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Country profiles on policies to support environment-friendly innovation

Eco-Innovation Policies in Japan

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FOREWORD

The report is part of a series of country profiles on eco-innovation policies developed for eight non-EU OECD members: Australia, Canada, Japan, Korea, Mexico, New Zealand, Turkey and the US. Country profiles are based on extensive desk research and on field missions in selected countries (Canada, Japan, Korea, the US). Country experts have commented earlier drafts of their country profile.

This series complements the eco-innovation roadmaps developed by EU member countries under the Environmental Technology Action Plan. It provides an empirical basis for further investigation on policies to support eco-innovation.

A short introduction presents the background for this series of country profiles, including the methodology, and a brief overview of some of the instruments identified.

The country profiles were drafted by Xavier Leflaive, under the supervision of Brendan Gillespie. Carla Bertuzzi has provided data and information on measurement issues and has drafted selected sections. IEEP was commissioned for the initial desk research and preliminary identification of policy issues. Country experts have provided most valuable inputs, in terms of time, information and policy relevance: Warren Hughes (Department of the Environment, Water, Heritage and the Arts, Australia), Javier A. Gracia-Garza (Environment Canada), Graham Campbell (Natural Resources Canada), Tim Karlsson (Industry Canada), Noriko Kishimoto (Ministry of the Environment, Japan), Kyu-Shik Park (Ministry of Environment, Republic of Korea), Carlos Muñoz Villarreal (Ministry of Environment and Natural Resources, Mexico), Vera Power and Alison Stringer (Ministry for the Environment, New Zealand), David Widawsky (USEPA), Sebahattin Dokmeci (Ministry of Environment and Forestry, Turkey).

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INTRODUCTION

Background

This report is part of the OECD work programme on eco-innovation policies.

The ambition of this report is to provide an empirical inventory of policies in place in Japan to promote eco-innovation. Considering that European countries had developed roadmaps for eco-innovation policies in the context of the European Commission Environmental Technology Action Plan (ETAP), the secretariat prepared an inventory of eco-innovation policies in eight non-EU OECD countries (Australia, Canada, Japan, Korea, Mexico, New Zealand, Turkey and the US). A similar project for China is published separately.

The objective of this work is to complement the knowledge base on eco-innovation policies in OECD countries and to provide empirical material for additional research on policy issues related to eco-innovation. The outline of each country profile is similar to that of ETAP roadmap, to facilitate comparison.

The work was implemented in coordination with country delegations, which have identified experts in each country who could provide additional information and review initial drafts of the country profile of their country.

A consultant (IEEP, Brussels, Belgium) has been commissioned to collect all information publicly available in English on eco-innovation policies in each of the eight non-EU OECD members. Field missions have been organised by the country experts in four countries (Canada, Japan, Korea, the US). During these missions, the secretariat met with the agencies identified and selected by the country expert. Draft country profiles have been developed on the basis of desk research and field missions. They have been reviewed by national experts and revised accordingly. All country profiles present information which was up-to-date at the end of 2007. In most cases, more recent information has been taken into account.

Policy instruments to support eco-innovation

The country profiles confirm that eco-innovation policies deploy a variety of instruments. They have to adjust to the features of the domestic economy, in particular the knowledge base, the size of domestic markets, and the *vigueur* of the venture capital industry.

In most non-EU OECD countries, public research and development (R&D) remains a major orientation. The US and Japan typically allocate significant public finance to environment-related R&D. However, three trends have emerged: i) some countries are concerned by the competition and trade issues related to such support; ii) public resources are increasingly channelled via Departments not directly in charge of environment policies (Energy, Agriculture, Transport), making inter-agency cooperation even more necessary; iii) the role of research organisations is being redefined, to intensify

linkages with the private sector and stimulate the development of marketable outputs; incubators in the US, or the National Institute of Advanced Industrial Science and Technology's (AIST) Technology Licensing Office in Japan illustrate innovative arrangements in this area.

Attracting private funds to finance environmental R&D is another major policy orientation. The main issue is to reduce risks for private investors investing in environmental R&D projects, while making sure that public money is used effectively and does not crowd out private initiatives. A variety of funds have been established to reduce risks to private investors (e.g. Sustainable Technology Development Canada-SDTC in Canada), or incubators (e.g. The Clean Energy Alliance in the US, Environmental Technology Business Incubator in Korea). Measures are taken to stimulate the venture capital industry and to provide incentives for environment-related projects; e.g. this is the role of the Environmental Venture Fund in Korea.

Environment-related performance standards are being set with the aim of stimulating innovation in goods and services. Such standards are pursued in particular in the field of energy and resource efficiency. However, standards may provide disincentives and can only have a lasting positive effect on innovation if they are timely revised. Schemes such as the Top Runner programme in Japan aim to address this challenge.

Market-based instruments are burgeoning in non-EU OECD Countries. A number of new projects and initiatives have been identified at national or local level. One interesting case is the all-encompassing Emission Trading Scheme envisioned in New Zealand, where equitable sharing of responsibility across sectors and stakeholders is based on the principle of equity across sectors.

There is some evidence that, besides environmental policy instruments and regulation, soft instruments such as voluntary commitments, eco-audits and eco-labels play a role as determinants of innovative behaviour in firms. Voluntary initiatives can become mandatory over time (cf. Stand-by Korea). Industry initiatives abound and, in particular contexts, can change the relationship between the administration in charge of environment policies and the business sector. This is illustrated by Performance Tracks in the US, where the US Environmental Protection Agency (USEPA) and firms enrolled in the programme construct a collaborative relationship. This typifies what can be seen as a new phase in environmental policies which sets out to promote broader sustainability, rather than address one single environmental issue. In that perspective, governments rely less on regulatory tools and endeavour to work with industries, in sectors which use materials and/or energy.

In line with the OECD Council Recommendation on Improving the Environmental Performance of Public Procurement [C(2002)3], green procurement initiatives are burgeoning at local and national levels. Guidelines are supported by websites, green products databases, and *pro forma* requests for tenders. The Green Purchasing Network is an international network active in this area.

Some initiatives set out to promote technologies and products developed by one country. Others try to alleviate barriers to the deployment of environment-friendly technologies and products; shared definitions, standards and labels contribute to a level playing field for the creation and diffusion of environment-friendly technologies, products and life-styles. Such efforts are still plagued by institutional problems related to intellectual property rights and international monetary transfers. Typically, the capacity of a national agency to (financially) support one country's side of a multinational joint venture depends on how countries will share the intellectual property rights. Few cooperation projects reach developing countries (with the exception of East Asia, and China in particular).

COUNTRY PROFILE OF JAPAN

Introduction and country definitions of eco-innovation

Japan has ambitions to become a *Leading Environmental Nation* as declared in its “Strategy in the 21st Century: Japan's Strategy for a Sustainable Society”. Eco-innovation is at the heart of the strategy¹. A number of key strategic policy documents explicitly refer to that concept: eco-innovation has been referenced in the Innovation 25 (a Cabinet Decision of June 2007), in the 21 Century Environment Nation Strategy (a Cabinet Decision of June 2007), in the Economic Growth Initiative (as revised in June 2007) and in the Economic and Fiscal Reform 2007 (Basic Policies) (a Cabinet Decision of June 2007). Furthermore, the technological development to address global warming, which forms an important part of eco-innovation, constitutes the basis for the innovative technological development that is included in the Cool Earth 50 proposed by Prime Minister Abe in May 2007 with respect to the challenge of global climate change. The promotion of eco-innovation is a joint responsibility of all the ministries involved.

Definitions related to eco-innovation used in the country

In a document presented at the OECD, METI defines eco-innovation as techno-social innovations to meet environment challenge, resource constraints and diversification of values among the people with compatibility between economy and environment. Concrete measures are taken in Japan to support this type of innovation, at industry level (working towards sustainable manufacturing which utilizes recycling resources and reduces resources), at the level of infrastructures (deployment of zero-emission social infrastructures, e.g. zero-emission-type coal fired power generation with efficient coaling/carbon capture and storage, and distribution and diversification of energy sources using IT technology; environment friendly transport or IT systems; etc.), and involving consumers (realizing sustainable consumption and life-style, for instance by selling functionalities, not goods).

Japan also defined eco-innovation in the “Economic and Fiscal Reform 2007 - Basic Policies” (19th June 2007 Cabinet Decision; this is the annual document directing Japan’s whole economic policies) as “the comprehensive initiative for technology development and social reform, using its dominance of high level technologies in *monodzukuri* area and in environment or energy saving as driving force, in order to achieve the sustainable society”; where *monodzukuri* literally means "goods production": it is the art of making things as perfectly and efficiently as possible while respecting nature in terms of both the materials used and the environment; this concept is at the core of the Japanese notion of value creation.

¹ <http://www.env.go.jp/en/focus/070606.html>; <http://www.env.go.jp/en/focus/attach/070606-a.pdf>;
<http://www.env.go.jp/en/focus/attach/070606-b.pdf>

Institutions playing a major role on eco innovation

The information provided in this report is mainly based on initiatives taken by the following bodies:

- Ministry of the Environment (MOE)
- Ministry of Economy, Trade and Industry METI (formerly, MITI) and its affiliates;
- Ministry of Education, Culture, Sports, Science and Technology (MEXT)
- Ministry of Land, Infrastructure, Transport and Tourism (MLIT)
- The Council for Science and Technology Policy (CSTP)

In Japan, industry (e.g. Nippon Keidanren) is a major contributor to innovation and the report refers to a number of examples of such contribution and commitment.

Ministry of the Environment

The government passes the legislation that sets the requirements (standards, bans, etc.) and targets that create the framework for environmental policies. This includes, for example, the Law on Promoting Green Purchasing & Basic Policy on Green Purchasing (2001, in coordination with METI)². MOE hosts the Office of Environmental Research and Technology and oversees the Japanese Environmental Technology Verification program (J-ETV) (see below) (see <http://www.env.go.jp/en/>). It focuses on basic environmental information for policy making, including monitoring data of global warming.

The Ministry of the Environment cooperates on programmes with other institutions (e.g. METI; Ministry of Agriculture, on the production of biofuel from wood).

The Ministry supervises the National Institute for Environmental Studies (NIES). Since its establishment in 1974, the National Institute for Environmental Studies (NIES), independent administrative institution, has been playing a major role in environmental research in Japan. The current five year plan (2006-2010) covers four main areas for research: Climate Change, Sustainable Material Cycles, Environmental Risk, and the Asian Environment where NIES will undertake advanced, farsighted fundamental research. In addition, NIES disseminates a variety of environmental information from both internal and external sources. NIES has a budget of 71 billion Yen for 5 years.

Ministry of Economy, Trade and Industry, METI (formerly, MITI)

METI is a key driver for innovation, including eco-innovation in Japan. It considers that eco-innovation will provide a source of international competitiveness not easily emulated by other countries and work as the engine for new economic growth. Simultaneously, a sustainable society where economy is compatible with environment and people will serve as a world model for an innovation-driven sustainable industry and society. This approach is becoming a key to future growth of Japan's economy.

² <http://www.env.go.jp/en/laws/policy/green/index.html>

METI supplies significant research and development (R&D) budgets (leading position relative to other ministries), is working on accelerating patent applications³, and works on global mutual respect of intellectual property rights (IPR) – a big issue for Japan.

METI actions focus on encouraging progress towards climate change (in line with the Kyoto protocol target, for a post-2012 framework, R&D for long term target as 50% in 2050), 3Rs (Reduce, Reuse, and Recycle)⁴, promoting environment-friendly management and environment-related business and address hazardous substances. On the legislative side it was behind the “Energy Conservation Law” and the “Law Concerning Special Measures for Promotion of New Energy Use” (New Energy Law, approved in 1997 and revised in 2002) that encourages renewable energies⁵.

Furthermore, METI is a driver for the establishment of industrial clusters to encourage innovation; in addition, It promotes the concept of industrial complex integrating plants of different industrial sectors and where energy and resource would be used in a most ideal way. METI and MOE introduced the eco-town initiative in 1997⁶. They also works on the strategic development of energy and environmental cooperation with Asian countries (see <http://www.meti.go.jp> and <http://www.env.go.jp/en/>).

As a part of METI, the Agency of Natural Resources and Energy (ANRE) deals with, inter alia, energy conservation policy, and new energy policy (<http://www.enecho.meti.go.jp/english/index.htm>).

METI works with or through a range of affiliate agencies, including:

- New Energy and Industrial Technology Development Organization (NEDO). NEDO is Japan’s largest public management organisation promoting R&D as well as the dissemination of industrial, energy and environmental technologies. It sets out to both enhance Japan’s industrial competitiveness and address energy and global environmental problems. It implements two policies: promotion of R&D through the concept of Selecting and Focusing; and responsive revisions to project plans through objective evaluations. Supported research areas range from advanced industrial technologies to innovative new energy and environmental technologies. Activities to disseminate new energy and energy conservation technologies are also promoted. NEDO’s mission is to enhance Japan’s industrial competitiveness and address energy and global environmental problems, and its role is to comprehensively coordinate and professionally manage R&D activities (<http://www.nedo.go.jp/english/>).
- The Research Institute of Economy, Trade and Industry (RIETI); RIETI was established in 2001 as a new platform to bring about creative and innovative policy debates based on world-class research, analysis and policy studies from mid- and long-term strategic perspectives (<http://www.rieti.go.jp/en/index.html>);
- National Institute of Advanced Industrial Science and Technology (AIST). AIST is one of the largest independent administrative institutions in Japan. In 2001, 16 research laboratories from the former Agency of Industrial Science and Technology were merged. Its mission is to

³ See also the Japan Patents Office <http://www.jpo.go.jp>

⁴ The Resource Recycling Promotion Law entered into effect in 1991 and later amended to Law for the Promotion of Utilization of Recyclable Resources. A wider range of laws supporting the move towards creating a sustainable society based on the 3Rs is available at <http://www.meti.go.jp/policy/recycle/main/english/law/legislation.html>

⁵ http://www.enecho.meti.go.jp/english/policy/new_energy/outline.html

⁶ http://enviroscope.iges.or.jp/modules/envirolib/upload/973/attach/973_eco-industrial-clusters.pdf

(a) contribute to a sustainable society by engaging in R&D strategically, (b) strengthen the industrial competitiveness through innovations in industrial technology by enhancement of its function as the innovation hub, (c) contribute to local industrial development by strengthening the cooperation among local industries, academia and governments, and (d) contribute to industrial technology policies to be undertaken by the Japanese government, by understanding and analyzing the environment of the industrial technology, and proposing policies about mid- and long-term industrial technology strategies. Most research areas at AIST deal with energy conservation (http://www.aist.go.jp/index_en.html).

AIST has developed the concept of Full Research, which means a continuous mode of research from basic research to product realisation research aimed at commercialising products. It considers itself as a mediator between academia and industry, through the exchange of human resources, technology and information. AIST has created a system for technology transfer which contributes to more advanced industrial activity and the creation of new industries based on the intellectual property created through R&D at the Institute; the patent rights of an invention originating from an AIST researcher are transferred to AIST. To implement the patent, the Center searches for an implementing company through the services of a technology licensing office (TLO). When AIST staff create new ventures, the ventures are accredited as AIST ventures, and the Institute may choose to offer support such as preferential use of facilities and reduced royalties (see [AIST Technology Transfer policy](#)).

Ministry of Education, Culture, Sports, Science and Technology (MEXT)

The Science and Technology Policy Bureau is responsible for the planning and drafting of basic science and technology policies. The Bureau is also responsible for the formulation of research programs and promotion of research evaluation, training of researchers and technicians, regional science and technology promotion (<http://www.mext.go.jp/english/>).

Ministry of Land, Infrastructure, Transport and Tourism (MLIT)

The MLIT was established in 2001, through the consolidation of the former Ministry of construction, Ministry of Transport, National Land Agency and Hokkaido Development Agency. MLIT's responsibilities include collectively promoting national land planning policies, infrastructure policies, social fund maintenance and transport policies, etc. While MLIT does not have eco-innovation as an explicit goal, two of its goals are related - goal 2 on Enhancing Global Competitiveness and goal 4 on Preserve and Create a Beautiful and Benign Environment (www.mlit.go.jp).

The Council for Science and Technology Policy (CSTP)

The CSTP is a major policy council of the Cabinet Office; it institutionalises cooperation between Ministry of the Environment, METI and other governmental agencies. It was established in January 2001 (<http://www8.cao.go.jp/cstp/english/index.html>). The mission of the CSTP is:

- to undertake comprehensive planning of the promotion of science and technology;
- to set policy for the distribution of the budget, personnel and related resources as well as other measures for the promotion of science and technology;
- to undertake wide-ranging evaluations of research activities and other important national research activities;

- on the occasion of importance, to seek out questions and provide an opinion to the Prime Minister.

The Japan Science and Technology Agency (JST)

JST's mission is to promote science and technology in Japan by conducting a broad range of activities, including the following (see <http://www.jst.go.jp/EN/>):

- Promotion of consistent research and development from basic research to commercialization with particular emphasis on the creation of new technological seeds;
- Upgrading the infrastructure for the promotion of science and technology, including dissemination of scientific and technological information

The Energy Conservation Centre, Japan (ECCJ)

The Energy Conservation Centre contributes to promoting the efficient use of energy, protection of the global warming and sustainable development (see http://www.eccj.or.jp/index_e.html).

Business – Nippon Keidanren

Nippon Keidanren (Japan Business Federation) is a comprehensive economic organization born in May 2002 by amalgamation of Keidanren (Japan Federation of Economic Organizations) and Nikkeiren (Japan Federation of Employers' Associations). Its membership of 1,662 is comprised of 1,343 companies, 130 industrial associations, and 47 regional economic organizations (as of June, 2007) (<http://www.keidanren.or.jp/>).

The mission of Nippon Keidanren is to accelerate growth of Japan's and world economy and to strengthen the corporations to create additional value to transform Japanese economy into one that is sustainable and driven by the private sector.

In 1997, Keidanren business federation adopted its “*Voluntary Action Plan on the Environment*”, a commitment to reduce emissions of carbon dioxide by 2010 to a level lower than year 1990. By the year of 2005, 35 industries were engaged in applying measures toward this goal (altogether representing 45% of Japan's total CO₂- emissions in 1990). A follow-up has shown that CO₂ emissions for 2004 were 0.5% lower than in 1990, and the reduction target has been achieved every year since 2000 (Nippon Keidanren, Nov 2005).

Policy documents related to eco-innovation

Some of the main policy documents related to eco-innovation in Japan include:

- *Becoming a Leading Environmental Nation in the 21st Century: Japan's Strategy For A Sustainable Society - 2007*⁷;
- *Third Science and Technology Basic Plan (2006-2010)*;
- *Intellectual Property Strategic Programme*;

⁷ <http://www.env.go.jp/en/focus/attach/070606-b.pdf>

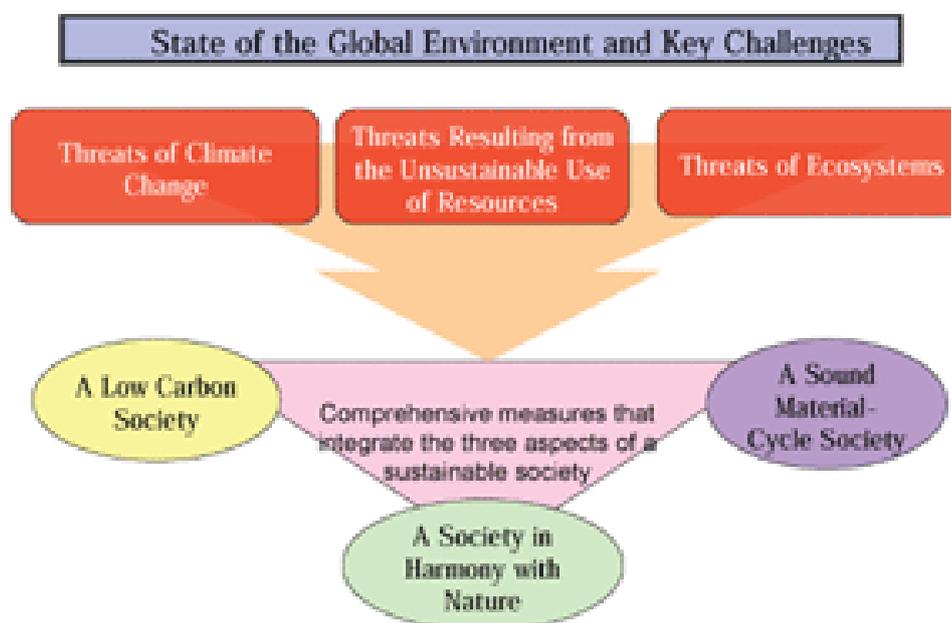
- Keys to create innovations and promote eco-innovation -2007;
- Economic Growth Initiative -2007;
- Economic and Fiscal Reform 2007: Basic Policies -2007;
- Cool Earth-Innovative Energy Technology Program-2008.

In addition, there is a range of other policy documents where innovation is encouraged. These include the Biomass Nippon Strategy (focusing on encouraging biomass as part of the renewables ambitions), the new Innovation 25 which is a long-term strategy initiative for the creation of innovation contributing to growth with a time perspective of 2025; it has an eco-innovation angle⁸, as it is acknowledged that eco-innovation can both solve problems that have global scale constraints (such as those on environment, resources and energy), and become the driving force behind economic growth at domestic and global level.

Becoming a Leading Environmental Nation Strategy in the 21st century

Japan’s strategy for a sustainable society was decided by the Cabinet in June 2007. It proposes to build sustainable society through comprehensive measures integrating the three aspects of the society, specifically, a “low carbon society, a “sound material-cycle society” and a “society in harmony with nature. It shows eight strategies which should be implemented with priority in the next one to two years⁹ (see <http://www.env.go.jp/en/focus/attach/070606-b.pdf>).

Figure 1. The Strategies supporting Japan’s strategy for a sustainable society



⁸ http://www.kantei.go.jp/foreign/innovation/okotae2_e.html

⁹ http://www.rccap.unep.org/envhealth/event/HL/05_Japan.ppt

*Third Science and Technology Basic Plan (2006-2010)*¹⁰

This is the third in a series of science and technology (S&T) plans. It builds on the Science and Technology Basic Law of 1995. One of the 6 specific goals of this plan is Goal 3: 'Economic Growth and Environmental Protection' which is part of the objective: *Maximize National Potential, to create a competitive nation for achieving sustainable growth*. The plan makes grants available for research.

*Intellectual Property Strategic Programme*¹¹

Intellectual Property Strategy Headquarters (IPHQ), which was established in March 2003 based on the Intellectual Property Basic Act, has annually formulated the Intellectual Property Strategic Programmes (IPSP). The measures being taken by the government to create, protect and exploit intellectual property are supposed to be included in the Programmes. The IPSP sets out to promote innovation by promoting intellectual creation, appropriately protecting such creation and accelerating its effective exploitation.

Policies, Initiatives and instruments – a national inventory

Research and Development

Japan is a world leader in terms of R&D expenditure. R&D spending has been estimated at around 3.1% of GDP in 2004 and above 3.5% in 2005. Funding for Science and Technology has increased from 3.6 trillion Yen (FY2005) to 3.8 trillion Yen (FY2006) and is implemented by the various Ministries, on the basis of a general plan of the Council for Science and Technology Policy (CSTP).

Several funds and initiatives have been set up to promote the R&D phase of new environmental technologies, especially in the context of METI, via NEDO (New Energy and Industrial Technology Development Organization, an affiliate of METI) and AIST (National Institute of Advanced Industrial Science and Technology, an affiliate of METI).

The Global Environment Research Fund

The Global Environment Research Fund ([GERF](#)) is a competitive grant scheme for global environment research, initiated in 1990 with calls for proposals. Since then, the GERF has played a role as a core fund in Japan for promoting global environment studies through interdisciplinary interaction among natural, social and political sciences. Research areas cover global system changes, transboundary pollution, conservation and recovery of broad-regional ecosystems, sustainable societies and policies for their implementation. The annual budget is about 25 million USD.

Each year the Ministry of the Environment formulates a "Global Environment Research Program" through consultation with external reviewers. Based on the program, research projects are conducted in a timely fashion in accordance with the international situation, reflecting domestic/international trends in global environmental research. Applicants are to be researchers belonging to Japanese research institutions. Selected projects include:

¹⁰ http://www8.cao.go.jp/cstp/english/basic/3rd-BasicPlan_06-10.pdf

¹¹ <http://unpan1.un.org/intradoc/groups/public/documents/APCITY/UNPAN010247.pdf>

- Development of GHG Sink/Source Control Technologies through Conservation and Efficient Management of Terrestrial Ecosystems – Intermediate to Long-Term Strategies for the Stabilization of Atmospheric GHG Concentration – (FY2003-2007);
- Japanese Climate Policy Scenarios towards the Year 2050 (FY2004-2008);
- Comprehensive Assessment of Climate Change Impacts to Determine the Dangerous Level of Global Warming and Appropriate Stabilization Target of Atmospheric GHG Concentration (FY2005-2009);
- Integrated Research on Climate Change Scenarios to Increase Public Awareness and Contribution to the Policy Process (FY2007-2011).

Programmes managed by METI and its affiliate bodies

METI has a budget of 503,300 million Yen (3,483 million Euro)¹². It disburses funds to a range of agencies (NEDO, etc.) and itself supports universities, public research organisations and the not-for-profit sector for R&D. The main issues for METI are industrial competitive performance and environmental and energy problems.

The role of NEDO

NEDO promotes research and development across a wide spectrum of technological stages through the following activities:

- National projects (medium- to long-term, high-risk R&D projects);
- Support for practical application by business enterprises;
- Grants to universities and other research organizations for the discovery of technological seeds.

Drawing on the combined efforts of industry, academia and government, NEDO mainly carries out national R&D projects that stimulate the economy through enhanced Japan's industrial competitiveness. It also endeavours to provide solutions to energy and environmental problems.

The role of AIST¹³

AIST covers six research fields, i.e. life science & technology, information technology & electronics, nanotechnology, materials & manufacturing, environment & energy, geological survey and applied geoscience, metrology and measurement technology. In particular, AIST is engaged in developing technologies based on sustainable energy having low environmental impact.

¹² The exchange rate used in this report is: 1 Euro = 144.5 Yen

¹³ http://www.aist.go.jp/aist_e/aist_laboratories/4environment/index.html

Verification of technologies

Japan - Environmental Technology verification programme (J-ETV)

Japan has had an environmental technology verification programme since 2003 – J-ETV. It is under the responsibility of the Ministry of the Environment, which coordinates three advisory groups: the ETV Program Advisory Committee, Working Groups in each category, and the Technology Verification Committee. The Verification Organizations, which include some of local government and public-interest corporations, report to the MOE (see <http://www.env.go.jp/policy/etv/en/index.html>¹⁴).

Environment technology verification is seen as less of a certification program (technologies are not judged as good or bad according to some standard) and more of a program for advanced environmental technologies for which no objective performance data exist. The objective is to promote the spread of technology by having independent parties verify the performance of the technologies. This is expected to promote both environmental protection and environmental business.

The pilot period to establish a verification system was 2003-2007. Starting in FY2008, the verification programme is being implemented. The budget for FY 2008 is 180 million yen and suppliers contribute part of the costs of verification in some categories.

Performance Targets

Key initiatives with performance targets have been developed under a range of laws and regulations. In particular, the Revised Energy Conservation Law (1998) established tougher energy consumption efficiency standards on equipment by adopting the Top Runner Programme. There is a range of industry voluntary performance targets as well.

Top Runner Programme

The Top Runner programme is prescribed under the "Law Concerning the Rational Use of Energy (Energy Conservation Law, Section 6: Measures Related to Machinery and Equipment). It is a high profile, internationally acclaimed programme that has successfully encouraged innovation in a range of areas.

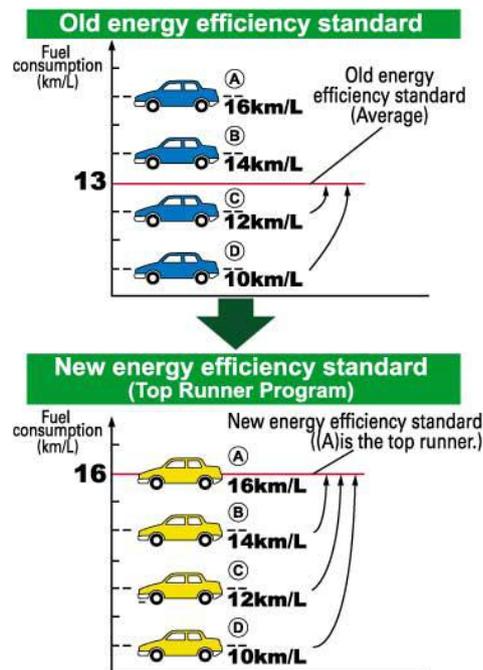
The Top Runner Programme works by setting energy efficiency targets at industry level, based on the value of the most energy-efficient products on the market at the time; targets are periodically reevaluated and aligned on the performance of the best in class. Figure 3 below¹⁵ shows how the programme works for passenger cars.

As of 2007, the Top Runner standards have been established for 21 items, from passenger vehicles, to freight vehicles, air conditioners, electric refrigerators, electric freezers, electric rice cookers, microwave ovens, fluorescent lights, electric toilet seats, TV sets, video cassette recorders, DVD recorders, computers, magnetic disk units, copying machines, space heaters, gas cooking appliances, gas water heaters, oil water heaters, vending machines and transformers. See <http://www.enecho.meti.go.jp/english/toprunner/program.pdf> and http://www.eccj.or.jp/top_runner/index.html for more information.

¹⁴ See also http://www.nsf.org/business/drinking_water_systems_center/pdf/FinalSummaryJuly13-142005IntlForum.pdf ; http://ec.europa.eu/environment/etap/pdfs/overview_env techno_verification.pdf; http://www.epa.gov/etv/pdfs/publications/forum_jul2005.pdf

¹⁵ <http://www.enecho.meti.go.jp/english/toprunner/program.pdf>

Figure 2. The Top Runner Programme



Industry-led voluntary performance targets

In Japan industry-led voluntary performance targets are common place, and industry is seen as a proactive motor for innovation, driven by resource efficiency considerations and the ensuing competitiveness benefits. Box 1 highlights selected examples.

Box 1. Industry-led voluntary performance targets

Nippon Keidanren

In the industrial and energy conversion sectors, in 1997 the Keidanren took the lead in formulating Keidanren Voluntary Action Plan on the Environment, and established the target of limiting carbon dioxide emissions in FY2010 to under $\pm 0\%$ of FY1990 levels. To date 34 industries have formulated voluntary action plans on the environment establishing quantitative targets for each industrial classification. These action plans now cover approximately 80% of the industrial and energy conversion sectors.

Each industrial classification voluntarily decides which of four indicators—energy intensity, energy consumption, carbon dioxide emissions intensity, carbon dioxide emissions—it will select as targets of the voluntary action plan for their own industrial classification.

Toshiba

Toshiba launched its Fourth Voluntary Environmental Plan in 2005 - it provides further concrete targets on eco efficiency (factor performance - calculated by comparing the amount of value created and the amount of environmental impacts) for the achievement of the Environmental Vision 2010. In fiscal 2006, compared with fiscal 2000, product eco-efficiency and business process eco-efficiency improved and were 1.68 times and 1.22 times respectively, and overall eco-efficiency was 1.59 times.

Canon

In 2003, Canon put forth the overriding indicator Factor 2 for their 2010 Vision. Factor 2 represents the goal of at least doubling overall lifecycle environmental efficiency (consolidated net sales divided by lifecycle CO2 emissions) by 2010, using 2000 as the baseline date. They set Mid-Term Environmental Goals (2004-2005) to serve as milestones, and in 2005 they achieved almost all the individual goals.

Source: http://www.kyomecha.org/pdf/kp_achieveplan.pdf, <http://www.toshiba.co.jp/env/en/management/plan.htm>,
<http://www.canon.com/environment/charter/factor2.html>

Legislation-based performance targets

Japan has a range of performance targets integrated into legislation, using emission limit values. Examples include:

- Drinking water: because of evidence of the human health impacts of boron and fluorine, Japan introduced effluent standards in 2001 of 10 mg/L for boron and 8 mg/L for fluorine, with the exception of seawater¹⁶;
- Air pollution: Japan's Air Pollution Control Law (amended in 2004, entered into force in 2006);
- Energy Conservation Law - amended in April 2003¹⁷;
- Reinforcement of Energy Saving for Plants, Buildings, and Transportation (2005).

¹⁶ http://www.nsf.org/business/drinking_water_systems_center/pdf/FinalSummaryJuly13-142005IntlForum.pdf

¹⁷ obligation was imposed on such buildings to make a regular report and formulate a medium- and long-term plan for energy use

To improve energy efficiency, the government relies on boosting innovation and on carrying out internal reforms to speed up the demand for innovative products and companies. Governmental measures to achieve this goal include the establishment of performance standards for specific sectors such as housing.

The activities to reduce oil dependence in the transport sector include: standards to promote fuel efficiency of passenger vehicles; new blending limit regulation of oxygenated compounds that contain ethanol by 2020; support for regional efforts leading to increased ethanol production; and dissemination of electric and fuel cell vehicles including support the development of safe, efficient, low-cost hydrogen storage technology.

Mobilisation of Financing

The main initiatives to finance R&D programmes have already been mentioned.

The Industrial Cluster Policy illustrates how public support can be used to access market and private financial resources. In 2001, Japan also launched an Industrial Cluster Policy following the international debate on Clusters and Systems of Innovation. Some of METI's Industrial Clusters relate to environmental themes¹⁸. Budget moneys are available for industry-academic network formation, technical development, incubator and related facilities for entrepreneurs, and market development and collaboration with financial institutions.

The Eco-town projects illustrate how central government initiatives can generate local actions. The Ministry of Economy, Trade and Industry (METI) and the Ministry of the Environment (MOE) introduced the eco-town initiative in 1997. Financial support by both ministries triggered regional scale initiatives that targeted the effective resource circulation of a full range of by-products based on three industrial ecological principles: (a) the zero emissions concept; (b) principle of 3Rs; and (c) green procurement and EMSs. There are 26 eco-town projects in Japan. There are also efforts to promote cooperation among eco-towns through clustering¹⁹.

Market-based Instruments

The focus here will be on:

- Subsidies and public support schemes - for renewables (e.g. photovoltaics);
- Voluntary Domestic Emissions Trading Scheme (J-VETS).

Subsidies and support schemes for renewables

The 5-Year Plan for Photovoltaic Power Generation Technology Research and Development (FY2001 -FY2005) follows two generations of programmes designed to support the development of photovoltaic technologies in Japan (from 1974 on). Each plan has increased levels of support as the technology develops.

¹⁸ Ibid last footnote

¹⁹ <http://gec.jp/gec/EN/Activities/2005/Eco-Towns/GEC.pdf> . See Michael G Norton *Japan's eco-towns - industrial clusters or local Innovation systems?*
<http://journals.iss.org/index.php/proceedings51st/article/view/535>

In addition to RD&D funding, the market has been supported through net metering and capital grants (including to residential areas, industry, and government offices) and procurement requirements²⁰. Solar photovoltaic capacity increased from 19 MW in 1992 to 453 MW in 2001²¹, an average annual growth rate of more than 42% and stood at near 1,132 MW in 2004. The target for 2010 is 4,820 MW.

There is also public support for wind and, increasingly, for biomass power (see <http://www.iea-pvps.org/ar05/jpn.htm>).

Japan's Voluntary Domestic Emissions Trading Scheme (J-VETS)

Japan's voluntary emissions-trading scheme has been set up to accumulate knowledge and experience on cost-efficient emissions reduction and trading. The government provides economic incentives for the corporations that endeavour to achieve reduction targets they have determined themselves and implements voluntary participation to trade of emissions allowances, for domestic emissions.

One third of the cost of CO₂ reduction activities is subsidised by the government, as an incentive. However, should firms fail to achieve the target, the subsidy will have to be returned to the government²².

Procurement

Green public procurement became mandatory in Japan in 2001, when the law on the Promotion of Procurement of Eco-Friendly Goods and Services by the State and Other Entities (Law on Promoting Green Purchasing) was passed. The law requires all governmental institutions to develop green procurement policies, set targets, implement and report to the Environment Minister every year. It requires efforts from local governments and private sector as well. It provides evaluation criteria and a database of eco-products. The Ministry of the Environment discusses with all ministries to identify which products should be covered.

More concretely, the law requires that all general official vehicles are low-emission vehicles. For official vehicles other than general official vehicles, it sets quantitative targets for switching to the use of low-emission vehicles.²³

The Green Purchasing Network was established in 1996 to promote the concept and practices of green purchasing in Japan and to provide purchasing guidelines. Guidelines have been developed for sixteen products (from copiers to workwear) and services (from offset printing to hotels & inns); additional ones are in progress.

In 2005 the International Green Purchasing Network (IGPN, <http://www.igpn.org/>) was launched (based on the Sendai declaration), with partners from around the world, to:

- promote the development of environmentally friendly products and services and Green Purchasing activities around the world;

²⁰ The Renewables Portfolio Standard (RPS) Law newly established in 2002, obliged energy suppliers the use of a certain percentage of renewable energy.

²¹ <http://data.iea.org/ieastore/assets/products/eptnotes/feature/4Q2004.pdf>

²² <http://www.iges.or.jp/en/cp/pdf/activity06/07.pdf>

²³ http://www.kyomecha.org/pdf/kp_achieveplan.pdf p.64

- collect and share information on global Green Purchasing activities, the best examples, know-how, products information, purchasing policies and recent trends;
- harmonise the efforts of Green Purchasing and the development of environmentally friendly products and services from the global viewpoint.

One of major aims for the next five years is to develop a global green purchasing database.

Awareness raising and training

There is a range of awareness raising and training initiatives in Japan²⁴, with a number of ministries sharing efforts. Examples include:

- Cool Biz and Warm Biz – lifestyle and use of air conditioning innovation;
- Leading by Example – innovative technologies and the Prime Minister’s Official Residence;
- Labels and certificates.

METI considers that environment management performances and product environment performances should be made more visible so that companies and products having high environment values enjoy preferred positions in the market.

Legislation is also being revised to support wider awareness. For example, the government of Japan will promote environmental conservation activities and environmental education based on the Law for Enhancing Motivation on Environmental Conservation and Promoting Environmental Education (Law No. 130 of 2003) – the prime aim being to encourage GHG emission reductions.

“Cool Biz” and “Warm Biz”²⁵

This initiative is more a social eco-innovation than a technological one. Business people are invited to wear cool and comfortable clothes that are appropriate for business occasions, shedding ties and jackets. This “Cool Biz” campaign was widely accepted by the majority of companies and people, and it reduced electricity demand during the summer months. It also reduced emissions by 460,000t-CO₂, which represents monthly emissions of 1 million households.

Similarly, Warm Biz promotes the idea of “wear more clothes if you are cold, don’t depend on the heater”²⁶; note that, in Japan, heating consumes 2.5 times more energy than air conditioning.

Leading by Example

The Prime Minister’s Official Residence and the government buildings have adopted a range of eco-technologies to set a good model for the general public. At the official residence of the Japanese Prime Minister, fuel cell systems, solar panels on the roof, and small-scale wind power generation have been installed.²⁷

²⁴ <http://www.env.go.jp/en/focus/attach/070606-b.pdf>

²⁵ http://www.env.go.jp/earth/cop/cop11/climate_c.pdf

²⁶ http://www.env.go.jp/earth/cop/cop11/climate_c.pdf

²⁷ http://www.env.go.jp/earth/cop/cop11/climate_c.pdf

Labels and certificates

The Ministry of the Environment is in charge of eco-labelling, via the Japan Environment Association: to promote environment-friendly lifestyles through wise product choice, the Japan Environment Association ([JEA](#)) manages the Eco Mark Program aimed at certifying and spreading Eco-friendly products. A committee composed of academics, governments, consumer groups, and experts from various industries sets standards and carries out the certification. The Eco Mark is labelled on products with relatively less environmental impact compared to similar products, during the entire life cycle, from exploiting and collecting the product materials, to the manufacturing, distribution, use and consumption, disposal, and recycling. After screening Eco-friendly products submitted for approval by manufacturers, the JEA certifies and publicizes products qualifying for the Eco Mark. As of September 30, 2008, the number of product categories is 48 and the number of certified products is 4,315.



The JEA serves as the General Affairs Office for the Global Ecolabelling Network(GEN). GEN is a non-profit association consisting of 27 organizations (25 members, 2 associates) that are implementing ecolabelling programs similar to the Eco Mark. Its role includes making certification standards identical, appealing the network's endeavours, information exchange, providing information on the Internet, supporting the launch of new eco-labelling programs all over the world, etc.

Other Ministries undertake more specific initiatives. METI certifies products on the basis of energy conservation. The Ministry of Land, Infrastructure and Transport has established the Green Management Certification system for trucking firms undertaking initiatives to lower their environmental burden by more than a certain amount (e.g. measures to lower fuel consumption).

Acting Globally

Transmission of eco-innovation models to the world will be an integral part of Japan's initiatives towards eco-innovation. Japan's international collaborations with implications for eco-innovation include:

- Collaboration on intellectual property rights (IPR);
- Clean Development Mechanism / Joint Implementation;
- Asia-Pacific Environmental Innovation Strategy Project (APEIS);
- Japanese International Co-operation Agency (JICA);

The regional component of Japan's strategy for energy efficiency is highlighted below.

Intellectual Property Rights (IPR)

To facilitate international collaboration on intellectual property, Japan has initiated the APEC Cooperation Initiative on Patent Acquisition Procedures, which sets out to enable applicants to more quickly obtain a higher-quality patent in the APEC region. In September 2007, the APEC Ministers

endorsed the initiative. Also, intellectual property issues are addressed in a number of bilateral Economic Partnership Agreement (EPA) with Singapore, Malaysia, Chile, Thailand, the Philippines, and Indonesia.

Another important intellectual property-related programme proposed/promoted by Japan is a Patent Prosecution Highway. This system ensures that applications for which patents have been granted in the first country will be eligible for accelerated examination through simple procedures in a second country.

Clean Development Mechanism / Joint Implementation (CDM/JI) projects

As of October 2007, the Japanese government had approved a total of 242 CDM/JI projects in, *inter alia*, Chile, Thailand, Vietnam, Bhutan, South Korea, Brazil, and Kazakhstan.

NEDO and the Global Environment Centre Foundation (GEC) publicly solicits project proposals and entrusts feasibility studies to Japanese entities including private companies and NGOs in order to facilitate the process to realize CDM/JI projects focusing on energy conservation technologies in the steel industry, the cement industry, the food industry and other industries, as well as methane collection technologies, power generation technologies including biomass, solar, wind and hydro power generations, afforestation/reforestation, etc.

Under NEDO programme, during 1998 through 2007, 318 feasibility studies were made in 48 countries, and under GEC programme, between 1999 and 2007, 141 feasibility studies were undertaken in 33 countries and 1 region consisting of Pacific small islands²⁸.

Asia-Pacific Environmental Innovation Strategy Project (APEIS) ²⁹

The APEIS is supported by the MoE. It was endorsed at ECO ASIA³⁰ in 2001. It entails knowledge-based tools for decision-making, including good practices inventory and innovative policy instruments inventory. There is also a focus on environmental markets (environmental industry and environmental finance), environmental technologies (renewable energy and information technology) and eco-consciousness (environmental education and participation).

Japanese International Co-operation Agency (JICA)

JICA's budget was 1,354 million USD in 2004³¹.

JICA is working with developing countries to tackle environmental problems via programmes on environmental management, nature conservation, waste resources and disaster management and natural resources and energy. Initiatives in this area include support for environmental centres, assistance with waste processing, and countermeasures for pollution and acid rain (<http://www.jica.go.jp/english/>).

²⁸ http://www.nedo.go.jp/english/archives/170927_2/cdm_schemes.pdf

²⁹ http://www.eoc.csiro.au/modis/apeis_2/1st-day_2003-11-28/00_Takamoto.pdf

³⁰ Eco Asia is a network of Environmental ministers and international organizations from the Asia-Pacific region

³¹ [Http://ecoinnovationfinancingconference.rec.org/downloads/presentations/japan_ecoinnovationshort.pdf](http://ecoinnovationfinancingconference.rec.org/downloads/presentations/japan_ecoinnovationshort.pdf)

Regional cooperation for energy efficiency

Japan encourages energy efficiency through promoting energy conservation standards and assessment systems by sectors in the Asia-Pacific region. In particular, Japan seeks to establish a regional framework to save energy. The “Asia Energy and Environmental Cooperation Strategy” seeks to promote energy conservation by working with other countries in Asia mainly, China and India, given the rapid increase of their energy demand. Other candidates as priority countries are Thailand, Indonesia, and Vietnam.

The cooperation framework would tackle the following five areas:

- Energy efficiency or conservation: The activities include setting up energy efficiency standards and labelling systems (for the consumer, transport, and electricity sectors); industry dialogues as well as the use of international approaches such as the clean development mechanism; assess energy efficiency efforts using international benchmarks; and collaboration with the International Energy Agency.
- Development of “new energy”: The goal is to accelerate the adoption of new energies in the participating countries by promoting training, dispatch of experts throughout the region, and the development of new energy technologies.
- Clean coal: The objective is to promote the dissemination of clean and safe coal technologies in Asia through training programs, experts dispatching, and technological development and testing. Cooperation will be promoted in the area of coal liquefaction technology.
- Stockpiling: Japan proposes to build an effective stockpiling Asian scheme by developing a regional framework that facilitates cooperation and exchange.
- Nuclear power: The goal is to promote a common framework to safely develop this type of energy.

Country Synthesis

Strategic highlights

Japan has ambitions to become a *Leading Environmental Nation* as declared in its “Strategy in the 21st Century: Japan's Strategy for a Sustainable Society”. A number of key strategic policy documents explicitly refer to that concept. The promotion of eco-innovation is a joint responsibility of all the ministries involved. In Japan, eco-innovation, defined as a new field of techno-social innovations, explicitly covers three areas:

- industry: working towards sustainable manufacturing which utilizes recycling resources and reduces resources;
- infrastructures: deployment of zero-emission social infrastructures, e.g. zero-emission-type coal fired power generation with efficient coaling/carbon capture and storage, and distribution and diversification of energy sources using IT technology etc.,
- consumers and lifestyles: realizing sustainable consumption and life-style. Japan considers that innovations are not realized by technological seeds alone. They must be recognized as offering values that are appreciated by the consumers of a sustainable society.

Therefore, an eco-innovation roadmap, from Japan's perspective, should cover necessary changes in social systems.

The Ministry of Economy, Trade and Industry (METI) plays a central role, in coordination with the Ministry of the Environment. METI, and its affiliate bodies (NEDO, AIST) bring a clear orientation towards economic development and national competitiveness. Cooperation with industry is an essential trademark of Japan's policies to support eco-innovation.

One feature of Japan's policies is a heavy reliance on public support to R&D. Japan is a world leader in terms of R&D expenditure, which amounted to 3.5% of GDP in 2005. Several funds and initiatives have been set up to promote the R&D phase of new environmental technologies.

Under METI's initiative, most projects are geared towards industrial development. AIST has created a system for technology transfer which contributes to more advanced industrial activity and the creation of new industries based on the intellectual property created through R&D at the Institute; the patent rights of an invention originating from an AIST researcher are transferred to AIST. To implement the patent, the Center searches for an implementing company through the services of a technology licensing office (TLO). When AIST staff create new ventures, the ventures are accredited as AIST ventures, and the Institute may choose to offer support such as preferential use of facilities and reduced royalties

Targets related to energy efficiency and environmental performance play a crucial part in Japan's policies to support eco-innovation. Industry is considered as a proactive motor of innovation and the system entails a number of industry-led voluntary performance targets. In addition, the government initiates dynamic targets which incentivize industries to over perform the market (see the Top Runner Programme).

Japan devotes a particular interest to social (not merely technological) innovation. This is illustrated by the Cool Biz and Warm Biz initiatives and a number of programmes which set out to adjust life-styles and consumption patterns.

In selected areas, Japan intends to play a leading role in international cooperation, at both G8 and regional level. It uses bilateral Economic Partnership agreements to foster some of its priorities (e.g. on intellectual property) and initiates a number of initiatives in South East Asia (e.g. on energy efficiency or conservation).

Appendices

Summary table

Actions	Initiatives
Research and Development	METI, NEDO, AIST
Verification of Technology	JETV
Performance Targets	The Top-Runner Programme Environmental Laws Industry self commitments/ voluntary agreements.
Mobilisation of Financing	NEDO METI
Market-based Instruments and State Aid	Vehicle taxes Subsidies and public support schemes - for renewables (Eg PV) Voluntary Domestic Emissions Trading Scheme (J-VETS)
Procurement	Green Procurement Law International Green Purchasing Network (IGPN)
Awareness Rising and Training	“Team -6% Campaign” “Cool Biz” – lifestyle and use of air conditioning innovation Warm Biz,” Leading by Example – innovative technologies and the Prime Minister’s Official Residence Using of labels and certificates
Acting Globally	Intellectual product rights (IPR) CDM and JI Asia-Pacific Environmental Innovation Strategy Project (APEIS) Japanese International Co-operation Agency (JICA)

Eco-industries and innovation in Japan

Japan is a world leader in eco-innovation, building on its dependency on imports for energy/natural resources, and on opportunities for industrial policy building on resource efficient goods and processes.

The environmental market in Japan itself has been rapidly expanding since the second half of the 1990s, partly due to the advancement of environmental laws. Statistics on the size of the industry and future forecast of the environmental businesses have been reported by the Japanese Ministry of the Environment, following the OECD/Eurostat classification (MoE, 2004). The market size based on the OECD classification was approximately 30 trillion yen in year 2000, and the expected expansion was estimated to approximately 47 trillion yen by 2010 and approximately 58 trillion yen by 2020.

A forecast of the “environmentally-induced businesses” indicates that the market size would increase from approximately 41 trillion yen in 2000 to 103 trillion yen in 2025; employment would increase from approximately 1.06 million people in 2000 to 2.22 million people in 2025 (MoE, 2005).

Since the introduction of ISO 14001 in 1996, over 20,000 Japanese businesses have been certified, by far the country with the highest number of certifications in the world. The certification trend is spreading rapidly from large businesses to middle sized and small businesses and from the manufacturing sector to the service sector.

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