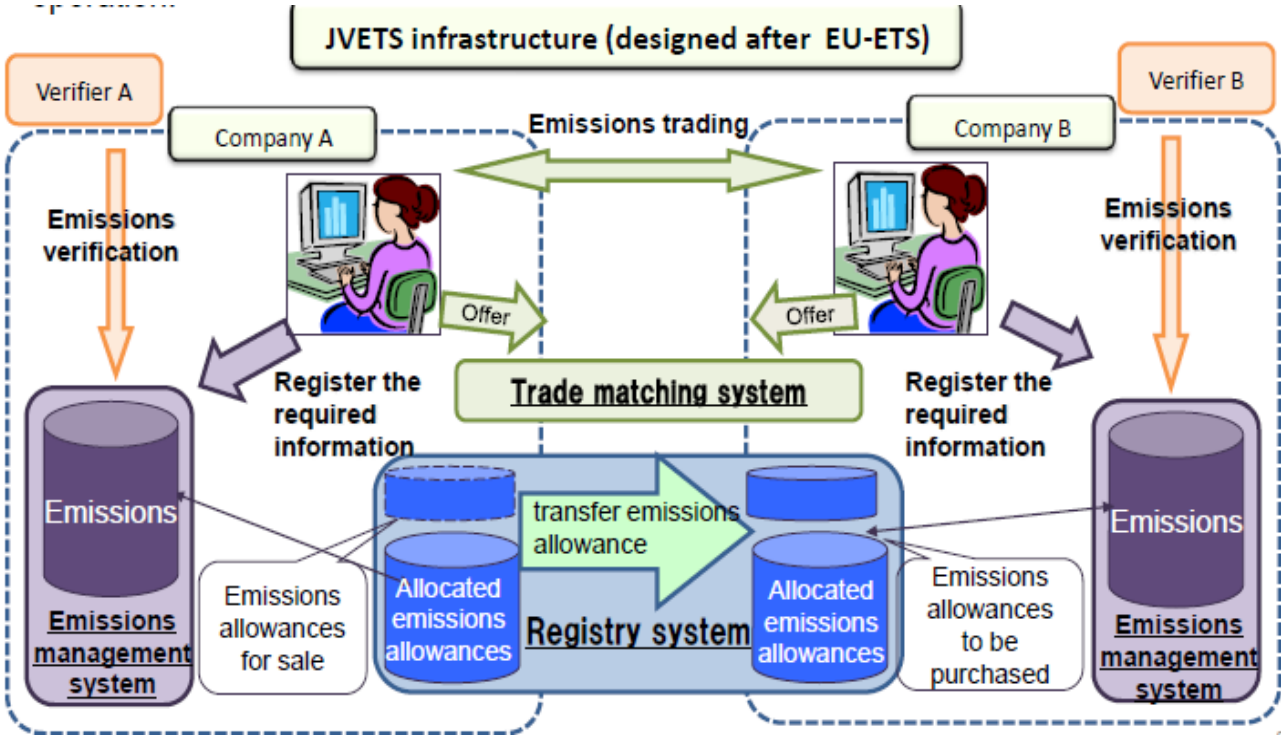
10 Japan's Voluntary Emissions (JVETS) 2011, Office of Market Mechanisms, Climate Change Policy Division, Ministry of the Environment, JAPAN, May 2011, http://www.env.go.jp/en/earth/ets/jvets1105.pdf

The main objective of JVETS was to offer opportunities for regulators as well as business to get first-hand experience with new types of emissions trading and other related regulatory tools. Companies participated in this scheme voluntarily by proposing emissions reduction targets for receiving subsidies from the MOE. The MOE would then review individual proposals on the basis of "cost-efficiency" optimization and allocate emission allowances to each participant. From April 2006 participants were able to trade allowances freely in order to reach their pledged emissions reduction. JVETS also features a banking system though which participants are permitted to transfer any excess emission allowances to the next phase. In case of non-compliance, the subsidy must be returned to the MOE.

JVETS Operation Infrastructure

The infrastructure of JVETS is modeled on the European Union's ETS.

One of the key merits of 'JVETS is that it has established a basic infrastructure (**monitoring of emission, reporting and verification guidelines**, a **registry system**, and **emissions management system** etc.) for future emissions trading schemes.'*11*



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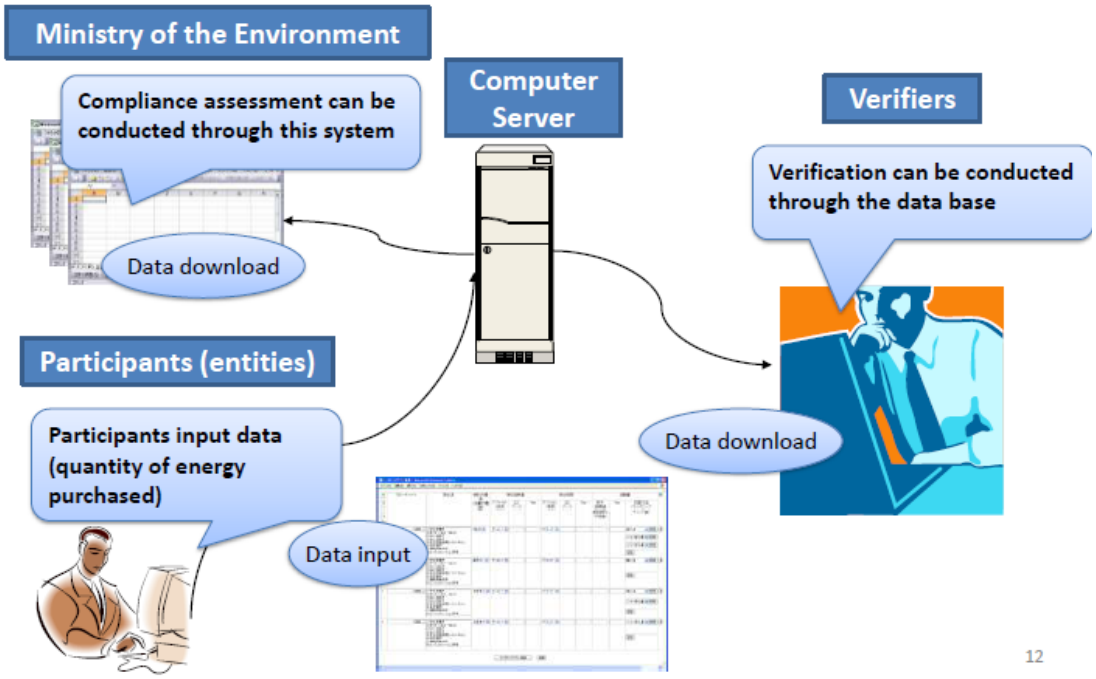
Three core information systems of JVETS*12*

System	System overview	Contribution
Registry system	• Manages the initial allocations (JPAs), emissions allowance transactions (trading) and retirement • Manages all accepted allowances and credits in JVETS (JPAs and jCER) • Emission allowance transaction time: 10am-6pm (JST) on business days	• No double counting and the same security level of allowance retirement as the national registry in Kyoto Protocol • Open access to the web-based registry system for all participants
Emissions management system	• Based on the emissions monitoring and reporting guidelines, all participants' emissions base years and their actual emissions amounts in their commitment periods are stored under the system. • The data are used for third-party verification. • EU-ETS verifiers voluntarily use similar management systems	• Integrated emissions calculation method • Streamlined emissions calculation and verification processes • Database of all stakeholder information
Trade matching system ("GHG-trade.com")	• Encourages emission allowance transactions among the participants • Requires pre-contacts before sales of allowances • Updates allowance prices and amounts for participants' transactions on the notice board. (After confirmation of the contract details, participants should pay to their clients' bank accounts and apply for allowance transactions in the registry system.)	• Opportunities for the participants to find their trading counterparts through the Internet

Emissions Management System of JVETS



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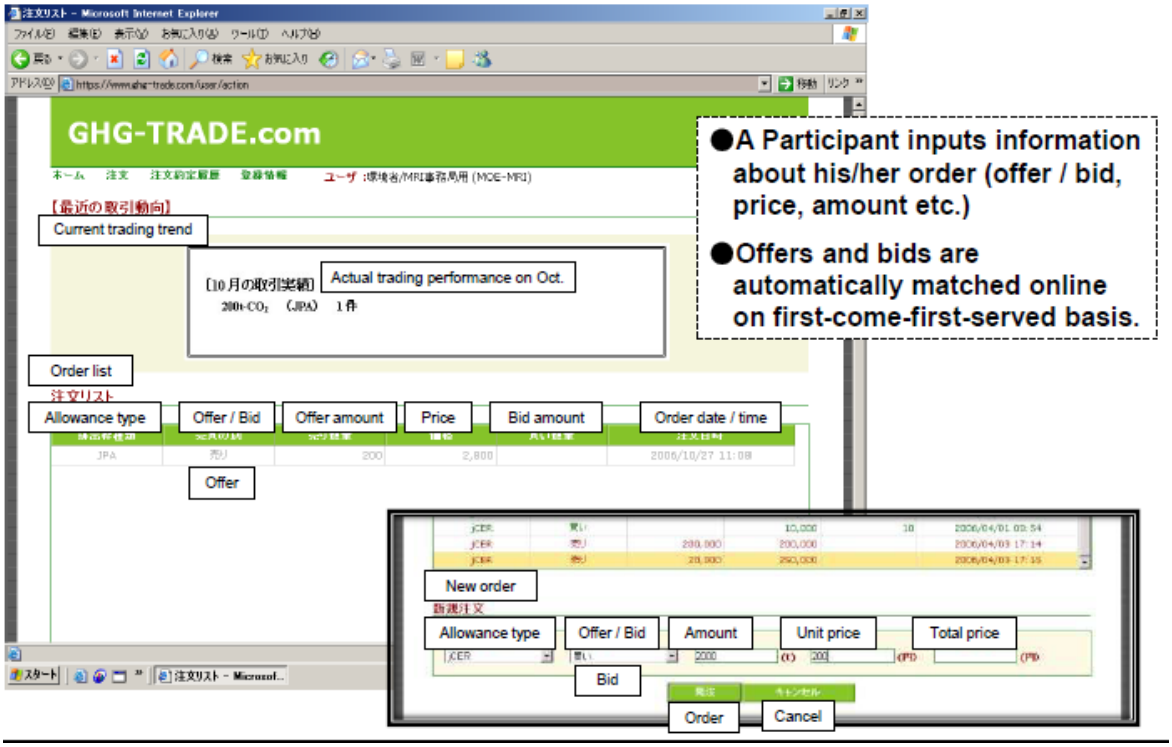
Trade Matching System of JVETS - "GHG-TRADE.com"

Web-based trading market for JVETS participants



Achievements – 2006-2009 (Total number of participants: 303 companies)*13*

Commitment Period	FY2006	FY2007	FY2008	FY2009
Achieved Reduction (kt-CO2)	377(29%)	280(25%)	383(23%)	950(28%)
Committed Reduction (kt-CO2)	273(21%)	217(19%)	136(8%)	335(10%)
Number of transactions	24	51	23	24
Average JPA price (JPY/t-CO2)	JPY1,212	JPY1,250	JPY800	JPY750

For further background information and an analysis of JVETS, including some related concerns, refer to the Institute for Global Environmental Strategies' (IGES) Senior Policy Researcher for the Climate Policy Project Mr. Sudo Tomonori's presentation notes for the US-Japan Workshop on Climate actions and Co-benefit March 22-23, 2006.*14*

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14 'Japanese Voluntary Emissions Trading Scheme (JVETS) -Overview and Analysis' Sudo, Tomonori, (Senior Policy Researcher, Climate Policy Project) Institute for Global Environmental Strategies (IGES), US-Japan Workshop on Climate actions and Co-benefit March 22-23, 2006, Sudo, Tomonori, (Senior Policy Researcher), http://www.epa.gov/ies/pdf/workshops/IES_Japan2006/Sudo.pdf