



OECD Environmental Performance Reviews

JAPAN



OECD Environmental Performance Reviews: Japan 2010



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Foreword

The global economic and financial crisis has underlined the need for Japan to develop a new economic model. It must reinvigorate economic growth, create new jobs and enhance the quality of life, not least for its ageing population. Japan's New Growth Strategy to 2020 takes up this challenge by identifying the environment, and in particular eco-innovation, as a new source of long-term economic growth. The Strategy aims to do this while reducing pollution and greenhouse gas emissions, minimising waste and inefficient use of natural resources, maintaining biodiversity, and strengthening energy security. This is fully in line with work underway in the OECD to develop a Green Growth Strategy for submission to the 2011 annual meeting of Economy and Finance Ministers. The Japanese experience, highlighted in this Environmental Performance Review, will be a valuable input to this exercise.

Japan has made substantial progress in strengthening its performance since the last OECD Environmental Performance Review in 2002. Environmental policies have been improved, often with the active participation of the business community. As a result, air emissions per unit of GDP, energy and materials use per unit of output, and final disposal of waste have further decreased. Japan has shown leadership in several environmental areas, including the promotion of the 3Rs (reduce, reuse and recycle) approach for sound waste and materials management, and innovative policy measures for eco-innovation and green technologies.

This Environmental Performance Review aims to provide further support to Japanese environmental initiatives. It presents 38 policy recommendations, with a special focus on climate change, the 3Rs and biodiversity. A central message is that Japan would benefit from enhancing the cost-effectiveness of its environmental policy mix, and from making greater use of market-based instruments. More specific recommendations in this direction include:

- Taking advantage of the 2011 tax reform to broaden the use of environmentally related taxes and to reduce incentives and subsidies that have perverse environmental effects.
- Putting a consistent price on carbon, for example through a mandatory emissions trading scheme in combination with a carbon tax.
- Promoting waste prevention and greater cost recovery in municipal waste services by expanding the use of waste charging schemes.
- Redesigning agricultural support measures so as to minimize environmental impacts and protect biodiversity.

Japan is the first country to undergo a third OECD Environmental Performance Review. The Review is the result of rich and co-operative dialogue between Japan and other members and observers of the OECD Working Party on Environmental Performance. We are confident that this collaborative effort will be useful to advance the policy debate on how to tackle the shared and common environmental challenges that OECD members and their partners face.



Angel Gurría
OECD Secretary-General

Preface

The principal aim of the OECD Environmental Performance Review programme is to help member and selected partner countries to improve their individual and collective performance in environmental management by:

- helping individual governments to assess progress in achieving their environmental goals;
- promoting continuous policy dialogue and peer learning; and
- stimulating greater accountability from governments towards each other and the public opinion.

The present report reviews the environmental performance of Japan since the previous Review in 2002. Progress in achieving domestic objectives and international commitments provides the basis for assessing environmental performance. Such objectives and commitments may be broad aims, qualitative goals, or quantitative targets. A distinction is made between intentions, actions and results. Assessment of environmental performance is also placed within the context of Japan's historical environmental record, present state of the environment, physical endowment in natural resources, economic conditions, and demographic trends.

The OECD is indebted to the Government of Japan for its co-operation in providing information, for the organisation of the review mission to Japan (13-22 July 2009), and for facilitating contacts both inside and outside governmental institutions.

Thanks are also due to all those who helped in the course of this Review, to the representatives of member countries participating in the OECD Working Party on Environmental Performance, and especially to the examining countries: Germany, Korea and Norway.

The team that prepared this Review comprised experts from reviewing countries: Mr. Helmut Schnurer (Germany), Ms. Kwang-Yim Kim and Mr. Jong-Ryool Kim (Korea) and Mr. Bent Arne Sæther (Norway); and members of the OECD Secretariat: Mr. Gérard Bonnis, Ms. Ivana Capozza, Mr. Brendan Gillespie, Mr. Krzysztof Michalak, Mr. Tappei Tsutsumi, Ms. Frédérique Zegel and Mr. Christian Avérous (consultant). Ms. Carla Bertuzzi, Ms. Sarah Miet, Ms. Sylvie Dénaux (OECD Secretariat) and Ms. Beatrix De Koster (consultant) provided statistical and editorial support during the preparation of the report.

The OECD Working Party on Environmental Performance discussed the draft *Environmental Performance Review of Japan* at its meeting on 4 May 2010 in Paris, and approved the Assessment and recommendations.

Table of Contents

Executive Summary	13
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Part I

Sustainable Development

Chapter 1. Developments since the 2002 Review	19
Assessment and recommendations	20
1. Key socio-economic developments	21
2. Key environmental pressures	23
3. The framework for sustainable development and environmental management	26
4. Key environmental and sustainable development initiatives	29
Notes	31
Selected sources	31
Chapter 2. Greening Growth	33
Assessment and recommendations	34
1. Fiscal policy and the environment	36
2. Promoting eco-innovation and environment-friendly products	49
3. Expanding environment related markets and employment	54
4. Social dimensions	56
Notes	58
Selected sources	60
Chapter 3. Implementation of Environmental Policies	63
Assessment and recommendations	64
1. Strengthening the environmental policy mix	66
2. Promoting environmental democracy	71
3. Progress in air and water management	74
4. Chemicals management	86
Notes	91
Selected sources	93

Chapter 4. International Co-operation	95
Assessment and recommendations	96
1. Multilateral environmental diplomacy	97
2. Official development assistance and bilateral co-operation	101
3. Environment and trade	105
4. Marine issues	108
5. Transboundary air pollution	112
Notes	114
Selected sources	115

Part II

Selected Issues

Chapter 5. Climate Change	119
Assessment and recommendations	120
1. Greenhouse gas emissions profile	122
2. Policy and institutional framework	126
3. Climate change and energy policy	129
4. Climate change and transport policy	137
5. Cross-sectoral policy instruments	141
6. Climate change policies at local level	144
7. Climate change impacts and adaptation	144
8. Co-operation with developing countries	145
Notes	145
Selected sources	146
Chapter 6. Waste Management and the 3Rs (Reduce, Reuse, Recycle)	147
Assessment and recommendations	148
1. Objectives and policy framework	149
2. Performance	153
3. Economic aspects of waste and the 3Rs policy	163
4. International issues and co-operation	164
Notes	167
Selected sources	168

Chapter 7. Nature and Biodiversity	169
Assessment and recommendations	170
1. Policy framework and objectives	171
2. The state of nature and biodiversity	174
3. Nature and biodiversity protection in designated areas	178
4. Nature and biodiversity protection outside of designated areas	181
5. Expenditure on nature conservation	185
Notes	187
Selected sources	188
References	189
Reference I.A. Selected Environmental Data	190
Reference I.B. Selected Economic Data	191
Reference I.C. Selected Social Data	192
Reference II. Abbreviations	193
Reference III. Selected Environmental Websites	195
Tables	
1.1. Socio-economic trends and environmental pressures	21
1.2. Actions taken on the 2002 OECD Review recommendations for sustainable development	29
2.1. Energy-related taxes, 2001 and 2009	41
2.2. Tax incentives for fuel-efficient and low-emission vehicles	43
2.3. Actions taken on the 2002 EPR recommendations for economy-environment integration	45
2.4. Energy subsidies, 2007	47
2.5. Market sizes and employment potential of the environmental goods and services sector	55
3.1. Actions taken on the 2002 EPR recommendations for environmental management	66
3.2. Selected environmental legislation, 2000-08	67
3.3. Atmospheric emissions by source	75
3.4. Actions taken on the 2002 EPR recommendations for air management	78
3.5. Actions taken on the 2002 EPR recommendations for water management	79
3.6. Actions taken on the 2002 EPR recommendations for chemicals	88
3.7. Chemicals regulated under the Chemical Substances Control Law	89
4.1. Actions taken on the 2002 EPR recommendations for international co-operation	98
4.2. Japan in East Asia: ASEAN + 3	100
4.3. Fluorocarbons recovery, 2001 and 2008	106
5.1. GHG emissions by sector and by gas, 1990, 2000, 2007 and 2008	122
5.2. Key measures in the Kyoto Target Achievement Plan	127
5.3. Actions taken on the 2002 EPR recommendations for climate change	129
5.4. Energy prices in selected OECD countries, 2008	136

6.1. Other quantitative targets of the Second Fundamental Plan for Establishing a Sound Material Cycle Society	152
6.2. Actions taken on the 2002 EPR recommendations for waste management and 3Rs	153
6.3. Achievements of recycling targets	159
6.4. 3R-related bilateral co-operation with Asian countries	167
7.1. Actions taken on the 2002 EPR recommendations for nature and biodiversity	173
7.2. Protected areas, 2000-08.	178
7.3. Forest functions in public perception, 1980-2007	184
I.A. Selected Environmental Data	190
I.B. Selected Economic Data	191
I.C. Selected Social Data	192

Figures

1.1. Selected environmental indicators	25
1.2. Pillars of a sustainable society	28
2.1. Environment-related investment in stimulus packages, 2001-02 and 2008-09 ..	37
2.2. Environmentally related taxes	41
2.3. Road fuel prices and taxes.	42
2.4. Pollution abatement and control expenditure	49
2.5. Environmental patents.	51
2.6. Sales of selected eco-products, 2000-07.	54
3.1. Dioxin and photochemical oxidants	75
3.2. Freshwater use, 2007	79
3.3. Changes in organic, nitrogen and phosphorus pollution in three areas under total pollution load control system, 1999-2007	81
3.4. Agricultural inputs, 2007	82
3.5. Livestock density, 2006.	83
3.6. Population connected to public wastewater treatment plant, 2007	84
3.7. Top 10 chemicals releases and transfers, 2007	90
4.1. Official development assistance, 2008.	102
4.2. Aid in support of the environment, 2001-08.	103
4.3. Tropical wood imports, 2000-08	107
4.4. Fish catches, 2007	110
5.1. CO ₂ emission intensities, 2007	124
5.2. CO ₂ emissions from energy use by end-use sector, 1990-2008.	125
5.3. Overview of the Kyoto and mid-term emission targets in Japan	126
5.4. Energy structure and intensity	131
5.5. Renewable energy	132
5.6. Targets and performance of the Top Runner Programme, 1997-2005	135
5.7. Vehicle fuel efficiency	138
5.8. Transport sector	140

6.1. Material flows and indicators	151
6.2. Generation and treatment of waste	156
6.3. Public expenditure on municipal waste management, 1995-2007	162
6.4. International trade in waste	165
6.5. Exports of non hazardous recyclables from Japan	165
7.1. Fauna and flora	174
7.2. Invasive alien species in rivers, 1991-2005	177
7.3. Protected areas, 2009	179

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General Notes

Signs

The following signs are used in Figures and Tables:

- . . : not available
- : nil or negligible
- . : decimal point.

Country aggregates

OECD Europe: This zone includes all European member countries of the OECD except Slovenia,* i.e. Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland, Turkey and United Kingdom.

OECD: This zone includes all member countries of the OECD except Chile, Israel and Slovenia,* i.e. the countries of OECD Europe plus Australia, Canada, Japan, the Republic of Korea, Mexico, New Zealand and the United States.

Country aggregates may include Secretariat estimates.

Currency

Monetary unit: Japanese Yen (JPY).

In 2008, JPY 103.38 = USD 1.00.

In 2009, JPY 93.57 = USD 1.00.

Cut-off date

This report is based on information and data available up to end of April 2010.

* Chile, Israel and Slovenia became members of the OECD in 2010.

Executive Summary

Since the last *Environmental Performance Review* in 2002, Japan has made *steady progress in addressing a range of traditional environmental problems*, notably air and water pollution, and the management of chemicals and waste. The energy intensity of the economy has continued to decrease, particularly in the industrial sector, and is among the lowest in OECD countries. Material intensity has also decreased. At the same time, several more complex, long-term challenges have come to the fore: climate change, sound waste and materials management, and biodiversity conservation. In 2007, Japan adopted the “Strategy for a Sustainable Society in the 21st Century” that presents Japan’s vision for responding to these challenges. The Strategy has a strong international dimension, reflecting Japan’s traditional proactive and constructive role in international environmental co-operation.

Much of the last decade was characterised by *sluggish economic growth*. Trade within the East Asian region, particularly with China, expanded significantly. However, several trends called into question Japan’s economic growth model: excessive dependence on exports, weak domestic demand, a growing number of lower-paid, non-regular workers, an ageing population, and faster rates of growth in neighbour economies. The *need for a new growth model* was reinforced by the 2008-09 financial crisis. In late 2009, the government adopted a New Growth Strategy that identified environment and green innovation as two of the key drivers of future growth and job creation.

The environment as a driver for economic recovery and long-term growth

Eco-innovation is a *key feature* of Japan’s economic and environmental policies. Public and private environmentally related research and development (R&D) expenditures are substantial and increasing. Between 2000 and 2005, Japan accounted for 30% of world inventions in air, water and waste management technologies. Japan is a pioneer and world leader in a range of green technologies, including green information and communication technologies (ICTs) and climate-related technologies. According to some studies, Japan has the third largest share of the global market in environmental goods and services. Employment in environment-related enterprises has doubled since the previous *OECD Environmental Performance Review*.

The Japanese approach to eco-innovation is *broad*er than promoting technology development; it also seeks to encourage structural changes, including changes in consumer behaviour and lifestyles. Programmes such as the Eco-Town initiative address issues of social and industrial organisation. Domestically, the government has supported the supply of environmental technologies by deploying a range of measures that stimulate demand for green products,

including green procurement, subsidies, tax breaks, and an environmental technology verification scheme. Internationally, Japan's official development assistance is partly tied to transfers of Japanese environmental goods and services to partner countries.

The government's *response to the financial crisis* included substantial additional support for the environment sector, mostly energy efficiency, renewable energy technologies, and related R&D. Environment-related measures are estimated at USD 28 billion, or 0.57% of Japan's 2008 GDP, and accounted for about 16% of the overall anti-crisis package. The whole package was second largest among G7 countries. Some measures included in the stimulus package, such as support for agricultural production and the car industry, are likely to have adverse environmental impacts and distort competition. The overall economic and environmental impacts of the measures designed to promote economic recovery require careful evaluation.

Enhancing the cost-effectiveness of the environmental policy mix

Japan's approach to environmental policy is characterised by a strong emphasis on *performance standards and negotiated agreements* with industry, such as the Top Runner Programme and the Keidanren Voluntary Action Plan on the Environment. While these approaches have helped to persuade industry that investment in clean technologies can confer a competitive advantage, it is questionable whether they will provide sufficient incentives to improve environmental performance and drive the development of new technologies to the extent wanted by Japanese policy makers. Such approaches require a large investment of civil servants' time, and businesses have a bargaining advantage because of the superior information at their disposal. Moreover, it is often difficult to determine the progress that would have been achieved without these measures, especially since they promote incremental rather than fundamental changes in products and processes. A much *broader involvement of the public (consumers)* in environmental decision-making is also needed to build consensus on the measures that are required for making the transition to a sustainable society and to counter-balance the demands of the business sector and economic decision-makers.

More cost-effective policy instruments, particularly market-based instruments that apply to the economy as a whole and not just to particular sectors, would provide better incentives for achieving environmental objectives and for promoting eco-innovation. There has been a *slightly greater use of market-based policy instruments* since the 2002 OECD Review, notably water and waste charges, and a trial CO₂ emissions trading system. However, there is a continued strong tendency to encourage industry and consumers to purchase environmentally friendly products by providing various forms of *subsidies* (e.g. tax breaks and bonuses) rather than by including environmental costs in the price of goods and services. In view of their impact on the already strained public finances, such measures should be reconsidered in terms of their environmental effectiveness and economic efficiency. There is scope to broaden the use of *environmentally related taxes*, given Japan's relatively low tax-to-GDP ratio and the low share of indirect taxes in total receipts. This would generate revenue that could help fiscal consolidation or compensate for reductions in other taxes. The tax reform foreseen in 2011 would provide a good opportunity to reform the subsidies used to implement environmental policy, and to broaden the scope of environmentally related taxes, with a view to establishing a tax system that is more supportive of economic growth and environmental protection.

Developing more cost-effective means to address climate change

Under the Kyoto Protocol, Japan committed to a 6% reduction in its greenhouse gas (GHG) emissions on average over the 2008-12 period compared with the 1990 level. Under the Copenhagen Accord, Japan submitted its target of reducing GHG emissions by 25% by 2020 compared to the 1990 level. This target is “premised on the establishment of a fair and effective international framework in which all major economies participate and on agreement by those economies on ambitious targets”. However, *national net GHG emissions increased*, and in 2007 they were 9% above the base-year level. This was largely driven by rising emissions from electricity generation due to the increased share of fossil fuels, especially coal, in the energy mix. On the other hand, unlike many OECD countries, Japan has made remarkable *progress in the transport sector*, where emissions decreased by nearly 12% between 2000 and 2008. Technological advancement and tax incentives have helped to considerably improve the average fuel efficiency of the road vehicle fleet. Energy demand in the transport sector has also decreased since 2003 with the rise in oil prices.

Japan has made significant progress in integrating energy and climate policy, particularly by promoting technological progress to enhance energy efficiency of products, vehicles and manufacturing processes. A negotiated agreement with the manufacturing sector has been central to Japan's climate strategy. This may have helped Japan's major industrial sectors to become among the most efficient in the world. In contrast, *electricity consumption in the residential and commercial sectors has been growing steadily*, largely due to the increased use of electric appliances. This has more than offset the efficiency improvements achieved, for example, through the *Top Runner Programme*. Renewables account for about 3% of energy supply, which is low by OECD standards. Overall, Japan's energy policy pays insufficient attention to demand-side management, and tax rates on energy products are among the lowest in OECD countries.

While the economic recession brought GHG emissions down in 2008, this effect is likely to be temporary and achieving the Kyoto and provisional 2020 targets will require more cost-effective policy approaches. In particular, Japan should replace the *trial emissions trading scheme (ETS)* by a mandatory cap-and-trade scheme that is compatible, as far as possible, with trading schemes in other countries. It should be complemented by a *carbon tax*, so as to extend the price signal on CO₂ emissions to the widest possible range of sectors. Japan will also need to make extensive use of the Kyoto flexibility mechanisms to achieve its climate targets.

In September 2009, the government announced that Japan will provide USD 11 billion in official development assistance and other official flows and USD 4 billion of private funds for climate change actions in developing countries by 2012. This is consistent with Japan's strong commitment to environment in its development co-operation programme.

Moving from the management of waste to sound materials management

Japan has been at the forefront of efforts to shift from the management of waste to the sound management of materials based on the 3Rs – reduce, reuse and recycle. Quantitative targets for resource efficiency, recycling, and final disposal of waste have been achieved and

strengthened. The overall resource productivity of the Japanese economy increased by 37% between 2000 and 2007, mainly due to a decrease in construction. Overall, the 3Rs policy has focused on recycling and reducing final disposal, mainly to deal with landfill constraints. However, further efforts are needed in waste prevention (reduction and reuse). Cost recovery for municipal waste services should be improved by expanding the use of waste charging schemes. In addition, recovery costs should be internalised into product prices.

Japan has played a leading role in improving information on material flows at the international level and is promoting the 3Rs in Asia. However, an increase in the recyclables trade and greater price variations are undermining the viability of the Japanese domestic recycling system. There are concerns that trade in non-hazardous recyclable materials may mask illegal trade in hazardous waste. These developments underline the importance of co-ordinating waste management policies in the Asian region.

Improving biodiversity protection

Biodiversity protection has become a higher priority in recent years. The 2008 Basic Act on Biodiversity is intended to guide the review of all nature-related legislation. In March 2010, Japan released its 4th National Biodiversity Strategy. However, the deterioration and fragmentation of biodiversity sites has continued, underlining the need for stronger measures. Protection of biodiversity within and outside protected areas has not been sufficient to significantly reduce the rate of biodiversity loss. A relatively high portion of species face extinction: nearly a quarter of mammals and more than a third of freshwater fish. Invasive alien species are also an increasing threat.

About 24% of Japan's territory is under some form of protection. However, less than 6% of the national land area is registered by the International Union for Conservation of Nature, which is low by OECD standards. There is significant scope to increase the portion of forests and marine areas dedicated to nature conservation. A national strategy to develop biodiversity corridors is needed that takes account of the expected impacts of global warming. The links between biodiversity monitoring and policy-making should be tightened. Strengthening nature and biodiversity management requires closer inter-ministerial co-operation. Japan is promoting the revitalisation of traditional rural landscapes (*satoyama* landscapes), aiming to achieve a balance between farm production and conservation of biodiversity and ecosystem services. More effective means should be used to integrate biodiversity protection into sectoral policies, particularly in agriculture, forestry and fisheries. This includes withdrawing or redesigning subsidies, providing better incentives to protect biodiversity, and establishing payments for ecological services, including in *satoyama* areas.

PART I

Sustainable Development

PART I

Chapter 1

Developments since the 2002 Review

In a changing economic, social and international context, Japan has managed to reduce some of the pressures on the environment, notably energy use, air emissions, water abstractions and municipal waste generation. However, greenhouse gas emissions and generation of non-municipal waste have grown, pressures on nature and biodiversity have intensified, and air and water pollution remain of concern in some areas. Japan defined its own model of a sustainable society, based on a low-carbon economy, sound material cycle and biodiversity conservation. These three priority areas are reflected in the environmental plans that were approved at both national and local levels during the review period. Japan has also taken steps to improve inter-institutional co-ordination and the integration of environmental concerns into sectoral planning.

Assessment and recommendations*

Prior to the 2008-09 global economic downturn, Japan's economy had grown steadily, albeit at a much lower rate than in other Asia Pacific region and OECD countries. The economic expansion phase was characterised by a reduction in both energy and resource intensities. Progress was made in reducing some *pressures on the environment*, notably air emissions, water abstractions and municipal waste generation. However, further efforts are needed to reduce the generation of non-municipal waste, manage the risks associated with chemicals, and tackle air and water pollution in some areas. Greenhouse gas emissions have grown and are above the Kyoto target. Pressures on nature and biodiversity have also intensified.

In recent years, there has been a move from a strictly environmental interpretation of *sustainable development* to a more integrated approach, recognising the linkages between environmental protection, economic growth and social change. These linkages are given much emphasis in the 2006 Third Basic Environment Plan and the 2009 New Growth Strategy. The 2007 Strategy for a Sustainable Society outlines the pillars of Japan's sustainable society model: low-carbon economy, sound material-cycle and harmony with nature. However, there is no specific institution that co-ordinates governmental policy on sustainable development. While mechanisms are in place to ensure policy co-ordination, *integrated policy-making remains difficult*, with ministries and local authorities focussing on the implementation of their respective sectoral and local plans.

As recommended by the 2002 OECD *Environmental Performance Review*, Japan reinforced its evaluation procedures to *ensure accountability for the implementation of environmental plans*. The Ministry of the Environment and its major advisory body, the Central Environment Council, annually conduct progress reviews and disclose the results to the public. However, these reviews do not sufficiently assess the *cost-effectiveness of the policy mix*. In many cases, considerations other than effectiveness and efficiency guide policy choices, which are often selected from a limited set of options. Japan's environmental administration would also benefit from further strengthening the independence of its advisory bodies.

Recommendations

- Clarify linkages and priorities among different *sectoral plans and the basic environment plans*.
- Strengthen *inter-institutional co-operation*, so as to ensure more effective and coherent integration of sectoral and environmental policies at all levels of government.
- Improve the *evaluation of environmental policy* by strengthening *ex ante* and *ex post* economic analysis and enhancing the independence of advisory bodies.

* Assessment and recommendations reviewed and approved by the OECD Working Party on Environmental Performance at its meeting on 4 May 2010.

1. Key socio-economic developments

1.1. Economic structure and performance

Japan is the OECD's second largest economy¹ and a major player in world trade. After the so-called "Lost Decade" of the 1990s, a prolonged period of economic stagnation and deflationary pressures, Japan began to recover in the early 2000s, driven by its exports. However, between 2000 and 2008, Japan's economy grew at a much lower rate than the OECD average (Table 1.1). The global economic slowdown of 2008 and the simultaneous rise in the

Table 1.1. **Socio-economic trends and environmental pressures**

	Japan (2000-08, % change)	OECD (2000-08, % change)
Selected economic trends		
GDP ^a	10.6	18.5
Private final consumption ^a	9.2	20.0
Agricultural production ^b	-2.0	..
Industrial production ^c	5.5	10.3
Road transport^b		
Freight transport ^d	10.8	..
Passenger car transport ^e	-2.3	..
Vehicle stock	9.9	15.0
Energy		
Total primary energy supply	-5.1	3.5
Total final consumption of energy ^b	-0.8	4.6
Energy intensity	-18.2	-26.1
Renewable energy supply	-7.7	18.8
Selected social trends		
Population	0.6	5.6
Life expectancy at birth ^b	1.7	..
Ageing index ^f	37.9	18.9 ^b
Poverty rates ^g	8.8	..
Unemployment	-15.9	-0.6
Selected environmental pressures		
Pollution^b		
CO ₂ emissions from energy use ⁱ	4.7	4.1
Emissions of SO _x	-15.3	-20.4
Emissions of NO _x	-8.0	-15.3
Resource use		
Water abstractions ^h	-4.1	..
Municipal waste ^b	-7.3	-5.3
Waste from manufacturing industries ^b	14.5	..
Material intensity ^h	-18.2	-8.2
Nitrogenous fertiliser use ^b	11.2	7.6
Pesticide use ^j	-20.7	..

a) Based on values in USD at 2005 prices and PPPs.

b) To 2007.

c) Mining and quarrying, manufacturing, and production of electricity, gas and water.

d) Based on values in tonne-kilometres.

e) Based on values in passenger-kilometres.

f) Number of persons over 65 years old per hundred persons under 15 years old.

g) Share of population with an income under 40% of the median income, after taxes and transfers. Between mid-1990s and mid-2000s.

h) To 2005.

i) Sectoral approach; excluding marine and aviation bunkers.

j) To 2006.

Source: OECD, Environment Directorate; OECD-IEA.

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value of the Japanese currency sharply reduced the volume of exports. As a result, the Japanese economy contracted by 1.2% in 2008 and by 5.2% in 2009, and was dragged into the sharpest recession since the Second World War (Chapter 2). The recession bottomed out in late 2009, owing to a rebound in exports and a fiscal stimulus, which limited the negative impact of lower employment and wages on domestic demand (OECD, 2009a).

Industry

Manufacturing industry makes up a larger part of the economy than in many other OECD countries, despite the growth of the service sector. Industrial activity amounted to nearly 30% of GDP in 2007, in line with the OECD average, while the manufacturing sector alone accounted for 21.6% (compared to an estimated OECD average of about 17.5%). Overall, industrial production grew between 2000 and 2008 (Table 1.1). Japan is one of the largest merchandise exporters. High- and medium-high-technology industry, such as transport equipment, electronics and chemicals, make up the largest share of manufactured goods and exports.² More traditional sectors, such as steel and metals, also play a key role. Japan is among the largest exporters of technology-intensive goods, although its share in OECD technology exports has considerably decreased (OECD, 2007).

Agriculture

Agricultural production continued to decrease during the review period, as did its share of the economy, going from 1.8% of GDP in 2000 to 1.5% in 2007 (Table 1.1). Japan's agricultural production comprises mainly rice, fruit and vegetables. Japan is the largest net importer of agricultural and wood products in the world. Agriculture is a highly protected sector in Japan. Support to agriculture has decreased, although this support remains among the highest in OECD. Moreover, the vast majority of agricultural subsidies are linked to production levels, with potentially negative impacts on the environment (Chapters 2 and 7).

Energy

While the economy and industrial production grew between 2000 and 2007, Japan's *total final consumption* (TFC) of energy and *total primary energy supply* (TPES) decreased by 1%. Energy use drastically fell in 2008 as a consequence of the economic crisis (Table 1.1). Industry accounts for the largest part of TFC in Japan, with a share of about 30%. Industrial energy consumption has remained largely stable, owing to investments in energy efficiency in some manufacturing sectors. However, growing electricity consumption in the residential and commercial sectors is of concern. Japan's *energy intensity* (TPES per unit of GDP) has decreased, albeit at a lower rate than in many countries, and is among the lowest in OECD (Table 1.1). As in most OECD countries, fossil fuels account for most of TPES. The contribution of *renewables* to energy supply, mostly from hydroelectric power, is relatively modest (Chapter 5).

Transport

Japan has well-developed transport networks. The increasing commercial integration of Japan into the East Asia region has led to intensive air and maritime traffic. Nonetheless, road remains the dominant *freight transport* mode and its volume (in tonne-kilometres) has increased at the same rate as the economy (Table 1.1). However, improved logistics has led to a decline in distance travelled and freight traffic volumes (in vehicle-kilometres). Moreover, contrary to most OECD countries, *passenger transport* by car has decreased since the early 2000s. Several factors explain this trend, including rising fuel prices (Chapter 5).

Compared to other OECD countries, passenger car ownership in Japan has increased at a lower rate and remains below the average (Table 1.1). However, there are significant differences between the major metropolitan areas, where public transport has gained passengers at the expense of private vehicles, and smaller cities and rural areas (MLIT, 2008). Here, passenger travel is increasingly dependent on private cars to cope with the relocation of many public facilities and cultural activities to suburban areas.

1.2. The social context

Japan is one of the most densely populated countries in the world, with a population of over 128 million and a *population density* of 338 inhabitants per square kilometre (km²), far exceeding the OECD average. Japan's population is mostly concentrated in coastal plains, resulting in large variations of population density across regions. The low fertility rate and immigration levels have led to a *slow population decline*, especially in rural areas (Table 1.1). On the other hand, the number of households has grown, with consequences for energy and resource use.³ Japan's population is also *rapidly ageing*. Life expectancy at birth exceeds the OECD average by a fair margin and has continued to rise (Table 1.1). Overall, health indicators for the Japanese population are excellent.

The Japanese *unemployment* rate remains low by OECD standards, although it rose to 5% in 2009 due to the economic downturn (Chapter 2). More and more women are part of the labour force. The growing number of non-regular workers is aggravating income inequalities and poverty.⁴ The *poverty* rate climbed by about 9% in the last decade, and reached a relatively high level compared to the OECD average (Table 1.1).

The Japanese people demonstrate a growing *awareness of environmental problems* (Chapter 3). For example, 98% of the respondents to recent opinion polls declared to know something or a great deal about climate change. This awareness is translating into concrete action more often than in the past, especially with regard to reducing waste, increasing recycling, and saving energy.

2. Key environmental pressures

Japan's archipelago consists of *four main islands and thousands of small islands* (Box 1.1). More than two-thirds of the country is covered with forests, while arable land constitutes only 13% of the land area and is intensively cultivated (Figure 1.1). Most industries, agricultural activities and people are concentrated in the coastal plains and basins.

Nature and biodiversity

As a result of its wide range of climatic conditions, Japan's vegetation and wildlife are diverse (Box 1.1). However, *pressures on biodiversity are rising*. Relatively high shares of fauna and flora species are threatened by deteriorating and fragmented habitats, and by invasive alien species (Figure 1.1). *Protected areas* registered by the International Union for Conservation of Nature (IUCN) cover less than 6% of the territory, which is low by OECD standards, and very few protected areas have been designated in recent years (Chapter 7). Complex coastlines with many bays and small islands provide Japan with an abundant marine life. However, only a few marine areas are protected. Consumption of fish per capita is among the highest in OECD countries. Despite decreased fish production, Japan accounts for the second highest share of the world's fish catches (Figure 1.1). Agriculture is also a major source of pressure on biodiversity. Japan's use of *fertilisers and pesticides* per km² of agricultural land remains well above the OECD averages (Chapter 3).

Box 1.1. Physical context

Japan is an *archipelago of about 6 800 islands*. Honshu is the largest island, followed by Hokkaido, Kyushu and Shikoku. Together, these four islands represent 98% of Japan's land area, totalling some 378 000 km². Japan stretches from 25 to 45 degrees latitude north, has an extensive coastline of about 35 000 kilometres and no land border. Mountains and hilly terrain cover some two-thirds of the country; some mountains in Honshu are over 3 000 metres high, including the well known Mount Fuji. Hills and mountains are cultivated as much as possible. Japan is very *prone to seismic activity*. It experienced around one-fifth of the world's earthquakes of magnitude seven between 1997 and 2006.

As a result of its length, mountainous terrain and proximity to the Asian monsoon area, Japan has *very diverse climatic conditions with great seasonal variations*. Hokkaido has long winters with frequent snowfalls, while the southern islands around Okinawa enjoy a subtropical climate. The central Honshu island is characterised by cold winters and warm, moist summers. Annual precipitation also varies greatly between regions and seasons. In the last few years, *extreme weather events* have become more frequent in Japan, along with a general rise in heavy rain episodes. This increases the risk of floods and has a significant impact in a country where a large part of the population, infrastructure and assets are concentrated in coastal areas and many of the largest bays are below sea level.

Japan's large range of latitude also results in a *wide diversity of flora*. Vegetation ranges from subtropical to temperate and cold temperate, and even alpine. The northern and central islands have a wide variety of evergreen broad-leafed and coniferous forests and deciduous broad-leafed forests. Subtropical rain forests are found in the south western islands. Natural forests make up about half of the total area; the other forests are secondary or planted.

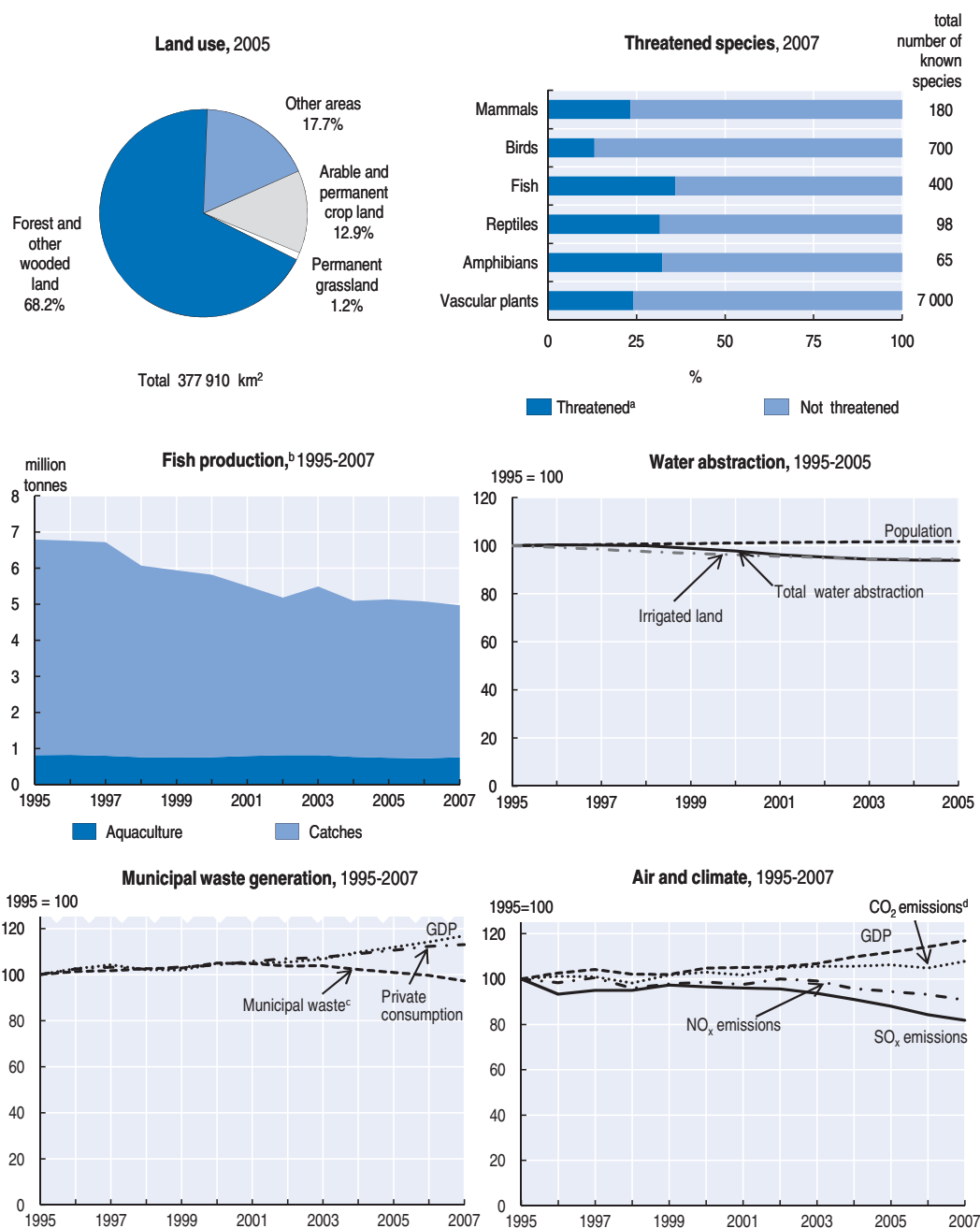
Japan's *wildlife* is diverse. In the southern islands, tropical animals such as the flying fox and the serpent eagle can be found, in addition to the Iriomote cat (found only on Iriomotejima Island). The mainland islands host sika deers, mandarin ducks and coppers pheasants. The mainland is also home to the only Japanese indigenous primate, the Japanese macaque. Two bear species are present in Japan: the higuma, found only on Hokkaido, and the smaller Asiatic black bear. Japan seas host an abundant marine life, including seals, sea lions, whales and porpoises. Commercial fish, such as tuna, sardine and squid, play an important economic and social role in the country.

Japan is relatively poor in *natural resources*. It has enough resources in magnesium, gold and silver to meet its needs, but has to import a wide variety of minerals, including bauxite, copper, iron ore and coke. Almost 90% of Japan's energy supply (fossil fuels and uranium) is imported. Japan is also a very large importer of wood and wood products, as domestic round wood production meets less than a fifth of national demand, as well as of living marine resources, which constitute a large share of the Japanese diet.

Water

Water abstraction decreased during the review period, following the decreasing trends in population, agricultural production, and irrigated areas (Figure 1.1). With 650 cubic metres per inhabitant, Japan's water abstraction per capita is below the OECD average, but remains above a large number of OECD countries, notably European. Gross freshwater abstraction represents about 20% of available water resources, indicating a moderate water stress. The overall quality of Japanese rivers has improved, owing to the extension of

Figure 1.1. Selected environmental indicators



a) IUCN categories "critically endangered", "endangered" and "vulnerable" in % of known species.

b) Fish catches and aquaculture in inland and marine waters, including freshwater fish, diadromous fish, marine fish, crustaceans, molluscs and miscellaneous aquatic animals. Catches exclude marine mammals, crocodiles, coral, pearls, sponges and aquatic plants.

c) Waste collected by or for municipalities, waste directly delivered and separate collection for recycling by the private sector. It includes household, bulky and commercial waste and similar waste handled at the same facilities.

d) Emissions from energy use only; excludes international marine and aviation bunkers; sectoral approach.

Source: OECD, Environment Directorate; OECD-IEA (2008), *CO₂ Emissions from Fuel Combustion*; OECD (2009), *OECD Economic Outlook*, No. 86.

StatLink <http://dx.doi.org/10.1787/888932318642>

wastewater systems. However, lakes and coastal waters continue to suffer from frequent algae blooms, due to the still high nutrient load from agriculture, discharges from small wastewater treatment plants and small factories (Chapter 3).

Waste and material intensity

While GDP and private final consumption increased during the review period, the generation of municipal waste decreased by 7% (Figure 1.1). The generation of waste per capita (400 kg in 2007) is among the lowest in OECD countries. Recycling of selected waste streams has improved, and final disposal amounts of waste have been reduced by more than half (Chapter 6). However, waste generation by manufacturing industries has grown faster than GDP. Japan's domestic material consumption (DMC)⁵ decreased during the review period. Only DMC of fossil fuels grew, reflecting increasing imports of these fuels and their dominant role in the energy mix (Chapter 5). *Material intensity* (as measured by DMC per unit of GDP) decreased faster than in the other OECD countries and has remained well below the OECD average since 1980 (Table 1.1).

Air pollution

Emissions of sulphur (SO_x) and nitrogen oxides (NO_x) continued to decrease during the economic recovery period (2002-07), showing a strong decoupling from GDP growth and fossil fuel use (Figure 1.1). Emission intensities decreased further during the review period: with 0.2 kg of SO_x and 0.5 kg of NO_x per unit of GDP (USD 1 000), Japan is one of the least pollution-intensive OECD countries. Notable progress was made in reducing emissions of dioxins, especially from waste incineration, as well as transport-related emissions (*e.g.* volatile organic compounds, carbon monoxide and particulate matter), owing to technological improvements of the vehicle fleet. Nonetheless, *air quality in urban areas* remains a problem (Chapter 3). High levels of photochemical oxidants occur, due to emissions from stationary and mobile sources, as well as from sources outside the country (Chapter 4).

Climate change

Greenhouse gas (GHG) emissions further increased; in 2007, they were 9% above the 1990 level, far exceeding the Kyoto Protocol target. The economic recession brought GHG emissions down by 6.4% in 2008. CO_2 emissions from energy use have increased by nearly 5% since 2000, albeit at a lower rate than GDP (Figure 1.1). As a result, the carbon intensity of the Japanese economy has decreased and is now below the OECD average. However, progress has been slower than in other major OECD economies, mainly due to a high share of fossil fuels in the energy and electricity mix. Efficiency improvements have helped to moderate the increase of industrial emissions, and higher fuel efficiency of vehicles has largely contributed to the decline in CO_2 emissions from transport (Chapter 5).

3. The framework for sustainable development and environmental management

3.1. Institutional framework

Japan's central environmental administration was last reorganised in 2001, within the framework of a central government reform. On that occasion, the Ministry of the Environment (MOE) was established, replacing the Japan Environmental Agency (OECD, 2002). MOE has remained the main authority in charge of national environmental policy, and oversees a number of affiliated institutions.⁶ Among these, the Japan Environmental

Safety Corporation and the Environmental Restoration and Conservation Agency were established in 2004 to manage the PCB (polychlorinated biphenyls) waste treatment programme and the pollution-related health damage compensation and prevention programmes, respectively (Chapters 3 and 6). Other ministries have key environment-related responsibilities, including: the Ministry of Agriculture, Forestry and Fisheries (MAFF); the Ministry of Land, Infrastructure, Transport and Tourism (MLIT); and the Ministry of Economy, Trade and Industry (METI) (OECD, 2002).

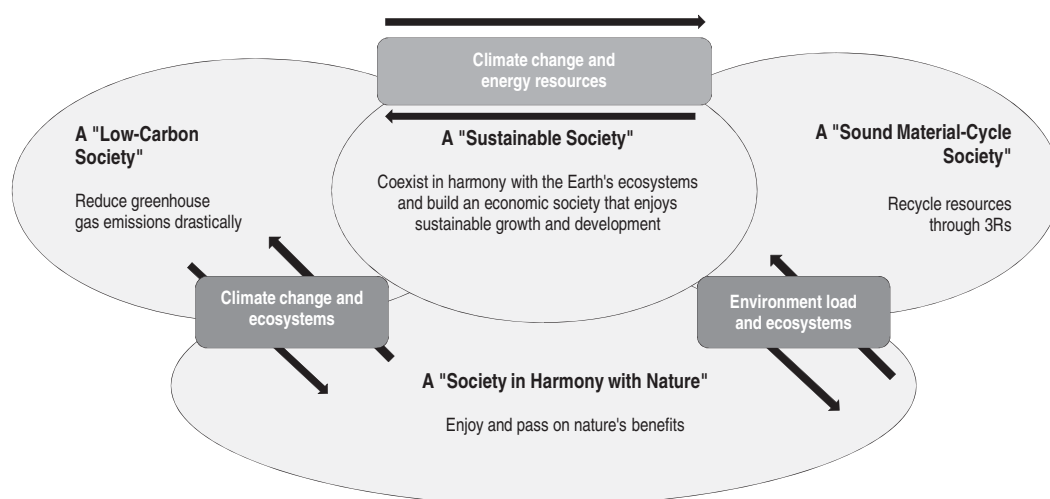
Prefectures and municipalities of metropolitan areas are responsible for local administration, including the implementation of environmental policies.⁷ Smaller municipalities do not have environmental regulatory responsibilities, except for municipal waste management. With some 75 000 officials in 2008, the local environmental administration accounts for 3% of the local government staff, and is much larger than the national environmental administration, whose total staff is around 1 500 (MOE, 2009). The human and budgetary resources for environmental management in local governments continued to decrease over the review period, partly due to the outsourcing of waste collection and management to the private sector (Chapter 6). In 2005, MOE established *seven Regional Environmental Offices*⁸ to assist local authorities in implementing environmental policies, in particular for waste management and nature conservation. These offices are also responsible for cross-cutting activities, including the development of environmental awareness and education initiatives.

There is no specific institution that co-ordinates governmental policy on sustainable development. Nonetheless, *mechanisms are in place to ensure policy co-ordination* among ministries and consultations with stakeholders. For instance, the Cabinet co-ordinates key strategic policies, such as climate change and ocean policy, with the establishment of *ad hoc* “headquarters”. The Central Environment Council, composed of non-governmental experts, remains the major advisory body to MOE (OECD, 2002). The expert councils under the aegis of other ministries also take account of environmental issues. However, the independence of these advisory bodies from the government needs to be reinforced.

3.2. Strategic and planning framework

“Sustainable development” is well-rooted in Japan’s strategic policy design. Japan’s Strategy for a Sustainable Society in the 21st Century was approved by the Cabinet in 2007. It outlined *Japan’s model of a sustainable society*, based on three pillars: low-carbon economy, sound material-cycle and harmony with nature (Figure 1.2).⁹ The strategy calls for further co-ordination among institutions, larger participation of all economic and social actors, and enhanced international co-operation. Eco-innovation is at the core of the strategy, and seen as a tool to tackle environmental problems and contribute to economic growth and social progress. Eco-innovation is also a building block of the 2009 New Growth Strategy (Chapter 2).

The *multi-annual basic environment plans*, required by the Basic Environment Law (Chapter 3), are the main components of environmental policy and address the integration of environmental considerations into sectoral policies (OECD, 2002). These plans, which result from inter-ministerial consultations, are approved by the Cabinet and guide government budget allocation. They are implemented through sectoral plans and local plans. According to a 2006 survey, almost all prefectures and larger cities, as well as nearly half of the minor cities, had implemented their basic environmental plans (Ogata, 2006). Some local authorities (e.g. the Osaka prefecture) have promoted advanced environmental plans, anticipating measures defined at national level (Box 1.2).

Figure 1.2. **Pillars of a sustainable society**

Source: Government of Japan (2007).

Box 1.2. **Environmental policy at local level: the Osaka experience**

The *Prefecture of Osaka*, in the Kansai region, has a population of nearly 9 million inhabitants. It includes the municipalities of Osaka (2.6 million inhabitants) and of Sakai (840 000 inhabitants). Osaka's economy grew significantly during the review period, although it was severely affected by the 2008-09 economic crisis.

Building on pioneering pollution control efforts, the prefecture has launched and implemented a *comprehensive environmental plan for 2002-10*. The Osaka prefecture is committed to reducing its own GHG emissions by 9% in 2010 compared to the 1990 level; it is on track to achieve this target, having reached a 5.5% reduction in 2007. The local authorities have negotiated GHG emissions reductions with large emitters, introduced carbon offsets, and promoted R&D on fuel cell vehicles and the use of transport fuels containing 3% bio-ethanol. Freight vehicles and buses entering designated areas in Osaka must have a sticker showing compatibility with specific emission requirements, which are more demanding than nation-wide requirements. The prefecture has met its air quality standards for nitrogen oxides and suspended particulate matter. The prefecture has also promoted the 3Rs (reduce, reuse, recycle) and reached high recycling rates of home appliances.

With the 2008-09 economic crisis, more emphasis has been placed on green growth. This concept is central in the 2025 vision for the development of Osaka prefecture (December 2008). Significant public financial support was injected into the local economy, focusing *inter alia* on energy savings, solar power, fuel cells, low carbon industrial facilities, and research and development. Enterprises are promoting greater Osaka and Kansai as an "Eco-Business Centre of Asia".

As recommended by the 2002 *OECD Environmental Performance Review*, Japan has taken action to improve co-ordination among the basic environment plans and their associated sectoral plans, as well as to better integrate environmental considerations into sectoral policies (Table 1.2). Compared to the previous plans, the 2006 *Third Basic Environment Plan* highlights more explicitly the linkages between environmental protection, economic growth and social change. However, this plan is part of a *complex planning system*, with a

Table 1.2. **Actions taken on the 2002 OECD Review recommendations for sustainable development**

Recommendations	Actions taken
Ensure that co-ordinated and <i>integrated sectoral plans</i> , associated with the Second Basic Environment Plan, are developed through close co-operation among the ministries concerned, and assure accountability for implementation of the plans.	The basic environmental plans and the major associated sectoral plans, namely those concerning biodiversity, the material-cycle society, and the achievement of the Kyoto target on climate change, were approved by the Cabinet, thereby committing ministries concerned. MOE and the Central Environment Council annually review the implementation of the basic environmental plans and of the major associated plans. Related information is made available to the public.
Better <i>integrate</i> environmental concerns in physical planning, transport, agriculture, energy and urban policies.	Each ministry involved in the implementation of the Third Basic Environment Plan has formulated specific policies to integrate environmental considerations into its institutional activities (namely METI, MLIT and MAFF).

Source: OECD, Environment Directorate.

multiplicity of sectoral strategies and basic plans at both national and local levels. The priorities and the linkages between the plans formulated by each ministry and the Third Basic Environment Plan remain unclear. The national government does not oversee local environmental policies. Despite being approved at cabinet level, the Third Basic Environment Plan does not provide a coherent framework for action for all ministries and local authorities.

MOE and the Central Environment Council systematically *review the implementation of the basic environmental plans*, disclose related information to the public, and conduct public hearings and opinion polls. Local governments also assess their plans. However, there is no evidence that these reviews influence the annual planning and budgeting processes. Further, they do not sufficiently assess the *cost-effectiveness of the policy mix* and, in many cases, considerations other than effectiveness and efficiency guide policy making.

4. Key environmental and sustainable development initiatives

During the review period, *Japan's environmental policy*, at both national and international levels, had a strong focus on climate change and energy efficiency, sound waste and materials management and, more recently, biodiversity conservation. In 2007, Japan recognised these areas as the three building blocks of its sustainability model (Figure 1.2).

In 2005, Japan launched the *Kyoto Protocol Target Achievement Plan* as its road map to attain the committed 6% reduction in GHG emissions by 2008-12 from the 1990 level (Chapter 5). The Plan consists of a mix of regulation, governmental spending, voluntary measures, and economic incentives addressing key economic sectors. A CO₂ emissions trading scheme has been implemented on a trial and voluntary basis. The *2008 Action Plan for Achieving a Low-carbon Society* set a long-term goal of a 60% to 80% reduction in emissions by 2050. In 2009, Japan announced a target of cutting its GHG emissions by 25% compared to the 1990 level by 2020, which is “premised on the establishment of a fair and effective international framework in which all major economies participate and on agreement by those economies on ambitious targets”. In March 2010 the Cabinet approved and submitted to the Diet the bill of the Basic Act on Global Warming Countermeasures, which foresees the introduction of emissions trading and taxation measures.

Since 2000, Japan has been promoting an *integrated sound waste management and the 3Rs (reduce, reuse, recycle) approach* (Chapter 6). The Fundamental Plan for Establishing a Sound Material-Cycle (SMC) Society (2003) has specified measures and targets to minimise consumption of natural resources and generation of environmental loads. In 2004, G8 countries endorsed the Japanese 3Rs initiative to encourage more efficient use of resources and materials. More recently the Japanese policy has put more emphasis on worldwide resource limitation. The Fundamental Plan was revised in 2008 with a view to promote synergies between the 3Rs and climate change measures, and to develop a sound material-cycle in East Asia.

In 2007, Japan released the *3rd National Biodiversity Strategy*, which outlined four “biodiversity crises”: species and habitat degradation, degradation of biodiversity in the countryside (*satochi-satoyama*), ecosystem disturbances caused by alien species, and threats to species and ecosystem generated by global warming. The 2008 *Basic Act on Biodiversity* is intended to guide the review and revision of all nature-related pieces of legislation, some of them dating back to the early 1900s. In May 2008, Japan launched the *Satoyama Initiative*, aiming at developing a model for resource management and land use that strikes the balance between economic production and conservation of biodiversity and ecosystem services. Japan released a new biodiversity strategy in March 2010 and has agreed to host the 10th meeting of the Conference of the Parties to the Convention on Biological Diversity in October 2010, reflecting the country’s growing political focus on biodiversity issues (Chapter 7).

The policy framework to tackle traditional environmental management issues, such as *air pollution and water management*, has been in place for decades. Major novelties include regulatory measures to reduce pollution from particulate matter and volatile organic compounds in urban areas, and to increase the coverage and efficiency of water supply and sanitation infrastructure. Japan has adopted a water management policy based on a sound hydrological cycle linking various areas, such as forestry, agriculture, river basin and quality management, and water supply and sanitation (Chapter 3).

In the area of *chemicals management*, the Chemical Substances Control Law was amended to provide a common legal framework for all industrial chemicals – new and existing – and extend the risk-based approach to evaluation and regulation. A well developed Pollutant Release and Transfer Register (PRTR) has been in place since the early 2000s (Chapter 3).

Environmental policy implementation was supported by initiatives to enhance the scope and policy relevance of *environmental data systems*, including through the requirement for corporate reporting (introduced in 2005) and the adoption of the Environmental Information Strategy in 2009. Japan enacted a legal framework to promote *environmental education* in 2003 (Chapter 3).

In recent years, Japan has been giving *increasing attention to the linkages between environment, economy and society*. The Japanese government responded to the 2008-09 economic recession by adopting fiscal measures to support energy efficiency and eco-innovation, thereby contributing to developing a low-carbon society. The 2009 New Growth Strategy sees the environment, health and tourism sectors as the main drivers of future growth and job creation. In its effort to enlarge the market of environment-friendly products, Japan expanded the scope of the Top Runner Programme, launched incentive

schemes to encourage purchases of energy efficient equipment, reformed its vehicle related taxes to link them to the environmental performance of vehicles, and reinforced its green public procurement policy (Chapter 2).

In a changing international economic and political context, Japan has been giving more importance to *economic and environmental co-operation in Asia*. Japan launched a number of partnership initiatives, including the Tripartite Environment Ministerial Meetings between Japan, China and Korea, which have become more action-oriented in recent years. Japan has also contributed to maintain a high-level political focus on water and sanitation, and in 2006 it launched the Water and Sanitation Broad Partnership Initiative (Chapter 4). In 2009, the government launched the Hatoyama Initiative to support developing countries in addressing climate change problems.

Notes

1. In terms of nominal GDP.
2. With high- and medium-high-technology industries accounting for some 80% of its exports in 2007, Japan was second only to Ireland (OECD, 2009b).
3. The number of households was 49.1 million in 2005, with 2.55 persons per household, down from 2.67 in 2000.
4. Non-regular workers do not have lifetime employment and have lower salaries than regular workers; they represented 34% of the labour force in 2007.
5. DMC is the total amount of materials directly used by the economy in a given year. DMC equals domestic extraction of resources plus imports minus exports, including processed products for imports and exports. Domestic extraction is the flow of raw materials extracted or harvested from the environment and used by the economy as material factor inputs.
6. These include: the National Institute of Environmental Studies, the National Environmental Research and Training Institute, the National Institute for Minamata Disease, the Biodiversity Centre of Japan, and the Global Environment Information Centre.
7. Japan's territory is divided into 47 prefectures, which are themselves divided into numerous municipalities.
8. Hokkaido, Tohoku, Kanto, Chubu, Kinki, Chukoku-Shikoku and Kyushu.
9. The strategy builds on the integrated implementation of eight sectoral and cross-sectoral strategies: 1) international leadership to overcome the climate change problem; 2) conservation of biodiversity for the sustainable use of nature's benefits for the current generation and generations to come; 3) creation of sustainable material-cycles through the 3Rs (reduce, reuse, recycle); 4) international co-operation using experience and knowledge derived from having overcome pollution; 5) economic growth centred on environmental and energy technologies; 6) creation of dynamic local communities that use the benefits of nature; 7) educating people to value the environment, think for the environment, and act for the environment; and 8) creating a system to support a "leading environmental nation".

Selected sources

The government documents, OECD documents and other documents used as sources for this chapter include the following. Also, see list of websites at the end of this report.

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PART I

Chapter 2

Greening Growth

Following a period of modest economic growth, Japan's economy was severely hit by the 2008-09 global economic downturn. The anti-crisis fiscal stimulus package included several environment-related measures. Reforming the tax system, expanding environmentally related taxes and removing environmentally harmful subsidies could help fiscal consolidation without hampering economic recovery. The long-term strategy to 2020 outlines a green growth path, and sees eco-innovation as the link between environmental improvement, economic growth and social progress. Japan is a leader in environmental and climate-related technologies and is promoting the development of green markets and employment. The declining and ageing population represents a new challenge for both economic and environmental policies.

Assessment and recommendations*

Japan's export-driven economy slowed significantly in 2009 as a consequence of the *global economic downturn*. The government responded with a large-scale fiscal stimulus and a long-term growth strategy. *Environment-related measures accounted for some 16% of the overall anti-crisis package*. Support to energy efficiency, renewable energy technologies and related research and development (R&D) constituted the core of the "green" stimulus measures, reflecting emphasis on the transition to a low-carbon society. However, as in many other countries, Japan's stimulus package included *measures that can have negative environmental impacts and distort competition*, such as support to the car industry and agricultural production, and discounts on highway tolls. "Green innovation" is one of the six pillars of the 2009 New Growth Strategy to 2020. Although still at an initial stage of definition, the Strategy appears to include the main elements of the 2009 OECD Declaration on Green Growth.

The private sector has a growing role in providing environmental infrastructure and services. *Pollution abatement and control expenditure in the business sector increased during the review period, partially offsetting the decline in public expenditure*. According to some studies, Japan holds the third largest share of the global market of environmental goods and services. *Employment in environment-related enterprises has doubled since the previous review and accounts for 95% of total (public and private) environmental employment*. The eco-business is expected to expand further, providing for additional job opportunities in the sector. Some Japanese financial institutions have also started to provide environment-related financial services.

Eco-innovation is a core element of Japan's environmental policy and part of the government's strategy to contribute to economic growth and social progress. Japan is a world leader in environment- and climate-related technological innovation, and is a pioneer in some new green technologies, such as green information and communication technologies. *Government expenditure for environment- and climate-related R&D increased considerably during the review period*. However, it still represents a relatively low share of the public R&D budget; by expanding direct public investment in basic R&D, the government would share the risk of developing new technologies with the private sector and further accelerate innovation. The private sector, especially the manufacturing industry, is considered a driver of eco-innovation. *Performance targets, such as the Top Runner Programme, have contributed to technological improvement*. Nonetheless, these performance targets should be assessed in terms of their level of ambition, capability of inducing breakthrough innovations and cost-effectiveness.

* Assessment and recommendations reviewed and approved by the OECD Working Party on Environmental Performance at its meeting on 4 May 2010.

Japan has promoted the diffusion of cleaner goods in both the public and private sector. *Green public procurement* has been mandatory since 2001, although only for central government institutions, which has helped to enlarge the market of some eco-products. Japan should consider the financial implications of its green purchasing policy and make sure that it targets goods and services with the highest potential environmental returns. Information on environmental performance of products is made available through a variety of *eco-labels*. Japan provides *fiscal support to businesses and households* to invest in energy saving and pollution control equipment. Incentive schemes are in place to encourage purchases of energy efficient household appliances (e.g. the Eco-Point Programme) and vehicles. However, rewarding energy-efficient or environmentally friendly products strains the public budget and is less cost-effective than internalising environmental impacts in the price of goods and services.

Revenue from *environmentally related taxes* increased by 6% during the review period, although its share in total tax revenue decreased. The taxation system has been “greened” to some extent, for example with the introduction of a coal tax and tax breaks for fuel-efficient vehicles. These tax incentives have contributed to renew the vehicle fleet with more efficient and smaller vehicles. The earmarking of vehicle and road fuel taxes for road construction and maintenance was removed in 2009. However, the tax rates on energy products, including transport fuels, have not changed since the previous review and remain among the lowest in OECD. There is no evidence that fuel taxes have substantially contributed to reduce energy consumption from transport in Japan. There is scope to broaden the use of environmentally related taxes, given the relatively low tax-to-GDP ratio and the low share of indirect taxes in total receipts. In general, environmentally related taxes can generate revenue that, depending on the economic circumstances, can help fiscal consolidation through deficit reduction and/or be used to reduce other taxes or to finance government expenditure, including environmental expenditure. The tax reform foreseen in 2011 is set to include environmentally related tax measures.

Phasing out *environmentally harmful subsidies* should be a central part of a comprehensive environmental fiscal reform, with a view to increasing cost-effectiveness of policy measures and to reducing pressure on the public budget. Japan removed subsidies to domestic coal production and reduced support to agricultural producers. Nonetheless, support to agriculture remains high and mostly linked to production. Japan continues to subsidise business activities related to fossil fuels for securing a stable energy supply, such as exploration and refining, and to exempt fuels used in several sectors from excise duties. As emphasised in the previous two *OECD Environmental Performance Reviews*, businesses often benefit from government financial assistance to meet environmental targets, thereby deviating from a consistent application of the polluter-pays-principle.

Income inequality and relative poverty have slightly decreased since 2000, although they remain higher than in the mid-1990s. The impacts of environmentally related taxes and charges on low-income households are an emerging issue and should be further explored. The *decline and ageing of Japan’s population* create new challenges for the design of environmental policies and the planning of environmental, energy and transport infrastructure. *Regional inequality* in Japan is relatively low in comparison with other OECD countries, and the majority of the population enjoys good quality environmental services. However, disparities remain between large metropolitan areas and small and medium-sized cities, for instance concerning accessibility of public transport services, domestic gas supply and wastewater treatment plants.

Recommendations

- Evaluate the impact of the *New Growth Strategy to 2020* on the environment, as well as the net contribution of environment-related sectors to growth and employment.
- Review *transport-related taxation and pricing*, with a view to directly linking taxes on the purchase and ownership of vehicles to their fuel efficiency, and to better targeting pollution related to vehicle use through fuel taxes and road pricing.
- *Mainstream environmental considerations in the 2011 tax reform*, with a view to broadening the use of environmentally related taxes and reducing incentives and subsidies that have perverse environmental effects, or that contravene the polluter-pays-principle.
- Speed up the implementation of *green public procurement* in local governments, while ensuring its environmental effectiveness, economic efficiency and compliance with competition rules.
- Further expand public direct investment in basic R&D in *environment- and climate-related technologies*; analyse the effectiveness and dynamic efficiency of current *performance targets* (e.g. the Top Runner Programme) in inducing eco-innovation.
- Strengthen the analysis of the *social-environment interface* as a support for decision-making, including the distributional impacts of environmental policies and the impacts of demographic and other social trends on the environment.

1. Fiscal policy and the environment

1.1. From economic recovery to recession

Japan is the OECD's second largest economy in terms of GDP. While losing relative ground in the last two decades, Japan's GDP per capita was still slightly above the OECD average in 2008.¹ Japan is one of the largest merchandise exporters. High- and medium-high-technology industries, such as transport equipment, electronics and chemicals, make up the largest share of manufacturing and exports.

After the so-called "Lost Decade" of the 1990s, a prolonged period of economic stagnation and deflationary pressures, *Japan's economy started to recover in 2002*. Between 2000 and 2008, it grew by 10.6%, a rate much below the OECD average (18.6%). The recovery was mainly the result of a surge in exports caused by the low value of the Japanese currency, increased US demand, and stronger integration with other Asian countries. China is now Japan's main single country trade partner. However, domestic demand was weak: average nominal wages decreased as the number of lower paid, non-regular workers increased, household income remained stagnant and public expenditure contracted as part of the fiscal consolidation plan. General price levels slowly declined, a phenomenon not seen in any other OECD country during that period. Hence, the economic expansion primarily benefited the export-oriented manufacturing sectors and large firms, whereas the rest of the economy, which depends more on domestic demand, lagged behind.

The 2008 global economic slowdown and the simultaneous rise in the value of the yen sharply reduced the volume of exports. Consequently, the Japanese economy contracted by 1.2% in 2008 and declined by 5.2% in 2009, the sharpest fall in economic activity since the Second World War. The crisis had a severe impact on unemployment, and the unemployment rate was above 5% in 2009. Japan also faces greater deflationary risks than other OECD countries. The budget deficit (excluding one-off factors) is projected to climb

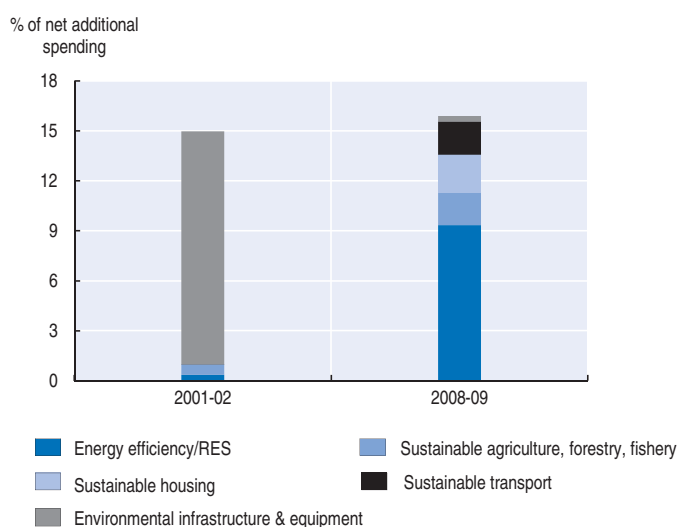
from 3% of GDP in 2007 to about 9% in 2010. Japan shoulders a very large debt-to-GDP ratio. At 167% in 2007, it was the highest gross government debt among OECD countries, and it could rise to over 200% of GDP in 2011 (OECD, 2010a).

During the economic downturn, Japanese authorities acted quickly to stabilise the financial markets, stimulate the economy, increase social security and prepare for future growth. Between August 2008 and April 2009, the government launched *four stimulus packages*. The stimulus totalled JPY 132 trillion (about USD 1.3 trillion) for 2008-09, or 4.7% of 2008 GDP. It was the second largest stimulus effort in G7 countries and was based on additional public spending (4.2% of GDP) (OECD, 2009a). The additional spending consisted mainly of: transfers to firms and households; investment in social infrastructure, education and technology; and active labour market policies.

A considerable part of the additional spending was environment-related, in an attempt to link the anti-crisis measures to the long-term goal of promoting green growth and a transition to a low-carbon society (Box 2.1 and Figure 2.1). In early 2010, the Diet approved another supplementary budget, which explicitly acknowledged the environment as one of the three pillars of Japan's response to the crisis, together with employment and economic growth.

The fiscal stimulus and large public investment partially offset the negative impacts of lower employment and wages on domestic demand. This, together with a rebound in exports, helped Japan to arrest the economic recession in the second half of 2009 and slowly recover (OECD, 2009b). Fiscal stimulus cannot continue for long, however, considering Japan's large budget deficit and government debt. Once a recovery is in place, *Japan should reduce the stimulus and move towards fiscal consolidation*, implementing spending reductions and a broad tax reform (OECD, 2009a). The upturn will need to rely primarily on private domestic demand, given the uncertainty of export markets. The New Growth Strategy, approved in December 2009, appears to be moving along these lines, as well as incorporating green growth features (Box 2.2).

Figure 2.1. **Environment-related investment in stimulus packages,^a**
2001-02 and 2008-09



a) Data cover three stimulus packages in 2001-02, and four stimulus packages in 2008-09.

Source: Ministry of Finance and OECD calculations.

Box 2.1. The environmental dimension of fiscal stimulus packages

During the review period, Japan implemented *large stimulus packages* containing additional fiscal spending in 2001-02 and 2008-09. The 2008-09 fiscal stimulus is much larger than the previous one, with a higher weight of net additional spending and lower tax cuts. The composition of net spending is also different, with a lower share devoted to public investment (OECD, 2009a).

Direct environment-related investment and fiscal incentives are estimated at nearly JPY 2.9 trillion (USD 28 billion), equivalent to 0.57% of 2008 GDP and to 16% of the 2008-09 fiscal stimulus (considering the four packages approved between August 2008 and April 2009). While this share is only slightly higher than in 2001-02, the composition of the “green” stimulus differs greatly (Figure 2.1). The bulk of the 2001-02 environment-related stimulus consisted of public investment in environmental infrastructure and equipment, mainly waste and wastewater infrastructure development. This kind of investment accounted for only 2% of green investments in 2008-09. The *promotion of energy efficiency, renewable energy sources and related R&D* represents the core (some 60%) of the 2008-09 “green” anti-crisis measures, reflecting the emphasis Japan is putting on the transition to a low-carbon society. The remaining green component is almost evenly shared among support to sustainable housing (i.e. improvement of quality and energy efficiency of residential buildings), sustainable transport infrastructure (i.e. railways and local public transport), and rural development, including support to the *Satoyama Initiative* (Chapter 7).

The *green measures in the 2008-09 stimulus packages* include: i) tax reductions for fuel-efficient and cleaner vehicles (Section 1.2); ii) “eco-point” system to reward purchases of energy-saving home appliances (Section 1.3); iii) tax incentives for investments in energy-saving and renewable energy facilities, including the possibility to claim immediate depreciation of their costs; iv) tax incentives for R&D, especially for small and medium-sized enterprises; v) capital grants and tax incentives for businesses and households that install photovoltaic panels and energy-efficient appliances; vi) a feed-in tariff to support photovoltaic energy (Chapter 5); vii) tax incentives and capital grants for energy efficient renovation of residential and public buildings (including schools); viii) support for energy efficiency and biomass reuse in agriculture; ix) forest maintenance, such as thinning, to enhance GHG absorption capacity (Chapter 5); and x) support for green investments at local level, through the Local Green New Deal Funds.

This kind of investment is likely to have a more immediate impact on economic activity than traditional infrastructure projects (OECD, 2009a). However, some measures included in the stimulus packages can have *negative environmental impacts* and should be carefully assessed for consistency with environmental objectives. These measures include:

- transfers to highway companies to compensate them for the *temporary reduction in highway* tolls until the end of 2010, which are intended to reduce travel and logistics costs and to stimulate domestic demand (Box 2.3);
- subsidies for the *automobile industry* in the form of car-scrapping incentives (Section 1.3);
- investments in *road construction*, airports and fishery infrastructure (e.g. ports); and
- *additional support to farmers* to expand production of rice, barley and beans, as well as measures to stimulate domestic demand for agricultural, forestry and fishery products, e.g. requiring schools to serve such products more frequently.

In January 2010, the Diet approved *another supplementary budget*, which diverts about JPY 7.4 trillion allocated in the previous budgets to new spending measures. All the environment-related measures were confirmed and partly extended, including the “eco-point” system for home appliances, subsidies for low-emission vehicles, and support for the renovation of buildings (with the introduction of a housing “eco-point” scheme). However, the 2010 regular budget includes some measures that are potentially harmful to the environment, including increased support for agricultural production, further discounts on highway tolls, and a provision for lowering motor fuel taxation in case of oil price peaks.

Box 2.2. Japan's New Growth Strategy: towards green growth?

In December 2009, the Cabinet approved *Japan's New Growth Strategy*. It outlines a model of growth based on domestic demand, innovation, and stronger economic integration of Japan in the Asia region, as well as less dependence on heavy public investment in infrastructure. The Strategy takes into account the challenges of climate change and Japan's ageing population. As a result, it identifies the environmental and health sectors, together with increased leisure time and tourism, as the main sources of demand and, hence, as the key drivers of future growth and job creation. In particular, the promotion of "green innovation", i.e. innovation in the environment and energy sectors to achieve a low-carbon society, is one of the six basic policies, as indicated below. Greening the tax system is one of the instruments that will be used to promote green innovation.

Basic policy	Objectives to 2020	Priorities
Become a leader in environment and energy through "green innovation"	Generate market value of over JPY 50 trillion and 1.4 million jobs in environment-related sectors; reduce global GHG emissions by at least 1 300 MtCO ₂ eq by promoting Japanese technology worldwide.	- Renewable energies and innovative technologies. - Zero-emission residential and commercial buildings. - Comprehensive policy package to achieve a low-carbon society, including regulatory reforms and greening the tax system.
Health leader strategy through "life innovation"	Create market value of about JPY 45 trillion and 2.8 million jobs in health-related sectors.	- R&D in pharmaceuticals, medical and nursing care technologies. - Expand the availability of accessible housing for elderly and disabled people. - Strengthen medical and nursing care services.
Economic strategy for Asia	Establish a Free Trade Area of the Asia-Pacific (FTAAP); take advantage of Asia growth opportunities.	- Roadmap for reaching the FTAAP agreement. - Promote international adoption of Japanese safety standards. - Public-private support for sustainable transport and environmental infrastructure. - Make Haneda Airport an international hub; "open skies" agreement; port infrastructure. - Revise regulations that obstruct flows of people, goods, and capital.
Promote a tourism oriented nation and local revitalisation	- Increase annual number of foreign visitors to Japan to 25 million, for JPY 10 trillion of market value and 560 000 jobs. - Revitalise urban and under-populated areas. - Increase the self-sufficiency rate for food to 50% and for timber to over 50%; increase agriculture, forestry, fisheries, and food product exports by a factor of 2.5, to JPY 1 trillion. - Double the market of existing housing; reduce the share of insufficiently earthquake-proof housing to 5%.	- Ease tourist visa requirements for citizens of Asian countries. - Increase use of paid vacation time. - Use private finance initiatives and public-private partnerships to provide infrastructure in urban areas. - Introduce an individual household income support system for farmers; promote partnerships among agriculture, commerce and industry. - Revitalise forests and forestry, e.g. through biomass use. - Improve the market of existing housing. - Earthquake-proof renovation of buildings.
Strategy for a science and technology oriented nation	Increase public and private investment in R&D to over 4% of GDP; increase the number of Japanese world leading universities and research institutions; expand ICTs.	- Reform universities and public research institutions; ensure full employment for those who complete doctoral courses. - Reform systems and rules to foster innovation. - Provide "one-stop" government services; reform regulations to encourage ICT use.
Employment and human resources	- Halve the number of "freeters";^a rectify M-shaped female employment; increase the number of job-card holders to 3 million;^b increase the minimum wage; shorten working hours and increase utilisation of paid vacation time. - Achieve a sustainable increase in the birth rate; attain the world's top level of academic achievement.	- Increase the employment rate of young people, women, the elderly, and the disabled. - Improve assistance to job seekers and the unemployment insurance system; expand the job-card system to include vocational qualification. - Expand childcare services; make childcare leave more flexible. - Improve the quality of education. - Improve the social environment to ensure the safety of children.

a) "Freeter" is a Japanese expression for people between the age of 15 and 34 who lack full time employment or are unemployed (excluding students), live with their parents and earn some money with low skilled and low paid jobs.

b) Under the job-card system, businesses provide training to part-time and low-skilled workers and issue them with job cards that contain a record of their training, evaluation and employment.

Although very broad, the Strategy appears to include the main elements of the 2009 OECD Declaration on Green Growth: green investments, R&D, low carbon infrastructure, tax instruments, co-ordination of labour market with education policies, and international co-operation.

1.2. Greening the tax system

Japan's tax system differs from that of many OECD countries in several respects. In particular, the tax revenue to GDP ratio is one of the lowest in the OECD area (28.3% in 2007, compared to the OECD average of 35.8%). Revenues from indirect taxes on goods and services, including those on energy and transport, account for a much lower share of tax receipts than the average for the other OECD countries (18% of tax receipts in 2007, compared to 30.9%).²

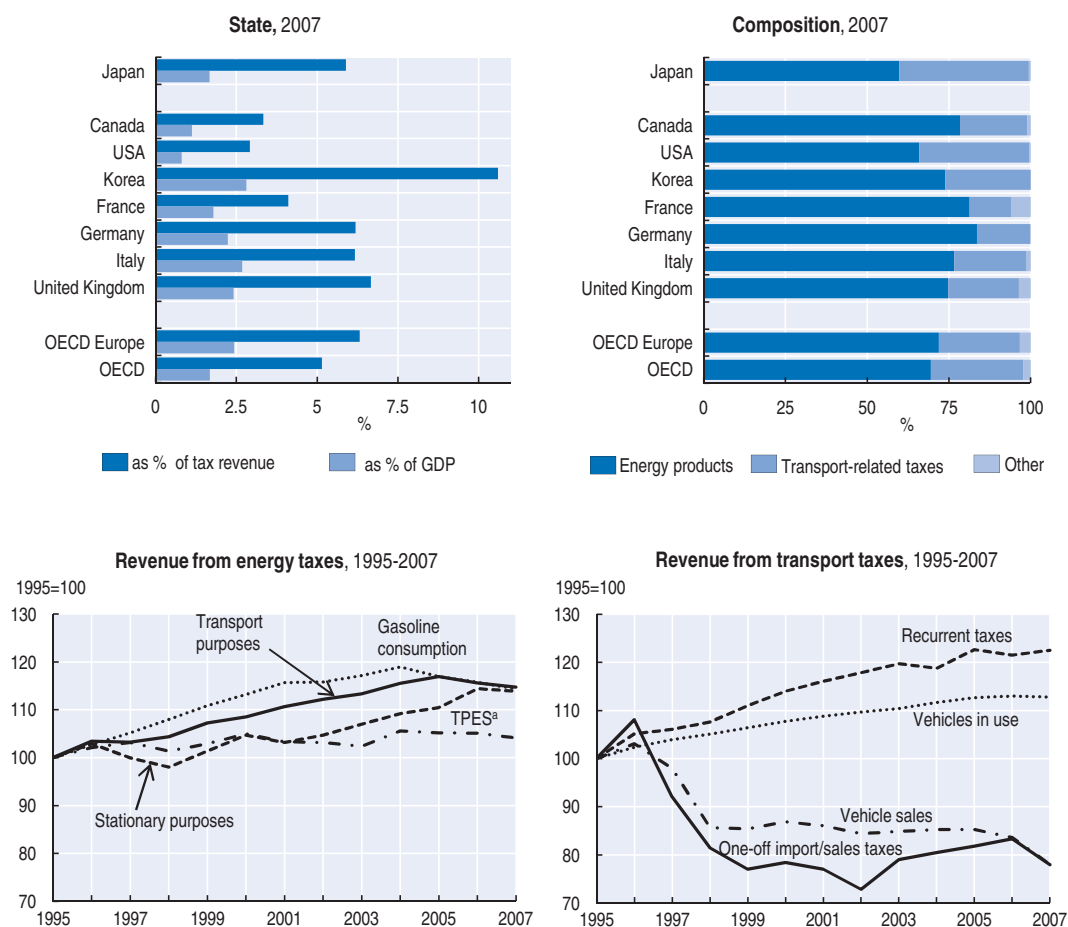
As in all OECD countries, environmentally related tax revenues largely consist of revenues from taxes on energy use and vehicles. Japan imposes a multiplicity of such taxes, some of which are collected at local level. *Revenues from environmentally related taxes* (in real terms) have increased by about 6% since 2000 and accounted for 1.7% of GDP in 2007. This share is in line with the OECD weighted average, although well below the OECD Europe average (Figure 2.2), and it has slightly decreased since the previous review. Revenues from environmentally related taxes accounted for 5.9% of total tax receipts in 2007, down from 6.3% in 2000. This share is above the OECD weighted average, though it ranks in the lower half of OECD countries (Figure 2.2). Energy taxes play a relatively minor role in Japan compared with other major economies, accounting for less than 60% of environmentally related tax revenue (Figure 2.2).

Taxes on energy products

Tax rates on energy products are lower in Japan than in a number of other OECD countries, notably European countries, and have remained virtually unchanged (in nominal terms) since the previous review (Table 2.1). Exceptions include the extension of the petroleum tax to coal in 2003 and the increase of the tax rate on natural gas and liquefied petroleum gas (LPG), which partly corrected for the uneven tax burden on various fossil fuels (IEA, 2003). This, combined with the growing share of coal and natural gas in total primary energy supply (TPES), has led to an increase in revenues from energy taxes for stationary purposes (Figure 2.2), despite a rather stable TPES (Chapter 5).

Taxes on fuels for transport purposes account for some 83% of the revenue from energy-related taxes. Japan's taxation of transport fuels stands out among OECD countries in a number of ways. Japan is one of the few OECD countries taxing aviation fuel used on domestic flights. Gasoline and diesel taxes – and prices – are well below those of most OECD countries (Figure 2.3). In 2008, taxes accounted for 27% of the diesel price and 40% of the gasoline price, compared to a range of 48-58% of the diesel price and 59-65% of the gasoline price in the G8 European countries.³ Bioethanol blended gasoline benefits from tax exemption on its bioethanol content (up to 3%).

While fuel prices have increased since 2003, in line with world oil prices, tax rates have remained unchanged in nominal terms and their impact on transport decisions has thus been negligible (Figure 2.3). Yet, *passenger demand appears to be sensitive to fuel prices*: passenger traffic by car continued to grow in the early 2000s and started to progressively decrease, as did gasoline consumption, when fuel prices rose (Figure 5.8). The gasoline tax represents over 65% of the revenue from transport fuel taxes, due to the dominance of gasoline vehicles in the fleet (Chapter 5). Consequently, revenues from fuel taxes largely follow the trend in gasoline consumption (Figure 2.2). The response of Japanese consumers to the rise in fuel prices, exacerbated by the 2008 oil price peaks, shows that a *higher and better targeted fuel taxation, e.g. on the basis of fuel carbon content*, would offer an incentive for

Figure 2.2. **Environmentally related taxes**

a) Total primary energy supply.

Source: OECD-EEA Database on Economic Instruments for Environmental Policy; OECD-IEA (2009), *Energy Balances of OECD Countries*; Ministry of Land, Infrastructure, Transport and Tourism; Japanese Automobile Manufacturers Association.

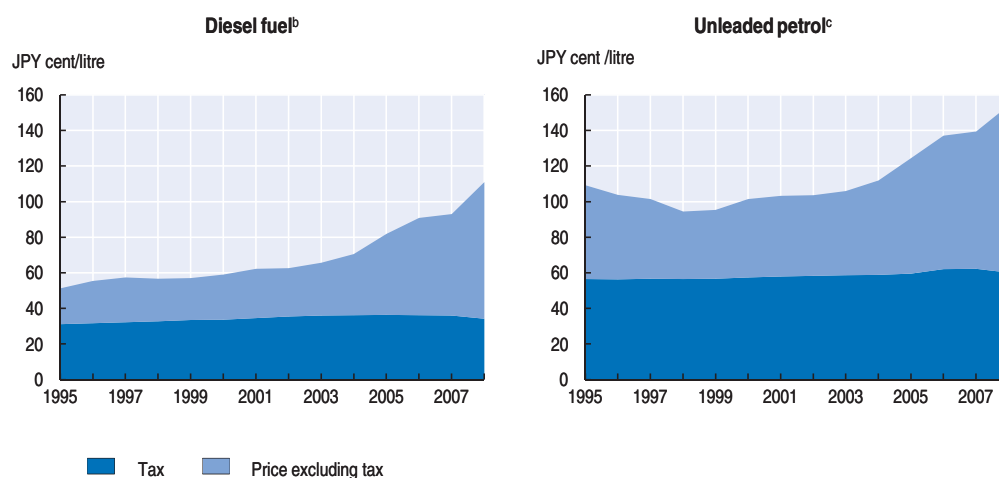
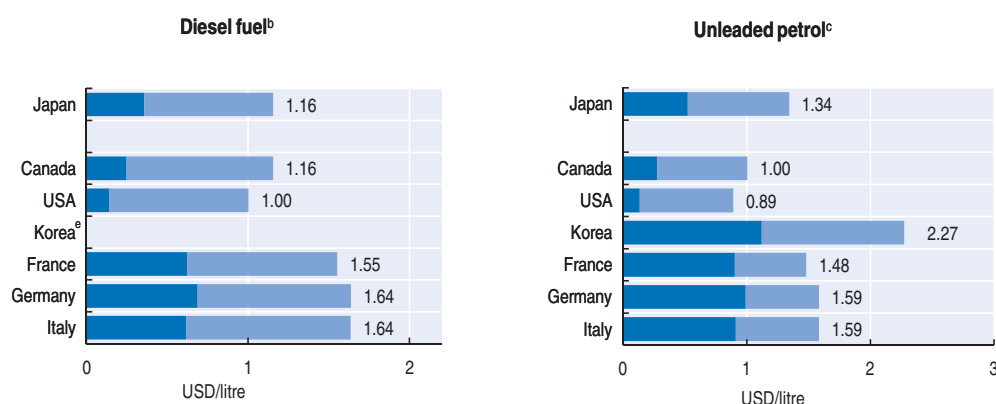
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Table 2.1. **Energy-related taxes, 2001 and 2009**

		2001	2009	Exemptions
Gasoline tax	On unleaded gasoline			Aviation, diplomats, heating, gasoline used as solvent for rubber and as raw material for petrochemicals.
	Gasoline tax	48.6 JPY/l	48.6 JPY/l	
	Local gasoline tax	5.2 JPY/l	5.2 JPY/l	
Delivery tax	On delivery of:			Agriculture, forestry, fishing, mining.
	Light oil	32.1 JPY/l	32.1 JPY/l	
	Diesel fuel	32.1 JPY/l	32.1 JPY/l	
LPG tax	On LPG used for transport purposes	17.5 JPY/kg	17.5 JPY/kg	Exports; LPG used as heating fuel or in manufacturing.
Petroleum and coal tax	On natural gas, imported LPG	0.72 JPY/kg	1.08 JPY/kg	Exports; fuel oil used in agriculture, forestry or fishing; naphtha and gaseous hydrocarbons used as raw materials for production of petrochemicals and ammonia.
	On crude oil, imported petroleum products	2.04 JPY/l	2.04 JPY/l	
	On coal	–	0.70 JPY/kg	
Aviation fuel tax	On aviation fuels	26 JPY/l	26 JPY/l	Central and local governments, international air transport.
Power-resource development tax	On sale of electricity	0.445 JPY/kWh	0.375 JPY/kWh	

Source: Government of Japan.

Figure 2.3. Road fuel prices and taxes

Trends in Japan,^a 1995-2008State,^d 2008

a) At constant 2005 prices.

b) Automotive diesel for commercial use.

c) Unleaded premium (RON 95); Japan and Korea: unleaded regular.

d) Diesel fuel: at current prices and exchange rates; unleaded petrol: at current prices and purchasing power parities.

e) Data not available.

Source: OECD-IEA (2009), *Database of End-use Prices*.StatLink  <http://dx.doi.org/10.1787/888932318680>

buying smaller and more fuel-efficient cars, driving shorter distances and shifting to public transport. However, in its 2010 budget, the government announced that fuel taxation would be reduced in case of new oil price spikes.

The government has been discussing the introduction of a *carbon tax* for several years and has signalled its intention to introduce such a tax as part of a comprehensive tax reform scheduled for 2011. In 2009, the Ministry of the Environment (MOE) proposed a tax of JPY 1 064 (USD 10) per tonne of CO₂ on fossil fuels, including transport fuels. This is a

relatively low level compared to similar taxes applied in other countries (e.g. Finland and Sweden) and to the average price of a CO₂ allowance in the EU emissions trading system (Chapter 5). Under the proposed carbon tax scheme, the gasoline tax would be simultaneously reduced, so that the final tax rate, including the carbon tax, would be comparable to the minimum rate applied in the EU. Moreover, relief measures for specific industries would be considered. While such exemptions would help moderate the potential impacts of the carbon tax on the international competitiveness of Japanese industries, they would create uneven abatement incentives across sectors and should therefore be transitional and targeted to the most exposed sectors. A carbon tax could complement a new mandatory emissions trading system, thereby extending carbon pricing to households, offices and transport (Chapter 5).

The revenue from most energy-related taxes is earmarked for several purposes.⁴ Earmarking revenue from transport fuel and vehicle taxes for road construction and maintenance was removed in 2009. For several years, the rates of these taxes had been based on the financial requirement for road work. The removal of earmarking is thus a positive step that allows these taxes to be better designed to meet environmental goals, primarily climate change goals. In general, earmarking tax revenue reduces the flexibility of fiscal decisions and, therefore, overall efficiency, and should be limited to the extent possible.

Vehicle taxes

Japan imposes taxes on the purchase and ownership of motor vehicles at prefectural and national levels. None of these taxes is directly based on the environmental performance or fuel efficiency of vehicles.⁵ Nonetheless, during the review period, tax breaks were introduced to favour the purchase of more environment-friendly vehicles (Table 2.2). As from 2001, the automobile tax was reduced by 25-50% depending on a vehicle's fuel efficiency and exhaust emission levels, and it was increased by 10% for old vehicles.⁶ The tax break was extended in 2009 to the acquisition tax and the motor vehicle tonnage tax.

Table 2.2. **Tax incentives for fuel-efficient and low-emission vehicles**

Type of vehicle	Fuel efficiency	Emissions performance	Incentives		
			Automobile tax	Acquisition tax ^a	Motor vehicle tonnage tax ^b
Alternative-energy next generation vehicles	Electric (including fuel cell), plug-in hybrid, clean diesel, hybrid and natural gas vehicles that meet certain performance requirements		50% reduction	Exempted	Exempted
Passenger cars	Compliant with 2010 standards +25%	Emissions down by 75% from 2005 standards	50% reduction	75% reduction	75% reduction
	Compliant with 2010 standards +10%	Emissions down by 75% from 2005 standards	25% reduction ^c	50% reduction	50% reduction
Heavy-duty vehicles	Compliant with 2015 standards	Compliant with 2009 standards	–	75% reduction	75% reduction
		NO _x or PM emissions down by 10% from 2005 standards	–	50% reduction	50% reduction

a) From 1 April 2009 to 31 March 2012.

b) From 1 April 2009 to 30 April 2012, with reductions applicable once only, at the time of the mandatory vehicle inspection.

c) Discontinued in April 2010.

Source: Ministry of Land, Infrastructure, Transport and Tourism.

The so-called “next generation vehicles”, including hybrid and plug-in hybrid, electric, clean diesel and compressed natural gas cars, are fully exempted. These tax breaks are set to be phased out in 2012.

Revenues from the acquisition tax decreased sharply in the second half of the 1990s, with both the decline of vehicle sales and the shift to small and mini cars. Revenues rebounded in 2002 with the introduction of the automobile tax break, which boosted sales of more expensive standard-size, albeit more fuel-efficient, cars. Revenues from recurrent taxes (automobile and motor vehicle tonnage taxes) have slightly decreased in nominal, though not in real, terms since 2002-03, with the growing number of small and fuel-efficient vehicles in the fleet. The vehicle stock has continued to increase until recently (Figure 2.2).

Other environment-related taxes

Several local authorities have introduced a landfill tax for disposal of industrial waste (Chapter 6). Some 0.5% of environment-related tax revenue is generated by a levy on SO_x emissions linked to the 1973 Law Concerning Compensation for Pollution-Related Health Damage. The purpose of the levy is to secure funding for compensating victims of air pollution certified by 1987 (OECD, 2002). The levy rate is set *ex post*: the financial requirement for health damage compensation (i.e. the revenue requirement) is shared among emitters proportionally to their 1982-86 emissions (60% of the revenue) and current annual emissions (40% of the revenue). Only installations that were active as of 1987 are deemed responsible for air pollution and are charged. The levy is thus more an instrument to enforce environmental liability than an economic incentive. Its burden on emitters is fading, as is the revenue. While it contributed to the uptake of SO_x abatement equipment in the 1980s, it is doubtful that it has played a role in curbing emissions in recent years (OECD, 2010b).

Other tax incentives

Japan provides *fiscal support* to both households and businesses. Households can claim tax credits for the purchase of new houses meeting energy efficiency standards and for the installation of energy efficient equipment, such as heat insulation materials and solar panels. Similarly, businesses can benefit from tax credits or special depreciation rates on investment costs for improving energy performance and controlling pollution. Tax credits are also given for investment in R&D (Section 2).

Assessment

Japan plans to carry out a *comprehensive review of the tax system* by 2011, which will include a review of environmentally related taxes and consider the reinforcement of such taxes. A number of fiscal incentives have been introduced to make the tax system more environment-friendly, notably in the case of vehicle taxes, as recommended by the 2002 OECD *Environmental Performance Review* (EPR) (Table 2.3). However, *tax breaks to subsidise environment-friendly vehicles* are generally less efficient than charging the polluting dimension of road transport. Such tax breaks represent expenditure for the government, in terms of foregone fiscal revenues, as was the case with the automobile tax. Moreover, they can contribute to increasing vehicle use, which can potentially offset the technical efficiency gains. Hence, the environmental effectiveness of these measures is questionable, e.g. in terms of reducing emissions of greenhouse gases or air pollutants.

Table 2.3. Actions taken on the 2002 EPR recommendations for economy-environment integration

Recommendations	Actions taken
Continue to <i>restructure environment-related taxes</i> in a more environmentally friendly way.	MOE established an Expert Committee to discuss potential effects of the carbon tax. Japan introduced tax incentives to favour more environment-friendly vehicles (see below).
Review and further develop the system of <i>road fuel and motor vehicle taxes</i> , with a view to promoting more sustainable modes of transport, to internalising environmental costs, while paying attention to the demand for transport infrastructure and to introducing more flexibility in the allocation of the revenue.	Taxation of road fuels has remained unchanged. Japan has introduced tax breaks for motor vehicle taxes to link them to fuel efficiency and exhaust gas emissions of vehicles, including heavy-duty vehicles. The earmarking of vehicle and road fuel taxes to road construction and maintenance was phased out in 2009.
Continue to <i>reduce sectoral subsidies</i> that have negative environmental implications.	Japan phased out subsidies for domestic coal production in the early 2000s. Support to farmers has decreased.
Strengthen efforts to buy and use " <i>greener goods</i> " (e.g. via green procurement policies and the green consumer movement) so as to promote more sustainable production and consumption patterns.	Green public procurement requirements have been mandatory for central government institutions since 2001. The Eco-Mark certification programme has been extended and several other eco-labels apply. Several incentive schemes are in place to favour the purchase of cleaner products, including vehicles and electric appliances.
Review <i>distributional implications</i> of proposed market-based instruments for environmental management and sustainable development.	No actions taken.
Assess the impact of changes in <i>technology and lifestyle</i> (e.g. the impact of information/communications technology, increased recreation time, retirement) on environment and nature, taking into account related changes in patterns of settlement, transport, production and consumption.	Some reports, including the White Papers issued by MOE and MLIT, describe the interactions between the environment, on the one hand, and social, demographic and settlement changes, on the other.

Source: OECD, Environment Directorate.

Higher oil prices have largely helped to moderate passenger traffic by car since 2003, and might have well been the primary incentive to shift to cleaner vehicles. Overall, Japan needs to redirect taxation from purchase and ownership of vehicles to their use and associated pollution load, i.e. through better targeted fuel taxes and road pricing (Box 2.3). Any remaining taxes on vehicles should be directly linked to their fuel efficiency and environmental performance.

Japan needs to reform its tax system to come to grips with urgent, and potentially conflicting, objectives: raising tax revenues to cope with high public debt and growing social spending resulting from an ageing population, while promoting economic growth and addressing widening income inequality (Jones and Tsutsumi, 2008). The OECD recommended raising the consumption tax rate and broadening the base of direct taxes by reducing allowances and deductions (OECD, 2009a).⁷ Broadening the use of indirect taxes on the consumption of goods and services that are potentially harmful to the environment, e.g. through a carbon tax, can also contribute to reaching these goals. Such taxes would generate revenues that can help the government with fiscal consolidation and/or be used to partly reduce taxes on households and businesses, thereby promoting economic growth. The regressive nature of such taxes should be addressed through *ad hoc* social benefit schemes. The introduction of other taxes, such as on air and water pollutants, could also be considered. Japan needs to streamline its current environmentally related taxes, with a view to reducing overlapping tax bases and administrative burden, as well as improving the fiscal autonomy of local governments. The current municipal tax on immovable property could also be redesigned to offer incentive towards energy efficient housing.

Box 2.3. Road pricing

In addition to fuel and vehicle taxes, Japan applies a flexible and rather complex system of road pricing for its nearly 9 000 kilometres of motorways. The network is self-financed through the “toll-pool” system, which allows cross-subsidisation between profitable and unprofitable motorways, and prices are very high (OECD, 2005a). Lower rates apply to light vehicles and motorcycles. Discounts of 30 to 50% apply to motorway tolls at off-peak times and for long-distance use. To divert traffic from congested roads running through residential areas, a discounted toll applies on some urban stretches of motorways (so-called “*environmental road pricing*”). The 2008-09 anti-crisis package introduced further discounts on road tolls during weekdays and a flat rate of JPY 1 000 on weekends, aiming to stimulate travel and tourism. Furthermore, in its 2010 budget, the government approved the expansion of toll discounts on a pilot basis, with a view to progressively eliminating all road tolls. Overall, despite high prices, the toll system encourages long-distance driving, including over routes that are very well served by fast trains. The measures recently approved would strengthen this incentive, whereas an appropriate implementation of the polluter-pays-principle would require road pricing to reflect both the distance travelled and the environmental performance of vehicles.

1.3. Subsidies

The government provides various types of financial assistance to businesses and households. Subsidies to businesses included in the 2008-09 stimulus packages amounted to some 0.5% of GDP, the fourth highest GDP share for such subsidies among OECD countries (OECD, 2009c). Businesses often benefit from government financial assistance to meet environmental targets, also under negotiated agreements (Chapters 3 and 5), thereby undermining a consistent application of the polluter-pays-principle. Besides straining the public budget, some support measures can have harmful environmental effects, as they affect production and consumption decisions. Japan needs to regularly review its subsidy policies to verify that the benefits are higher than the associated costs, including environmental costs. Removing perverse subsidies should be a central part of a comprehensive environmental fiscal policy reform, with a view to increasing the cost-effectiveness of policy measures, which are particularly important during times of economic crisis. As recommended in the 2002 OECD EPR, Japan has taken some steps to reduce environmentally harmful subsidies (Table 2.3).

Subsidies to promote environment-friendly products

Like other vehicle-producing countries, Japan introduced support measures for its car industry as part of the 2008-09 anti-crisis policy package. The so-called *Green Vehicle Purchasing Promotion Programme* provides subsidies for purchasing new fuel-efficient cars and heavy goods vehicles to replace old ones. Eligible vehicles need to comply with the 2010 fuel efficiency standards. However, purchases not associated with scrapping old vehicles can also benefit from a subsidy, albeit lower, if the new vehicle exceeds the 2010 standards by at least 15%. The government has allocated approximately JPY 370 billion (about USD 3.7 billion) to the programme, expecting an increase in sales of up to 690 000 vehicles. The programme is set to terminate in September 2010.

The *Eco-Point Programme* was launched in mid-2009 to encourage purchases of energy-efficient household appliances, namely TV sets, air conditioners and refrigerators. Consumers are awarded “eco-points” for the purchase of these products depending on

their energy performance, with or without scrapping old appliances. The “eco-points” can be used to buy other goods and services nationwide. The government covers the costs of the programme (some JPY 232 billion), which is set to end in December 2010.

These incentive schemes have softened the impact of the economic crisis on the automotive and electric appliance sectors. However, they distort the market by discriminating among manufacturing sectors and consumers, namely low-income households who cannot afford to buy new products. From an environmental perspective, *rewarding the purchase of energy-efficient goods is not a cost-efficient way to reduce environmental impacts*. These incentives encourage the use of subsidised products. The Japanese experience shows that despite the improved energy efficiency of electric appliances, overall electricity consumption in the residential sector has increased (Chapter 5). Moreover, the environmental impacts over the whole lifecycle of a product should be considered, including the increased demand for steel.

Energy subsidies

Japan offers financial support for energy efficiency programmes, renewable energy sources, and related research and development. In 2008-09, this support averaged some JPY 465 billion (about USD 4.7 billion) per year.⁸ In the early 2000s, Japan phased out its *subsidies for domestic coal production*, following a restructuring programme of the coal industry.⁹ However, Japan still subsidises other fossil fuels (Table 2.4), and exempts from excise duties fuels used in agriculture, forestry, fishery, mining, petrochemicals, manufacturing, and for heating purposes (Table 2.1).

Table 2.4. **Energy subsidies, 2007**

Subsidy	Purpose	Budget amount for 2007 ^a (JPY million)
Natural gas exploration subsidy	Promote natural gas exploration by mining companies	907
Subsidy for oil refining technology programmes in oil-producing countries	Promote joint research with oil-producing countries on oil refining technologies	9 925
Oil prospecting subsidy	Support geological surveys abroad	1 812
Oil refining rationalisation subsidy	Assist the development of advanced oil refining technologies	12 457
Oil product quality assurance subsidy	Support analysis of petroleum products and development of analysis techniques	1 898
Subsidy for structural reform measures for petroleum product distribution	Assist business diversification and other structural reform measures by oil distributors	12 442
Large-scale oil disaster prevention subsidy	Support the construction and maintenance of oil fences and their transport in emergencies	800
Promotion of natural gas use subsidy	Help private firms convert coal-burning facilities to natural gas-burning ones	6 005

a) Financial year.

Source: IEA (2008).

Fisheries support

Government financial transfers to fisheries have continued to decline, from about USD 2.8 billion in 2000 to USD 2.2 billion in 2005. Nonetheless, Japan remains the largest provider of governmental support to this sector among OECD countries. This support is linked neither to production nor to investment in new vessels, which have the greatest potential to reduce fish stocks. Japan provides direct payments for fleet reduction (for scrapping vessels and surrendering licenses), as well as interest subsidies for the renewal of small fishing vessels, mainly to improve fisheries management and work safety.

Some 70% of government financial transfers to fisheries are for coastal infrastructure construction (e.g. fishing ports, coastal roads) (OECD, 2009d). While these subsidies do not increase fishing effort, they constitute payments to the construction industry and can provide incentives to invest in unnecessary or unprofitable infrastructure, especially at a time when the fisheries sector is declining (Chapter 7).

Agricultural support

Agriculture is a highly protected and low-productivity sector in Japan. Total support to agriculture, including general services such as education, marketing and infrastructure, decreased during the review period. It accounted for about 1% of GDP in 2006-08, which is in line with the OECD average.

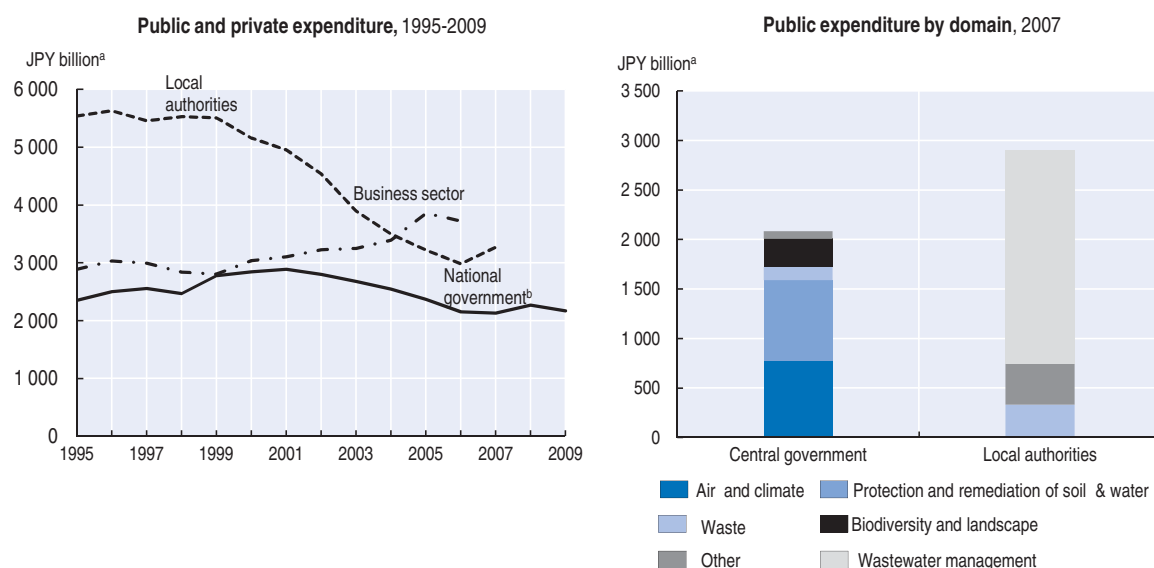
Support to farmers also decreased from 58% of gross farm receipts in 2000-02 to 49% in 2006-08.¹⁰ However, support to farmers in Japan remains twice the OECD average. Moreover, support linked to production (i.e. to levels of input or output) accounts for nearly 95% of support to producers, far above the OECD average (55%). This kind of support is generally distortionary and environmentally harmful, since it stimulates production and input use, with negative impacts on the use of water, land, fertilisers and pesticides. While administered prices of some agricultural products, including rice, were abolished during the review period, market price support still accounts for 85% of agricultural support.¹¹ Rice continues to be the most heavily supported commodity. As a result, Japanese consumers pay almost twice the world market price for agricultural products. Japan needs to reduce its high level of support, moving away from support to production and towards direct support to farmers. Improving the composition of support could bring benefits to farmers, consumers and the environment (OECD, 2009e).

Japan has introduced direct payments for *environmentally friendly farming* that requires halving the use of chemical fertilisers and pesticides (Chapter 7). However, these payments account for only 0.5% of total payments to farmers, a very low share compared with agri-environmental payments in other major OECD economies. Further efforts are needed to make agricultural support conditional on meeting appropriate environmental standards, as recommended in the 2002 OECD *Environmental Performance Review*.

1.4. Environmental expenditure

Public pollution abatement and control (PAC) expenditure represented about 1.2% of GDP in 2007, down from 1.7% in 2000.¹² Also the share of public expenditure devoted to environmental protection has steadily declined since 2000, reaching 3.4%. Expenditure has been scaled down in all sectors, with the exception of those related to climate change. Most of Japan's public expenditure on environmental protection is spent at local level, by prefectures and municipalities, although with substantial financial transfers from the central government. Fiscal autonomy of local authorities is indeed low. PAC expenditure by the central government has decreased by 24% in real terms since 2000, while local expenditure has decreased even more, by 37% (Figure 2.4). These trends partly reflect the *increasing role of the private sector* in financing and managing environmental infrastructure and services, particularly in the waste sector (Chapter 6). Indeed, private PAC expenditure has increased by 22% since 2000.

Investment represented about 38% of public PAC expenditure in 2007, down from 55% in 2000. Despite this decline, *environmental investment* still represents 15% of Japan's overall gross capital formation, the highest share among OECD countries. This reflects an ongoing,

Figure 2.4. **Pollution abatement and control expenditure**

a) At constant 2005 prices.

b) 2009: provisional budget.

Source: Ministry of the Environment and OECD calculations.

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large-scale investment plan to fill Japan's environmental infrastructure gap, especially in sewerage and wastewater treatment facilities (Chapter 3). As a result, wastewater management still accounts for over 70% of public PAC expenditure at local level (Figure 2.4). On the other hand, the weight of the waste sector has slightly decreased, showing that progress has been made in developing waste treatment infrastructure and outsourcing municipal waste management to the private sector (Chapter 6). At the central level, growing attention to climate change has resulted in an increasing share of public expenditure, comparable to the share allocated to prevention and remediation of water and soil pollution, which had traditionally been higher in Japan (Figure 2.4).

2. Promoting eco-innovation and environment-friendly products

2.1. Policy framework

The promotion of eco-innovation is a key feature of Japan's environmental policy and the main link between economic, industrial and environmental policies. *Japan's definition of eco-innovation* goes beyond the development and application of environmental technologies, to embrace the social aspects of technological progress and its impacts on quality of life. This concept of eco-innovation implies broad structural changes in the economy and society (OECD, 2009f).

The key features of *Japan's approach to eco-innovation* are close co-operation with the private sector and active involvement of consumers to promote lifestyle changes. The manufacturing sector has heavily invested in eco-innovation, which is seen as a factor of competitiveness. At the same time, the government has put in place a number of measures to stimulate demand for environmental technologies and products, such as tax incentives for cleaner vehicles (Section 1.2), the Eco-Point Programme (Section 1.3), and the green public procurement policy (Section 2.4). Japan has also supported exports of environmental technologies through

international co-operation activities. Examples include 3Rs (reduce, reuse, recycle) initiatives in Asia (Chapter 6) and official development assistance, which is often provided at more concessional terms when tied to Japanese technology (Chapter 4).

Several *strategic policy documents* include eco-innovation as an objective.¹³ The 2009 New Growth Strategy identified “green innovation” as one of the six growth drivers to 2020 (Box 2.2). Several ministries are involved in promoting eco-innovation, often in co-operation. In particular, the Ministry of the Environment (MOE), the Ministry of Economy, Trade and Industry (METI) and the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) and their affiliated institutions. METI has a general responsibility in industrial and R&D policies, including overseeing the New Energy and Industrial Technology Development Organisation, which co-ordinates and manages R&D activities, including environment-related R&D. The Council for Science and Technology Policy, established in 2001, is an advisory body to the Cabinet Office that ensures co-ordination among different ministries.

2.2. Research and development in environmental technologies

Financing environment-related R&D

Japan is one of the OECD leaders in R&D, with R&D expenditure well above the average. In 2007, public and private R&D expenditure accounted for 3.4% of GDP, up from 3% in 2000. The business sector funds and carries out over 78% of R&D, the highest share among OECD countries. High- and medium-high-technology industries, such as transport equipment, electronics and chemicals, accounted for some 80% of Japan’s exports of manufactured goods in 2007. Japan’s number of patent applications is among the highest in the world.

Central government outlays for R&D for *environmental purposes* have slightly increased, although remaining below 1% of the overall government R&D budget, a relatively low share by OECD standards.¹⁴ According to the annual Survey on Research and Development conducted by Japan’s Statistics Bureau, 10% of large enterprises invested in environment-related R&D in 2007, and environment accounted for nearly 6% of their R&D budget.¹⁵ Over 70% of these enterprises were in the manufacturing sector.

Government outlays for *energy* R&D accounted for 13.7% of the public R&D budget in 2008, the highest share among OECD countries. Japan’s public R&D outlays on “green energy” (including renewables, hydrogen and fuel cells technologies, energy efficiency, and carbon capture and storage) have considerably increased and are the second highest among OECD countries in absolute terms. However, these expenditures represent some 25% of the energy R&D government budget, the lowest share among OECD countries, reflecting large private sector expenditure in this field (Chapter 5).

Japan’s environmental R&D efforts have been moving from traditional pollution control technologies to climate-related and *non-traditional “green technologies”*. In particular, Japan is a pioneer in “green information and communication technologies” (ICTs), acknowledging their potential contribution to higher efficiency in energy and resource use (OECD, 2009f).¹⁶

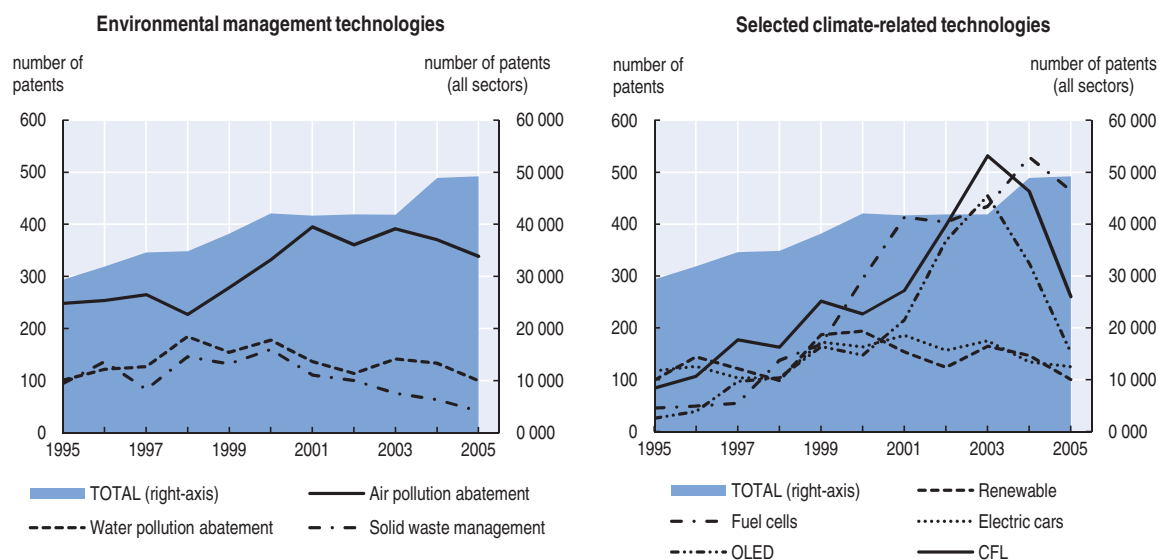
Japan has launched a number of initiatives to promote R&D in *environmental technologies*, such as the Global Environment Research Fund and the Global Environment Research Programme, managed by MOE. In the last few years, the funded research projects have focused on climate change mitigation, adaptation and carbon sinks. The 2008 *Cool Earth Innovative Energy Technology Programme* sets priorities for 21 energy- and climate-related technologies, for which development road maps are being established. Businesses investing in environmental R&D, as in other R&D fields, benefit from special tax treatment.

Tax subsidies for R&D have increased since 2000 (OECD, 2007). Nonetheless, direct government investment in basic R&D for environment- and climate-related technologies should increase to share the risk with the private sector of developing new technologies and to further accelerate innovation (OECD, 2009a).

Patents in environmental technologies¹⁷

Japan accounted for around 30% of world inventions in *air, water and waste management technologies* over the 2000-05 period. Patent applications in these areas represented 1.3% of overall Japanese inventions, a relatively low share compared to other countries (OECD, 2009g). Patents in air pollution control technologies represented nearly 65% of all environmental management innovations. Their number increased rapidly until 2001 and then tended to stabilise (Figure 2.5). Explanations include the introduction in the late 1990s of stricter standards on dioxins emissions from waste incineration and the sharp increase in related public investment (Chapter 6).¹⁸ Although not easy to track, negotiated agreements with industrial facilities may have provided some incentive to innovate (Chapter 3). Innovations related to solid waste management and water pollution control technologies reached a peak in 1998-2000 and have declined since, in line with worldwide trends (OECD, 2009g).¹⁹

Figure 2.5. **Environmental patents**



Source: EPO/OECD Worldwide Patent Statistical Database.

StatLink  <http://dx.doi.org/10.1787/888932318718>

The high level of investment in R&D has helped Japan become a leader in *climate-related technologies* (OECD, 2009a).²⁰ The number of patent applications for some of these technologies is growing faster than for traditional environmental management technologies, or for technologies in other sectors (Figure 2.5). This development is in line with trends in other Kyoto Protocol Annex I countries (OECD, 2009h), and can be partly explained by the increase in public expenditure for related R&D, especially for fuel cells, energy-efficient lighting, solar energy and bio-energy. Although this is difficult to assess, the Top Runner Programme targets on fluorescent lights, TV sets and computers agreed in the late 1990s (Section 2.3) might have contributed to spur innovation in light emitting diode technology (LED), organic LED,²¹ and compact fluorescent lamps (CFL). The Keidanren Voluntary Action

Plan on the Environment, launched in 1997, might also have played a role. On the other hand, the recent decline in the number of patents for renewable energy technologies seems to indicate that the Renewable Portfolio Standard, introduced in 2003 to promote renewable electricity, has not induced substantial innovation in that sector (Chapter 5).

Environmental Technology Verification Programme

The Japan Environmental Technology Verification Programme (J-ETV) was launched in 2003 and, following a pilot phase, has been fully operational since 2008. It aims to make environmental technologies more attractive for investors and consumers, thereby facilitating their wider use. In order to benefit from the J-ETV, target technologies need to be at a relatively advanced stage of development and deal with environmental problems for which no regulation exists. Technology manufacturers and distributors can voluntarily apply for verification after paying a fee that partially covers the costs of the process. Verified technologies can then use the J-ETV label.

MOE co-ordinates the J-ETV Programme, approves the technology testing protocols, and maintains the database of verified technologies. The “verification organisations”, which include local governments, public corporations and non-profit organisations, carry out the verification process and report to MOE. The criteria for selecting verification organisations have not been particularly strict, and the independence and technical skills of verification organisations need to be strengthened. Promoting the J-ETV label in export markets would make the verification programme more attractive for technology manufacturers.

During the pilot phase (2003-07), the J-ETV Programme’s annual budget was between JPY 200 and 250 million; 157 technologies were verified in 10 technology fields, such as organic wastewater treatment at small facilities and volatile organic compound (VOC) abatement for small factories. At the end of the pilot phase, some 65% of participating companies declared that they had obtained, at least partially, the benefits they had expected from the programme for their business activities.

2.3. Performance targets

Japan has a long-standing tradition in implementing performance targets to improve the environmental performance of production processes and products. In 1998, Japan introduced the *Top Runner Programme*, which is a system of dynamic energy efficiency targets for a variety of products, ranging from vehicles to household electric appliances. Targets are set at the level of the best performing model on the market. Manufacturers are directly involved in target setting. It has been effective in promoting technological and energy efficiency improvements of such products, although the overall impact on energy savings and related costs remain unclear (Nordqvist, 2006). While the programme does not call for public financial support, a number of measures are in place that contribute to achieving Top Runner objectives, including fiscal incentives for purchasing products that meet or exceed the programme’s targets (Sections 1.2 and 1.3).²²

Other measures, including market-based instruments, might be more cost-effective in producing more rapid eco-innovation. The Top Runner Programme focuses on realistic levels of energy efficiency, thereby encouraging incremental improvements rather than breakthrough innovations. The “top runners”, i.e. firms with the most energy-efficient products at the start of a target cycle, do not need to invest further (OECD, 2009a). Moreover, since compliance is assessed by comparing performance in the base and target years, target setting does not take account of potential technological improvements that would

occur in the absence of the programme, or of developments already available but commercially untapped (Nordqvist, 2006). Comparing performance in the target year with baseline projections would be more appropriate (IEA, 2008).

In many cases, performance targets are negotiated with the industrial sector within the framework of *voluntary agreements*, such as the Keidanren Voluntary Action Plan on the Environment for the control of GHG emissions (Chapter 5). Often, as in the Top Runner Programme, these performance targets are accompanied by a “name-and-shame” mechanism: the names of under-performing companies are disclosed to the public. This mechanism puts the brand image of companies at risk, representing an incentive for eco-innovation in Japan that is probably more effective than the stringency of environmental regulations. According to an OECD survey conducted in 2003, fewer than 5% of facilities in Japan felt that environmental policies were very stringent, and more than 65% found them to be not particularly stringent (Johnstone et al., 2007).

2.4. Promoting green products

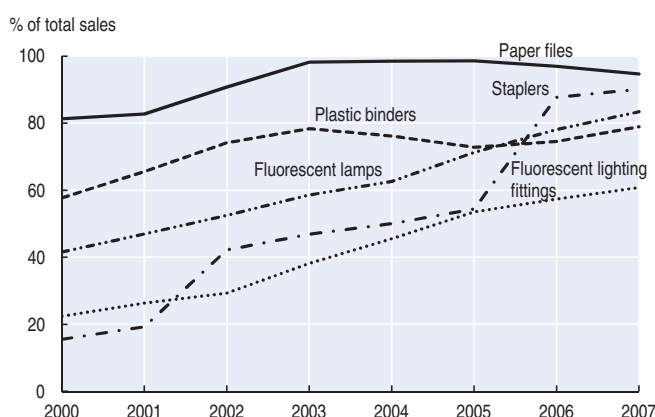
Green public procurement

Japan had introduced a green public procurement policy before the adoption of the 2003 OECD Recommendation on “Improving the Environmental Performance of Public Procurement”. The 2001 Law for the Promotion of Procurement of Eco-Friendly Goods and Services (Law on Promoting Green Purchasing) requires all governmental institutions to develop green procurement policies, define annual targets for the purchase of selected eco-products, and annually report to MOE. The 2008 *Basic Policy for the Promotion of Procurement of Eco-Friendly Goods and Services* represents the framework for green procurement at the national government level. It defines evaluation criteria for 246 categories of products and services, up from 152 in 2002, including for materials and equipment used in public works construction. In 2007, Japan extended the green purchasing requirements also to the procurement of services.²³

However, green public procurement requirements do not apply to the local level. Nonetheless, many *local authorities* have voluntarily implemented similar measures and subscribed the Green Purchasing Network’s guidelines. Further extending the green purchasing requirements to local governments would enhance the effectiveness of the policy, in particular since a large share of public expenditure is invested locally. In expanding its green purchasing policy, the government should make sure that tendering procedures are transparent and competitive, and do not discriminate among potential suppliers.²⁴

More than 90% of products and services procured by central government agencies meet the required environmental criteria. This outcome was achieved with minor increases in public expenditure. Since the introduction of the green public procurement policy, the *market shares of eco-friendly products* widely used in the public administration have substantially increased (Figure 2.6). According to MOE’s estimates, the national government’s green purchasing policy resulted in a reduction of carbon dioxide (CO₂) emissions by 89 500 tonnes in 2006, which is equivalent to the amount of CO₂ emitted by a town of 42 000 inhabitants. The overall costs to the Japanese economy of achieving such emission reductions should be assessed and compared with the costs of alternative policy measures.

Figure 2.6. Sales of selected eco-products, 2000-07



Source: Surveys of selected national associations (File and Binder; All Japan Stationary; Japan Luminaires; Japan Electric Lamp Manufactures).

Eco-labelling

The Japanese Environment Association (JEA), under MOE's aegis, manages the Japanese environmental product certification system, the *Eco-Mark Programme*. The label is assigned to products that have lower environmental impacts than similar products over their whole life cycle, from material extraction to disposal. Manufacturers who are awarded the Eco-Mark pay an annual fee that is proportional to product sales.

As of 2007, 4 617 products were awarded the Eco-Mark in 47 product categories. JEA aims to achieve 6 000 certified products in 51 categories by 2012. The market share of Eco-Mark products has increased. According to some estimates, the use of certified products has led to some decreases in CO₂ emissions, resource consumption and waste disposal. Obtaining the Eco-Mark has become the norm for major manufacturers, which suggests that the awarding criteria need to be constantly revised to ensure that the environmental impact of a labelled product is substantially lower than average.

Many other certification programmes exist. For instance, an energy efficiency label is associated with products that achieve Top Runner targets, and a uniform energy conservation label applies to some home appliances (Chapter 5). Many companies have also launched their own eco-labels. However, criteria for awarding the labels may differ greatly. Japan should consider streamlining the overall eco-labelling system to improve reliability, send clear messages to consumers and reduce possibilities of falsification.²⁵

3. Expanding environment related markets and employment

The global and Japanese markets for environmental goods and services have expanded in the last decade and are expected to grow faster in the future. According to some estimates, the value of the global market for environmental goods and services, including renewable energy technologies and low carbon activities,²⁶ was about USD 1.6 trillion in 2007-08. Japan accounted for 6.3% of this global market, the third largest share after the US and China (Innovas Solutions, 2009).

In the second half of 2008, overall Japanese exports suffered from declining global demand, but exports of environmental products grew by over 35% compared to the same period in 2007 (Nitta, 2009). According to a survey conducted by the Japanese External Trade Organization in 2009, some 18% of Japanese manufacturing businesses were

producing and exporting environmental products, especially waste treatment devices, eco-paints and adhesives, photovoltaic cells and other renewable energy technologies, electric, hybrid and fuel cell vehicles, and wastewater treatment equipment (JETRO, 2009). The latter drove export growth in 2008. East Asia, particularly China, is the main export market for Japanese environmental products and technologies, followed by Europe.

In 2003, MOE estimated the market size and employment of environmental businesses.²⁷ According to this study, the *eco-business* turnover was JPY 30 trillion (USD 280 billion) in 2000 and will nearly double by 2020 (Table 2.5). The 2009 New Growth Strategy aims at enlarging the environment and energy-related markets by an additional JPY 50 trillion (USD 530 billion) (Box 2.2). Resource management, broadly defined and including housing renovation and repair, was estimated to account for two-thirds of the market in 2000; environmental protection, mainly wastewater treatment facilities and provision of waste services, accounted for the remaining third.

Table 2.5. Market sizes and employment potential of the environmental goods and services sector^a

	Market size (JPY billion)			Employed		
	2000 ^b	2010 ^c	2020 ^c	2000	2010 ^c	2020 ^c
Pollution management, <i>of which</i> :	9 594	17 943	23 706	296 570	460 479	522 201
Air pollution control	642	3 166	5 169	8 971	39 306	53 579
Wastewater management	4 818	5 821	5 831	59 099	62 353	54 224
Waste management	3 614	7 736	11 126	211 859	330 006	378 035
Cleaner technologies and products	174	453	609	3 108	10 821	13 340
Resources management, <i>of which</i> :	20 177	28 830	34 061	468 917	648 043	700 898
Recycled materials	7 878	8 744	9 404	201 691	211 939	219 061
Renewable energy	163	929	929	5 799	30 449	28 581
Energy conservation and energy management	727	4 883	7 868	13 061	160 806	231 701
Other ^d	10 794	13 720	15 275	218 436	219 059	195 655
Total	29 944	47 227	58 376	768 595	1 119 343	1 236 439

a) Private sector only.

b) The figures for the market size in the year 2000 use varying fiscal year definitions.

c) Forecast.

d) Includes: repair of machinery, furniture, etc.; housing renovation and repair, and urban greening.

Source: MOE (2003).

StatLink  <http://dx.doi.org/10.1787/888932318946>

In the MOE study, environment-related *employment* was estimated at 769 000 in 2000, equivalent to 1.2% of total employment, and was expected to grow by 46% in 2010 and reach 1.2 million employed by 2020. The largest growth in employment and market value was expected in the energy sector and in the manufacturing sector for air pollution control equipment (Table 2.5). More recent estimates indicate that employment in private environment-related businesses had already reached 1.4 million in 2006, compared to about 76 500 employed in the public environmental administration (MOE, 2009). Initiatives such as the *Eco-Town Programme* to improve resource and waste management have positively contributed to local development and employment, supporting industrial restructuring in favour of environment-related sectors (Chapter 6). In 2008, the government launched similar initiatives – the “Eco-Model City Projects” and the “Biomass Towns” – to stimulate a local development based on climate-related activities and biomass energy (Chapter 5).

The 2009 New Growth Strategy expects to double employment in environment-related businesses by 2020 (Box 2.2). Overall, the transition to a green economy will require industrial restructuring and, therefore, a reallocation of labour resources across sectors. *Net employment effects should be carefully assessed*; labour market and education policies should take into account the new skills and competences that will be needed to adjust to greener technologies, production processes and working methods.

Involving the financial sector

Japanese financial institutions have seized the opportunity offered by the growing interest in the environment to provide *targeted financial products*, such as low-interest loans for environmental investments or ISO 14001 certification of enterprises. Formerly public financial institutions have taken the lead. In 2004, the Development Bank of Japan (DBJ) launched a system of environmental rating of companies' activities, which assesses the companies' efforts to reduce their environmental impact, and adjusts the terms of financing accordingly. In 2002, a Shoko Chukin Bank investment fund was established to finance environment-related investments in small and medium-size enterprises (SMEs). Several private financial institutions are also increasingly providing this kind of service, and have broadened their target customers from large corporations to SMEs (Ito, 2006). Some local governments have co-operated with local banks to increase the availability of funds for environmental investments; the Environmental Finance Project launched by the Tokyo Metropolitan Government is an example.

The Japanese stock market has promoted some *eco-funds*, which invest in environmentally responsible companies, and are often combined with socially responsible investment funds (so-called Eco-SRI funds). Around 25 such funds were available as of July 2006. While in 2006, Eco-SRI funds accounted for only 0.4% of all investment funds in Japan, their net asset value had grown by more than 50% in about one year, indicating increased interest among investors (Ito, 2006).

4. Social dimensions

4.1. Distribution issues

Income inequality increased in the 1990s but has remained fairly stable since 2000, in line with the OECD average.²⁸ The proportion of the population in *relative poverty*, with income below one-half of the median household disposable income, has also slightly decreased since 2000, although it remains higher than in the mid-1990s. In the mid-2000s, it was nearly 15%, well above the OECD average of 10%. Several factors explain these trends, including the increasing share of the elderly in Japan's population, the growing proportion of non-regular workers in total employment, and the relatively low level of social spending as a share of GDP. Given the severe budget constraints, Japan should correct labour market dualism and better target social spending (Jones, 2007).

Energy and water charges accounted for 7.4% of household consumption expenditure in 2008, up from 6.7% in 2001, putting Japan in the upper half of OECD countries. While the share of water and sewerage charges in expenditure has remained constant, the share of energy has increased from 5.2% to 5.8%. This is closely linked to increased domestic electricity consumption (Chapter 5). Given the energy consumption patterns and the above-average electricity and gas prices, in Japan the energy bill represents a relatively higher share of domestic expenditure than in most OECD countries. Households also pay

disproportionally higher energy prices, especially for gas, than industrial customers (Chapter 5). Since energy and water represent primary needs, their cost clearly weighs down more on low-income household budgets.

The tax reform foreseen in 2011 is an opportunity to *address environmentally related taxation (and pricing) together with income distribution issues*, and to review cross-subsidies between different customer categories. The potentially negative impacts of environmentally related taxes on income distribution should be addressed by targeted compensation measures; tax exemptions for particular population groups should be avoided.

4.2. Accessibility of environmental, energy and transport services

Regional inequality in Japan has increased during the review period, although it has not reached the level of the early 1990s and remains relatively low in comparison with other OECD countries (OECD, 2009i).²⁹ Disparities remain between metropolitan and non-metropolitan regions – whose economy is more dependent on agriculture, public works and construction projects. Out-migration from rural regions persists. New trade relationships and the relocation of investments in the East Asia region are also likely to influence the spatial distribution of economic activity within Japan (OECD, 2005b).

Japan has heavily invested in *infrastructure development* to overcome natural barriers and improve accessibility across regions and between core and peripheral areas. For example, the high-speed rail network (the *Shinkansen*, or bullet train) has had a significant impact on reducing travel times between major urban centres.³⁰ Public investment has tended to be higher in regions with lower population density and income level (OECD, 2005b).

However, the *accessibility of core cities within each region*, i.e. the accessibility of urban services for rural periphery dwellers, differs widely across regions.³¹ Public transport services are less accessible in non-metropolitan regions and in urban areas with lower population density. This, together with urban sprawl, has resulted in a higher reliance on private car travel, especially in cities with up to 200 000 inhabitants (MLIT, 2008). Households in small cities spend 80% more for private transport (including fuel use, purchase and maintenance of vehicles) than households in major cities, and private transport accounts for 9.2% of their overall consumption expenditure, compared to 5.2% for major city dwellers.³² The 2009 New Growth Strategy aims, among other things, at revitalising peripheral urban areas through infrastructure development (Box 2.2). However, considering the tight budget constraints and the declining population of some areas, Japan should thoroughly assess costs and benefits of infrastructure investment, and involve private finance.

Progress has been made in developing *domestic gas supply infrastructure*, an area where Japan had lagged behind other OECD countries (IEA, 2008). Nonetheless, in 2008, households in medium-sized and small cities were still spending two and four times more, respectively, on fuels other than natural gas than households in major cities.³³

Virtually the whole Japanese population has access to safe *drinking water*. Over 70% of the population are now connected to public *wastewater treatment plants*, although gaps between large cities and medium- and small-sized cities still exist. Around 9% of the population, mostly in sparsely populated areas, use individual on-site treatment systems (*Johkasou*); some 10% of the population are estimated to be still using old *Johkasou* systems (so called *tandoku-shori*), which only treat flush toilet wastewater (Chapter 3). Overall, modern *waste treatment and recycling facilities* have been developed and ensure adequate waste services throughout the country (Chapter 6). Nonetheless, some problems persist in

rural areas and on small islands, where cases of illegal dumping of municipal waste have been reported. Also, waste recovery rates greatly differ across prefectures, varying from nearly 32% in Mie to about 10% in Osaka.

4.3. The environmental dimensions of ageing and depopulation

Japan's population is predicted to drop to some 100 million by 2050, from about 128 million in 2008. Japan has the highest ratio of people over 65 years old in the population (22% in 2008), and life expectancy at birth is among the highest among OECD countries. The ageing of the population and depopulation are already affecting rural areas and the ability to maintain natural ecosystems, including *satochi-satoyama* (Chapter 7). However, unlike most other OECD countries, these trends are no longer limited to rural areas.

The impact of these demographic trends on Japan's environment is complex. Population decline is expected to lead to a decrease in resource and energy consumption (MOE, 2006). However, the number of households is projected to increase, resulting in a decrease in household size from 2.55 people in 2005 to an estimated 2.37 people by 2025. This may well lead to greater resource and energy consumption and waste generation per capita, due to decreasing household economies of scale (e.g. less sharing of family-sized food and personal care products, water heating and electrical appliances). Aging is likely to exacerbate this phenomenon: a person over 60 years old and living alone spends on average 1.5 times more on water, electricity and heating than a young person (up to 34 years old) living alone.

Population decline and ageing are likely to negatively affect the profitability of the current level of environmental services (e.g. waste and wastewater) and public transport infrastructure. The elderly tend to rely more on private cars for travel, especially in non-metropolitan areas (MLIT, 2008). The decrease in the number of passengers travelling by public transport has already led to the elimination of some public transport routes and services in peripheral areas (Chapter 5).

Notes

1. In 2008, Japan's GDP per capita in purchasing power parity was USD 34 100 and the OECD average was USD 33 700.
2. The consumption tax rate is the lowest among OECD countries at 5%.
3. The tax rate on diesel includes the petroleum tax and the diesel oil delivery tax; the tax rate on gasoline includes the petroleum tax and the gasoline tax.
4. Revenue from the petroleum and coal tax is used to finance oil development and stockpiling, energy conservation and renewable energy source development; proceeds from the power-resource development tax are earmarked for promoting power source locations and R&D; and those from the aviation fuel tax are used to finance airport construction.
5. The prefectural acquisition tax is charged on retail price at the time of purchase; the prefectural annual automobile tax is based on engine size; and the national tonnage tax is imposed at the time of the mandatory periodical vehicle inspection on the basis of the weight and age of the vehicle, with reduced rates for "next generation vehicles".
6. Diesel cars older than 11 years and gasoline cars older than 13 years.
7. Japan applies exceptionally high corporate tax rates. The share of direct taxes (personal and corporate income taxes and social security contributions) in total tax revenue is relatively high compared to other OECD countries. Several studies show that for a given level of taxes, a higher incidence of direct taxes (especially on business activity) relative to indirect taxes is detrimental to economic growth (Jones and Tsutsumi, 2008).

8. Including about JPY 140 billion per year of financial support for the improvement of the environmental performance of businesses.
9. The main type of subsidy concerned coal consumption of electric utilities, whereby coal producers received subsidies to cover the difference between market prices and those established under domestic agreements.
10. Support to agriculture is measured in terms of Producer Support Estimate percentage, which expresses the monetary value of public transfers to producers as a percentage of gross farm receipts.
11. Market price support indicates the value of transfers resulting from any policy that leads to higher domestic market prices (e.g. tariffs, production quotas, administered prices).
12. This estimate is based on government expenditure classified as “Environment Protection” according to the Classification of the Functions of Government (COFOG).
13. For instance, the 2007 Strategy for a Sustainable Society in the 21st Century and the Third Basic Environment Plan (Chapter 1), as well as the Third Science and Technology Basic Plan.
14. The allocation of expenditures to specific objectives is determined on the basis of managerial intentions at the time of commitment of the funds. Given the uncertainty associated with basic R&D, this may be difficult to establish with confidence.
15. Large enterprises are those with a capital above JPY 100 million.
16. In 2008, METI launched the Green IT Initiative, with a focus on infrastructures and technologies for teleworking, intelligent transport systems, and home and building energy management systems.
17. Patent data on environment- and climate-related technologies are extracted from the EPO/OECD *Worldwide Patent Statistical Database* (PATSTAT April 2009), according to the methodology presented in OECD (forthcoming 2010).
18. Patents in air pollution control refer only to stationary sources, though they may include innovations in the automotive industry linked to the tightening of vehicle emission standards.
19. Some technical difficulties in extracting aspects of energy recovery, material recycling and waste prevention may result in a downward bias in the data.
20. Over the 2000-07 period, Japan accounted for 67% of world patents in electric cars, over 60% in organic light emitting diode (OLED) technology, 50% in efficient lighting, some 45% in fuel cells, and over 30% in renewable energy technologies.
21. OLED is an energy saving technology that can be used, among other things, in television screens and computer monitors.
22. Compliance with the targets is assessed on the basis of the weighted average energy performance of a company's sales, and not on the individual products that are sold.
23. Law concerning the Promotion of Contracts Considering Reduction of Emissions of Greenhouse Gases and Others by the State and Other Entities.
24. OECD Council Recommendation on Improving the Environmental Performance of Public Procurement [C(2002)3].
25. In 2008, a number of Eco-Mark falsification cases occurred, including falsification of the percentage of waste paper pulp in recycled paper, inappropriate use of printing inks, and falsification of recycled plastic products. In response, the Eco-Mark Office strengthened its inspection activities.
26. Alternative fuels, carbon finance and building technologies.
27. Firms producing goods and services that measure, prevent, limit, minimize or correct environmental damage to water, air and soil, as well as problems related to waste, noise and ecosystems. This includes cleaner technologies, products and services that reduce environmental risk and minimize pollution and resource use. The estimate covers the domestic market only.
28. As measured by the Gini coefficient for disposable income.
29. As measured by the Gini index of inequality of GDP per capita across regions.
30. For example, the completion of the Kyushu *Shinkansen* between Shin-Yatsushiro and Kagoshima-Chuo in March 2004 has reduced the travel time between Hakata and Kagoshima-Chuo from 3 hours 40 minutes to about 2 hours 10 minutes.

31. Rural-to-urban centre travel time by land averages 90 minutes in Kanto, Kinki, and Chubu, two hours for Kyushu and up to three hours for southern cities such as Kagoshima and Miyazaki.
32. The composition of household consumption expenditure in small cities normally differs from that in large cities. For example, households in small cities spend less on rent for housing.
33. Mainly kerosene.

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PART I

Chapter 3

Implementation of Environmental Policies

Japan uses a mix of environmental policy instruments, including regulatory, economic and information-based measures. It is promoting wider participation of the public in environmental decision-making, and greater access to information and justice to support these efforts. This chapter also reviews progress in improving air management, in particular in urban areas, strengthening the management of inland and coastal waters and reducing impacts of chemicals on human health and the environment.

Assessment and recommendations*

A number of the objectives of Japan's Second (2000) and Third (2006) Basic Environmental Plans were met by implementing a *comprehensive set of policy instruments*. National efforts were supplemented by regulatory and enforcement actions by prefectures and municipalities, and the implementation of negotiated agreements and voluntary initiatives by the business sector. However, the management of key environmental domains, including waste, water and air management, is still based on the legal framework developed in the 1970s and 1980s and the Basic Environmental Law adopted in 1993. A *number of amendments promulgated over the review period* introduced new measures but also made the legal framework more complex.

Despite some progress with the use of market-based instruments, especially in water management, *regulatory instruments and negotiated agreements with industry* remain the most common policy choice. The effectiveness and transparency of negotiated agreements could be improved. Damage compensation mechanisms played an important role in addressing the legacy of past pollution. Non-compliance, even though infrequent, was followed by swift and firm enforcement and innovative non-compliance measures. However, efficiency gains could be achieved by integrating environmental notification of industrial operations and inspections. The application of *environmental impact assessment (EIA) procedures* is limited by relatively high eligibility thresholds and inadequate public consultation by project proponents.

Policy implementation is accompanied by extensive *environmental information disclosure*, including regular state of the environment reports, self-monitoring and corporate reporting by industry. In spite of the recent adoption of the Environmental Information Strategy (2009), environmental information and data systems remain fragmented. They also lack economic and financial information to support policy and decision-making in an integrated way. In spite of a number of public consultative mechanisms, including the Central Environmental Council and its manifold working groups, *greater participation of the public* could provide further support for environmental decision-making. Lack of support for grassroots NGOs leaves much of the bargaining power with industry and economic decision-makers.

In the area of *air management*, Japan is still one of the least pollution-intensive OECD countries. Further progress was made in reducing emissions of carbon monoxide (CO), non-methane volatile organic compounds (NMVOCs), dioxins and particulate matter. Emissions of sulphur and nitrogen oxides and heavy metals were further reduced and low ambient concentrations of these pollutants were maintained. Progress was made in reducing NMVOCs and CO emissions from mobile sources (–48% and –56%, respectively) and dioxin emissions from waste incineration (–90%) despite increases in transport and incineration activities. However, *problems persist with air quality in urban areas*, in particular with high levels of photochemical oxidants due to emissions from small- and medium-sized installations (as well as from sources outside the country), and with cumulative effects of emissions from mobile sources. Japan is not on track to meet its emission targets for NMVOCs and small particulate emissions are not systematically monitored.

* Assessment and recommendations reviewed and approved by the OECD Working Party on Environmental Performance at its meeting on 4 May 2010.

Progress was made in improving the *quality of Japanese rivers* with important decreases of biological oxygen demand (BOD), nitrogen, phosphorus and heavy metals discharges. This was due to: i) the extension of municipal sewerage and wastewater treatment coverage in large cities (reaching the level of close to 100% of the population in cities with more than one million inhabitants); ii) the expansion of wastewater systems in rural areas (including individual sanitation units); and iii) reduced nutrient loads from agriculture. However, *lakes and coastal waters* continue to suffer from algae blooms due to continued high nutrient load from agriculture, low and insufficient *sewerage and wastewater treatment capacity* in smaller cities, and discharges from unregulated small sources. Better co-ordination of various water management objectives, and the redirection of funding towards better water quality management within integrated river basin management, would help to broaden the historical emphasis on water quantity management (flood control and water supply for agriculture) to include water quality and nature conservation objectives.

Japan has gradually developed a comprehensive, risk-based approach to *chemicals management*. Nevertheless, the private sector could shoulder a greater part of the burden of investigating the potential health and environmental risks of chemicals that have not been subject to systematic assessment (existing chemicals). The Japanese *pollutant release and transfer register (PRTR)* system is well developed. The substances and sectors it covers, and its communication methods, should be subject to regular review.

Recommendations

- Review and update the 1993 Basic Environmental Law in order to consolidate, streamline, and make the existing body of laws more coherent.
- Expand the use of *economic instruments*, for example trading schemes and user charges, to increase the economic efficiency of environmental policies; review the cost-effectiveness of *regulatory instruments and agreements negotiated with industry*.
- Implement vigorously the 2009 *Environmental Information Strategy*; strengthen the collection of relevant information, particularly regarding economic aspects of environmental policies, and ensure that this information systematically responds to the demands of relevant decision makers.
- Broaden the range of *mechanisms for public participation in environmental decision-making*; increase public support for grassroots NGOs and more public participation in EIA procedures.
- Strengthen efforts to *reduce NO_x and NMVOC emissions* in order to effectively tackle photochemical smog in urban areas; establish a monitoring system for *small particulates*.
- Further integrate the management of water quantity and quality; reinvigorate efforts to reduce pressures on the *quality of inland lakes and coastal waters* by reducing pollution from agriculture and small- and medium-sized sources (e.g. by strictly applying minimum environmental quality standards for heavy metals).
- Speed up the *expansion of water supply and sanitation infrastructure in medium and small cities* carefully assessing costs and benefits of existing collective and individual systems.
- Accelerate the *programme for testing and assessing the potential health and environmental effects of existing chemicals*, particularly through the greater involvement of the private sector, with a view to establishing a comprehensive chemicals management system, including the management of potential risks to children's health.

1. Strengthening the environmental policy mix

1.1. Progress in reforming administrative instruments

During the review period, Japan's environmental policies followed the general directions of the First Basic Environmental Plan of 1994 with the adjustments introduced by the Second and Third Basic Environment Plans, adopted in 2000 and 2006 respectively. A number of the objectives of these plans were met by implementing a *comprehensive set of policy instruments*, many of them recommended in the 2002 OECD *Environmental Performance Review* (EPR) of Japan (Table 3.1).

Table 3.1. **Actions taken on the 2002 EPR recommendations for environmental management**

Recommendations	Actions taken
Strengthen and extend the use of <i>economic instruments</i> (e.g. taxes and charges) to implement environmental policy in more environmentally effective and economically efficient ways and to progress towards sustainable production and consumption.	Domestic water supply and sewerage water tariffs have been raised and include an increasing block charge component; domestic and industrial water charges are differentiated on the basis of pipe size. The number of municipalities applying waste charges and of prefectures applying landfill taxes (industrial waste) has increased. Japan has introduced CO ₂ emissions trading on a voluntary and trial basis. Taxes have been "greened" to some extent.
Continue to assure appropriate <i>enforcement of regulatory measures</i> .	Compliance monitoring systems have been expanded, and non-compliance responses are widely and consistently applied. The capacities of enforcement staff have been strengthened but the lack of integrated, cross-media inspections results in additional administrative burden and stretches enforcement capacity.
Take the necessary steps to systematically carry out <i>strategic environmental assessment</i> during the development of environmentally relevant policies, plans, and programmes.	There has been good progress in strengthening the capacities of national and local administrations to carry out EIA procedures. The development of legal requirements for the Strategic Impact Assessment, however, is still in the planning phase.
Ensure that <i>voluntary agreements</i> become more transparent, effective and efficient.	The number of voluntary approaches has increased and their scope has become broader. Negotiated agreements are still not open to public scrutiny.
Further develop <i>environmental data, indicators and information</i> as tools facilitating decision-making and communication, and review the potential for grouping related institutional capacities together; improve <i>public access to environmental information</i> held by the environmental administration, sectoral ministries and the private sector.	A comprehensive set of indicators has been developed under the Third Basic Environmental Plan. Multiple channels have been established for communicating environmental information to the public. There has been significant progress in engaging the private sector in environmental reporting. Environmental information systems, however, still lack economic dimension, and institutional capacities are still fragmented, which results in data gaps and inconsistencies.
Promote <i>environmental education</i> at all levels and forms of education, including training for teachers.	There have been several initiatives to expand environmental education activities at all levels, and NGOs are increasingly engaged in awareness raising and capacity building.

Source: OECD, Environment Directorate.

Reform of the legal framework

The 1993 *Basic Environment Law*, together with a number of legal acts for specific environmental sectors, remain the basis for the implementation of environmental policies in Japan (OECD, 2002). A limited number of new legal acts were introduced during the review period to address emerging environmental challenges (Table 3.2). In the early 2000s, important legislative steps were taken to reduce emissions of dioxins from waste incinerators based on environmental quality and effluent control standards. The 2000 Basic Law for Establishing a Sound Material-Cycle Society initiated several legal acts to regulate waste management, including food waste, PCBs, and end-of-life vehicles. Following several cases of contaminated soil, a new Soil Pollution Control Law went into effect in early 2003 (Chapter 6). New acts were also promulgated to strengthen access to environmental information and education.

Table 3.2. **Selected environmental legislation, 2000-08**

2000	Construction Material Recycling. Basic Law for Establishing a Sound Material-Cycle Society. Food Recycling (amended in 2007). Recovery and Destruction of Fluorocarbons (amended in 2006).
2001	Promotion of the Procurement of Eco-Friendly Goods and Services by the State and Other Entities. Special Measures for Reducing PCB Waste. Special Measures for the Rejuvenation of Ariake Sea and Yatsushiro Sea.
2002	Soil Contamination Countermeasures. Promotion of Nature Restoration. Recycling of End-of-Life Vehicles. Wildlife Protection and Hunting Management.
2003	Special Measures for Removal of Environmental Problems Caused by Specified Industrial Waste. Enhancing Motivation for Environmental Conservation and Promoting Environmental Education. Promotion of Business Activities with Environmental Consideration by Specified Corporations, and by Facilitating Access to Environmental Information, and Other Measures.
2004	Invasive Alien Species. Emissions From Non-road Special Motor Vehicles.
2005	Asbestos Health Damage Relief.
2006	Promotion of Contracts for Reduction of Emissions of Greenhouse Gases and Other Gases by the State and Other Entities.
2007	Promotion of Ecotourism. Basic Act on Biodiversity. Effective Utilisation of Resources from Agricultural, Forest and Marine Organisms as Raw Materials for Biofuel.

Source: Ministry of the Environment.

In spite of regulatory progress, the management of key environmental domains, such as waste, water and air management, is still based on the legal framework developed in the 1970s and 1980s. A number of amendments promulgated over the review period introduced new measures but also made the legal framework more complex. It would be useful to consolidate the separate legal acts and numerous amendments dealing with individual issues into a *coherent body of laws*. A comprehensive review and revision of the 1993 Basic Environmental Law could provide a basis for regulatory reform with the aim to streamline and simplify regulations and allow a wider application of economic instruments. The Basic Act on Biodiversity adopted in 2008 is a good example to follow as it proposes guidance for the review and subsequent revision of all nature legislation and provides a legal basis for future biodiversity strategies (Chapter 7).

Environmental standards, licenses and impact assessment procedures

Statutory ambient quality standards and statutory emission/effluent standards, established in secondary legislation, are still the two key elements of Japan's approach to pollution control. Water effluent standards cover 15 general parameters ("living environment items") and 27 toxic pollutants ("human health-related items"). The emission and effluent standards remain uniform and are not sector-specific. Over the review period, some pollutants were removed from the list of ambient standards and replaced by others of growing concern (e.g. total zinc in water). The Ministry of the Environment (MOE) is currently conducting a review of standards, which is expected to introduce a number of new pollutants and new thresholds to control ambient water and air quality. In areas specified by air and water laws with serious air and water pollution problems, pollution levels must meet statutory standards based on *total pollutant loads limits* for emission of air pollutants and for discharging pollutants to inland waters and coastal seas.

New regulated facilities must submit *environmental notifications* to the prefectural governor (or the mayor in ordinance-designated cities)¹ prior to their establishment. If a facility has submitted a notification but fails to meet emission or effluent standards (or, where applicable, total pollutant loads), the prefectural governor may order the operator to modify the facility's design or technological processes or to abandon the project altogether. Since there is no formal environmental permitting procedure in Japan, the introduction of more explicit environmental performance requirements into the notification process, such as performance standards for pollution abatement equipment or the limitations of notification validity, would help to promote better compliance.

Waste treatment and disposal facilities regulated by the 1970 Waste Management and Public Cleansing Law are required to apply for a license from the competent local authority.² This requirement does not apply, however, to municipal waste management facilities operated by municipalities themselves. License decisions and conditions are frequently appealed by the operator or by any directly affected party.

Since the promulgation of the *Environmental Impact Assessment Act* in 1997, around 20 large-scale projects are subjected annually to EIA procedures at the national level and around 50 are carried out by Japanese local governments. Some steps were taken to improve the application of the EIA, such as the revision of EIA guidance documents for the implementation of the EIA at the local level in 2006 and the creation of an Internet-based information support system with EIA regulations, good practices and case studies. However, over ten years of accumulated experience show the need for improving EIA procedures. Key areas for improvement include the revision of project thresholds, which currently exclude several important projects from EIA obligations, and the review of project types, since projects applying new technologies, such as CO₂ storage, deep-sea water intake or wind power generation, are not covered by the current EIA procedures. The EIA practice would also benefit from more active involvement of environmental authorities at the local level and better communication with the public, especially during the scoping stage.

1.2. Fostering compliance

Enforcement actions

Site-specific compliance inspections conducted by local governments are the main instrument for assuring environmental compliance. The inspections, which are still conducted separately for air, water and waste, are mostly unannounced and their frequency is left to the discretion of local governments. The number of inspections has remained fairly stable over time, with around 30 000 for air emissions and 55 000 for water management annually (MOE, 2008). Some prefectural and ordinance-designated municipal authorities set prioritisation criteria to target their inspections. This is a positive development that helps to orient inspections towards high-risk installations since the criteria usually include the total volume of pollution emission/effluent, release of hazardous pollutants, and compliance record. The introduction of more integrated cross-media compliance inspections, which would review simultaneously and in a comprehensive way compliance with air, water and waste requirements, could be beneficial for both government and industry; it would reduce the administrative burden on companies as well as reduce the time and costs of enforcement actions.

Formal inspection procedures vary between local governments. While MOE issues guidelines for local governments to help them create site inspection manuals, they are not always followed by prefectural and municipal authorities. Many inspections include a

review of *emission/effluent monitoring* results to verify the reported self-monitoring data.³ Inspection reports, as well as official communication between authorities and the operator, are available to the public upon request.

Rather than impose penalties, *administrative enforcement actions* aim to guide or order operators to comply with requirements. Local governments promote regulatory compliance by issuing administrative guidance to operators based on inspection results. Most businesses usually do take immediate steps to follow the guidelines since the intervention of authorities is already considered as a sanction, and the potential loss of reputation is likely to be a more important deterrent for Japanese companies than penalties. If administrative guidance is insufficient, the local government may issue an order to improve operations or take corrective action. The authorities have suspended operations in a limited number of cases. Such administrative sanctions are imposed if companies significantly or repeatedly exceed emission/effluent limits, or when major corrective action is required. However, this happens rarely and there are practically no cases of non-compliance with an administrative order. In some cases, authorities issue “restoration orders”, which require the violator to take clean-up action. In 2000, waste management regulations were reinforced so that a restoration order can be issued not only in cases of “serious damage” but also when “any damage” occurs. This change has led to an increase in the number of administrative sanctions imposed for industrial waste management offences. Sanctions (unlike license decisions) are rarely appealed (OECD, 2009a).

Criminal enforcement has been very rare in Japan, with most enforcement actions being related to waste management violations. The local government can file a complaint or bring a charge to the public prosecutor depending on the extent of environmental impact and the operator’s intent (*e.g.* for an intentional illegal discharge or falsification of records). However, it is at the discretion of the public prosecutor to pursue the case. Although the maximum penalty levels stipulated in the law are the same for physical and legal persons, fines for companies are usually much larger than for individuals (OECD, 2009a).

Compliance promotion

Building consensus between industries and local authorities has been an important feature of Japan’s environmental compliance assurance. Although usually not legally binding, *Local Pollution Control Agreements (LPCAs)* between a prefecture, a municipal government and an operator are very commonly used to achieve environmental goals. LPCAs are often directly negotiated between local governments and individual polluting facilities, allowing case-by-case determination of emission limits and self-monitoring and reporting arrangements. LPCAs “customise” environmental regulations to fit local conditions. They typically focus on problem-specific environmental media and/or groups of pollutants. To date, over 40 000 facilities have been party to an LPCA (Ogata, 2006). However, the public is seldom involved in these negotiations and, as most agreements are not open to public scrutiny, their levels of ambition are not always clear. Nonetheless, industry’s compliance with negotiated agreements is very high, since local governments commonly link positive decisions on notifications and licenses with the signature of such agreements (OECD, 2009a).

All major branches of Japanese industry, from manufacturing to distribution, transport and construction, also adopt *voluntary action programmes*. These include quantitative targets and timelines concerning, for instance, control of greenhouse gas emissions, the reduction, reuse and recycling of waste, and reduced use of hazardous chemicals in manufacturing (Welch, Hibiki, 2002). Businesses consider voluntary initiatives as a way to

reduce further government regulation. The Japanese Business Federation (Keidanren) regards corporate environmental management as a key part of a global competitiveness strategy for Japanese businesses. The 1997 Keidanren Voluntary Action Plan on the Environment continues to be the framework for implementing environmental measures at all levels of Japanese industry, which include declaring specific environmental objectives and conducting follow-up surveys each year (OECD, 2009a).

Environmental management systems, most of which follow the ISO 14001 standard, have become an important mechanism for strengthening the environmental performance of Japanese firms. The number of ISO 14001 certifications has grown significantly, from 1 400 in 1998 to 20 000 in 2004, accounting for 20% of the total number of such certifications worldwide. One study has revealed that ISO 14001 certifications raised the market valuation of firms since investors considered the acquisition of the standard as a way to reduce the risk of future liability caused by environmental pollution (Welch, Mori, 2008).

Firms that have entered into a local voluntary agreement and those that are active internationally have been certified in greater numbers than smaller firms and those serving the domestic market (Welch, Mori, 2008).⁴ To assist *small and medium-size companies* in acquiring an environmental management system, an Eco Action 21 (EA21) standard was introduced in 1996 by MOE with assistance from the National Association for Promotion of Environmental Conservation. The EA21 system integrates the environmental management system, environmental performance evaluation, and environmental reporting into one easy-to-apply environmental programme. Some prefectures have introduced their own simplified version of ISO 14001, such as the Kyoto Environmental System Standard, whose acquisition fees are approximately one-tenth of those required by the ISO series.

In 2007, MOE and METI (the Ministry of Economy, Trade and Industry) released “Environmental Management Guidelines for Pollution Prevention in Industry” and “Modalities of Environmental Management for Pollution Prevention” (OECD, 2009a). These reports emphasise the need of putting into practice *company-wide environmental compliance* and recommend a number of concrete measures that businesses can implement to achieve it.⁵ However, the documents are methodological and do not provide any guidance for prioritising enforcement actions in specific segments of the regulated community.

1.3. Economic instruments of environmental policies

The use of *economic instruments*, other than environmentally related taxes, has been on the rise. This is particularly true in water management and nature conservation, while the use of market-based instruments in waste and air management has been very limited so far.

In water supply and sanitation, *domestic water tariffs* have been well designed to generate revenue and encourage efficient water use, and they have increased over the review period (OECD, 2010). All infrastructure operation and maintenance costs, and between one-third and one-half of the capital costs, are now recovered from the revenue of water charges (Murakuni, 2006). The remaining two-thirds or one-half of capital costs are financed by subsidies, which is mainly because water supply systems have been extended to new areas where the costs of providing services per person (or per cubic metre) are higher. Domestic water supply tariffs with an increasing-block charge component encourage efficient water use. Domestic and industrial water pricing includes differential charges for installed water pipe sizes. The industrial water tariff sets an upper limit for the volume of water that can be requested by users. The use of *agricultural water* is not metered

and relies on flat rate pricing, which encourages excessive use of water. However, water trading between farmers is allowed within Land Improvement Districts, thus aggregate consumption is controlled. Moreover, farmers may sell part of their water rights to urban water utilities, further contributing to economic efficiency.

There are no entry fees for national parks, although service fees are sometimes charged for visitors' information centres and tourism activities (such as scuba diving). Parking fees are also sometimes charged, in which case the revenue is used to clean up the park. An access fee (JPY 1 000) is charged for regulated utilisation areas. The revenue from various levies, such as the prefectural forestry protection tax and the Yokoyama greenery tax, is increasingly used for *nature and environment conservation purposes* (Chapter 7).

Charging households and businesses for *waste management* has progressed, but cost recovery for municipal waste services is still low, about 13% nationwide, up from 6% in 2000. For industrial waste, 27 prefectures out of 47 and one ordinance-designated city (Kitakyushu) out of 60 had introduced a landfill tax as of 2009. The tax levied is mainly used for waste generation control, recycling, reduction, and other appropriate waste treatment measures (Chapter 6).

Japan has taken its first steps to implement a CO₂ emissions trading system. As of 2009, 303 companies participated in Japan's Voluntary Emissions Trading Scheme (JVETS), covering about 1% of industrial CO₂ emissions. In 2008, the government launched a trial emissions trading system, involving 715 firms and covering more than two-thirds of industrial CO₂ emissions. However, as in the previous programme, participants were not required to set a cap on emissions and no fine was issued in case of non-compliance (Chapter 5). The experience from CO₂ trading could provide a basis for introducing emission trading of traditional pollutants (SO_x and NO_x). In addition, total pollution load programmes could serve as a basis for stimulating faster and optimised responses by the regulated community.

2. Promoting environmental democracy

2.1. Environmental information and reporting

Environmental information disclosure in Japan has been comprehensive and detailed, based on an extensive system of *continuous monitoring by prefectures and municipalities supplemented by self-monitoring by enterprises*. However, environmental data collection efforts tend to focus on environmental statistics, often neglecting relevant economic, financial and sectoral data. These efforts also continue to be driven by the needs of administrative processes and budget priorities. Recent budgetary pressures at the local level have resulted in less funding available for monitoring and, in some cases, data collection was suspended. A recently adopted Environmental Information Strategy (2009) should help to streamline existing data collection, and to make it more cost-effective, responding better to available funding. Data collection should also be directed towards more comprehensive (cross-sectoral) coverage of priority and emerging issues.

Annual *national reports on the environment* (White Papers), produced since 1969, provide the main record of progress made in the implementation of national environmental policies. They have been supplemented with sectoral reports.⁶ Since 2007, the White Papers and "sound material-cycle society" reports have been merged, and a report on biodiversity was added in 2009, which provide good examples of how reporting efforts can be better focused and integrated. In addition, local governments publish annual

environmental assessment reports, using their own sets of indicators and which, in many cases, go beyond national level indicators. The Environmental Reporting Guidelines, released in 2000 and revised in 2007, provide detailed guidance to local governments and the private sector on preparing environmental reports. Since 2005, public corporations are required by law to publish environmental reports and disclose them to the public.

The implementation of plans and programmes has been the subject of *regular policy evaluations* by MOE, as stipulated by the 2001 Government Policy Evaluations Act. The results are disclosed publicly after a review by policy evaluation committees of external experts. The Second Basic Environmental Plan was reviewed three times over the 2000-06 period by the Central Environmental Council (Chapter 1). As a result of the evaluation, a comprehensive set of indicators for monitoring the implementation of the core programmes was included in the subsequent Third Basic Environmental Plan. Along with the formal reviews, public hearings and surveys are conducted among stakeholders.

2.2. Public participation

Since the promulgation of the 1998 Law on Non-Profit Activities, which made it possible for citizens groups to register and acquire legal status, the number of *environmental* NGOs in Japan increased from a few hundred in the late 1990s to over 15 000 in 2007 (MOE, 2009a).⁷ Most of these groups are engaged in environmental education, nature conservation and community planning. Increasingly, they are participating in decision-making at municipal level by direct action and referenda. Most recently, however, NGOs are conducting campaigns that aim to build partnerships with authorities and businesses to propose alternative policies.

As their operations rely heavily on donations, membership fees and some income-generating activities, Japanese NGOs tend to be small (between 10 and 100 members), operating mainly at the local level (only 10% claim to be active throughout the whole country) (Han, Furumura, 2005). Support provided by the Japanese Fund for Global Environment, with an annual budget of around JPY 400 million (about USD 4 million), has also been instrumental in building NGO capacity. However, *no single national-level co-ordinating body for NGO groups exists*. This weakens the position of NGOs in discussing national and long-term policy objectives and solutions with the national administration and business representatives. In order to strengthen public involvement in discussions between government decision-makers and industry, the role of public consultative mechanisms, including the Central Environmental Council and its extensive working groups, should be further developed and grassroots NGOs should be provided with more public support.

2.3. Access to justice

Since the 1970s, many pollution victims suffering from air pollution-related diseases or from mercury, cadmium or arsenic poisoning sought *health damage compensation via judicial litigation*. The extent of the damage was assessed on a case-by-case basis in each lawsuit. However, this type of legal action is time-consuming and costly. A number of cases that had been brought to court before 2000 were settled only recently.⁸ Several court cases are still pending, including cases involving Minamata and asbestos-related diseases. Even though the process was complex and took a long time, several of the pollution-related lawsuits have led to a reform of the regulatory framework and stronger enforcement actions by the authorities (Osaka, 2009).

To avoid the complexity of these court cases, Japan has adopted several *administrative health damage compensation systems* whereby public institutions can, through simple and non-judicial procedures, recognise pollution-related injury and quickly provide compensation to victims. In the review period, compensation was provided through the Pollution-related Health Damage Compensation System (PHDCS). The PHDCS, which is funded by a pollution levy collected from stationary pollution sources (80%) and from the motor vehicle tonnage tax (20%) (Chapter 2), provides medical care and welfare support, compensation for disabilities and other related expenses to certified sufferers of air pollution (over 50 000) and Minamata and Itai-Itai diseases (over 1 000). Additional support was provided through the Pollution-related Health Damage Prevention Programme (PHDPP), which is financed by a JPY 50 billion (about USD 500 million) endowment fund established by polluting enterprises and the national government.⁹ The PHDPP mostly supports medical consultation, health impacts research, and planning and investment activities in 47 areas affected by air pollution. In 2006, under the Asbestos Health Damage Relief Act, a separate fund was established to cover the cost of medical care for people exposed to asbestos. The fund is financed by the central and local governments, as well as by industry.

In cases where the administration and representatives of the public have conflicting opinions and a solution cannot be found through judicial or administrative procedures, an *independent dispute resolution system* is used. This includes the Environmental Dispute Co-ordination Commission (EDCC) at the national level and Pollution Examination Commissions in prefectures.¹⁰ The main issues for conciliation, mediation and arbitration include transport noise, air pollution and impacts of odours. From its inauguration in 1970 to 2007, the EDCC handled 785 cases (of which 773 were settled) and another 1 100 cases were handled at the prefecture level.

2.4. Environmental education

Japan's environmental education efforts were significantly strengthened in 2003 with the promulgation of the *Law for Enhancing Motivation for Environmental Conservation and Promoting Environmental Education*, which calls for developing a basic environmental education policy. At the national level, the Ministry of Education, Culture, Sports, Science and Technology, the Ministry of the Environment, the Ministry of Agriculture, Forestry and Fisheries, the Ministry of Economy, Trade and Industry, and the Ministry of Land, Infrastructure, Transport and Tourism have been engaged in the implementation of this law. In 2006, an action plan was adopted to fulfil Japan's commitment under the UN Decade of Education for Sustainable Development 2005-14. A number of follow-up actions included seminars to exchange experience among teachers, training on best practices, and local projects that introduced environmental awareness elements into school curricula and reduced environmental "footprints" of school operations. Networks of parliamentarians and NGOs were established to support environmental education efforts at the national and local levels. All these activities were included in the Basic Plan for the Promotion of Education in Japan formulated in 2008.

3. Progress in air and water management

3.1. Air management

Trends in air quality

After large decreases in air pollutant emissions in the 1970s and 1980s, the trends over the review period followed the levelling off tendency achieved during the 1990s. Low concentrations of the main air pollutants already achieved in the 1990s were sustained during the review period (Box 3.1).

Box 3.1. Trends in air emissions and air quality

Air emissions

Air pollutant emissions continued to decrease over the review period. The decreasing trends of CO, NMVOC and NO_x emissions were mainly observed in the transport sector. Most SO_x emission reductions were achieved in the industrial sector (Table 3.3).

However, emissions showed increasing trends in some sectors, for example SO_x and NO_x emissions from power stations increased by 12% and 17%, respectively. Solvents are still the major source of NMVOC (75% of the total) emissions. CO emissions increased from industrial combustion, making this sector responsible for nearly 60% of total CO emissions (Table 3.3).

Emissions of 18 hazardous air pollutants that are subject to the PRTR system decreased by around 25% over the review period (MOE, 2009a). There is still some concern over mercury emissions from coal-fired power plants as these emissions have been gradually increasing since 2001, although annual average concentrations have remained below the guideline value. Continued efforts to address high emissions of dioxins, especially from waste incineration, have resulted in an impressive 92% decrease since 1997 (Figure 3.1).

Air quality

Concentrations of the main air pollutants in ambient air remained low over the review period. Air pollution monitoring stations recorded almost 100% compliance with ambient air environmental quality standards (EQS) for SO₂, NO₂ and CO (MOE, 2009a). The NO₂ compliance rate at the roadside air pollution monitoring stations also increased to 95% in 2007. The average annual concentrations of suspended particulate matter (SPM) were reduced significantly, reaching compliance rates of about 90% in 2007 at both ambient and roadside monitoring stations. However, SPM concentrations have fluctuated from year to year due to “yellow” dust pollution and sandstorms (Chapter 4). Particular progress was made in reducing NO_x and SPM concentration in the urban areas of Tokyo/Saitama/Chiba/Kanagawa, Aichi/Mie and Osaka/Hyogo. Compliance rates with ambient standards for SPM were still low (65%) only in the Aichi/Mie area.

Despite decreasing NO_x and SPM emission levels, the trend in photochemical oxidants concentration worsened over the review period with levels of ozone, peroxyacetylene nitrate and hydrogen peroxide rising continuously (Figure 3.1). This trend prompted frequent public warnings. For example, in 2007, photochemical smog warnings were issued for a total of 220 days in 28 prefectures (MOE, 2008). Nationwide, the compliance rates for environmental quality standards for oxidants are particularly low, with only 0.1% at ambient air monitoring stations and 3% at the roadside stations.

Ambient air levels of toxic chemicals showed further decreasing trends. The annual average concentration decreased by 25% for benzene, 18% for trichloroethylene (TriCE) and 31% for tetrachloroethylene (TetraCE) between 2003 and 2007, following reductions of their total emissions. Environmental quality standards were met for TriCE and TetraCE. The exceedance rate of the benzene standards decreased further to less than 1% in 2007. The annual average concentration of dioxins in ambient air fell by an impressive 40% and satisfied the EQS of 0.6 pg-TEQ/m³ at all 740 monitoring stations in 2007 (Figure 3.1).

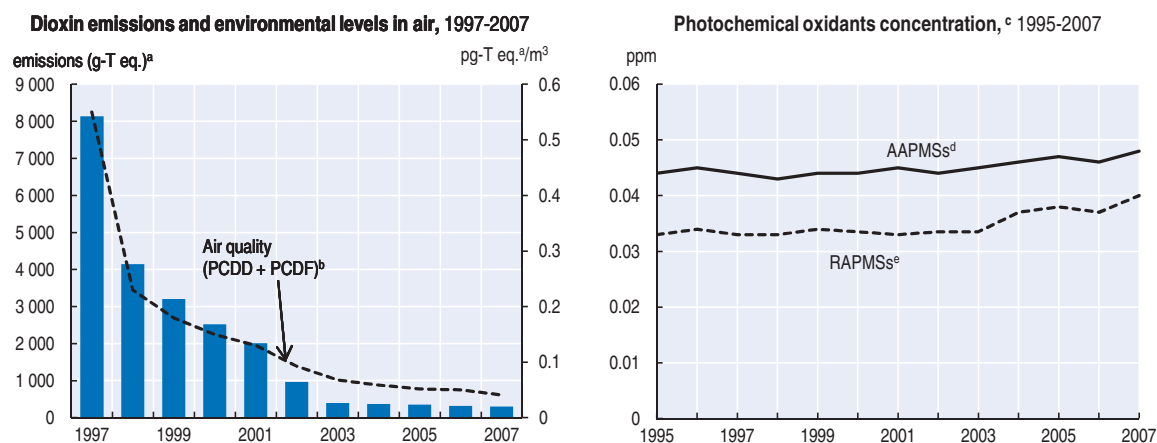
Table 3.3. Atmospheric emissions by source
1 000 tonnes and % of total atmospheric emissions

		SO ₂	(%)	NO _x	(%)	NM VOC	(%)	CO	(%)
Power stations	2000	177.1	19.2	237.6	11.3	2.8	0.2	76.3	1.9
	2007	198.5	25.4	278.7	14.3	3.2	0.2	84.2	3.1
Industrial combustion	2000	350.7	38.1	489.4	23.2	7.7	0.4	1 674.1	42.6
	2007	282.9	36.3	494.4	25.4	8.1	0.5	184.7	57.4
Non-industrial combustion	2000	160.0	17.4	175.2	8.3	11.1	0.6	82.2	2.1
	2007	91.8	11.8	155.2	8.0	9.9	0.6	68.2	2.5
Industrial processes	2000	47.1	5.1	74.0	3.5	289.3	16.1	0.0	0.0
	2007	48.6	6.2	71.1	3.7	295.2	18.0	0.0	0.0
Mobile sources	2000	154.4	16.8	1 075.9	50.9	180.2	10.0	1 896.4	48.3
	2007	132.5	17.0	898.5	46.2	93.1	5.7	838.5	30.4
Solvents	2000	–	–	–	–	1 309.4	72.7	–	–
	2007	–	–	–	–	1 228.9	75.0	–	–
Miscellaneous	2000	32.0	3.0	59.7	2.8	–	–	198.1	5.0
	2007	26.0	3.0	45.5	2.3	–	–	184.5	6.7
Total	2000	921.0	100.0	2 111.9	100.0	1 800.5	100.0	3 927.1	100.0
	2007	780.3	100.0	1 943.3	100.0	1 638.4	100.0	2 760.1	100.0
Change 2007/2000 (%)			–15.3		–8.0		–9.0		–29.7

Source: Japan's Inventory submission to the UNFCCC, April 2009.

StatLink  <http://dx.doi.org/10.1787/888932318965>

Figure 3.1. Dioxin and photochemical oxidants



a) Toxic equivalent.

b) Polychlorinated dibenzo-p-dioxins + polychlorinated dibenzofurans.

c) Annual average.

d) Ambient air pollution monitoring stations.

e) Roadside air pollution monitoring stations.

Source: MOE (2009a).

Policy measures to reduce air emissions

The regulatory measures, including strict emission standards and total emission control programmes for specific areas established by the 1968 Air Pollution Control Law, continued to provide a policy framework for SO_x and NO_x emission reduction efforts from stationary sources. Compliance monitoring was strengthened through around 2 000 monitoring stations, which are operated by prefectures and ordinance-designated municipal governments, and an increasing number of compliance inspections: the number of on-site inspections of around

220 000 facilities emitting NO_x, SO_x and soot increased from 23 000 in 2003 to 28 000 in 2007. The results showed overall good compliance with a small number of administrative orders and a stable number of administrative warnings (around 500 cases) issued by inspectors to redress non-compliance. Reduction of NO_x emissions from large fossil fuel plants was supported by the Environmental Action Plan of the Japanese Electric Utility Industry, first formulated in 1996 and periodically reviewed. In 2005, the NO_x emission guidelines for small sources were introduced, and funds were provided for the diffusion of efficient, small combustion equipment.

Emissions of NMVOCs from the mobile sources were reduced by half between 2000 and 2007 (Table 3.3). Slower progress in reducing emissions from stationary sources led to establishing in 2004 an ambitious objective to reduce them by 30% by 2010, compared with the 2000 level.¹¹ Since 2006, all new NMVOC emitters are required to report their emissions and to comply with tightened emission standards by 2010.¹² The government has provided tax breaks for business operators who install equipment that facilitates the reduction of NMVOC emissions, such as direct or heat storage combustion equipment. The taxation rate for the fixed property tax of such equipment has also been reduced. Voluntary efforts have set sectoral targets (by individual enterprises and business associations), and introduce reduction measures according to voluntary action plans. The Japanese Environmental Management Association for Industry examines voluntary NMVOC emissions reduction plans for businesses that are not members of any industry association, and provides advice on ways to control emissions voluntarily. In addition, MOE has created NMVOC Measures Performance Awards to reward businesses that implement voluntary emissions reduction programmes. In spite of these efforts the NMVOC emission levels from stationary sources decreased more slowly than expected (5% between 2000 and 2007) and the 2010 target is not likely to be met (Table 3.3). Next steps will include new emission standards for NMVOC, which will be introduced for existing facilities in 2010.

Important efforts were made to reduce *high levels of NO_x in the urban areas of Tokyo and Osaka*. Combined with emissions of suspended particulate matter (SPM) and NMVOCs, these pollutants have led to increased levels of photochemical oxidants and frequent smog alerts. The 2002 revisions of the 1992 “Law Concerning Special Measures to Reduce the Total Amount of Nitrogen Oxides Emitted from Motor Vehicles in Specified Areas” introduced: i) new 2010 emission reduction targets; ii) stricter emission standards for NO_x and SPM for both passenger and heavy-duty vehicles; and iii) requirements for the installation of particulate filters in all new passenger and light-duty vehicles.¹³ Building on this experience, the provisions of the 1992/2002 Law were expanded to cover a third metropolitan area – Nagoya (the Aichi and Mie designated areas). At the same time, an Action Plan for the Development and Diffusion of Low-emission Vehicles, which was formulated in 2001, introduced tax incentives (reduction of the acquisition tax and automobile tax) and subsidies for the take-up of electric or hybrid buses or CNG (compressed natural gas) trucks. At the end of 2007, the number of low-emission vehicles in use in Japan was about 16 million units, which surpassed the 2001 government target of 10 million by 2010. As a result, emissions of NO_x and SPM show strong decreasing trends in all three areas and are on track for meeting emissions standards set for 2010. National efforts to reduce air emissions were supported by local government actions, with all designated prefectures systematically implementing measures to curb emissions from motor vehicles based on the “Total Emission Reduction Plans”. In 2003, the Tokyo Metropolitan Government, in close co-operation with neighbouring cities, put in place

regulations banning from Tokyo urban areas all diesel-fuelled vehicles that fail to meet stringent SPM standards (Box 3.2). Osaka implemented a similar pollution control measure for incoming traffic in 2009, using its own sticker labelling system (Box 1.2).

Box 3.2. Tokyo Metropolitan Government's efforts to improve urban air quality

The Tokyo Metropolitan Government's (TMG) efforts to address air quality problems accelerated after the revision of its Environmental Master Plan (first developed in 1997) in 2002 and the introduction of an ordinance in 2003 that banned certain vehicles from the metropolitan area. According to the ordinance, diesel vehicles, such as buses, trucks and special-purpose vehicles, that fail to meet the suspended particulate matter (SPM) standards, can no longer enter the city. In order to maximise the effects of the regulation, neighbouring prefectures (Sitama, Chiba and Kanagawa) have also implemented the measure. However, private passenger cars are exempt from the regulation.

The restrictions were accompanied by strict enforcement measures for those who violate the regulation. These measures include roadside vehicle inspections, on-site inspections of business facilities and video monitoring. In addition, a public campaign was launched in 2004, together with a "Dial 110 to Stop Black Smoke" call centre for the public. TMG also provided financial support programmes for SMEs to assist them in complying with the rules. The programmes included a loan mediation programme for replacing vehicles not meeting the standards with low emission cars, and subsidies for the installation of SPM emission reduction devices. As part of its efforts to decrease air emissions in the Tokyo Bay area, TMG promoted the use of land-based power supply facilities to provide electricity to ships so that they could reduce their emissions at seaports.

These measures made it possible to achieve speedy compliance with environmental quality standards for SPM. The compliance rate increased from below 1% in 2003 to 12% with the start of the diesel vehicle regulation in 2005, to reach 97% in 2006 and 100% in both 2007 and 2008.

In 2008, TMG's Environmental Master Plan was revised again to include further commitments for improving air quality in the Tokyo metropolitan area. These aim to: i) satisfy environmental standards for SPM and NO_x emissions in all air pollution monitoring stations by 2010; and ii) achieve zero warning statements with respect to photochemical smog by 2016. To reach these goals, TMG is promoting greater use of low-emission vehicles, improved public transport infrastructure and better management of chemicals to reduce NMVOC emissions. TMG called on the national government to set the environmental standard for PM_{2.5} and to extend the measures introduced by TMG to other parts of the country.

Further efforts needed

Japan has taken various steps to implement the air management recommendations made by the 2002 OECD *Environmental Performance Review* (Table 3.4). The current review shows that Japan's policy instruments to address air pollution are based mainly on regulation (quality standards, pollution limits and non-compliance responses) and voluntary approaches by business. While the results of this policy approach have been positive, especially in reducing air pollution in large cities, the cost-effectiveness of individual measures has not been properly assessed. There is a large potential for introducing *economic instruments* for which the total pollution load programmes could serve as a basis. The introduction of pollution loads trading, as done in other OECD countries, for

Table 3.4. **Actions taken on the 2002 EPR recommendations for air management**

Recommendations	Actions taken
Continue efforts to reduce <i>NO_x</i> and <i>NM VOC emissions</i> , in light of the persistent <i>NO₂</i> and photochemical oxidant issue in metropolitan areas.	More stringent limits for emissions from transport and industry have been set; requirements for NMVOC emissions have been introduced for industry; emissions from solvents, however, are still high and remain largely unregulated.
Further develop and implement comprehensive policies to control <i>fine particulate emissions</i> from both mobile and stationary sources and to meet environmental quality standards.	Emission limits for coarse particulate emissions from transport, industry and energy have been made more stringent; regulatory framework for small particulates is still under development.
Continue efforts to <i>reduce emissions of toxic chemicals</i> , ensuring in particular that voluntary agreements are efficient and effective.	An effective mix of regulatory, voluntary and investment measures have kept emissions of toxic chemicals low. There has been no in-depth analysis of the economic effectiveness of voluntary measures.
Use <i>cost-benefit analysis</i> more systematically in integrating major air management and transport decisions, including those for road investment.	The application of cost-benefit analysis in air and transport management decisions has been limited, and co-ordination of transport and environmental policies remains weak.

Source: OECD, Environment Directorate.

conventional pollutants and on a regional scale for CO₂, could stimulate faster and more economically efficient responses by the regulated community. At the same time, voluntary programmes must be made more transparent by having the public participate more in the development and implementation of these programmes.

Photochemical smog remains a serious problem, particularly in the three designated metropolitan areas of Tokyo/Saitama/Chiba/Kanagawa, Aichi/Mie and Osaka/Hyogo. Except for voluntary efforts by business and supporting programmes for SMEs, no substantial measures have been introduced to reduce NMVOC emissions, particularly from the use of solvents and large stationary sources. While the reduction of NO_x and NMVOC emissions from various small sources is a good starting point, careful and expanded monitoring and analysis are needed to develop more appropriate and effective instruments. Further efforts are also needed to reduce SPM emissions (and concentration levels) in metropolitan areas, which will contribute to reducing photochemical smog. Another desirable step in the near future would be the introduction of standards for small particulates (PM_{2.5}).

3.2. Water management

Japan has one of the highest levels of precipitation among OECD countries. Significant fluctuations in rainfall, both seasonal and between years, combined with rapid run-off and high population density, make water management challenging. Water shortages and disastrous floods occur frequently, and pressures on water resources from industrial, agriculture and domestic use and from pollution have been intense. Japan's water management was the subject of an in-depth examination in the 2002 OECD *Environmental Performance Review*. Subsequently, Japan has taken various steps to implement the recommendations on water management made in that report (Table 3.5).

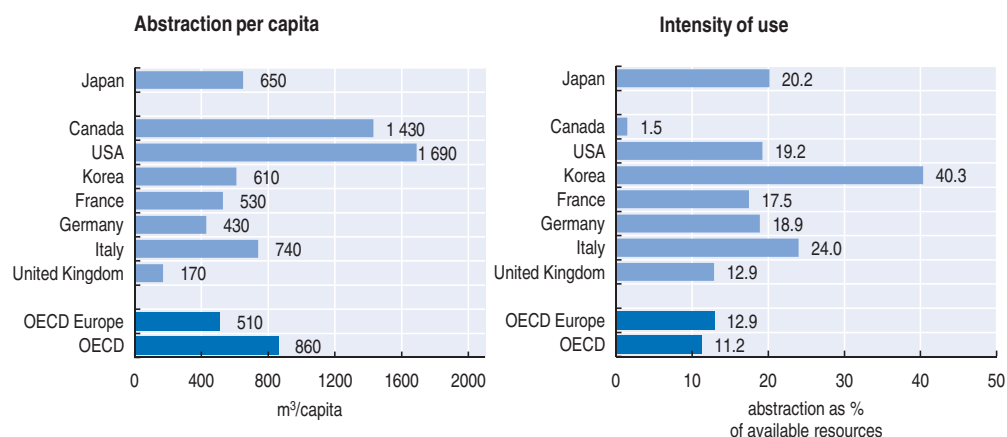
Trends in water use and quality

The intensity of water use decreased only slightly during the review period and is still nearly twice the OECD average (Figure 3.2). Progress was made in improving the quality of Japanese rivers and groundwater with important decreases of BOD/COD, nitrogen, phosphorus and heavy metals discharges.¹⁴ However, lakes and coastal waters continue to suffer from

Table 3.5. **Actions taken on the 2002 EPR recommendations for water management**

Recommendations	Actions taken
Consolidate the body of <i>water-related laws</i> into coherent legislation integrating quantity and quality management and taking a whole river basin approach.	River basin management plans have been developed for priority rivers, but there has been no progress in consolidating water-related laws that would balance water quality and quality management.
Take additional measures to expedite implementation of <i>sewerage construction</i> programmes (e.g. expanding advanced treatment infrastructure, improving combined sewer overflows); further increase the application of the polluter pays and user pays principles; consider a possible role for <i>public-private partnerships</i> towards this end.	There has been important progress in expanding sewerage and wastewater treatment coverage in large and medium-size municipalities. Cost-recovery of operation and water infrastructure maintenance has increased; the outsourcing of water and sanitation services to the private sector has expanded significantly, leading to cost reduction and greater effectiveness.
Strengthen implementation of <i>nutrient reduction measures</i> for lakes, bays and inland seas, in particular regarding diffuse sources such as agriculture.	Some progress has been made in expanding nutrient reduction programmes in agriculture; support for managing and reducing impacts of manure stockpiling has increased.
Strengthen the control of <i>substances hazardous</i> to human health and ecosystems, through cleaner production, effluent control, pesticide regulation and groundwater protection.	Enforcement of emission limits has been enhanced for hazardous substances from large sources and agriculture but concerns remain over emissions from small and medium-size enterprises.
Streamline the <i>water quality classification system</i> and include ecological water quality criteria.	Ecological water quality criteria are well established in the environment Water Quality Standards, but there has been slow progress in streamlining water quality classification and its expansion to cover priority pollutants.

Source: OECD, Environment Directorate.

Figure 3.2. **Freshwater use, 2007^a**

a) Or latest available year.

Source: OECD, Environment Directorate.

algae blooms due to high nutrient load from agriculture, low and insufficient sewerage coverage and wastewater treatment capacity in smaller cities, and discharges from unregulated small sources (Box 3.3).

Progress in the regulatory and incentive framework for managing point source pollution

The *water quality management system*, which is based on national water quality standards supplemented by effluent standards, has proved environmentally effective for reducing pollution by substances that are hazardous to human health. More stringent health-related standards, which have been frequently applied by prefectural or local authorities, together with negotiated agreements between the authorities and industry, have helped to adapt

Box 3.3. Trends in water use and water quality

Water use

Of the approximately 83.5 billion cubic metres of *freshwater used for human activities* in Japan, around 88% continue to be withdrawn from rivers, lakes and marshes, and the remaining 12% from groundwater. Japan's water abstraction per capita is below the OECD average, but remains above a large number of OECD countries, notably European (Figure 3.2). The water resources utilisation rate is high in the regions of Kanto and Kinki where population and industry are concentrated.

Agriculture accounts for about 66% of total freshwater withdrawal, the domestic and commercial sectors for about 19% and industry for 15%. The demand for agricultural water declined over the review period due to a decrease in rice paddy fields. Industrial water use also declined, partly due to increasing recycling rates. Slower population growth also contributed to the decrease in overall abstractions.

Excessive pumping of groundwater still results in *lower groundwater levels and subsequent ground subsidence*. In 2007, 60 areas in 37 prefectures continued to suffer ground subsidence, including snow-covered areas that use groundwater for melting snow and areas pumping brine water from natural gas wells. Measures such as restrictions on pumping groundwater have slowed down, or almost stopped, ground subsidence in Tokyo, Osaka and Nagoya.

Water quality

Rates for compliance with health-related *Water Quality Standards (WQS)* have been close to 100% for the last two decades. WQS compliance rates related to biochemical oxygen demand (BOD), a typical water quality indicator for *organic contamination*, increased from 79% in 2000 to 87% in 2008. Overall, organic pollution of rivers has decreased; however, BOD values remain relatively high in inland lakes and reservoirs, with compliance rates of about 50%. Pressure from organic pollution is also still high in coastal waters, especially in three designated areas, where compliance rates are in the 56-67% range: Osaka Bay (67%), Tokyo Bay (63%) and the Ise Bay (56%).

Eutrophication continues to be of concern. While the share of lakes and reservoirs compliant with phosphorus quality standards increased from 40% in 2000 to 60% in 2008, nitrogen standards were met in only three out of 37 classified inland water bodies in 2008. Impacts from nutrients still lead to frequent algae blooms ("red" and "blue" tides) that affect aquatic life in coastal areas and increase costs of drinking water treatment from inland water intakes.

The *quality of groundwater* continued to improve. According to the 2008 monitoring survey, only 7% of monitored wells did not meet quality standards (MOE, 2009a). The limits for nitrate nitrogen (from fertilisers, livestock effluents and domestic wastewater) were exceeded in 4% of the monitored wells. The share of samples not meeting national water standards for pesticides was less than 0.1% throughout the review period. Other substances that exceeded quality standards include arsenic, TriCE, TetraCE and fluorine, from industrial or natural origin.

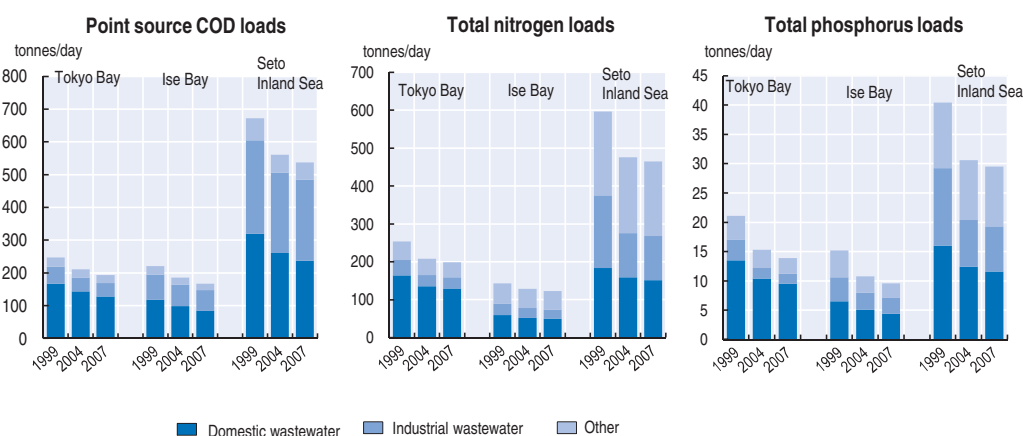
efforts to local conditions. Japan's water quality monitoring system has been expanded at the prefectural level and in the designated cities, with the emphasis being placed on installing automated water-quality monitoring equipment and regular reporting.

In 2007, about 277 000 facilities were controlled for compliance with health quality effluent standards. On-site inspections carried out over the review period (around 55 000 a year) resulted in higher numbers of warnings and penalties issued by inspectors. At the same time, the number of orders requesting the suspension of operations decreased.

However, the *effluent standards that relate to the “living” environment* apply only to sources designated by the Water Pollution Control Law (i.e. those with daily wastewater discharge above 50 m³ per day) and do not cover many smaller sources of water pollution. As the number of these sources is large (including many small wastewater treatments plants, hotels and car wash services) and their cumulative impact on water quality can be high, there is a need to include them in the effluent standards control system.

The *total pollution load control programme*, which supplements water and effluent standards, helped to reduce organic pollution in the designated areas of the Seto Inland Sea (including Osaka prefecture), the Tokyo Bay and the Ise Bay, where the COD loads were reduced by 21%, 22% and 25% respectively over the review period. However, reductions in nutrient loads were much smaller, especially between 2004 and 2007 (Figure 3.3). Similar trends were observed with the implementation of the “total pollution load control” system in inland waters, where regulations for phosphorus are in effect for 1 200 lakes and reservoirs, and for nitrogen for around 200 inland water bodies.

Figure 3.3. Changes in organic, nitrogen and phosphorus pollution in three areas under total pollution load control system, 1999-2007



Source: Ministry of the Environment.

Japan has experimented with the introduction of *economic instruments in water pollution control*. For example, the Osaka prefecture has compensated the Shiga prefecture for sustainable forest management around Lake Biwa, which is the source of the Yodo River, Osaka’s main supply for drinking water (Box 7.2). Thirty prefectures (out of 47) levy a forestry protection tax aimed at complementing allocations from the central budget for forest management and conservation activities. In most cases, a surtax is added for the management and conservation of regional forests, including the protection of headwaters critical to the water supply. First steps were taken to introduce tradable load reduction assignments for nitrogen and phosphorus in enclosed water bodies: a new framework for nitrogen and phosphorus loads trading was introduced through the amendments of the Sewerage Law in 2005 and a draft guideline for trading was issued by the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) in 2007.

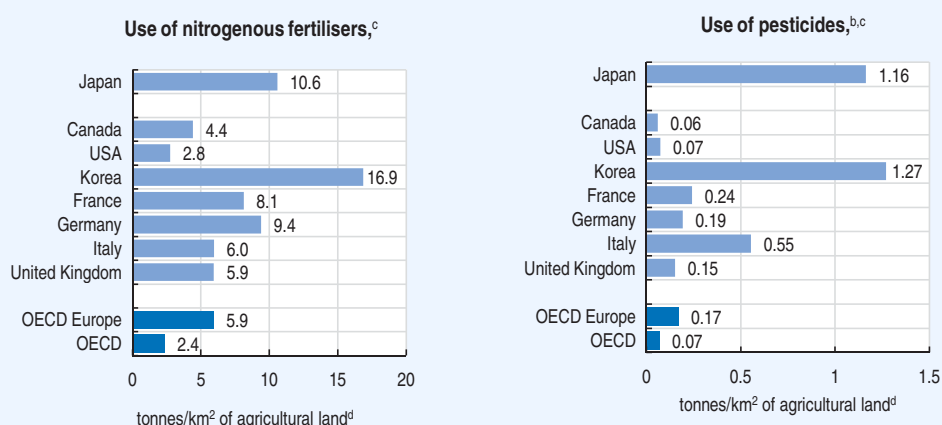
Reducing nitrogen and phosphorus load from agriculture

Even though there is little information on agriculture's share in nutrient pollution loads, indirect evidence shows that agricultural activity is an important factor in the eutrophication of inland and coastal waters and that these pressures are likely to continue in the future (Box 3.4).

Box 3.4. Environmental impacts of agriculture

While the use of phosphorus fertilisers declined over the review period (by 35%), the use of nitrogenous fertilisers increased by over 11%. The absolute levels of farm nitrogen (N) and phosphorus (P) per hectare remain among the highest across OECD countries (171 kg N/hectare versus 74 kg for the OECD average, and 51 kg P/hectare versus 10 kg for the OECD average) (OECD, 2008). The intensity of nitrogenous fertilisers use is still high in Japan (Figure 3.4).

Figure 3.4. Agricultural inputs, 2007^a



a) Or latest available year.

b) 2006.

c) Apparent consumption. For pesticides, sales are often used as a proxy.

d) Arable area, permanent crop land and permanent grassland.

Source: IFA; OECD, Environment Directorate.

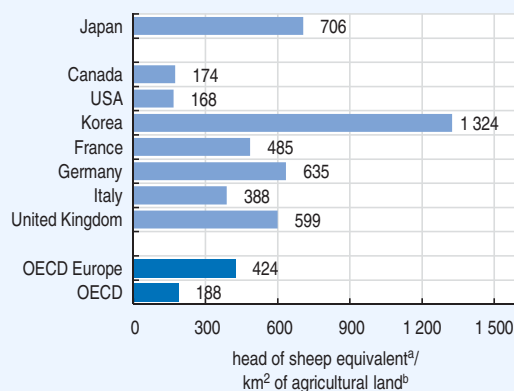
While livestock production has declined over the last decade, its density is still one of the highest among OECD countries (Figure 3.5). There has been a trend towards larger operating units, especially for pigs and dairy cows, leading to increased localised levels of livestock effluents. However, the number of livestock farms equipped with manure treatment facilities has recently increased, reaching nearly 90% of the government's target for this period. Even though the share of farms under nutrient management plans increased from 15% in 2000-03 to 30% in 2008, nutrient use efficiency (output/input) is among the lowest across OECD countries.

The decrease in pesticide use over the review period (by nearly 21%) was most likely associated with the 20% reduction in crop production volume and, to a limited extent, to the increase in the number of farmers adopting environmentally beneficial practices, including organic farms. The intensity of pesticide use, however, remains significant by OECD standards, due in part to the pressure on land and labour, and to the humid temperate climate (Figure 3.4).

Box 3.4. Environmental impacts of agriculture (cont.)

Some regions are experiencing water shortages, which is leading to growing competition for water resources. Projections suggest that demand for irrigation water for dryland crop production may expand. Given that agriculture is the major user of water resources, reducing future demand for water will in part depend on promoting the efficient use of water by agriculture.

Figure 3.5. **Livestock density, 2006**



a) Based on equivalent coefficients in terms of manure:

1 horse = 4.8 sheep; 1 pig = 1 goat = 1 sheep; 1 hen = 0.1 sheep; 1 cow = 6 sheep.

b) Arable area, permanent crop land and permanent grassland.

Source: FAO (2008), FAOSTAT Database.

Japan has implemented various initiatives to address water pollution from agriculture. The 2003 Principles of the Environmental Policy in Agriculture, Forestry and Fisheries provided a new framework for agri-environmental policies, with a shift to cross-compliance measures targeted to environmentally beneficial practices, more clearly defined policy goals, and provision of a policy evaluation framework. With the full enforcement of the 2004 Act on the Appropriate Treatment and Promotion of Utilisation of Livestock Manure, provisions were applied to about 62 000 livestock farmers in an effort to eradicate improper practices, such as open stockpiling and landfilling, which result in groundwater pollution. About 90% of manure (80 million tonnes) is now recycled as fertiliser. In addition, the 2006 Japanese Biomass Strategy established a set of programmes aimed at recycling more than 80% of biomass waste (which includes livestock manure) and utilising more than 25% of unused biomass by 2010. In 2007, Japan introduced an agricultural support scheme designed to promote more environmentally friendly farming which involves reducing the application of chemical fertilisers and pesticides by half compared to conventional farming (Chapter 7). Organic farming techniques have yet to be adopted, for which the Ministry of Agriculture, Forestry and Fisheries (MAFF) established demonstration farms at a budgetary cost of JPY 4.4 billion (USD 47 million).¹⁵

Water supply and sanitation

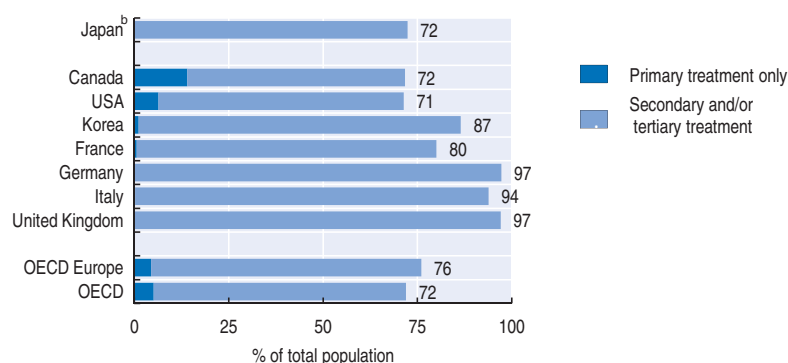
Most of the Japanese population had access to safe drinking water (98% in urban and 91% in rural areas) already in the 1990s. However, the quality of tap water is still considered inadequate. The problems are due to disinfection chemicals and their by-products and, in

some areas, bacterial and pathogenic contamination. A revision of drinking water quality standards, as well as a system for quality assessment and assurance based on WHO guidelines, introduced in 2004, helped to address the quality concerns. Demand is nonetheless high for the renovation or reconstruction of existing facilities – many of which are 50-60 years old.¹⁶ One analysis estimates that the water supply industry will require annual investment of USD 30 billion by 2020 (Kobayashi, 2008). This would represent a considerable increase over the USD 12-16 billion invested annually in the previous decade. So far, the government-sponsored Fiscal Investment and Loan Programme and municipal bonds have provided funding for local government investments in water supply, while increasing block tariffs for water use have been sufficient to cover between 30 and 50% of capital costs and all operation and maintenance costs. Water charges will need to be raised, however, to cover the financial needs for the renovation of infrastructure.

Important progress was made during the review period in expanding *wastewater treatment services*. The share of the population using wastewater treatment services of various types increased from 69% in 2001 to 84% at the end 2007. This included 72% connected to public municipal systems, an area where Japan has been lagging behind many OECD countries (Figure 3.6). Another 3% was served by the agriculture community's effluent treatment facilities and 0.3% by community wastewater treatment facilities (MOE, 2009a). Around 9% used the individual on-site treatment "Johkasou" system, which is mainly applied in sparsely populated areas (JECES, 2005) (Box 3.5).

In spite of these efforts, a wide gap in the *wastewater treatment coverage rate* still exists between large cities and medium and small-sized municipalities. While the connection rate reached nearly 100% in Tokyo and 11 other cities with a population of over 1 million (2008), less than 80% of the population were served by wastewater treatment in cities with fewer than 0.5 million people (which, taken together, total nearly 70 million people). For the 1 300 municipalities with fewer than 50 000 people (totalling 22 million), the wastewater treatment coverage rate remained below 70%. Overall, secondary treatment is still the dominant method, as only 12% of the population were connected to systems that use advanced treatment technologies (MOE, 2009a).

Figure 3.6. **Population connected to public wastewater treatment plant, 2007^a**



a) Or latest available year.

b) 2008 data excluding the 12% of the population connected to independent sewerage facilities ("johkasou", treatment facilities for rural areas and community wastewater treatment plants).

Source: OECD, Environment Directorate.

StatLink  <http://dx.doi.org/10.1787/888932318737>

Box 3.5. Decentralised wastewater treatment systems (Johkasou)

The growing use of flush toilets in Japan's less populated areas not covered by sewerage collection and treatment systems has led to the development of small-scale decentralised wastewater treatment systems known as "Johkasou" ("jouka" – purification, "sou" – tank). While conventional septic tanks typically provide only primary treatment and partial biological treatment, a Johkasou unit can offer tertiary treatment, ensuring effluent BOD levels of below 20 mg/l. Moreover, Johkasou treatment is able to eliminate pathogens. It can also be used in highly populated areas for on-site wastewater treatment, which includes water reclamation for non-potable use.

Depending on their size, one Johkasou unit can provide service to an individual house (up to five people) or to several buildings (up to 5 000 people). Johkasous can be used in different topographical locations, require little installation time and come at an affordable price, and their treated water and sludge can be easily reused. They are also less vulnerable to natural disasters, in particular earthquakes.

A regulatory framework established in 1983 (the Johkasou Law) still regulates the manufacturing, installation and management of individual units. Johkasous are monitored several times a year by maintenance services and are subject to annual water quality checks by an inspection agency. Biosolids are recycled in a variety of ways, including as biogas and compost.

Johkasou systems installed up to the 1990s ("tandoku-shori") could only treat flush toilet wastewater. Other domestic wastewater (from bathing and dishwashing) was discharged directly into the environment. With the recognition that tandoku-shori Johkasou units were not adequately protecting the environment, and the growing use of flush toilets, the installation of tandoku-shori Johkasous was banned in 2000; and they are not counted as individual wastewater treatment facilities in official statistics. The use of "gappei-shori" Johkasou was then promoted, as these units can treat all wastewater from households ("gappei" means combined or merged). In 2003, the management of Johkasou was transferred from the Ministry of Health, Labour and Welfare to the Ministry of the Environment.

The implementation of the Johkasou Law is supported by various subsidy programmes. Through the Johkasou Installation Promotion Programme, the central government supports 13% of Johkasou unit installation costs, while 27% of the costs are supported by the municipal government and 60% are covered by the users. The Municipal Johkasou Installation Programme and Small- and Medium-scale Johkasou Installation Programmes for Local Governments are supported by the national and municipal governments respectively (33%), municipal bonds (57%) and user purchase payments (10%). Total annual subsidies for the Johkasou programmes increased from JPY 100 million in 1987 to JPY 25 billion in 2004. Even though the number of "gappei-shori" Johkasous doubled between 1999 and 2007 (to nearly 3 million units), the "tandoku-shori" Johkasous still constitute 65% of the total number of Johkasou units in operation. The less efficient systems need to be replaced at a faster pace in order to reduce the burden on water quality in areas not connected to sewerage systems.

Notwithstanding progress, there is an *urgent need to further develop municipal wastewater treatment services in smaller cities and to expand advanced treatment that removes nitrogen and phosphorus*. Over the years, the Japan Sewage Works Agency (JSWA) has played a major role in developing wastewater infrastructure, constructing some 60% of Japan's wastewater facilities.¹⁷ Taking into account the needs of municipalities, these efforts should be supported by wider involvement of the private sector. The 2002 revision of the Water Works

Law paved the way for the privatisation of the water supply business, and the private sector is increasingly providing specific services to local water utilities or, in some cases, actually managing them on behalf of local authorities. A number of analyses show that the expanded use of contracts and private service provision has improved efficiency and reduced costs (Murakuni, 2006). Similarly, the consolidation of many small water service providers into larger companies has enabled operators to take advantage of economies of scale and lower operation and maintenance costs. Ultimately, however, efforts to meet demands for good quality drinking water and appropriate wastewater treatment have to be combined with more integrated management of Japan's rivers and inland waters.

Towards integrated water resources management

The 1999 *National Comprehensive Water Resources Plan (Water Plan 21)* provided a basis for integrated water management in Japan.¹⁸ The plan stressed the efficient utilisation of existing water resources facilities rather than the development of new water resources. In particular, it called for establishing sustainable water use systems, improving water quality and reviving natural features of the waterways, including riverside leisure management. Consequently, "Basic Water Resources Development Plans" were implemented for seven designated river systems.¹⁹ Several other river basins also developed management plans (MLIT, 2008). These plans and subsequent investments put emphasis on constructing water storage facilities that would sustain a stable intake of water irrespective of fluctuations in river flows and help in flood control. Only a limited set of measures were introduced for managing water demand, such as recycling of water in households and the use of rain water collection systems. However, due to excess capacity, environmental concerns and budget limitations, the construction of new water storage facilities decreased. Emphasis shifted towards developing wastewater treatment systems and promoting nature protection along waterways (Chapter 7).

In 2003, the Japanese government adopted a policy that established a *sound hydrological cycle* in various areas, such as forests, agricultural land, rivers, water supply and sewerage systems. The ministries of health, agriculture, economy, infrastructure and the environment collaborate to implement this policy.

In the context of Japan's need to secure a stable water supply for its economy and population, there is a need to *move more vigorously away from managing water storage, and focusing more on integrated water resource management*. This should include a balanced approach, with more efficient use of water, comprehensive control of water quality and integrating nature conservation considerations. In particular, the Japan Water Agency, which is engaged in the construction and refurbishment of major dams for ensuring water supply (for domestic, industrial and agricultural uses) and river management (flood control, maintenance of water flows) should work much closer with the Ministry of the Environment on water quality management activities

4. Chemicals management

4.1. Objectives and institutional framework

The chemicals industry remains an important part of Japan's manufacturing sector and exports, although its share of world chemical production has slightly declined due to the growth of the industry in China and other Asian countries.²⁰ Japan's policy approach to chemicals management is increasingly based on a *science-based approach to risk assessment and management*, with the overall objective of minimising the adverse effects of chemicals

on human health and the environment. This is in line with various international commitments, including the 2006 UNEP and WHO Strategic Approach to International Chemicals Management (SAICM), as well as with the OECD's Chemicals Programme. The potentially unknown health and environmental risks associated with the growing use of *nanomaterials* has also become the subject of analysis (Box 3.6).

Box 3.6. **Nanomaterials**

Nanomaterials have unique properties at the microscopic level and are already being incorporated into a wide range of consumer and industrial products. Projections suggest that these materials are likely to *impact on a range of economic sectors*, including pharmaceuticals, cosmetics, construction materials and energy (OECD, 2009b). Japan is an important player in these new markets, with the second highest number of nanotechnology patents in the world (nearly 15% of these patents worldwide). At the same time, the unique properties of nanomaterials may impact on human health and the environment in ways that are not understood at this time. Moreover, it is not yet clear the extent to which traditional methods can be used to assess the human health and environmental impacts of nanomaterials. Insufficient attention to these health, safety and environmental issues may generate social opposition and prevent the benefits of nanotechnology from being realised.

To address some of these uncertainties, METI is investing JPY 200 million in a *research programme (2006-10)* to develop a risk assessment methodology for manufactured nanomaterials. In November 2008, METI hosted an Expert Meeting on Safety Measures for Nanomaterial Manufactures. In March 2009, MOE issued "Guidelines for Preventing the Environmental Impact of Manufactured Nanomaterials". The main thrust of the Guidelines is to encourage manufacturers to design processes and products that prevent manufactured nanomaterials from being released to the environment (MOE, 2009b).

Japan is also participating actively in the *OECD Working Party on Manufactured Nanomaterials*. The main goal of this work is to test 14 representative manufactured nanomaterials, which have been identified among nanomaterials already in commerce or soon to be commercialised, using OECD Test Guidelines or other internationally recognised protocols. Japan is the lead sponsor, with the US, for testing three of them – fullerenes (C60), single (SWCNT) and multiple wall carbon nanotubes (MWCNT) – and is also contributing to evaluations of five others – titanium oxide, aluminium oxide, zinc oxide, cerium oxide, and silicon oxide. The cost of testing each of these manufactured nanomaterials will vary: some countries have estimated the cost to be USD 3-4.5 million per nanomaterial.

The main means of *evaluating the potentially adverse impacts of chemicals on human health and the environment* is by conducting a battery of laboratory tests, and assessing the results in light of how exposure to these chemicals might affect human health and the environment. The chemicals being evaluated include chemicals entering the Japanese market (new chemicals), and priority chemicals that were already on the market before legislation for chemicals went into effect (existing chemicals). The framework for evaluating and regulating industrial chemicals is provided by the Chemical Substances Control Law, which was originally enacted in 1973 and has been amended several times since then. It is complemented by a range of laws that regulate more specialised chemicals, such as some pesticides and pharmaceuticals (OECD, 2002). Various ministries are responsible for

overseeing the implementation of chemically related laws, including MOE, METI, MHLW (Ministry of Health, Labour and Welfare) and MAFF. The involvement of different institutions calls for effective co-ordination, which has not always been easy to achieve.

Japan's chemicals management system was the subject of an *in-depth examination* in the 2002 OECD *Environmental Performance Review* (OECD, 2002). Subsequently, Japan has taken various steps to implement the recommendations on chemicals made in that report (Table 3.6).

Table 3.6. Actions taken on the 2002 EPR recommendations for chemicals

Recommendations	Actions taken
Further improve the efficiency and effectiveness of <i>chemical management</i> and further extend the scope of regulation to include ecosystem protection.	In May 2003, the Chemicals Law was amended to include evaluation of ecotoxicity, and to strengthen the risk-based evaluation and regulation of chemicals. A further amendment in 2009 reinforced the risk-based approach to evaluation and regulation.
Strengthen voluntary initiatives in the chemical industry and grant a more active role to chemical producers in <i>safety investigations</i> (e.g. of <i>existing chemicals</i>).	The Japanese HPV Challenge Programme (launched in June 2005) is accelerating data collection on high production volume (HPV) existing chemicals. Japan also actively participates in the OECD HPV Chemicals Programme.
Introduce measures to encourage manufacturers to reduce the <i>environmental and health risks</i> posed by chemicals used in consumer products, at all stages of the products' life cycle.	Manufacturers of electrical and electronic equipment are now required to disclose information on the presence of specified substances. The Japanese Green and Sustainable Chemistry Network (GSCN), established in 2000 and supported by the Japanese government, actively promotes R&D for the environment, human health and safety through innovation in chemical technology.
Continue to instruct farmers about and monitor their <i>compliance with regulations and guidelines concerning the application of pesticides</i> .	A Ministerial Ordinance was issued in March 2003 obliging users of agricultural chemicals to follow user instructions prescribed at the time of registration, or risk penalties. The sale and use of 21 agricultural chemicals was banned.
Continue to develop <i>publicly accessible databases on chemicals</i> (e.g. on toxicity, risk assessment, emissions at all stages of the life cycle) and strengthen <i>risk communication</i> concerning hazardous chemicals.	A variety of initiatives, mostly Internet-based, have been launched to strengthen risk communication, primarily with industry, but also with the public and students. 326 lectures on the PRTR system were organised in the period 2003-09. Roundtables were organised in various locations to promote information sharing and mutual understanding of chemicals among citizens, the administration and industry. The Japan Chemicals Collaborative Knowledge (J-CHECK) database was started in 2008 with safety information collected through the Japan HPV Challenge Programme.

Source: OECD, Environment Directorate.

4.2. Regulation of new and existing chemicals

New chemicals

The Chemical Substances Control Law was originally enacted in 1973 following pollution incidents involving PCBs (polychlorinated biphenyls). As a result, the Law focused on evaluating and regulating chemicals that had similar hazardous properties as PCBs: persistent, bioaccumulative and toxic. Following recommendations in the 2002 OECD *Environmental Performance Review* of Japan, several amendments to the law were introduced that broadened the basis for evaluating and regulating chemicals:

- data on ecotoxicity, in addition to data on human toxicity, must be submitted as part of the notification and evaluation process of new chemicals;
- information on exposure must be taken into consideration to provide a better basis for assessing risks to human health and the environment;
- new provisions require the testing, reporting and regulation of persistent and bioaccumulative existing chemicals of an unknown toxicity; and
- manufacturers and importers are subject to a new requirement whereby they must submit new information that has come to their attention about the potential health or environmental impacts of chemicals used in their products.

At the time of the last EPR (2002), there were about 300 notifications of new chemicals per year. This number increased to 666 in 2008, reflecting changes in notification requirements. Based on evaluations conducted under the Chemical Substances Control Law, chemicals have been assigned to one of the five categories of regulated chemicals (Table 3.7). The assessment of new chemicals, and their assignment to a regulatory category, is done by the government on the basis of information submitted by industry.

Table 3.7. Chemicals regulated under the Chemical Substances Control Law

Category	Explanation	No. of chemicals (January 2010)
Class I Specified Chemical Substances	Chemicals that are persistent, bioaccumulative and (eco-) toxic. They require a license from METI for manufacture or import where alternatives do not exist. Their use is strictly controlled. All the persistent organic pollutants covered by the Stockholm Convention are in this Class.	16
Class II Specified Chemical Substances	Chemicals that are persistent and (eco-) toxic, but not bioaccumulative. Current and future volumes manufactured/imported must be reported. The government may specify labelling and other technical guidelines.	23
Type I Monitoring Chemical Substances	Existing chemicals that are persistent and bioaccumulative, but whose toxicity is unknown. If they are found to be highly toxic, they would be included in the Class I group of chemicals. Amounts manufactured or imported must be reported annually. The government may require testing.	36
Type II Monitoring Chemical Substances	New or existing chemicals that are persistent and possibly hazardous to health. Possible candidates for inclusion in Class II, depending on further information on toxicity. Amounts manufactured or imported must be reported annually. The government may require testing.	957
Type III Monitoring Chemical Substances	Chemicals that are persistent and hazardous to living organisms. Possible candidates for inclusion in Class II, depending on further information on eco-toxicity. Amounts manufactured or imported must be reported annually. The government may require testing.	157

Source: Ministry of the Environment.

Existing chemicals

It is estimated that tens of thousands of chemicals were on the Japanese market before the Chemical Substances Control Law was enacted in 1973 and, as a result, generally have not been subject to systematic assessment for potential health and environmental effects. Many of these chemicals are also present in other markets. In response to concerns about unknown risks, Japan has actively worked with other OECD countries to share the burden of investigating existing chemicals. By the end of 2008, Japan had tested 1 543 existing chemicals for degradation and bioaccumulation, and 326 and 509 for mammalian and ecological toxicity respectively.

The 2003 amendments to the Chemical Substances Control Law broadened the scope of the law to eco-toxicity of existing chemicals. At that time, a Resolution in the House of Counsellors called for co-operation between government and industry, and for international co-operation, in the investigation of existing chemicals. In response to this Resolution, the “Japan High Production Volume (HPV) Challenge Programme” was launched in 2005 by METI, MOE and MHLW.²¹ This is a joint initiative between government and industry. The main target is to evaluate the 645 organic chemicals produced or imported in quantities greater than 1 000 tonnes per year, especially the 126 chemicals that have not yet been assessed within the OECD HPV Chemicals Programme. By August 2008, sponsors had been identified for evaluating 91 target, and three non-target, HPV substances. This task will involve 62 companies and three trade associations. The sponsors plan to submit information in 2011 for assessment of these chemicals by the government in 2012.

The new common legal framework

In May 2009, the Chemical Substances Control Law was further amended. It now provides a *common legal framework for all industrial chemicals* – new and existing – and extends the risk-based approach to evaluation and regulation. The notification system for new chemicals will continue as before, supplemented by information on production and use. Existing priority chemicals will be screened, and the government may nominate “priority assessment chemical substances” for further investigation. This category replaces Type II and III chemicals (Table 3.7). Requests for additional information on priority assessment chemicals will be based on the OECD Screening Information Data Set.

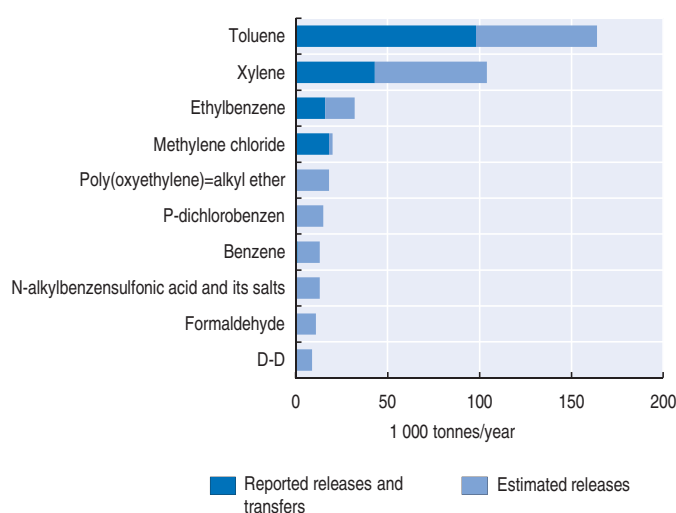
4.3. Environmental monitoring of chemicals

Pollutant Release and Transfer Register

Monitoring of chemicals in the environment has been an important element of Japanese chemicals management since 1973. The “Law Concerning the Reporting of the Release Into the Environment of Specific Chemical Substances and Promoting Improvements in Their Management” was enacted in 1999, providing the legal basis for the establishment of the Japanese Pollutant Release and Transfer Register (PRTR). The enactment of this law was triggered by the related 1996 OECD Council Recommendation. The Law requires designated facilities to report annually on the quantities of specified chemicals they release to the environment (air, water, land) and that they transfer for disposal as waste. The government complements the reported data with estimates of amounts of these chemicals released to the environment that are not reported (Figure 3.7). These figures are summarised and made available to the public. The overall objective is to encourage businesses to take voluntary measures to improve chemicals management, mainly by reducing releases of chemicals to the environment.

In 2007, about 41 000 facilities submitted reports under the PRTR system. Between 2001 and 2007, the total amount of reported chemicals that were released to the environment fell from 313 000 to 234 000 tonnes. In 2008, the number of substances covered by the PRTR system increased from 354 to 462 (effective 1 April 2010). Information from PRTRs is used by

Figure 3.7. **Top 10 chemicals releases and transfers, 2007**



Source: Ministry of the Environment.

the government when setting priorities for risk assessment. The government then supplies facility specific and aggregated information about PRTR data to the public and also makes it available through a geographic information system (GIS).

Monitoring programmes

Since the last EPR in 2002, the approach to monitoring chemicals in the environment has changed. Drawing on analyses by experts and recommendations from government departments involved in the implementation of chemicals laws, an *Expert Group for Promoting Environmental Surveys and Monitoring of Chemicals* now establishes the content of the monitoring programmes. In 2005, the Expert Group agreed that monitoring surveys should be organised as follows:

- the Initial Environmental Survey aims to examine the environmental persistence of chemicals identified under the PRTR Law. In 2005, 34 chemicals were selected as targets;
- the Detailed Environmental Survey examines the environmental persistence of chemicals identified under the Chemical Substances Control Law as requiring further investigation. In 2005, 13 chemicals were selected as target chemicals;
- the Environmental Survey for Exposure Study also examines selected chemicals identified under the Chemical Substances Control Law. In 2005, 21 chemicals were selected as targets.

The overall conclusion was that in the period 2002-05, the concentrations of monitored chemicals in surface water, wildlife and air remained unchanged or were gradually decreasing (MOE, 2007).

Notes

1. An ordinance-designated city is a city with over 500 000 population that has been delegated to carry out many of the functions normally performed by prefectural governments.
2. Licenses are valid for five years.
3. Under the Air Pollution Control Law and the Water Pollution Control Law, it is mandatory for all regulated facilities to conduct either continuous or periodic measurements of emissions and effluents, to record the measurement results, and to keep the records for a certain period. Self-monitoring is usually done by an accredited laboratory. However, regular reporting of results is not required by law except for dioxins.
4. Sectors with the highest rate of ISO 14001 certifications include: electrical machinery and equipment, followed by services, construction, chemical and metal products. Industries where certification rates are low include forestry and fisheries, petroleum and steel products, as well as finance and insurance.
5. These include: i) environmental management on-site and in the factory; ii) company-wide environmental management; iii) employee education; and iv) stakeholder communication. The Guidelines recommend specific initiatives that should be taken by local governments, including the review of notifications and self-monitoring reports, inspections, communication with businesses, and awareness-raising activities.
6. For example, plans for a “sound material-cycle society” (since 2001), environmental risk assessment of selected chemicals (since 2002) and, most recently, for biodiversity (launched in 2009).
7. The 1998 Law was introduced as a response to significant citizens’ movements supporting victims of the Great Hanshin-Awaji (Kobe) earthquake in 1995. The law provided a “non-profit organisation” status for voluntary organisations, which allowed them to act fully as legal persons (act as a contractual partner) and conferred legitimacy.

8. For example, a 1996 damages suit over air pollution in Tokyo was settled only in 2008 with hundreds of asthma patients accepting a court-brokered settlement that required the central and municipal authorities, as well as diesel vehicle manufacturers, to pay JPY 1.2 billion in compensation. Compensation was paid directly to asthma patients and to a special programme that supports pollution reduction measures, such as strengthening air pollution monitoring and reducing traffic congestion.
9. Since 2004, both programmes are managed by a single organisation – the Environmental Restoration and Conservation Agency (ERCA).
10. The Environmental Dispute Settlement Law also designates the EDCC as an appeal mechanism for objections to mining permissions (in cases where they affect nature conservation areas). The public can also file complaints related to environmental pollution through counsellors in local governments. Each year local governments receive around 100 000 complaints, for which they make a recommendation and then inform the appropriate government agencies for further action.
11. The 30% reduction target was expected to be achieved by direct regulations (10%) and voluntary efforts (20%).
12. New standards to control NMVOC emissions were applied in 2006 for facilities with annual NMVOC emissions of 50 tonnes or more. The six categories, with specified emission limits for each category, included: coating, adhesive bonding, printing, chemical product manufacturing, solvent cleaning and NMVOC storage.
13. Since 2002, the amended 1992 regulation has been called the “Law Concerning Special Measures to Reduce the Total Amount of Nitrogen Oxides and Particulate Matter Emitted from Motor Vehicles in Specified Areas” (the Automotive NO_x and PM Law).
14. Water Quality Standards (WQS), established by the 1993 Basic Environment Law, are the basis for evaluating water quality of Japan’s rivers, lakes and coastal areas. The WQS include standards related to public health (established for 26 substances, such as cadmium, cyanide, lead and mercury), and standards that aim to protect the “living” environment (pH, biological oxygen demand/chemical oxygen demand, suspended solids, dissolved oxygen and total coliform). In 2003, additional environmental quality standards to conserve aquatic life were established for total zinc.
15. Organic farming differs from eco-farming in that it totally prohibits the use of chemicals.
16. As Japan’s population peaked in 2006 and is now entering a longer-term decline (leading to a projected reduction of the population by 20 million over the next 50 years), there will be no substantial demand for construction of new water supply facilities.
17. JSWA was established in 1972 as a joint venture between the central and prefectural governments and large municipalities, but since 2003 is fully owned by local governments. The primary tasks of JSWA are to support local governments in the planning, design and construction of sewerage facilities; train local government staff; conduct research and develop technology based on requests from local governments.
18. The Water Plan is a multi-year plan that addresses basic medium- to long-term planning issues regarding water resources development, conservation and utilisation, and makes forecasts of long-term water demand. It is formulated and revised in accordance with the Comprehensive National Development Plan, which is stipulated in the Comprehensive National Land Development Act. The Water Plan is approved by the Prime Minister’s cabinet.
19. The seven river basins include Tone River, Arakawa River, Toyokawa River, Kiso River, Yodogawa River, Yoshino River and Chikugo River. For the Tone and Arakawa rivers, a single plan has been formulated.
20. In 2007, the Japanese chemicals and petrochemicals industry generated JPY 17 trillion of value-added, the highest rate in the manufacturing sector, and accounted for 4.2% of employment in the sector. Total exports and imports of the chemicals and petrochemicals industry amounted to JPY 41 trillion, second among Japanese manufacturing industries, and third in the world behind the US and China.
21. High production volume (HPV) chemicals generally involve greater exposure to people and to the environment than chemicals produced in lower volumes. Relatively high exposure will magnify the impact of any inherent harmful properties, hence the priority assigned to these chemicals for testing and assessment.

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PART I

Chapter 4

International Co-operation

Japan is an active player in international environmental co-operation. In a changing international economic and political context, Japan has given more importance to regional and bilateral co-operation in the Asian region, notably in such areas as transboundary air pollution, fisheries management and marine pollution, which are analysed in this chapter. Environment is a prominent component of Japan's development assistance. Japan has also taken action, at home and internationally, to tackle environment-trade issues arising from multilateral environmental agreements, such as trade in ozone depleting substances and tropical timber, as well as safety and environmental impacts of shipbreaking.

Assessment and recommendations*

Japan has played a *proactive and constructive role in international environmental co-operation*, particularly in the areas of climate change, waste management and resource productivity, chemicals management, water and, more recently, biodiversity. It has a good record of meeting international commitments in multilateral and other environmental agreements, and actively supports international initiatives and institutions. In a changing international economic and political context, Japan will need to reinforce its efforts in order to maintain its leadership.

Japan's absolute level of *official development assistance (ODA)* to developing countries is among the highest in the world. However, Japanese ODA decreased to 0.19% of gross national income (GNI) in 2008, which is far below the 0.7% UN goal and among the lowest in OECD. *Environment is a prominent component of the country's aid policy*, accounting for about 30% of its ODA in 2008. Over 90% of Japanese bilateral environmental co-operation is in the form of loans that must be repaid, albeit on concessional terms. More concessional terms apply to loans for environmental projects that are tied to the purchase of Japanese goods, services and technologies. All ODA projects are systematically assessed for their economic and socio-environmental feasibility before approval. The results of these reviews are publicly disclosed, although how opportunities and risks identified are followed up is not always clear. A revision of the environmental guidelines is addressing the effectiveness of the environmental impact assessment and the application of strategic environmental assessment.

Japanese *bilateral environmental co-operation programmes* with China, Indonesia and other countries have contributed to real environmental improvements in those countries. Japan has attached increasing importance to promoting *regional environmental co-operation* in various areas, notably: transboundary air pollution, fisheries management, and co-operation on oil spills. The Tripartite Environment Ministerial Meetings between Japan, China and Korea have become more action-oriented in recent years. However, further efforts are needed on the implementation side, for instance to tackle *transboundary transport of photochemical oxidants and dust and sand storms*, which continue to cause problems in Japan.

Japan has co-operated actively with its partners to integrate trade and environment policies and to tackle *illegal trade in environmental sensitive products*. For instance, Japan is the second largest contributor to the Multilateral Fund for the Implementation of the Montreal Protocol on ozone depleting substances (ODS). *Recovery and safe disposal of ODS* has considerably increased. Japan has been at the forefront of *international co-operative efforts to manage chemicals*, most recently in relation to manufactured nanomaterials. Japan established an *ad hoc* enforcement unit to ensure continuous monitoring of *trade in species* identified under the Convention on International Trade in Endangered and Threatened

* Assessment and recommendations reviewed and approved by the OECD Working Party on Environmental Performance at its meeting on 4 May 2010.

Species of Wild Fauna and Flora (CITES). On the other hand, imports of wood products still include a significant share of uncertified or unlabeled products, despite good progress with green procurement.

Japan has developed a new framework to promote a sustainable model for managing the *marine environment*. Nonetheless, further efforts are needed to implement some marine conventions, including the London Dumping Convention and the Ballast Water Convention. Monitoring of off-shore marine areas has revealed high concentrations of heavy metals and persistent organic pollutants. Illegal discharge of waste oil by ships is a continuing problem. *Overfishing* of some fish stocks (e.g. in the Northwest Pacific region, tuna fish stocks) is still a concern and requires more sustainable management of fish stocks, as well as improved preservation of marine ecosystems through regional and bilateral co-operation. Japan's policy on whaling continues to generate widespread international criticism. As the home to one of the largest shipping fleets in the world, Japan has contributed actively to international initiatives to improve the *health, safety and environmental performance of the shipping industry*.

Recommendations

- Maintain a strong commitment to environment within an expanded volume of *official development assistance* in line with international commitments; promote a more systematic application of strategic environmental assessment in development co-operation; and maximise the benefits of environmental development aid by providing it under untied conditions.
- Promote *sustainable management of fisheries and the marine ecosystems* through a region-wide agreement for the Northwest Pacific Ocean and bilateral co-operation with developing countries providing fish resources to Japan.
- Strengthen the enforcement of laws and regulations to prevent illegal trafficking in *wildlife and wildlife products*.
- Strengthen *tripartite co-operation with China and Korea on chemicals management*, and extend it to other countries in the Asian region where chemicals production and use are increasing.
- Strengthen *regional co-operation to monitor transboundary air pollution*, especially the precursors of photochemical oxidants and dust and sand storms, and to reduce emissions at source.

1. Multilateral environmental diplomacy

Over the last 10-15 years, Japan has played a *proactive and visible role in international environmental co-operation*, particularly in the areas of climate change (Chapter 5), waste management and resource productivity (Chapter 6), chemicals management (Chapter 3), water, and, more recently, biodiversity (Chapter 7). The Third Basic Environment Plan (approved by the Cabinet in 2006) includes strengthening international efforts as one of its six major strategic aims. The priority Japan has assigned to international environmental co-operation reflects its will to be a constructive international player, and the importance it gives to international economic and environmental interdependencies. Japan's large and trade-oriented economy requires major natural resources inputs (e.g. oil, forest and fish products, metals), and it exports a range of products that have to meet environmental standards in other jurisdictions.

Over the review period, Japanese authorities have consistently expressed a commitment: i) to *enhance bilateral, regional and multilateral environmental co-operation*; and ii) to *assist developing countries in Asia and beyond* to address environmental problems, particularly through the transfer of technology. Japan has actively supported and hosts a range of environmentally related international institutions (e.g. ITTO, United Nations University, UNEP and UNDRC). It has organised several major environmental events since the last *OECD Environmental Performance Review (EPR)* in 2002, such as the Kyoto World Water Forum in 2003 and the 10th meeting of the Conference of Parties to the Convention on Biological Diversity in Nagoya in 2010. Overall, Japan has a *good record in responding to its commitments* as signatory to multilateral environmental agreements (MEAs), ratifying the agreements it has signed, meeting deadlines for submission of reports and data, and implementing domestic legislation and programmes.

Japan has taken important steps to implement some of the recommendations made by the 2002 *OECD EPR*, which provide a benchmark for assessing Japan's performance. However, further efforts are needed to implement some other recommendations, in particular those concerning official development assistance, management of shared fish stocks and some trade issues (Table 4.1).

Table 4.1. Actions taken on the 2002 EPR recommendations for international co-operation

Recommendations	Actions taken
Strengthen <i>bilateral and regional efforts</i> to address shared environmental concerns, particularly regarding transboundary air and marine pollution, and migratory birds.	Japan actively participates in the Tripartite Environment Ministerial Meetings and in the preparation of the related action plans. It participates in regional projects for monitoring transboundary air pollution (EANET) and controlling dust and sand storms, and has made progress in implementing NOWPAP.
Further increase <i>official development assistance (ODA) for environmental purposes</i> , particularly that aimed at facilitating solutions to global environmental problems, as well as total ODA, taking into account the UN target (0.7% of GNP).	A relatively large and slightly increasing share of ODA has environmental purposes. The overall level of ODA has, however, decreased and remains far below the UN target.
Implement the new laws on <i>recovery of fluorocarbons from household appliances</i> , automobiles and commercial air conditioning systems.	Comprehensive legislation on fluorocarbon recovery was enacted, making it mandatory for a number of products (e.g. refrigerators, air conditioning equipment). Fluorocarbon recovery has considerably increased.
Continue to co-operate with other OECD countries (e.g. on harmonisation of test procedures for new and existing chemicals) and continue to <i>promote environmentally sound chemical management</i> in East Asia.	Japan has continued to co-operate actively in the OECD Chemicals Programme, and has organised a number of regional activities on chemicals in the Asian region, particularly on persistent organic pollutants.
Co-operate internationally to develop means of ensuring that <i>timber and wood products used in Japan</i> originate from sustainably managed tropical and boreal forests.	In 2006, Japan introduced a legality verification requirement on imported wood and wood products in public procurement and issued guidelines for suppliers. Some bilateral co-operation projects focus on surveillance of forests and traceability of timber. Japan also participates in the development of legal standards and tracking systems within the Asia Forest Partnership.
Seek to strengthen regional collaboration to <i>improve the management of shared fish stocks</i> in the North Pacific.	Japan has been co-operating with some countries to introduce regional management regimes for some of the shared fish stocks.
Continue to develop <i>institutions for regional responses to oil emergencies</i> , including surveillance, analysis, communication and response (e.g. in the framework of the Northwest Pacific Action Plan).	Japan contributed to the establishment of a regional co-operative oil spill response mechanism (the NOWPAP Regional Oil Spill Contingency Plan) in 2004. The Plan was subsequently extended to the Sakhalin island and to pollution accidents from hazardous and noxious substances.
Continue to develop and implement international technical guidelines regarding <i>ballast waters and ship scrapping</i> .	Japan considers accessing the 2004 IMO Ballast Water Management Convention, following a technical feasibility assessment. It also considers accessing the 2009 IMO Ship Scrapping Convention, and has engaged in bilateral co-operation to establish environmentally sound ship-scrapping facilities in some developing countries.

Source: OECD, Environment Directorate.

1.1. Institutional responsibilities

Principal responsibility for the pursuit of Japan's international environmental agenda resides with the Ministry of Foreign Affairs (MOFA) and the Ministry of the Environment (MOE). MOFA is responsible for overall foreign policy, negotiation of government-to-government agreements, and formulation of official development assistance (ODA) policies and guidelines. MOE leads work on international environmental issues through its Global Environmental Bureau. It also provides information and guidelines, such as the 2004 International Environmental Co-operation Guidebook.

The Japan International Co-operation Agency (JICA) is the main institution for implementing development co-operation activities. JICA was given more independence in 2004. Its responsibilities were further broadened in 2008, incorporating parts of the former Japan Bank for International Co-operation, and it became the "new JICA". The new JICA is responsible for: i) technical co-operation projects (as before); ii) implementation of ODA loans; and iii) part of the grant aid formerly handled by MOFA. In 2008, an Office for Climate Change was established within JICA to manage climate-related aid activities. The new JICA is one of the world's largest bilateral development organisations working in about 150 countries.

A range of other central ministries and associated institutes are involved in environmentally-related development co-operation, including:

- Ministry of Finance (*e.g.* customs, management of contributions to multilateral funds, such as the Global Environment Facility and the World Bank Multilateral Fund);
- Ministry of Agriculture, Forestry and Fisheries (*e.g.* coastal and high seas fisheries management);
- Ministry of Economy, Trade and Industry (*e.g.* environment-trade relationships, environment and energy, some forms of environmental assistance for developing countries).

At the *sub-national level*, prefectural and municipal authorities formulate environmental plans and programmes, which may include international (environmental) components. For instance, Osaka territorial authorities and their business partners share their environmental experience with territorial authorities in a number of countries through twinning arrangements with other cities or ports. Osaka also hosted an Asia Metropolis Summit (October 2007), dealing with the environment, adopted a declaration for "creating harmony in Asia" and launched an urban network, ASIA11 + 1. Environmental non-governmental organisations (NGOs) are also playing an increasingly co-operative role overseas.

1.2. Regional co-operation

Over the review period, there has been a major shift in Japanese economic and environmental co-operation towards the Asian region. In recent years, several countries from East Asia and Southeast Asia, notably China and Korea, experienced very rapid economic growth, in contrast to Japan's modest economic growth (Table 4.2). Trade within the region expanded significantly, and China became Japan's major trading partner. Rapid economic growth in the region has been exerting increasing pressure on the environment, such as transboundary pollution (Section 5). As a result, Japan has considerably expanded its environmental co-operation, exports of environmental technology (*e.g.* air pollution control, energy-efficient technologies, monitoring instruments), and environmentally

Table 4.2. **Japan in East Asia: ASEAN + 3**

	Japan		Korea		China		ASEAN ^d	
	2008	2000-08 ^a	2008	2000-08 ^a	2008	2000-08 ^a	2008	2000-08 ^a
GDP ^b (billion USD)	4 910.7	10.6	929.1	40.8	4 327.4	117.3	1 502.7	..
Population (million)	127.7	0.7	48.6	3.3	1 327.7	4.8	582.7	12.5
GDP ^c /capita (USD/cap.)	34 115.7	9.9	27 691.9	36.3	5 970.3	107.4	4 751.2	..

a) Percentage change.

b) USD current prices.

c) Based on current purchasing-power-parity (PPP).

d) Includes Brunei Darussalam, Cambodia, Laos, Indonesia, Malaysia, Myanmar, Philippines, Singapore, Thailand and Viet Nam.

Source: International Monetary Fund.

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related development co-operation, both bilaterally and regionally. Environmental co-operation in the region is characterised by a variety of partnership initiatives (often Japanese initiatives), with different geographic perimeters.

The *Tripartite Environment Ministerial Meeting*¹ (TEMM), involving Japan, China and Korea, has taken place annually since 1999. At their 2009 meeting, the ministers agreed to develop a five-year action plan (2009-14) with ten priority areas: environmental education, awareness and participation; climate change; biodiversity; conservation; dust, sand storm and pollution control; recovery, reuse and recycling (3Rs); transboundary movements of electronic waste; chemicals management; governance; and environmental industries and technologies. An action plan is being prepared for each of these priority areas, reflecting a shift from analysis to action. The broader *Northeast Asian Conference on Environmental Co-operation* (NEAC), created in 1992 by China, Japan, Korea, the Russian Federation and Mongolia, is a continuing forum for exchanging information and views on the state of the environment.²

Following a 2002 proposal from the Association of Southeast Asian Nations (ASEAN), China, Japan and Korea began to participate in ASEAN environment ministers meetings (ASEAN + 3). Since 2008, these meetings have superseded the meetings of the Environment Congress of Asia and the Pacific (ECOAsia) process, which had generated an Asia-Pacific Forum for Environment and Development (APFED). The ASEAN + 3 meetings facilitate a broad-ranging policy dialogue in such fields as natural resources conservation, marine environment, environmental technology training, clean technology, and transboundary pollution. In 2008, the ASEAN-Japan Dialogue on Environmental Co-operation and the East Asia Summit (EAS) Environment Ministerial Meeting were launched.

Japan was also instrumental in launching the *Clean Asia Initiative* (CAI) in 2008, which aims to promote an Asian development model for a sustainable society, low-carbon and pollution intensities, sound material-cycle, nature and biodiversity protection, greening markets, and to further strengthen partnerships. Japan co-operates regularly through partnerships such as the Low Carbon Society, the Water Environment Partnership in Asia, the Asia 3Rs Promotion Forum and the Asia Forum on Environmentally Sustainable Transport. There is also the *Asia Pacific Economic Co-operation* (APEC) forum, which facilitates wide-ranging exchanges on environmental issues among Asia-Pacific countries and regions, and the Asian-Pacific Network (APN) for Global Change Research, which has operated since 1996 and has a dedicated secretariat in Kobe.

Initiatives for environmental leadership in Asia

The United Nations Decade of Education for Sustainable Development (UNDESDE) was proposed by the Japanese Prime Minister at the World Summit on Sustainable Development (Johannesburg, 2002). In 2006, Japan adopted a UNDESDE *National Plan of Action*. The 2007 Strategy for a Sustainable Society in the 21st Century addresses the need for training future environmental leaders with the ability to meet environmental challenges both in Japan and overseas. In 2007, leaders from countries across Asia agreed to work together toward developing environmental leadership in Asia. In 2008, MOE adopted the Vision for Environmental Initiatives for Asian Sustainability in Higher Education. The same year, the *Environmental Leadership Initiatives for Asian Sustainability* (ELIAS) project was launched, encompassing a variety of training and academic programmes and partnerships involving universities, government and industry.³

2. Official development assistance and bilateral co-operation

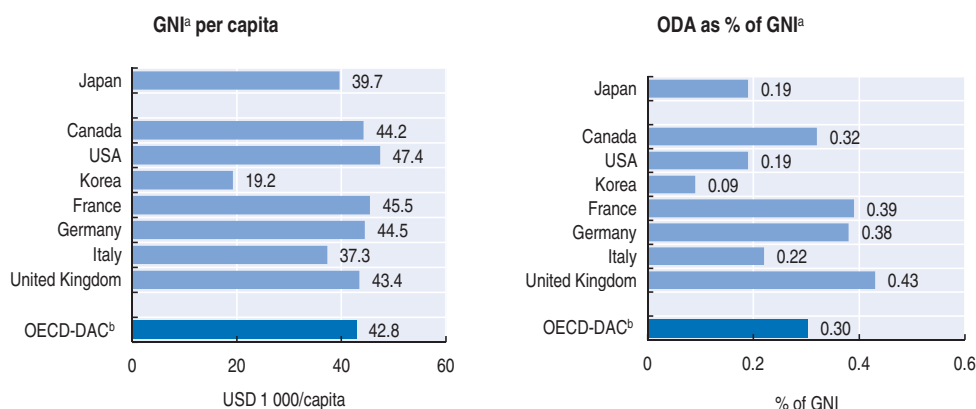
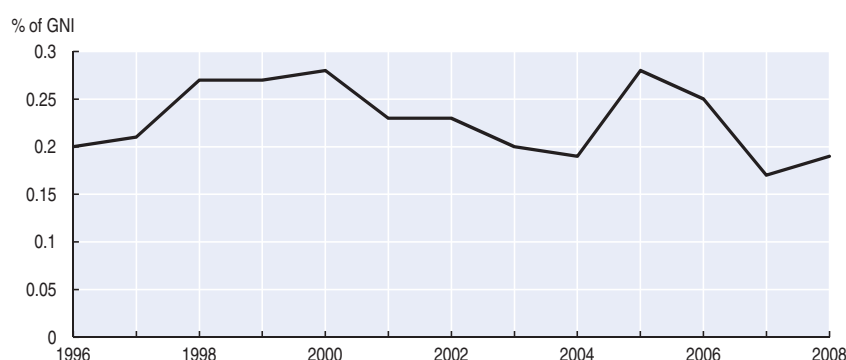
2.1. Official development assistance

Japan's net *official development assistance* (ODA) was USD 9.58 billion⁴ in 2008. While Japan remains the largest donor in a number of countries, it is one of the few OECD donor countries with declining ODA over the review period. From 2000 to 2008, the level of Japan's ODA fell from first to fifth place among OECD countries, representing only 0.19% of GNI, which is far from the UN target of 0.7%, and makes Japan one of the smallest donors using this measure (Figure 4.1).

The structure of Japanese ODA⁵ in 2008 consisted of grants (44%), non-grant assistance, mostly loans (40%), and multilateral aid (16%). As for bilateral ODA, 66% went to Asian countries and 13% to Africa. China, Indonesia (Box 4.1), Iraq, Philippines and Viet Nam were the largest recipients.

A large share of Japan's bilateral ODA has environmental objectives.⁶ According to Japan's reporting on the environment policy marker, in 2008 this share amounted to about USD 4.2 billion or about 30% of Japan's total ODA commitments.⁷ Over 90% of this assistance is in the form of loans, with the remainder being bilateral grants (OECD, 2010a). Japan's environmental aid is in part provided under tied conditions. In particular, in 2002, Japan introduced the Special Terms for Economic Partnership (STEP) loans, which can be used for major infrastructure and environmental projects, and are tied to the procurement of Japanese technology, goods and services. Since lower interest rates and more concessional terms apply to STEP loans than to untied loans, partner countries can have an incentive to accept tied conditions. In 2008, STEP loans accounted for about 10% of loans disbursement (OECD, 2010a).

Overall, Japan's *environment-focused aid* increased during the review period (Figure 4.2).⁸ However, aid activities strictly targeting the environmental sector *per se* represent a very low share.⁹ Aid activities that have environment as a principal or significant policy objective have increased, although they do not necessarily target environmental sustainability in their entirety.¹⁰ Some 70% of these activities include aid for social and economic infrastructure, mainly water supply and sanitation and transport infrastructure. Much of the environment-focused aid targets, directly or indirectly, the objectives of the 1992 Rio conventions on biological diversity, climate change and, to a lesser extent, desertification (Figure 4.2).

Figure 4.1. **Official development assistance, 2008****ODA in Japan as % of GNI^a, 1996-2008**

a) Gross national income in USD at current exchange rates.

b) Member countries of the OECD Development Assistance Committee.

Source: OECD Development Assistance Committee.

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When allocating ODA, JICA screens all development aid projects against potential environmental impacts according to the “Guidelines for Environmental and Social Considerations”. Projects are classified into four categories, according to their potential environmental impact. Related information is made available on the JICA website and the public is invited to submit comments on projects with potentially significant adverse environmental impacts. However, how opportunities and risks identified are followed up is not always clear. *Environmental impact assessment* (EIA) of aid projects is carried out by partner countries according to their own procedures. JICA provides technical support and reviews EIA reports submitted by partner countries, although only a few projects have been abandoned due to negative EIA results (OECD, 2010a).

The Guidelines were revised in 2010. The revised guidelines include *strategic environmental assessment* (SEA), which will be conducted at an early stage of the planning process (“Master Plan Studies”) but not for all development plans. Japan should continue to develop a more comprehensive approach to environmental screening of strategic interventions, building upon the OECD/Development Assistance Committee guidelines on SEA.

Box 4.1. Bilateral environmental co-operation with Indonesia

Japanese ODA to Indonesia represents roughly 50% of Japanese aid to ASEAN countries. The framework for co-operation with Indonesia was developed by the Ministry of Foreign Affairs, projects are being implemented by JICA, and much of this aid is focused on environmental issues.

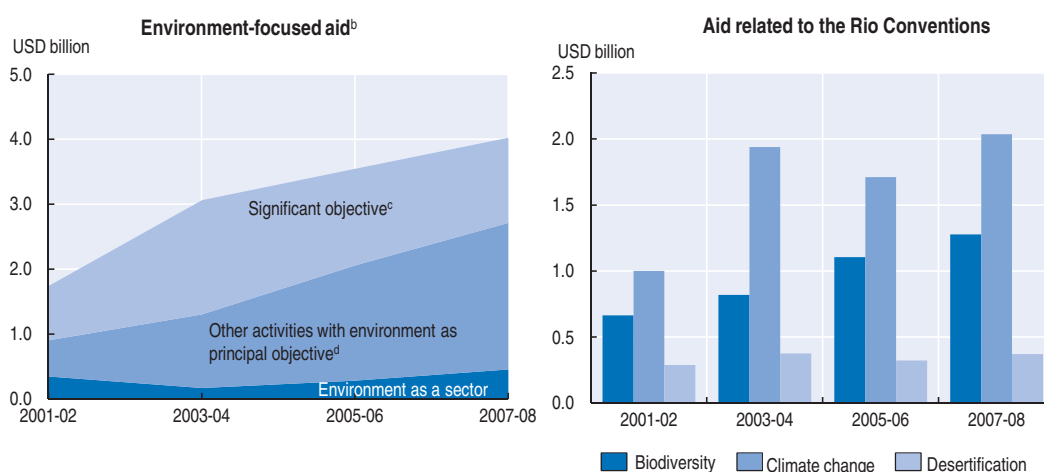
An action plan for co-operation in *combating illegal logging and trade in illegally logged timber and wood products* was signed in June 2003. As a result, Japan and Indonesia are working together to: i) monitor the state of forests and logging in Indonesia using satellite data; and ii) develop timber traceability technology using two-dimensional bar codes.

Since 2007, Japan has promoted the *co-benefits approach* to improve the environment and prevent climate change, while simultaneously benefiting the development process of partner countries. Two cities have been selected to implement model projects: a landfill in Banjarmasin (Borneo island) and a slaughter house in Palembang (Sumatera island). There are also plans to identify Clean Development Mechanism projects, another promising area for co-operation.

Currently, environmental co-operation is focused on: i) *capacity building* (improving the administrative abilities and institutional strength of national and local governments for natural resource and environmental management, and promoting environmental education); ii) establishing a system to *monitor atmospheric pollution and water contamination*; iii) improving the *urban environment* through measures targeted at urban slums; and iv) actions to repair damage from *natural disasters*.

Japan also provides *support for specific projects*, such as a project to strengthen management of the Gunung Halimun-Salak Park and the Programme on Mangrove Management. In addition, Japan is supporting a project to strengthen capacities to operate and maintain water infrastructures and implement comprehensive flood control, such as in the Citarum river basin. Furthermore, Japan provided support for the implementation of Indonesia's national action plan for climate change (including energy, forestry and water projects) through loans totalling USD 300 million in 2008 based on the Cool Earth Partnership approach, and USD 400 million in 2009 based on the Hatoyama Initiative (Chapter 5).

Figure 4.2. Aid in support of the environment,^a 2001-08



a) Average commitments of bilateral ODA expressed at 2007 prices and exchange rates.

b) The coverage ratio for activities screened against the environment policy marker is 99% of total sector allocable aid.

c) Activities where environment is an important, but secondary, objective of the activity.

d) Activities where environment is an explicit objective of the activity and fundamental in its design.

Source: OECD, Aid Activity Database (Creditor Reporting System).

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Through the *Environmental Conservation Initiative for Sustainable Development* (EcoISD), which was launched at the World Summit on Sustainable Development (Johannesburg, 2002), Japan has committed itself to co-operation with developing countries (mainly through ODA) in implementing four action plans, namely on global warming, pollution control, freshwater issues and conservation of the natural environment. EcoISD has influenced Japanese environmental ODA for much of the last decade. Japanese bilateral environmental co-operation was given further impetus by framework statements and commitments at the highest level, such as the Water and Sanitation Broad Partnership Initiative, the Cool Earth Partnership Initiative and the Hatoyama Initiative on climate change (Chapter 5).

2.2. Water and sanitation

In 2003, the UN Secretary General asked the then Japanese Prime Minister to chair an Advisory Board on Water and Sanitation (UNSGAB) to guide it on actions that were needed to achieve the water-related Millennium Development Goals (MDGs). The Advisory Board prepared an action plan – the *Hashimoto Action Plan* (named after the Japanese Prime Minister) – that was launched at the 4th World Water Forum in Mexico in 2006. The action plan has been influential in maintaining a high-level political focus on water and sanitation issues and continues to guide the work of the UNSGAB.

At the 4th World Water Forum, Japan also launched the *Water and Sanitation Broad Partnership Initiative* (WASABI). Led by MOFA and JICA, this is a sector assistance policy framework that promotes integrated water resources management (e.g. in Indonesia), provision of safe drinking water and sanitation (e.g. in India), support for water use for food production (e.g. in Pakistan), water pollution prevention and ecosystem preservation (e.g. in Laos), and mitigation of damage from water-related disasters (e.g. in Tunisia).

The WASABI initiative is implemented primarily through ODA and builds on Japan's extensive experience of co-operation in the water sector. Over the period 2000-08, Japan's ODA represented 32% of total bilateral ODA to the water sector. Nearly 85% of this assistance was in loan form during 2000-08, and 77% of the assistance went to Asia. Assistance to Africa increased, especially in recent years, and the total amount of grant support was greater than support in loans.

During its presidency of the G8 in 2008, Japan actively promoted and strengthened co-operation on water and sanitation. At the Hokkaido Toyako G8 Summit in July 2008, the Leaders' Declaration emphasised the importance of integrated water resources management, sanitation, the need for better water governance and strengthened partnerships between G8 and African countries.

2.3. Bilateral environmental co-operation with China

Japan and China have actively co-operated on environmental issues for nearly three decades. The *Japan-China Joint Committee on Environmental Protection* has met annually since 2000, and promotes environmental co-operation as well as exchanges of environmental technology and experience between the two countries.¹¹ The *Sino-Japan Friendship Centre for Environmental Protection*, established in 1996, has directly supported the Chinese Ministry of Environmental Protection (OECD, 2007). A Joint Statement was issued by the Japanese and Chinese environment ministers in 2007 emphasising the co-benefits approach, namely to improve the environment and prevent climate change at the same time.

Japan remains consistently, and by far, the *major donor to China*. However, as China's economy has become stronger, Japanese ODA commitments to China have declined from USD 2.3 billion in 2000 to USD 285 million in 2008. New ODA loan commitments to China have ended. Grant aid and technical co-operation are now focusing on environmental and global issues, policy reform and post-disaster emergency relief following the Sichuan earthquake. Environment focused aid to China reached 68% of total Japanese ODA in 2006-07 (OECD, 2009a), which is high compared to other donors, although these activities do not necessarily target the environment in their entirety.

There is evidence that Japanese ODA has had a *positive impact on environmental conditions* in China, for example reduction in SO₂ and other air emissions, reduction in chemical oxygen demand (COD) effluents, and benefits from urban gas and regional heat supply projects (OECD, 2007). As the volume and grant component of Japanese aid to China decrease, emphasis is shifting to environmental education, awareness and training, as well as promoting co-operation between private companies. The Clean Development Mechanism (CDM) has also facilitated the engagement of the private sector in Japan-China co-operation.

2.4. Bilateral environmental co-operation with Africa

In addition to extensive bilateral and regional environmental co-operation programmes in Asia, Japan has strengthened its environmental co-operation efforts in Africa. The Tokyo International Conference on African Development (TICAD), for example, guides environmental co-operation with African countries. In May 2008, TICAD IV took place in Yokohama¹² and adopted the Declaration "Towards a vibrant Africa" stressing four aims: boosting economic growth, achieving the MDGs, consolidating peace and good governance, and addressing environmental issues and climate change. In particular, the Declaration focuses on strengthening co-operation concerning climate change and access to water and sanitation and education for sustainable development. Also, in its 2009 report on Japan's international co-operation, MOFA gave major attention to new approaches to African development, linking poverty alleviation and environmental goals.

3. Environment and trade

3.1. The environment-trade interface

Japan is the *fourth largest trading country* in the world (after the US, China and Germany), with export revenues of USD 771 billion and imports of USD 698 billion in 2007. Its outward foreign direct investment (FDI) position was USD 680 billion in 2008, one of the largest FDI stocks among OECD countries. During the review period, China became Japan's major trading partner.

Japan has long been aware of the *environment-trade interface* and has co-operated actively with its partners within the frameworks of WTO, OECD, APEC and ASEAN to integrate trade and environment policies. A number of more specific environment-trade issues arise from MEAs. These include the 1989 Basel Convention on the transboundary movement of hazardous waste, together with the 1995 Basel Ban Amendment (Chapter 6); the 1998 Rotterdam Convention requiring prior informed consent for trade in certain dangerous chemicals; the 2004 Stockholm Convention, which promotes the phase-out of persistent organic compounds; the 1973 Washington Convention on International Trade in Endangered and Threatened Species of Wild Fauna and Flora (CITES); the 1985 Vienna Convention for the Protection of the Ozone Layer and its 1987 Montreal Protocol. In some cases, the implementation of these MEAs has generated concern over potential associated illegal trade.

3.2. Ozone depleting substances

In keeping with the 1987 Montreal Protocol, Japan phased out the production, import and export of chlorofluorocarbons (CFCs) in 1995. As recommended in the previous OECD EPR of Japan (2002), the country has increased *recovery of fluorocarbons* (CFCs, HCFCs, HFCs) contained in household, commercial and vehicle equipment (e.g. refrigerators, air conditioners) (Table 4.3). Recovery became mandatory in 2001 for domestic refrigerators and air conditioners, and in 2004 for freezers (Home Appliance Recycling Law); in 2002 for commercial refrigeration and air conditioning equipment (Fluorocarbons Recovery and Destruction Law); and in 2005 for motor vehicles air conditioners (Law for the Recycling of End-of-Life Vehicles). A revised version of the Fluorocarbon Recovery and Destruction Law came into force in October 2007. As of March 2008, there were 76 authorised destruction operators for commercial equipment in Japan.

Table 4.3. **Fluorocarbons recovery, 2001 and 2008**

Fluorocarbons recovery	2001 (tonnes)	2008 (tonnes)	2001-08 (% change)
Room air conditioner	467	1 167	150
Household refrigerators	136	299	120
Household freezers ^a	..	557	..
Refrigerators and air conditioners for commercial use	1 960	3 773	93
Automobile air conditioners	153	835	446

a) Added to Home Appliance Recycling Law in 2004.

Source: Association for Electric Home Appliances; Ministry of the Environment.

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Both domestic and commercial users of equipment containing ozone depleting substances (ODS) are charged a *fee* at disposal time to cover the costs of recovery, transport and destruction of the fluorocarbons. As the fee may discourage people from turning in appliances for fluorocarbon recovery, and to some extent encourage illegal trade in these substances (e.g. CFC₁₂) in Japan or overseas, the effectiveness of this fee system should be reviewed, as should be the use of *sanctions* (Chapter 6).

Japan has been the second largest contributor to the *Multilateral Fund for the Implementation of the Montreal Protocol* since its creation in 1991. It contributed USD 88 million over 2006-08, or 22% of total contributions. It has been active, particularly in Asia, in assisting developing countries to phase out ODS, and in combating illegal trade of CFCs.

3.3. Chemicals

Japan recognises the high costs and time incurred when *testing chemicals* (Chapter 3). It has therefore actively supported international efforts to minimise costs by harmonising approaches for testing chemicals and sharing testing costs, especially for endocrine disrupters. Japan has also supported efforts to develop internationally-agreed methods that minimise or avoid the use of animals in chemicals testing. Harmonising testing methods and supporting the mutual acceptance of test data for the assessment of chemicals also contribute to avoiding non-tariff barriers to trade (OECD, 2010b).¹³ Effective control of some chemicals can only be achieved through international co-operation.

Japan is also engaged in global and regional activities, especially with countries in the Asian region, where chemical production and use are increasing. Japan acceded to the *Stockholm Convention on Persistent Organic Pollutants* (POPs) in 2002. It has been the single

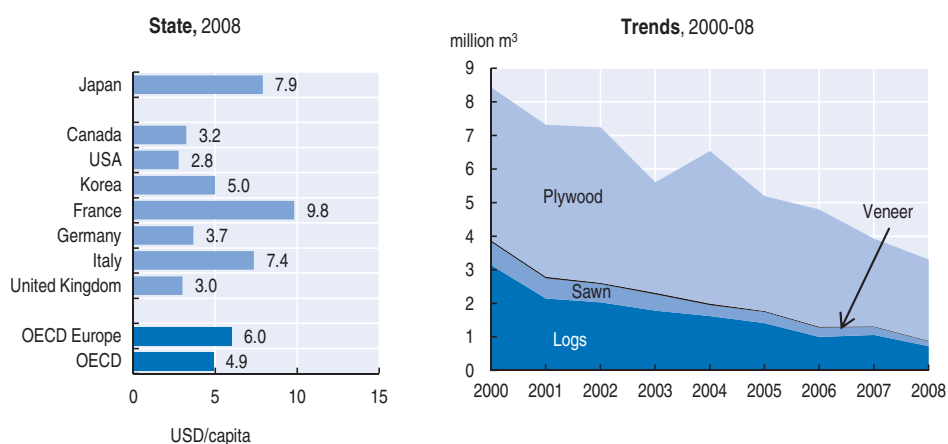
largest financial contributor among members and has regularly nominated experts to support the work of the technical bodies working under the Convention. In 2007, Japan was nominated as a member of the group conducting an effectiveness evaluation in the Asia-Pacific region. Japan acceded to the *Rotterdam Convention on the Prior Informed Consent Procedure* for certain hazardous chemicals and pesticides in international trade in 2004. In 2008, Japan contributed USD 448 102, 22% of the Convention's general trust fund for the operational budget, the single largest contribution. Japanese experts also participate in the technical bodies established under the Convention.

Japan served as the *Asia-Pacific regional focal point for the 2006 UNEP and WHO Strategic Approach to International Chemicals Management (SAICM)* from 2006 to 2009, and will be vice-chairing the International Conference on Chemicals Management until 2012. Japan has implemented bilateral co-operation projects with Thailand and Bhutan within the framework of the SAICM Quick Start Programme. It has also taken the lead in developing POPs monitoring in East Asia and has introduced chemicals management into the *Tripartite Environmental Ministerial Meetings with China and Korea*.

3.4. Forest products

In 2008, Japan accounted for some 8% of the volume of timber imports worldwide (versus 40% for the EU, and 16% for both China and the US). Its share of world imports of tropical timber was 12% (versus 17% for the EU, 33% for China, and 6% for the US), and it remains the world's largest importer of tropical plywood. Yet, between 2000 and 2008, Japan's imports of tropical timber decreased by 60%. This decline is linked to the contraction of the Japanese economy, competition with China for log supply, and substitution of tropical hardwood logs by softwood in plywood manufacturing (Figure 4.3). Most of the tropical timber imported by Japan comes from Indonesia, Malaysia, Papua New Guinea and Africa (mainly Gabon and Cameroon).

Figure 4.3. Tropical wood imports, 2000-08



Source: OECD, Environment Directorate; International Tropical Timber Organization.

In line with the recommendation from the previous OECD EPR (2002), Japanese authorities have been actively tackling illegal logging and trade in illegal timber, which are serious global concerns. To combat illegal logging, Japan has included in its bilateral co-operation and ODA the surveillance of forest condition and deforestation using satellite

images and traceability (labelling and certification), for instance with Indonesia (Box 4.1). In its regional co-operation, Japan has promoted the development of standards for legality and a timber tracking system as part of the Asia Forest Partnership (AFP). Japan has hosted and supported the International Tropical Timber Organization (ITTO) and its projects for monitoring illegal timber trade. In addition, Japan has included action against illegal logging in its various climate initiatives.

Japan introduced the verification of legality of harvested timber and derived wood products (e.g. paper) in its *public procurement policy* in 2006. The Forestry Agency has drawn up guidelines for authorised suppliers and certifies wood imports. However, sustainable management of the forests of origin is a desirable, but not mandatory, feature of procured wood items (IGES, 2007). A large share of wood imports still originates from uncertified forests, partly because forest certification systems are not yet well recognised in Japan (MOE, 2009). Japan should provide an operational definition of sustainable forest management (SFM) in line with the international consensus on SFM criteria. Further advances will require further co-operation from both timber producing and timber consuming countries and particularly from important players, including the Russian Federation, China and Southeast Asian countries.

3.5. Trade in endangered and threatened species of wild fauna and flora

Japan is a party to the 1973 *Convention on International Trade in Endangered and Threatened Species of Wild Fauna and Flora* (CITES) and its Bonn Amendment (1979), but not to its Gaborone Amendment (1983). The Ministry of Economy, Trade and Industry (METI) is Japan's CITES management authority, except for "introductions from the sea", which are under the responsibility of the Fisheries Agency. METI co-ordinates the *CITES Enforcement Unit*, established in 2000, which includes the Customs Office, the National Police Agency and other CITES authorities.¹⁴

Efforts have been made over the review period to enhance public awareness and education, species protection, monitoring and enforcement. Close to 1 000 export CITES documents and 3 000 re-export CITES documents were issued in 2005-06, although the number of denials is unknown. NGOs have continued to play a significant role in reporting on illegal trafficking of wildlife and wildlife products. Japan is the second largest contributor to the Convention; in 2010, it also contributed USD 60 000 to the international Monitoring of Illegal Killing of Elephants (MIKE) project.

However, Japan is the world's second largest import market for wildlife products, including those linked to traditional medicine (OECD, 2002). Reports continue to document *illegal trafficking*. While the number of seized CITES specimen decreased from 2 382 in the biennium 2005-06 to 1 612 in 2007-08, criminal prosecutions or notifications (for violation of legislation regulating both internal and international trade) grew from 18 to 32 during the same period.¹⁵ There is a need for improved surveillance and for enhanced public education.

4. Marine issues

Japan is an archipelago of about 6 800 islands (including artificial and tidal islands), with about 35 000 km of coastline, where about half of its population lives. Five of its straits are used for international navigation. Japan's economic and social development has historically been closely linked to the *wealth and vitality of the marine environment*. Japan has looked to the marine environment for trade, food, recreation, minerals and raw materials, and its Exclusive Economic Zone is among the largest in the world (about four million km²).

4.1. Progress with the overall framework for managing the marine environment

In 2005, a decade after ratifying the United Nations Convention on the Law of the Sea (UNCLOS), Japan developed a *comprehensive National Ocean Policy*. In 2007, the Basic Act on Ocean Policy came into force, which aims to: harmonise the use of the ocean with the conservation of the marine environment; ensure marine safety and security; improve scientific knowledge; develop marine industries; develop international co-operation; and facilitate co-ordination of the various administrations in charge of maritime transport, shipbuilding, fisheries, energy and mineral resources, and environment. In 2008, the government adopted a first Basic Ocean Plan for the next five years, presenting measures to address these issues. The Headquarters for Ocean Policy, established within the Cabinet of the Prime Minister, is leading government efforts to implement the policy and the plan.

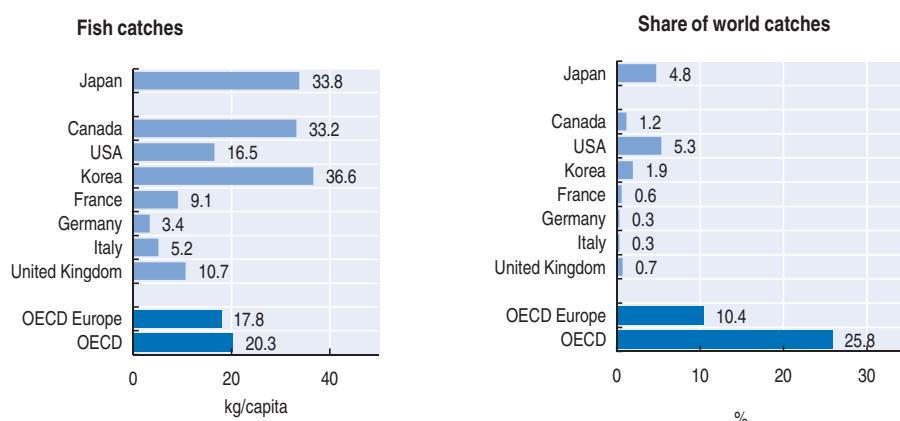
Japan has made significant progress since 2000 in implementing the Action Plan for the Protection, Management and Development of the Marine and Coastal Environment of the Northwest Pacific Region (NOWPAP), which was adopted in 1994 within the framework of the UNEP Regional Seas Programme. NOWPAP is a specialised mechanism for co-operation among coastal states (China, Japan, Korea and the Russian Federation) in the region.¹⁶ It has a regional co-ordinating centre in Japan (Toyama) and Korea (Busan). Japan hosts the first of four regional activity centres and has contributed in particular to monitoring algae blooms; using remote sensing techniques for monitoring; and funding international marine litter clean-up campaigns in China, Japan, and the Russian Federation. In the framework of NOWPAP, Japan has strengthened its efforts to address the marine litter problem, and in 2009 adopted the Law for the Promotion of Marine Litter Disposal; a national policy and regional management plans are being formulated under this law.

Japan has signed and ratified many of the *major conventions and protocols on marine management*, including some within the framework of the International Maritime Organisation (IMO). It is a member in over 25 international bodies engaged in marine protection, and has a number of bilateral agreements in place covering marine pollution control, ocean science, and fisheries management (OECD, 2002). Japan is also a member of the International Whaling Commission.

4.2. Fisheries management

In 2007, Japan produced about five million tonnes of fish (including from marine fisheries, inland-water fisheries and aquaculture). About 80% were taken from the marine environment (coastal waters and high seas). Japan accounts for some 5% of *fish catches* worldwide (ranking second among OECD countries), and its fish catches per capita are well above the OECD average (Figure 4.4). With its imports of 3.5 million tonnes of fish per year, mostly from China, Japan is the world's leading importer of fish.

However, *the sector is declining* in Japan: fisheries production has decreased by nearly 17% since 2000. Fishers and fishing vessels are decreasing in numbers. Falling production is partly due to declining stocks in adjacent areas, as well as fewer and older fishers (OECD, 2009b). Nevertheless, fisheries still have high economic and social importance in Japan, particularly in coastal areas, where they are a major source of employment. There are about 2 900 fishing ports in Japan. The decline and vulnerability of fish and other marine resources are thus major and growing socio-economic concerns. *Japanese fisheries policy* is based on fishing effort regulations to secure both a stable supply of fishery products, and a sound development of the fishing industry with appropriate conservation of living marine resources (Chapter 7).

Figure 4.4. **Fish catches, 2007**

Source: FAO; OECD, Environment Directorate.

The resource-rich *Northwest Pacific region* is among the most heavily fished waters of the world. It contributes over 20 million tonnes of fish, or over 25% of world marine catches, per year (FAO, 2009). Japan is a party to bilateral mutual fishing access agreements with the governments of the Russian Federation (since 1984), China (new agreement since 2000), and Korea (new agreement since 1999). However, there are no region-wide agreements bringing together all fishing countries of the region, as recommended by OECD. Japan has been co-operating with countries in the region to introduce a regional fisheries management framework, and participates in other regional management regimes.¹⁷

Much of the fish resources consumed in Japan come from the *Economic Exclusive Zones (EEZs) of developing countries*. Some of these resources are imported and some are fished by Japanese vessels under bilateral agreements. Japan thus has a special responsibility in supporting developing countries' efforts to strengthen their fishery management. Japan continues to take measures against illegal, unreported and unregulated fishing, especially of tuna (OECD, 2002). In 2003, it started a new global trade monitoring and control system under which only tuna products from large-scale tuna longline vessels listed in positive lists are permitted to enter the country. Japan further strengthened its international co-operation in conservation and management of tuna and tuna-like species by ratifying, in 2005, the Western and Central Pacific Fisheries Commission (WCPFC) and, in 2006, the UN Agreement for the Implementation of the Provisions of the UNCLOS relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks.

4.3. Whaling and management of small cetaceans

While Japan discontinued commercial whaling in 1987, when the *moratorium by the International Whaling Commission (IWC)* became effective, it continues to argue in favour of resuming commercial whaling. Japan has proposed the removal of thirteen species of whales and dolphins from the CITES endangered and threatened species lists, considering that their stocks are above sustainable levels or there is insufficient scientific data. These pro-whaling positions have generated strong opposition in many countries. Moreover, Japan continues to authorise the hunting of whales for research purposes (OECD, 2002). Yet the International Whaling Commission has repeatedly expressed concern about the objectives and results obtained by the Japanese Institute of Cetacean Research. According

to Japan's position, the *management of many species of small cetaceans* is not under the IWC's mandate and should be left to coastal countries. Japan manages its small cetacean fisheries by means of prefectural permit schemes and catch limits.

4.4. Marine pollution

The degradation of the health of oceans due to *marine pollution* is an issue of growing global concern. Pollution from land-based sources is a major factor, along with contamination from ocean dumping, marine oil spills, and oil and gas exploration activities.

Pollution from on-shore and off-shore sources

Pollution discharges in Japan's offshore environment have lessened in recent years, but still lead to concentrations that often infringe environment quality standards (EQS). *Illegal dumping of waste and oil* remains the major cause of marine pollution incidents. Discharges from agriculture and municipalities (nitrogen and phosphorus contamination) and from industry (high levels of COD) are also of concern (Chapter 3). NOWPAP is monitoring coastal marine conditions using satellite imagery.

Illegal discharges of waste oil by ships cause a large majority of marine pollution incidents detected by the Japanese Coast Guard. After the good progress that was made in the 1990s, the number of cases detected per year has not shown a consistent decreasing trend since 2000. Discharge of ship waste in Japan's waters is banned, and port facilities have been better equipped or upgraded to handle ship waste of various types. Also, surveillance by port and maritime authorities has been strengthened. Nevertheless, the increasing volume of shipping into and out of Japan's numerous ports remains a challenge for the limited number of inspectors assigned to environmental surveillance. To prevent the introduction of invasive marine species (including bacteria and other microbes) into its marine environment, Japan plans to further review the feasibility of implementing some measures of the Convention for the Control and Management of Ships' Ballast Water and Sediments (London, 2004), including the installation of Ballast Water Management Systems on ships constructed before 2009, and the possibility of installing such systems on any new ship.

Japan is a contracting party to the 1972 Convention on the Prevention of Marine Pollution by Dumping of Waste and Other Matters (the "London Dumping Convention"), but adhered only in 2007 to its 1996 Protocol. Japan prohibited *disposal of waste at sea* in 1970, yet disposal of "exceptional" municipal waste and sewage sludge continued, albeit to a lesser degree, until 2007, when a ban was introduced. Disposal at sea of dredged sand and gravel and certain types of industrial and agricultural waste continues under a permitting scheme. However, monitoring of offshore zones used for such waste disposal has revealed hot spots with relatively high concentrations of heavy metals and organic compounds (e.g. PCBs).

The risk of *oil spills and accidents* associated with intense maritime transport is a major concern to Japan. This is linked to the large imports of oil and gas, mostly shipped from the Middle East through the Malacca and Singapore straits, where maritime accidents are frequent, resulting in negative impacts on fisheries and sensitive coastal ecosystems. In line with the International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC Convention), and its National Contingency Plan for Oil Pollution Preparedness and Response (amended in 2001), Japan has developed detailed plans for dealing with pollution incidents, organises regular oil spill response training exercises and stockpiles equipment to combat oil spills, which requires about JPY 100 million (over USD 1 million) of funding per year.

In 2004, a *regionally-based, co-operative oil spill response mechanism*, the NOWPAP Regional Oil Spill Contingency Plan, was established for the marine waters of the Northwest Pacific involving China, Japan, Korea and the Russian Federation. This initiative follows a recommendation made in the previous EPR of Japan (2002). In 2006, the contingency plan was extended to include the eastern sea areas surrounding the large-scale oil and gas development project of the Sakhalin island. In 2007, it was used effectively to address the Heibei Spirit accident off the coast of Taean (Korea), when 9 000 tonnes of crude oil spilled into the sea. Then, in 2008, the plan was further extended to include pollution incidents from hazardous and noxious substances. These developments are welcome and are the result of positive and concrete multilateral regional co-operation. However, with projected large increases in energy demand and trade in Northeast Asia, there is a need to further strengthen this international co-operation and to improve the management of maritime traffic, including with ASEAN countries.

4.5. Shipbuilding and recycling

Japan has one of the *largest shipping fleet of the world*. With 25% of the world shipbuilding market in 2009, Japan is the third largest shipbuilder in the world, after Korea and China, of ships weighing over 100 gross tonnage. The Japanese shipbuilding industry has been investing in improving energy efficiency and environmental performance of ships,¹⁸ which includes the implementation of the 2005 regulations for the prevention of air pollution from ships (Chapter 3).

International concern has risen about *worker health, safety, and environmental impacts of the shipbreaking and vessel demolition industry*. This global industry has developed, particularly in India and Bangladesh, with the rising prices for scrap steel and new international regulations that aim to replace single-hull tankers with double-hull vessels. The risks derive from the large amounts of toxic substances and hazardous materials (e.g. PCB, asbestos) that can be released in the environment during the demolition and recycling processes.

In line with the recommendation from the previous EPR (2002), Japan is engaged in *international discussions* on how to improve health, safety and environmental conditions in this industry. Japan is considering to rapidly access the 2009 Hong Kong Convention for the Safe and Environmentally Sound Recycling of Ships. It also has to implement the Convention on the Control of the Transboundary Movement of Hazardous Waste and their Disposal (Basel, 1989). In co-operation with the Philippines, Japan has recently defined a project to establish a new shipbreaking industry in the Philippines by 2013, which will use the most advanced methods, respect environmental standards and create many jobs; JICA is providing financial support for the project. Pending the entry into force of the Hong Kong Convention, Japan should implement high safety and environmental requirements for shipbreaking, especially at bilateral level: improving workplace conditions and the handling of toxic materials, sharing upgraded technology, and reinforcing the inspection and sanction system.

5. Transboundary air pollution

Since the 1990s, Japan has actively promoted regional institutional and scientific co-operation on transboundary air pollution. The *Acid Deposition Monitoring Network in East Asia (EANET)* was established largely through the initiative of Japan and is now supported by UNEP (OECD, 2002).¹⁹ Transboundary air pollution remains a concern for Japan, mainly because of its contribution to increasing *photochemical oxidant concentrations*. Precipitation

throughout Japan is classified as acidic, and presents pH levels similar to those measured in areas of Europe and North America, where acidification damage has occurred.²⁰ Northeast Asia has been identified by UNEP as one of the global “hot spots” for air pollution, along with Europe and North America.

The rapid increase in economic growth, industrialisation and urbanisation in East Asia may intensify acid deposition. In addition to increasing research, monitoring and education on this problem, the *sources of transboundary air pollution* should be controlled. Expanded international support to China and other Asian countries in the form of scientific and technical capacity building, technology development and transfer, technical assistance and funding will be essential. Controlling sources of transboundary air pollution would provide multiple benefits, including reduced local air pollution and damage to health, as well as reduced emissions of greenhouse gases.

Dust and sand storms are also recognised as a transboundary air pollution problem that affects Japan and other countries in the region. Addressing this issue is one of the ten priorities of the annual Tripartite Environment Ministerial Meeting, involving Japan, China and Korea. The Asian Development Bank and the Global Environment Facility have implemented a project to limit and control dust and sand storms (Box 4.2).

Box 4.2. Dust and sand storms

Dust and sand storms (DSS) largely originate in the *Yellow River basin and deserts in China and Mongolia* and are brought eastward by winds. These storms have intensified due to desertification and soil degradation, partly caused by overgrazing and expansion of cultivated fields. In Japan, DSS cause respiratory and ophthalmological diseases, industrial production problems and dirtiness. The Japan Meteorological Agency provides maps and forecasts of DSS; since 2007, the Ministry of the Environment website provides information to the public about this type of air pollution.

Japan has been actively participating in *regional co-operation activities to monitor and prevent DSS*. In 2003, the Asian Development Bank (ADB) and the Global Environment Facility (GEF) launched the project “ADB/GEF Project on Prevention and Control of Dust and Sand Storms in Northeast Asia” with other three international organisations (UNEP, UNESCAP, UNCCD) and four countries (Japan, China, Korea and Mongolia). An extensive DSS monitoring network and an early warning system are being set up, ranging from the northwestern part of China to the Japanese archipelago. The project also includes measures to prevent the formation of DSS at source, such as rehabilitation of soil and vegetation, controlling tree felling, improving water management, poverty alleviation (to reduce the pressure on land), and capacity building.

In 2006, a *Tripartite Directors General Meeting (TDGM)* was held to promote regional co-operation on DSS issues in the northeast Asian region. The 2007 TDGM agreed to establish a steering committee with government officials and experts, and two working groups with experts from research institutes, to conduct joint research on DSS. Since then, a TDGM, which has been extended to Mongolia, has been held once a year.

Notes

1. See also the *OECD Environmental Performance Reviews of China and Korea*.
2. The associated Northeast Asian Sub Regional Programme of Environmental Co-operation (NEASPEC) has promoted: i) sharing regional information on emission monitoring, emission standards, policies and legislation; ii) building awareness on clean technology options and their availability; iii) enhancing technical and management capacity for pollution control; and iv) developing institutions to support capacity building (i.e. North-East Asian Training Centre for Pollution Reduction in Coal-fired Power Plants and North-East Asian Centre for Environmental Data Training). The programme has received support from UNESCAP.
3. For example, ProSPER.Net includes 19 universities and international organisations from Japan, China, Korea, ASEAN countries, India and Australia.
4. Official development assistance is defined as government aid to promote economic development and welfare of recipient developing countries. ODA is usually measured on a net basis, i.e. after subtracting loan repayments from gross aid flows.
5. Data on the structure and geographical distribution of aid are presented on a gross basis to show the level of new aid provided during the period.
6. Within the *OECD Creditor Reporting System Aid Activity Database*, countries use a policy marker to identify activities that have environmental objectives. Japan screened 99% of its sector-allocable aid against the environment marker in 2006-08.
7. This share rises to about 37% when considering only the aid activities screened against the environment marker and allocable to specific sectors.
8. Environment-focused aid is defined as either intended to produce an improvement in the physical and/or biological environment of the recipient country, area or target group, or including specific actions to integrate environmental concerns within a range of development objectives (e.g. through institution building and/or capacity development).
9. Activities classified as “general environmental protection”, i.e. environmental policy and administrative management, biosphere protection, biodiversity, site preservation, flood prevention/control, environmental education/training, environmental research.
10. “Principal objective” means environment is an explicit objective of the activity and fundamental in its design; “significant objective” means environment is an important, but secondary, objective of the activity.
11. The Committee is an intergovernmental conference based on the 1994 Japan-China Co-operation Agreement on Environmental Protection (OECD, 2002).
12. With the participation of heads of state and government and delegations from Japan and 51 African countries, together with representatives of 34 other countries, 75 international and regional organisations, and representatives of the private sector, academic institutions and civil society organisations from both Africa and Asia.
13. It has been estimated that the OECD Chemicals Programme saves OECD governments and the chemical industry at least EUR 150 million (about USD 200 million) per year, through harmonisation of standards, burden sharing, information exchange and outreach activities.
14. The scientific authorities include the Ministry of the Environment and the Ministry of Agriculture, Forestry and Fisheries.
15. A case in 2005 involved the arrest of two smugglers with 1 738 pieces of ivory.
16. In the NOWPAP region, land-based pollution comes from the activities of 560 million people and from the discharges of 407 km³ per year from river watersheds of 1.8 million km² (Yangtze River excluded).
17. For instance: in the North Pacific Ocean (Convention on the Conservation and Management of the Pollock Resources in the Central Bering Sea; North Pacific Anadromous Fish Commission); in the South Pacific and Indian Ocean (Convention for the Conservation of Southern Blue Fin Tuna, Agreement on the Establishment of the Indian Ocean Tuna Commission); and in the Atlantic Ocean (International Convention for the Conservation of Atlantic Tuna).
18. E.g. improved hull design, double-hull structures, propeller and stern shape, reduction in ship weight.
19. At present, the participating countries are Cambodia, China, Indonesia, Japan, Laos, Malaysia, Mongolia, Myanmar, Philippines, Korea, the Russian Federation, Thailand and Viet Nam.
20. Data from 31 sites throughout Japan show that, nationwide, annual average pH ranged from 4.96 to 4.46 in 2006.

Selected sources

The government documents, OECD documents and other documents used as sources for this chapter include the following. Also, see list of websites at the end of this report.

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PART II

Selected Issues

PART II

Chapter 5

Climate Change

The current trends in greenhouse gas emissions represent a major challenge for Japan. A wide range of voluntary, regulatory and economic measures has been put in place to reduce these emissions. Technological progress and negotiated agreements are distinctive features of this policy mix. Local authorities and the private sector play an important, often innovative, role in designing and implementing climate policy. Energy, transport and climate policies are generally mutually supportive, with a focus on energy efficiency, renewable energy sources, infrastructure development and R&D. Japan is a world leader in climate-related R&D. Co-operation with developing countries and adaptation to climate change are receiving growing attention.

Assessment and recommendations*

Japan has shown *strong commitment to the global effort against climate change*. Within the framework of the 2009 Copenhagen Accord, Japan submitted its target of reducing greenhouse gas (GHG) emissions by 25% by 2020 compared to the 1990 level. This target is “premised on the establishment of a fair and effective international framework in which all major economies participate and on agreement by those economies on ambitious targets”. *Co-operation with developing countries* is given strong emphasis; in 2009 Japan launched the Hatoyama Initiative, which builds on the 2008 Cool Earth Partnership Financial Mechanism, to provide funding for climate change mitigation and adaptation in developing countries. When the Kyoto Protocol entered into force, Japan launched the *Kyoto Protocol Target Achievement Plan*, which consists of a wide range of regulatory, voluntary and economic measures. The government is implementing the Plan in close co-operation with the business sector. Local authorities are also very active and have sometimes taken the lead in introducing innovative policy measures. Japan has established a research programme to guide its climate adaptation policy.

Under the Kyoto Protocol, Japan committed to a 6% reduction in its GHG emissions on average over the 2008-12 period compared with the 1990 level. However, *national net emissions increased*, and in 2007 they were 9% above the base-year level. This was largely driven by rising emissions from electricity generation, due to the increased share of fossil fuels, especially coal, in the energy mix. Consumption of coal has increased in part to compensate for an unexpected fall in nuclear power. Consequently, progress in reducing CO₂ intensities has been slow compared to other OECD countries. The economic recession had a downward effect on energy demand and GHG emissions in 2008, which were 6.4% below the 2007 emissions. However, this effect is likely to be temporary and achieving the ambitious 2020 targets will require the use of significantly more cost-effective policy instruments.

Unlike many OECD countries, Japan made remarkable *progress in the transport sector*; CO₂ emissions have decreased by nearly 12% since 2000. Technological advancement and favourable tax treatment have helped to considerably improve the average fuel efficiency of the road vehicle fleet. Efficiency of freight transport has also improved. Distance travelled by car has decreased since 2003 with the rise in oil prices; passengers have increasingly used the well developed public transport system. However, passenger transport in minor cities and rural areas largely relies on private vehicles. Tackling traffic congestion remains a challenge, especially in major metropolitan areas and on motorways.

Japan has effectively *integrated energy and climate policies*, with a strong focus on energy efficiency, R&D and, more recently, renewable energy sources. Japan is a world leader in *climate-related R&D*, which benefits from growing public spending. The Renewable Portfolio Standard has created a market for renewable electricity and has contributed to developing wind, solar

* Assessment and recommendations reviewed and approved by the OECD Working Party on Environmental Performance at its meeting on 4 May 2010.

and biomass capacities. Japan has one of the largest solar photovoltaic installed capacities in the world, although the contribution of solar power to energy supply is negligible. Overall, the share of renewables in energy supply has remained fairly stable at a much lower level than in many other OECD countries. The current *policy approach to renewables* is based on technology-specific support and short-term targets, which limit investor flexibility, thus potentially increasing overall costs. A fragmented electricity grid is also an obstacle to a more extensive use of some renewable energy sources, such as wind and solar photovoltaic. Further diversifying the energy mix, including by developing renewable energy sources, would contribute to improving Japan's energy security and reducing its GHG emissions.

Energy intensity has been steadily declining, although not as much as in other countries. Energy efficiency of manufacturing has further improved; Japan's major industrial sectors are among the most energy efficient in OECD. However, *electricity consumption in the residential and commercial sectors has been steadily growing*, largely due to the increased use of electric appliances, which has more than offset their efficiency improvements promoted by initiatives such as the *Top Runner Programme*. Energy performance standards apply to a wide range of buildings and factories, although they remain mostly voluntary. Overall, Japan's energy conservation policy is largely based on promoting technological progress and pays insufficient attention to demand-side management. There is further scope to reduce domestic and commercial energy consumption and GHG emissions.

Tax rates on energy products, including transport fuels, are among the lowest in OECD and do not convey a strong price signal. *Putting a consistent price on carbon, e.g. through emissions trading in combination with a carbon tax*, would drive investment in renewables and energy conservation more cost-effectively than current policies. The government has postponed the introduction of a carbon tax for several years. The trial *emissions trading system (ETS)* is a novel initiative, but it remains voluntary and marginal. Participants benefit from governmental subsidies. In March 2010 the Cabinet approved and submitted to the Diet the bill of the Basic Act on Global Warming Countermeasures, which foresees the introduction of emissions trading and taxation measures. Japan has made extensive use of the *Kyoto market mechanisms* to reduce the costs of achieving its target.

Negotiated agreements, such as the Voluntary Action Plan in the manufacturing sector, dominate Japan's policy mix to achieve its climate objectives. Negotiated and voluntary targets should be made more transparent and take into account what would be achieved by business-as-usual technological progress. Japan should consider complementing the voluntary approach with mandatory measures, including standards (*e.g. for buildings*) and market-based instruments. The systems in place to evaluate the effectiveness of policy measures seldom include quantitative analyses of their economic efficiency compared to possible alternative options.

Recommendations

- Examine the cost-effectiveness of the climate policy mix, particularly of negotiated agreements, looking across a range of alternative measures.
- Put a consistent price on carbon through emissions trading in combination with climate-related taxes; transform the trial emissions trading system (ETS) into a mandatory cap-and-trade scheme that is compatible as far as possible with trading schemes in other countries; gradually introduce auctioning of permits.
- Establish a consistent and long-term framework to develop renewable energy sources and reduce reliance on fossil fuels, avoiding technology-specific targets.
- Further expand integrated public transport systems in smaller cities and rural areas, and improve traffic demand management to tackle congestion in large metropolitan areas and on motorways.
- Develop a comprehensive climate change adaptation strategy; mainstream adaptation into land-use and sectoral plans; as part of broader international efforts, provide additional finance to further integrate climate change mitigation and adaptation into development co-operation.

1. Greenhouse gas emissions profile

By ratifying the Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC) in 2002, Japan committed to a 6% reduction in its greenhouse gas (GHG) emissions on average over the 2008-12 period compared with the 1990 levels.¹ However, in 2007 Japan's total GHG emissions reached nearly 1 370 million tonnes of CO₂ equivalent (MtCO₂eq), 1.8% above the 2000 levels and about 9% above the 1990 baseline (Table 5.1). Japan is the world's third largest economy in terms of GDP and the seventh largest emitter of GHGs,

Table 5.1. GHG emissions by sector and by gas,^a 1990, 2000, 2007 and 2008

Sector/greenhouse gas	Base year ^b	2000	2007	2008	Share in 2008 emissions	Change base year-2007	Change 2000-07	Change 2007-08
	(MtCO ₂ eq)				(%)			
Total	1 261	1 344	1 369	1 282	100.0	8.6	1.8	-6.4
Carbon dioxide CO ₂ , of which:	1 143	1 254	1 301	1 214	94.7	13.7	3.7	-6.6
Energy originated, of which:	1 068	1 180	1 233	1 152	89.9	15.4	4.5	-6.6
Energy conversion	324	358	447	420	32.7	37.8	25.0	-6.1
Industrial sector	371	377	370	336	26.2	-0.3	-1.7	-9.1
Transport	211	259	238	228	17.8	12.7	-8.2	-4.1
Service	84	101	103	98	7.6	22.9	1.3	-4.6
Residential	57	69	63	59	4.6	10.5	-9.2	-5.7
Agriculture, forestry, fisheries	21	16	13	11	0.9	-40.5	-21.5	-13.3
Non-energy originated ^c	75	74	68	62	4.9	-10.0	-8.9	-7.7
Methane (CH ₄)	32	26	22	21	1.7	-31.8	-15.7	-2.1
Nitrous oxide (N ₂ O)	31	29	23	22	1.8	-28.3	-21.3	-0.5
Three fluorinated gases (PFC, HFC, SF ₆)	51	36	24	24	1.8	-53.2	-32.1	-1.9

a) Total CO₂ equivalent emissions excluding CO₂ from land use, land use change and forestry (LULUCF).

b) CO₂, CH₄, N₂O: 1990; f-gases: 1995.

c) Includes industrial processes and waste.

Source: Japan's inventory submission to the UNFCCC, 2010.

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accounting for about 3% of the GHG global total emissions in 2005. The Japanese economy was hit hard by the global economic crisis, and this had a downward effect on energy demand in 2008 (Section 3). As a result, GHG emissions dropped by 6.4% in 2008, the first year of the Kyoto commitment period (Table 5.1). This effect will only be temporary, as economic growth is expected to pick up in 2010 and 2011, and it will not be large enough to fill the gap between the commitment and current emissions.

CO₂ emission intensities

Carbon dioxide (CO₂) emissions account for the vast majority of Japan's GHG emissions and are almost all energy related (Table 5.1). Japan's *carbon intensity* and *CO₂ emissions per capita* are below the OECD average (Figure 5.1), reflecting the relatively low energy intensity of the Japanese economy. On the other hand, *CO₂ emissions per unit of total primary energy supply* (TPES) are slightly above the OECD average. The carbon intensity of the economy has decreased at a lower rate than on average in OECD countries and, contrary to many other countries, CO₂ emissions per capita and per unit of TPES have increased since 2000 (Figure 5.1). Factors explaining these trends include the increase of fossil fuels, especially coal, in energy supply, and the relatively high energy efficiency in some manufacturing sectors (e.g. iron and steel, chemicals and cement), which makes further progress more costly and difficult (Section 3).

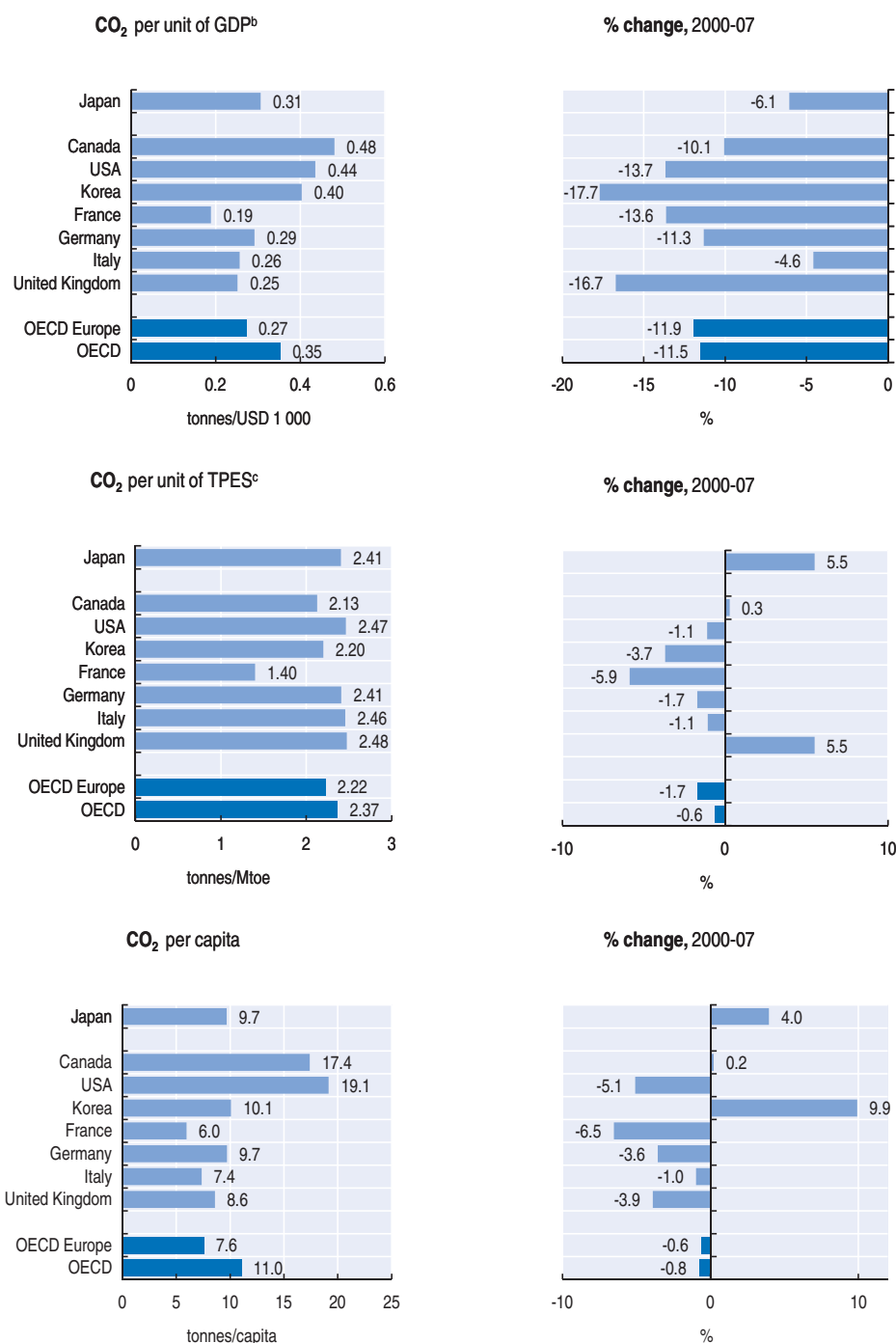
CO₂ emission trends by sector

Energy-related CO₂ emissions grew relatively faster in Japan than on average in OECD countries despite relatively weak economic growth and a stable population. Energy conversion, industry and transport accounted for nearly 77% of GHG emissions and 81% of CO₂ emissions in Japan in 2008. *Emissions from the energy industry* increased more rapidly between 2000 and 2007 than in the previous decade and have driven overall emission growth (Table 5.1). Because of the increased share of fossils in the fuel mix for electricity generation to compensate for an unexpected fall in nuclear power, carbon intensity of electric generation rose by nearly 20% since 2000. The economic recession resulted in a drastic decrease in both energy demand and GHG emissions from energy conversion in 2008 (Table 5.1).

Industry accounts for about 28% of CO₂ emissions (Table 5.1). The steel industry represents 42% of emissions from industrial combustion, followed by chemicals (15%). Owing to further improvements in the energy efficiency of manufacturing processes, emissions slightly decreased between 2000 and 2007, before dropping by 9% in 2008 with the fall of industrial production. Non-energy emissions from industrial processes have also decreased.

After having increased during the 1990s, *CO₂ emissions from transport* have decreased since 2000 (Table 5.1). However, the recent drop has not yet offset the rise of the 1990s, and transport has been among the major drivers of the overall growth of GHG emissions above the Kyoto base-year level. As in many OECD countries, road transport is responsible for most transport-related emissions (90% in 2008). However, contrary to most OECD countries, emissions from road transport dropped during the review period (by nearly 12%). Emissions from both freight and passenger road transport have decreased, after having peaked in the early 2000s, paralleling the trends in energy consumption (Section 4).

Emissions from combustion of fossil fuels in the residential, commercial and public sectors have dropped since 2000, but remain above the 1990 levels (Table 5.1). The decline in the second half of the 2000s is mainly due to a change in the fuel mix used in these sectors (e.g. for

Figure 5.1. **CO₂ emission intensities,^a 2007**

a) Includes CO₂ emissions from energy use only; excludes international marine and aviation bunkers; sectoral approach.

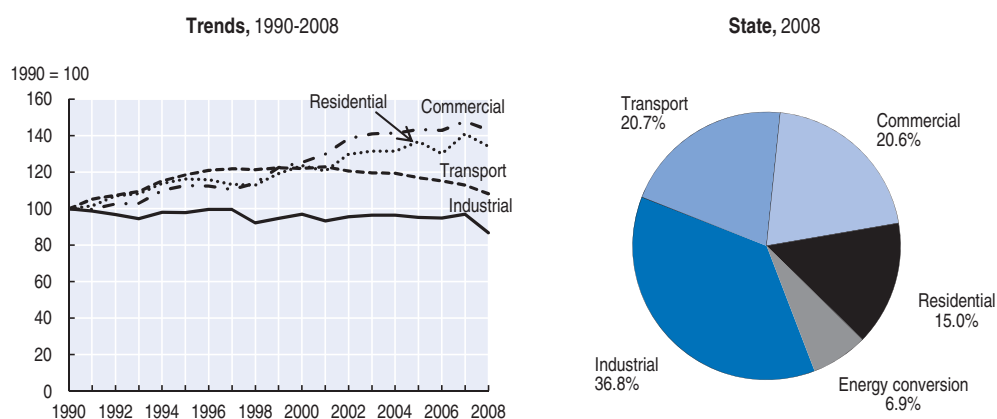
b) At 2005 prices and purchasing power parities.

c) Total primary energy supply.

Source: OECD-IEA (2009), *CO₂ Emissions from Fuel Combustion*; OECD (2009), *OECD Economic Outlook*, No. 86; OECD-IEA (2009), *Energy Balances of OECD Countries*.

water and space heating, cooking), with decreased use of coal and oil, and a larger use of natural gas and electricity.² In order to take into account the growing share of electricity in total energy supply of services and households, CO₂ emissions associated with electricity generation could be allocated pro rata to these sectors when analysing emission trends (Figure 5.2). According to this estimate, between 2000 and 2007, emission from the commercial and residential sectors increased by about 16% and largely contributed to overall emission growth, before dropping in 2008 due to the economic recession (Section 3).

Figure 5.2. **CO₂ emissions from energy use by end-use sector,^a 1990-2008**



a) Emissions from electricity production and combustion of fossil fuels are allocated to end-users.

Source: Institute for Environmental Studies and GHG Inventory Office of Japan.

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Emissions of non-CO₂ greenhouse gases

Emissions of non-CO₂ greenhouse gases accounted for 5% of total emissions in 2008. These emissions have decreased significantly in the last two decades (Table 5.1). Emissions of methane (CH₄) are mainly generated by waste management and agriculture; these emissions have declined because waste disposal has decreased and incineration facilities and farming practices have improved. The decline in nitrous oxide (N₂O) emissions is linked mainly to the use of abatement equipment in adipic acid production.

The total emissions of the three *fluorinated gases* (HFCs, PFCs and SF₆), comprising less than 2% of total GHG emissions, have decreased by over 30% since 2000 as a result of reduced emissions from solvent use and electric appliances. The implementation of the legislation on the recovery of fluorocarbons from electric appliances has contributed to this progress (Chapters 4 and 6). However, emissions of HFCs have been increasing again since 2004-05 and are expected to further rise in the future, due to the growing use of refrigerating and air conditioning equipment.

Emission removals

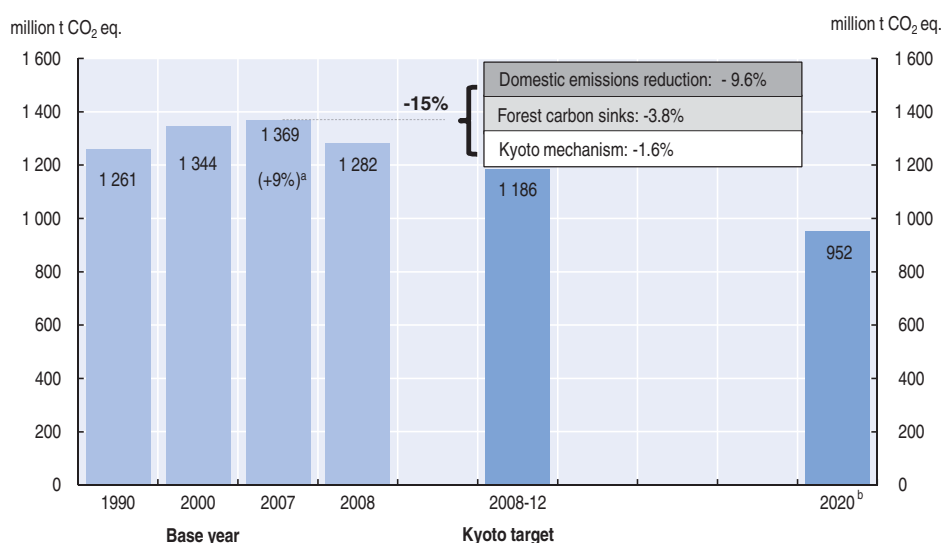
Japan has projected that emission removals from *land-use change and forestry* would contribute 3.8% to the overall GHG emission reductions needed to meet the Kyoto target. This means absorbing 47.7 MtCO₂ per year during the 2008-12 period. Emission removals have increased and, in 2007, they accounted for 3.2% of base year emissions, indicating that Japan needs to slightly increase absorption capacity to meet its target.

2. Policy and institutional framework

The 1998 *Law Concerning the Promotion of Measures to Cope with Global Warming* remains the legislative basis of Japan's climate policy. The Global Warming Prevention Headquarters, established in 1997 and chaired by the prime minister, continues to co-ordinate climate change policy at national level and regularly reviews progress. The Ministry of the Environment (MOE) retains major implementation responsibilities at the central level. Many other ministries are involved, including the Ministry of Economy, Trade and Industry (METI), the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) and the Ministry of Agriculture, Forestry and Fisheries (MAFF) (OECD, 2002). Local authorities have become more involved in designing and implementing climate policy. As required by the legislation, most prefectures and large cities have developed their emission reduction plans. In 2008, the requirement for local plans was extended to middle-sized cities.

When the Kyoto Protocol took effect in February 2005, the Global Warming Prevention Headquarters launched the *Kyoto Protocol Target Achievement Plan*. The Plan was last revised in 2008 to take account of the increase in GHG emissions and of the need to cut emissions by 15% from the 2007 levels in order to meet the Kyoto target. This cut is to be achieved mainly through reductions in domestic emissions (9.6%), carbon sinks (forests) and the Kyoto mechanisms, which are expected to make additional reductions possible (Figure 5.3).³ The Plan consists of a mix of regulation, governmental spending, voluntary measures, and economic incentives addressing key economic sectors. The greatest emission reductions are expected from the implementation of energy efficiency standards (e.g. Top Runner Programme) for electric appliances and vehicles, the Voluntary Action Plan in the industrial sector, the development of renewable energy sources, and the improvement of building energy performance (Table 5.2). The government implements these policy measures in close co-operation with the private and business sectors.

Figure 5.3. **Overview of the Kyoto and mid-term emission targets in Japan**



a) Percentage change relative to the base year.

b) -25% relative to the base year, "premised on the establishment of a fair and effective international framework in which all major economies participate and on agreement by those economies on ambitious targets".

Source: Japan's Inventory submission to the UNFCCC, 2010; Ministry of the Environment.

Table 5.2. **Key measures in the Kyoto Target Achievement Plan**

Measures	Reduction in 2007 (MtCO ₂)	Expected average reduction in 2008-12 (MtCO ₂)	Government budget in 2007 (JPY million)	Implementing measures
Industry				
Voluntary Action Plan	..	65 300	13	
Energy management in factories and workplaces	4 500	8 200-9 800	26 500 ^a	● Law Concerning the Rational Use of Energy.
Commercial sector				
Improvement in the energy efficiency of buildings	13 300 ^b	28 700	1 000 (incl. R&D)	● Law Concerning the Rational Use of Energy. ● Tax reduction. ● CASBEE.
Energy management systems	3 700	5 200-7 300	2 270	
Improvement in the efficiency of appliances under Top Runner standards	14 350	26 000		● Law Concerning the Rational Use of Energy.
Dissemination of highly energy efficient equipment	1 440	6 400-7 200	12 500 + 5 800 ^a	
Residential sector				
Improvement in the energy efficiency of buildings	6 600	9 300	187 000 ^a + 40 (incl. R&D)	● Law Concerning the Rational Use of Energy. ● CASBEE. ^b
Transport				
Improvements in the fuel efficiency of automobiles and appliances under Top Runner standards	15 280	24 700-25 500	6 000 (+ R&D)	● Law Concerning the Rational Use of Energy. ● Tax exemption on vehicle taxes. ● Advantageous interest rate.
Improvement in freight transport efficiency	13 090	13 890	26 930 ^a	● Law Concerning the Rational Use of Energy.
Energy conversion sector				
Reduction of CO ₂ emissions intensity in the electric power sector through promotion of nuclear energy	..	14 000-15 000	303 449 (+ R&D)	● Tax reduction. ● Advantageous interest rate.
Promotion of measures for renewable energy (greater use of biomass heat, photovoltaic generation, etc.)	33 150	38 000-47 300	87 125 (incl. R&D) ^a	● Act on special measures concerning new energy use by electric utilities. ● Tax reduction.
Promotion of introduction of cogeneration and fuel cells	12 460	14 000-14 300	58 500 ^a	● RPS ^c Act.
Non-energy related CO₂				
Reduction of CO ₂ from waste incineration	10 750 ^d	5 800	34 821 ^a	● Basic Act for Establishing a Sound Material Cycle Society.
Installation of N ₂ O decomposers in the production process of adipic acid	..	9 850	None	● Voluntary action by private companies.
F-gases				
Promotion of substitute materials and products	45 600	64 000	2 160 (+ R&D)	● Guidelines. ● Tax reduction.
Sinks				
Promotion of forest and forestry measures	39 970	47 670	76 500	

a) Includes other measures.

b) Comprehensive Assessment System for Built Environment Efficiency.

c) Renewables Portfolio Standard.

d) 2006.

Source: Review of the Kyoto Target Achievement Plan, 2008.

The 2007 *central government budget for the Plan* was about JPY 1 trillion (USD 8.5 billion), representing around 2% of overall public expenditure at the central level.⁴ However, the methods used for selecting policy measures, allocating the budget to them, and determining the expected emissions reductions take little or no account of cost-effectiveness and do not consider possible alternative options. In many cases, quantitative data of economical and social costs are not available.

In July 2008, Japan launched the *Action Plan for Achieving a Low-carbon Society*, setting the goal of a 60% to 80% reduction in GHG emissions by 2050. This action plan puts great emphasis on the development and dissemination of climate-friendly technologies, use of economic instruments, and regional and citizen's initiatives (Box 5.1). It also sets a number

Box 5.1. Action Plan for Achieving a Low Carbon Society

1. Development and dissemination of new and existing advanced technologies:
 - *Carbon capture and storage (CCS) technology*: verification tests on a large scale from 2009 onward, aiming at implementation by 2020.
 - *Clean combustion technology for coal*: increase the generation efficiency of integrated gasification combined cycle (IGCC) power generation to 48% by 2015.
 - *Innovative solar power generation*: increase the efficiency of solar electric power generation to over 40% by 2030; reduce power generation cost to JPY 7/kWh.
 - *Fuel cells*: reduce costs to JPY 400 000/kW, improve durability to 90 000 hours, and ensure the wide use of fuel cells by 2020-30.
 - *Super efficient heat pump* (air conditioning and hot water supply in residential buildings): reduce costs by 25% and increase efficiency by 50% by 2030; halve costs and double efficiency by 2050.
 - *Zero-emissions energy sources* (renewables and nuclear power): increase their share in electricity supply to over 50% by around 2020.
 - *Solar power generation*: achieve world leadership; set targets for increasing generation 10-fold by 2020, and 40-fold by 2030.
 - *Next generation vehicles*: increase the share of next generation vehicles (hybrid, electric, plug-in hybrid, fuel cell, clean diesel vehicles, CNG vehicles, etc.) from about 2% of new car sales to 50% by 2020.
 - *Energy efficient lighting*: replace incandescent light bulbs with bulb-shaped fluorescent lamps by 2012.
 - *Energy-efficient housing and buildings*: implement energy efficiency measures in all new houses and buildings; promote “200-year Housing”, i.e. building a stock of high-quality housing that can be used for many years.
 - *Promotion of nuclear power*: improve utilisation capacity to the level of major nuclear-using countries, establish a nuclear fuel cycle, while securing safety as top priority.
 - *Implement initiatives in the government sector*: cut GHG emissions by 8% compared to the 2001 level by 2010-12.
2. Framework for moving the whole country towards reduced carbon intensity:
 - *Emission trading*: experimental implementation of an integrated domestic market from fall 2008.
 - *Make the tax system greener*: extend environmentally related taxes as part of a comprehensive review of the tax system.
 - *“Visualisation” of emissions*: disclose information about GHG emissions linked to the production and consumption of many goods and services.
 - *Guide flow of capital to environmental businesses*: promote community funds, etc. and guide financial institutions in implementing the Principles of Responsible Investment (PRI).
3. Support for regional and citizens’ initiatives:
 - *Cut GHG emissions in agriculture, forestry and fisheries*: establish 300 “Biomass Towns” by 2010.
 - *Create low-carbon cities and regions*: select about ten cities as environmental models by 2008.
 - *Environmental education*: increase the number of Education for Sustainable Development (ESD) Centres (UNESCO Associated Schools) to 500.
 - *National energy-saving campaigns*: promotion of Team Minus 6%, Eco Action Point, Green IT; consider daylight-saving time.

of technology- and sector-specific targets. Within the framework of the Copenhagen Accord, Japan confirmed its mid-term target of cutting its GHG emissions by 25% from the 1990 levels by 2020. This target is “premised on the establishment of a fair and effective international framework in which all major economies participate and on agreement by those economies on ambitious targets”. In March 2010, the Cabinet approved and submitted to the Diet the bill of the Basic Act on Global Warming Countermeasures, which confirms the 2020 target and sets the 2050 target of 80% less emissions compared to 1990 levels. The bill also foresees the introduction of emissions trading and taxation measures.

The 2002 OECD *Environmental Performance Review of Japan* (EPR) made a number of recommendations related to climate protection, which provide a useful framework for assessing Japan’s present climate policy (Table 5.3).

Table 5.3. Actions taken on the 2002 EPR recommendations for climate change

Recommendations	Actions taken
Seek the entry into force of the <i>Kyoto Protocol</i> in 2002, with <i>timely ratification</i> processes, and with the widest possible participation. Further develop the national policy framework to combat climate change, with a <i>balanced mix of policy instruments</i> (including an expanded use of economic instruments such as taxes and charges), to reach domestic and international commitments; review and further develop environment-related taxes where appropriate, from the viewpoint of GHG reduction and other objectives.	Japan ratified the Kyoto Protocol in 2002, following the revision of the law concerning measures to combat global warming. Japan’s Voluntary Emissions Trading Scheme (JVETS) has been operating since 2005; in October 2008, a trial domestic emissions trading was launched. MOE established an Expert Committee to discuss potential effects of the carbon tax. The bill of the Basic Act on Global Warming Countermeasures (2010) foresees the introduction of emissions trading and taxation measures.
Develop and implement <i>co-ordinated demand management measures</i> (e.g. road pricing, parking charges, energy service company) and energy efficiency improvement measures (energy efficiency standards and other measures) in the <i>transport and residential/commercial</i> sectors.	In the transport sector, Japan has implemented various measures for demand management and energy efficiency improvement such as introducing ITS, flexible expressway toll, Top Runner Programme and tax reduction for low-emission vehicles. In the residential/commercial sectors, the Top Runner Programme has improved energy efficiency of a wide range of electric appliances. The Law Concerning the Rational Use of Energy introduced higher energy efficiency requirements for residential and commercial buildings. A system for the assessment of energy efficiency of buildings (CASBEE) was developed.
Strengthen the management of <i>motor vehicle traffic</i> through a comprehensive package of policies including traffic demand management measures (e.g. land-use planning, economic instruments, information technology) and measures promoting the use of more fuel efficient vehicles and of <i>less polluting transport modes</i> .	See above.
Continue to implement policy measures to reduce emissions of <i>HFCs, PFCs and SF₆</i> with a balanced mix of policy instruments.	Japan has implemented a mix of measures to reduce non-CO ₂ GHGs, such as: <i>i</i>) voluntary initiatives; <i>ii</i>) promotion of the development of alternative substances; and <i>iii</i>) recovery of HFCs contained in appliances.
Review and revise <i>voluntary initiatives in industry</i> to improve energy efficiency and reduce GHG emissions (e.g. more explicit targets, expanded public access to relevant information).	Relevant ministerial councils regularly assess the voluntary initiatives in each industrial sector, and disclose information to the public. They can recommend more ambitious targets.
Take further measures to encourage the development and use of <i>renewable forms of energy</i> and to promote <i>fuel switching</i> where appropriate.	Japan has implemented a system of renewable energy quotas in the electricity sector (renewable portfolio standard), and a feed-in tariff to promote photovoltaic installations.

Source: OECD, Environment Directorate.

3. Climate change and energy policy

Japan depends on outside sources for its energy needs, and its energy mix is heavily based on fossil fuels (Box 5.2, Figure 5.4). The 2002 Basic Act on Energy Policy sets the key priorities of Japan’s energy policy: energy security, environmental “suitability” and use of market mechanisms. Measures to improve energy efficiency and to reduce reliance on fossil fuels are expected to largely contribute to meeting the Kyoto target (Table 5.2).

Box 5.2. Energy structure and trends

Energy mix

While the economy was recovering between 2002 and 2007, Japan's total primary energy supply (TPES) slightly decreased. It sharply decreased in 2008 (by over 4% compared to the previous year) as a consequence of the economic crisis, falling to the lowest level since the mid-1990s. Japan's energy supply is heavily based on fossil fuels (Figure 5.4). As of 2008, they represent 83% of TPES, which is in line with the OECD average, but fairly above the OECD Europe average (77%). Oil accounts for 43% of Japan's TPES, down from 49% in 2000. Nuclear power has also decreased in recent years, due to the temporary shutdown of power plants caused by earthquakes and related security concerns, and accounts for 13% of TPES. This decline has been offset by the increased use of natural gas and especially coal, which comprise 17% and 23% of TPES, respectively. Japan has very limited domestic supplies of natural resources and imports about 88% of its energy supply, mainly fossil and nuclear fuels.

Japan has diversified its fuel mix for electricity generation. Coal represents the main fuel, accounting for 30% of electricity output, followed by natural gas, nuclear and oil (Figure 5.5). The share of coal products and natural gas in electricity output has increased to compensate for the decrease in nuclear power and oil. About 9% of electric power is generated from renewables, compared to 16% for OECD countries and over 20% for OECD Europe. Overall, power generation from renewables has also been declining, reflecting, among other things, the fact that hydropower, which represents 85% of renewable electricity, has been approaching its full capacity.

While the contribution of renewables to energy supply has slightly increased in OECD countries since 2000, in Japan this share has been wavering around 3% (Figure 5.5), about half of the OECD average (6.7%) and far below the projected 7 to 8.2% in 2010. When excluding traditional renewable technologies, such as hydro and geothermal power, the share falls to less than 1.5%. Hydro power remains the main renewable source (40%), followed by biomass and renewable municipal waste (35%) and geothermal energy (17%). Energy supply from all renewable sources has substantially decreased, with the exception of that from renewable municipal waste, photovoltaic and wind. Japan has the third largest installed photovoltaic capacity among OECD countries and produces some 18% of the world's photovoltaic cells. Energy production from photovoltaic and wind has increased 6- and 27-fold, respectively, although the contributions of these renewables to energy supply and electricity generation remain negligible.

Energy use and energy efficiency

Japan's energy intensity, as measured by TPES per unit of GDP, was 0.12 toe per USD 1 000 (at purchasing power parity), which is well below the OECD average (Figure 5.4). Japan's total final energy consumption (TFC) has slightly declined since 2000, while real GDP has increased by around 2% per year. However, electricity consumption grew by 7%, especially in the service and residential sectors. Electricity consumption per capita is slightly below the OECD average, but remains higher than in a number of countries, namely all large European OECD economies.

The industrial sector is the largest final energy consumer in Japan and, with a share of about 30%, takes up a larger part of TFC than in many OECD countries (Figure 5.4). While industrial production increased between 2000 and 2007, energy consumption from industry remained largely stable. Indeed, energy consumption per unit of industrial production decreased by 7.5% in that period, owing mainly to improvements in energy efficiency. The most energy consuming industry is iron and steel, which makes up 23% of industrial consumption, followed by chemical and petrochemical (19%), machinery (10%) and paper (9%). Energy consumption in the steel and machinery sectors has risen by 15% and 17% respectively since 2000 due to an increase in production, while in other sectors it has dropped or remained unchanged.

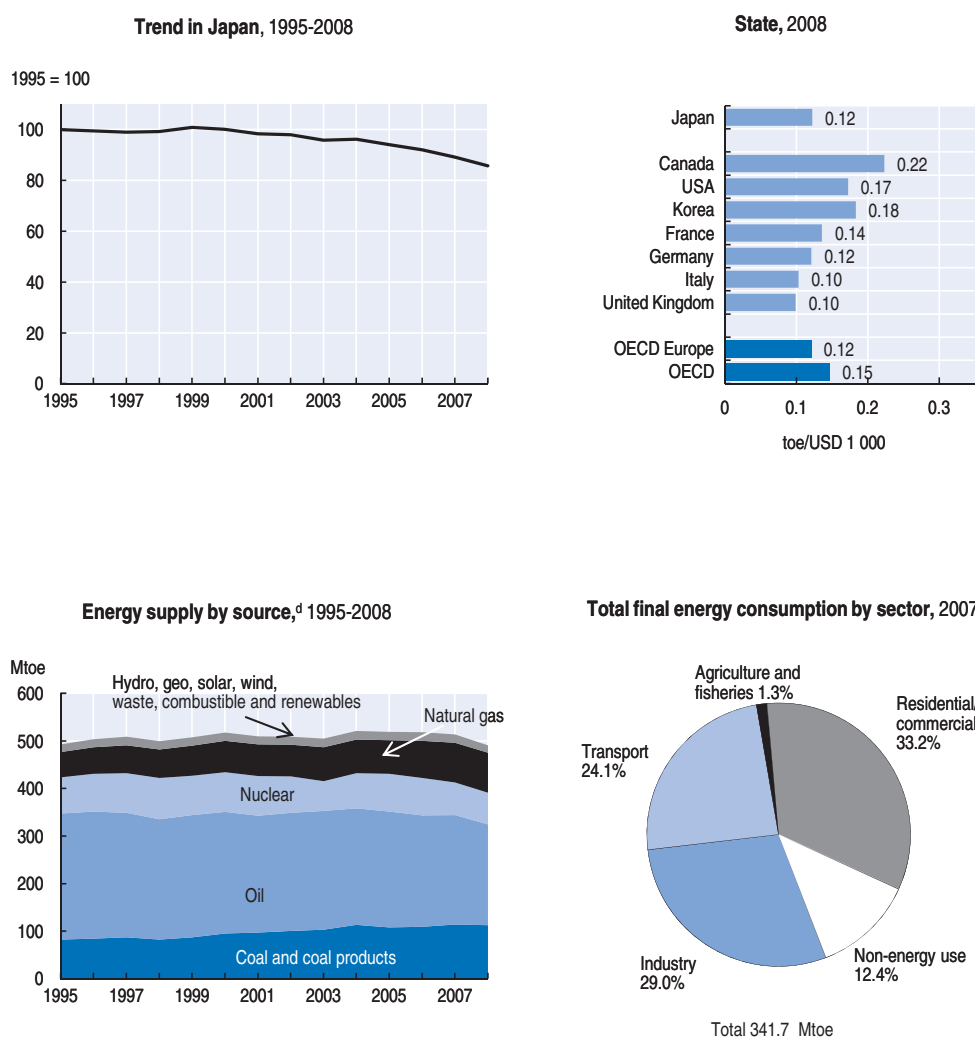
Final energy consumption from the commercial (including service) and residential sectors slightly increased (by 4% and 1%, respectively) between 2000 and 2007. Heating and cooling accounted for almost half of energy consumption in the tertiary sector, followed by use of electric appliances and lighting. During that period, electricity consumption from households grew by 13% and from commercial and service activities by 19%. This reflects: i) an 8.3% expansion of office floor space; ii) a 9% increase in the number of households (while the total population grew by only 0.7%); and iii) the demand for more and bigger electric appliances. These trends have cancelled out the improvement in energy efficiency of office equipment and home appliances. Energy consumption in these two sectors is expected to further increase in the future.

Box 5.2. Energy structure and trends (cont.)

Energy consumption from transport accounts for 24% of TFC (Figure 5.4). Contrary to many OECD countries, it decreased by 6% during the review period. This decline was driven by a 6% decrease in energy use from road transport (both freight and passengers). Nonetheless, road transport still accounts for 90% of total consumption in the sector (Figure 5.8). Only energy use from domestic aviation has increased during the period (by 2%).

Figure 5.4. **Energy^a structure and intensity**

Energy^b per unit of GDP^c



a) Excludes international marine and aviation bunkers.

b) Total primary energy supply.

c) GDP at 2005 prices and purchasing power parities.

d) Breakdown excludes electricity trade.

Source: OECD-IEA (2009), *Energy Balances of OECD Countries*; OECD (2009), *OECD Economic Outlook*, No. 86.

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Following the requirements of the 2002 Basic Act on Energy Policy, the 2003 *Basic Energy Plan* (subsequently revised) aims at promoting nuclear power, securing a stable energy supply, promoting technological progress, developing renewable energy sources, and contributing to the development of an international framework for energy conservation and climate change. The 2006 *New National Energy Strategy* sets the following quantitative targets to be reached by 2030:

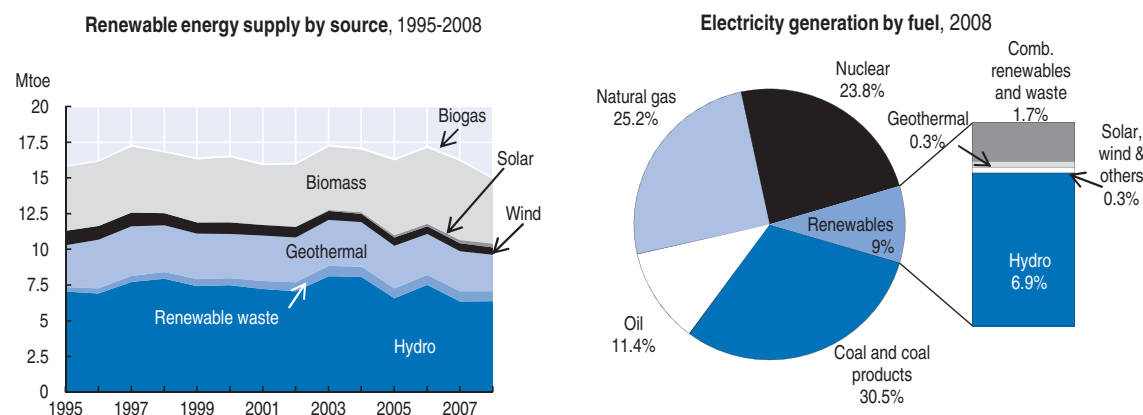
- reduce final energy consumption per unit of GDP by 30%;
- reduce the share of oil in TPES to 40%;
- reduce the oil dependence of the transport sector to 80%;
- increase the proportion of nuclear energy in total power generation to 30-40%; and
- expand the ratio of exploration and development of oil resources by Japanese companies to around 40%.

METI is the main authority in charge of designing and implementing Japan's energy policy, in co-operation with other authorities, such as MOE and MLIT. It systematically evaluates energy policy measures against several criteria, including their potential contribution to reducing GHG emissions. The evaluation is conducted *ex ante* as a contribution to the budget process, and *ex post* (every three to five years) to assess efficiency and effectiveness of policies and measures. However, these evaluations focus primarily on the measures that have been selected for implementation and seldom include a cost-effectiveness analysis that examines a range of alternative policies (IEA, 2008).

3.1. Promoting renewable energy sources

The share of renewable sources, mainly hydro power, has fluctuated around 3% of energy supply, which is relatively low compared to other OECD countries (Figure 5.5). Japan aims at increasing the share of renewables in primary energy supply to 10% by 2020. Japan has also introduced a target for “new energy”, which includes all renewable energy technologies whose development needs assistance, thus excluding large hydro power plants and geothermal heat. The target is a 3% share of new energies in TPES by 2010 (from some 2% in 2005), implying a considerable increase in overall renewable energy supply in a relatively short period. This global target is based on short-term technology-specific targets, which

Figure 5.5. Renewable energy



Source: OECD-IEA (2009), *Energy Balances of OECD Countries*.

StatLink <http://dx.doi.org/10.1787/888932318832>

potentially limit investor flexibility. The government provides capital grants for the installation of renewable energy plants. Global long-term targets would create a more stable scenario for investors, facilitate investment planning and, therefore, potentially bring down overall costs. Putting a price on carbon, as through a mandatory emissions trading system (Section 5.2), would drive investments in renewables in a more cost-effective way.

Under the *Renewables Portfolio Standard (RPS)*, introduced in 2003, each electric utility has to sale a target rate of electricity generated from new energy. These utility-specific targets add up to national annual targets. The goal is to produce 17 billion kWh of electricity from new energy sources by 2014, a nearly five-fold increase of current production levels. The annual targets have been easily achieved so far. The RPS appropriately does not specify which renewable sources are to be increased, thus allowing a choice of cost-effective investments to meet the goal. Utilities can meet their obligations by either producing the required volume of electricity from renewables or trading with other generators; banking excess generation and borrowing from the following year are also allowed. The RPS has contributed to the development of renewable electricity in recent years, especially of wind, solar and biomass technologies (Box 5.2, Figure 5.5). Nonetheless, as many other countries, Japan needs to upgrade its electricity grid to allow for higher levels of electricity from renewables and particularly from wind, for which the highest potential is located in the northern and sparsely populated island of Hokkaido. Moreover, Japan should streamline market rules on grid interconnections to minimise barriers to entry (IEA, 2008).⁵

The “Policy Package to Address the Economic Crisis” (April 2009) includes the target of increasing solar photovoltaic installations 20-fold by 2020. In November 2009, Japan launched a feed-in-tariff (FIT) scheme: solar panel owners can sell excess photovoltaic electricity to utilities at JPY 48/kWh for 10 years. This tariff is around twice the electricity price and slightly above the estimated generation cost (ANRE, 2008); the level of the feed-in tariff is comparable to that applied in other countries, such as Germany and Spain, and is set to decrease over time. The government estimates that the cost to households will be between JPY 30 and 100 per month and that in the first years of implementation the FIT will cost domestic and industrial consumers JPY 80-90 billion per year. Since only generation exceeding household needs can be sold, individuals are also encouraged to reduce their energy consumption. Investment costs for installing solar panels in the commercial, residential and public sectors are partly subsidised. Firms also benefit from a 7% tax deduction or can claim a special depreciation rate for investment in solar panels until 2011.

The 2002 Biomass Nippon Strategy (revised in 2006) promotes biomass energy as a means to address climate change, contribute to a sound material-cycle society, and support the development of agriculture and forestry. Japan foresees the establishment of 300 “Biomass Towns” by 2010, which will rely extensively on biomass energy, following the model of “Eco-Towns” (Chapter 6).⁶ As of end 2009, 221 biomass towns had been created.

Japan has set a target of 500 million litres (Ml) of crude-oil equivalent for the consumption of transport fuels derived from biomass by 2010. This is expected to reduce CO₂ emissions by 1.3 Mt. Given the high production costs of domestic biofuels, Japan would have to provide significant support to stimulate domestic supply or rely on imports to meet this goal. Biofuel production is at an early stage in Japan and mostly based on waste and residue materials. In 2007, the government announced a roadmap for increasing the annual production of biofuels to 50 000 kilolitres (kl) per year by 2011.⁷ To minimise potential impacts on vehicle safety and exhaust emissions, upper limits of 3% and 5% have

been set for biofuel content in gasoline and diesel respectively. Bioethanol-blended gasoline benefits from tax exemption on its bioethanol content (up to 3%). However, emission reductions achieved using biofuels come at a much higher overall cost than those achieved using other policy measures, namely emissions trading (OECD, 2008).

Japanese energy policy includes a complex mix of financial and fiscal incentives to encourage particular energy technology choices. It is not clear how well this mix has been working (IEA, 2003). Japan should develop a comprehensive map of all the various measures that impact the energy sector and assess their effectiveness and cost-effectiveness, with a view to rationalising these policy options.

3.2. Promoting energy efficiency

In a context of economic recovery, energy consumption slightly declined in Japan from 2000 to 2007, but it dramatically fell in 2008 as a consequence of the economic crisis. Japan's *energy intensity* has been steadily, albeit slightly, decreasing, owing largely to heavy investments in energy efficiency in the manufacturing sector (Figure 5.4). Nevertheless, some consumption trends are still cause for concern, in particular concerning electricity in the tertiary and residential sectors (Box 5.1), and have prompted the Japanese authorities to take action.

Japan has traditionally attached high priority to energy efficiency, aiming to both increase the security of energy supply and curb GHG emissions. The 1979 *Law Concerning the Rational Use of Energy* remains the centre-piece of Japan's energy efficiency policy; it has been revised several times during the review period since 2000 to cover small factories, buildings and transport. Among the novelties, *energy management requirements* have been extended, moving from a factory-based approach to a company-based approach. Energy management (e.g. energy plans, energy use reporting and energy managers) is now mandatory for a larger number of industrial and commercial companies whose overall energy consumption is above a certain threshold.⁸ Industrial firms are also required to reduce their energy intensity by 1% per year. In addition, a recent amendment to the Law introduced "*sectoral benchmarking*" for industrial energy-intensive sectors (iron and steel, cement and electricity generation): medium- and long-term energy efficiency targets have been set at the level of the best performing companies in each sector. METI carries out on-site inspections and discloses to the public the names of the companies that fail to meet the targets. The "name-and-shame" mechanism is effective in Japan, since it puts the image of the brand at risk.

Building owners and developers are required to report on the *energy performance of buildings*. This requirement, initially applied to the construction and renovation of large non-residential buildings, has now been extended to large residential buildings and to smaller non-residential buildings. Japan has developed the *Comprehensive Assessment System for Built Environment Efficiency* (CASBEE), under which buildings are rated against several criteria, including energy and resource efficiency, and local and indoor environmental quality. Contrary to many other countries, however, energy efficiency standards for buildings remain voluntary in Japan.

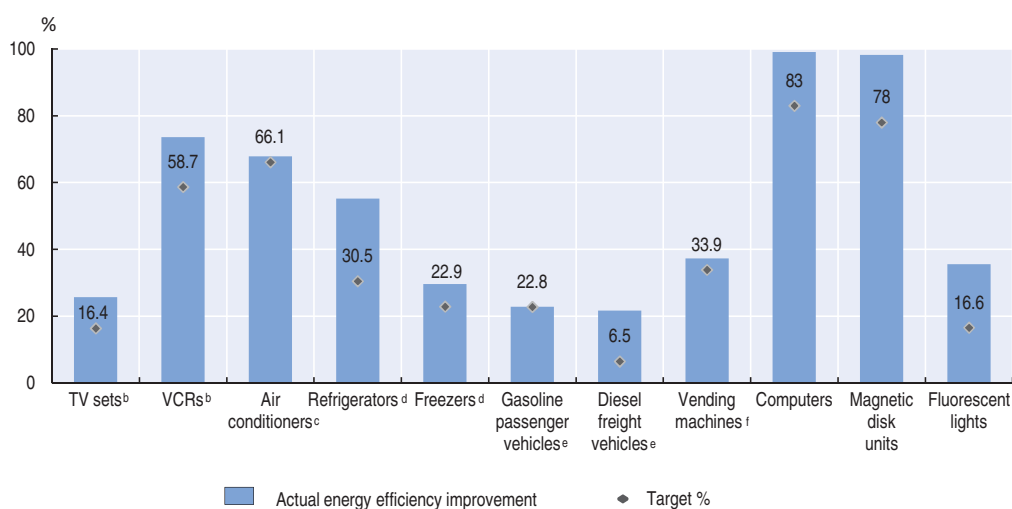
Japan provides *fiscal and financial support* to small and medium-sized enterprises (SMEs) for implementing energy efficiency measures, including the installation of efficient equipment, energy management systems and research and development. Similar subsidies apply to the building sector. Enterprises and households can claim tax credits or

special depreciation rates on investment costs for the installation of energy efficient equipment, including solar panels. Owners of highly efficient buildings have access to low-interest loans.

The Top Runner Programme

In 1998, Japan introduced the Top Runner Programme, which is a set of energy efficiency standards for energy intensive products, such as home appliances and motor vehicles. During the review period, the coverage of the programme was extended from 10 to 23 product categories. While many countries have introduced minimum efficiency performance standards, Japan has set efficiency targets for product categories to be achieved within a given number of years on the basis of the most efficient model on the market. The target refers to the weighted average energy performance of the products sold by a company in the target year, and not to the individual product sold. METI can disclose the names of companies that fail to meet the targets, as well as issue recommendations, orders and fines. To date, no enforcement actions have been taken, as targets have been systematically met or exceeded (Figure 5.6). Manufacturers highly support the programme, since they are directly involved in setting the targets and energy efficiency is considered to be a competitive advantage.

Figure 5.6. **Targets and performance of the Top Runner Programme,^a 1997-2005**



a) The energy efficiency standard is defined in terms of kilometres per litre for vehicles and kWh/year for electronic appliances. The "energy efficiency improvement" shows the change in this indicator. For example, if energy efficiency increased from 10 kilometres per litre to 15, that would be a 50% improvement.

b) Until 2003.

c) Until 2004.

d) 1998-2004.

e) From 1995.

f) From 2000.

Source: Energy Conservation Centre, 2008.

Manufacturers and importers must provide information to consumers about the energy performance of their products, either using or not using a label. Japan has recently introduced a uniform energy conservation label (for air-conditioners, TV sets and refrigerators) and a label for retailers who excel in promoting energy efficient products. While the Top Runner Programme is implemented by manufacturers, the resulting energy and CO₂ emission savings will mostly

come from the sectors purchasing the products, such as the commercial, residential and government sectors. According to some estimates, the *Top Runner Programme* has reduced energy consumption by 5% in road transport and by 8% in the residential sector. However, there is scope to improve the programme. The financial and economic costs of the programme have not been analysed. Other measures, including market-based instruments and other standard setting measures, might be more cost-effective and induce more rapid technological advancement (Chapter 2). Also, the constant overachievement of targets raises questions about their level of ambition (Figure 5.6).

Energy prices

Energy taxes have remained virtually unchanged since the previous *OECD Environmental Performance Review of Japan* (2002) (Table 2.1). Exceptions include the introduction of a tax on coal in 2003 and the increase of the tax rate on natural gas and liquefied petroleum gas (LPG). Overall, energy taxation is lower than in a number of other OECD countries, notably European.

Nonetheless, energy prices are relatively high in Japan (Table 5.4). The price of natural gas is higher than in other major industrialised countries, especially for domestic customers. This is partly due to the high cost of shipping. Households pay a disproportionately higher price than industrial customers. Electricity retail prices have decreased in recent years, owing to improvements in the efficiency and competitiveness of the electricity sector (IEA, 2008). Although electricity prices remain higher in Japan than in many OECD countries, their decline has not helped moderate the use of electric appliances in the residential sector.

Table 5.4. **Energy prices in selected OECD countries, 2008**

	Electricity		Oil			Natural gas	
	Industry (USD ^c /kWh)	Households (USD ^d /kWh)	Industry ^a (USD ^c /t)		Households ^b (USD ^d /1 000 l)	Industry (USD ^e /10 ⁷ kcal)	Households (USD ^d /10 ⁷ kcal)
			High sulphur	Low sulphur			
Japan	0.116 ^f	0.173 ^f	776.5	945.6	908.4	454.0 ^f	1 212.4 ^f
Canada	0.059 ^e	0.078 ^e	571.5	..	909.2	357.0	448.7
USA	0.070	0.114	558.4	..	892.0	368.1	525.3
Korea	0.060	0.131	692.0	722.8	1 657.5	499.5	936.1
France	0.060	0.126	555.7	587.4	914.4	607.3	688.1
Germany	0.109	0.224	..	591.8	859.3	..	..
Italy	0.290	0.240	..	643.3	1 492.6	646.5	905.9
United Kingdom	0.146	0.188	x	576.0 ^f	871.8	446.0	672.7
OECD Europe	0.117	0.179	..	660.7	963.4	..	..
OECD	0.102	0.134	..	..	953.4	428.9	648.5
JPN price/OECD Europe (%)	99	97	..	143	94	..	..
JPN price/OECD (%)	114	129	..	..	95	106	187

..: Not available.

x: Not applicable.

a) HS High-sulphur oil, LS Low-sulphur oil.

b) Light fuel oil.

c) At current exchange rates.

d) At current PPPs.

e) 2006 data.

f) 2007 data.

Source: OECD-IEA (2009), *Energy Prices and Taxes*, 3rd quarter 2009.

StatLink  <http://dx.doi.org/10.1787/888932319041>

3.3. R&D in energy and climate change technologies

In Japan, public research expenditures for energy, as share of GDP, exceed those of other major economies. Nuclear power remains the dominant energy research area, accounting for 65% of total outlays in 2008. While total R&D expenditure on energy remained fairly stable during the review period, Japan's R&D on renewable, hydrogen and fuel cells technologies increased considerably, reaching some 10% of total energy R&D outlays in 2008. Japan has also increasingly promoted research on clean coal technology and carbon capture and storage. On the other hand, the public R&D budget for energy efficiency decreased by 25% between 2000 and 2008, and represents now some 12% of the total, owing to the growing role of the private sector in this research area. Japan's energy R&D funding is linked to its overall energy policy objectives.

Japan is a world leader in climate-related technological innovation, as indicated by the number of patents it holds in this area (Chapter 2). The 2008 Cool Earth Innovative Energy Technology Programme prioritises 21 energy- and climate-related technologies, and will provide road maps to guide the development of these technologies.

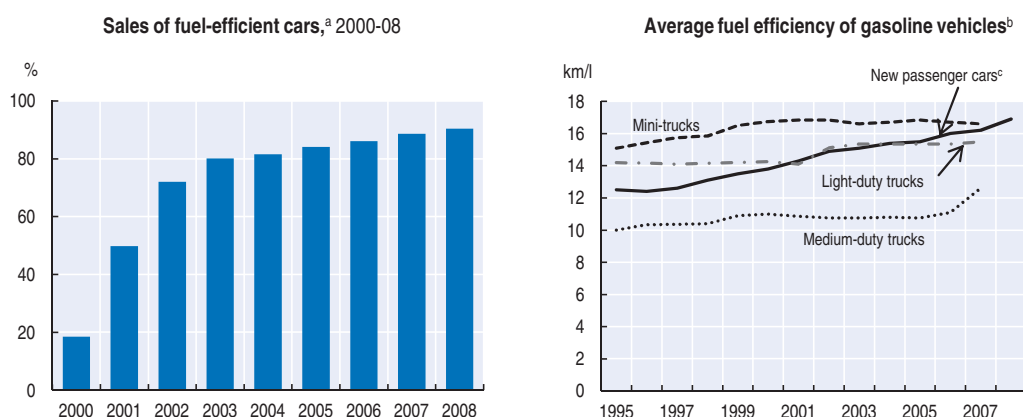
4. Climate change and transport policy

In 2002, Japan set a specific target for the transport sector: 250 MtCO₂/year by 2010, which represents a 15.1% increase from the 1990 level. The target was lowered in 2008 to 240 MtCO₂/year to take account of the actual reduction in GHG emissions from transport. Japan has implemented a wide-ranging set of measures to achieve this target, focusing on promoting vehicle fuel efficiency, vehicle taxation, public transport, efficient logistics and congestion and traffic flow management. Great attention is being given to “next-generation vehicles” in the Action Plan for Achieving a Low-carbon Society (Box 5.1). MLIT is the main authority in charge of transport policy and has explicitly integrated climate-related goals into its policy documents.

Vehicles

The Top Runner Programme (Section 3.2) sets targets for average fuel efficiency of new passenger and heavy-duty vehicles by 2010 and 2015. Noticeably, Japan is the only country in the world that has imposed fuel efficiency standards for heavy-duty vehicles. Progress has been rapid, and the 2010 target for passenger cars (15.1 km/l or 153.8 g-CO₂/km) was achieved well in advance (JAMA, 2009). Average fuel efficiency of new gasoline passenger cars produced in Japan was 16.5 km/l in 2008, only slightly below the 2015 target of 16.8 km/l,⁹ indicating that targets could be further raised (Figure 5.7).

Diesel-fuelled cars account for a negligible share of the vehicle fleet. Consequently, Japan has one of the lowest diesel consumption rates for transport purposes among OECD countries. According to Japan's estimates, increasing the share of diesel passenger vehicles in the fleet by 10% would help to reduce GHG emissions from transport by 2 MtCO₂/year (IEA, 2008). The 2006 New National Energy Strategy promotes the use of clean diesel vehicles that have exhaust gas emissions comparable to those of gasoline vehicles. To this end, such vehicles have been fully or partially exempted from vehicle-related taxes (Table 2.2).

Figure 5.7. **Vehicle fuel efficiency**

a) Share of certified fuel-efficient and low-emission passenger cars in total sales.

b) Vehicles produced in Japan.

c) Average certified fuel efficiency.

Source: Japan Automobile Manufacturers Association.

Vehicle taxes

Vehicle-related taxes have been repeatedly modified to favour environmentally friendly vehicles. A reduction of up to 50% applies to the annual automobile tax depending on a vehicle's pollutant emission reductions and fuel efficiency; the tax is increased by 10% for old vehicles. Full or partial exemptions apply to the acquisition and tonnage taxes for low-emission and fuel-efficient cars and so-called "clean vehicles" until 2012 (Table 2.2). Within the framework of the 2008-09 stimulus package for economic recovery, the government introduced a *car scrapping incentive*, subsidising the replacement of old vehicles (13 years or older) with new energy-efficient ones (Chapter 2).

Fuel prices and taxes

Japan deviates from most other OECD countries in fuel taxation. Japanese gasoline taxes and prices are substantially lower than in most OECD countries (Figure 2.4). Tax rates have remained unchanged for more than a decade. Taxes account for a much lower share of fuel prices than in the European G8 countries. This gives drivers a weak incentive to drive energy efficiently even if they choose low-emission cars. In a scenario with lower oil prices and economic recovery, the recent positive trends in GHG emissions from road transport may well turn negative. Fuel taxation more in line with the OECD average would counteract this and help fiscal consolidation (Chapter 2).

Traffic management

Japan has implemented various measures for tackling traffic congestion. *Intelligent transport systems*, using electronic tolls, centrally controlled traffic signals and vehicle information systems, have been introduced. Investments in rail carrying capacity, ring roads and by-passes are helping to make traffic more fluid. The government has also promoted *eco-driving* (e.g. steady speed, reduced load) through several information campaigns. While the overall effects of eco-driving are not clear, it appears to be more promising for freight than passenger transport. Overall, *traffic congestion* remains a

problem, especially in large metropolitan areas. This suggests that stronger incentives are needed to optimise car use, such as congestion charges and peak pricing on urban stretches of motorways.

Japan applies a flexible and rather complex system of *road pricing for motorways*. Lower rates apply to light vehicles and motorcycles. Motorway tolls offer discounts of 30-50% at off-peak times, for long-distance use and on weekends. To divert traffic from congested roads running through residential areas, a discounted toll applies on some urban stretches of motorways (so-called “environmental road pricing”). The government is planning to progressively eliminate road tolls.¹⁰ Overall, the toll system encourages long-distance driving, including over routes that are very well served by fast trains (Chapter 2). Japan should carefully review its road toll system and assess the potential environmental impacts of reducing or eliminating tolls, with a view to making road pricing consistent with its climate-related goals.

Freight transport

New measures have been implemented to improve efficiency in freight transport and to promote a modal shift from road to railways or navigation. *Large carriers and consigners* are required to decrease their energy use by 1% per year over the mid- to long- term, to introduce energy management plans and to periodically report to MLIT.

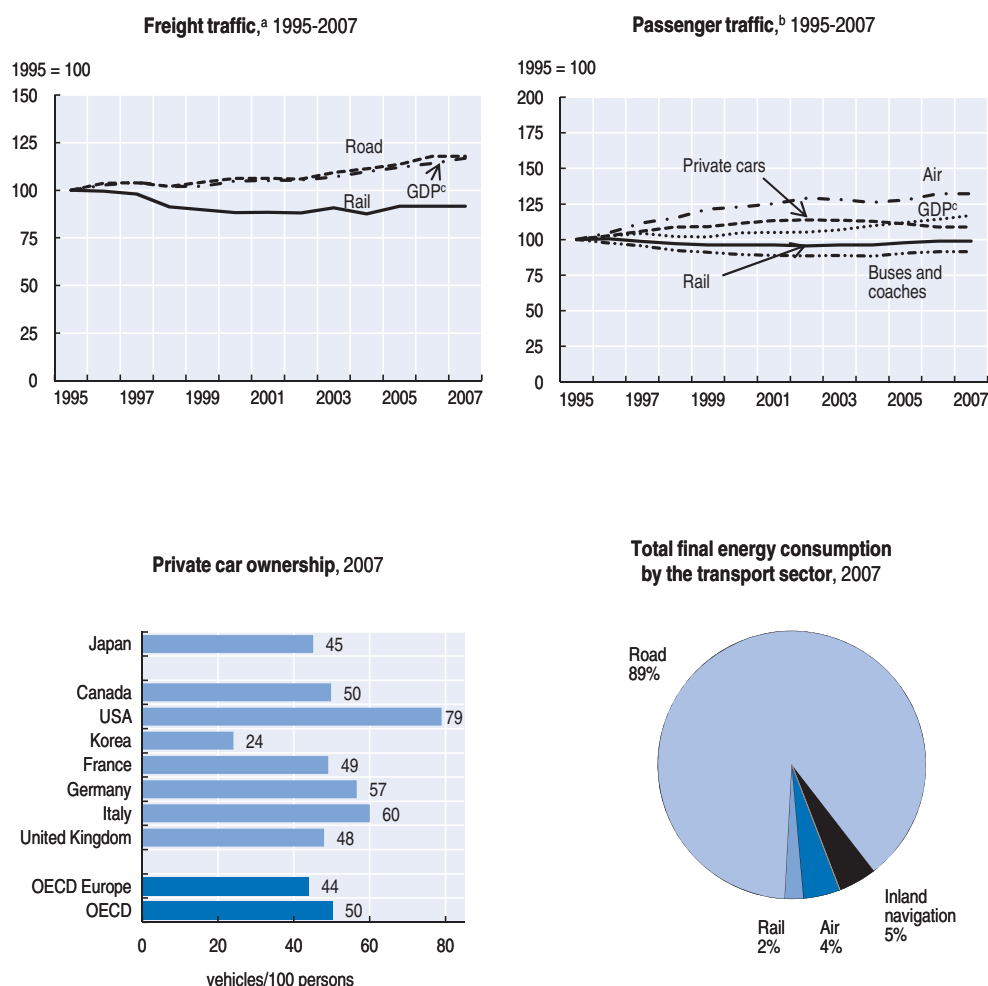
Public transport

Japan has *very well-developed rail and public transport systems*. The government has continued to extend public transport networks and facilities and to improve interconnections and ticketing systems. *Model projects of environmentally sustainable transport* have been developed in 27 areas since 2005. Some municipalities have introduced the “compact city” model in their urban master plans, aiming to bring local economic and social activities closer together.

Performance

Road has remained the dominant freight transport mode and has continued to grow in line with GDP (in tonne-kilometres). Remarkably, this growth is associated with a decrease in distance travelled by heavy duty vehicles (in vehicle-kilometres), indicating an improvement in loading efficiency of road freight transport. Also distance travelled by car has decreased since 2003. The rise in oil prices might well have been a major driver for this decline and have made travelling by public transport more attractive. Air traffic has increased and dominates long-distance passenger traffic (Figure 5.8).

In the three major metropolitan areas,¹¹ public transport is the dominant transport mode, accounting for some 60% of passenger travel. Private car transport remains dominant at national level, and especially in minor cities and rural areas, although it accounts for a lower share of passenger travel than in most OECD countries. The decline in the number of passengers travelling by public transport, together with the need to control public spending, has led to a shutdown of some routes and services in peripheral areas (MLIT, 2008). The number of passenger cars in use increased by some 10% between 2000 and 2008, albeit at a much lower rate than in the previous decade. Private car ownership remains lower in Japan than in the other G8 OECD countries (Figure 5.8).

Figure 5.8. **Transport sector**

a) Index of relative change since 1995 based on values expressed in tonne-kilometres.

b) Index of relative change since 1995 based on values expressed in passenger-kilometres.

c) GDP at 2005 prices and purchasing power parities.

Source: OECD, Environment Directorate; OECD-IEA (2009), *Energy Balances of OECD Countries*.

These trends have resulted in a decline of *energy consumption from transport* (Box 5.1). In particular, energy use from road transport, which makes up about 90% of consumption from the sector, has declined (Figure 5.8). The policy measures described above have contributed to this achievement and, consequently, to a reduction in CO₂ emissions. Only emissions from aviation have grown. Technological advancement and tax incentives have helped to considerably improve average fuel efficiency of the road vehicle fleet, with a shift to smaller and more fuel-efficient cars (Figure 5.7). Efficiency of logistics and freight transport has also improved, mainly due to a shift from driver-owned trucks to larger freight service companies and the adoption of eco-driving by operators. Traffic flows have improved, resulting in reduced traffic congestion and travel time and improved on-road fuel intensity. However, in minor cities and rural areas, CO₂ emissions per passenger have increased, which reflects high reliance on private vehicles (MLIT, 2007). More efforts are therefore needed to improve transport management in these areas.

5. Cross-sectoral policy instruments

5.1. Voluntary initiatives

The Voluntary Action Plan (VAP) *on the Environment* was launched in 1997 by Keidanren (the federation of Japanese industries). Industries in the Keidanren VAP committed themselves to bringing their GHG emissions below the 1990 levels by 2010. Also businesses not affiliated to Keidanren in the transport, commercial and service sectors have set up GHG emissions reduction plans. Overall, the VAPs cover about 80% of 2007 CO₂ emissions from the industrial and energy conversion sectors, and about 45% of national emissions. Each sector stipulates its own target and emission reduction measures in the VAP in consultation with the government. Many industries set their targets in terms of energy or emission intensities.¹² This means they can achieve their targets even if emissions increase, as happened during the economic expansion period.

Keidanren's Evaluation Committee was established in 2002 to carry out *independent reviews of the VAP*. According to the review of the 2007 results, decreased use of nuclear power and increased production resulted in emissions above the target. In 2007, about half of the assessed industries did not meet their targets. Nonetheless, between 2000 and 2006, overall emissions of participating industries remained below the 1990 levels. The review recommended improving the VAP analysis at industry level and ensuring information disclosure.

The voluntary approach has triggered participation and *visible commitment of industrial organisations and companies* to reduce emissions. However, it does not secure a cost-effective and well-balanced distribution of mitigation efforts across industries and companies, and it does not motivate them to go beyond their voluntary commitments. While the government regularly reviews progress and raises the emission targets of successful industries, the level of ambition of these targets and the potential for further energy improvements should be carefully considered. In particular, the target-setting process should be made more transparent. It should take into account the information advantage of the business sector (e.g. on emission abatement costs) and the incentive for businesses to slow down progress towards targets to avoid stricter targets in the future. It should also be determined whether progress made would have been made without the VAP and, hence, whether public money could have been spent on more effective and ambitious programmes. The *cost-effectiveness of the VAP* needs to be thoroughly assessed and compared with other possible policy instruments to make sure that the instruments used are those that allow to achieve the emission reduction targets at the lowest cost.

5.2. Market-based approach

Emissions trading

In 2005, Japan's *voluntary emissions trading scheme (JVETS)* was launched to gain experience in emissions trading. As of 2009, 303 companies participated in the programme, although they accounted for less than 1% of industrial CO₂ emissions. Participants in the JVETS voluntarily pledge to reduce emissions relative to their average in the previous three years. One-third of the abatement costs are borne by the government; this subsidy is returned if the target is not achieved, although no other penalty applies. To meet their targets, firms can either cut their emissions or purchase allowances from firms that have exceeded their targets, as well as credits from the Kyoto mechanisms. Targets have always been exceeded so far and the number of transactions has been modest. In 2008, companies achieved a 23% reduction in emissions from baseline levels, which was much higher than

the committed 8%, and traded allowances at around JPY 800/tCO₂, compared to an average price of JPY 1 200/tCO₂ in the previous two years. The budget to operate the JVETS and subsidise participants has been between JPY 1.8 and 3 billion per year.

A *voluntary domestic credit scheme* was introduced in 2008, with the aim of reducing GHG emissions from small and medium-sized enterprises (SMEs). Under this scheme, large companies that finance emission reduction projects in SMEs can acquire credits certified as emission reductions in their joint project. These credits can then be used to meet the large companies' targets under the VAP.

In October 2008, the government launched a *trial emissions trading system* (ETS), involving 715 firms and covering more than two-thirds of industrial CO₂ emissions. Many ETS participants also take part in the VAP and set their reduction targets accordingly.¹³ However, the trial ETS does not require participants to set a cap on emissions and no fine is issued in case of non-compliance. Participants receive for free an allocation of permits, equal to their baseline emissions net of their own reduction commitment. They can use emission credits acquired through the Kyoto mechanisms and the domestic credit scheme. It is too early to assess the effectiveness of the system.

These emissions trading experiences are a positive step forward, since they imply a *price signal for GHG emissions*, although the signal is still relatively weak. This voluntary approach reflects concerns of the business community about the potential negative impacts of mandatory emission caps on competitiveness. Japan needs to follow up on its plan to introduce a mandatory ETS at the earliest opportunity, with a view to achieving the announced mid- and long-term targets. A mandatory cap-and-trade system, which sets the overall desired level of emissions, would minimise abatement costs, create a clear and credible price signal for investment decisions and promote innovation. The possibility of banking permits (i.e. carrying over permits that are not used in the trading period in which they are issued) would help limit uncertainty and price volatility. Auctioning would provide revenues to help fiscal consolidation (OECD, 2009a). To take account of acceptability issues, auctioning could be gradually introduced, aiming at full auctioning in the mid-term. The ETS should ideally cover the entire economy, including transport. A mandatory ETS could also be linked to such systems implemented in other countries, namely in the EU, thus reducing the overall cost of meeting the targets and lowering carbon prices (OECD, 2009b).¹⁴ The 2010 bill of the Basic Act on Global Warming Countermeasures foresees establishing a mandatory ETS. A *mandatory cap-and-trade system is set to become operational in Tokyo in 2011, covering around 40% of total emissions from the commercial and industrial sectors in the metropolitan area* (Box 5.3).

Carbon taxation

The government has been discussing the *introduction of a carbon tax* for several years. In 2009, MOE proposed a tax of JPY 1 064 (USD 10) per tonne of CO₂ on fossil fuels, including transport fuels. Relief measures for specific industries would be considered, such as exempting coal for steel manufacturing and compensating large emitters. Such sectoral exemptions would create uneven abatement incentives across sectors and a loss of efficiency. Therefore, they should be transitional. Japan plans to introduce the carbon tax as part of the *comprehensive tax reform scheduled for 2011*. This would provide opportunities to raise additional revenues that can help fiscal consolidation, or partially or fully shift the tax burden from more distortionary taxes on businesses and labour (Chapter 2).

Box 5.3. The Tokyo Metropolitan Emissions Trading Scheme

Tokyo is one of the biggest cities in the world with 13 million population and USD 815 billion of GDP in 2006. It functions as Japan's political, economical and cultural centre, attracting people, companies and government institutions. This has resulted in large CO₂ emissions (56 Mt), which are comparable to those of a country like Norway, for example. The top contributor to CO₂ emissions is the commercial sector (21 Mt), followed by transportation (15 Mt) and households (14 Mt). Emissions from transport decreased by 16.5% in the 2000-07 period, whereas those from the commercial sector increased by 9%. The Tokyo Metropolitan Government (TMG) is committed to *reducing GHG emissions in the Tokyo area by 25% from the 2000 levels by 2020*. This target is shared among sectors, with larger cuts required in the transport (–40%) and residential (–20%) sectors, and a 10% cut in the business sector.

To tackle emissions from the public sector, TMG has implemented a *reporting system*. The system is based on the approval of five-year emission reduction plans at the government agency or institution level, mid-term reporting and final reporting. Successful government institutions receive an award. The system can be implemented relatively easily since fewer than 1% of these institutions in the metropolitan area emit approximately 40% of total CO₂.

TMG launched its metropolitan *cap-and-trade* system in April 2010. This set emission caps on some 1 400 buildings and commercial activities, with the aim of decreasing emissions by 6% in 2010-14 and 17% in 2015-19 from the base level (average of continuous three years in 2002-07 period). This is quite unique compared to other emissions trading systems (ETSs), which usually target the industrial sector. Participants in the ETS have several options to achieve their targets; for example, they can offset their emissions by reducing emissions from large sources outside of the Tokyo metropolitan area. Trading is set to begin in 2011.

According to the *opinion poll* conducted by the Tokyo Chamber of Commerce and Industry in May 2008, around 90% of firms acknowledged the importance of measures to combat climate change. About 60% declared that they expected an increase in economic costs from the implementation of the ETS, although only 4% opposed the introduction of the ETS and some requested relief measures to be included in the system.

TMG became a member of the *International Carbon Action Partnership* (ICAP) in May 2009, and presented its system as a model for low carbon metropolitan areas. In an effort to reinforce co-operation with neighbouring prefectures, TMG has launched a number of initiatives (e.g. workshops) in which 80% of prefectures and large cities have participated.

5.3. The Kyoto mechanisms and carbon sinks

According to the Kyoto Protocol Target Achievement Plan, the Kyoto mechanisms – i.e. emissions trading, Clean Development Mechanism (CDM) and Joint Implementation (JI) – could account for 1.6% of the GHG emission reductions needed to meet the Kyoto target (Figure 5.3). Japan has been purchasing emission credits from the international market since 2004, and JPY 30.3 billion have been allocated for credit purchases in the 2008-12 period. The New Energy and Industrial Technology Development Organisation (NEDO) is the independent agency managing these credit purchases. As of 2008, NEDO had purchased 55 MtCO₂. The company Japan Carbon Finance Ltd. develops GHG reduction projects, which are funded by the Japanese Greenhouse Gas Reduction Fund (JGRF), and purchases related emission credits. As of June 2008, Japan Carbon Finance had purchased credits for 18.5 MtCO₂ and distributed them to JGRF investors.¹⁵

As of end 2009, Japan was the world's fourth largest CDM investor, with 277 projects representing 11.6% of the total number of CDM projects worldwide. These are concentrated in a few countries, with China alone accounting for two-thirds of total credits from CDM projects, and the top five host countries (China, Brazil, Korea, India and Chile) accounting for more than 85% (OECD, 2009a). The government has issued guidelines for assessing their effectiveness. Japan has also been using part of its official development assistance (ODA) to develop CDM projects. However, in accordance with the 2004 decision of the OECD Development Assistance Committee, Japan should ensure that the use of ODA for CDM projects does not reduce funds available for aid activities.

As a relatively energy efficient economy, Japan has much scope to use the Kyoto mechanisms to *reduce the costs of achieving its targets* beyond the Kyoto commitment period. Increasing emission credit purchasing to 20% of total emission reductions would more than halve the cost of achieving a 20% cut (relative to 1990 levels) in emissions by 2020 relying on domestic measures alone (OECD, 2009b).

Japan plans to increase forest capacity for carbon uptake by thinning additional 0.2 million hectares (ha) per year in 2007-12, for a total of 3.3 million ha. In 2007 and 2008, Japan appropriated the necessary budget resources for these additional forest improvements.

6. Climate change policies at local level

Prefectures and municipalities play an important role in climate change policy and develop their own targets, policies and measures. The central government provides guidelines, model projects, and financial support. Some municipalities, such as the Tokyo Metropolitan Government, have led the way for the introduction of innovative policies (Box 5.3).

In 2008, the government launched the *Eco-Model City Project*. The GHG emission reduction plans of 13 cities were selected to receive governmental technical and financial support. The government also shares information with other cities and oversees the project. There is a wide variety of participants, ranging from Yokohama with 3.65 million inhabitants to Shimokawa with 3 900 inhabitants. This is a promising initiative for both technical and social innovation, although it is too early to assess results in terms of GHG reductions on the ground.

7. Climate change impacts and adaptation

Like many other OECD countries, Japan is in its *early stage of assessing climate change impacts* and mainstreaming climate change adaptation into physical planning and other long-term decisions. Some research projects have attempted to assess the nature, magnitude and costs of climate change impacts in Japan.

A *Committee on Climate Change Impacts and Adaptation Research* was established in October 2007. In October 2009, MOE, the Ministry of Education, Culture, Sports, Science and Technology, and the Japan Meteorological Agency jointly released a report on "Climate Change and Its Impacts in Japan" to provide inputs for policy-making. The report recognises the impacts that have already been observed, such as the increase in mean temperatures and frequency of heavy rains; it estimates that a rise in temperature by 2 to 3.2 degrees Celsius from pre-industrial levels would cost Japan from JPY 11 trillion/year to JPY 17 trillion/year. Only the basic elements of an adaptation strategy have been laid down, such as vulnerability assessment, constant monitoring, and early warning. Integration of

climate change adaptation into planning processes will be the responsibility of each sector authority. Adaptation is also an important part of Japan's co-operation with neighbouring and developing countries (Chapter 4).

8. Co-operation with developing countries

In 2007, Japan launched the Cool Earth 50 strategy, proposing the long-term target of halving current global emissions by 2050. Co-operation with developing countries is a key element of this strategy. In 2008, Japan introduced a *Cool Earth Partnership Financial Mechanism*, amounting to USD 10 billion over five years.¹⁶ Based on policy consultations with developing countries, USD 2 billion would be allocated to assist with adaptation efforts and improve access to clean energy, and USD 8 billion would be used to support mitigation. The latter includes the promotion of CDM projects, improved policies (legal systems, capacity development, monitoring), private sector programmes and co-benefits initiatives. As of November 2008, eight countries were already getting assistance from Japan under the partnership (Indonesia, Tuvalu, Senegal, Madagascar, Guyana, Niger, Namibia, and Ethiopia) and 60 were at an early consultation stage.

In 2009, Japan launched the new *Hatoyama Initiative*, which absorbs the Cool Earth Partnership and the related financial commitments to support developing countries in addressing climate change. Under this initiative, Japan will provide overall USD 11 billion in ODA and other official flows and USD 4 billion of private funds by 2012. These initiatives put great emphasis on the use of Japanese technologies and expertise, which may result in tied aid to developing countries and reduce aid effectiveness (OECD, 2010).

Japan has been promoting co-operation in the Asia-Pacific region on the basis of a "co-benefits approach", with the aim of achieving economic gains from addressing climate change and air pollution problems, and simultaneously benefiting the development process of the partner country. Co-benefits demonstration projects have taken places in China and Indonesia, following the 2007 Joint Ministerial Statements, as well as in other countries (e.g. in Malaysia, Thailand) (Chapter 4).

Notes

1. The base year is 1990 for carbon dioxide, methane and nitrous oxide, and 1995 for fluorinated gases.
2. Coal has not been used in the residential sector since 1999.
3. The projected emission reduction by Kyoto mechanisms varies in accordance with actual emission levels in 2008-12.
4. This budget can be divided into four categories: i) measures directly contributing to the target (JPY 530 billion); ii) measures contributing in the mid- or long-term (JPY 149 billion); iii) measures indirectly contributing to the target (JPY 365 billion); and iv) other measures (JPY 40 billion).
5. Renewables are intermittent electricity sources that can negatively affect the stability of the electricity grid.
6. Municipalities are required to prepare and implement a programme for using more than 90% (in carbon content) of biomass derived from local waste or more than 40% (in carbon content) of locally available unused biomass.
7. In 2008, 200 kl of bioethanol and 10 000 kl of biodiesel were produced.
8. This implies that energy management is required also in small factories, offices and shops that are part of a larger company, even if their on-site energy consumption is relatively low.

9. Average fuel efficiency is measured using the JC08 test cycle. If measured using the less strict 10-15 test cycle, average fuel efficiency of new gasoline passenger cars produced in Japan was 16.9 km/l in 2008.
10. Japan plans to phase out tolls on 37 motorways, representing 18% of total motorway length, starting from June 2010.
11. Tokyo, Osaka, Kyoto and the neighbouring prefectures of Saitama, Chiba, Kanagawa, Aichi, Hyogo and Nara.
12. For instance, the Japanese Federation of Electric Power Companies has voluntarily committed to reducing CO₂ emissions intensity of electricity generation to 0.33 kg-CO₂/kWh by 2020. However, carbon intensity of power generation rose to 0.453kg-CO₂/kWh in 2007, by nearly 20% since 2000, due to the increased share of fossils in the fuel mix.
13. Businesses that do not participate in the VAP use the JVETS target-setting method.
14. Linking ETSs directly tends to lower the overall cost of meeting the countries' or regions' joint targets by allowing higher-cost emission reductions in one ETS to be replaced by lower-cost emission reductions in the other.
15. JGRF was established in 2004 by a total of 33 entities, including private firms and two government banks.
16. In addition to the commitment of USD 1.2 billion for the Climate Investment Fund.

Selected sources

The government documents, OECD documents and other documents used as sources for this chapter include the following. Also, see list of websites at the end of this report.

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PART II

Chapter 6

Waste Management and the 3Rs (Reduce, Reuse, Recycle)

Over the last decade, Japan has shifted from a waste management policy to an integrated waste and material management approach that promotes dematerialisation and resource efficiency. Landfill shortage and dependency on natural resources imports have been key drivers of these changes. This chapter analyses progress achieved in building a sound material-cycle society based on the 3Rs (reduce, reuse and recycle). With international movement of recyclables developing rapidly, loopholes have appeared in Japan's advanced recycling system. This chapter examines steps taken to promote and spread the 3Rs strategy in Asia, and to prevent illegal transboundary movements of waste.

Assessment and recommendations*

The 2000 Basic Law for Establishing a Sound Material-Cycle Society has integrated the environmentally sound management of waste with the 3Rs (reduce, reuse and recycle) approach. This represents a *shift from waste management to sound materials management*. The Fundamental Plan, which implements the law, was approved by the Japanese Cabinet in 2003 and revised in 2008. Quantitative targets for resource efficiency, recycling, and final disposal of waste have been achieved and strengthened. Overall resource productivity of the Japanese economy increased by 37% between 2000 and 2007, mainly due to declining inputs of construction materials. Inputs of imported resources (fossil fuels, metals) continue to grow and the environmental impacts related to these trade flows have not yet been assessed.

About 60% of municipalities are charging for waste collection, but *cost recovery for waste services* is still low (about 13% nationwide). During the review period, recycling of selected waste streams has improved. The 3Rs concept has been successfully implemented by local authorities, Japanese businesses and citizens in Eco-Towns. The *Eco-Town Programme* has created synergies between industrial and urban areas to maximise resource use, recycling and local development. *Final disposal amounts* of non-municipal and municipal waste have been reduced by 55% and 40% respectively. However, waste generation from the manufacturing industry has increased faster than GDP. Overall, the 3Rs policy has focused on recycling and reducing final disposal, mainly to respond to landfill shortage. Further efforts are needed in waste prevention (reduction and reuse).

Treatment and disposal of waste have been streamlined with the installation of bigger facilities serving larger areas. Incineration capacity for non-municipal waste has increased significantly, yet dioxin emissions from waste incineration have been cut drastically. A polychlorinated biphenyl (PCB) waste treatment system has been established. However, compared to 2000, non-municipal landfill capacity has decreased, and securing disposal sites in major cities continues to be a challenge.

The *principle of extended producer responsibility* (already applied to containers and packaging, electric and electronic equipment, construction materials, and food) has been broadened to include end-of-life vehicles. However, this principle has been only partially implemented (e.g. electric and electronic equipment, end-of-life vehicles). The current situation, where final owners are charged for returning their end-of-life electric and electronic products, continues to encourage illegal dumping, unregulated collection activities and uncontrolled exports of secondary, potentially hazardous, materials. Although regulatory measures have been taken, significant resources will be needed to remediate contaminated sites.

Japan has played a leading role in improving *information on material flows* at the international level and is promoting the 3Rs in Asia. However, an increase in the recyclables trade and price variations are undermining the effectiveness of the Japanese domestic

* Assessment and recommendations reviewed and approved by the OECD Working Party on Environmental Performance at its meeting on 4 May 2010.

recycling system. There are concerns that hazardous waste is being exported under the cover of trade in non-hazardous recyclable materials. This underlines the importance of co-ordinating waste management policies within the Asian region.

Recommendations

- Continue to promote the 3Rs strategy at national and local levels and implement the Fundamental Plan for Establishing a Sound Material-Cycle Society: include targets on resource productivity by sector; continue to support analysis of resource productivity by sector and material flows, including better assessment of trade-related flows and their associated environmental impacts.
- Continue to promote the 3Rs strategy internationally, as well as international efforts to control illegal shipments of hazardous waste; promote the co-ordination of waste management and 3Rs policies in Asia.
- Strengthen the extended producer responsibility system in order to reduce waste generation and illegal dumping of waste, for instance by promoting environment-friendly design and eco-labelling, further internalising recovery costs into product prices (e.g. by a recovery fee included in the purchase price), and abolishing charges to consumers for disposal of electric and electronic products.
- Implement measures that promote synergies between recycling, landfill diversion and reduction of greenhouse gas emissions (e.g. develop incineration capacity with energy recovery, improve separate collection of bio-waste).
- Increase recycling and materials and energy recovery to substitute primary resources for production and fossil fuels for energy supply.
- Promote waste prevention and greater cost recovery in municipal waste services by expanding the use of waste charging schemes.

1. Objectives and policy framework

1.1. Establishing a sound material-cycle society in Japan

National objectives and principles for waste management and 3Rs have been set in a comprehensive legislative system. Historically, health concerns have been the main drivers of the Japanese waste policy. The Waste Management and Public Cleaning Law (WML, 1970) called for improving public health through environmentally sound waste disposal. The increase of waste generation and shortage of landfills have led, in the 1990s, to the development of recycling-oriented legislation, such as the Law for the Promotion of the Effective Utilisation of Resources (1991), implemented by recycling laws on specific waste streams: containers and packaging (1995), home appliances (1998), food waste (2000), construction waste (2000), and end-of-life vehicles (ELV, 2002). The Basic Law for Establishing a Sound Material-Cycle (SMC) Society, enforced since 2001, has consolidated Japan's waste legislation and broadened its scope. The Basic Law aims to promote a sustainable society where consumption of natural resources and environmental loads are minimised through shared responsibility among authorities, businesses and citizens. It calls for preventing waste generation (reduce), promoting the cyclical use of products (reuse, recycle), and ensuring proper waste disposal. It strengthens the responsibility of the waste generator and extends environmental producer responsibility. On the consumption side, the Law for Promoting Green Purchasing (2001) requires public bodies to promote eco-friendly products.

Since 2000, the various pieces of legislation have been revised to expand the scope of 3Rs implementation to new products and industries, streamline waste management and strengthen health protection (Soil Contamination Countermeasures Law, PCB Law). More recently, the Agriculture, Forestry and Fishery Biofuels Law (2008) has been drafted to also support the achievement of a low carbon and a recycle-based society.

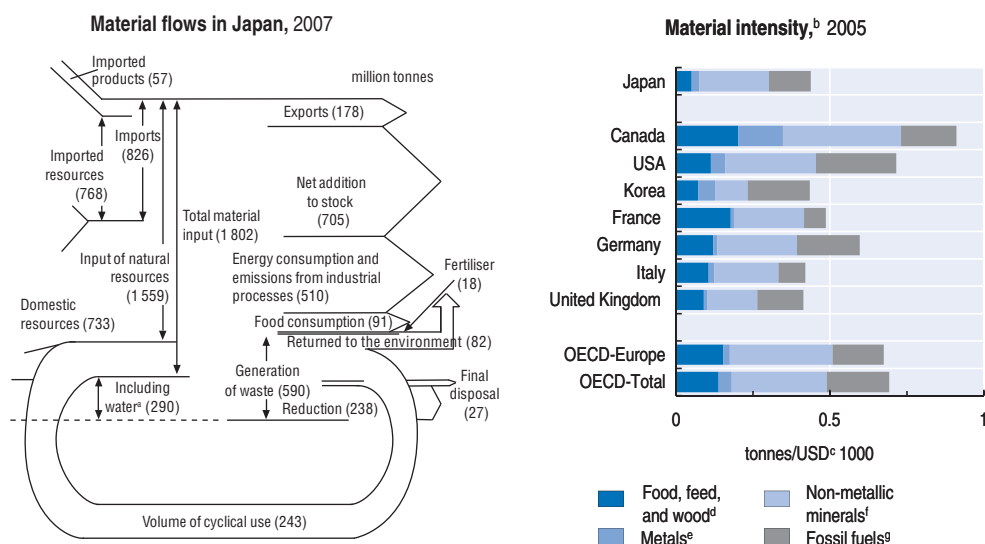
The first *Fundamental Plan for Establishing a SMC Society*, required by the related law, was approved by the Japanese Cabinet in 2003. It specifies economy-wide material flow indicators and effort indices to monitor progress in implementing SMC society measures (Figure 6.1). The plan is reviewed annually by the Central Environment Council.¹ Based on the Council's recommendations, the government revised the Plan in March 2008 with a view to: i) strengthening collaborative efforts with climate change measures that promote the integrated development of a low-carbon, SMC society in harmony with nature; ii) clarifying the concept of a SMC society by using specific material flow indicators; iii) developing regional material-cycle spheres (i.e. reduce resources consumption and improve efficiencies at the most relevant territorial scale) revitalising local communities; and iv) taking the lead in promoting the 3Rs at the international level and contributing to developing sound material circulation in East Asia (Government of Japan, 2008) (Table 6.1).

Japanese performance on waste management can also be assessed against the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (1989), the OECD Council Decision Concerning the Control of Transboundary Movements of Wastes Destined for Recovery Operations (2001), and the OECD Council Recommendation on the Environmentally Sound Management of Waste (2004). The 2002 OECD *Environmental Performance Review* (EPR) of Japan made recommendations regarding waste management and the 3Rs in Japan. Actions taken by Japan to implement these recommendations are presented in Table 6.2 (OECD, 2002).

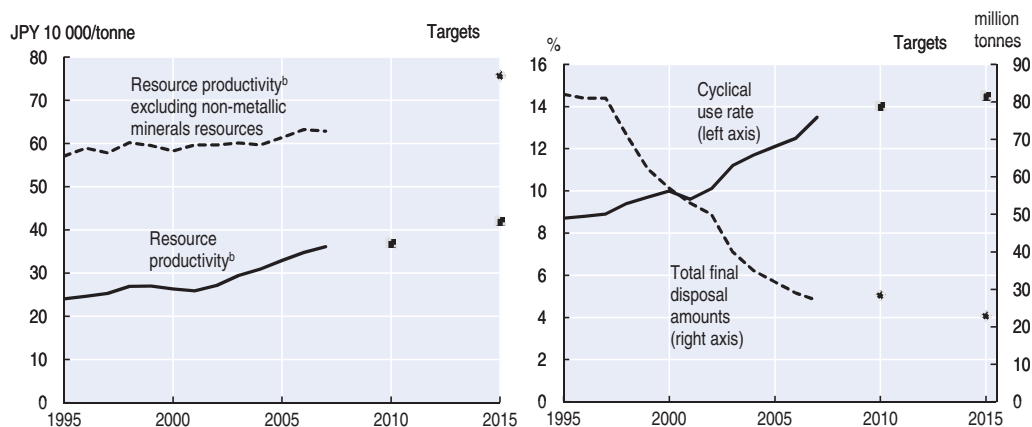
1.2. From the 3Rs initiative to the Kobe action plan: toward a worldwide SMC society

Japan actively promotes the 3Rs internationally. The heads of state and government of G8 countries endorsed the Japanese 3Rs initiative to encourage more efficient use of resources and materials (Sea Island Summit, 2004). The objectives of the initiative, which were detailed at the time of the official launch (Tokyo Ministerial Conference, 2005), include: i) promote the 3Rs in each country; ii) reduce barriers to international flows of goods and materials; iii) improve co-operation between developed and developing countries; iv) encourage co-operation among stakeholders; and v) promote science and technology for the 3Rs. G8 countries agreed to set targets, taking account of resource productivity (St. Petersburg Summit, 2006), and made a commitment to encourage conservation, recycling and substitution of raw materials, including rare metals, for sustainable growth (Heiligendamm Summit, 2007). They endorsed the 3Rs Action Plan (Hokkaido Toyako Summit, 2008) that had been adopted by environment ministers (Kobe, 2008) and which aims: to prioritise 3Rs policies and improve resource productivity (giving higher priority to waste reduction); to establish an international SMC society; and to promote collaboration for capacity development for the 3Rs in developing countries. Responding to G8 requests, two OECD Council recommendations have been adopted (2004 and 2008) to improve information on material flows in order to promote resource productivity.

Figure 6.1. Material flows and indicators



Indicators and targets of the Fundamental Plan establishing a sound material-cycle society



- a) Input of water included in waste (sludge, animal manure, human waste, waste acid, and waste alkali) and sediment associated with economic activities (sludge from mining, building and waterworks and tailing from mining).
- b) Domestic material consumption (DMC) per unit of GDP, where DMC is the sum of domestic (raw materials) extraction (DE) used by an economy and its physical trade balance (imports minus exports of raw materials and manufactured products). A decline in material intensity is equivalent to a rise in material productivity, i.e. GDP/DMI in Japanese indicators, where DMI=DE+IMP.
- c) GDP at 2000 prices and purchasing power parities.
- d) Domestic production from agriculture, forestry and fisheries, plus trade of raw and processed products from these sectors (e.g. cereals, live animals, foodstuff, feedstuff, pulp and paper, processed wood, fuel wood, biofuel).
- e) Domestic extraction of metal ores, plus trade of metal ores (e.g. bauxite), metal concentrates (e.g. nickel matte), refined metals (e.g. steel, aluminium, copper), products mainly made of metals (e.g. vehicles, machinery, electronics and electrical equipment), and scrap.
- f) Domestic extraction and trade of minerals used in industry (e.g. salts, potash, phosphate rocks) and construction (e.g. sand, gravel, stones), plus trade of derived processed products (e.g. cement, glass).
- g) Coal, crude oil, natural gas, peat and traded derived products (e.g. plastic and rubber).

Source: Ministry of the Environment; OECD (2008), OECD Pilot MF Database.

StatLink <http://dx.doi.org/10.1787/888932318851>

Table 6.1. **Other quantitative targets of the Second Fundamental Plan for Establishing a Sound Material Cycle Society**

Objectives	Unit	Targets ^a	2000	2007	Achievements
Reducing waste		(% change/2000)			(%)
Daily amount of municipal waste ^b generated per person	Kg/person/day	-10	1.185	1.089	-8
Daily amount of household waste ^c generated per person	Kg/person/day	-20	0.654	0.601	-8
Total amount of commercial waste ^b generated	Million tonnes	-20	18	15	-16
Final disposal amount of non-municipal waste	Million tonnes	-60	45	20	-55
Raising awareness of SMC					
Awareness of waste reduction, cyclical use, and green purchasing	% of respondents	90	71, 83 ^d	94, 86 ^d	
Action for waste reduction, cyclical use, and green purchasing	% of respondents	50	32, 82 ^e	62, 84 ^e	
Promoting SMC business					
Green purchasing	% of companies	50/50/30 ^f	24/15/12	62/67/57	
Environmental business management	% of companies	50/30 ^g	30, 23/12, 12	49, 37/27, 20	
	Number of Eco Action				
	21 certificates ^h	6 000	..	2 926	
SMCS market	JPY trillion	Double	21	30	44

a) Target year: 2015.

b) Including recycled waste.

c) Excluding recycled waste. When including recycled waste, reduction achieved is 4%.

d) Percentage of respondents trying to: reduce and recycle waste, buying environmentally friendly products.

e) Percentage of respondents refusing plastic bags, sorting waste.

f) 50% of all the local governments and listed companies (Tokyo, Osaka and Nagoya Stock Exchanges), and about 30% of the unlisted (> = 500 employees) companies surveyed, implementing organisation wide green purchasing.

g) 50% of listed companies and about 30% of the unlisted companies surveyed publishing an environmental report that includes environmental accounting results.

h) Certification system for small and medium size enterprises integrating environmental management, performance evaluation and reporting.

Source: Ministry of the Environment.

1.3. Institutional framework

Responsibility for implementing waste management legislation is shared by central and local governments: the central government establishes the national strategy, supervises multi-prefecture waste management, and controls waste imports and exports. Prefectures and certain large cities (designated by Cabinet order) regulate, through a licensing system, non-municipal waste management businesses located in their regions. Management of municipal waste is the responsibility of individual municipalities, but neighbouring municipalities may join in co-operative agreements to benefit from economies of scale. Municipalities are increasingly subcontracting collection and treatment of municipal waste to private companies. Some enforcement duties of the Ministry of the Environment (illegal dumping and waste trade) were decentralised to seven Regional Environment Offices, created in 2005.

The Ministry of the Environment (MOE, created in 2001) is responsible for waste management and 3Rs policy. The Ministry of Economy, Trade and Industry (METI) contributes to the design of the 3Rs policy. The METI, the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) and the Ministry of Agriculture, Forestry and Fisheries (MAFF) have authority over the minimisation and recovery of waste generated by the industries under their supervision.

Table 6.2. **Actions taken on the 2002 EPR recommendations for waste management and 3Rs**

Recommendations	Action taken
Implement the <i>Basic Law for Establishing a Sound Material-Cycle Society</i> and related recycling regulations, develop quantitative targets, monitor the effectiveness and efficiency of their implementation, and broaden the application of extended producer responsibility (e.g. to automobile producers).	The Fundamental Plan for Establishing a Sound Material-Cycle Society (which implements the Law) was approved by the Cabinet in 2003, reviewed, and revised in 2008. Quantitative targets (on resource productivity, cyclical use rate and final disposal amounts) set for 2010 (1st Plan) were on track in 2006 (target on disposal achieved); the revised Plan includes stricter targets for 2015. Laws have been amended to further promote recycling (packaging and containers, home appliances, food waste). Extended producer responsibility has been broadened to include end-of-life vehicles (2002 law came into force in 2005).
Expand the use of <i>economic instruments</i> for waste management, especially <i>user charges</i> for cost recovery in municipal waste services.	Charging households and businesses for waste services has progressed but cost recovery in municipal waste services is still low (about 13% nationwide).
Develop more efficient <i>municipal waste management services and companies</i> , increasing the setting up of inter-municipal treatment and disposal facilities.	The government has been promoting partnerships between municipalities through area-wide waste management programmes, providing subsidies to local authorities (> 50 000 inhabitants). The number of domestic waste incinerators fell by 25% and larger and more efficient incinerators are now operating. However, incineration capacity has decreased by 6%. Between 2000 and 2007, dioxin emissions from municipal waste incineration facilities have been cut by 95%. There has been a drop in the number of landfills (-12%), as well as in remaining landfill capacity (-26%).
Improve the accountability of industry concerning <i>voluntary initiatives</i> on waste reduction and recovery.	Since 2001, businesses generating large amounts of industrial waste are required to submit a waste management plan, and report on its implementation to the prefecture's governor. Results must be published by the governors; 11 000 reports were submitted in 2004 (9 000 in 2001). Since 2005, specified companies are legally required to publish environmental reports with various environmental performance indicators, such as material and energy input, waste generation and disposal, eco-efficiency, etc.
Increase capacity for <i>treatment and disposal of industrial waste</i> , with appropriate public access to information and participation.	While the number of incineration plants for industrial waste fell, capacity increased more than twofold. Between 2000 and 2007, dioxin emissions from industrial waste incineration decreased by 90%. The remaining capacity of landfills increased by 6% until 2005, then dropped by 13% in 2006.
Extend environmental legislation and policy attention to cover all types of <i>contaminated sites</i> .	The Soil Contamination Countermeasures Law came into force in 2003. The number of registered sites is increasing, as well as restoration measures. Contaminated sites are still a concern and remediation costs (estimated at about JPY 17 trillion in 2007) will have to be funded. The Law was revised in 2009.

Source: OECD, Environment Directorate.

2. Performance

2.1. Material flows and resource efficiency

The Japanese economy is highly dependent on imports of natural resources. The country has limited space for landfilling, and so has strong incentives to *manage its natural resources efficiently*. The country initiated economy-wide material flows (MF) studies in 1992 to better understand the material² basis of the economy. It then actively contributed to promote MF studies at international level. The National Institute for Environmental Studies (NIES) leads research activities, produces annual MF data on behalf of the Ministry of the Environment (MOE) and designs related policy options. Japan has been a world leader in the use of MF Accounts in government policy, including targets on resource efficiency in the Fundamental Plan for Establishing a SMC Society. Recent government research uses multi-scale material flow models to assess the performance of policy measures and technologies in sustainable production and consumption; it also links material flow information at the macro-, meso- and micro-levels. Industry and local authorities have also progressed in using MF analysis to benchmark their activities (Box 6.1) (OECD, 2008a, 2008b, 2008c).

In 2007, 1.8 billion tonnes of materials were supplied to the Japanese economy (Figure 6.1) (Ministry of the Environment, 2009a, 2009b). Imports accounted for 46% of this total input, domestic resources for 41% and recycling for 13%. Less than half of these

Box 6.1. Environmental management based on eco efficiency indicators

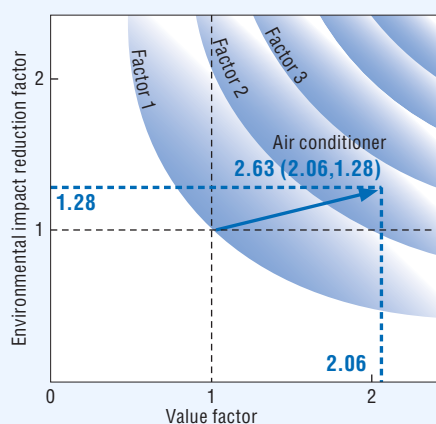
Although the Fundamental Plan for Establishing a Sound Material-Cycle Society does not set binding targets for industries, some companies have started to apply the eco-efficiency concept in their business decision-making and/or communication tools. The World Business Council for Sustainable Development has proposed this management philosophy to encourage businesses to search for environmental improvements that also yield economic benefits. The Japan Environmental Efficiency Forum, bringing together companies and research laboratories, was funded by METI in 2004 to develop the concept. The same year, the Japan Environmental Management Association for Industry (JEMAI), Secretariat of the Forum, released a handbook on eco-efficiency indicators.

Eco-efficiency is defined as the ratio: value of product (or service)/environmental load. Factor X expresses the relative level of improvement in eco-efficiency. It compares the eco-efficiency of the evaluated product with the eco-efficiency of a reference product. The goal is to improve the functional performance of a product over its life cycle while its environmental impacts are reduced. Life-cycle assessment (LCA) is used to integrate multiple environmental impacts (e.g. climate change, acidification, eutrophication, summer smog, ozone depletion, eco-toxicity, radioactive emissions, resource depletion, waste, land use, etc.). Eco-products are then defined as products (or services) that improve eco-efficiency.

Progress has been made to standardise calculation methods of environmental impact (denominator) and product value (numerator). For example, in 2009, eight leading Japanese electronics companies (Fujitsu, Hitachi, Panasonic, Mitsubishi, NEC, Sanyo, Sharp and Toshiba) collaborated to develop guidelines for a Common Factor X approach (Figure a). Although this does not allow direct product comparison between companies, it does give insights into the replacement effect for products manufactured by the same company.

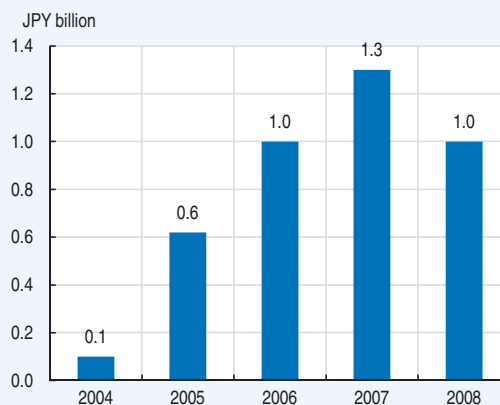
METI has supported the improvement of resource productivity of production processes through standardisation of materials flow cost accounting (MFCA). The system measures the flows and stocks of materials in a production process in both physical and monetary units. It makes it possible to identify waste-generating steps in the process and generates cost information based on resource productivity (Figure b).

Figure a



Factor T (Toshiba): The 2007 air conditioner has a factor 2.63 compared to the 2000 model. Its functional value has been increased by 2.06, and its environmental impact has been reduced by 1.28.

Figure b



Canon: Introduction of MFCA: economics benefits from reduced purchasing of (main and secondary) raw materials.

As part of the Environmental Consideration Law (2004), MOE has published guidelines (2007) requiring businesses to include eco-efficiency indicators in their environmental reports. It recommends combining them with environmental accounting information to show the relationship between all environmental impacts caused by an organisation's activities and the results of the activities (value added, net sales, etc.). International conferences on eco-balance, eco-design and eco-materials have been regularly organised during the last decade with the participation of industry.

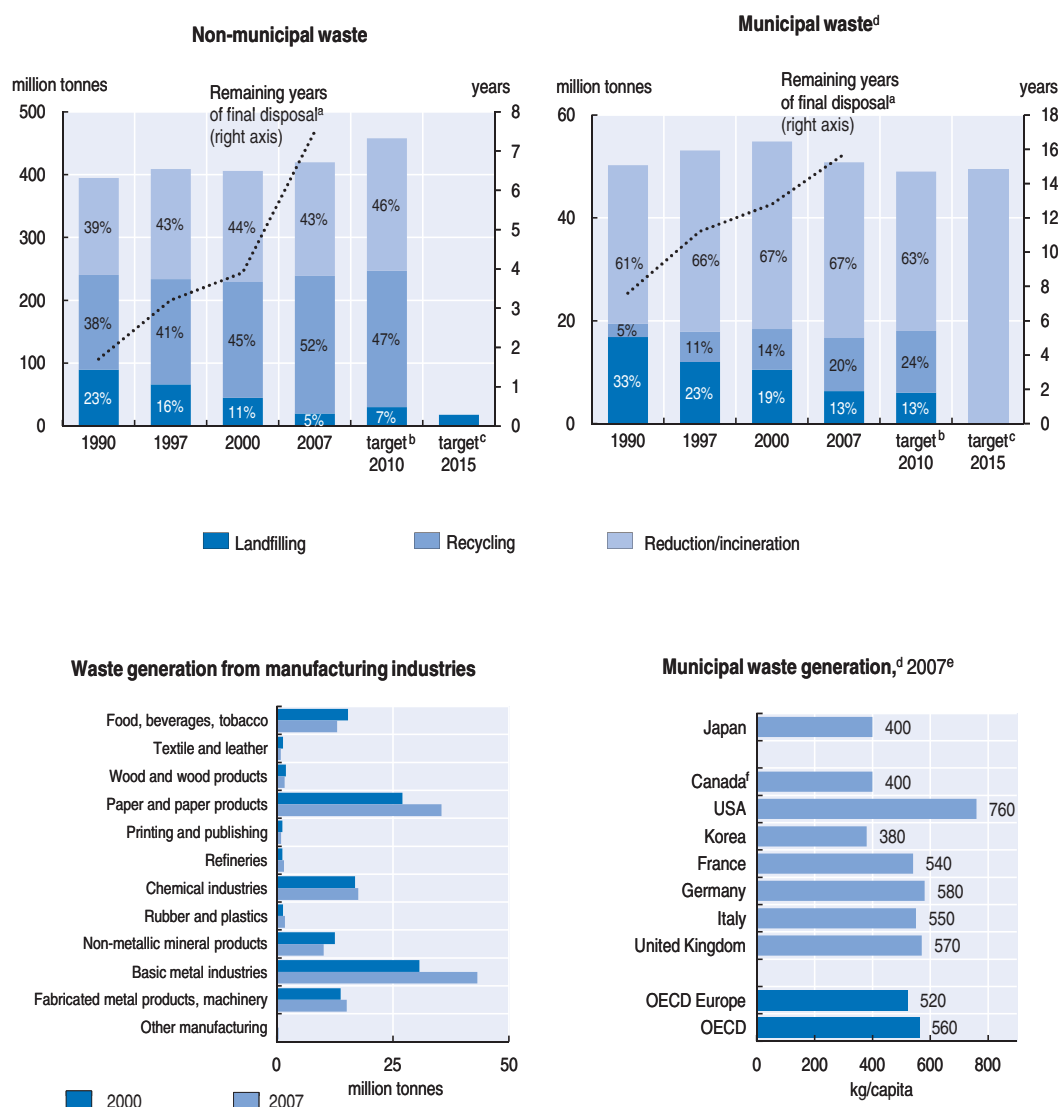
materials was added to stock (buildings, infrastructures and durable goods), 178 million tonnes were exported, 510 million tonnes were consumed as energy by industrial processes, and 590 million tonnes of waste were generated (of which 41% were recycled). In 2005, Japanese material intensity was 37% below the OECD average. Japan has set national objectives to *improve resource productivity* (generate GDP with a lower input of natural resources) by 40% in 2010 and by 60% in 2015 compared to 2000. Between 2000 and 2007, Japan's overall resource productivity increased by 37%. This trend is linked to a decrease in construction and the associated reduced use of non-metallic minerals, which make up the largest share of total input of natural resources. However, the input of fuel oil and metallic resources, which are mostly imported, increased in line with the demand for new high-tech products. The government considers that the exploitation of these resources has not been curbed enough, and it has included a challenging target on resource productivity, excluding non-metallic minerals, in the revised Fundamental Plan. Given the importance of the resources trade for Japan, the government also decided to monitor the country's total material requirement, which includes indirect flows that are associated with imports but that take place in other countries (*e.g.* raw material extraction necessary to produce imported metal ores).

2.2. Waste prevention and generation

According to the WML, waste is defined as unwanted solid or liquid materials or items of no use as they are no longer saleable. It differentiates between non-municipal³ ("industrial waste" in Japanese legislation) and municipal waste, and specifies within both categories specially controlled (hazardous) waste.⁴ The Basic Law for Establishing a SMC Society also includes (collected or disposed) used goods, and secondary materials generated by human activities. Radioactive waste is not covered by these laws. In 2007, 590 million tonnes of waste were generated in Japan. Of this amount, non-municipal waste accounted for 71%, municipal waste for 9%, night soil⁵ for 6% and other by-products⁶ for 14%.

About 420 million tonnes of non-municipal waste were generated in 2007, mainly composed of sludge (44%), livestock excrement (21%) and construction debris (15%) (Figure 6.2). This waste was generated essentially by manufacturing industries (34%), agriculture (21%), construction (18%) and sewage disposal (19%). Hazardous industrial waste accounted for less than 1% of the total. Between 1997 and 2007, *non-municipal waste generation grew by 3%*, below the 12% cap target on growth set by MOE for 2010. This trend suggests that the objective on non-municipal waste generation was not ambitious enough. Since 2000, waste production from agriculture, mining and quarrying and construction sectors decreased (by 3%, 25% and 2% respectively), whereas generation from energy production, sewage disposal and manufacturing industries increased (by 37%, 2% and 15% respectively). Basic metal and paper and paper products industries together contributed 21 million additional tonnes of waste.

Generation of non-municipal waste has been *relatively decoupled from GDP*, but the amounts of waste generated by manufacturing industries have increased (+15%) faster than GDP (+11%). A landfill tax on industrial waste has been introduced in some prefectures. Products reuse has improved at the distribution and end-use stages: second-hand shops have grown rapidly within the last ten years (Matsumoto, 2009). However, apart from a few successful examples (photocopy machines), remanufacturing by the original equipment manufacturer is still scarce. Although the ELV Law (2002) has extended producer responsibility to end-of-life vehicles as from 2005, it has been criticised for not sufficiently encouraging environment-friendly design, which can enhance reuse. As automakers

Figure 6.2. **Generation and treatment of waste**

a) Remaining capacity at the end of the fiscal year divided by total final disposal in the fiscal year.

b) Targets set by MOE in 2001 with 1997 as reference year. Non-municipal waste generation target: cap on 1997/2010 growth rate.

c) Targets on non-municipal waste landfilling and municipal waste generation set in the 2nd Fundamental Plan with 2000 as reference year.

d) In interpreting national figures, it should be borne in mind that survey methods and definitions of municipal waste may vary from one country to another. According to the definition used by the OECD, municipal waste is waste collected by or for municipalities and includes household, bulky and commercial waste and similar waste handled at the same facilities. Japan: data cover municipal waste collection, waste directly delivered and separate collection for recycling by the private sector.

e) Or latest available year.

f) Household waste only.

Source: Ministry of the Environment; OECD, Environment Directorate.

StatLink <http://dx.doi.org/10.1787/888932318870>

are only partially involved in ELV recycling (car shredding residues, airbags and chlorofluorocarbons), the largest part of ELVs recycling is done by dismantling and shredding operators (Kojima, 2008). Besides progress on energy efficiency (Chapter 5), industries have started to develop technologies to make more efficient use of materials (e.g. lightening of cars and packaging, reducing the use of hazardous substances in products). Nevertheless, efforts should focus more on using secondary materials as a substitute for primary materials.

Household waste prevention is promoted through the “mottainai” spirit, a simple lifestyle avoiding waste, which is the leitmotiv of the 3Rs information campaign. MOE has taken measures to reduce packaging waste, such as granting awards and promoting charges for plastic bags. By 2009, 80% of prefectures and 40% of municipalities had already implemented schemes to reduce the use of plastic shopping bags. More than half of the municipalities charge households fees for municipal waste collection, and more than 80% charge companies for waste services.

With 400 kg of *municipal waste generated* per capita annually, Japan is well below the OECD average. Daily municipal waste generation per capita has decreased by 8% since 2000, well on track to achieve the 10% reduction target by 2015 set in the Fundamental Plan for Establishing a SMC society. Over the review period, total amounts of municipal waste generated were absolutely decoupled from private final consumption: municipal waste decreased by 7% while consumption rose by 9%. Of the 51 million tonnes of municipal waste generated in 2007, about 70% were produced by households and 30% by small businesses. The latter performed better than households⁷ against waste reduction targets (Table 6.1). These results argue for encouraging further waste charging schemes.

2.3. Circular use of resources

A number of laws have contributed to strengthening the recycling system in Japan. The Law for the Promotion of the Effective Utilisation of Resources (1991) prioritises both waste minimisation and rational use of natural resources. It designates specific industries (*e.g.* iron and steel, pulp and paper, car manufacturing) and product categories where 3Rs initiatives should be fostered (*e.g.* design of eco-friendly products, reduction, reuse and recycling of by-products generated in the manufacturing process). Additional recycling laws focus on specific waste streams: containers and packaging, home appliances, food waste, construction waste, and end-of-life vehicles. METI supports specialised industrial associations for promoting the 3Rs policy, and has expanded the classification system for recyclable waste and standards for industrial activities. The Law for Promoting Green Purchasing (2001), through its promotion of eco-labels, has pushed manufacturers to develop eco-products and resource-efficient production processes (Box 6.1). The Eco-Town Programme has positively contributed to regional development, promoting recycling and streamlining waste treatment (Box 6.2). A permit exemption scheme has been introduced, allowing MOE-certified businesses⁸ to establish recycling (and disposal) facilities for designated waste. Significant progress has also been made towards meeting recycling targets (Table 6.3).

The cyclical use rate – which compares recovered resources to total material input – of the Japanese economy has improved by 35% since 2000 and reached 13.5% in 2007. Non-metallic minerals (debris and slag) account for about 60% of cyclical resources, followed by biomass (23%) and metals (16%).

The recovery rate of *non-municipal waste* has gained 7% over the review period, exceeding 50% of generated waste in 2007. This overall percentage is largely influenced by the share of sludge, whose mass is mostly dehydrated. More than half of industrial waste is reduced or recycled on the industrial site (Nakamura, 2007). Recovery rates of main waste streams have been further improved, in particular for construction debris (95%), slag (91%), soot (72%) and metal scraps (92%). Cement and mining industries play a major role in recycling, accepting various waste and by-products (blast-furnace slag, coal ash, sewage sludge) from other industries. In 2007, the cement manufacturing industry used 450 kg of waste or by-product

Box 6.2. The Eco Town Programme: Success of the 3Rs at the regional level

The Eco-Town Programme is a national initiative, launched in 1997, to reduce resource use by optimising waste management within designated areas (Van Berkel et al., 2009). It also aims to extend the life of landfills (at that time, remaining capacity for non-municipal waste was 3.2 years) and to revitalise the local economy by developing innovative recycling industries. The principle was to *maximise economic and environmental benefits from geographic proximity* through the use of waste in industrial applications. The designation of Eco-Towns is subject to METI and MOE approval, based on proposals of local governments in consultation with local stakeholders (private sector, research institutes, community groups and citizens). An Eco-Town Plan is typically a combination of town planning, community recycling and outreach activities, and proposals for specific innovative recycling plants.

Under the Eco-Town Programme, MOE provides grants to respective local authorities for town planning, community recycling, and promotion and outreach activities in collaboration with citizens and non-profit organisations. The grants are limited to a maximum of 50% of the project costs, typically in the range of JPY 3-5 million/year (USD 30-50 000/year) for a 3-5 year period. Simultaneously, METI provides investment subsidies in the range of JPY 100-7 000 million (USD 1-70 million) to private enterprises willing to invest in the innovative recycling projects included in Eco-Town plans. The METI grant is then supplemented by an investment subsidy from the local government (1-10% of the METI grant).

Between 1997 and 2006, 26 Eco-Town plans were implemented in Japan with various geographical targets: six metropolitan areas, six regions including several towns and/or villages, two islands, ten cities and two industrial or port areas. Approximately USD 1.65 billion were invested in 61 innovative recycling projects, with an average government subsidy of 36% (87% of which came from METI and 13% from MOE). In addition, at least 107 other recycling facilities were constructed without government subsidy. Recycling projects concern mainly plastic, organic and municipal solid waste, WEEE (waste electrical and electronic equipment) and industrial waste. In Fukuoka Prefecture (Omura City and Kita-Kyushu City), collection and recycling systems of rare metals have been successfully established. The Eco-Town Programme has also provided a platform for the private sector to innovate using 3Rs as the guiding paradigm, and has contributed to improving the sector's productivity.

The aggregated capacity of the subsidised recycling projects amounts to nearly 2 million tonnes/year. This accounts for about 7% of the Fundamental Plan target to increase in 2010 the amount of waste diverted from landfill by 28 million tonnes compared to 2000. Also, in Eco-Towns, employment in the recycling sector has grown as a share of total employment. The availability of investment subsidies, the implementation of ambitious recycling legislation, access to technological resources from the private sector, and widespread recognition of the urgency to act on environmental issues, have been the main driver of the Eco-Town Programme.

to produce one tonne of cement, which is 100 kg more compared to 2000. Recovery of used office computers, small batteries, car shredding residues and airbags has steadily increased. Successful recycling systems have been implemented in some prefectures, for example for retrieving phosphorus from sewage sludge incineration or rare metals from appliances. Given the significance of metals accumulated in Japanese electronics equipment in total world reserves (more than 15% for gold, antimony, silver, indium), the establishment of a nationwide approach for recycling these metals could provide great environmental and economic benefits.

Table 6.3. Achievements of recycling targets

	Target	Achievements	
Law for the Promotion of Effective Use of Resources (1990, amended in 2000)	(%)	2000	2008
Desktop PCs	50	..	75
Laptop PCs	20	..	54
CRT displays	55	..	78
LCD displays	55	..	71
NiCad batteries	60	..	73
NiMH batteries	55	..	77
Lithium-ion batteries	30	..	52
Small control valve type lead-acid batteries	30	..	51
Paper ^a	62	58	62
Glass bottles ^a	90	78	96
Containers and Packaging Recycling Law (1995, enforced since 2000, amended in 2006)			
Participating municipalities in total number of municipalities	(%)	2000	2007
Clear glass containers	98	81	96
Brown glass containers	98	82	96
Other glass containers	98	80	95
PET bottles	99	73	97
Other plastic containers and packaging	83	27	72
Steel cans	100	95	99
Aluminium cans	100	95	99
Cardboard	96	54	90
Beverage cartons	87	50	77
Other paper containers and packaging	53	11	38
Separately collected types of waste	(1 000 t)	2000	2007
Clear glass containers	356	352	332
Brown glass containers	307	313	291
Other glass containers	184	165	186
PET bottles	340	125	283
Other plastic containers and packaging	1 004	101	644
Steel cans	307	485	275
Aluminium cans	152	136	126
Cardboard	781	380	583
Beverage cartons	28	13	17
Other paper containers and packaging	171	35	83
Home Appliance Recycling Law ^b (1998, enforced since 2001, revised in 2009)	(%)	2001	2008
Residential air conditioners	70	78	89
CRT TVs	55	73	89
(2009) LCD and plasma TVs	50	..	..
Refrigerators and (2004) freezers	60	59	74
Clothes washers and (2009) dryers	65	56	84
Food Recycling Law(2000, enforced since 2001, amended in 2007)	(%)	2000	2006
Food manufacturers	85	..	81
Food wholesalers	70	..	62
Food retailers	45	..	35
Restaurants	40	..	22
Construction Material Recycling Law (2000, enforced since 2002)	(%)	2000	2005
Concrete waste	95	96	98
Asphalt waste	95	99	99
Wood waste	95	83	91
End-of-Life Vehicle Recycling Law (2002, enforced since 2005)	(%)	2000	2008
Car shredding residues	70	..	72-81
Air bags	85	..	94-95

a) 2008: 2007 data.

b) Weight of materials recycled/weight of units treated for recycling.

Source: Ministry of the Environment.

StatLink  <http://dx.doi.org/10.1787/888932319060>

Box 6.3. Electric home appliances recycling system

The Home Appliance Recycling Law (enforced since 2001) introduced a recycling framework for household electric equipment. It covers four categories of appliances: air conditioners, television sets, refrigerators and washing machines. Under the law, consumers pay for the collection, transportation and recycling of the appliances at the time of disposal; retailers collect the equipment from consumers, bring it to take-back sites designated by manufacturers (including importers), who then recycle the items. Manufacturers are required to meet recycling targets (depending on the appliance) and to collect fluorocarbons (CFCs, HCFCs and HFCs) from air conditioners and refrigerators. Small enterprises can contract out their recycling responsibility to the Association for Electric Home Appliances, a designated body that is also responsible for “orphan” products. Municipalities are no longer in charge of collecting this kind of equipment, but they have to bring items that have been illegally dumped in their area of jurisdiction to designated sites. An electronic system tracks the discarded products from the consumer to the manufacturer via the retailer (Aizawa *et al.*, 2008).

Under this recycling framework, manufacturers have a physical responsibility for their end-of-life products. Consumers pay for a recycling coupon which, in 2007, averaged JPY 3 261 (USD 28) for air conditioners, JPY 2 835 (USD 25) for CRT TVs, JPY 4 830 (USD 42) for refrigerators, and JPY 2 520 (USD 22) for washing machines. Implementation of extended producer responsibility is thus limited as producers only pay for transfer costs when appliances are collected by municipalities and, in some cases, invest in recycling plants. Recycling costs are not internalised in the price of products, as is done in Europe.

In 2008, 380 sites were designated for collection and 48 recycling plants were operating in Japan. The law has stimulated the development of new recycling technologies (design of processing lines by type of appliance, closed-loop recycling to high grade plastics) and eco-design (reduction of the number of components, disassembly identification system). Amounts of recycled resources (mainly iron, glass and mixed metals), with sound management of hazardous substances, has increased since 2001, along with the collection of fluorocarbons (2 023 tonnes in 2008, a more than threefold increase). The overall recycling rate (weight of materials recycled/weight of units treated for recycling) reached 83% in 2008, and targets by appliance were largely exceeded (Table 6.3).

However, this performance assessment is based on units that were transferred to manufacturers' recycling plants. Nearly 13 million used home appliances (or 3.9 kg/capita) were taken back in 2008, which represents only half of the estimated number of appliances discarded annually by Japanese households (21-23 million units in 2006). As a benchmark, the European directive, covering about 100 products, set a target to collect at least 4 kg of WEEE/capita in 2006.

A joint MOE and METI survey shows that 30% of remaining products were reused (exported or sold in Japan) and 20% were treated as scrap metal. The appropriate management of these hidden flows cannot be ensured by the authorities, who took several actions against retailers breaking the law. Furthermore, recycling coupons contributes to illegal dumping when consumers prefer not to pay for them.

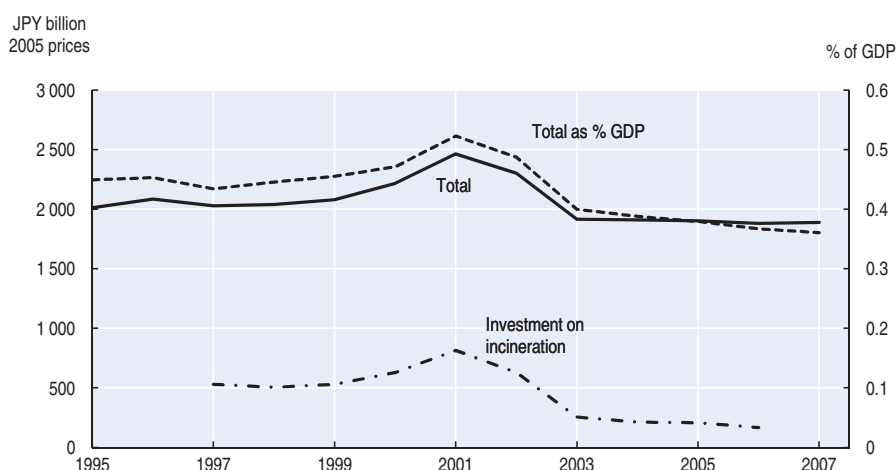
After a review of the recycling system that was conducted by the Central Environmental Council and the Industrial Structure Council in 2006, the Home Appliance Recycling Law was amended in 2009 to: i) include LCD, plasma TVs and laundry driers, and increase recycling target rates; ii) prevent illegal dumping on isolated islands with financial co-operation from manufacturers; iii) reduce recycling charges borne by consumers (–16% for air conditioners, –37% for small TVs, and –22% for small refrigerators), and iv) facilitate collection and transport operations for retailers. MOE reported a decrease in illegal dumping of home appliances in 2007, but the end of analogue television in 2011 is raising concern about the dumping of old TV sets.

Overall recovery of *municipal waste* has progressed from 14% to 20% of total waste generated, totalling 10 million tonnes in 2007. Some 70% of this waste was recovered through municipalities operating separate collection and sorting facilities, and the rest by citizen groups that directly forwarded the sorted waste (mainly paper) to recovery businesses. Separately collected amounts of container and packaging waste steadily increased over the review period, except for glass bottles and metal cans whose use is decreasing (Table 6.3). There has also been significant progress in the collection of plastic bottles and plastic containers. Over the same period, recycling rates⁹ improved considerably, reaching 62% for paper, 96% for glass bottles, 73% for plastics, 85% for steel cans and 93% for aluminium cans in 2007. These recycling rates exceed European benchmark rates, which were 48% for paper, 62% for glass and 50% for plastics. The collection of domestic electronic and electrical equipment has increased with the implementation of the Home Appliance Recycling Law, but illegal dumping and exports are still a concern (Box 6.3). One-fourth of recovered municipal waste is food waste, of which the bulk is collected from businesses (food distribution and restaurants) and used as compost, oil and fat extraction and animal foodstuff. Food waste from households is not separately collected, making the recycling rate of municipal food waste quite low (17%). The Food Recycling Law, which targets the food industry, aims to reduce pressure on landfills and increase energy recovery.

The modernisation of installations has improved *energy recovery from municipal waste incineration*. In 2007, two-thirds of municipal incinerators recovered energy and 23% generated electricity. Since the previous EPR (2002), installed capacity for power generation rose by 35% and electricity production increased by half, reaching 7 132 GWh in 2007. However, average power generation efficiency remains low, at about 11%, due to the high proportion of moisture in waste. In 2008, the government decided to more than double capacity for power generation from municipal waste incineration, aiming for 2 500 MW in 2012. To promote the integration of a low-carbon and sound material-cycle society, the revised Fundamental Plan includes a target to reduce greenhouse gas (GHG) emissions from waste by 7.8 million tonnes of CO₂ equivalent by 2010. In 2007, emissions from the waste sector totalled 24.2 million tonnes of CO₂ equivalent¹⁰ (1.8% of total GHG emissions), which was 5.1 million tonnes less than in 2000.

2.4. Waste treatment and disposal

Incineration remains the most widely used method for treating waste in Japan. Two-thirds of municipal waste is incinerated, a far higher share than in other OECD countries. Over the review period, the environmental performance of incineration technologies has further progressed in response to growing concerns over dioxins. Guidelines related to waste treatment have been revised, emissions limits have been set by the Law Concerning Special Measures Against Dioxins (1999)¹¹ (Yoshida *et al.*, 2009). Public investments in incineration have sharply increased (Figure 6.3). In 2003, the WML was amended to promote the development of modern waste treatment and recycling facilities operating over wide areas, across prefectures. Under this scheme, government subsidies were granted to prefectures that had implemented a waste treatment plan. A certification system was introduced, whereby MOE approved businesses¹² operating over wide areas are granted permit exemptions to establish local facilities. While the total number of incineration plants in Japan fell during the review period, treatment capacity for non-municipal waste increased more than twofold. The incineration capacity for municipal waste rose until 2005, then decreased to a lower level than in 2000. These measures have enhanced waste management efficiency, streamlined waste treatment and created economies of scale. As a result of the various measures taken, there has

Figure 6.3. **Public expenditure^a on municipal waste management, 1995-2007**

a) Investment and current expenditure including payments to specialised producers.

Source: Ministry of the Environment.

been a significant reduction of dioxin emissions from municipal (95%) and industrial (90%) waste incineration facilities. However, the transportation of waste between prefectures is a growing concern.

As a result of progress in recycling, the amounts of *non-municipal waste* going to landfill have been reduced by more than half since 2000, which means that Japan has reached the target set for 2010 and is on track for reaching the 2015 target. About 40% of non-municipal landfilled waste is generated by industries participating in the Keidanren Voluntary Action Plan on the Environment (Chapter 3).¹³ They committed to reduce the total amount of their residual waste by 86%¹⁴ in 2010 compared to 1990, which translates into a 55% reduction from 2000. When adopted in 2007, the plan's revised goal had already been achieved thanks to progress made by the construction industry, which contributes the most to landfilled waste. From 2000 to 2006, the iron and steel, energy, and paper manufacturing industries cut their residual waste by 7%, 77% and 34% respectively. Nationwide, these achievements mean that 3.6 additional years of landfill disposal capacity have been secured (Figure 6.2). However, remaining capacity, which increased until 2005, has decreased since, as few new sites are operational, and in great metropolitan areas like Tokyo, it is estimated that existing capacity will be exhausted in 4.5 years.

A large and constant share of *municipal waste* continues to be incinerated, but the amount incinerated has decreased at the same pace as the amount of this waste being generated. The combination of falling waste generation and better sorting, collection and recycling has resulted in a 40% decrease of municipal waste going to landfill. Despite a 26% reduction of remaining municipal landfill capacity, 3 years of sustainable final disposal capacity have been gained.

Since the 1970s, PCB (*specially controlled*) waste¹⁵ has been collected and stored according to WML specifications. However, except for a few cases, it was not treated until the late 1990s. The Law on Special Measures for Treating PCB Waste (*e.g.* transformers and capacitors) went into force in 2001 to ensure proper treatment, and requires those who hold this waste to dispose of it by 2016. The Japanese Environmental Safety Corporation (public company) has implemented a nationwide PCB waste management system with five regional

disposal facilities, and treated 731 tonnes of PCB waste from 2004 to 2007.¹⁶ To lower their PCB treatment costs, small and medium-size businesses can obtain subsidies from the government and prefectures through the PCB Waste Treatment Fund. Recently, the government has also started incineration tests to solve the issue of waste electrical equipment containing small amounts of PCB.

2.5. Illegal dumping and contaminated sites

Over the review period, the number of cases of *illegally disposed non-municipal waste* was reduced threefold. Tonnages dumped vary from year to year, depending on the reporting date of waste disposed over long periods. It was reported that 102 000 tonnes were illegally dumped in 2007, of which 20% were removed within the year. Construction waste continues to make up the bulk of this waste. In terms of amounts dumped, responsibility is almost evenly distributed among licensed, unlicensed, discharging and unknown businesses, with licensed businesses representing a slightly bigger share (31%). Since 2000, several major cases of illegal waste disposal have been reported (e.g. Gifu city, 567 000 tonnes), and in 2007 there were still 16.3 million tonnes of illegally dumped waste in Japan that needed to be cleaned up. The WML has been revised to strengthen penalties and tighten the tracking system of industrial waste, and the Regional Environment Offices and local governments jointly conduct inspections. These measures, however, have not brought the expected results.

In 2007, MOE estimated that 113 000 ha were potentially affected by soil contamination, implying remediation costs of about JPY 17 trillion (3.3% of the 2007 GDP). The Soil Contamination Countermeasures Law was enacted in 2002 (and implemented in 2003) to protect public health by remediating soil contamination in urban areas (industrial sites). A soil contamination survey is required when designated facilities handling hazardous substances cease operation, or when prefectural governments consider that such facilities may be causing damage to human health. If environmental quality standards are not respected, the prefecture designates the site and records it in a publicly accessible land register. The owner (or the polluter) of the site is then compelled to clean up the land. From 2003 to 2008, 946 cases were investigated, and 270 sites were designated as contaminated under the Law. This only accounts for 17% of surveys and 9% of designations over the period. As only a small part of contaminated properties is subject to mandatory site assessment, surveys and remediation activities are mostly initiated voluntarily for property transactions. In most cases, contaminated areas are remediated through removal of contaminated soil. The Law was revised in 2009 to expand requirements for treatment and/or removal of contaminated soil, and to promote *in situ* purification methods. The government and local authorities provide financial assistance for assessing and treating soil contamination, and for developing innovative cleanup techniques. Starting in 2010, listed companies will have to report the costs associated with the liability/remediation of contaminated lands on their balance sheets, which is a way to urge them to clean up their polluted sites.

3. Economic aspects of waste and the 3Rs policy

In support of efforts to reduce dioxin emissions, public investments to develop cleaner incineration reached a peak in 2001, and then decreased until 2007 (Figure 6.3). Since 2000, total public investments in waste management were cut by 66%, while total public expenditure in waste management¹⁷ fell by 15%, reaching some JPY 1.9 trillion (JPY 14 600 per capita) in 2007. Expressed as a share of GDP, this expenditure fell from 0.5% to 0.4%. Municipalities are increasingly outsourcing waste collection and treatment to private business. Since 2000, payment for these services (as a percentage of public waste expenditure), rose from 20% to

more than 30%. Since 1999, the legislation also encourages private sector participation in the provision of municipal waste infrastructures, and about 20 projects (mainly incineration plants) have been developed under private financing initiatives (Kleiss, Imura, 2006).

Charging households and businesses for waste management has progressed, but cost recovery for municipal waste services is still low, about 13% nationwide, up from 6% in 2000. For industrial waste, 27 prefectures out of 47 and one ordinance-designated city¹⁸ (Kitakyushu) out of 60 had introduced a landfill tax as of January 2009. The tax levied is mainly used for waste generation control, recycling, waste reduction, and other appropriate waste treatment measures. Preferential tax treatment or low interest rates are set by laws (Special Taxation Measures Law, Local Taxation Law), and is provided by governmental financial institutions to promote the use of equipment for high-temperature incineration, or for treating smoke and soot, PCBs or other types of waste. The Development Bank of Japan (DBJ) was¹⁹ a governmental financial institution that granted loans to support government policy. In 2004, the institution launched a system to promote environmentally responsible management. It offered preferential interest rates to companies according to their environmental rating, which was based on the bank's assessment of the companies' efforts to reduce their environmental impact, including their progress in recycling. Between 2004 and 2008, 120 companies were financed under this scheme, involving some JPY 160 billion.

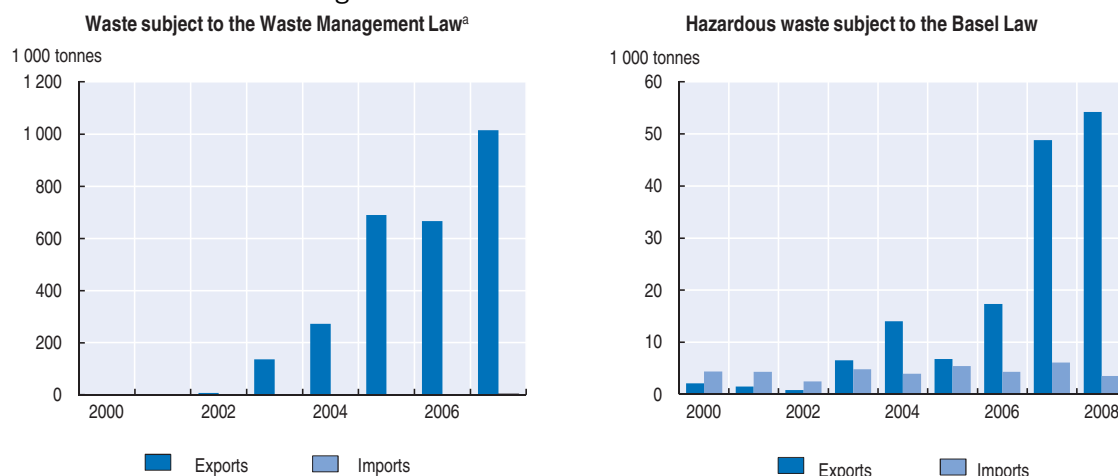
Considering the potential for growth of the environmental business market, MOE has estimated that this sector would expand from JPY 30 trillion in 2000 to JPY 47 trillion in 2010, and would create 350 000 additional jobs (Table 2.5). In the Fundamental Plan for Establishing a Sound Material-Cycle (SMC) Society, the government set a goal to increase the SMC market (waste and recycling, repair, housing renovation) twofold from its 2000 level. In 2006, the industry was worth JPY 30 trillion, representing a rise of 44% compared to 2000, and employed more than 600 000 people.

4. International issues and co-operation

4.1. Transboundary movements of waste and trade of recyclable resources

Japan ratified the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal in 1993, which it implemented with the Law for Control of the Export, Import and Others of Specified Hazardous Waste and Other Waste (Basel Law). However, the country has not ratified the 1995 BAN amendment (not yet in force), which prohibits exports of this waste to non-OECD countries. In 1993, the WML was revised to implement the OECD Decision on the Control of Transfrontier Movements of Wastes Destined for Recovery Operations. The Basel Law requires that trade in listed hazardous waste be controlled, and partly overlaps with the WML, which only restricts trade of non-valuable waste. METI²⁰ and MOE are the respective control authorities. Exports of recyclables (not listed in the Basel Law and whose valuable property can be proved) are only subject to commercial control.

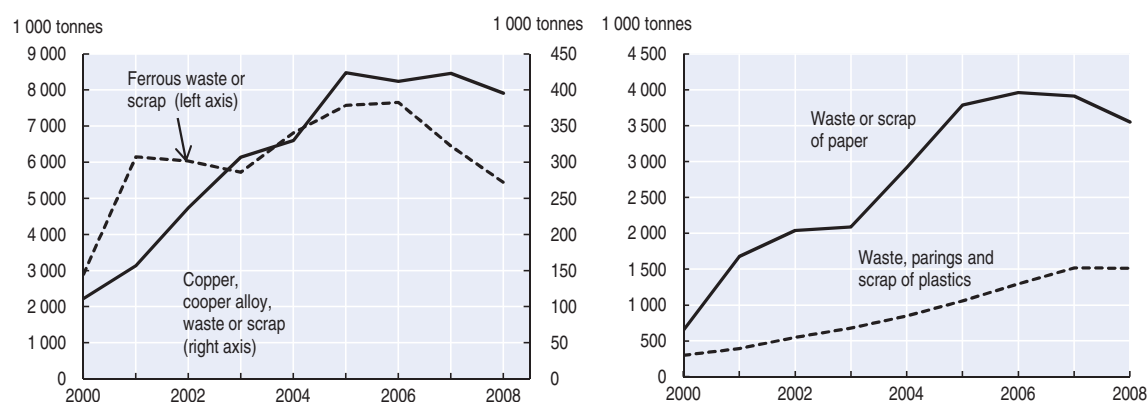
In 2008, Japan's exports of waste specified in the Basel Law reached 54 200 tonnes, a 26-fold increase compared to 2000 (Figure 6.4). Lead batteries make up the bulk of the Japanese shipments bound for Korea for metal recovery. In 2008, Japan imported 3 500 tonnes of hazardous waste composed of metals (in particular rare metals from waste electrical and electronic equipment) and glass from non-OECD Asian countries. Exports of waste subject to the WML (coal ash exported to Korea for cement production) also increased during the review period (2002-09), totalling one million tonnes in 2007. Growth of recyclables exports has been exceptional, driven by the rapid development of Asian countries and increasing demand for

Figure 6.4. **International trade in waste**

a) Confirmed exports and imports.

Source: Ministry of Economy, Trade and Industry; Ministry of the Environment.

StatLink <http://dx.doi.org/10.1787/888932318889>

Figure 6.5. **Exports of non hazardous recyclables from Japan**

Source: OECD ITCS Database.

these materials (Figure 6.5). Japan plays a significant role in the global trade of steel scrap, recovered paper and plastic scrap (OECD, 2008d), and is a net exporter of these materials, mainly sent to China (and Hong Kong, China for plastics).

Several cases of illegal exports of waste, including hazardous substances sent to developing countries, have shown weaknesses of Basel Law control procedures. To prevent these exports, METI and MOE have organised seminars to train stakeholders (traders, waste generators and custom agents) on Basel Convention and related national regulations. More than 10 000 people have attended these workshops since 2000. MOE regional offices, which were created in 2005, also support these efforts, urging exporters to consult with authorities on the legal status of materials before shipping them. In 2008, about 40 000 such consultations with METI²¹ and regional MOE offices took place. About 40% of plastic and half of metal scrap exports were screened (Kojima, 2008). This voluntary approach raises awareness on laws and regulations but does not ensure implementation of the laws. With exports on the rise, the control of this trade has been reinforced, and reported cases of Basel

Law and WML infringements have increased. Also, Japanese customs authorities have set up a computerised process to facilitate the trade of non-hazardous recyclable materials. With the Authorised Exporter System, there is less of an administrative burden on reliable operators. Since 2003, the Chinese government requires exporters who ship non-hazardous recyclables to China to be registered and certified. Also, the China Certification and Inspection Group ensures that cargo with recyclable materials is inspected before shipment.

In 2003, the Japanese government launched the Asian Network for the Prevention of Illegal Transboundary Movement of Hazardous Wastes. This initiative aims to strengthen policy dialogue with foreign governments and information exchange on hazardous waste. It seeks to enhance the capacity of countries to implement the Basel Convention, and improve mutual understanding of national legislations on hazardous waste, including of definitions and criteria to differentiate second-hand commodities from waste. The network's participants have recently stressed the importance of improving the HS (harmonised systems) trade classification to avoid that hazardous waste is exported on the pretext of recycling and reuse. In addition, Japan funds the Basel Convention Partnership on the Environmentally Sound Management of WEEE (waste electrical and electronic equipment) for the Asia-Pacific region. The country also collaborates on these issues with China and Korea, within the framework of the Tripartite Environment Ministerial Meetings (TEMM) and on a bilateral basis.

4.2. Promotion of the 3Rs in Asia

Japan is promoting the 3Rs in Asia with the hope that this will help to develop a SMC society in each individual country, enhance efforts to prevent illegal waste imports and exports, and facilitate trade of circular resources. Japan with other Asian countries agreed on these objectives at the second Asia 3R Conference in 2008. To support these efforts, various programmes and projects are underway that deal with issues such as: i) designing 3R strategies; ii) developing policy dialogue; iii) setting up 3R information centres and research networks, and iv) strengthening co-operation on the 3Rs and waste management technologies. In addition, Japan has stated that a Vision for an International Sound Material-Cycle Society in East Asia would be formulated by 2012.

Japan is actively promoting policy co-operation at bilateral, trilateral and multilateral levels through ministerial meetings and international conferences. It hosted the first Asia 3Rs Conference (2006) and the 2007 Environment Congress for Asia and the Pacific (ECO ASIA). In collaboration with international organisations (UNCRD, UNEP, IGES), Japan has played a major role in increasing knowledge and exchanging good practices and strategy development for the 3Rs in Asian countries (Table 6.4). Since 2007, Japan is participating with ten Southeast Asian countries, China, Korea and Mongolia in the Regional Forum on Environment and Health to improve the regional capacity to cope with local environmental and health problems. Japan chairs the Forum's working group on solid and hazardous waste, which focuses on urban and medical waste.

In addition, MOE supports the 3Rs Knowledge HUB²² initiated by the Asian Development Bank and the UNEP Regional Resource Centre for Asia and the Pacific. The Japanese Society of Waste Management Experts leads the activities of the Society of Solid Waste Management Experts in Asia and Pacific Islands. Japan also provides official development assistance to developing countries for capacity building in waste management and improving co-operation among central and local authorities and the private sector. Japan gives out grants

Table 6.4. **3R-related bilateral co-operation with Asian countries**

	Activities
Korea	Japan-Korea Waste Recycling Policy Dialogue (1 June 2006, Tokyo; 2 April 2007, Seoul; 3 July 2008, Tokyo).
China	Japan-China Waste Recycling Policy Dialogue (1 March 2007, Beijing; 2 March 2008, Tokyo) JICA ^a Promotion Project for Economic System with Environmentally Sound Resource Cycle started (October 2008).
Thailand	Assistance to national 3R strategy development through UNEP/ROAP ^b and IGES ^c since 2005.
Bangladesh	Assistance to national 3R strategy development through UNCRD ^d and IGES since 2006.
Cambodia	Assistance to national 3R strategy development through UNEP/ROAP and IGES since 2006.
Malaysia	JICA Solid Waste Reduction Programme Survey was conducted from 2004 to 2006.
Philippines	Assistance to national 3R strategy development through UNEP/ROAP and IGES since 2005. JICA Recycling Industry Improvement Programme Survey was conducted from 2006 to 2008.
Viet Nam	Assistance to national 3R strategy development through UNCRD and IGES since 2005. In Hanoi, the JICA Raw Garbage 3R Project was conducted from 2006 to 2009. JICA experts were dispatched (July 2008).
Indonesia	Assistance to national 3R strategy development through UNCRD and IGES since 2005. JICA Eco Labelling Programme Development was conducted from 2005 to 2007. JICA experts were dispatched (August 2006).
Singapore	The Vice Minister of the Environment made a visit to Japan to strengthen co-operation (July 2006), since then, a bilateral policy dialogue has been developed.

a) Japan International Co-operation Agency.

b) United Nations Environment Programme/Regional Office for Asia and the Pacific.

c) Institute for Global Environmental Strategies.

d) United Nations Centre for Regional Development.

Source: Ministry of the Environment.

and loans to improve waste treatment infrastructure, and disseminates 3R technologies. Moreover, Japanese cities and prefectures share their Eco-Town experience with Chinese cities and provinces.

Notes

1. Consultative body for the environment minister composed of academics, industry associations, consumer organisations, research institutes, trade unions, and NGOs.
2. Raw materials, underlying natural resources, products and residuals.
3. Sludge, livestock excrement, construction debris, slag, soot, metal scraps, waste plastic, waste wood, waste acid, glass/ceramic waste, waste oil, organic residue, waste alkali, cinder, waste paper, animal corpses, animal residue, waste textiles, rubber waste.
4. Waste that may be harmful to human health, the living environment or is explosive, toxic, or infectious (e.g. PCB, soot and dust generated in municipal waste incinerators).
5. Wastewater not connected to public sewage.
6. Such as manure, rice straw and wheat straw used as fertiliser.
7. Including recycled waste, generation per capita decreased by 4%, whereas excluding this waste, it fell by 8%.
8. As of 2008, 66 certifications were issued for municipal waste, and 48 for industrial waste.
9. Recycled material content in material production (paper and glass bottles) and in cans consumption (steel and aluminum cans); and recovered plastic (including energy recovery) in waste generation.
10. Excluding emissions from waste incineration for energy use and energy recovery (16.7 MtCO₂eq), which are accounted for in the energy sector.
11. Japan ratified the Stockholm Convention on Persistent Organic Pollutants in 2002, which seeks to minimise and eliminate the production, use and release of 21 chemicals, including dioxins and PCBs.
12. As of 2008, 69 certifications were issued for municipal waste treatment, and 169 for industrial waste treatment.

13. In which Japanese industries have made commitments on various environmental issues.
14. The original (1999) goal (75% reduction by 2010) was achieved in 2002.
15. Production and imports of PCBs were banned in 1974, while the use of products containing PCBs was authorised for the lifetime of the products.
16. Full capacity is expected to be reached by 2010. Treatment operations started in 2004 with one installation, then continued in 2005 with two installations, and in 2006 and 2008 with one installation for each year.
17. Investment and current expenditure, including payments to specialised producers.
18. An ordinance-designated city is a city with over 500 000 population, that has been delegated to carry out many of the functions normally performed by prefectural governments
19. The bank was privatised in 2008.
20. Exports of waste specified in the Basel Law require a permit that is issued by METI after MOE has confirmed that sufficient measures to prevent environmental pollution have been taken.
21. Since 2006, METI outsources consultation services to the Japanese Environmental Sanitation Center (JCES).
22. Think tank created to promote exchange of information, technology, good practices, policy strategy and management related to the 3Rs.

Selected sources

The government documents, OECD documents and other documents used as sources for this chapter include the following. Also, see list of websites at the end of this report.

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PART II

Chapter 7

Nature and Biodiversity

Nature conservation is identified as a priority in Japan, and is one of the three pillars of the 2007 Sustainable Society Strategy. However, biodiversity loss is increasing and greater efforts are needed to converge with good practices in other OECD countries. This chapter examines the management of biodiversity in protected areas and activities outside protected areas that affect species and their habitats, in particular agriculture, forestry and fisheries.

Assessment and recommendations*

In recent years, protection of biodiversity has been assigned a higher priority in Japan: it is one of the three pillars of the 2007 Strategy for a Sustainable Society, and Japan will host the 10th meeting of the Conference of the Parties to the Convention on Biological Diversity (CBD) in October 2010. In 2007, Japan adopted its 3rd *National Biodiversity Strategy*, and in 2008, the *Basic Act on Biodiversity* that is intended to guide the review of existing laws. In March 2010, Japan released its 4th *National Biodiversity Strategy*. However, protection of biodiversity within and outside protected areas has not been sufficient to significantly reduce the rate of biodiversity loss, which is the target agreed by the CBD Conference of the Parties in 2002.

Japan has a relatively high share of endemic species. A high portion, by OECD standards, face extinction; nearly a quarter of mammal species and more than a third of freshwater fish species. Conservation programmes are being implemented for 82 endangered species. The situation has deteriorated since the 2002 *OECD Environmental Performance Review*, underlining the need for strengthened protection measures. Intensive agricultural production, insufficient integration of environmental considerations into forestry and marine policies, and, increasingly, invasive alien species have been the main sources of pressure on species and their habitats. Global warming is intensifying these pressures.

About 24% of Japan's territory is designated as protected in various forms, such as natural parks. However, only 3.3% of Japan's territory has nature conservation as its primary function (IUCN categories I and II), which is low by OECD standards. Japan hosts three UNESCO World Natural Heritage Sites, and 37 wetlands of international importance. Although two-thirds of Japan's land area is covered in forest (25 million hectares), only 781 000 hectares of national forests are protected as ecosystem reserves. The length of coastline in a natural state has continued to decline. Hence, there is scope to significantly increase the portion of *national forests and marine areas* dedicated to nature conservation and biodiversity protection. The variety of protection regimes has resulted in heterogeneous management practices, and a need to further streamline nature conservation laws. *Financing for nature conservation* remains at a low level and has not noticeably improved since the last OECD review. Opportunities to charge people for accessing nature conservation sites remain insufficiently exploited.

A number of efforts have been made to *monitor ecosystems* and to *restore habitats*. However, a national strategy should be developed and implemented for restoring nature along rivers which serve as important corridors for biodiversity. More generally, biodiversity corridors need to be expanded to allow species to adapt to global warming.

There has been some progress in *inter-ministerial co-ordination in the management of protected areas*, for example, the Ministry of the Environment and the Ministry of Agriculture, Forestry and Fisheries have worked to connect existing protected forests.

* Assessment and recommendations reviewed and approved by the OECD Working Party on Environmental Performance at its meeting on 4 May 2010.

However, there is generally a need for closer, more effective co-ordination, particularly between these two ministries. An effective and policy-relevant biodiversity monitoring system involving all relevant ministries is needed.

The area of farmland has decreased continuously over the last 20 years, due to residential, commercial and infrastructure development. *Agricultural production is heavily supported*; 85% of assistance to farmers is in the form of market price support, which is more environmentally damaging than some other forms of support. Japanese agriculture is generally very intensive. More effective means must be found to integrate biodiversity protection into sectoral policies, particularly for agriculture, forestry and fisheries. This includes withdrawing or redesigning subsidies to provide better incentives to protect biodiversity, and establishing payments for ecological services.

The Japanese government is actively promoting the *Satoyama Initiative*. Domestically, this involves revitalising landscapes that once had achieved a balance between production and conservation of biodiversity and ecosystem services. However, there are questions about the extent and changes in the area of *satoyama* landscapes. Moreover, many *satoyama* areas have not proven to be economically viable under current policies. Many have been abandoned, and the increasing age of local communities has reinforced this trend.

There have been many valuable initiatives at the local level in rural, coastal and urban areas. Local populations have actively participated in protecting biodiversity in designated areas and in developing *green urban areas*. The national target of establishing 13 square metres of public open space per resident in urban areas was achieved. However, there is scope for better *co-operation among prefectures* to address biodiversity protection issues, such as maintaining game populations to an optimal size that cut across their jurisdictions.

Recommendations

- Consolidate the *policy framework for biodiversity protection*, in particular streamline nature protection legislation, strengthen inter-ministerial co-operation and better link biodiversity monitoring with policy-making.
- Expand the territory allocated to nature protection, in particular in *national forests and marine areas*, and provide additional finance for this purpose.
- Develop a *strategy for biodiversity corridors*, particularly in forests and along rivers, taking account of possible impacts of climate change.
- Redesign *agricultural support measures* so as to reduce the negative impacts on biodiversity, and provide incentives to protect it.
- Establish *payments for ecological services* as a means to protect biodiversity, including in *satoyama areas*.

1. Policy framework and objectives

Legal framework

Nature conservation in Japan is based on a *range of laws*. Since the last OECD *Environmental Performance Review (EPR)*, new legislation passed for conserving nature includes the Law for the Promotion of Nature Restoration (2002) and the Alien Species Act (2004). The 2008 Basic Act on Biodiversity is intended to guide the review and revision of all

nature legislation and provide a legal basis for future biodiversity strategies. It has already led to revision of the National Parks Law and the Nature Conservation Law in June 2009. A new national biodiversity strategy (NBS) was released in March 2010.

National biodiversity strategy

Japan has implemented the 2002 OECD recommendation to “review and revise the national biodiversity strategy”. The 1995 NBS has been revised three times over the review period (2002, 2007 and 2010). The 3rd NBS, released in November 2007, reiterates the main thrust of the 2nd NBS, which is that biodiversity should support life and livelihood.¹ The 3rd strategy also reiterates the importance of addressing the three issues identified in 2002: i) species and habitat degradation due to excessive human activity (over-use); ii) degradation of biodiversity in the countryside (*satochi-satoyama*) due to insufficient management (under-use); and iii) ecosystem disturbances caused by alien species. It also adds a new critical issue: iv) the potentially huge threat of species extinction and ecosystem collapse caused by global warming (MOE, 2008a). The 4th NBS provides a set of measures to halt biodiversity loss in Japan in the short-term (by 2020) and sets the target to improve the state of biodiversity from the current level by 2050.

The 3rd NBS sets the following *three broad goals* to create a “society in harmony with nature”: conservation of flora and fauna and indigenous ecosystems; sustainable use of land and natural resources; and integration of biodiversity concerns into social and economic policies.

The 3rd NBS’ Action Plan sets *quantitative targets*, notably:

- By 2012, designate ten new sites for inclusion in the List of Wetlands of International Importance under the 1971 Ramsar Convention Wetlands, in addition to the 33 existing sites in 2006.
- Designate 15 new species for protection by 2012 on top of the existing 73 designated for protection under the Law on the Conservation of Endangered Species of Wild Fauna and Flora.
- Increase the number of wildlife management plans from 90 in 2006 to 170 by 2012 under the Wildlife Protection and Hunting Management Law.
- Increase the number of eco-farmers from 110 000 in 2006 to 200 000 by end 2009.
- By 2012, increase the number of nature restoration committees by ten (from 19 in 2006) under the Law for the Promotion of Nature Restoration.
- Return Japanese ibises to the wild and make 60 of them settle in the Niigata prefecture (by 2015).
- Increase public awareness of the word “biodiversity” so that at least 50% of the population know what it means (by 2012).²

The Convention on Biological Diversity (CBD)

The 10th meeting of the Conference of the Parties (COP 10) to the Convention on Biological Diversity (CBD), which Japan will host in Nagoya, Aichi prefecture, in October 2010, will mark an important milestone: 2010 is the UN International Year of Biodiversity. It is also the deadline for the 2010 *biodiversity target* adopted at the COP 6 (The Hague, Netherlands, 2002), which requires contracting parties to significantly reduce the

rate of loss of biological diversity by 2010. For this occasion, Japan committed itself to prepare indicators to monitor progress in meeting the CBD 2010 biodiversity target, and to designate biodiversity conservation “hot spots” in Japan.

The private sector

Following a declaration of intent on nature conservation in 2003, the *Japan Business Federation* (Keidanren) released, in March 2009, its “declaration on biodiversity”. The overall objective is to establish a corporate management vision for dealing with biodiversity concerns. More specifically, Keidanren encourages its members to:

- Assess the impacts of their planned activities on biodiversity, both at home and abroad.
- Consider biodiversity trading or off-setting measures, as appropriate.
- Engage in biodiversity programmes not directly linked to the operations of the company; and promote biodiversity-friendly technology.

Recommendations of the 2002 OECD Environmental Performance Review (EPR)

A benchmark for assessing Japan’s performance related to biodiversity is provided by the recommendations of the 2002 EPR (OECD, 2002). Important steps have been taken to implement the OECD recommendations (Table 7.1), but in many cases further efforts are needed.

Table 7.1. Actions taken on the 2002 EPR recommendations for nature and biodiversity

Recommendations	Actions taken
Strengthen measures to prevent the decrease, fragmentation and degradation of habitats in <i>protected areas</i> and extend such areas and their interconnection within a national nature network.	The first Regulated Utilisation Area (2006) and a new national and a quasi-national park (2007) were designated; there are now 29 national parks and 56 quasi-national parks in Japan. The 3rd national biodiversity strategy (2007) and MOE’s “National Ecological Network Concept” (2008) stress the importance of conservation and restoration through networking ecosystems. The Natural Parks Law and the Nature Conservation Law (2009) were revised to enhance marine conservation measures and establish an ecosystem maintenance and recovery programme.
Intensify efforts to <i>integrate nature and biodiversity concerns</i> in agriculture, forestry, fishery and spatial planning policies (e.g. by gradually phasing out environmentally harmful subsidies, making support conditional on compliance with environmental and nature conservation standards, or rewarding efforts to improve biodiversity and amenities).	The level of support to farmers has been reduced, although it remains high by OECD standards and mostly linked to agricultural production. In 2007, Japan introduced new payments to promote environmentally friendly farming on 10% of commercial farms. Allotment gardens in urban areas have improved to function more as public green space. 63 resource recovery plans to restore fish stocks and ensure sound fishery management were implemented by 2008.
Review and revise the <i>national biodiversity strategy</i> .	The 3rd national biodiversity strategy was released in 2007; it includes 660 specific measures and sets 34 quantifiable targets. The 4th national biodiversity strategy was released in 2010.
Further strengthen the financial means, human resources and institutional capacities for <i>management of protected areas</i> ; explore options for establishing financial mechanisms (e.g. a compensation fund for nature, financed by charges on land conversion and habitat interference).	Number of Active Rangers increased from 60 in 2005 to 80 in 2008.
Continue to promote <i>re-naturalisation projects</i> to rehabilitate degraded ecosystems and to return to nature unused agricultural or industrial land and reclaimed wetlands.	The Law for the Promotion of Nature Restoration and the Basic Policy for Nature Restoration came into effect in 2003, and the Policy was revised in 2008. Nature Restoration Committees have been established under the law at 21 sites and 20 Implementation Plans for the Nature Restoration Programme have been formulated.
Accelerate progress in preserving and creating urban or peri-urban <i>open green space</i> and in revitalising <i>river banks</i> , with appropriate public participation.	Greening has been made mandatory for new and existing buildings above a certain size. As of 2008, 113 207 ha of urban parks were improved; 2 106 ha of special green conservation areas and 3 456 ha of special suburban green conservation areas were designated; 77 ha of civic green space were contracted; and the green area system was implemented in two areas. The National River Basin Census for River Basins was carried out and Basic Guidelines on Nature-Oriented River Improvement were issued.

Source: OECD, Environment Directorate.

2. The state of nature and biodiversity

Besides the Ministry of the Environment (MOE), many ministries and agencies collect information on biodiversity (e.g. in forests, agricultural areas, rivers, oceans). Effective conservation measures could be better implemented at the local and regional levels if such information were shared and managed collectively (and not individually, as is often currently the case). For this reason, an *inter-ministerial monitoring system* on biodiversity should be created. This would also help prepare indicators to monitor progress in meeting the CBD 2010 biodiversity target and to designate biodiversity conservation “hot spots”, which are both objectives that Japan is committed to reaching under the COP 10 CBD.

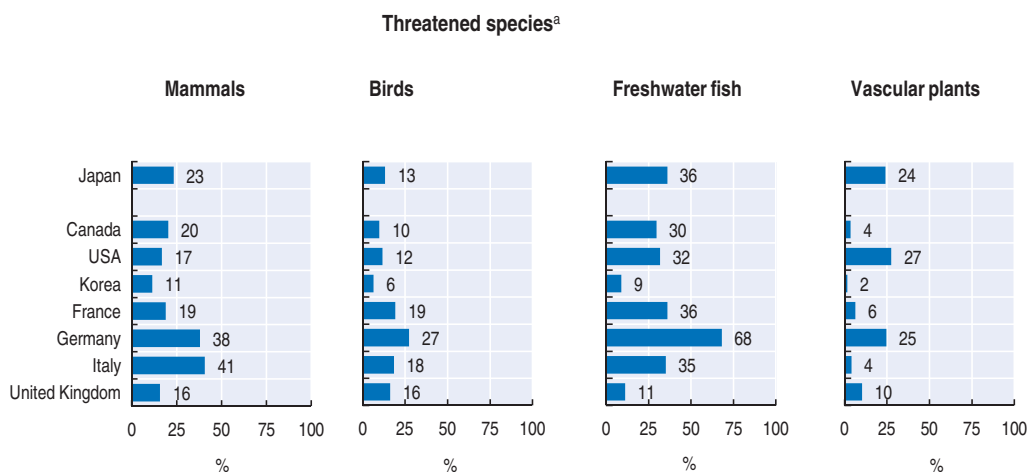
2.1. Endangered species

Japan has a *high share of endemic species*, reflecting habitats long isolated, including islands (e.g. Okinawa, Amami and Ogasawara) and mountainous regions. Approximately 40% of terrestrial mammals and vascular plants, 60% of reptiles and 80% of amphibians are endemic to Japan.

Overall, more than a third of freshwater fish, more than 30% of Japan's reptiles and amphibians, nearly a quarter of mammal species and of vascular plants, and more than 10% of birds living in Japan face a significant threat of extinction. These are high proportions by OECD standards (Figure 7.1). The situation has *deteriorated* since the last EPR (2002), reflecting insufficient attention given to nature protection within and outside protected areas. The 2nd revision (2006-07) of the Red List of Endangered Species includes 3 155 species, i.e. 461 species more than in 2002; however, this may also partly reflect scientific progress in identifying endangered species.

Japan is on track for meeting the 3rd biodiversity strategy objective of designating 15 new species for protection by 2012, which would be in addition to the 73 species designated for protection in 2006. Based on the Law on the Conservation of Endangered Species of Wild Fauna and Flora, 82 species have been classified as national endangered species so far, for which MOE has implemented *conservation programmes*. Thanks to the collaboration of local people and other stakeholders, success has been achieved in some

Figure 7.1. **Fauna and flora**



a) IUCN categories "critically endangered", "endangered" and "vulnerable" in % of known species.

Source: OECD, Environment Directorate.

Box 7.1. Initiatives to reintroduce large birds and protect migratory birds

Oriental white storks and crested ibises, widespread in rural areas throughout the country until around the 18th century, have become extinct in the wild because of over-hunting and other factors. Following successful captive breeding (initiated in 1965), this stork was successfully reintroduced in the wild in 2005 in the Hyogo prefecture. This is the result of a bottom-up approach, regrouping efforts by the local government (Toyooka City), NGOs and local residents. Stork-oriented rice farming has become the symbol of biodiversity friendly farming. As for the crested ibis, following successful captive breeding (since 1999), experimental release in the wild started in 2008 in Niigata prefecture (Sado City). The aim set by the 3rd biodiversity strategy is to make 60 ibises settle in Niigata prefecture by 2015. These attempts to reintroduce large birds to populated areas are among the first in the world and would not have been made possible without good co-operation with the Russian Federation (stork) and China (ibis). Under the US-Japan Migratory Bird Treaty, which entered into force in 1974, the breeding of short-tailed albatrosses in wild habitat has been successfully realised on Torishima island (an uninhabited island in the Pacific Ocean).

Some bird species travel a long distance between northern and southern hemispheres for wintering and breeding. On the initiative of the Australian and Japanese governments, the *Partnership for the East Asian Australasian Flyway* was established in 2006 to conserve such migratory birds and their habitats in their flyway. This partnership involves ten governments, as well as NGOs and international organisations.

localities in protecting some critically endangered species, such as the Tsushima leopard cat, the Okinawa rail, the Japanese wood pigeon, the Abe salamander, the Itasenpara bitterling, and the Blakiston's fish owl (MOE, 2008b). Initiatives have also been taken to reintroduce large birds and protect migratory birds (Box 7.1).

Over the last 25 years, the number and distribution of some large mammals, such as the sika deer and wild boar, have greatly expanded, causing serious impacts on natural ecosystems. Animal fences have been installed and buffer zones created to control the increase of deer populations. The affected prefectures or local governments have authorised more hunting, which increased from 150 000 to 200 000 head a year between 2000 and 2005, for both deer and boars. However, there are no co-ordinated efforts among prefectures to revise hunting plans so as to *maintain game populations at an optimal size*. The Wildlife Protection and Hunting Management Law has been revised several times (1999, 2002, 2006) for this purpose. The number of wildlife management plans was increased from 90 in 2006 to 104 in 2009. The 3rd biodiversity strategy has set a target of 170 wildlife management plans, to be reached by 2012.

Global warming is expected to intensify pressures on species and their habitats. For example, it is predicted that a 1-3°C increase in sea-surface temperature would result in the bleaching and extensive death of coral reef (MOE, 2008b). Further efforts are needed to create biodiversity corridors that would allow species to adapt to global warming, as highlighted in Japan's 3rd national biodiversity strategy.

2.2. Alien species

Alien species did not become a concern for Japan until the mid-1990s, when their adverse effects manifested themselves in various parts of the country.³ Many invasive alien species (IAS) have since expanded their range and become one of the major factors threatening biodiversity (Washitani, 2008). Of the estimated 2 232 foreign IAS that have been brought into Japan and

“established” there, 28 are mammal species, 39 bird, 13 reptile, 3 amphibian, 44 fish, 415 insect, 39 arthropod (other than insects), 57 mollusc (plus 13 other of invertebrate), 1 548 vascular plant, 3 other plant, and 30 are parasite species (Murakami and Washitani, 2002).

As a result, *Japan’s flora and fauna have changed significantly*. For example, alien fish species are already found in three out of four of the country’s largest rivers (e.g. large-mouth black bass), and alien plants are found in almost all of these rivers (e.g. African love-grass, Italian ryegrass, late goldenrod) (Figure 7.2). In Japan’s 109 largest rivers, one out of four to five plant species is alien. Monitoring of IAS should be expanded to other ecosystems, with priority given to Japanese islands where the risk of exotic species significantly changing local biota and ecosystems is particularly high, given the high level of endemic species.

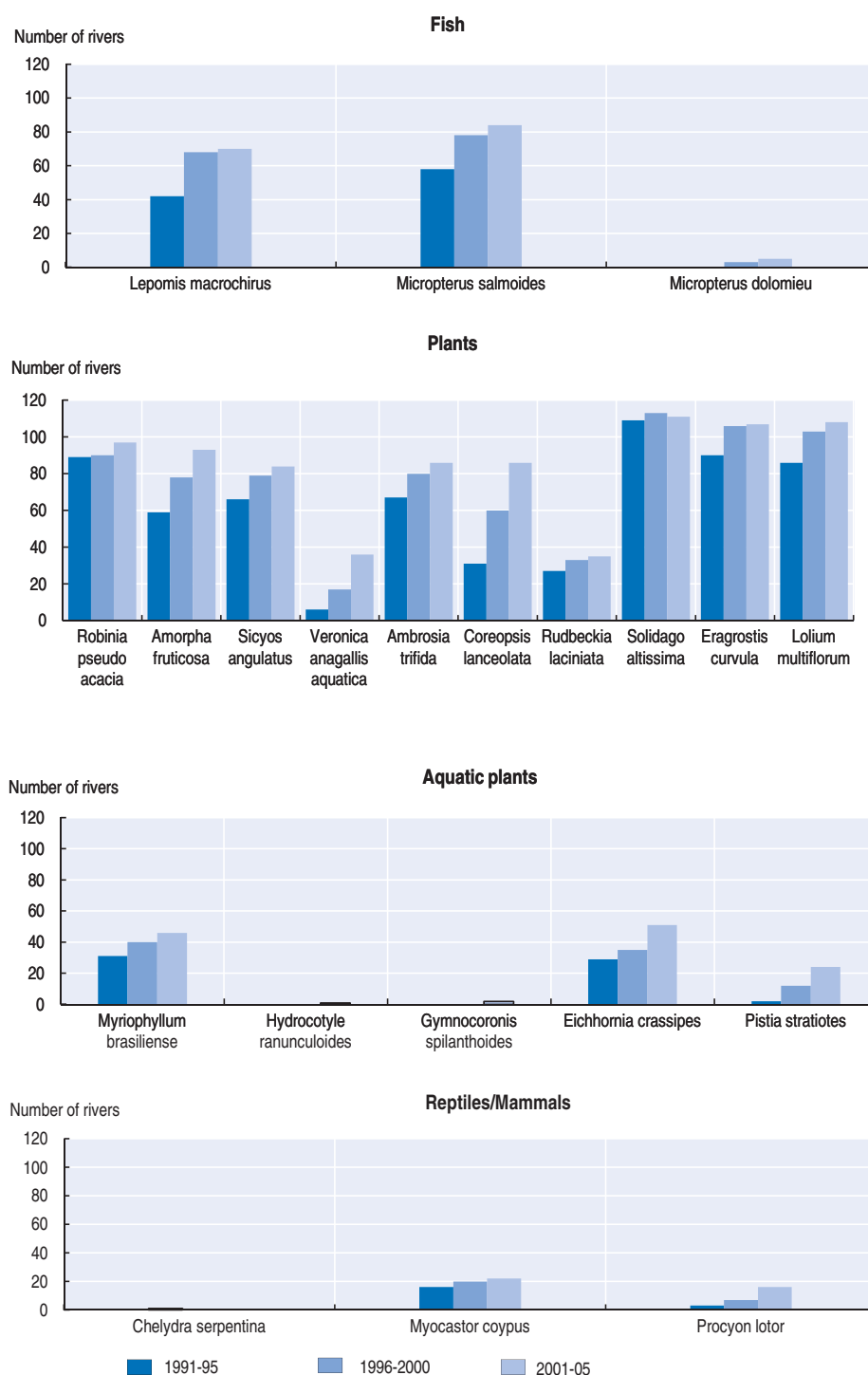
The Alien Species Act (2004) regulates the feeding, cultivation, storage, transport and import of IAS. So far, 97 IAS have been designated pursuant to the Act.⁴ One of them is the racoon, for which a nationwide distribution survey was carried out in 2007 to help devise effective eradication measures. Another is the goat, which was originally introduced in the Ogasawara islands where it became wild. Removal of wild goats on several Ogasawara islands was completed in 2003; it was then started on other islands in 2004. Eradication of this alien species is all the more necessary if Japan wants the Ogasawara islands to become a UNESCO World Natural Heritage site, as announced in 2007. Ratification of the International Maritime Organisation’s *Ship Ballast Water Convention* (Chapter 4) would provide an additional means of enhancing protection against IAS.

2.3. Ecosystems

The National Survey on the Natural Environment examines the condition of a range of ecosystems, including rivers, lakes, wetlands and coastal habitats. The survey has been conducted for more than 30 years, at approximately five-year intervals. Undertaken with broad support from civil society (e.g. schools, NGOs) it has provided extremely valuable information.

The 5th survey, conducted in 1998, focused on coastal habitats. It shows that the natural coast has continued to decrease and accounts for 53% of the over 33 000 km of Japanese coastline (including islands) (MOE, 1998). Semi-natural coast accounts for 13%, artificial coast for 33% and estuaries for the remaining 1%.⁵ Tidal flats, seaweed and sea-grass beds, and coral reefs⁶ have also continued to decrease. The number of common orient clams, which is an indicator species for tidal flats of large inner bays, has been declining rapidly in recent years, and the fragmentation of the clam’s habitat raises concern for the species’ survival.

The *Monitoring Sites 1 000 project*, initiated in 2003, aims to detect signs of ecosystem degradation over the long term (100 years or more) through monitoring about 1 000 sites throughout Japan. It includes terrestrial and marine ecosystems. It is too early to draw conclusions at this point. *Nature restoration projects* have been carried out in a range of ecosystems – such as rivers, wetlands, tidal flats, seaweed beds, *satoyama* (rural ecosystems) and forests, as recommended by the previous *OECD Environmental Performance Review of Japan* (Table 7.1). MOE and the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) have taken co-ordinated action (nationwide) to restore nature along rivers (greening of river banks) and for improving the habitat of fish and other aquatic organisms in community waterways, such as rivers and irrigation channels. Manuals have been compiled for improving the effectiveness of such project co-ordination. MLIT published in 2005 a “Guide for Creating Rivers That Fish Can Easily Ascend”, based on 19 model rivers that have fish ladders. In 2006, MLIT issued basic guidelines on nature oriented-river improvements.

Figure 7.2. **Invasive alien species in rivers, 1991-2005**

Source: Study Group on Impacts and Management of Alien Species (2008).

However, Japan does not yet have a national vision and policy or target for re-naturing its rivers (i.e. returning them to a more natural state) or for restoration of natural habitats along river banks. This should be a key component of Japan's nature conservation policy, as rivers are very important biodiversity corridors. Many dams have been built on Japanese

rivers to control floods, with the result that fish can run up to 80% of the total length in only nine major rivers (out of 109). The MLIT is committed to pursuing *integrated water resource management* (IWRM), which also involves looking at water quality and nature management of river basins. Further efforts are needed to develop a comprehensive ecosystem approach to integrated water resource management by MLIT.

3. Nature and biodiversity protection in designated areas

Overall, Japan has designated some 24% of its land area for protection, totalling more than 9 million ha (Table 7.2). Protected areas are shared across the whole territory, including islands, covering a variety of ecosystems. Only 5.8% of Japan's territory has been registered by the International Union for Conservation of Nature (IUCN), which is low by OECD standards (Figure 7.3). Only 3.3% of Japan's territory conforms with IUCN categories I and II (strict nature reserves, wilderness areas and national parks).

Little progress has been made in expanding protected areas since 2000 (Table 7.2): 44 areas have been designated in recent years (totalling 140 000 ha), mostly in the form of (little restrictive) wildlife protection areas (74 000 ha). Since 2000, 12 new nature conservation areas have been established, totalling 2 700 ha only, and none at the national level. One national park – Oze National Park, formerly a part of the Nikko National Park – was the first new national park to open in 20 years. One quasi-national park⁷ (in Kyoto prefecture) was the first new designated such protected area in 17 years.

Table 7.2. **Protected areas, 2000-08**

Type of protected areas	2000		2008					
	Number ^a	Area (1 000 ha)	Number ^a	Area (1 000 ha)	Area ^b			(% nature ^c)
					(% of Japan's land area)			
					Total	SZ	SPZ	
Wilderness areas ^d	5	5.6	5	5.6	0.01		0.01	100
Nature conservation areas ^d	534	95.3	546	98.0	0.26	0.12	0.05	
National	10	21.6	10	21.6	0.06	0.05	0.04	67
Prefectural	524	73.7	536	76.4	0.20	0.07	0.01	5
Natural parks ^e	390 (63)	5 347.1 (2.7)	394 (69)	5 409.9 (3.8)	14.31	9.20	0.91	
National parks	28 (32)	2 046.5 (1.3)	29 (38)	2 086.9 (2.4)	5.52	3.97	0.73	13
Quasi-national parks	55 (31)	1 343.2 (1.4)	56 (31)	1 362.0 (1.4)	3.60	3.35	0.18	5
Prefectural natural parks	307	1 957.4	309	1 961.0	5.19	1.88	–	–
Wildlife protection areas ^f	3 858	3 567.0	3 884	3 641.0	9.63	0.78	0.78	
National	54	493.0	69	548.0	1.45	0.39	0.39	27
Prefectural	3 804	3 074.0	3 815	3 093.0	8.18	0.39	0.39	5
Natural habitat conservation areas ^g	7	0.9	9	0.9	0.00		0.00	100
Total protected areas^h	4 794 (63)	9 015.9 (3.8)	4 838 (63)	9 155.4 (3.8)	24.21	10.10	1.75	7

a) Figures in parentheses are for marine park zones. There can be several such zones in a natural park.

b) Protected areas are further subdivided into ordinary zones, special zones (SZ) and special protection zones (SPZ). SPZ are the most strictly controlled, and ordinary zones the least controlled.

c) Share of the area protected for nature conservation purposes (SPZ/total land's area under protection).

d) Under the 1972 Nature Conservation Law.

e) Under the 1957 Natural Parks Law.

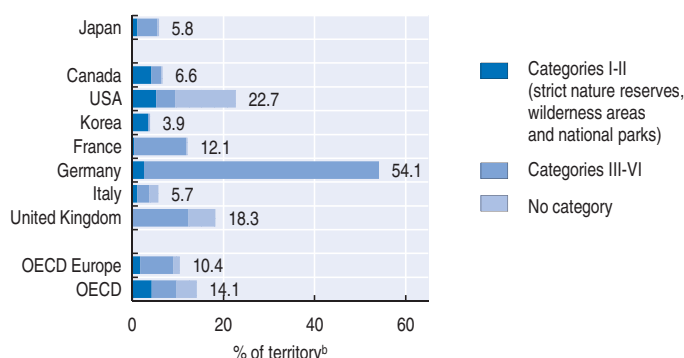
f) Under the 1918 Wildlife Protection and Hunting Law.

g) Under the 1992 Law on Conservation of Endangered Species.

h) Some protection categories overlap.

Source: Ministry of the Environment.

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Figure 7.3. **Protected areas, 2009^a**

a) Designated terrestrial and marine areas. IUCN management categories I-VI and protected areas without IUCN category assignment. National classifications may differ.

b) Surface area, inland waters and territorial waters out to 12 nautical miles.

Source: IUCN/UNEP-WCMC (December 2009), *World Database on Protected Areas*; *Global Maritime Boundaries Database* (December 2009).

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A key joint initiative of the Ministry of Agriculture, Forestry and Fisheries (MAFF) and MOE for national forests has been to *interconnect existing ecosystem reserves in national forests*. As of April 2009, 509 000 ha of “green corridors” have been established by the MAFF’s Forestry Agency (i.e. 7% of the national forest area). Such green corridors may prove crucial in the context of climate change where many wildlife species may need to move to new habitats.

Japan hosts *three UNESCO World Natural Heritage Sites* and is promoting the creation of a fourth one (Ogasawara islands). Japan has designated 37 *wetlands of international importance*, an increase from 11 in 1999 and 33 in 2005,⁸ and is therefore on track for meeting the 3rd national biodiversity strategy objective of 43 wetlands by Ramsar COP 11 in 2012. This result was made possible by designating rice paddies, in accordance with the Ramsar Convention on Wetlands (1971).⁹

3.1. Management of protected areas

Nature conservation is based on a range of laws and the approach to nature conservation and biodiversity concerns in these laws varies considerably depending on the law’s primary purpose. The variety of protection categories has led to *heterogeneous management practices*. In contrast to wilderness areas, natural habitat conservation areas and national nature conservation areas, which are protected exclusively or largely for nature conservation purposes,¹⁰ natural parks were primarily established to preserve the scenic beauty of landscapes with high amenity value. Promoting recreational and tourist activities and conservation of biodiversity are the key intents. The main management feature of wildlife protection areas is that hunting is banned. Construction, tree felling and some other activities are restricted on only 7% of the total area of these zones, those having the status of special protection area (Table 7.2). Benefits could be gained from streamlining nature legislation and making the overall system of nature protection more coherent.

To address pressures resulting from an ever-increasing number of visitors,¹¹ the Natural Parks Law was amended to create *regulated utilisation areas*, where only a limited number of entrants are allowed (e.g. 100 people per day in peak tourism periods, fewer

during the rest of the year).¹² Entrance is subject to a permit. Fines for breaking the rules specific to these areas (e.g. no littering, no feeding of animals, and limited noise) may be up to JPY 500 000 or six months penal servitude.

Since 2005, the *national park management staff* has been increased. The MOE's 73 ranger offices¹³ now have 80 "active rangers" to patrol nature protection areas and provide guidance to visitors. The Tokyo Metropolitan Government (TMG) has its own wildlife rangers. In 2004, the TMG also started to employ its own park rangers to enhance nature protection in Tokyo's natural parks.

3.2. Institutional co-ordination

There have been some *encouraging initiatives* to foster inter-ministerial co-ordination. In particular, the (ongoing) establishment of green corridors in national forests is a very positive step towards enhanced co-operation between MOE and the Forestry Agency. Regional liaison committees have been established for the UNESCO World Natural Heritage Sites. For each site, management activities (e.g. patrolling, promoting appropriate use, disseminating information) are implemented based on a management plan that was established through close collaboration between the relevant government agencies (MOE, 2006).

However, much remains to be done to improve co-ordination between government agencies, particularly between MOE and the Forestry Agency. Designation, management and administration of protected areas under nature legislation are the responsibility of MOE. In contrast, forest ecosystem reserves are established and managed in national forests by the Forestry Agency. As a result, while most nationally owned land in Japan is national forest, 781 000 ha of national forests have been protected as ecosystem reserves, compared with the nine million ha of protected areas administered by MOE.¹⁴ Stronger co-operation between MOE and the Forestry Agency is needed to enhance nature conservation in national forests and expand the number of ecosystem reserves. This would raise the share of national territory under nature protection, and improve Japan's profile against OECD standards in this area.

Japan has placed great importance on *partnerships with local governments, citizens and NGOs* in promoting nature and biodiversity protection in designated areas. For example, under the Green Workers Programme, established in 2004, local residents have helped in managing natural parks (on 165 sites nationwide). Another example is the creation of nature restoration committees in 21 regions to restore ecosystems through voluntary participation of local communities; however, the 3rd biodiversity strategy objective of increasing the number of these committees to 29 by 2012 has not yet been met. The Basic Policy for Nature Restoration, first released in 2003, was revised in 2008 with a view to promote effective implementation of nature restoration projects.¹⁵ There are several good examples of local governments fostering co-ordination with citizens' groups to protect biodiversity (e.g. reintroduction of the oriental stork in Toyooka City) or to restore habitats (e.g. sea grass beds in the few remaining natural coasts of Tokyo Bay; fish biodiversity corridors between the rice paddies and Lake Biwa in Shiga prefecture).

3.3. Urban green parks

Following to the 2002 OECD EPR recommendations (Table 7.1), the City Parks Law and the City Green Zone Conservation Law were amended in 2004. The amendment introduced three new schemes to expand the scope for urban green space. The Green Zone Conservation Scheme aims to protect relatively large-scale green zones near cities, such as

satoyama. The Greenery Area Scheme imposes greening requirements on large-scale construction projects in areas where greenery is especially scarce. The Horizontal City Parks Scheme promotes the greening of artificial grounds and rooftops.

As a result, the national targets of tripling urban green space and reaching 13 m² urban public open space per resident – set by the 3rd biodiversity strategy – were achieved in 2008, when urban parks covered 113 000 ha. This was primarily due to the introduction of greening requirements for large-scale buildings and of horizontal city park schemes. In addition, agreements have been made with landowners to give public access to 77 hectares of privately owned green urban areas (“civic green space”).¹⁶ In 2009, MLIT raised the national target to 14 m² urban public open space per resident.

Initiatives have been taken to enhance *public participation*. For example, under the Tokyo Greenship Action Programme (TGAP), launched in 2003, projects have been carried out by volunteers (including municipal employees) in collaboration with non-profit organisations (NPOs) to protect forests in ten (out of 47) conservation zones selected by the Tokyo Metropolitan Government (TMG).¹⁷ In 2007, it launched the ECO-TOP Programme to develop expertise on nature conservation in collaboration with the national government, companies and NPOs. This resulted in TMG certifying, in 2008, two nature and conservation courses (undergraduate and graduate levels) at the Tokyo Metropolitan University (TMG, 2009). Since the last EPR in 2002, there have been various other initiatives to enhance the greening of urban areas.

4. Nature and biodiversity protection outside of designated areas

The 2007 MAFF biodiversity strategy primarily seeks conservation of: i) the rural environment and *satoyama* through, for example, promotion of sustainable agriculture, including organic farming and on-farm biodiversity enhancement; ii) forests (e.g. appropriate thinning); and iii) *satoumi* (e.g. tidal flats and seaweed beds). To monitor progress in implementing the strategy, MAFF is developing indicators for measuring biodiversity in agriculture, forestry and fisheries.

4.1. Agricultural areas

The objective to preserve agricultural land is rooted in the many roles that paddy land plays – as part of the social landscape, as a buffer for water flows and as a contributor to food security. However, the farmland area has decreased continuously over the last 20 years. This is largely due to the conversion of farmland for non-agricultural use.

Conservation and revitalisation of *satoyama* landscapes

The 2007 Strategy for a Sustainable Society states that “Japan will revive and further develop the wisdom of living in harmony with nature and propose the Satoyama Initiative to the world”. In May 2008, the Satoyama Initiative was presented in the “Call for Action for Biodiversity” at the G8 Environmental Ministerial Meeting and in the Japanese Minister of the Environment’s declaration at the CBD COP 9 held in Bonn (Germany). The Initiative proposes a vision for resource management and land use that achieves a balance between economic production and conservation of biodiversity and ecosystem services on a global scale.

Traditionally, *satoyama* refers to secondary woodlands or grasslands that are managed for thatch, fodder and compost. Japan’s traditional landscape also includes other rural environments, such as arable fields and orchards, rice paddies, irrigation ponds and

ditches, and the villages and farmsteads themselves. The *complex rural ecosystem* formed by the combination of *satoyama* and these other environments is called the “*satoyama landscape*” (MOE, 2009).¹⁸ By forming a mosaic of different kinds of woodland, grassland and wetland environments, the *satoyama landscape* can provide a transition between different ecosystems (ecotones) and *habitats for wildlife*. It can also provide other ecosystem services, such as disaster prevention and watershed protection. According to MOE, areas classified as *satoyama* make up approximately 40% of Japan's land area (MOE, 2008a).¹⁹ Japanese people often feel a deep emotional attachment to the *satoyama landscape* and it has been a source of inspiration, imagination and creativity in Japanese culture.

A 2003 MAFF survey of paddy fields revealed that traditional *satoyama landscapes* provide habitat for one-third of total fresh water fish species and dragonflies, a quarter of reptiles and amphibians, about one-fifth of birds and 14% of plants. Nevertheless, the contribution of *satoyama landscapes* to biodiversity conservation is the subject of debate. Many experts consider that only few *satoyama* areas are still endowed with high biodiversity. Most have been *abandoned due to unfavourable economics of farming, the ageing of the farming community* and also, paradoxically, as a result of policies designed to keep land in agriculture and prevent land conversion.²⁰

Ongoing initiatives by MOE aim to identify good *satoyama* practices, support selected *satoyama*, develop innovative use of *satoyama* resources, promote participation of urban citizens and private companies in these efforts, and develop an action plan for *satoyama* restoration. Since 2004, pilot projects for *satoyama* restoration have been conducted in four regions, and activities developed in these pilots have been widely published to encourage their dissemination. MAFF has taken similar initiatives, for example to promote “beautiful villages”.

The effectiveness of the *Satoyama Initiative* in protecting biodiversity could be enhanced by better targeting payments to farmers so as to provide incentives for biodiversity protection. Consideration could also be given to *creating demand for products from satoyama areas by raising consumer awareness*. In 2008, MAFF started to recommend the use of a voluntary eco-label called the “living creature mark”. It applies to agriculture, forestry and marine products produced in a way that preserves local living creatures (e.g. rice with an oriental white stork mark). These brands may support local economies and are welcomed by consumers,²¹ who recognise that rice grown in paddies where abundant fish and birds live is also safe and healthy for humans. Finally, more effective biodiversity protection in the context of *satoyama* conservation and restoration requires better monitoring.

Agricultural policy and biodiversity conservation

In 2007, Japan introduced an agricultural support scheme designed to promote more *environmentally friendly farming*. The scheme applies to five crops plus rice. To be eligible, producers have to be certified (by governors) as “eco-farmers”. This involves reducing the use of chemical fertilisers and pesticides by half compared to conventional farming. The number of eco-farmers has rapidly increased, from 12 in 2000 to 186 000 in 2008 (or 10% of commercial farms), and Japan is on track for meeting the target set by the 3rd biodiversity strategy (200 000 eco-farmers). Such rapid enrolment in the scheme would not have been possible without (sufficient) incentives in the form of interest concessions and payments (by prefectures). Further expanding the scheme would require additional budgetary support, which was JPY 3 billion (about USD 30 million) a year in 2007 and 2008. *Payments for environmentally friendly farming* account for only 0.5% of total payments to farmers, a very low share compared with agri-environmental payments in the EU and the US.

The government is increasingly reducing its involvement in the price formation of agricultural products. Overall, there has been a *reduction in the level of support to producers*: the percentage Producer Support Estimate (% PSE) of Japan decreased from 58% in 2000-02 to 49% in 2006-08. However, *many production incentives remain* that have the potential to distort commodity production, and thereby make farmers more likely to take decisions based on production rather than environmental criteria. The level of producer support, as measured by the % PSE, is still almost twice the OECD average (Chapter 2). Further efforts are needed to reduce the high level of support to farmers and increase market access, while moving towards more decoupled policies that are better targeted to farm income, rural development, and environmental objectives (OECD, 2009a).

Direct payments to farmers in mountainous and hilly areas were introduced by MAFF in 2000 to lower the rate of farmland abandonment. Targeting agricultural areas that bring the greatest environmental benefits with policies aimed at securing those benefits will work better than policies affecting the agricultural sector more broadly (OECD, 2009b). To make the Satoyama Initiative a successful one, Japan should consider introducing *payments targeted to satoyama services*. This may help to achieve the first objective of the MAFF 2007 biodiversity strategy, namely conservation of the rural environment and satoyama.

Environmental performance of agriculture

MAFF is developing indicators to measure biodiversity in agriculture, an objective of the 2007 MAFF biodiversity strategy. A key agri-environmental challenge in Japan is strengthening the sector's capacity to provide *ecosystem and biodiversity services* in a context of abandonment of agricultural land. Many common species in agricultural landscapes (freshwater fish, insects, amphibians, paddy weeds, grassland plants) are now listed on national and prefectural red lists, suggesting that the biodiversity of agricultural landscapes is increasingly under threat (Washitani, 2008).

The intensity of pesticide use in Japan remains very high by OECD standards (Chapter 3). *Organic farming* techniques have yet to be adopted, for which MAFF has established demonstration farms at a budgetary cost of JPY 4.4 billion (USD 47 million). It is expected that by 2011 all prefectures and half of the municipalities will have launched promotional plans for organic farming; 14 prefectures have already done so. Organic products currently account for only 0.2% of agricultural production (in volume).

4.2. Forestry

Forests play a key role in shaping Japan's nature and biodiversity as they cover *two-thirds of Japan's land area* (25 million ha). The area covered by forests has remained constant over time. The multifunctional role of forests is well rooted in public perception, and environmental functions have largely taken precedence over economic functions (i.e. wood production) in successive opinion polls (Table 7.3). Carbon sequestration has become the top forest management priority for the Japanese government. Disaster prevention, particularly protection against flooding, and headwater conservation are still fairly highly ranked forest functions, while social functions (i.e. recreation) rank in the middle.

Between 2000 and 2008, the forest areas designated as *protection forests* increased from nine million to nearly 12 million ha. Restrictions on forestry activities in these areas vary according to the services they are expected to fulfil: water resource conservation, erosion control, or public health and recreation. The conversion of these forests to other land uses is

Table 7.3. **Forest functions in public perception,^a 1980-2007**

Forest functions	1980	1993	1999	2003	2007	Trends
Global warming mitigation	n.i.	n.i.	39	42	54	++
Disaster prevention	62	65	56	50	49	–
Headwater conservation	51	59	41	42	44	–
Air purification/noise reduction	37	38	30	31	39	=
Health and recreation	27	14	16	26	32	+
Wildlife habitat	n.i.	45	26	23	22	–
Outdoor education	n.i.	14	24	19	18	=
Wood production	55	27	13	18	15	–
Non-wood forest products	18	10	15	14	11	–

n.i.: Not included in poll.

a) % of responses in opinion polls with a maximum of three answers per multiple choice.

Source: Cabinet Office.

strictly controlled, and permission from MAFF is required. *Intensity of forest use* is very low in Japan, with only about one-third of the annual growth harvested, mainly because of difficult access to forest areas.

The *river basin approach* provides a context for sustainable forest management, since well-maintained forests have a key role in preventing landslides and flooding, and in protecting headwater quality. In particular, the river basin approach permits links between upstream and downstream communities, so that mechanisms for compensation and equitable sharing of benefits and burdens can be developed.

Progress has been made to achieve the 2007 MAFF biodiversity strategy objective of *improving forest conservation through appropriate thinning*. For example, in Kyoto prefecture (where forests cover 75% of the land) enhanced thinning has been pursued to increase timber productivity (less competition among trees) and carbon sequestration, but also to support biodiversity (more light on the underground). The thinned wood is then used for biomass production. This type of forest management is certified under the “Miyako Somagi” forest certification system. In addition, Kyoto prefecture encourages more intense forest use, for example by subsidising the use of local timber to build local houses.

However, the share of conifer plantations (primarily Japanese cedar) has increased at the expense of *natural forests* and now accounts for 47% of the total forest area in Japan. MAFF is developing indicators to measure biodiversity in relation to forestry, which is an objective of the 2007 MAFF biodiversity strategy.

Some 781 000 ha (or around 10%) of national forests are protected by MAFF as *ecosystem reserves*. The goal of such reserves is to preserve primeval forests of substantial size and particular forest types, with a view to protecting biodiversity and ecosystems, preserving genetic resources and contributing to research.

4.3. Fisheries

Measures have been taken to enhance the *protection of living marine resources*. The capture of sea turtles (two species), whales (blue whale, bowhead whale and finless porpoise) and dugongs has been banned. Studies and field research have been carried out to investigate the ecology, stock and migration of blue whales. Also, efforts have been made to eradicate invasive alien fish species, and by-catch prevention technologies have been developed. However, among the various types of marine protected areas, the extent of *marine areas strictly protected* from any human activity has remained extremely small. Efforts are underway to define the

various types of marine protected areas as indicated by the 2007 Basic Act on Ocean Policy. The 2009 amendment to the Nature Parks Law and Nature Conservation Law stresses the importance of biodiversity conservation in marine areas. As part of its biodiversity strategy, MAFF is developing indicators to measure biodiversity in relation to fisheries.

Japan manages its fisheries through *fishing effort regulation*. Japan's Total Allowable Catch (TAC) systems currently cover 30% of total fishing in Japan's Exclusive Economic Zone (EEZ). Introduced in 2003, the Total Allowable Effort (TAE) sets an upper limit on the number of fishing days and the number of operating vessels in a specific area within the EEZ. For offshore fisheries, a license (per vessel) specifies detailed terms and conditions for the major fishery operations, including limitations on fishing areas, fishing seasons, base port, gear use and fishing methods. This "fishery licensing system" coexists with the TAC and TAE schemes. Moreover, the government maintains a "fishery vessel registration system", and the total number and the total gross tonnage of fishing vessels are closely monitored (OECD, 2009c).

Resource Recovery Plans are being implemented to rebuild the stocks of 74 fish species. A key component of these plans is to *preserve and rehabilitate fishing grounds* (e.g. sea grass beds, tidal flats). *Fishery management in coastal areas* is based on traditional local fishery rights, and could serve as a model for other OECD countries. Groups of fishermen (fishery co-operative associations) traditionally have exclusive rights for operating certain fisheries, and thus assume all responsibility for ensuring the long-term sustainability of the resources. Also, interest concessions are granted for the renewal of small fishing boats in an effort to perpetuate Japanese coastal fisheries.

5. Expenditure on nature conservation

5.1. Public expenditure

Little has been done since the 2002 OECD EPR to improve financing of nature conservation. In 2009, MOE was allocated JPY 16 billion (USD 170 million) from the *central budget* for its nature management activities. The same amount was allocated to nature protection by the Ministry of Education, Culture, Sports, Science and Technology.²² Significantly more was allocated to nature protection by MAFF and MLIT. However, this represents a very minor part of the annual budgetary transfers to farmers and to MLIT water resource development plans, the latter being primarily used for building dams, canals and reservoirs. In 2009, nature management accounted for 7% of the total budgetary transfers to MOE, and for 12% of the total budgetary transfers to all ministries for environmental management.

Despite "society in harmony with nature" being one of the three pillars of Japan's 2007 Strategy for a Sustainable Society,²³ the JPY 15.4 trillion (USD 165 billion) government contribution to the *policy package to address the economic crisis*, released in April 2009, does not include support specifically intended for nature management.²⁴ In contrast, some 10% of this package (USD 16.7 billion) is devoted to further supporting the farming and tourism sectors. In September 2009, the new government announced its intent to *increase support to farmers* to JPY 1 trillion (over USD 10 billion) by 2013, a 50% increase over the current level of direct payments. This contrasts with the OECD recommendation to reduce the (already) high level of support to Japanese agriculture (OECD, 2009a). At a minimum, environmental cross compliance requirements should be attached to such support, which should not further distort agricultural production and trade; ideally, such support should also be linked to otherwise unremunerated but beneficial public services, such as environmental and biodiversity protection.

5.2. Financing

There is no *entry fee* for *national parks* but a service fee is sometimes charged for visitors' information centres (when these are managed by the private sector or a municipality). Parking fees are sometimes charged, in which case the revenues are used to clean up the park. An access fee (JPY 1 000) is charged for regulated utilisation areas. In *Okinawa*, a service fee for scuba diving has made it possible to raise money to fund nature protection projects. Such financing instruments could be introduced on other islands and applied to eco-tourism.

Thirty (out of 47) prefectures levy a *forestry protection tax* aimed at complementing allocations from the central budget for forest management and conservation activities. In most cases, a surtax is added for the management and conservation of regional forests, including the protection of headwaters critical to the water supply. In addition, in some prefectures, private companies, organisations and individuals living adjacent to downstream rivers may contribute to a fund for afforestation and thinning in upstream forests in exchange of tax breaks.

In 2009, *Yokohama City* began collecting a new tax, the *Yokohama greenery tax*, which will be applied for an initial 5-year period. The tax rate is JPY 900 (USD 10) per household and per semester. It will raise JPY 2.4 billion (USD 26 million) per year, which represents 15% of the central budget's annual allocation for MOE's nature management activities. *Yokohama* is the first (and so far only) city in Japan that applies such a greenery tax. The greenery tax rate should be differentiated based on the increase in property value, with houses close to new green spaces paying more than others.

In 2007, the *Tokyo Metropolitan Government (TMG)* established the *Fund for Green Tokyo*. Donators are eligible for income or individual inhabitant tax breaks. They can select the type of project their donation should be used for (e.g. roadside trees, planting grass in schoolyards).

There is scope to further develop *payment for ecosystem services* in Japan (Box 7.2). For example, private landowners could be compensated for the provision of well-defined and monitored biodiversity services, including in protected areas. This could prove a more cost-effective means of protecting biodiversity than relying on the public budget to finance additional MOE staff. Similarly, there is scope to increase or introduce fees for accessing environmental resources, for example in pristine coastal areas and protected areas.

Box 7.2. Paying for ecosystem services: The Yodo River

One example of a scheme involving payments for ecological services involves upstream and downstream communities on the *Yodo River*. It shows how mechanisms for compensation and equitable sharing of benefits and burdens can be developed. For 30-40 years *Osaka prefecture* has paid *Shiga prefecture* a cumulative amount of JPY 50 billion (about USD 530 million) for sustainable forest management around *Lake Biwa* as part of MLIT's *Yodo River water resource development plan* and the *Lake Biwa comprehensive development plan*.^{*} The aim is to protect *Lake Biwa* (located in *Shiga prefecture*), which is the source of the *Yodo River* that supplies drinking water to *Osaka prefecture* and *Osaka City*. Effectively the downstream community is paying the upstream community to maintain its source of water supply. Such payments for ecosystem services could be extended to other river basins, based on a cost-effectiveness analysis of meeting the desired objectives (e.g. protect the city's water supply sources from pollution).

^{*} The *Lake Biwa comprehensive development plan* is co-ordinated between MOE, MAFF and MLIT (through their regional offices in *Kinki*).

Notes

1. Biodiversity: i) is the basis for the existence of all life on earth (e.g. oxygen supply, soil fertility); ii) has a use value (e.g. food, timber, medicine); iii) is the basis for enriching culture (e.g. cultural diversity fostered by local natural environment); and iv) provides security of livelihood (e.g. disaster reduction).
2. An opinion poll in June 2009 revealed that 61.5% of Japanese had never heard of the word. This is particularly true in rural areas and among Japanese women.
3. For example, the redback spider, which is harmful to humans, was found in Takaishi City (Osaka prefecture) in 1995, and the Java mongoose was found to be a threat to rare species such as Amami rabbits, on Amami-Oshima island (Kagoshima prefecture).
4. The banded mongoose was added to the list of IAS in 2010.
5. A natural coast is a coastline in its natural state, unchanged by human activity and without artificial structure. A semi-natural coast includes roads, dikes and other concrete structures, but its intertidal zone is in a natural state.
6. These ecosystems provide important habitats for fish, shellfish and migratory water birds (tidal flats), and for organisms living in shallow coastal waters and marine resources in bays and estuaries (seaweed beds). Coral reefs support an enormous variety of organisms and have very high biological productivity.
7. Quasi-national parks are designated by MOE and managed by prefectures. They are not eligible to transfers from the central budget but get support from the prefecture.
8. The rapid increase between 1999 and 2005 was a response to the global objective set at COP 7 in 1999 to double the number of sites by 2005.
9. Japan always stressed the importance of rice paddies as wetland systems in the ambit of the Convention on Wetlands.
10. "Natural habitat conservation areas" have been established to protect habitats of the 82 national endangered species. "Wilderness areas" are areas where the natural environment has maintained an ecological stability without being influenced by human activities. "Nature conservation areas" must satisfy certain criteria, such as having outstanding natural forests.
11. National parks attract around 1 billion visits per year.
12. Restrictions in regulated utilisation areas are more stringent than in special protection zones, traditionally the most strictly controlled parts of national parks.
13. Including 67 ranger offices evenly distributed across the territory and six offices on Japanese islands.
14. MOE's protected areas include a (small) part of the forests that are privately owned or that belong to prefectures and municipalities.
15. Nature restoration committees fall under the 2002 Law for the Promotion of Nature Restoration, which is shared between the MOE, MAFF and MLIT. The need to consider upon a variety of opinions within committees has slowed down the decision-making process.
16. The use of privately owned open land in urban areas is strictly regulated (e.g. farmland and hilly areas cannot be used for construction).
17. 46 conservation zones (740 ha) have been designated so far, under the Tokyo Metropolitan Nature Conservation Ordinance.
18. Literally *sato* means the surrounding of a village and *yama* means mountain. The *satoyama* concept is also referred to as *satochi-satoyama* (*chi* means ground area or agriculture field).
19. There are broad estimates that 50% of farmland is intensive, 40% is *satoyama* and 10% is eco-farming.
20. Policies aimed at preserving farmland have also had the effect of reducing the attractiveness of land rental transactions and have led to under-use of agricultural land.
21. Though twice as expensive as common rice, Japanese consumers seem to be prepared to buy such rice brands, as shown by the rapidly increasing success of "consumer co-operation" shops where they are sold.
22. The Ministry administers the natural monuments (e.g. specific animal and plant habitats, geological and mineral features), based on the Law for the Protection of Cultural Properties.
23. Together with a "low-carbon society" and a "sound material-cycle society".
24. 10% of the overall recovery package has been allocated to low-carbon measures.

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The government documents, OECD documents and other documents used as sources for this chapter include the following. Also, see list of websites at the end of this report.

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References

I.A.	Selected Environmental Data	190
I.B.	Selected Economic Data	191
I.C.	Selected Social Data	192
II.	Abbreviations	193
III.	Selected Environmental Websites	195

I.A: SELECTED ENVIRONMENTAL DATA (1)

OECD EPR / THIRD CYCLE

		CAN	MEX	USA	JPN	KOR	AUS	NZL	AUT	BEL	CZE	DNK	FIN	FRA	DEU	GRC	HUN	ISL	IRL	ITA	LUX	NLD	NOR	POL	PRT	SLO	ESP	SWE	CHE	TUR	UKD*	OECD*
LAND																																
Total area (1000 km ²)		9985	1964	9632	378	99	7741	268	84	31	79	43	338	552	357	132	93	103	70	301	3	42	324	313	92	49	505	450	41	784	244	35096
Major protected areas (% of territorial area)	2	6.6	9.1	22.7	5.8	3.9	19.4	20.6	28.0	3.1	15.8	3.3	8.2	12.1	54.1	2.7	5.5	5.6	0.7	5.7	16.6	15.6	4.6	23.5	4.3	19.6	8.0	9.1	28.6	2.0	18.3	14.1
Nitrogenous fertiliser use (t/km ² of agricultural land)		4.4	1.0	2.8	10.6	16.9	0.2	1.6	3.8	10.1	8.3	11.2	8.1	8.1	9.4	3.8	5.5	0.6	7.2	6.0	10.3	13.7	7.9	9.4	2.1	5.8	3.5	5.2	3.2	3.3	5.9	2.4
Pesticide use (t/km ² of agricultural land)		0.06	0.04	0.07	1.16	1.27	-	0.03	0.10	0.50	0.11	0.12	0.07	0.24	0.19	0.12	0.17	-	0.07	0.55	-	0.55	0.07	0.10	0.44	0.15	0.14	0.07	0.09	0.04	0.15	0.07
Livestock densities (head of sheep eq./km ² of agr. land)		174	217	168	706	1324	62	573	489	1635	267	869	334	485	635	227	169	54	1165	388	948	1859	862	342	413	241	312	378	772	233	599	188
FOREST																																
Forest area (% of land area)		34.1	33.0	33.1	68.2	63.5	21.3	31.0	46.8	22.1	34.3	11.8	73.9	28.3	31.8	29.1	22.1	0.5	9.7	33.9	33.9	10.8	30.8	30.0	41.3	40.1	35.9	67.1	30.5	13.2	11.8	31.0
Use of forest resources (harvest/growth)		..	..	..	0.2	1.0	..	0.7	0.6	0.8	..	..	0.7	..	1.0	..	..	..	0.9	..	..	..	0.4	0.5	..	..	..	..	..	..	0.5	..
Tropical wood imports (USD/cap.)	3	3.2	0.9	2.8	7.9	5.0	9.1	5.3	0.9	28.1	0.9	7.7	5.8	9.8	3.7	5.0	0.1	8.0	7.1	7.4	0.7	33.3	4.0	1.4	14.1	1.8	6.1	1.5	0.6	2.1	3.0	4.9
THREATENED SPECIES																																
Mammals (% of species known)		20.3	31.8	16.8	23.3	11.4	23.8	18.0	22.0	35.9	20.0	22.0	10.8	19.0	37.9	37.8	37.8	-	1.8	40.7	51.6	18.6	13.7	13.5	26.2	21.7	13.3	18.3	32.9	14.3	15.8	..
Birds (% of species known)		9.8	16.2	11.7	13.1	6.3	13.0	21.0	27.7	24.9	50.0	16.3	13.3	19.2	27.3	1.9	14.5	44.0	5.4	18.4	23.1	21.6	16.1	7.8	38.1	14.0	26.9	17.5	36.4	3.7	16.2	..
Fish (% of species known)		29.6	27.6	31.7	36.0	8.9	1.0	10.0	50.6	23.4	41.5	15.8	11.8	36.1	68.2	26.2	43.2	-	23.1	35.1	27.9	22.1	9.4	21.0	62.9	24.1	51.4	10.9	38.9	11.1	11.1	..
WATER																																
Water withdrawal (% of gross annual availability)		1.5	16.7	19.2	20.2	40.3	4.8	1.2	4.5	31.9	10.7	5.0	2.1	17.5	18.9	12.1	4.8	0.1	2.3	24.0	3.3	10.9	0.6	19.1	12.4	0.9	30.4	1.4	5.0	19.1	12.9	11.3
Public waste water treatment (% of population served)		72	39	71	72	87	..	80	92	55	75	88	81	80	97	65	60	57	65	94	95	99	78	62	69	57	86	86	97	42	97	72
Fish catches (% of world catches)		1.2	1.5	5.3	4.8	1.9	0.2	0.6	-	-	-	0.9	0.2	0.6	0.3	0.1	-	1.6	0.3	0.3	-	0.5	2.6	0.2	0.3	-	1.0	0.3	-	0.6	0.7	25.8
AIR																																
Emissions of sulphur oxides (kg/cap.)		58.5	25.9	39.0	6.1	9.2	120.3	17.4	3.1	12.0	21.1	4.3	15.6	7.1	6.0	48.7	8.4	37.1	12.8	5.7	2.8	3.6	4.2	29.7	17.5	13.1	26.2	3.7	1.8	23.2	9.7	23.3
(kg/1000 USD GDP)	4	1.6	1.9	0.9	0.2	0.4	3.6	0.7	0.1	0.4	1.0	0.1	0.5	0.2	0.2	1.9	0.5	1.0	0.3	0.2	-	0.1	0.1	2.0	0.8	0.7	0.9	0.1	-	1.9	0.3	0.8
% change (2000-2007)		-16	-5	-21	-15	-9	5	14	-19	-26	-18	-18	2	-30	-21	9	-83	44	-61	-55	-	-17	-27	-25	-40	-44	-21	-24	-17	-24	-52	-20
Emissions of nitrogen oxides (kg/cap.)		69.8	14.0	51.3	15.2	26.4	85.1	37.8	26.5	24.5	27.7	30.7	34.8	21.8	15.7	33.5	18.8	84.0	27.7	19.5	29.2	17.1	41.5	23.2	24.1	15.4	34.0	18.4	10.7	17.3	24.5	30.6
(kg/1000 USD GDP)	4	2.0	1.0	1.2	0.5	1.1	2.6	1.5	0.8	0.7	1.3	0.9	1.1	0.7	0.5	1.3	1.1	2.4	0.7	0.7	0.4	0.5	0.9	1.6	1.2	0.9	1.2	0.5	0.3	1.4	0.7	1.0
% change (2000-2007)		-8	4	-24	-8	14	17	14	8	-21	-28	-17	-13	-17	-28	12	2	-5	-14	-20	-17	-26	-7	6	-15	-24	2	-22	-20	15	-20	-15
Emissions of carbon dioxide (t/cap.)	5	17.4	4.1	19.1	9.7	10.1	18.8	8.4	8.4	10.0	11.8	9.2	12.2	6.0	9.7	8.7	5.4	7.5	10.2	7.4	22.5	11.1	7.8	8.0	5.2	6.8	7.7	5.1	5.6	3.8	8.6	11.0
(t/1000 USD GDP)	4	0.48	0.31	0.44	0.31	0.40	0.55	0.33	0.24	0.30	0.52	0.27	0.37	0.19	0.29	0.33	0.30	0.21	0.25	0.26	0.30	0.30	0.16	0.51	0.25	0.35	0.27	0.15	0.15	0.30	0.25	0.35
% change (2000-2007)		8	23	1	5	13	17	10	14	-11	-	1	20	-2	-3	12	-	10	7	3	34	5	10	4	-7	-2	21	-12	1	32	-	4
WASTE GENERATED																																
Industrial waste (kg/1000 USD GDP)	4, 6	..	..	..	40	40	10	10	..	40	30	10	100	50	20	..	30	-	30	20	20	30	20	110	40	100	20	100	-	20	20	40
Municipal waste (kg/cap.)	7	400	350	760	400	380	690	400	590	490	290	800	510	540	580	450	460	560	780	550	690	630	830	260	470	290	580	520	710	430	570	560
Nuclear waste (t./Mtoe of TPES)	8	5.9	0.1	0.9	1.4	2.9	-	-	-	2.2	1.7	-	1.9	4.1	0.9	-	1.8	-	-	-	-	0.1	-	-	-	3.1	0.8	4.3	2.3	-	1.8	1.4

.. not available. - nil or negligible.

UKD: pesticides and threatened species: Great Britain; water withdrawal and public waste water treatment plants: England and Wales.

1) Data refer to the latest available year. They include provisional figures and Secretariat estimates.
Partial totals are underlined. Varying definitions can limit comparability across countries.

2) IUCN management categories I-VI and protected areas without IUCN category assignment; national classifications may differ.

3) Total imports of cork and wood from non-OECD tropical countries.

4) GDP at 2005 prices and purchasing power parities.

Source: OECD Environmental Data Compendium.

5) CO₂ from energy use only; sectoral approach; international marine and aviation bunkers are excluded.

6) Waste from manufacturing industries.

7) CAN, NZL: household waste only.

8) Waste from spent fuel arising in nuclear power plants, in tonnes of heavy metal, per million tonnes of oil equivalent of total primary energy supply.

I.B: SELECTED ECONOMIC DATA (1)

OECD EPR / THIRD CYCLE

	CAN	MEX	USA	JPN	KOR	AUS	NZL	AUT	BEL	CZE	DNK	FIN	FRA	DEU	GRC	HUN	ISL	IRL	ITA	LUX	NLD	NOR	POL	PRT	SLO	ESP	SWE	CHE	TUR	UKD	OECD	
GROSS DOMESTIC PRODUCT																																
GDP, 2008 (billion USD au 2005 prices and PPPs)	1194	1409	13253	4044	1212	720	107	294	356	237	189	175	1955	2738	299	179	11	179	1709	36	614	231	597	225	104	1280	313	286	874	2079	36900	
% change (2000-08)	20.1	20.6	18.6	10.6	40.8	28.0	25.5	18.9	15.4	39.7	10.5	24.7	13.9	10.1	36.1	30.0	37.7	41.4	7.1	34.2	16.7	20.2	38.6	7.8	62.0	27.6	21.0	16.6	41.0	20.0	18.5	
per capita, 2008 (1000 USD/cap.)	36.0	13.4	43.8	31.5	25.5	34.4	24.8	35.9	33.6	23.3	34.0	33.3	31.5	33.7	27.2	18.0	36.2	39.3	28.2	73.8	38.1	49.4	16.4	21.2	20.5	28.3	33.8	38.3	11.8	34.0	31.2	
Exports, 2008 (% of GDP)	35.0	28.4	13.4	18.1	56.3	23.3	31.3	59.9	90.9	77.1	54.6	46.4	26.7	48.1	22.1	82.6	41.9	81.7	29.4	177.6	77.7	46.2	40.1	33.3	85.3	27.0	53.8	57.3	23.2	28.5	28.7	
INDUSTRY																																
Value added in industry (% of GDP)	2	32	36	22	30	37	29	26	31	23	38	26	32	20	30	19	29	24	34	27	15	25	46	32	24	38	28	28	28	24	26	
Industrial production: % change (2000-08)	-5.2	7.9	5.0	5.5	60.8	11.7	11.0	36.1	11.5	57.0	5.5	24.8	-0.4	21.1	0.3	55.9	..	42.2	-1.8	15.0	10.7	-7.1	63.4	-7.7	77.1	0.6	13.2	20.8	41.1	-6.5	10.3	
AGRICULTURE																																
Value added in agriculture (% of GDP)	3	2	3	1	1	3	2	7	2	1	2	1	3	2	1	4	4	6	2	2	0	2	1	4	3	4	3	2	1	11	1	2
Agricultural production: % change (2000-07)	3.9	22.4	6.9	-2.0	-5.0	-16.4	17.8	-2.1	-7.6	..	3.0	-	-7.9	-4.0	-18.0	4.3	3.0	-7.1	-5.1	-9	-8.0	-	5.1	-4.0	-10.9	-2.9	-2.0	-	-2.9	-9.8	..	
Livestock population, 2006 (million head of sheep eq.)	106	234	696	36	25	275	99	16	23	11	22	8	144	108	19	10	1	49	57	1	36	9	54	15	5	90	12	12	96	102	2373	
ENERGY																																
Total supply, 2008 (Mtoe)	267	186	2297	491	227	129	17	32	58	45	19	35	267	335	33	27	5	15	174	4	80	31	98	24	18	138	50	27	96	207	5434	
% change (2000-08)	6.5	26.3	0.6	-5.1	20.3	18.4	2.2	13.3	-1.3	12.9	3.2	8.4	5.4	-0.7	20.3	6.5	50.6	11.2	2.2	24.6	8.8	22.5	10.4	-1.2	2.5	13.0	4.6	9.0	26.3	-7.4	3.5	
Energy intensity, 2008 (toe/1000 USD GDP)	0.22	0.13	0.17	0.12	0.18	0.18	0.16	0.11	0.16	0.19	0.10	0.20	0.14	0.12	0.11	0.15	0.41	0.09	0.10	0.12	0.13	0.13	0.16	0.11	0.16	0.11	0.16	0.09	0.11	0.10	0.15	
% change (2000-08)	-27.6	-19.7	-31.3	-18.2	-31.0	-24.6	-30.0	-17.8	-25.6	-25.1	-18.8	-31.1	-19.4	-18.4	-25.4	-32.4	-13.8	-50.3	-13.1	-31.0	-23.5	-15.0	-38.8	-25.0	-47.1	-27.6	-26.7	-15.5	-26.8	-34.8	-26.1	
Structure of energy supply, 2008 (%)	4																															
Solid fuels		9.6	4.0	24.1	23.0	28.3	44.1	10.3	10.7	7.5	44.3	21.9	16.2	4.8	24.4	32.8	11.7	1.8	16.2	9.9	1.5	10.2	2.4	55.7	10.7	21.8	9.9	5.1	0.6	28.5	17.0	20.9
Oil		34.6	56.9	37.1	43.1	39.3	30.1	35.7	40.7	41.0	20.4	38.1	28.6	30.9	32.9	51.3	26.9	15.8	50.3	41.2	66.9	39.5	37.5	25.6	52.9	20.4	46.5	27.0	41.5	30.1	32.7	37.3
Gas		30.4	28.1	24.0	17.1	13.6	20.5	20.0	22.6	26.1	15.3	21.4	11.4	14.7	22.9	10.7	40.5	-	29.7	40.6	29.1	44.3	18.2	12.7	17.6	28.4	25.2	1.7	10.5	31.9	40.9	23.7
Nuclear		9.1	1.4	9.5	13.6	17.3	-	-	-	20.9	15.0	-	17.8	42.3	11.5	-	14.8	-	-	-	-	1.4	-	-	-	24.3	11.0	33.5	27.1	-	6.6	10.9
Hydro, etc.		16.3	9.6	5.3	3.2	1.5	5.3	34.0	26.1	4.5	5.0	18.6	26.0	7.4	8.4	5.2	6.2	82.3	3.7	8.3	2.6	4.6	41.9	6.0	18.8	5.1	7.4	32.7	20.3	9.5	2.8	7.1
ROAD TRANSPORT																																
Road traffic volumes per capita, 2007 (1000 veh.-km/cap.)	10.1	0.7	16.3	6.8	4.7	10.1	13.7	10.3	9.2	4.6	8.2	10.1	8.5	7.0	10.1	2.3	9.6	10.1	9.3	8.8	8.4	8.2	4.2	8.9	2.9	5.2	8.6	8.3	1.0	8.3	8.7	
Road vehicle stock, 2007 (10 000 vehicles)	1883	2569	24795	7413	1590	1417	273	513	575	483	262	299	3665	4922	608	349	24	226	4021	36	822	269	1702	573	164	2696	478	430	946	3316	67322	
% change (2000-07)	7.2	67.7	12.2	4.8	31.8	19.4	17.4	3.6	9.8	29.5	16.3	21.1	8.4	7.9	42.1	26.9	34.4	46.5	11.2	20.8	11.7	16.7	41.2	20.6	14.6	25.8	9.0	11.9	58.6	17.1	14.9	
per capita (veh./100 inh.)	57	24	82	58	33	67	65	62	54	47	48	56	59	60	54	35	78	52	68	75	50	57	45	54	30	60	52	57	13	54	57	

.. not available. - nil or negligible.

1) Data may include provisional figures and Secretariat estimates. Partial totals are underlined.

2) Value added: includes mining and quarrying, manufacturing, gas, electricity and water and construction; production: excludes construction.

3) Agriculture, forestry, hunting, fishery, etc.

4) Breakdown excludes electricity trade.

5) Refers to motor vehicles with four or more wheels, except for Italy, which include three-wheeled goods vehicles.

Source: OECD Environmental Data Compendium.

I.C: SELECTED SOCIAL DATA (1)

OECD EPR / THIRD CYCLE

	CAN	MEX	USA	JPN	KOR	AUS	NZL	AUT	BEL	CZE	DNK	FIN	FRA	DEU	GRC	HUN	ISL	IRL	ITA	LUX	NLD	NOR	POL	PRT	SLO	ESP	SWE	CHE	TUR	UKD	OECD	
POPULATION																																
Total population, 2008 (100 000 inh.)	329	1058	3013	1278	485	211	42	83	106	103	55	53	619	823	112	101	3	43	594	5	164	47	381	106	54	449	91	76	739	610	11831	
% change (2000-08)	8.6	8.4	7.8	0.6	3.4	11.9	10.7	2.8	4.3	1.5	2.8	2.6	5.4	-0.1	2.8	-1.7	13.6	16.7	5.2	10.9	3.2	6.2	-0.4	3.8	0.2	13.2	3.9	5.6	10.4	4.3	5.5	
Population density, 2008 (inh./km²)	3.3	54.3	31.6	337.9	489.7	2.8	15.9	99.4	350.2	132.2	127.4	15.7	112.9	230.0	85.0	107.9	3.1	62.9	198.7	186.8	395.9	14.7	121.9	115.3	110.4	90.2	20.5	183.7	95.0	252.1	33.9	
Ageing index, 2008 (over 64/under 15)	81.5	19.1	63.6	164.3	59.3	68.6	60.5	113.3	100.9	103.9	85.7	99.0	91.2	154.1	130.2	106.3	55.5	52.9	140.5	77.1	83.4	76.8	87.5	114.1	78.2	113.1	105.5	114.8	26.8	92.5	76.2	
HEALTH																																
Women life expectancy at birth, 2007 (years)	83.0	77.5	80.7	86.0	82.7	83.7	82.2	82.9	82.3	79.9	80.7	83.1	84.3	82.4	82.0	77.3	82.9	82.1	84.0	81.9	82.3	82.9	79.7	82.3	78.1	84.4	83.0	84.2	74.8	81.1	..	
Infant mortality, 2006 (deaths /1 000 live births)	5.4	18.1	6.9	2.6	5.3	4.7	5.0	3.6	3.7	3.3	3.8	2.8	3.8	3.8	3.7	5.7	1.4	3.7	3.9	2.5	4.4	3.2	6.0	3.3	6.6	3.8	2.8	4.4	21.7	5.0	..	
Expenditure, 2007 (% of GDP)	10.1	5.9	16.0	8.1	6.8	8.7	9.2	10.1	10.2	6.8	9.8	8.2	11.0	10.4	9.6	7.4	9.3	7.6	9.0	7.3	9.8	8.6	6.4	9.9	7.7	8.5	9.1	10.8	5.7	8.4	..	
INCOME AND POVERTY																																
GDP per capita, 2008 (1000 USD/cap.)	36.0	13.4	43.8	31.5	25.5	34.4	24.8	35.9	33.6	23.3	34.0	33.3	31.5	33.7	27.2	18.0	36.2	39.3	28.2	73.8	38.1	49.4	16.4	21.2	20.5	28.3	33.8	38.3	11.8	34.0	31.2	
Poverty (% pop. < 50% median income)	12.0	18.4	17.1	14.9	14.6	12.4	10.8	6.6	8.8	5.8	5.3	7.3	7.1	11.0	12.6	7.1	7.1	14.8	11.4	8.1	7.7	6.8	14.6	12.9	8.1	14.1	5.3	8.7	17.5	8.3	10.6	
Inequality (Gini levels)	2	31.7	47.4	38.1	32.1	31.2	30.1	33.5	26.0	26.0	25.0	26.0	26.0	30.0	34.0	26.0	28.0	31.0	32.0	27.0	28.0	24.0	32.0	37.0	24.0	31.0	23.0	27.6	43.0	33.0	30.3	
Minimum to median wages, 2003	3	41.0	19.0	32.0	31.0	25.0	57.0	46.0	x	47.0	37.0	x	x	61.0	x	49.0	49.0	x	38.0	x	54.0	51.0	x	40.0	44.0	45.0	29.0	x	x	44.0	44.0	..
EMPLOYMENT																																
Unemployment rate, 2008 (% of civilian labour force)	4	6.1	4.0	5.8	4.0	3.2	4.2	4.2	3.9	7.0	4.4	3.4	6.4	7.8	7.3	7.7	7.8	3.0	6.0	6.8	4.8	2.8	2.5	7.2	7.8	9.5	11.4	6.1	3.5	9.8	5.6	6.1
Labour force participation rate, 2008 (% 15-64 years)		80.4	65.0	75.6	80.8	69.3	77.9	79.9	78.4	69.0	70.3	83.5	76.2	69.1	80.0	68.3	60.4	85.0	73.8	63.4	68.3	81.0	82.0	62.7	78.3	68.8	74.2	71.2	85.2	50.8	76.6	72.2
Employment in agriculture, 2008 (%)	5	2.4	13.0	1.5	4.2	7.2	3.3	7.0	5.6	1.8	3.3	2.7	4.5	2.9	2.3	11.3	4.5	4.0	5.8	3.9	1.4	2.6	2.8	14.0	11.5	4.0	4.4	2.2	4.0	23.7	1.5	5.0
EDUCATION																																
Education, 2007 (% 25-64 years)	6	86.6	33.3	87.9	84.0	77.9	68.2	71.6	80.1	68.0	90.5	75.5	80.5	68.7	84.4	59.6	79.2	64.5	67.6	52.3	65.7	73.2	78.9	86.3	27.5	87.0	50.7	84.6	86.0	28.7	68.3	70.1
Expenditure, 2006 (% of GDP)	7	6.5	5.7	7.4	5.0	7.3	5.7	6.3	5.5	6.1	4.8	7.3	5.8	5.9	4.8	..	5.6	8.0	4.7	4.9	3.3	5.6	5.4	5.7	5.6	4.3	4.7	6.3	5.9	2.7	5.9	5.8
OFFICIAL DEVELOPMENT ASSISTANCE																																
	8																															
ODA, 2008 (% of GNI)		0.32	..	0.19	0.19	0.09	0.32	0.30	0.43	0.48	..	0.82	0.44	0.39	0.38	0.21	..	..	0.59	0.22	0.97	0.80	0.88	..	0.27	..	0.45	0.98	0.42	..	0.43	0.30
ODA, 2008 (USD/cap.)		144	..	88	75	17	138	82	206	223	..	511	219	175	170	63	..	..	300	81	858	425	831	..	58	..	151	513	269	..	187	129

.. not available. - nil or negligible. x not applicable.

1) Data may include provisional figures and Secretariat estimates. Partial totals are underlined.

2) Ranging from 0 (equal) to 100 (inequal) income distribution; figures relate to total disposable income (including all incomes, taxes and benefits) for the entire population.

3) Minimum wage as a percentage of median earnings including overtime pay and bonuses.

Source: OECD.

4) Standardised unemployment rates; MEX, ISL, TUR: commonly used definitions.

5) Civil employment in agriculture, forestry and fishing.

6) Upper secondary or higher education; OECD: average of rates.

7) Public and private expenditure on educational institutions; OECD: average of rates.

8) Official Development Assistance by Member countries of the OECD Development Assistance Committee.

REFERENCE II

Abbreviations

APEC	Asia-Pacific Economic Co-operation
ASEAN	Association of Southeast Asian Nations
CBD	Convention on Biological Diversity
CDM	Clean Development Mechanism
CFC	Chlorofluorocarbon
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
EEZ	Exclusive economic zone
EIA	Environmental impact assessment
EPR	Environmental Performance Review
GDP	Gross domestic product
GEF	Global Environment Facility
GHG	Greenhouse gas
HCB	Hexachlorobenzene
HCFC	Hydrochlorofluorocarbon
IUCN	International Union for Conservation of Nature
IWC	International Whaling Commission
JEA	Japanese Environment Association
J-ETV	Japan Environmental Technology Verification Programme
JICA	Japan International Co-operation Agency
JSWA	Japan Sewage Works Association
JVETS	Japanese Voluntary Emissions Trading Scheme
LPCA	Local pollution control agreement
MAFF	Ministry of Agriculture, Forestry and Fisheries
METI	Ministry of Economy, Trade and Industry
MLIT	Ministry of Land, Infrastructure, Transport and Tourism
MOE	Ministry of the Environment
MOFA	Ministry of Foreign Affairs
NBS	National biodiversity strategy
NEAC	Northeast Asian Conference on Environmental Co-operation
NGO	Non-governmental organisation
NIES	National Institute for Environmental Studies
NMVOC	Non-methane volatile organic compound
NO_x	Nitrogen oxide
ODA	Official development assistance
ODS	Ozone-depleting substance

PCB	Polychlorinated biphenyl
PCDD	Polychlorinated dibenzodioxin (dioxin)
PCDF	Polychlorinated dibenzofurans (furan)
PHDPP	Pollution-related Health Damage Prevention Programme
PM	Particulate matter
POP	Persistent organic pollutant
PRTR	Pollutant Release and Transfer Register
PSE	Producer support estimate
SMC	Sound material-cycle
SO₂	Sulphur dioxide
SO_x	Sulphur
TEMM	Tripartite Environment Ministers Meeting
TFC	Total final consumption
TMG	Tokyo Metropolitan Government
TPES	Total primary energy supply
UNFCCC	United Nations Framework Convention on Climate Change
VOC	Volatile organic compound
WASABI	Water and Sanitation Broad Partnership Initiative
WCPFC	Western and Central Pacific Fisheries Commission
WQS	Water quality standards

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Host institution

Ministry of the Environment

 Ministry of Economy, Trade and Industry
 Ministry of Finance
 Ministry of Health, Labour and Welfare
 Ministry of Agriculture, Forestry and Fishery
 Ministry of Land, Infrastructure and Transport
 Statistical Bureau of Japan
 Biodiversity Centre Japan
 Global Environment Information Centre
 National Institute for Environmental Studies
 Asia Pacific Energy Research Centre

Nature Conservation Society Japan
 Friends of the Earth Japan
 World Wildlife Fund Japan (Japanese only)
 Japanese Trade Union Confederation
 Japan Federation of Economic Organisations

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