
2 Emissions-reduction policies

Key points

- There is a large number and diverse range of emissions-reduction policies in place, and in the process of being implemented, in nearly all of the nine countries studied — the Commission has identified more than 1000 policies in total.
- Some countries use cross-sectoral policies.
 - Germany, the United Kingdom and New Zealand operate multi-sector — but not yet economy-wide — emissions trading schemes (ETSs). (ETSs are under consideration or proposed in Australia, China, Japan, South Korea, and the United States.)
 - The United States is in the process of setting economy-wide emissions standards for all large emitters of greenhouse gases.
- Most countries have adopted sector-specific policies, primarily targeting electricity generation and road transport and, to a much lesser extent, agriculture and forestry. Few policies specifically target other sectors (such as resources or manufacturing).
- In the electricity generation sectors of the countries studied:
 - renewable energy targets (using certificate schemes) and feed-in tariffs (often supported by capital subsidies) are the primary emissions-reduction policies
 - subsidies and preferential loans to support the construction of renewable generation capacity are common
 - technology standards (regulating generation technology and emissions levels) are also used
 - electricity-specific ETSs are in use in the United States (across ten states) and Australia (in New South Wales). The cross-sectoral EU and NZ ETSs also apply.
- In the transport sectors of the countries studied:
 - policies predominantly target fuels and vehicles. Fuel taxes, government assistance to biofuels (such as fuel content mandates and excise exemptions), and vehicle fuel efficiency standards are the primary emissions-reduction policies
 - tax exemptions and subsidies for lower-emissions vehicles are common
 - policies such as investment in public transport and freight infrastructure, that may less directly reduce emissions, are widely used.
- A wide range of energy efficiency policies targeting households and businesses are in place in all the countries studied.

This chapter summarises the emissions-reduction policies of the nine countries covered by this study — Australia, China, Germany, India, Japan, New Zealand, South Korea, the United Kingdom, and the United States. Specific details of the policies analysed in chapters four and five are in appendix B, and a full stocktake of policies can be found on the Commission’s website (appendix P).

2.1 Approach

The Commission used three main criteria in determining whether to include policies in its stocktake. Generally, policies were included if they:

- are in place or committed — where ‘committed’ means the policy not only has a high probability of being implemented, but specific details have also been released (for example, the policy is in the process of enactment)
- have the explicit intent, or the effect, of reducing emissions (for example, fuel excises are often considered to be road-user charges or general taxation but they also have the effect of reducing emissions)
- operate at the national or state/provincial level (policies at the local government level were generally not included because they are not likely to be material to cross-country comparisons).

The Commission used two further criteria to identify the smaller number of policies analysed in chapter 4 (electricity generation) and chapter 5 (road transport). Generally, policies were analysed if they:

- penalise emissions or give an incentive for abatement (which covers explicit or implicit taxes and subsidies, and regulations, but not voluntary codes)
- have a material impact on a country’s emissions in a sector and/or impose significant total costs.

The stocktake was compiled by the Commission through a combination of its own research, utilisation of existing stocktakes of emissions-reduction policies¹, consultation with government agencies in each of the study countries, and assistance from specialist consultants. Governments in each of the study countries were given the opportunity to comment on a listing of their country’s policies, while in draft form.

¹ Datasets include those published by the International Energy Agency, the United Nations Framework Convention on Climate Change and the Department of Climate Change and Energy Efficiency (Australia).

The Commission’s stocktake identified over 1000 policies across the nine countries, with large numbers in nearly all of the countries studied (table 2.1).

Table 2.1 Number of policies in the stocktakes, by country

	<i>Australia</i>	<i>China</i>	<i>Germany</i>	<i>India</i>	<i>Japan</i>	<i>NZ</i>	<i>South Korea</i>	<i>UK</i>	<i>US</i>	<i>Total</i>
Number	237	82	131	68	67	31	69	104	307	1096

The stocktakes include the key policies analysed in chapters 4 and 5, as well as other policies identified in each country. However, it is unlikely to be exhaustive for all countries. For example, given time and resource constraints, research for the United States necessarily focused on federal government policies, similar policies used in multiple states, schemes in which multiple states participated, and other state government policies in the five states with the largest greenhouse gas emissions.

Emissions-reduction policies were classified into specific categories using a taxonomy based loosely on one developed by the International Energy Agency (IEA 2011b). The Commission’s taxonomy has six broad categories and 33 policy types (table 2.2).

Table 2.2 Taxonomy of emissions-reduction policies

<i>Explicit carbon prices</i> Emissions trading scheme — cap-and-trade Emissions trading scheme — baseline and credit Emissions trading scheme — voluntary Carbon tax	<i>Regulatory instruments</i> Renewable energy target Renewable energy certificate scheme Electricity supply or pricing regulation Technology standard Fuel content mandate
<i>Subsidies and (other) taxes</i> Capital subsidy Feed-in tariff Tax rebate or credit Tax exemption Preferential, low-interest or guaranteed loan Other subsidy or grant Fuel or resource tax Other tax	Energy efficiency regulation Mandatory assessment, audit or investment Synthetic greenhouse gas regulation Urban or transport planning regulation Other regulation
<i>Direct government expenditure</i> Government procurement — general Government procurement — carbon offsets Government investment — infrastructure Government investment — environment	<i>Support for research and development (R&D)</i> R&D — general and demonstration R&D — deployment and diffusion
	<i>Other</i> Information provision or benchmarking Labelling scheme Advertising or educational scheme Broad target or intergovernmental framework Voluntary agreement

For the purposes of presentation in this chapter, most policies were also grouped by sector. In particular, they were divided into those that have cross-sectoral coverage and those that are specific to electricity generation, transport, forestry and agriculture. This was done so that the documentation of key policies here aligns with the sector-specific analysis in chapters 4 and 5.

The one exception to this sectoral approach was energy efficiency policies. The main types of energy efficiency policies are summarised in the last section of this chapter, with more detailed discussion on select policies in appendix C.

A number of industries (such as resource extraction, processing and manufacturing) are not presented separately by sector in this chapter. Generally, this is because there are few emissions-reduction policies that are specific to these industries in the countries studied. Their emissions are covered (to varying degrees) through:

- cross-sectoral policies (such as emissions trading schemes (ETSs), carbon taxes or emissions standards that apply to sources of emissions across an economy)
- energy efficiency policies (that target large users of energy, including electricity oil, gas, coal and biomass).

Emissions in these industries are also indirectly covered to the extent that they use an input covered by other policies (such as electricity or transport policies). For example, while there are few policies specifically targeting manufacturing emissions in Australia, approximately half of the sector's total emissions are from electricity that is already subject to a range of emissions-reduction policies (chapter 1).

Details on individual policies analysed in chapters 4 and 5 are provided in appendix B, and a full stocktake of policies can be found on the Commission's website (appendix P).

Copenhagen Accord commitments

In 2010, each study country made an international commitment to reduce or limit the growth in their emissions by a 2020 deadline as part of the Copenhagen Accord (table 2.3). However, the commitments are expressed in ways that are not directly comparable. The 2020 targets for Australia, Germany, Japan, New Zealand, South Korea, the United Kingdom and the United States are expressed as a percentage reduction in emissions relative to the level of emissions in a base year. Base years vary from 1990 (for Germany, Japan, New Zealand and the United Kingdom), to 2000 (for Australia), to 2005 (for the United States). Commitments for China and

India are expressed as a reduction in emissions per unit of GDP (emissions intensity) against the base year 2005.

McKibbin, Morris and Wilcoxon (2010) attempted to convert the various countries' commitments into common terms — a percentage change in emissions relative to a standard base year.² They used the G-Cubed model of the global economy to estimate emissions under a 'no policy action' scenario (business as usual), and emissions resulting from a stylised implementation of the Copenhagen targets. The authors used these two scenarios to reformulate the original Copenhagen targets into equivalent targets with common base years of 1990, 2000, 2005 and 2020.

Table 2.3 Emissions-limitation commitments under the Copenhagen Accord, by country

<i>Country</i>	<i>Commitment to limit emissions by 2020, relative to various base years</i>
Australia	5 per cent to 25 per cent below 2000 level Moving above 5 per cent is conditional on a global, comprehensive agreement.
China	40 per cent to 45 per cent cut to 2005 emissions intensity level ^a Increase the proportion of non-fossil fuels used in primary energy consumption to 15 per cent, and increase forest coverage by 40 million hectares and forest stock volume by 1.3 billion cubic metres relative to 2005.
Germany	20 per cent to 30 per cent below 1990 level Moving above 20 per cent is conditional on a global, comprehensive agreement for the period beyond 2012.
India	20 per cent to 25 per cent cut to 2005 emissions intensity level ^a
Japan	25 per cent below 1990 level Conditional on all major economies joining a 'fair and effective international framework with ambitious targets'.
New Zealand	10 per cent to 20 per cent below 1990 level, conditional on a global, comprehensive agreement.
South Korea	30 per cent below business as usual level
United Kingdom	20 per cent to 30 per cent below 1990 level Moving above 20 per cent is conditional on a global, comprehensive agreement for the period beyond 2012.
United States	17 per cent below 2005 level ^b

^a An 'endeavour' to reduce emissions intensity. ^b 'In the range of' 17 per cent.

Source: DCCEE (2010c).

McKibbin, Morris and Wilcoxon (2010) found that varying the base year used to express a commitment can significantly affect its apparent stringency. They also note that expressing emissions-reduction targets relative to a given base year gives little useful information about the actual size of the reduction required by 2020 compared to a business as usual scenario. For example, Australia's 2020

² Where commitments are conditional or given as a range, the lower-bound levels were used.

Copenhagen commitment to an unconditional emissions reduction of 5 per cent on 2000 levels is estimated to be equivalent to a 30 per cent increase in emissions on 1990 levels, an 18 per cent reduction relative to 2005 levels, and a 35 per cent reduction against business as usual emissions levels in 2020.

When expressing Copenhagen commitments in terms of reductions against business as usual projections by 2020, McKibbin, Morris and Wilcoxon (2010) estimated that Japan has committed to the largest reduction (48 per cent), Australia's commitment is in line with that of Europe (36 per cent) and the United States (33 per cent), while China's commitment is smaller (22 per cent). India's commitment is estimated to result in an increase in emissions of 0.4 per cent by 2020, compared with business as usual.³

2.2 Cross-sectoral policy measures

Most of the policy measures in the countries studied apply to a particular sector. But there are some cross-sectoral policies that target emissions more broadly. The most widely applied cross-sectoral policies are emissions trading schemes. Carbon taxes are not currently used, but are under consideration in Japan and South Korea. The United States is in the process of introducing greenhouse gas emissions standards for all large stationary emitters.

Emissions trading schemes

ETs are the only policy type that involve an explicit market price on emissions. The most common form of ETS is a cap-and-trade scheme that sets a limit on the amount of emissions, with permits issued that allow holders to emit greenhouse gases up to a quantitative cap. Permits can be traded, thus establishing a market 'price' for emissions.

Among the countries studied, the United Kingdom and Germany participate in the European Union's cap-and-trade ETS. The scheme applies to multiple sectors covering around 40 per cent of EU emissions. New Zealand operates a national ETS that is currently in a transition phase — there is no binding cap on total emissions and the government has effectively capped the price of emissions certificates. The New Zealand ETS covers a range of sectors accounting for around 45 per cent of the country's emissions. A cap-and-trade ETS is planned for a group of western

³ McKibbin, Morris and Wilcoxon (2010) did not report estimates for South Korea and New Zealand.

states in the USA, although it is likely that the scheme will only cover California by 2012 (box 2.1).

The Australian Government has announced that it is planning to introduce an ETS in July 2012, with a fixed price on emissions permits for the early years of the scheme (chapter 1). Japan and South Korea have also proposed the introduction of an ETS, although implementation has been delayed (Reuters 2010). China is considering trialling a pilot ETS in some of its provinces (Reuters 2011). Japan, South Korea and China currently operate voluntary ETSs of limited scope. ETSs that apply exclusively to electricity generation are discussed in section 2.3.

Carbon taxes

A carbon tax is an alternative mechanism for effectively putting an explicit price on emissions. Carbon taxes have generally not been used to date in the countries studied. However, some governments have taxed the use of fossil fuels. For example, the UK Climate Change Levy (introduced in 2001) is a tax on energy used by business and the public sector (including electricity, gas and coal). The tax rate depends on the energy content of the fuel rather than emissions. The Japanese Government has announced that the Petroleum and Coal tax — a pre-existing (revenue) tax on crude oil and petroleum products — will be increased in stages over the next four years based on the ‘emissions content’ of fossil fuel inputs. South Korea is considering introducing a carbon tax from 2012. In its early years, Australia’s fixed price ETS would be equivalent to a carbon tax.

US greenhouse gas emissions standards

An ‘emissions standard’ places restrictions on the type and quantity of emissions that can be released into the atmosphere from a specified source. The US Environmental Protection Agency (USEPA) has the power to regulate greenhouse gas emissions under the *US Clean Air Act 1963*. In January 2011, the USEPA progressively began requiring large stationary greenhouse gas emitters to hold a permit to continue emitting. Initially, permits are being required only for the largest emitters (covering fossil fuel electricity generators and petroleum refineries). Eventually, they will be required for any type of stationary installation emitting more than 50 000 tonnes of greenhouse gases per year (covering approximately 70 per cent of US emissions).

Box 2.1 Cross-sectoral emissions trading schemes

European Union

The European Union Emissions Trading Scheme (ETS) commenced in 2005 and operates in 30 countries (including Germany and the United Kingdom). It covers CO₂ emissions from power stations, combustion plants, oil refineries, iron and steel works, and factories making cement, glass, lime, bricks, ceramics, pulp, paper and board. Transport fuels, agriculture and forestry are not covered. Aviation fuels will join the scheme in 2012 with the petrochemicals, ammonia and aluminium industries and additional greenhouse gases to be covered in 2013. Covered emitters are obliged to surrender one European Union Allowance (EUA) for each tonne of CO₂ emitted. The total number of EUAs issued is capped at a level consistent with the target for EU-wide emissions, and permits are traded. Offset credits obtained under the Kyoto Protocol Clean Development Mechanism can be used to meet obligations under the European Union ETS. From 2013, the emissions cap will decline annually to achieve a 21 per cent reduction relative to 2005 levels by 2020. In May 2011, the spot price was around €16–17 (A\$22–23).

New Zealand

The New Zealand ETS commenced in 2008. It covers forestry, electricity generation, transport fuels (including domestic aviation and coastal shipping) and industrial processes. Waste and synthetic gases are scheduled to be covered from 2013, and agriculture from 2015. Emissions include CO₂ from liquid fossil fuels, and CO₂ and methane from electricity. By 2015, all sectors of the economy will be covered. Covered emitters must surrender New Zealand Units (NZUs) to cover emissions. Currently, the number of NZUs that can be issued is not capped. In the transition phase (July 2010 to December 2012), firms with ETS obligations are only required to surrender one permit for every two tonnes of emissions. Emitters may pay NZ\$25 (A\$20) instead of surrendering a NZU, effectively capping the per-tonne price at NZ\$12.50 (A\$10). Offset credits obtained under the Kyoto Protocol Clean Development Mechanism can be used to meet obligations under the New Zealand ETS. From 2013 onwards, one permit will be required for each tonne of CO₂-e. Early 2011 spot prices for NZUs have ranged from NZ\$19–21 (around A\$14–16).

United States

The Western Climate Initiative was intended to cover seven US states (California, New Mexico, Washington, Oregon, Montana, Utah and Arizona) and four Canadian provinces (British Columbia, Ontario, Québec and Manitoba). The initiative aims to reduce emissions to 15 per cent below 2005 levels by 2020. Currently, it appears that only California is fully committed to implementing an ETS by 2012. The Western Climate Initiative has recommended that the 2012 cap be the same as projected emissions for that year. Therefore, it is likely that the permit price and abatement will be close to zero in 2012.

Sources: Appendixes B, F, H, J, K.

The USEPA is in the process of establishing the first industry-specific greenhouse gas emissions standards that will apply to permit holders. Draft emissions standards for electricity generation are scheduled for release in July 2011, and for petroleum refineries in December 2011. The mechanisms that will be used to meet the new standards are still unclear at this point. In the case of electricity generation, the EPA has indicated the types of abatement technologies that may be used. These include fuel switching (from coal to gas), carbon capture and storage (CCS), and improvements in generation efficiency (USEPA 2011a; 2011b). Technology standards that apply specifically to electricity generation and transport are discussed in sections 2.3 and 2.4 respectively.

2.3 Policy measures specific to electricity generation

Renewable energy targets (using certificate schemes) and feed-in tariffs (supported by capital subsidies and preferential loans for renewable generation) are the most widely applied policies targeting electricity generation in the countries studied. Technology standards and ETSs have been adopted to varying degrees. Fossil fuel taxes, differential electricity taxes, and direct tax incentives are used to a lesser extent (table 2.4).

Renewable energy targets

A renewable energy target — a type of technology standard — requires that a quantity or proportion of electricity be generated using specified renewable technologies over a given period of time. In some countries targets are aspirational. Targets can be met through renewable energy certificate schemes or various other policy instruments (such as feed-in tariffs).

Table 2.4 Emissions-reduction policies specific to electricity generation, by country

The jurisdictional coverage of a policy may be national (N), sub-national (S) or European Union (EU).

	<i>Australia</i>	<i>China</i>	<i>Germany</i>	<i>India</i>	<i>Japan</i>	<i>NZ</i>	<i>South Korea</i>	<i>UK</i>	<i>US</i>
Feed-in tariffs	S ^a	N,S	N	N,S	N		N	N	S
Renewable energy certificate schemes	N			S ^b	N		N ^c	N	S ^d
Other technology standards	S ^e	N						N	N,S ^f
Capital subsidies	N,S	N,S	N,S	N,S	N,S	N	N	N,S ^g	N,S
Preferential loans		N	N,S	N			N	N	N
Emissions trading schemes	S ^h	S ⁱ	EU ^j		N ^k	N ^j	N ^l	EU ^j	S ^m
Fossil fuel taxes				N	N				
Differential electricity taxes								N	
Tax incentives	S	N		N			N	N	N

^a Each state (apart from Tasmania) operates its own policy. ^b A certificate trading scheme is under development. ^c From 2012. ^d Mandatory in 36 states; most of these states use certificate schemes. ^e Queensland Gas Scheme. ^f From January 2011, the US Environmental Protection Agency began the regulatory process for setting national emissions standards for all stationary installations that emit more than 50 000 tonnes per year. At least 6 states have their own current emissions standards. ^g In Scotland, Wales and England. ^h NSW and ACT Greenhouse Gas Reduction scheme (baseline and credit). ⁱ Several Chinese cities have implemented voluntary emissions trading schemes (including Beijing, Tianjin and Shanghai). ^j Cross-sectoral ETS that also applies to electricity generation. ^k Japan operates a small voluntary ETS. It appears that introduction of a national ETS has been delayed. ^l South Korea operates a small voluntary baseline and credit ETS. A national ETS is scheduled for 2015 although it appears that this has been delayed. ^m Ten states participate in the Regional Greenhouse Gas Initiative. The Western Climate Initiative is a framework to establish a cross-sectoral ETS, and intends to cover seven western US states and four Canadian provinces. Only California has committed to implementation by 2012.

Sources: Appendixes B, D–K.

Renewable energy certificate schemes are the most common instruments for implementing mandatory renewable energy targets among those countries studied. Under such schemes, tradable certificates are issued to renewable electricity generators for the units of electricity they produce. An obligation is placed on generators or electricity retailers to surrender these certificates to a regulator to meet the renewable energy target. Renewable generators receive the market price for the electricity they produce, and earn an additional subsidy by selling the certificate to a retailer or generator with obligations under the scheme. The rules governing how renewable electricity is certified vary between schemes, altering which renewable generation technologies are eligible for a subsidy, as well as the level of subsidy received per megawatt hour of electricity.⁴

Mandatory renewable energy targets of varying magnitude and using different instruments have been adopted in Australia, the United Kingdom and Germany (under European Union mandates), Japan, South Korea, and in a majority of US and Indian states. China has adopted an aspirational renewable energy target with sub-targets for different renewable generation technologies. New Zealand has an aspirational target (table 2.5).

Other technology standards

Diverse other technology standards are applied in the electricity sectors in the United States, the United Kingdom, China and Queensland. Generally, technology standards place requirements or restrictions on the construction or operation of generation technologies.

In the United States, a number of states place limits on the emissions intensity of new electricity generators. In the case of California, the emissions standard effectively prohibits new coal-fired power stations without CCS. In the United Kingdom, any new coal-fired power station with a capacity of over 300 megawatts (MW) is required to be ‘carbon capture ready’. Cross-sectoral emissions standards being implemented by the USEPA are discussed in section 2.2.

China’s Large Substitute for Small policy is a unique technology standard that requires the decommissioning of small, inefficient thermal power plants to allow the construction of larger, more economically efficient and less emission-intensive

⁴ Rules can govern: tethering — the type of generation technology eligible for certification; banding — the number of certificates created per megawatt hour of electricity; or carve outs — a mandate that a percentage of the renewable energy target must come from a designated technology.

electricity generation. Up to 2011, the policy focused on closing small plants (below 50 MW capacity), larger older plants (less than 100 MW and in operation for over 20 years), and plants of less than 200 MW that have reached the end of their design life. Between 2011 and 2020, more plants between 100 and 200 MW will be closed.

Table 2.5 Renewable energy targets, by country

<i>Country</i>	<i>Target</i>	<i>Instrument for meeting the target</i>
Australia ^a (National)	20% by 2020 Mandate	A tradable certificate scheme (the Large-scale Renewable Energy Target) covering large-scale renewable energy projects (such as wind and solar farms, and hydroelectricity schemes).
China (National)	15% by 2020 Aspirational	Various instruments including capital subsidies and feed-in tariffs for wind, biomass, solar and hydroelectricity. Individual targets are set for each source of generation.
Germany (National)	20% by 2020 EU Mandate	Feed-in tariffs.
India (At least 21 states)	From less than 1% to 14% by 2010-11 to 2015-16 Mandate	Renewable energy certificate trading is under development. Eligible technologies differ across states. Separate targets are set for solar and non-solar generation.
Japan (National)	Around 1% Periodic mandate	The government imposes a periodic obligation on electricity retailers to use a certain amount of renewable electricity. Eligible technologies include solar photovoltaic, wind, biomass, small hydroelectricity and geothermal.
New Zealand (National)	90% by 2025 Aspirational	To be implemented by removing 'unnecessary regulatory barriers' faced by renewable energy generation.
South Korea (National)	10% by 2020 Mandate	From 2012 companies with power generation facilities of more than 500 MW (currently 13) will be required to purchase renewable energy up to the target.
United Kingdom (National)	20% by 2020 EU Mandate	Tradable certificate scheme — different technologies receive different levels of support depending on their cost.
United States ^b (At least 41 States)	Varies by state Mandate and aspirational	Most states have renewable tradable certificate schemes. Some states use feed-in tariffs. Eligible technologies differ across states.

^a Australia also operates the Small-scale Renewable Energy Scheme (SRES). This rewards owners of small-scale renewable generation such as heat pumps and solar water heaters, which receive Small-scale Technology Certificates. Electricity retailers are required to purchase a number of certificates each year. ^b Thirty-six states have mandated targets and five states have aspirational targets.

Sources: Appendixes B, D-K.

In Australia, the Queensland Government operates the Queensland Gas Scheme. The scheme requires electricity retailers to source a minimum percentage of their electricity from eligible gas-fired generation. The mandatory target increased from

13 per cent in 2008 to 15 per cent in 2010. By 2020, the target will rise to 18 per cent.

Feed-in tariffs

Feed-in tariffs pay a guaranteed tariff for electricity produced with prescribed technologies (generally renewable sources such as solar photovoltaic (PV) and wind generation). FITs are available for larger-scale generation (such as wind farms, biomass and biogas) and smaller-scale generation (such as domestic solar PV). Tariffs can be calculated on a net or gross basis. A net approach pays a tariff for surplus energy that is exported to the grid and not consumed on-site. A gross approach pays a tariff on all electricity produced. These tariffs are often higher than those paid by general consumers.

Feed-in tariffs apply at a national level in Germany, Japan, South Korea, and the United Kingdom, and at a state level in Australia. China and India operate national and sub-national schemes (figure 2.1). FITs also exist in some US states where they operate mainly as commercial arrangements between utilities and small-scale generators that the utilities use to meet their renewable energy target obligations. New Zealand does not use FITs.

The types of renewable technology eligible for FITs vary by country. South Korea and Germany offer FITs for hydroelectricity, biomass, biogas, wind and solar PV, while Australia and Japan offer FITs only for solar PV. FIT rates also vary between generation technologies. The level of FITs is highest for solar PV and lower for more established technologies such as wind, hydroelectricity and biomass. Average FITs are above average annual wholesale electricity prices in each study country, except for non-solar PV generation in South Korea.⁵

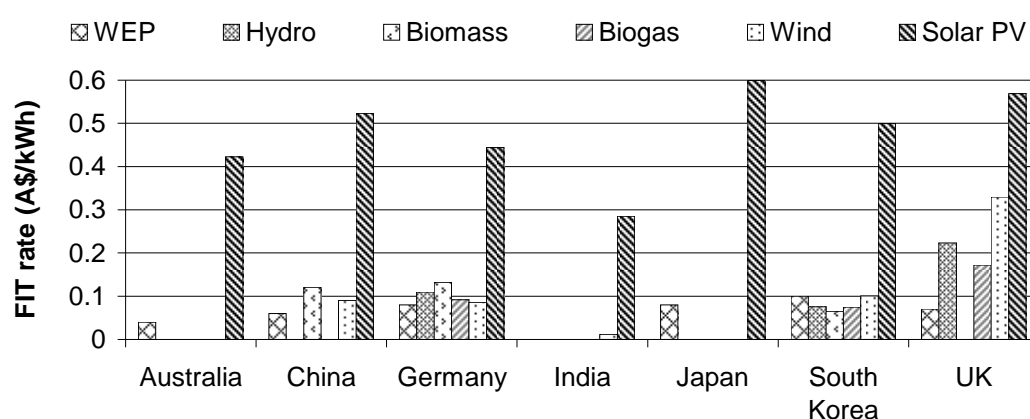
Capital subsidies

Capital subsidies are direct financial transfers from governments to households or firms investing in low-emissions electricity generation (such as solar PV cells or wind farms). Capital subsidies can have multiple objectives in addition to greenhouse gas reduction, such as addressing barriers to the adoption of energy efficiency measures and providing industry assistance. Capital subsidies are

⁵ South Korean average FITs for hydroelectricity, biomass and biogas are below the average South Korean wholesale electricity price. Average Korean FITs were calculated using fixed tariffs that appear to be below the average wholesale electricity price and a variable tariff often set above the wholesale electricity price.

typically offered by all levels of government in the countries studied. Subsidies are provided for widely varying purposes, from assisting in the provision of large-scale generation capacity to helping individual households and small businesses install small-scale generation. In many cases, subsidies are provided in addition to other financial incentives for renewable generation, such as feed-in tariffs and renewable energy certificates.

Figure 2.1 **Average feed-in tariffs for different technologies, by country^a**
A\$ (2010)



^a Where multiple FITs exist for a given generation technology, unweighted averages have been calculated. Average FITs were not adjusted for net and gross differences and have been converted to 2010 Australian dollars. The wholesale electricity price (WEP) is an estimate of the 2010 average annual price per kilowatt hour paid to non-renewable generators. The Australian WEP is the unweighted average price for each National Electricity Market state. The Chinese WEP is for November 2010. The Indian WEP was not available. The South Korean WEP is for the year to 31 March 2010. South Korean average FITs were calculated using a mixture of fixed tariffs that appear to be below the average WEP and a variable tariff often set above the WEP. **WEP** Wholesale electricity price. **PV** photovoltaic. **FIT** feed-in tariff.

Sources: Appendixes B, D–G, H–J.

Preferential loans and guarantees

Preferential loans reduce the cost of borrowing to invest in low-emissions generation technologies. These can be in the form of low or zero interest rate loans, or loan guarantees where the government takes on the default risk.

A wide range of preferential loan schemes operate at the national or sub-national level in most of the study countries. These can provide small-scale support (such as the Indian Government's Off-grid and Decentralised Solar program that provides low interest loans for small solar power generation), or large-scale assistance (such as the US Government's Loan Guarantee Program for emissions-reduction projects with total costs over US\$25 million).

Low-interest loans and loan guarantees may appear to increase the availability of capital for low-emissions generation projects. However, they do represent costs to government. The difference between the market cost of borrowing and the preferential interest rate is financed by the taxpayer. In cases where guaranteed loans are not repaid, governments may incur large liabilities.

Emissions trading schemes

Two study countries have implemented ETSs that are specific to their electricity sectors. Ten US states are party to a regional cap-and-trade ETS that applies solely to electricity generation. In Australia, the New South Wales Government operates a baseline and credit ETS for emissions in the electricity sector above a benchmarked target (box 2.2). Cross-sectoral ETSs in Germany and the United Kingdom (through the European Union ETS), and New Zealand, also cover electricity generation (section 2.2).

Box 2.2 Emissions trading schemes specific to electricity generation

US Regional Greenhouse Gas Initiative

The Regional Greenhouse Gas Initiative is a state-based cap-and-trade emissions trading scheme (ETS) covering ten north-western US states (Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island and Vermont). The Regional Greenhouse Gas Initiative commenced in 2009, and aims to reduce CO₂ emissions by 10 per cent below 2009 levels by 2018. Generators larger than 25 megawatts (capacity) in the participating states must purchase an allowance for CO₂ emissions. The scheme caps CO₂ emissions until 2014, after which the cap will be reduced by 2.5 per cent per year until 2018. The 2011 permit price currently sits at around US\$2.05/t CO₂ (A\$2.20).

NSW Greenhouse Gas Reduction Scheme

The NSW Greenhouse Gas Reduction Scheme is a baseline and credit ETS for emissions in the electricity sector above a benchmarked amount. The scheme has operated since January 2003. It requires electricity retailers and other buyers or sellers of electricity in New South Wales to meet mandatory emissions benchmarks based on the size of their share of the electricity market. Parties that emit CO₂ at a rate higher than their benchmark targets are required to purchase offsets (a NSW greenhouse abatement certificate) from eligible abatement projects or pay a penalty of A\$12.00/t CO₂. The spot price of an abatement certificate over 2010 was around A\$5.00/t CO₂. A similar scheme operates in the Australian Capital Territory.

Sources: Appendixes B, D, K.

Fossil fuel taxes

India and Japan impose taxes on fossil fuels, including fossil fuels used to generate electricity. These taxes raise the cost of production (and the retail price) of electricity generated from these energy sources. The taxes implicitly subsidise untaxed sources of electricity generation.

In India, the Clean Energy Tax imposes a levy of Rs.50 (A\$1.20)⁶ per tonne of coal, lignite or peat, which are domestically produced or imported. The tax revenue is hypothecated to a National Clean Energy Fund established to fund research and development in clean energy technology and environmental remediation programs.

Japan imposes a tax on petroleum and coal products. The tax rates are ¥2040 (A\$25.50) per kilolitre of oil, ¥1080 (A\$13.50) per tonne of natural gas or petroleum gas, and ¥700 (A\$8.75) per tonne of coal. Japan is proposing to progressively lift these tax rates between 2013 and 2015 as part of its environmental tax reform. The rates are expected to rise by 37 per cent for oil, 72 per cent for gas and 96 per cent for coal.

Differential electricity taxes

Electricity taxes may be imposed at rates that depend on the generation technology (for example, lower-emission electricity generation incurs a lower tax rate or an exemption). These types of policies are not widely applied in the study countries. One exception, is the United Kingdom's Climate Change Levy that taxes non-residential users of electricity (fossil fuels such as gas and coal are also taxed but road transport fuels are not). Electricity generated from renewables (such as solar and wind) and approved cogeneration schemes do not pay the tax.

Direct tax incentives

Direct tax incentives provide tax credits for investment in renewable generation, or for the production of renewable electricity. These policies are not widely used in the study countries.

In the United States, national investment tax incentives offer tax credits that provide up-front payments for installed renewable capacity. A production tax incentive also offers renewable generators up to US\$0.022 (A\$0.024) for each kilowatt hour

⁶ Conversion of foreign currency values to Australian Dollars (A\$) in this chapter used average exchange rates over January to April 2011 (RBA 2011).

produced. In China, a national scheme offers a reduced valued-added tax rate for electricity generated from renewables (including wind, small hydroelectricity and biomass).

Research and development

All countries studied fund a wide range of programs that subsidise the research, development and commercialisation of renewable electricity generation technologies. For example, the UK Marine Renewables Deployment Fund provides £50 million (A\$84 million) to support research into wave and tidal technologies, and the demonstration of these technologies.

Most countries also fund the research and development of clean coal technologies. For example, the Australian Government funds the National Low Emissions Coal Initiative — a program that subsidises low-emissions coal research and the construction of demonstration projects. Governments in Germany, India, the United Kingdom and the United States fund a range of similar programs.

Research and development programs for carbon capture and storage operate in Australia, China, Germany, South Korea, the United Kingdom and the United States. In addition, the Australian Government has established the Global Carbon Capture and Storage Institute that aims to accelerate the development of industrial-scale CCS projects internationally. The European Union has committed to funding up to 12 demonstration CCS plants in EU countries (including Germany and the United Kingdom). Some of these programs also fund CCS research in other energy-intensive sectors (such as resource extraction and manufacturing).

2.4 Policy measures specific to transport

Emissions-reduction policies in the transport sectors of the countries studied predominantly relate to road transport. The most widely applied policies concern fuels, and passenger and light commercial vehicles (summarised in table 2.6). Policies targeting heavy vehicles (such as freight transport) tend to be less widely used. There is also a range of transport-related policies that may less directly reduce emissions (such as public transport and freight infrastructure policies). Few countries have policies targeting domestic maritime and aviation emissions. Regulation of international emissions falls under the jurisdiction of the International Civil Aviation Organisation, the International Maritime Organisation, and the United Nations Framework Convention on Climate Change. There are currently no binding agreements on reducing these emissions although negotiations are ongoing

(ICAO 2011; IMO 2011). In the absence of an international agreement, some countries have committed to unilateral action to regulate international emissions. For example, the European Commission has committed to including domestic and international aviation in the European Union ETS from 2012 (EC 2011a).

Fuel policies (road transport)

Fuel policies are taken to include any measure that taxes, subsidises or regulates road transport fuels (such as petrol, diesel and liquid petroleum gas). Fuel taxes and government assistance to biofuels are the most widely applied emissions-reduction policies covering road transport fuels in the study countries.

Fuel taxes

Historically, fuel taxes have been imposed for a variety of reasons unrelated to emissions reductions (such as to fund road construction and maintenance, to fund public transport, or simply to raise revenue for general government purposes). However, fuel taxes can also serve to reduce greenhouse gas emissions by reducing demand for fuel.

All study countries impose fuel taxes at the point of consumption — as an excise amount per litre of fuel or a consumption tax set at a percentage of the value of fuel sales. There are marked differences in tax rates (table 2.7). Generally, broadly based consumption taxes (such as value added taxes and goods and services taxes) are also imposed on transport fuels.

Some countries also impose fuel taxes on the production of fuels. For example, Japan imposes a Petroleum and Coal Tax on imported crude oil and refined petroleum products used to produce transport fuels, while the New Zealand ETS applies to transport fuels and is paid by fuel producers.

Recently, some governments have introduced taxes directly linked to emissions from road transport fuels. For example, the New Zealand ETS applies to transport fuels in addition to the already existing fuel excise (the European Union ETS does not). The Japanese Government has announced an increase in its Petroleum and Coal Tax based on the emissions content of the fuel category. The California Cap-and-Trade ETS (expected to commence in California in 2012 as part of the Western Climate Initiative) will cover transport fuels from 2015. South Korea is considering imposing an economy-wide carbon tax that may apply to transport fuels.

Table 2.6 **Emissions-reduction policies specific to road transport (passenger and light commercial vehicles), by country**

The jurisdictional coverage of a policy may be national (N), sub-national (S) or European Union (EU).

	<i>Australia</i>	<i>China</i>	<i>Germany</i>	<i>India</i>	<i>Japan</i>	<i>NZ</i>	<i>South Korea</i>	<i>UK</i>	<i>US</i>
Fuel policies									
Fuel taxes	N	N	N	N,S	N	N	N	N	N,S ^a
Biofuel policies									
fuel content mandates	S ^b	S ^c	N	N			N ^d	N	N,S ^e
production subsidies (fuel tax exemptions)	N	N	N	N	N	N	N		N
capital subsidies for fuel producers	S ^f				N				N
Vehicle policies									
Fuel efficiency/emissions standards	N ^d	N	EU		N	N ^d	N	EU	N
Vehicle fuel efficiency labelling	N	S ^g	N	N	N	N	N	N	N
Vehicle technology mandates			EU					EU	N
Differentiated vehicle taxes	N,S ^h		N	N	N		N	N	N
Subsidies for vehicle purchase		N	N	N	N		N	N	N,S ⁱ
Capital subsidies for lower-emissions vehicle research and manufacture	N ^j		N				N	N	N

^a Fuel taxes are levied in all 50 US states, the District of Columbia and at the federal level. ^b *The Biofuels Act 2007 (NSW)* sets a mandate for ethanol and biodiesel content in New South Wales. ^c The National Scheme of Extensive Pilot Projects on Bioethanol Gasoline for Automobiles mandates a 10 per cent blend of ethanol in petrol in five provinces (Heilongjiang, Jilin, Liaoning, Henan and Anhui), and cities in Hubei, Shandong, Hebei and Jiangsu provinces. ^d Voluntary scheme. ^e Fuel content mandates operate in nine US states and at the federal level. ^f Victoria provides infrastructure grants for biofuel facilities through the Biofuels Infrastructure Program. ^g Covers ten provinces including Beijing, Tianjin, Hebei, Shanxi, Inner Mongolia and Shandong. ^h NSW, the ACT and Victoria offer discounted car registration and Queensland and the ACT offer discounted stamp duty for lower-emissions vehicles. The Australian Government's luxury car sales tax is imposed at a higher threshold for lower-emissions vehicles. ⁱ California. ^j The Australian Government's Green Car Fund closed in January 2011.

Sources: Appendixes B, N, O.

Table 2.7 Transport fuel tax, by country^a

At the point of consumption, excluding broad-based consumption taxes, A\$ (2010)

	<i>Petrol</i>	<i>Diesel</i>	<i>LPG</i>
	A\$/L	A\$/L	A\$/L
Australia	0.38	0.38	..
China	0.16	0.13	..
Germany	0.94	0.67	0.14
India	(7.5% plus) 0.68	(7.5% plus) 0.19	(5%)
Japan	0.67	0.40	0.12
New Zealand	0.45	0.003	0.08
South Korea	0.70	0.49	0.21
United Kingdom	0.96	0.96	0.27
United States ^b	0.11	0.12	0.10

^a Rates are current as at March 2011 and have been converted to 2010 Australian dollars. ^b Rates are the sum of federal-level fuel excise and the weighted average state-level volumetric tax rate, as of December 2010. .. Not applicable.

Sources: Appendixes B, O.

Some countries have policies that can counteract the effect of fuel taxes. Fuel subsidies (or fuel-price regulation) provide a subsidy (either on production or consumption) to encourage the production and use of fossil fuels. These policies aim to reduce the cost and expand access to fuels. For example, India and China operate retail-price controls on some fuels, which set the price of fuel paid by consumers. The US Government provides subsidies for the production of compressed natural gas, liquefied natural gas and other fossil fuel products. In Australia, the Fringe Benefits Tax on employer-provided vehicles applies to a reduced taxable value the further a vehicle is driven. A recent government review found that the policy may encourage individuals to travel unnecessary distances, increasing pollution and road congestion (Henry et al. 2010). The Australian Government has since announced it intends to amend the tax to apply a flat tax rate independent of the distance travelled (Swan 2011).

Biofuel policies

The two main biofuels used for road transport are ethanol and biodiesel. Biofuel policies may have objectives in addition to reducing greenhouse emissions (such as regional development and agricultural assistance). The most common biofuel policies in the study countries are fuel content mandates, and fuel production subsidies (usually in the form of fuel excise exemptions). Capital subsidies for fuel refineries are used to a lesser extent.

Fuel content mandates are requirements for a minimum percentage of specified ‘low emissions’ fuels to be blended with petrol or diesel. For example, in 2010, Germany had a biofuel quota of 3.6 per cent for petrol and 4.4 per cent for diesel (measured by energy content). All study countries, except New Zealand and Japan, use fuel content mandates (table 2.8).

Table 2.8 Transport fuel content mandates, by country
(2009, 2010)

<i>Country</i>	<i>Mandate</i>	<i>Biofuel type</i>	<i>Application</i>	<i>National/ sub-national</i>	<i>Voluntary/ mandatory</i>
Australia	4 per cent (petrol) 2 per cent (diesel)	All	Per cent of total fuel consumption	NSW	Mandatory ^a
China	10 per cent	Ethanol	Per cent blend in petrol	Provincial	Mandatory
India	5 per cent	All	Per cent blend in all fuels	National	Mandatory
Japan	..	..	..	..	..
Germany	3.6 per cent (petrol) 4.4 per cent (diesel)	All	Per cent of total fuel consumption ^b	National	Mandatory
New Zealand	..	..	..	..	..
South Korea	3 per cent	Biodiesel	Per cent blend in diesel	National	Voluntary
United Kingdom	3.25 per cent	All	Per cent of total fuel consumption	National	Mandatory
United States	8 per cent ^c	All	Varies by jurisdiction	National and state	Mandatory

^a In practice, exemptions to the mandates have been granted where producers could not meet the required fuel content level using domestically produced biofuels. ^b By energy content. ^c National 2011 Renewable Fuel Standard across petrol and diesel. Additional mandates also apply in several states. .. Not applicable.

Sources: Appendixes B, N.

Production subsidies provide assistance to biofuel producers in various ways. Assistance most commonly takes the form of an excise exemption on the tax rate paid per litre of standard petrol or diesel for fuels containing biofuel. For example, India provides a full excise exemption on ethanol (up to 5 per cent blends) and on biodiesel (up to 20 per cent blends). In Australia, ethanol and biodiesel are subject to the full fuel excise but producers receive grants that reduce the effective excise

rate to zero.⁷ Some countries pay direct subsidies to producers per litre of biofuel. For example, New Zealand pays biodiesel producers up to NZ\$0.45 (A\$0.35) per litre for biodiesel. All study countries, except the United Kingdom, provide biofuel subsidies or tax exemptions to biofuel producers (table 2.9).

Capital subsidies for fuel refineries that produce ‘low-emissions’ fuels are less widely applied. Government subsidies may take the form of direct payments, loan guarantees or preferential loans for fuel refineries. For example, the Biorefinery Assistance Program in the United States provides loan guarantees for the development, construction and retrofitting of commercial-scale bio-refineries to produce ‘advanced biofuels’ (such as cellulosic ethanol).

Table 2.9 Biofuel production subsidies, by country

<i>Country</i>	<i>Policies</i>
Australia	Biodiesel and ethanol are subject to the fuel excise but producers receive grants reducing the effective excise rates to zero (changes are proposed from December 2010).
China	Subsidies, tax reductions and/or exemptions of the Value Added Tax are provided to ethanol producers. Subsidies differ by province.
Germany	Fuel tax exemption for biofuels.
India	National excise exemption on ethanol (up to 5 per cent blends with petrol) and on biodiesel (up to 20 per cent blends on diesel).
Japan	Fuel tax exemption for ethanol and biodiesel.
New Zealand	Ethanol is exempt from most fuel taxes compared to unleaded petrol. Grants to biodiesel producers based on value of production.
South Korea	Fuel tax exemption for biodiesel.
United Kingdom	..
United States	A range of national and state tax credits for the production of ethanol. Various payments to biofuel producers at federal and state levels.

.. Not applicable.

Sources: Appendixes B, N.

Governments in all countries studied also subsidise the research and development of biofuels, and fund demonstration production projects to varying degrees. For example, the Australian Government funds the Australian Biofuels Research Institute, which coordinates research and development activities, and subsidises the demonstration and commercialisation of biofuel technologies.

⁷ The Australian Government has proposed phasing out this arrangement from December 2011, and gradually increasing the effective tax rates on biofuels.

Vehicle policies

Fuel efficiency standards are the most widely applied emissions-reduction policy targeting passenger and light commercial vehicles in the countries studied. Differential vehicle taxes, and subsidies for the purchase of lower-emissions vehicles, are also used in many of the countries. Policies targeting heavy vehicles (such as freight transport) tend to be less widely applied.

Fuel efficiency standards

Historically, fuel efficiency standards have been linked with objectives other than greenhouse gas emissions reductions. For example, the first fuel efficiency standards were introduced in the United States in the 1970s as an energy security measure in response to the first oil shock (Energy Policy and Conservation Act 1975 (US)).

Fuel efficiency standards impose a limit on the average amount of fuel that can be consumed by a vehicle for a specified distance travelled. An alternative approach used by some countries to limit fuel use is emissions standards. These impose a limit on the average quantity of CO₂-e a vehicle can emit per distance travelled. (Emissions standards have also been imposed to reduce pollutants that are harmful to human health or the environment, such as lead and sulphur dioxide.) Fuel and emissions standards may apply to individual vehicles or as an average across a manufacturer's fleet. Heavy vehicles are generally not covered under vehicle fuel efficiency or emissions standards. (One exception is the United States, which has introduced standards for heavy vehicles that will apply from 2014.)

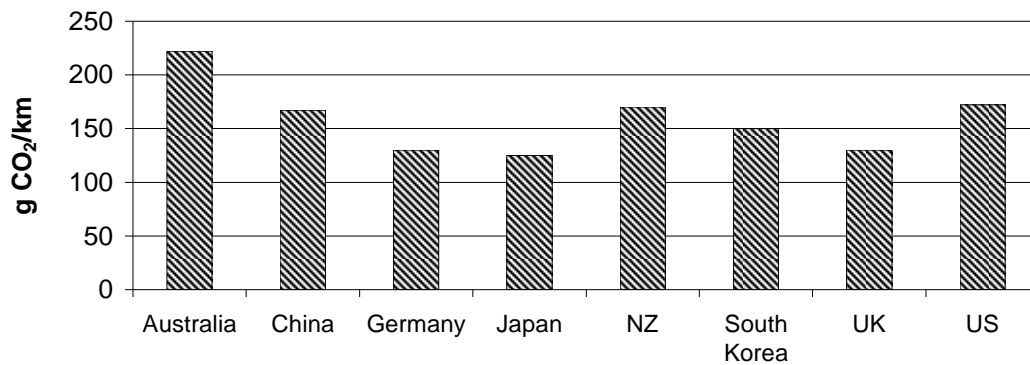
All study countries, except Australia, New Zealand and India, impose mandatory vehicle fuel efficiency or emissions standards (figure 2.2). Australia⁸ and New Zealand have voluntary emissions standards. The Indian Government has announced an intention to introduce mandatory fuel efficiency standards in the near future.

Study countries have a range of vehicle policies related to fuel efficiency and emissions standards. For example, all study countries have adopted, or are implementing, fuel efficiency labelling of new vehicles. Some countries use vehicle technology mandates that aim to reduce vehicle emissions in different ways. For example, Germany, the United Kingdom (under European Union mandates) and the United States have tyre standards designed to reduce fuel consumption. The United

⁸ The Australian Government is considering the introduction of a mandatory scheme (ATC/EPHC Vehicle Fuel Efficiency Working Group 2009).

Kingdom and Germany (also under European Union mandates) limit the use of synthetic greenhouse gases in vehicle air conditioning systems.

Figure 2.2 **Vehicle emissions standards, by country^{a,b}**
Grams of CO₂ per kilometre travelled



^a Each country's fuel efficiency or emissions standard has been converted grams of CO₂ per kilometre travelled on the New European Drive Cycle. ^b Australia has a voluntary 2010 target for average emissions for all new light-duty vehicles. China has committed to a 2015 target for average passenger vehicle fuel efficiency. The European Union (including Germany and the United Kingdom) has a 2012 target for average fleet emissions with a commitment of 95 gCO₂/km by 2020. Japan requires average fleet fuel efficiency of 16.8 km/L (equivalent to 125 g CO₂/km New European Drive Cycle). New Zealand has a voluntary 2015 target for average emissions for new and used light vehicles. South Korea has committed to a 2015 target for average fuel efficiency with offset credits of up to 10 g CO₂/km available for implementing tire pressure monitoring systems, low-rolling resistance tyres, and gear shift indicators. The United States has committed to a 2016 target for average fleet emissions or fuel efficiency. India does not currently have a fuel efficiency or emissions standard.

Sources: ICCT (2011); Appendixes B, C.

Vehicle taxes

All study countries impose some forms of vehicle taxes. Generally, these take the form of once-off sales taxes and annual vehicle registration fees.

Vehicle taxes have been in place in study countries for a number of years without being explicitly linked with emissions-reduction objectives. However, the level of vehicle taxes often varies with vehicle characteristics that are correlated with emissions (such as engine size, weight or fuel efficiency). For example, most states in Australia set annual car registration fees based on engine size or vehicle weight.

Some vehicle taxes more directly relate to the level of a vehicle's CO₂ emissions. For example, the US Gas Guzzler Tax — introduced in 1978 to discourage the production and purchase of fuel inefficient cars — requires producers or importers

to pay a dollar amount on passenger vehicles with fuel efficiency rating below 22.5 miles per gallon. The tax increases as vehicle fuel efficiency falls — from about US\$1000 (A\$1090) for 22 miles per gallon (9.4 kilometres per litre) up to a maximum of US\$7700 (A\$8370) for vehicles of less than 12.5 miles per gallon (5.3 kilometres per litre).

More recently, other study countries have introduced differentiated vehicle taxes based on a vehicle's emissions. For example, Germany and the United Kingdom charge annual vehicle taxes based, in part, on a vehicle's emissions intensity. In Germany the tax rises by €2/g CO₂/km (A\$2.70) in excess of 120 g CO₂/km. In the United Kingdom, annual vehicle registration taxes are calculated on average emissions per kilometre. Germany, India, Japan, South Korea, and the United States offer lower sales tax rates or exemptions for electric or lower emissions vehicles. Some states in Australia offer discounted car registration (NSW, ACT and Victoria) and/or discounted stamp duty (Queensland and ACT) for lower emissions vehicles. The Australian Government's luxury car sales tax is imposed at a higher threshold for lower emissions vehicles.

Vehicle subsidies

An alternative approach to reducing taxes on lower-emissions vehicles is to subsidise their purchase. Subsidies can be offered to consumers that purchase specific vehicle types, such as hybrid or electric cars. For example, the UK Government offers a 25 per cent subsidy up to £5000 (A\$8380) when purchasing a low-emissions vehicle. China, Germany, Indian, Japan, South Korea, the United Kingdom and the United States also offer such subsidies.

Some study countries encourage the supply of lower-emission vehicles through capital subsidies to vehicle manufacturers (either for the production of particular vehicle types or for research, development and deployment activities). Government subsidies (in the form of grants or loans) can reduce the development or production costs of lower-emissions vehicles. The effect of these types of subsidies on emissions is difficult to discern. They also have the effect of supporting domestic car production and can be seen as a form of industry assistance or trade protection policy.

Among the countries studied, the US Government operates the Advanced Technology Vehicle Manufacturing Loan Program, which funds projects that help vehicles manufactured in the United States meet higher fuel efficiency requirements. The Australian Government's Green Car Fund — closed in January 2011 — subsidised research, development and commercialisation of lower-emission vehicle technologies and their uptake. Major grants provided under the scheme

include A\$149 million to General Motors Holden to build the four cylinder car ‘Cruze’, A\$35 million toward Australian production of the Hybrid Camry, and A\$42 million to develop a more fuel efficient engine for the Ford Falcon. Germany, South Korea and the United Kingdom also subsidise the development or production of lower-emissions vehicles.

Government fleet policies

Government fleet policies — guidelines or rules on government vehicle purchases and leasing — can include fuel efficiency targets, or quotas for particular vehicle types or fuels. Most countries studied use these types of policies. For example, the US Federal Fleet Management Guidance sets a target to reduce vehicle fleet petrol and diesel consumption by 2 per cent annually, and to increase the use of ‘alternative fuel’ (biofuels and gaseous fuels) by 10 per cent annually to 2015 (from a 2005 baseline). It also includes mandates for using ‘alternative fuel’ vehicles and hybrid electric vehicles.

Other land transport-related policies

There are a range of other land transport policies that may less directly result in emissions reductions. Many of these policies have other explicit objectives, and complex and indirect impacts on emissions, making it difficult to attribute emissions reductions to them (chapters 3 and 5). Policies of this kind include:

- *investment in passenger and freight transport infrastructure*, including:
 - *high-speed rail*. For example, China, India, South Korea, the United Kingdom and the United States are investing in new high-speed passenger and/or freight networks connecting large population centres and heavy freight corridors. The Australian Government has commissioned a feasibility study into a high-speed rail network on the east coast of Australia (including consideration of a Newcastle to Sydney ‘spine’, northward links to Brisbane and southwards links to Canberra and Melbourne (DIT 2011.)
 - *transport infrastructure to encourage modal shifts to lower-emissions forms of transport*. For example, new subway projects are under construction or planned in the Indian cities of Delhi, Chennai, Kolkata and Bangalore. The city of Sydney operates a bus corridor program that has established priority bus lanes on existing roads and bus-only roadways such as the Liverpool-Parramatta T-way rapid transit line. In 2009, the South Korean Government enacted a law expanding the construction of bicycle only lanes.

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- The UK Government is subsidising the construction of a public plug-in network for electric vehicles.
- *lower emissions public transport infrastructure*. For example, the UK and US Governments are funding the electrification of fossil fuel powered rail networks. The ACT Government is progressively changing over the Territory’s bus fleet to compressed natural gas.
 - *‘intelligent transport systems’*. For example, Japan is rolling out a national traffic control and information sharing system to reduce congestion and vehicle emissions. The Queensland Government’s FreightSmart program encourages alternative freight delivery systems that reduce urban congestion and vehicle emissions.
 - *road pricing and road use policies*, including:
 - *congestion pricing*. For example, the city of London charges a fee for vehicles entering central London between 7 am and 6 pm weekdays. Toll charges on the Sydney Harbour bridge rise during morning and afternoon peak periods, and fall overnight and during the day.
 - *road tolls based on fuel efficiency and distance travelled*. For example, Germany charges a truck toll for freight vehicles based on the distance travelled, the size of the truck and its emissions category.
 - *rationing and auctioning of vehicle licences*. For example, the city governments in Beijing and Shanghai cap the number of new vehicle licences issued in a month and auction them off.
 - *high-occupancy lanes and/or low-emissions vehicle-only lanes*. For example, Melbourne’s Eastern Freeway has a high occupancy vehicle lane during morning peak times. In some US states, low-emissions vehicles are permitted to use high occupancy vehicle lanes with only one person in the car.

Aviation and maritime policies

There are currently no multilateral agreements covering international aviation and maritime emissions. Negotiations (between national governments, the International Civil Aviation Organisation, the International Maritime Organisation, and the United Nation Framework Convention on Climate Change) on how international transport emissions will be counted, and what steps may be taken to reduce them, are ongoing (ICAO 2011a, IMO 2011).

In the absence of an international agreement, the International Maritime Organisation has developed a range of technical and operational energy efficiency

measures for new and existing ships designed to reduce emissions, and is negotiating with member countries to make the measures mandatory (IMO 2011). The International Civil Aviation Organisation is coordinating a range of voluntary measures to reduce aviation emissions (such as increased fuel efficiency of aircraft, the development of aviation biofuels and offset markets for aviation emissions, and improvements to air navigation practices (ICAO 2011a)).

Some of the countries studied have taken policy action to reduce domestic aviation or maritime emissions. For example, the New Zealand ETS covers transport fuels used for domestic flights and shipping (fuel used by international aviation and marine transport is exempt). The Japanese Government has imposed a Petroleum and Coal Tax on imported crude oil and petroleum used to make transport fuels (including aviation and maritime fuels). This tax is to be progressively increased from 2013 to 2015 (although petrol, light oils and jet aviation fuels will initially be exempt).

Some countries have taken unilateral policy action to cover international emissions that otherwise would have been covered under multilateral agreements. These policies are examples of businesses being subjected to the policies of foreign governments. For example, the United Kingdom imposes an air passenger duty (charged to the carrier) on flights departing the United Kingdom. The rate of the duty increases with the distance flown. The European Commission has committed to including domestic and international aviation (covering aircraft that arrive or depart from EU airports) in the European Union ETS from 2012 (EC 2011a). The European Commission has also publicly stated that the European Union will bring all international shipping visiting EU jurisdictions into the ETS if there is no global agreement on maritime emissions by the end of 2011 (EC 2011b).

There is a range of policies in the countries studied that support research and development in relation to aviation biofuels. For example, the US Federal Aviation Administration (in partnership with the aviation industry) funds the Continuous, Lower Energy, Emissions and Noise Reduction Program to develop aviation biofuels. The US Air Force is undertaking tests with private sector companies to meet a goal of certifying all of its aircraft as able to use aviation biofuel blends, and to be able to obtain 50 per cent of its aviation fuel needs from biofuels by 2016. The US and Chinese Governments have signed a series of research partnerships between the Boeing Company, US government agencies, and Chinese research institutions and state companies to undertake aviation biofuels research (ICAO 2011b). The European Union funds a range of aviation biofuel research programs, including Sustainable Way for Alternative Fuels and Energy for Aviation (SWAFEA 2011).

2.5 Forestry and agriculture

Forestry

Many of the study countries have made public commitments to emissions-reduction policies in the forestry sector. Some policy commitments appear to be aspirational targets to increase the land area covered by forest or to increase forest stock. Other policy commitments involve the use of financial incentives and land-use regulations to increase forestry coverage and reduce emissions from land clearing.

For example, the National Mission for a Green India program — one of the eight programs under the National Action Plan on Climate Change — aims to increase forest cover on a total of 10 million hectares of land, and to increase CO₂ sequestration in forests by 50 – 60 Mt per year by 2020. It is currently unclear how these targets will be achieved. The Indian Government has allocated A\$2.72 billion to a Compensatory Afforestation Fund Management and Planning Authority to fund programs for the conservation, regeneration and management of existing forests and wildlife habitats. Details on how the money will be used are currently unclear.

China has adopted an aspirational target to increase forest cover by 40 million hectares, and forest stock volume by 1.3 billion cubic metres by 2020 from 2005 levels. It is unclear how these targets will be achieved.

The Australian Government offers a tax deduction to businesses that plant forests for the purpose of absorbing CO₂ from the atmosphere. Some state government policies also encourage the expansion of forestry coverage (such as Victoria's Carbon Tender which pays landholders to permanently revegetate a portion of their land) or emissions reductions through changes to land management practices (such as Queensland's *Vegetation Management Act* (1999) that regulates land clearing).

New Zealand has three main schemes that subsidise afforestation and the maintenance of existing forests. The East Coast Forestry Project subsidises the planting of commercially productive forest (up to 200 000 hectares by 2020). The Afforestation Grants Scheme provides finance to smaller landholders for planting new forests. The Permanent Forest Sinks Initiative encourages the establishment of permanent forests on previously unforested land by granting landholders tradable offset credits that they can sell on the domestic or international carbon markets.

The United Kingdom operates a number of schemes (such as the Woodland Grant scheme and the Environmental Stewardship scheme) that provide financial incentives for landowners wanting to create new woodland or improve land management practices.

The US Government and some state governments operate a range of policies that provide financial incentives and technical assistance for voluntary sequestration of emissions by private land owners.

Forestry sectors in some of the countries studied are covered by ETSs. The New Zealand ETS has applied to forestry since its inception in 2008. The owners of eligible forests can receive emission permits for increases in the carbon stock of their forest and can trade these on the domestic emissions market or convert them to Kyoto units to be traded overseas. Forest owners are required to surrender New Zealand Units to the Government if carbon stocks fall (for example if a forest is harvested). Units earned from forestry sequestration can be traded internationally to meet obligations under the Kyoto Protocol. In addition, the US Western Climate Initiative cap-and-trade scheme, in principle, will permit offsets from forestry activities. The European Union ETS does not currently cover forestry.

Agriculture

Agricultural food production (including cereals, grains, meat and dairy) can be a significant source of a country's overall greenhouse gas emissions. Currently, it appears there are few emissions-reduction policies that apply to the agricultural sectors of the countries studied.

China and South Korea have announced policies to reduce emissions from rice growing. However, there is little detail on how these targets will be achieved.

A number of countries fund research into reducing agricultural emissions. For example, Australia and New Zealand have a range of policies that fund research into reducing emissions from various farming activities. The UK Government funds research into reducing methane emissions from dairy cattle. Japan operates a national program studying potential uses for biomass from the agriculture and forestry sectors. A draft law before the Japanese legislature would set targets for the proportions of biomass (such as cattle excrement, food waste, wood waste and forestry residue) to be re-utilised by 2020.

Existing ETSs deal with agricultural emissions in different ways. The New Zealand ETS will require the agriculture sector to report emissions from 2012 (with agriculture scheduled to be covered from 2015). Agriculture will receive uncapped permit allocations on an output intensity basis. Agricultural activities cannot currently earn New Zealand Units for sequestration of emissions. The Western Climate Initiative cap-and-trade scheme, in principle, will permit offsets for agricultural activities. The European Union ETS does not cover agriculture.

The Australian Government has introduced legislation to parliament to establish a national Carbon Farming Initiative — a voluntary scheme that would enable farmers, forest growers and other landholders to earn carbon credits for saving or storing greenhouse gases through eligible sequestration activities (DCCEE 2011b).

2.6 Energy efficiency

All study countries use a wide range of policies designed to increase energy efficiency, many of which are promoted as contributing to emissions reductions. Energy efficiency policies apply to households, businesses and government operations in the countries studied. Appendix C discusses some of the major energy efficiency policies in electricity consumption and road transport in more detail. Further information on specific energy efficiency policies is provided in the country stocktakes on the Commission's website (appendix P). Energy efficiency policies that relate to road transport are also discussed in section 2.4.

The most widely applied policies aim to reduce household and commercial energy consumption through:

- *information provision.* All study countries operate energy efficiency labelling schemes for certain electrical appliances (such as energy efficiency star rating labels on household appliances). Some countries also operate energy efficiency rating schemes for residential and commercial buildings that require disclosure of the building energy efficiency rating prior to rental or sale.
- *minimum standards.* All study countries set minimum energy efficiency standards for specific electrical appliances. Generally, appliances that do not meet these standards can not be sold in the country. Study countries also set energy efficiency related building standards for residential and commercial buildings through their respective building codes and regulations (covering areas such as insulation, heating, cooling and lighting).
- *direct financial assistance.* Governments may provide zero or low interest loans, or product subsidies and rebates, to encourage the purchase of energy-efficient electrical appliances and the installation of energy efficiency building measures.
- *market-based schemes.* Governments can require electricity retailers to meet energy savings targets by encouraging the uptake of energy efficiency measures by residential customers or by purchasing offset certificates.

Study countries also operate a range of energy efficiency policies that specifically target energy use by businesses. Primarily, these policies relate to electricity use,

but can include other energy sources such as oil, gas, coal and biomass. Policies fall into three broad categories.

- *Information and financial assistance to small and medium businesses to reduce energy use.* Voluntary programs can offer information and subsidies to encourage the uptake of energy efficiency measures by businesses. For example, the UK Carbon Trust and Low Carbon Australia are non-profit companies established with seed funding from their respective governments. They provide information and advice to businesses and the public sector on how to reduce energy use, and subsidise the uptake of energy-efficient technologies. All countries studied offer a range of these policies.
- *Partnership programs for 'large' energy users.* These policies can include voluntary or mandatory energy (or emissions) reporting, energy audits of business operations, and the uptake of energy efficiency measures. Australia, China, Japan, South Korea and the United States operate these types of programs.
- *Market-based mechanisms for 'large' energy users.* Market-based mechanisms usually set a cap on energy use or an energy efficiency target for businesses, then impose a penalty for not achieving targets (such as a fine or requirement to buy an offset certificate). A number of countries have implemented, or are considering, these types of schemes (box 2.3).

Study countries also target energy efficiency in government operations. This can be through energy audits to identify energy efficiency opportunities, the mandating of energy efficiency targets, and government procurement policies which set minimum energy efficiency standards for government purchases of goods and services (such as minimum fuel efficiency standards on car fleet purchases). All study countries have incorporated energy efficiency objectives into aspects of their government procurement policies.

Box 2.3 **Market-based energy efficiency schemes for business**

In the countries studied, a range of market-based schemes that aim to improve energy efficiency in business operations are in use or about to be implemented.

- *The Tokyo Metropolitan Government's baseline and credit trading scheme.* The mandatory scheme (commenced in 2010) covers emissions from the energy consumption of approximately 1400 office buildings and 300 factories (about 20 per cent of Tokyo's emissions). The scheme aims to reduce emissions by 25 per cent by 2020 from 2000 levels. Covered installations are set emissions targets based on energy consumption and must buy offsets or pay a fine for energy consumption above the target. Saitama Prefecture operates a similar scheme.
- *The Indian Perform, Achieve and Trade scheme.* The scheme (to commence in April 2011) requires approximately 700 of the most energy intensive industrial units and power stations in India to reduce their energy intensity by a specified percentage (depending on the current level of efficiency). Energy users that achieve reductions above their mandated amount receive Energy Savings Certificates that can be traded. The firms included in the scheme are responsible for around half of India's emissions.
- *The South Korean Greenhouse Gas and Energy Target Management Scheme.* The scheme (to commence in 2012) is a system of mandatory agreements covering companies producing at least 25 000 metric tons of emissions a year (470 companies, including 36 power generators). The agreements would set energy savings and emissions-reduction targets for each emitter. Emitters who would have to buy offsets or pay a fine for not meeting a target.
- *The NSW Energy Savings Scheme.* The scheme (commenced in 2009) is a mandatory energy efficiency scheme for electricity retailers who are required to meet energy savings targets. Electricity retailers meet their targets by implementing energy saving activities (with households and business customers) or by purchasing energy savings certificates from companies with recognised energy reductions.

Source: Appendix P.