

Australian Environmental-Economic Accounts 2014



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2014

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AUSTRALIAN ENVIRONMENTAL-ECONOMIC ACCOUNTS

EMBARGO: 11.30AM (CANBERRA TIME) THURS 3 APR 2014

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INQUIRIES

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NOTES

ABOUT THIS RELEASE

This publication represents the first issue of *Australian Environmental–Economic Accounts* (AEEA). It brings all ABS environmental accounts together in one place to deliver a broad and cohesive picture of the environmental stocks and flows of relevance to the Australian economy and society.

AEEA responds to the growing demand for integrated environmental–economic information and reflects an emerging maturity within the Australian Bureau of Statistics (ABS) environmental program.

Jonathan Palmer
Acting Australian Statistician

INTRODUCTION

INTRODUCTION

The Australian Environmental–Economic Accounts represents the culmination of efforts by the Australian Bureau of Statistics (ABS) to develop, implement and regularly produce a set of environmental–economic accounts (‘environmental accounts’).

The ABS currently produces a range of separate environmental accounts for water, energy, waste, land, and environmental assets as part of the national balance sheet. This publication brings together the ABS environmental accounts in one place to deliver a more complete picture of the interactions of the environment with the economy and society of Australia. From time to time special articles will be included to highlight developments in the theory and practice of environmental accounting. Going forward, the range of information included in the Australian Environmental–Economic Accounts is expected to expand to cover a wider range of accounts, not necessarily limited to ABS accounting products.

The Australian Environmental–Economic Accounts are underpinned by the System of Environmental–Economic Accounting (SEEA), which was adopted by the United Nations Statistical Commission as an international statistical standard in 2012. An important feature of the SEEA is that it links environmental information to the System of National Accounts (SNA), which provides the concepts and methods for much of the official economic statistics produced around the world. In late 2013 the Bureau of Meteorology recommended adoption in Australia of the SEEA in the Guide to Environmental Accounting in Australia.

The Australian Environmental–Economic Accounts represents a work in progress. Over time, and as resources allow, the accounts will be improved and extended. This may involve, for example, including more types of accounts (e.g. environmental protection expenditure, water and air pollution), providing greater levels of geographic detail, valuation of additional environmental assets (e.g. water, fish) and/or more detailed industry breakdowns. The ABS welcomes feedback on the current edition of Australian Environmental–Economic Accounts and on the priorities for improvement and expansion of this publication.

For further information on this publication, please contact:

Michael Vardon
Director
Centre of Environment Statistics
Australian Bureau of Statistics
michael.vardon@abs.gov.au or 02 6252 7348

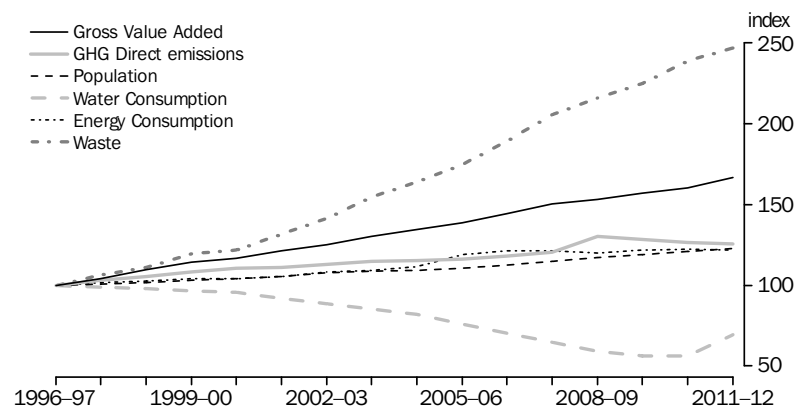
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MAIN FINDINGS

INTEGRATED SOCIOECONOMIC AND ENVIRONMENTAL INDICATORS

Australia's economic production as measured by Gross Value Added (GVA) in chain volume terms rose by 67% over the period 1996–97 to 2011–12. Over the same period, indicators of environmental pressure related to the production of waste, energy consumption and greenhouse gas (GHG) emissions increased; and water consumption by industry fell. Waste production rose 147%, energy consumption increased 22%, GHG emissions increased 25% and water consumption by industry fell by 31%. The latter drop can be partly explained by the reduction in water availability due to climatic conditions (e.g. drought) as well as the adoption of water conservation measures. As water availability over the most recent years has increased due to higher rainfall, water consumption has increased, leading to increased intensity of water use by industry.

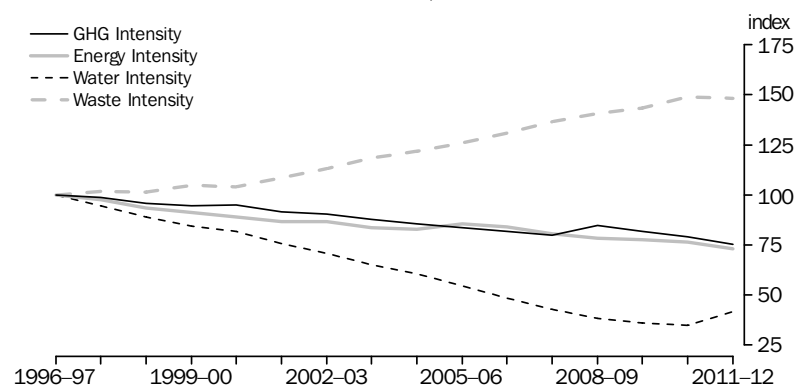
SELECTED SOCIOECONOMIC AND ENVIRONMENTAL MEASURES, Australia, 1996–97 to 2011–12



Note: Index: 1997 = 100

A comparison of changes in selected indicators of environmental pressure per unit of economic production (GVA) between 1996–97 and 2011–12 illustrates, among other things, the close correlation between Australia's GHG emissions intensity and energy intensity¹, with both decreasing approximately 25% during this period.

SELECTED INTENSITY MEASURES, Australia 1996–97 to 2011–12



Notes: Index: 1997 = 100

Intensity = physical measure (GL, J, Tonnes)/\$ of GVA

¹ The intensity indicators presented in this publication are described in the Glossary.

MAIN FINDINGS *continued*

INTEGRATED SOCIOECONOMIC AND ENVIRONMENTAL INDICATORS *continued*

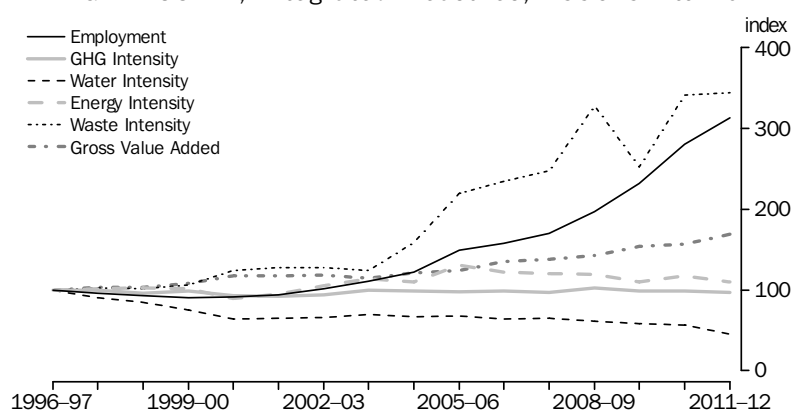
Waste intensity is the only indicator of intensity to increase over the period (48%). This result is consistent with international evidence which suggests that economic growth is associated with growth in waste production per capita².

INDICATORS OF ENVIRONMENTAL PRESSURE FOR SELECTED INDUSTRIES

Mining

The value of mining production, as measured by GVA, increased steadily between 1996–97 and 2011–12, from \$80b to \$134b or 69%. The mining industry's share of total GVA rose from 4.7% in 1996–97 to 9.6% in 2011–12. The increase has been accompanied by a proportionately larger rise in the number of persons employed in the mining industry, from 84,500 in 1996–97 to 259,600 in 2011–12.

MINING INDUSTRY, Integrated Measures, 1996–97 to 2011–12



Note: Index: 1997 = 100

The indicators of environmental pressure for the mining industry reveal a mixed picture. Energy consumed per unit of economic production (energy intensity) has risen by 10% over the period 1996–97 to 2011–12. The mining industry has increased its focus on lower value (dollar per tonne) commodities, such as coal and iron ore. This has resulted in a relatively greater level of energy use for extraction and processing than for commodities with higher unit values (i.e. more tonnes must be removed in order to generate the same value of production). Part of this relates to the higher proportion of production coming from open cut mines. This method typically requires removal of large quantities of soil, rock and so on (i.e. overburden) to expose the commodity, with a corresponding energy use for overburden removal, before commodity production begins.

Waste intensity recorded the greatest increase among the indicators of environmental pressure of the mining industry, increasing by 244% from 1996–97 to 2011–12. The majority of this increase occurred between 2003–04 and 2011–12 when waste intensity rose by 220%. This period coincides with a rapid expansion of the mining industry, with opening and expanding mines contributing to a major proportion of waste production in the mining industry. Similarly clean-up of laydown yards, historic waste stockpiling and demolition of closed mines, all produce large amounts of waste.

GHG emissions intensity and water intensity recorded for the mining industry decreased by 3% and 55% respectively for the period 1996–97 to 2011–12.

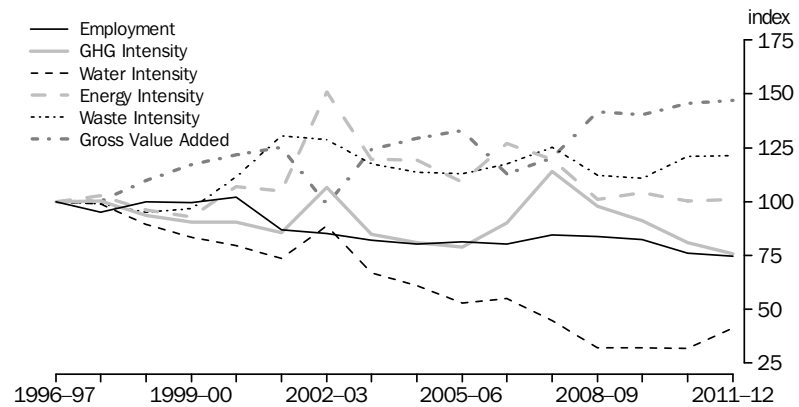
² Productivity Commission, 2006, Inquiry Report No. 38.

MAIN FINDINGS *continued*

Agriculture

Between 1996–97 and 2011–12 the value of production generated by the agriculture industry, as measured by its GVA, rose from \$23b to \$34b. The agriculture industry's contribution to total GVA across all industries dropped from 3.6% in 1996–97 to 2.4% in 2011–12. This decrease was accompanied by a drop (26%) in employment in the agriculture industry, from 402,450 in 1996–97 to 321,050 in 2011–12.

AGRICULTURE INDUSTRY, Integrated Measures, 1996–97 to 2011–12



Note: Index: 1997 = 100

Consistent with the change in water intensity observed for the mining industry, the agriculture industry witnessed a steady trend downwards, decreasing 59% over the period 1996–97 to 2011–12. In response to the climatic conditions of the early 2000's (e.g. drought), the agriculture industry became more efficient with water use through infrastructure improvements, technology advancements and changes to crop selection.

Energy intensity remained almost unchanged from 1996–97 to 2011–12, increasing only 1%, while waste production has shown a 21% increase in intensity for the agriculture industry. In contrast, GHG emissions intensity decreased 24% from 1996–97 to 2011–12.

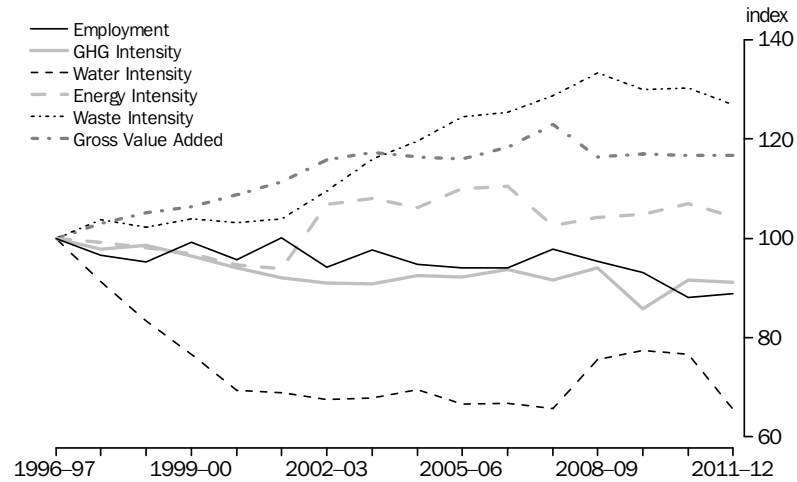
Manufacturing

GVA of the manufacturing industry rose between 1996–97 and 2011–12 from \$90b to \$105b. Manufacturing's contribution to total GVA fell from 13.5% in 1996–97 to 7.5% in 2011–12. Similarly, the number of persons employed in the manufacturing industry fell from 1,077,525 in 1996–97 to 938,300 in 2011–12.

MAIN FINDINGS *continued*

Manufacturing *continued*

MANUFACTURING INDUSTRY, Integrated Measures, 1996–97 to 2011–12



Note: Index: 1997 = 100

In comparison to the mining and agricultural industries, manufacturing's recorded GHG and energy intensities remained relatively steady between 1996–97 and 2011–12. Waste intensity experienced the greatest increase of the intensity indicators for the manufacturing industry, increasing 27% between 1996–97 and 2011–12. Energy intensity of the manufacturing industry fell by 6% in the 5 years leading up to 2001–02 but thereafter increased, and across the entire time series 1996–97 to 2011–12 energy intensity increased by 4%.

ENVIRONMENTAL ASSETS

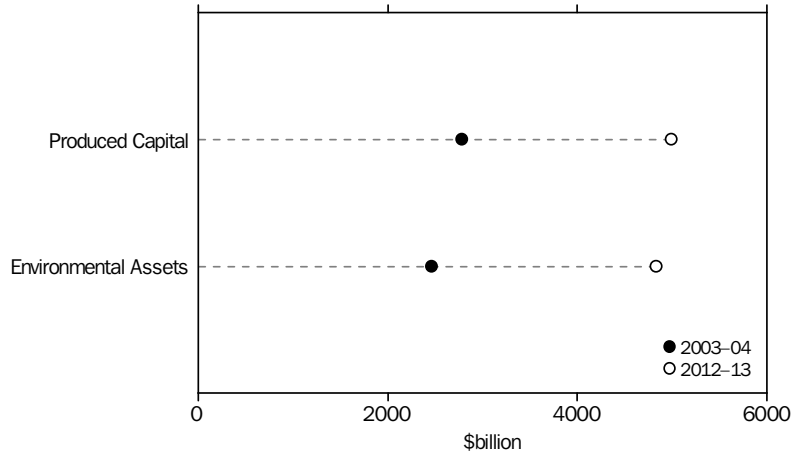
The notion of environmental assets used in this publication is consistent with the SEEA definition and has the potential to include: subsoil assets, both mineral and energy; land; soil resources; timber resources, both plantation and native forest; aquatic resources (e.g. fish), both cultivated and natural; water resources, comprising surface water, ground water and soil water; and other biological resources. The ABS makes estimates of the value of subsoil, land and timber assets. While the ABS does not currently estimate the value of water resources or aquatic resources, they are the subject of ongoing research.

The value of Australia's environmental assets (in current prices) increased 96% over the period 2003–04 to 2012–13 from \$2,457b to \$4,826b. The value of Australia's produced capital also increased over the same period, although to a lesser extent (79%), rising from \$2,778b to \$4,985b.

MAIN FINDINGS *continued*

ENVIRONMENTAL ASSETS *continued*

AUSTRALIA'S CAPITAL BASE, Current prices, 2003–04 and 2012–13

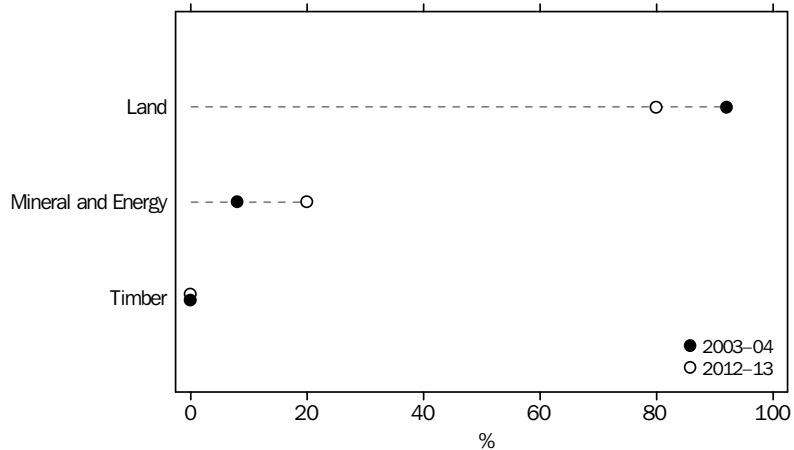


Overview of changes in environmental assets

In 2012–13 land accounted for 80% of the value of Australia's environmental assets, down from 92% in 2003–04. Over the same period, the value of land (in current prices) increased 72% to \$3,873b.

The share of mineral and energy resources among Australia's environmental assets rose from 8% to 20% in the decade to 2012–13. This occurred alongside a 376% rise in the value of mineral and energy resources from \$198b in 2003–04 to \$942b in 2012–13, a change that is further described below.

ENVIRONMENTAL ASSETS, Share of total value, Current prices, 2003–04 and 2012–13



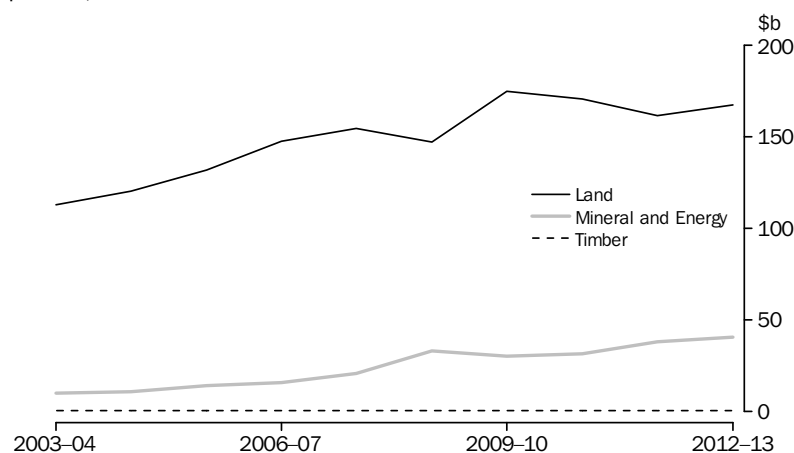
The overall value of Australia's timber assets grew by 14% between 2003–04 and 2012–13. Australia's timber assets are comprised of: native standing timber, which decreased in value by 35% to \$1.5b in the decade to 2012–13; and plantation standing timber, which rose in value by 30% to \$9.6b for the same period. Throughout this period, the value of Australia's timber assets remained at less than 1% of the total value of Australia's environmental assets.

The value of produced capital on a per capita basis increased in current price terms by 55% from \$139,469 in 2003–04 to \$215,599 in 2012–13. The value of Australia's stock of environmental assets on a per capita basis increased by 69% over the same period, from \$123,245 in 2003–04 to \$208,638 in 2012–13.

MAIN FINDINGS *continued*

Overview of changes in environmental assets
continued

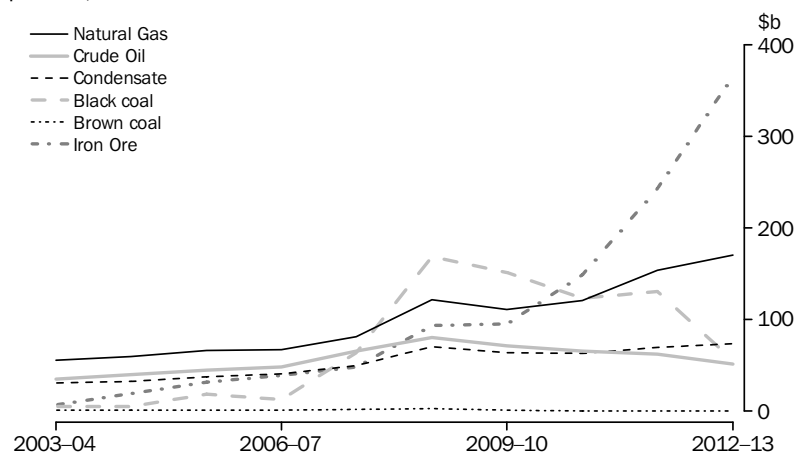
ENVIRONMENTAL ASSETS, By type of asset, Value per capita, Current prices, 2003–04 to 2012–13



Mineral and energy resources

Strong overseas demand for mineral and energy resources, particularly from China, drove a boom in the prices of many of these resources over much of the decade to 2012–13. These price rises increased the economic viability of many mineral and energy resources and led to increases in the amount of resources assessed as being within the scope of economically demonstrated resources (EDR) for these mineral and energy assets³.

VALUE OF SELECTED MINERAL AND ENERGY RESOURCES, Current prices, 2003–04 to 2012–13



Between 2003–04 and 2012–13, the value of Australia's iron ore assets rose from \$7b to \$366b as a direct result of increased market prices. In turn, the proportion of the value of total mineral and energy resources attributable to iron ore rose from 3% to 39% over the decade to 2012–13. Over the same period, estimates of the physical extent of EDR iron ore assets went from 14 gigatonnes to 49 gigatonnes, a 261% increase. Much of this change is explained by reclassification of iron ore deposits from sub-economic to economic categories⁴.

³ Economically demonstrated resources (EDR) is used to measure the physical extent of a given resource. EDR is a measure of the resources that are established, analytically demonstrated or assumed with reasonable certainty to be profitable for extraction or production under defined investment assumptions. Classifying a mineral resource as EDR reflects a high degree of certainty as to the size and quality of the resource and its economic viability.

⁴ Geoscience Australia – Trends in Australia's Economic Demonstrated Resources of Major Mineral

MAIN FINDINGS *continued*

Mineral and energy resources continued

Among other categories of mineral and energy resources, notable changes in the physical quantity of EDR between 2003–04 and 2012–13 included increases for copper (127%), gold (88%) and silver (98%).

For bauxite resources, estimates of physical quantity rose 14% from 5.6Gt to 6.4Gt over the 10 years to 2012–13. However, for this period, the value of Australia's bauxite assets fell considerably (94%) from \$16b to \$1b. This fall occurred against a backdrop of an over-supply of aluminium, of which bauxite is the most important ore, and increased refining costs⁵.

In 2012–13, the physical extent of Australia's energy resources was estimated at 63Gt for black coal; 44Gt for brown coal; 1,165Kt for uranium; 2,720b cubic metres for natural gas; 120GL for crude oil; 298GL for condensate; and 110GL for liquefied petroleum gas (LPG).

Black coal EDR increased significantly during the 2003–04 to 2012–13 period mainly due to new discoveries and through reclassification of existing resource⁶. Physical estimates of Australia's black coal rose 60% over the decade to 2012–13. This was accompanied by a 936% increase in value of black coal from \$5b to \$56b.

In contrast, the value of Australia's brown coal fell by 65% between 2003–04 and 2012–13, despite an 18% physical increase in brown coal EDR in Australia.

Between 2003–04 and 2008–09, the value of Australia's uranium deposits increased from \$194m to over \$859m. Since 2008–09, however, the economic value of uranium has fallen with international prices. While physical estimates have remained stable (1165Kt in 2012–13), the value of Australia's uranium resources dropped 67% between 2008–09 and 2012–13 to \$286m at the end of the period.

Monetary values for all of Australia's categories of petroleum resources increased over the period from 2003–04 to 2012–13, with the value of natural gas rising by 207%, condensate by 140%, liquid petroleum gas (LPG) 114%, and crude oil by 46%. Changes to the physical stocks of the resources were mixed, however, with rises for condensate (26%) and natural gas (11%) contrasting with declines for LPG (–51%) and crude oil (–34%).

Commodities <http://www.ga.gov.au/products-services/publications/aimr/trends.html>.

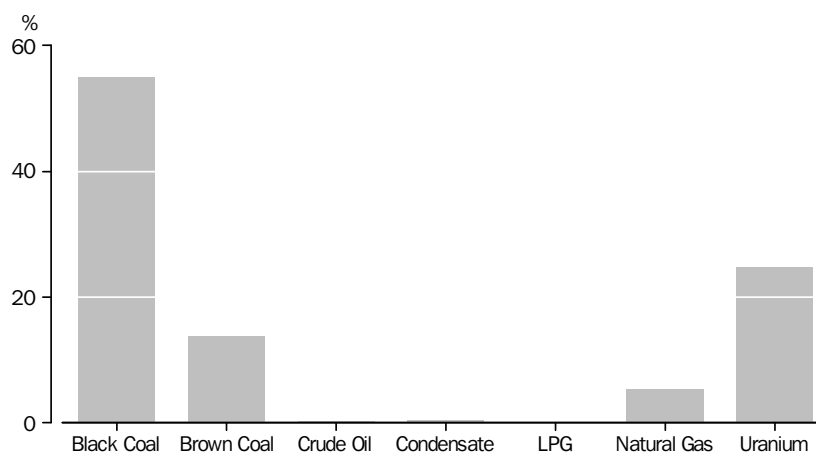
⁵ The Snowden group newsletter, September 2013: Commodity spotlight: Bauxite. <http://www.snowdengroup.com/news/newsletters/september-2013/commodity-spotlight-bauxite>.

⁶ Geoscience Australia – Trends in Australia's Economic Demonstrated Resources of Major Mineral Commodities <http://www.ga.gov.au/products-services/publications/aimr/trends.html>

MAIN FINDINGS *continued*

Mineral and energy resources continued

SHARE OF TOTAL ENERGY CONTENT, By type of energy resource, 30 June 2010



In terms of energy (petajoules–PJ) content, black coal represents Australia's most significant energy resource with an estimated energy content of 1,601,370PJ as at 30 June 2012. This is followed by uranium (663,600PJ) and brown coal (433,077PJ).

Resource rent and depletion

Resource rent is the benefit from holding and using environmental assets. It comprises a return on environmental assets and depletion; the latter is the change in the monetary value of the asset between the beginning and end of any one year arising purely from its extraction. For Australia, experimental estimates of resource rent, return on environmental assets and depletion are available in respect of subsoil mineral and energy assets.

The resource rent of subsoil assets increased 186% in the decade to 2012–13, from \$19.7b to \$56.3b. Of this, depletion increased 56%, while the return on subsoil assets rose 245%.

INCOME FROM MINERAL AND ENERGY RESOURCES, 2003–04 TO 2012–13

	<i>Return on mineral and energy assets</i>	<i>Depletion</i>	<i>Resource rent</i>
	\$b	\$b	\$b
2003–04	13.5	6.2	19.7
2004–05	15.4	6.4	21.8
2005–06	20.1	7.0	27.1
2006–07	24.0	7.4	31.4
2007–08	34.4	8.4	42.8
2008–09	37.9	11.8	49.7
2009–10	43.3	9.4	52.7
2010–11	46.6	8.9	55.5
2011–12	49.3	9.6	58.9
2012–13	46.6	9.7	56.3

MAIN FINDINGS *continued*

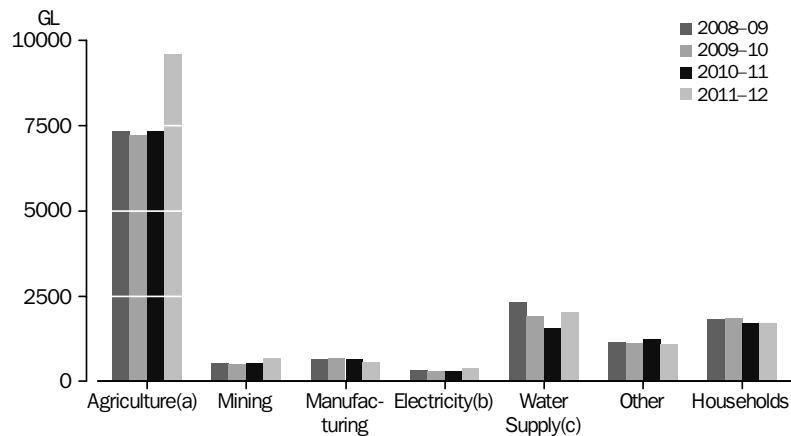
WATER SUPPLY, USE AND CONSUMPTION

Water consumption

Water consumption is the amount of water lost by the economy during use, meaning that the water has entered the economy but has not been returned to either water resources or the sea. Total water use differs from water consumption, because water use does not subtract in-stream use (such as that used in hydro electricity generation) and water supplied to other users and the environment.

Australian water consumption in 2011–12 was 16,019GL, an increase of 20% or 2,682GL since 2010–11. Water consumption declined between 2008–09 and 2010–11. The subsequent large increase in 2011–12 was mainly driven by a 30% or 2,236GL increase in water consumption by the agriculture industry, including forestry and fishing.

AUSTRALIAN WATER CONSUMPTION BY INDUSTRIES AND HOUSEHOLDS, 2008–09 to 2011–12



Notes: (a) Includes forestry and fishing
 (b) Includes gas
 (c) Includes waste services

The agriculture industry was the largest consumer of water throughout the four year period from 2008–09 to 2011–12, consuming 9,587GL of water in 2011–12 (accounting for 60% of total water consumption). Between 2008–09 and 2010–11 water consumption by the agriculture industry was steady at around 7,100GL per annum. The increase of 2,236GL in 2011–12 was driven by sheep, beef and grain farming, which increased 29% or 894GL and was the largest contributor to water consumption by the agriculture industry, accounting for 44% of agricultural water consumption in 2011–12. A large part of the rise can be explained by a 50% increase in cultivated land used for grain and seed production, from 158,200ha to 237,600ha.

The water supply industry experienced a 30% or 468GL increase in water consumption in 2011–12. A significant proportion of water consumed by the water supply industry relates to leakages from water distribution networks. Electricity, gas and mining industries showed similar percentage movements, while households was steady at 1,715GL or 11% of total water consumption in 2011–12.

Water consumption by the manufacturing industry was steady over the three years to 2010–11, and then decreased by 14%, or 94GL, in 2011–12. The reduction was driven by the wood, pulp, paper and converted paper product industry and the food, beverage and tobacco product industry consuming less water. The wood, pulp, paper and converted paper product industry decreased its water consumption from 92GL to 59GL (a 35%

MAIN FINDINGS *continued*

Water consumption continued

decline), a move associated with a falling volume of production – gross value added (in chain volume terms) fell 11% between 2008–09 and 2011–12. Water consumption by the food, beverage and tobacco product industry also decreased, falling from 295GL to 264GL (a 10% decline)⁷.

Manufacturing's share of water consumption dropped from 4.6% in 2008–09 to 3.5% in 2011–12. In the same period, water consumption by agriculture increased (from 52% to 59.8%) as it did by mining (3.6% to 4.2%).

Household consumption

Household water consumption accounted for 11% of total water consumption in Australia in 2011–12. Over the period 2008–09 to 2011–12 household water consumption decreased from 1,818GL to 1,715GL (6% or 103GL).

New South Wales was the main contributor to the national decrease, reducing its consumption from 548GL to 508GL (7% or 40GL) over the four years to 2011–12. All states and territories excluding Queensland (which experienced an increase of 2% or 5GL) showed a decrease in household water consumption over the four years, reflecting the broader national trend.

The average price paid for water by Australian households has increased by \$0.88/KL or 54% between 2008–09 and 2011–12, from \$1.63/KL to 2.51/KL. South Australia has the highest average water price at \$3.94/KL, followed by the ACT at \$2.85/KL and Victoria at \$2.78/KL. Western Australia has one of the lowest average water prices for households at \$1.51/KL.

Western Australia consumed 18% of all water in Australia, while contributing only 11% of total expenditure on water. Conversely, South Australia consumed 7% of the national total while paying 11%.

Water revenue and expenditure

Total revenue from sales of water increased from \$14,089m in 2010–11 to \$15,835m in 2011–12 (a 12% increase). The water supply industry accounted for 99% of total water revenue in 2011–12 and this share has remained constant between 2008–09 and 2011–12.

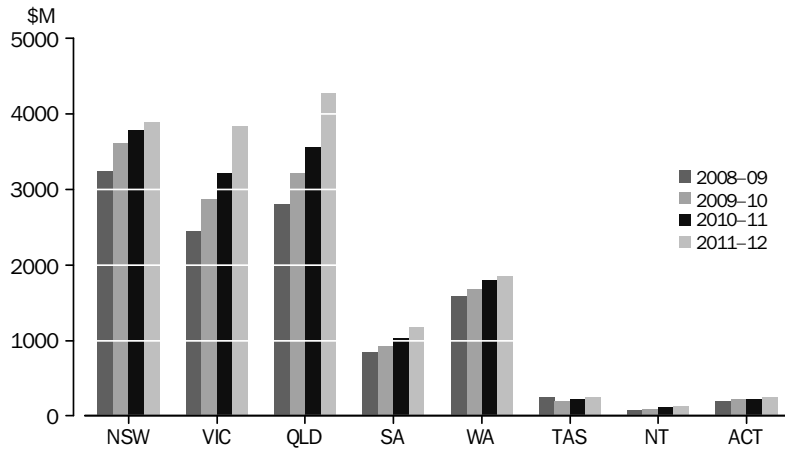
Of the total water revenue collected by the water supply industry in Australia in 2011–12, Queensland had the highest proportion of any state (27%, an increase from 24% in 2008–09), followed by NSW (25%, a decrease from 28% in 2008–09) and Victoria (24%, an increase from 21% in 2008–09).

⁷ Table 5 of Australian System of National Accounts, 2012–13 (cat. no. 5204.0).

MAIN FINDINGS *continued*

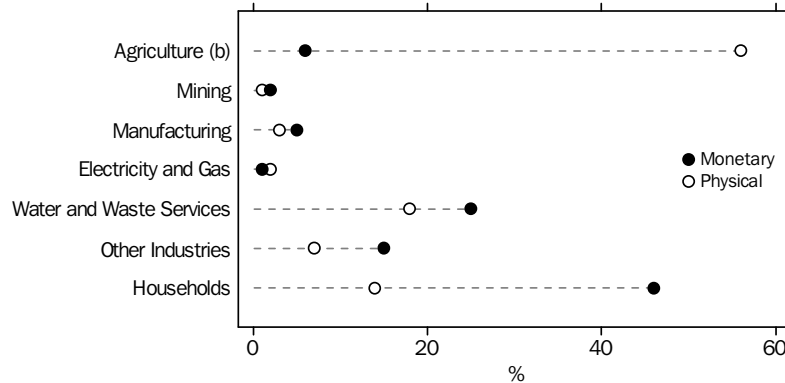
Water revenue and expenditure continued

REVENUE FROM NET WATER SALES AND RELATED SERVICES, By state/territory, 2008–09 to 2011–12



A comparison of relative use (in physical terms) and expenditure (in monetary terms) of distributed and reuse water across industries and households shows that, as of 2011–12, agriculture uses the most distributed and reuse water (56% of total) and pays comparatively less for it (6% of total water expenditure). In comparison, households use relatively little water (14% of total distributed and reuse water) and account for 46% of the total expenditure on water. While data on types of distributed and reuse water (i.e. potable and non-potable) are not available, water paid for and used by the agriculture industry is almost entirely non-potable.

WATER USE(a), Monetary and physical units, Percentage contribution to total, 2011–12



(a) Distributed and Reuse Water
 (b) Includes Forestry and Fishing

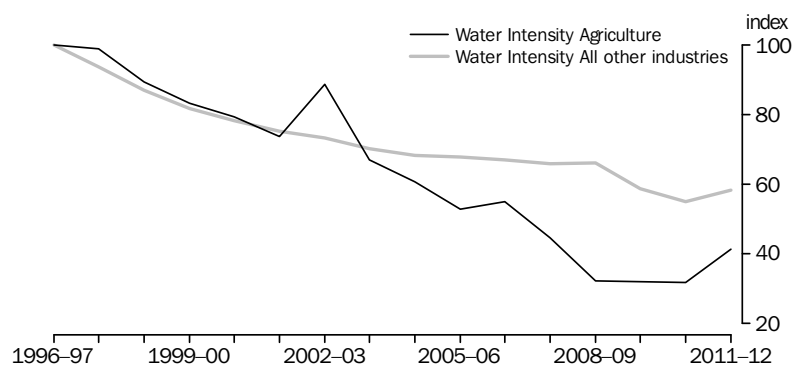
This contributed to the disparity between the prices paid per kilolitre (KL) between agriculture (\$0.09/KL) and all other industries (mining \$2.02/KL, manufacturing \$1.44/KL, electricity and gas \$0.38/KL, water and waste services \$1.15/KL and other industries \$1.70/KL). In addition, water used by agriculture is typically transported through open waterways and channels. The value of this infrastructure is less than that needed for potable water.

MAIN FINDINGS *continued*

Industry intensity of water use

Water intensity is a measure of the water consumed to produce one unit of economic output. It is calculated by dividing water consumption by industry Gross Value Added (GL/\$m GVA). The volume of water required by the agriculture industry to produce one unit of economic output fell by 59% between 1996–97 and 2011–12 to 0.28GL/\$m GVA. The water intensity of all other industries also declined over the period, though to a lesser extent, falling by 42%.

CHANGE IN WATER INTENSITY, Agriculture and all other industries, 1996–97 to 2011–12



Notes: Gross Value Added in chain volume terms
Intensity equals GL water / \$m GVA
Index: 1996–97 = 100

Gross value of irrigated agricultural production

In 2011–12, the total gross value of irrigated agricultural production (GVIAP) for Australia rose 5% from the previous year to \$13.5b. The three commodities with the highest GVIAP in Australia were vegetables (\$2.6b), fruit excluding grapes (\$2.4b) and cotton (\$2.2b).

Rice and cotton, which are the most water intensive crops, have seen significant increases in GVIAP from 2008–09 to 2011–12 increasing by 619% and 248% respectively. Other products recording an increase between 2008–09 and 2011–12 include: production of sheep and other livestock (105%); production from meat cattle (49%); sugar cane (20%); and fruit excluding grapes and nuts (2%).

Total GVIAP for cereals grown for grain and seed increased 27% or \$43m between 2010–11 and 2011–12. However over the four year period from 2008–09 to 2011–12 this has decreased by 36% or \$114m. Total GVIAP for grapes showed a similar trend, decreasing 19% between 2008–09 and 2011–12 before increasing 5% between 2010–11 and 2011–12.

ENERGY SUPPLY AND USE *Supply of energy*

Between 2008–09 and 2011–12, Australia's total net supply of energy increased by 0.4% from 19,636PJ to 19,706PJ. Net supply of energy accounts for the transformation of primary energy products to secondary energy products and related conversion losses. Thus net supply of energy avoids double-counting amounts of converted primary energy.

In 2008–09, 89% of total net supply was produced domestically and the remainder (11%) was imported. This pattern has been stable over the period 2008–09 to 2011–12 and in 2011–12 domestic production was 90% of total net supply and imports 10%.

MAIN FINDINGS *continued*

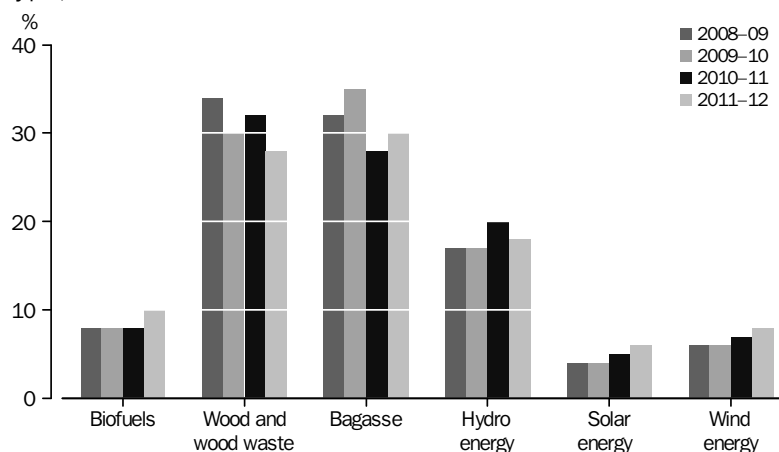
Supply of energy *continued*

From 2008–09 to 2011–12, the mining industry was the main producer of domestic energy, principally through extraction of fossil fuels and uranium. In 2008–09, the mining industry contributed 94% or 16,652PJ of domestic energy production, growing slightly to 95% or 16,905PJ in 2011–12. Relative shares of net energy supplied by other industries and imports remained relatively constant during the period.

Black coal accounts for the majority of domestic production of energy and has increased from 50% or 9,015PJ of domestic production in 2008–09 to 55% or 9,672PJ in 2011–12. In contrast, uranium has fallen from 27% or 4,846PJ of domestic production in 2008–09 to 20% or 3,525PJ in 2011–12.

Renewable energy production increased between 2008–09 and 2011–12 by 13% or 33PJ and grew from 1% to 2% of total energy production. Solar, hydro–electricity, and wind energy all grew during the period by 89%, 19% and 57% respectively.

PERCENTAGE CONTRIBUTION TO SUPPLY OF RENEWABLE ENERGY, By type, 2008–09 to 2011–12



Imports of energy products increased by 16% from 1,759PJ in 2008–09 to 2,034PJ in 2011–12. The most significant energy import is crude oil and refinery feedstock 941PJ or 53% of energy imports in 2008–09, increasing to 1,141PJ or 56% in 2011–12. In contrast, there has been a decrease in the imports of petrol (139PJ or 18% in 2008–09, decreasing by 6% to 125PJ in 2011–12) and other refined fuels and products (205PJ or 12% of energy imports in 2008–09, decreasing to 190PJ or 9% in 2011–12).

Use of energy

Between 2008–09 and 2011–12, Australia's domestic net energy use (i.e. by industry, households and government, but excluding exports) increased by 2% from 3,989PJ to 4,083PJ.

Net energy use by industry increased between 2008–09 and 2011–12 by 50PJ from 2,905PJ to 2,955PJ. However, net energy use by industry as a share of total domestic energy use has fallen slightly from 73% in 2008–09 to 72% in 2011–12. The primary fuel sources used by industry are diesel (growing from 602PJ or 21% of energy used by industry in 2008–09 to 695PJ or 24% in 2011–12), natural gas (falling from 701PJ or 24% of energy used by industry in 2008–09 to 678PJ or 23% in 2011–12), and electricity (626PJ or 22% of energy used by industry in 2008–09 and 630PJ or 21% in 2011–12).

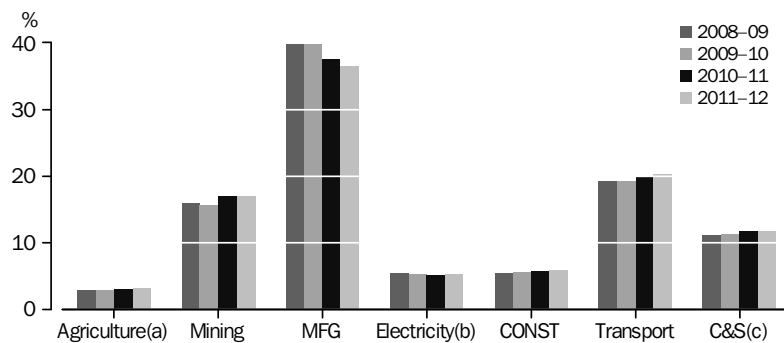
MAIN FINDINGS *continued*

Use of energy continued

Household net energy use increased by 39PJ between 2008–09 and 2011–12 from 1,002PJ to 1,041PJ and represents a slight increase from 25% to 26% of total domestic energy use. The primary fuel sources used by households are petrol (470PJ or 47% of energy used by households in 2008–09 to 484PJ or 46% in 2011–12), and electricity (falling from 216PJ or 22% of energy used by households in 2008–09 to 208PJ or 20% in 2011–12).

The manufacturing industry remains the largest user of energy among Australian industries, despite its consumption decreasing from 1,152PJ or 40% of domestic energy use in 2008–09 to 1,078PJ or 36% in 2011–12. In contrast, the mining, transport, and commercial and services industries marginally increased their shares of net energy used by industry between 2008–09 and 2010–11; mining rose from 466PJ or 16% of energy used by industry to 504PJ or 17%, transport rose from 559PJ or 19% to 601PJ or 20%, and commercial and services rose from 324PJ or 11% to 348PJ or 12%.

NET ENERGY USE, By Australian industry, 2008–09 to 2011–12



(a) Includes forestry and fishing

(b) Includes gas, water and waste services

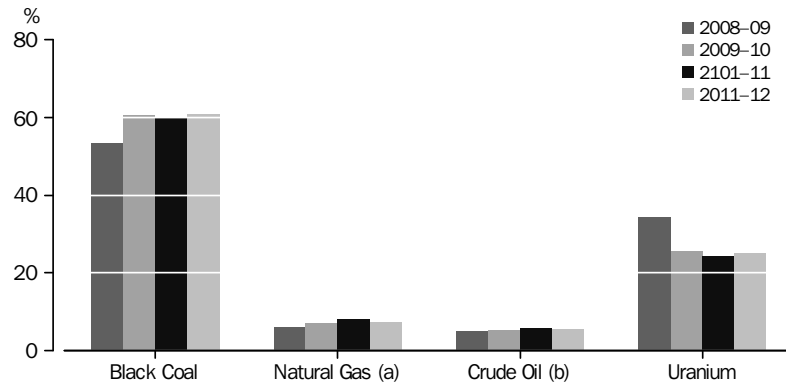
(c) 'Commercial and services' includes a range of service industries, including retail, wholesale, financial and health.

Exports remain the largest net user of Australian energy products, accounting for 13,896PJ or 78% of domestic energy extraction in 2008–09 and 14,050PJ (80%) in 2011–12. The main energy products exported are coal (7,411PJ or 53% of energy exports in 2008–09, increasing to 8,516PJ or 61% in 2011–12) and uranium (4,754PJ or 34% of energy exports in 2008–09, decreasing to 3,525PJ or 25% in 2011–12). Natural gas exports rose during the period (838PJ or 6% of energy exports in 2008–09, increasing to 1,048PJ or 7% in 2011–12), as did crude oil and refinery exports (678PJ or 5% of energy exports in 2008–09, increasing to 764PJ or 5% in 2011–12).

MAIN FINDINGS *continued*

Use of energy *continued*

NET ENERGY EXPORTS, By product, 2008–09 to 2011–12



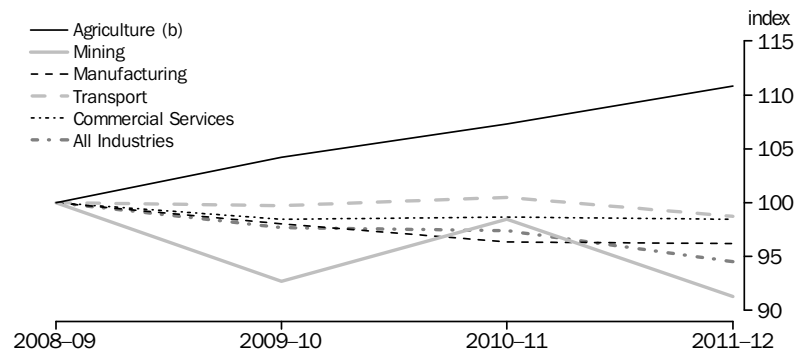
(a) Includes coal seam methane, town gas and coal mine waste gas, excludes biogas
(b) Includes refinery feedstock, ethane and other petrochemical feedstocks

Energy intensity

The energy intensity of Australian industry decreased by 5% between 2008–09 and 2011–12. The agriculture, forestry and fisheries industry was the only industry which recorded rising energy intensity during this period (11% increase). The decrease of the mining industry's energy intensity was a reversal on the trend seen over the decade to 2008–09.

Australia's most energy intensive industries were manufacturing (decreasing from 11,995 GJ/\$m GVA in 2008–09 to 11,535 GJ/\$m GVA in 2011–12), transport (decreasing from 8,564 GJ/\$m GVA in 2008–09 to 8,453 GJ/\$m GVA in 2011–12), and mining (decreasing from 4,121 GJ/\$m GVA in 2008–09 to 3,763 GJ/\$m GVA in 2011–12). The least energy intensive industries were commercial and services (decreasing from 455 GJ/\$m GVA in 2008–09 to 448 GJ/\$m GVA in 2011–12) and construction (decreasing from 1,630 GJ/\$m GVA in 2008–09 to 1,556 GJ/\$m GVA in 2011–12).

ENERGY INTENSITY, Selected industries (a), 2008–09 to 2011–12



(a) Excludes Electricity Supply and Gas Supply

(b) Includes Forestry and Fishing

Note: Index: 2008–09 = 100

Electricity use and expenditure

In 2009–10, Australian industries and households in total paid \$30,502m to use 907PJ of electricity.

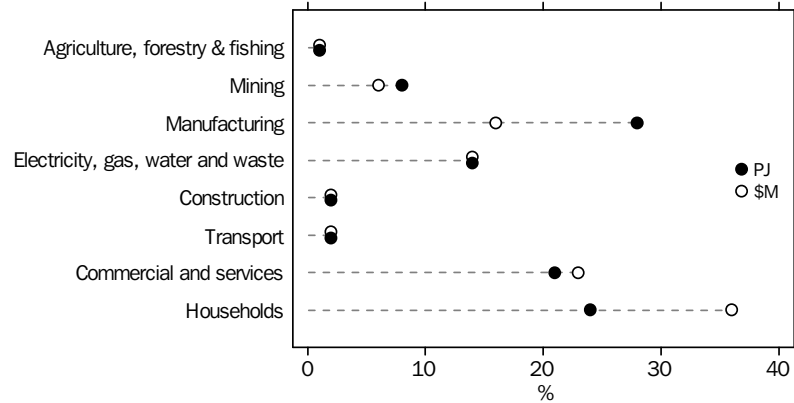
The manufacturing industry was the largest user of electricity in Australia in 2009–10, consuming 252PJ or 28% of total domestic use of electricity. The \$4,905m paid by the manufacturing industry for this electricity represents 16% of total expenditure on electricity.

MAIN FINDINGS *continued*

Electricity use and expenditure continued

In contrast, households used 221PJ or 24% of domestic use of electricity in 2009–10. The \$10,959m paid by households represents 36% of total expenditure on electricity.

ELECTRICITY USE (a), MONETARY & PHYSICAL UNITS, Percentage contribution to total, 2009–10



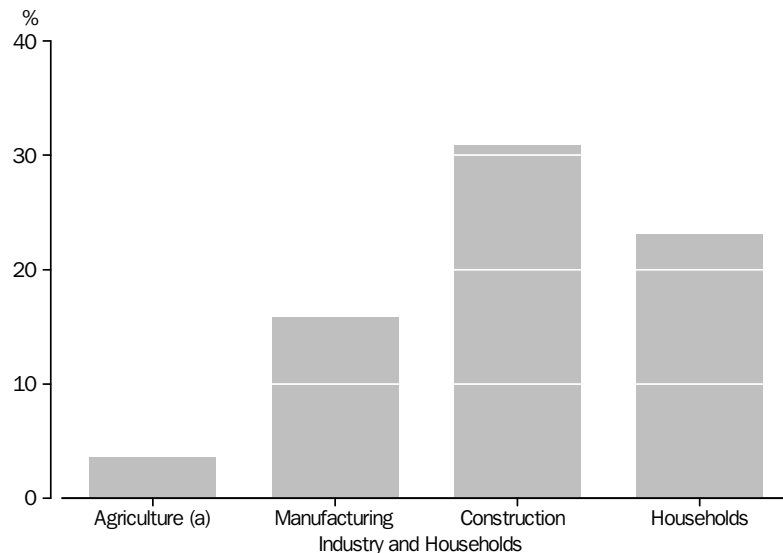
(a) 'Electricity' includes from solar, solar hot water, wind, hydro and other electricity.

WASTE GENERATION AND MANAGEMENT

Waste generation by industry and households

The Australian economy generated 53.7m tonnes of waste in 2009–10. The construction industry generated the largest volume of waste with over 16.5m tonnes, representing 31% of the total waste generated during 2009–10. In 2010, the number of households in Australia was estimated to be 8.4m with an average household consisting of 2.6 persons. Households generated 12.4m tonnes of waste in 2009–10, or around 1.5 tonnes of waste per household. In 2009–10 Australia imported 0.6m tonnes of waste.

WASTE GENERATION, By selected industries and households, Percentage contribution to total, 2009–10



(a) Includes Forestry and Fishing

MAIN FINDINGS *continued*

Waste management

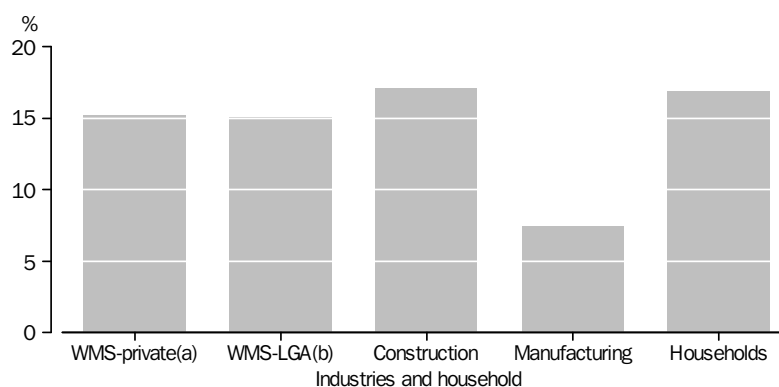
Broadly, there are three 'destinations' for Australia's waste: disposal to landfill; recovery for use in the domestic economy; and export.

Of the total waste generated in 2009–10, 25.2m tonnes was recovered domestically, 24.9m tonnes was disposed to landfill and 3.7m tonnes was exported.

Businesses and government provide waste management services that are used by other businesses, government and households. Waste management services include income from a range of services related to waste management, including collection, transport, recycling, treatment, processing or disposal of waste. In 2009–10, the supply of these services was valued at \$9,595m. Private waste management businesses (which include public trading enterprises) supplied just over half (54% or \$5,149m) of the value of these services while local government authorities provided just over one quarter (26% or \$2,512m). The remaining \$1,860m of waste management services was provided by businesses not primarily undertaking waste management. A large proportion of these (40% or \$748m) were provided by the construction industry.

Waste management services are used by businesses in their production processes, or by households. In 2009–10, the waste management services industry consumed 30% or \$2,903m of these services and the construction industry consumed 17% or \$1,643. Households spent \$1,623m on waste management services (recyclable and non-recyclable combined), mostly on municipal rates related to waste management services. Households accounted for 17% of total expenditure on waste management services.

EXPENDITURE ON WASTE MANAGEMENT SERVICES, By selected industries and households, Percentage contribution to total, 2009–10



(a) Waste management services operated by private businesses (incl. public trading enterprises)
 (b) Waste management services operated by local government authorities

Not all waste that is produced has a negative value. Where the owner/discarder of the waste materials receives payment for the waste, it is termed a waste product (e.g. paper and scrap metal). In 2009–10, waste products supplied to the economy were valued at \$4,582m. The waste management industry supplied about 50% of the value of these products in the form of sales of raw materials (e.g. paper, cardboard, metals, organic materials etc.). The remaining 50% of waste products were supplied by manufacturing (\$723m), wholesale (\$547m) and retail (\$550m), which made up over 80% of this remaining income from sale of waste products. In 2009–10, nearly two-thirds (63% or \$2,870m) of the total value of waste products supplied to the economy were consumed

MAIN FINDINGS *continued*

Waste management *continued*

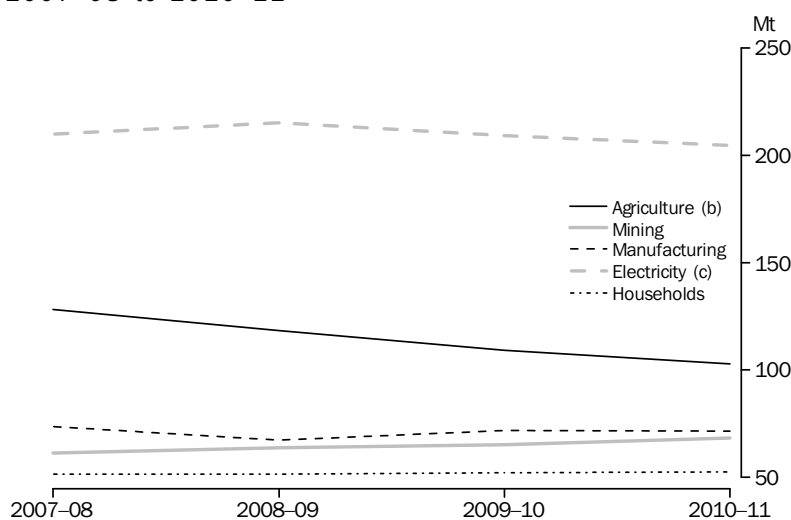
domestically with the remainder exported. Of those recyclable/recoverable materials exported, metal was the most valuable material (\$1,356m).

GREENHOUSE GAS EMISSIONS

All estimates of direct GHG emissions contained in this publication are recorded on a SEEA basis (i.e. on a residence basis). The residence basis differs from the territory basis underpinning estimates of GHG emissions produced according to the United Nations Framework Convention on Climate Change (UNFCCC).

Total direct GHG emissions measured on a SEEA basis fell in every year from 2007–08 to 2010–11. In total, GHG emissions fell from 596.3 Mt of CO₂ equivalents GHG in 2007–08 to 574.9 Mt in 2010–11, a fall of 3.6%. This fall can be largely attributed to the agriculture industry which recorded a fall in emissions of 25.4 Mt (or 19.8%) between 2007–08 (128.4 Mt) and 2010–11 (103.0 Mt). The electricity, gas, water and waste services industry also recorded a reduction in GHG emissions from 209.9 Mt in 2007–08 to 204.6 Mt in 2010–11 (i.e. a fall of 5.3 Mt or 2.5%), otherwise most industries recorded small increases in the production of GHG emissions for this period.

DIRECT GHG EMISSIONS (a), Selected industries and households, 2007–08 to 2010–11



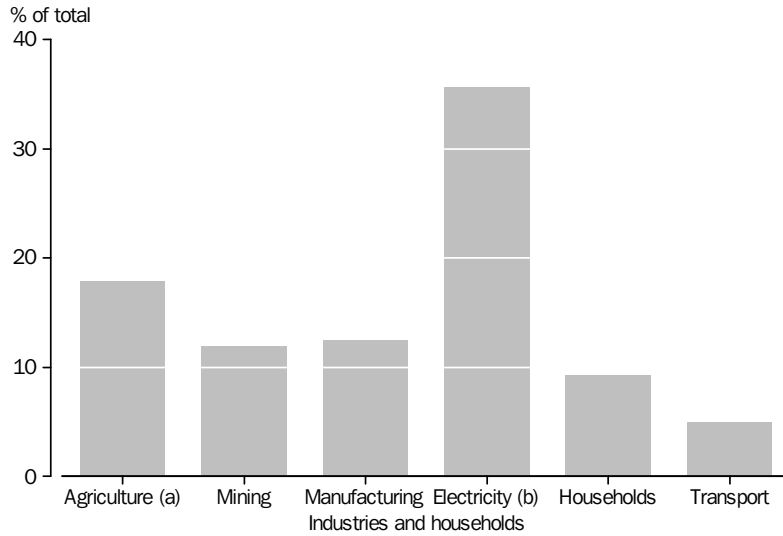
(a) SEEA Basis
(b) Includes Forestry and Fishing
(c) Includes Gas, Water and Waste Services

In 2010–11, the most significant contributor to direct GHG emissions was the electricity, gas, water and waste services industry with 204.6 Mt or 35.6% of total direct GHG emissions recorded on a SEEA basis. Other significant contributors were agriculture, forestry and fishing with 103.0 Mt of direct GHG emissions (17.9% of total); manufacturing (71.6 Mt, or 12.5%); and mining (68.5 Mt, or 11.9%). Households generated 52.7 Mt or 9.2% of direct GHG emissions in 2010–11.

MAIN FINDINGS *continued*

GREENHOUSE GAS EMISSIONS *continued*

DIRECT GHG EMISSIONS, Percentage contribution to total by selected industries and households, 2010–11



(a) Includes Forestry and Fishing
(b) Includes Gas, Water and Waste Services

ENVIRONMENTAL TAXES

In 2011–12 Australian governments levied environmental taxes of \$27.7b, an increase of 6% or \$1.75b over the previous year. In 2011–12 these taxes comprised 7% of total Australian tax revenue and were equivalent to 2% of GDP. Environmental taxes expressed as a proportion of GDP decreased gradually over the eight years to 2010–11; however, this trend was reversed between 2010–11 and 2011–12 when the ratio increased from 1.8% to 2%. Note that the Carbon Pricing Mechanism ('carbon tax') came into operation on 1 July 2012 and therefore the 2011–12 data presented here pre-date the introduction of the carbon tax.

Environmental taxes by type of tax

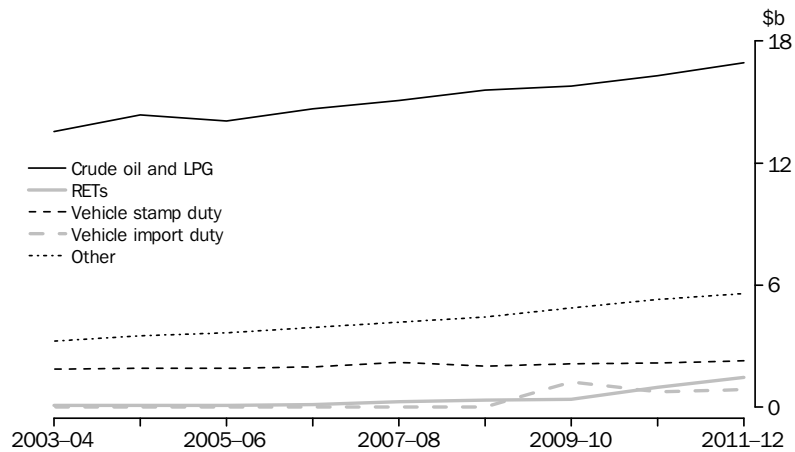
The most significant environmental tax in Australia is the excise duty on crude oil, LPG and petroleum products, accounting for 61% of total environmental taxes in 2011–12 (down from 63% in 2010–11 and 71% in 2003–04). Between 2010–11 and 2011–12 environmental taxes related to crude oil, LPG and petroleum products increased from \$16,305m to 16,925m (an increase of 4% or \$620m).

Between 2010–11 and 2011–12 Renewable energy certificates (RECs) experienced the greatest percentage rise among all environmental taxes, increasing 78% or \$683m. Renewable energy targets (RETs) create a legal requirement for liable entities (typically electricity retailers) to purchase a set number of RECs and the observed increase in RECs is driven by changes to the schedule of RETs.

MAIN FINDINGS *continued*

Environmental taxes by type of tax continued

ENVIRONMENTAL TAXES, By selected tax type, 2003–04 to 2011–12

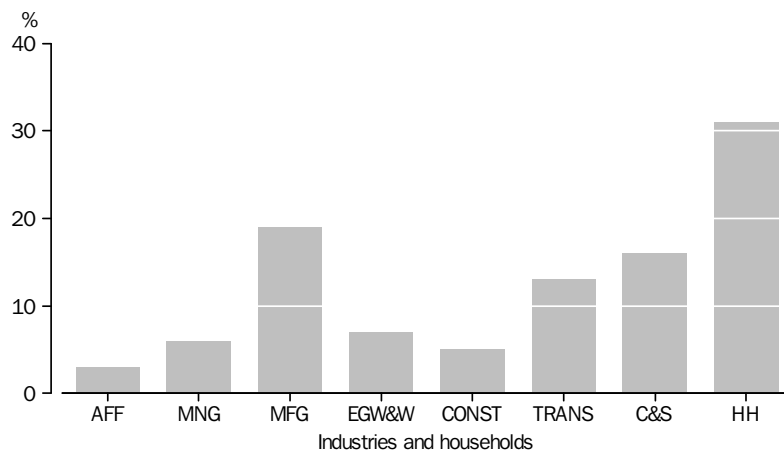


Environmental taxes paid by industry and households

The share of total environmental taxes paid by households was 30% in 2011–12, down from 36% in 2003–04. The amount of environmental taxes paid by households increased from \$7,913m in 2010–11 to \$8,423m in 2011–12 (an increase of 6%).

The manufacturing industry paid more environmental taxes than any other industry in 2011–12, contributing \$5,308m or 19% of all environmental taxes paid. The commercial and services industry paid the next highest amount in 2011–12 with \$4,523m or 16% of total environmental taxes followed by transport (\$3,351m or 12%), electricity, gas and water supply (\$2,070m or 7%), mining (\$1,653m or 6%), construction (\$1,241m or 4%) and agriculture (\$910m or 3%). Between 2003–04 and 2011–12 the share of environmental taxes paid by the manufacturing industry fell from 25% to 19%. In contrast, the electricity, gas and water supply industry increased its share of environmental taxes paid during this period from 1% to 7%. The share paid by all other industries remained relatively constant over the period.

ENVIRONMENTAL TAXES PAID BY INDUSTRY AND HOUSEHOLDS, Percentage contribution to total, 2011–12



Environmental taxes paid by the electricity, gas and water supply industry increased 52% between 2010–11 and 2011–12, the largest increase for any industry across this period. Since 2003–04 environmental taxes paid by this industry have increased by 614%. This increase is largely attributable to the growth of renewable energy certificates; a tax which is paid mostly by the energy, gas and water supply industry (98%). Between 2003–04 and

MAIN FINDINGS *continued*

*Environmental taxes paid
by industry and
households continued*

2011–12 significant increases in environmental taxes paid were also recorded for the mining (91% or \$788m) and construction (240% or \$876m) industries.

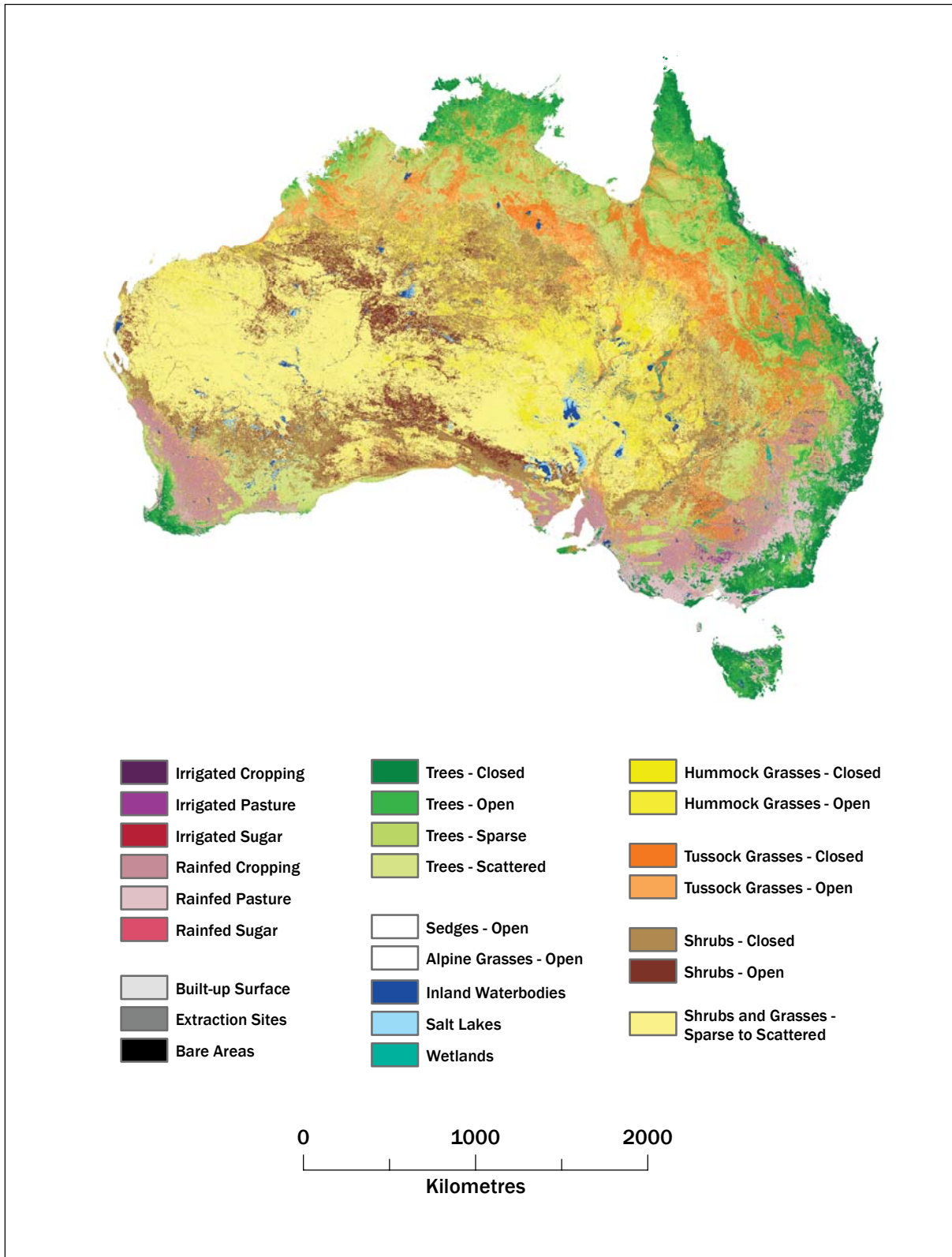
LAND

Experimental land cover accounts have been compiled for Australia for the periods January 2001 to December 2002 and January 2010 to December 2011 using Geoscience Australia's Dynamic Land Cover, beta version (DLCv2). The main landcover categories of this dataset have been collapsed to facilitate presentation. A 10 year time interval was selected as the rate of change in land cover is slow and because the supporting data set remains in a testing phase. As such the information should be interpreted cautiously and with reference to the data custodians Geoscience Australia.

The map below presents land cover for the period January 2010 to December 2011, while the figure shows the changes between the periods January 2001 to December 2002 and January 2010 to December 2011. The total land area of Australia is approximately 7.7m km². Herbaceous cover was the most abundant land cover in Australia in 2010–11 accounting for 3.6m km² or 47% of all land cover, followed by Woody trees with 2.1m km² or 28% and Woody–shrubs with 1.2m km² or 15%. Irrigated or rainfed cultivated land together represented 0.6m km² or 8% of all land cover in January 2010 to December 2011. There was little change in the area of irrigated or rainfed cultivated land between January 2001 to December 2002 and January 2010 to December 2011. Woody–shrubs showed the greatest absolute increase between January 2001 to December 2002 and January 2010 to December 2011, growing by 0.4m km², while the area of Wetlands increased by 85% or from 18,159 to 33,360 km².

MAIN FINDINGS *continued*

LANDCOVER, AUSTRALIA, JANUARY 2010–DECEMBER 2011

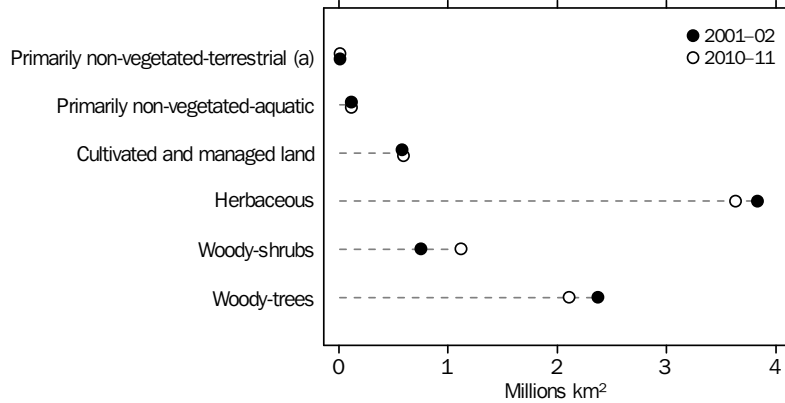


Source: Geoscience Australia, Dynamic Land Cover Dataset, version 2 (beta)

MAIN FINDINGS *continued*

LAND *continued*

LANDCOVER CHANGE, Experimental estimates, million km², Jan 2001–Dec 2002 to Jan 2010–Dec 2011



(a) This land cover category relates largely to urban land

Changes in land cover have many potential drivers, including human activities and natural phenomena. The DLCv2 data presented here summarises many observations of the Earth's surface to provide a single dominant land cover class for each of the two year periods selected. There will be some level of land cover change within and between each two year layer of DLCv2 caused by various drivers. This intra-period and inter-period variation should be considered when interpreting the changes reported between the periods January 2001 to December 2002 and January 2010 to December 2011. Examples of human activities that drive land cover change include urban development, crop and pasture management and industrial activity. Natural drivers of land cover change include flood events, bushfires and seasonal climatic variation. Attribution of specific causes to observed land cover change requires additional information.

FEATURE ARTICLE

LINKING GREENHOUSE GAS EMISSIONS WITH ECONOMIC PRODUCTION AND CONSUMPTION

INTRODUCTION

There are two approaches regularly used to link greenhouse gas (GHG) emissions with economic production and consumption. The *production approach* measures emissions that are physically produced by industries and households within an economic territory. The *consumption approach* assigns the territorial emissions to categories of final consumption, then adds emissions embodied in imports, and subtracts emissions embodied in exports. In aggregate the difference between the two approaches will therefore equal the net trade balance of emissions.

FIGURE 1 PRODUCTION AND CONSUMPTION BASED MEASUREMENT OF GHG EMISSIONS



The two approaches can generate significantly different results, and therefore represent a significant area of debate within international negotiations on climate change. While consumers often have some choice in their consumption decisions, at times they may lack the necessary constituency to alter producer decisions. Producers may have control over their production methods, but where incentives to move to less environmentally harmful practices do not exist, may be slow to change. As a result, it is well acknowledged that Governments must play a central role in setting and managing emissions trajectories.

PRODUCTION-BASED EMISSIONS FOR AUSTRALIA

Within Australia, the Department of Climate Change is responsible for compiling a National GHG Inventory (NGGI) for the purpose of reporting to the United Nation's Framework Convention on Climate Change (UNFCCC). Consistent with the production approach, the NGGI records all GHG emissions that are physically generated within a country's territory.⁸

In order to align the NGGI data to the macroeconomic indicators produced by the ABS, several adjustments need to be made. These predominately concern emissions of residents abroad, and non-residents in the territory. Examples include emissions associated with international land, water and air transport⁹. Once these changes are complete the compiler has a set of production-based emissions that are consistent and

⁸ Intergovernmental Panel on Climate Change (2006). *2006 IPCC Guidelines for National Greenhouse Gas Inventories* Geneva, Switzerland.

⁹ These are further outlined in the System of Environmental-Economic Accounts (SEEA) – an international statistical standard for combining environmental information with the existing macroeconomic statistical standard, the System of National Accounts (SNA).

PRODUCTION-BASED
EMISSIONS FOR
AUSTRALIA *continued*

comparable with macroeconomic statistics, including industry gross value added (IGVA) and employment.

FIGURE 2: GHG EMISSIONS, IGVA AND EMPLOYMENT FOR SELECTED INDUSTRIES, PERCENTAGE OF ALL INDUSTRIES, 2008-09

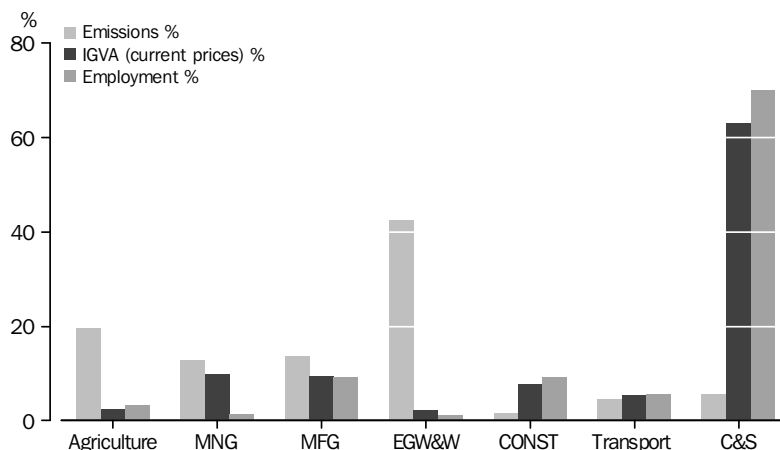


Figure 2¹⁰ shows that in 2008-09, the electricity, gas, water and waste services industry had the highest GHG emissions of any Australian industry¹¹, followed by the agriculture, forestry and fishing industry and the manufacturing industry. These three industries together accounted for 74% of emissions, but only 15% of total gross value added and 14% of employment in the Australian economy. Conversely, the commercial and services industries accounted for 70% of all employment and about 62% of gross value added, but only 5% of emissions. In aggregate, production-based emissions for Australia in 2008-09 were equal to 585 mega-tonnes of CO₂ equivalent (Mt CO₂-e).

THE CONSUMPTION
APPROACH: GHG INDUCED
BY FINAL DEMAND

In order to assemble consumption-based estimates, the ABS can combine its estimates of production-based emissions with ABS Input-Output tables to look at emissions induced through the final consumption of goods and services by Australian households and governments.

For example, the cumulative emissions for the production of manufactured food products – including agricultural production, manufacturing processes, transport and retailing – are attributed to the final consumer. This shifts the focus of the analysis to the demand-side, that is, to the emissions required to satisfy final demand, including emissions embodied in imports. Some brief results of this exercise are presented in figure 3 below.

10 Net CO₂ released from Land Use Land Use Change and Forestry is included in Kyoto Protocol data from 2007-08 onwards and has been included in the estimates.

11 Data from the Department of Climate Change National Inventory by Economic Sector provided the basis for estimates of GHG emissions produced by industry in Australia.

FIGURE 3: EXPERIMENTAL ESTIMATES OF DIRECT AND INDIRECT GHG EMISSIONS INDUCED BY CATEGORIES OF FINAL DEMAND—2008–09

	Household final consumption	Government final consumption	Investment and changes in inventories	Total consumption based emissions(a)	Exports
Direct and indirect emissions –					
Agriculture, forestry and fishing	13	—	5	19	37
Mining	2	—	5	7	68
Manufacturing					
Food, beverages and tobacco	43	—	1	45	27
Textile, Wood, paper and printing	6	—	1	7	1
Petroleum, coal and chemical products	15	2	2	19	12
Non-metallic mineral products	1	—	—	1	—
Metal products	1	—	3	4	43
Machinery and equipment	17	—	34	51	6
Total manufacturing	83	2	41	126	90
Electricity, gas, water and waste services	76	—	19	95	—
Construction	—	—	60	60	—
Transport					
Road	5	1	1	6	4
Other transport	19	3	—	23	15
Total transport	24	3	1	29	19
Commercial and services	101	36	13	150	13
Total direct and indirect emissions by Final use category	299	42	144	485	228
Direct Emissions by households	46	46	..
Total direct and indirect emissions Australia	345	42	144	531	228

.. not applicable

— nil or rounded to zero (including null cells)

(a) Discrepancies between total and components are due to rounding.

THE CONSUMPTION
APPROACH: GHG INDUCED
BY FINAL DEMAND
continued

These experimental estimates show that household demand for the outputs of the commercial and services¹², manufacturing, and electricity, gas, water and waste services industries were the most significant drivers of Australia's consumption based GHG emissions in 2008–09.

Note that emissions induced by domestic final demand relate only to those emissions associated with the final consumption expenditure of households and governments, inventory changes and gross capital formation. It includes the emissions embodied in imports. It also includes emissions embodied in intermediate inputs but excludes the emissions associated with that industry output subsequently consumed as an intermediate input by other industries.

For example, the total emissions produced by the electricity generation industry are much larger than emissions induced by its final demand. This is because much of the output of the electricity generating industry is consumed as an intermediate input by other industries and therefore recorded as part of emissions induced by demand for the

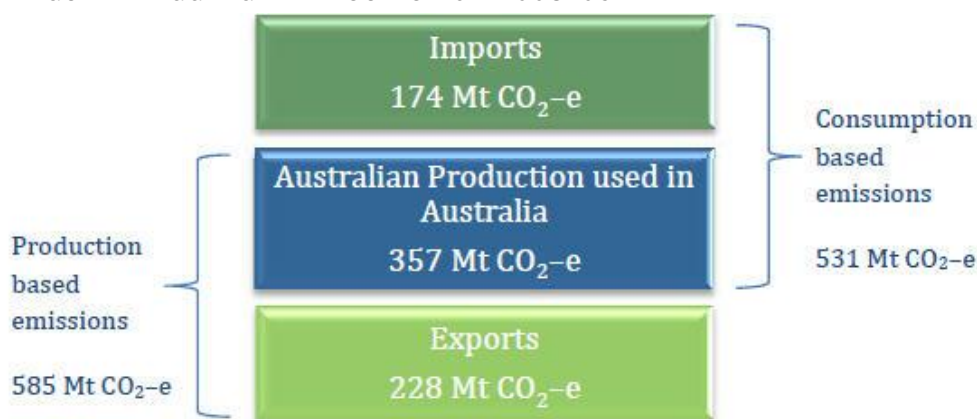
¹² The 'Commercial and services' industries are comprised of the following *Australian and New Zealand Standard Industrial Classification (ANZSIC), 2006* (cat. no. 1292.0) industry Divisions: Wholesale Trade; Retail Trade; Accommodation and Food Services; Information Media and Telecommunications; Financial and Insurance Services; Rental, Hiring and Real Estate Services; Professional, Scientific and Technical Services; Administrative and Support Services; Public Administration and Safety; Education and Training; Health Care and Social Assistance; Arts and Recreation Services; and Other Services.

THE CONSUMPTION
APPROACH: GHG INDUCED
BY FINAL DEMAND
continued

output of these other industries. Similarly, the transport industry records induced emissions that are less than the total emissions produced by this industry. Finally, direct emissions by households relates to emissions arising from householder's own transport activities, combustion of gas for heating, petrol used for lawn mowers, etc.

This analysis also shows that 228 Mt CO₂-e emissions were induced by exports. In the cases of both agriculture and mining, emissions embodied in exports exceeded emissions embodied in domestic final consumption. Embodied emissions associated with manufacturing exports (90Mt CO₂-e) approached those related to domestic final consumption of manufactured products (126 Mt CO₂-e).

FIGURE 4 AGGREGATE RESULTS FOR 2008-09



In aggregate, for 2008-09 production-based emissions for Australia were 585 Mt CO₂-e, while consumption-based emissions were equal to 531 Mt CO₂-e. Therefore, the net trade balance of embodied emissions is 54 Mt CO₂-e.

METHODOLOGICAL
ASSUMPTIONS OF THE
CONSUMPTION APPROACH

The consumption-based approach used here has two important assumptions that potentially affect the quality of the results. Firstly, in respect of GHG emissions, imported products are assumed to be produced using production functions that are identical to those used for locally produced products of the same type. Given the reliance on coal for electricity generation in Australia, a possible impact of this assumption is an overstatement of emissions embodied in imports. If this is the case, the data produced here will understate reported net exports of emissions. The assumption could be removed by incorporating global production functions and regional I-O models, though this would involve a considerable amount of additional data and would complicate the model significantly.

The second important assumption is that all consumers pay the same price per unit for their electricity. While neither assumption is expected to be entirely valid, to date no rigorous analysis of possible biases in the results has been undertaken. In both cases, the assumptions can potentially be addressed through the use of more sophisticated models to take these factors into account. Subject to the availability of data and resources, these developments may possibly be reflected in future editions of this work.

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Legoff, G., (2010) *CO₂ emissions embodied in the Australian international trade in goods* 18th International Input–Output Association conference (IIOA) 2010, Sydney, 23 June 2010.

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SELECTED SOCIOECONOMIC AND ENVIRONMENTAL MEASURES (a)—2009–10

<i>Industry Gross Value Added</i>	<i>WATER USE</i>		<i>ENERGY USE</i>		<i>Waste generated</i>	<i>Expenditure on waste services</i>	<i>GHG emissions(b)</i>	<i>Environmental taxes paid</i>	
	<i>Physical</i>	<i>Monetary</i>	<i>Physical</i>	<i>Monetary</i>					
	\$b	GL	\$b	PJ					\$b
Agriculture, forestry, fishing and hunting	29	3 868	439	8	381	1 920	56	109	811
Mining	95	78	152	76	1 713	267	52	69	1 480
Manufacturing	104	364	783	252	4 905	8 465	714	72	4 961
Electricity, gas, water and waste services	30	2 117	1 673	126	4 163	694	(c)	205	796
Construction	97	(c)	(c)	14	602	16 541	1 643	9	1 151
Transport	60	(c)	(c)	20	644	(c)	291	39	3 308
Public administration and defence	68	(c)	(c)	(c)	(c)	909	1 448	(c)	na
All other industries	723	845	2 601	190	7 135	11 951	3 767	19	4 557
Total all industries	1 206	7 273	5 647	686	19 543	40 747	7 971	522	17 064
Households	. .	1 672	7 269	221	10 959	12 425	1 623	53	7 809

. . not applicable

na not available

(a) All monetary values in this table are in current prices.

(b) GHG emissions generated on a SEEA basis.

(c) Included with 'All other industries'.

	2003–04	2004–05	2005–06	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12	2012–13
	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$
Produced Capital(a)	2 780	3 028	3 294	3 578	3 870	4 077	4 262	4 483	4 722	4 987
Net financial assets with rest of the world	-447	-498	-529	-613	-658	-694	-756	-773	-831	-817
Spectrum	9	10	10	10	11	11	11	11	12	16
Environmental assets										
Land	2 249	2 431	2 701	3 076	3 285	3 192	3 857	3 818	3 673	3 873
Mineral and energy assets	198	224	288	331	444	722	671	703	864	942
Timber	10	10	10	11	12	11	11	12	11	11
Net Worth	4 797	5 202	5 772	6 391	6 962	7 317	8 054	8 252	8 449	9 010

(a) Excludes inventories of plantation timber. These are included as part of natural capital.

	2003–04	2004–05	2005–06	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12	2012–13
	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$
Produced Capital(a)	139 469	150 073	161 068	171 791	182 125	187 952	193 448	200 671	207 799	215 599
Net financial assets with rest of the world	-22 440	-24 657	-25 852	-29 442	-30 942	-32 003	-34 328	-34 579	-36 578	-35 316
Spectrum	462	471	484	490	494	498	499	501	506	687
Environmental assets										
Land	112 845	120 465	132 057	147 688	154 585	147 140	175 056	170 895	161 654	167 429
Mineral and energy assets	9 913	11 087	14 082	15 888	20 890	33 289	30 447	31 464	38 017	40 729
Timber	487	486	489	504	555	516	508	515	502	480
Net Worth	240 639	257 825	282 226	306 828	327 622	337 305	365 545	369 377	371 807	389 522

(a) Excludes inventories of plantation timber. These are included as part of natural capital.

ENVIRONMENTAL ASSETS(a), Current prices—2003–04 to 2012–13

	2003–04	2004–05	2005–06	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12	2012–13
	\$b	\$b	\$b	\$b	\$b	\$b	\$b	\$b	\$b	\$b
Land	2 249.3	2 430.6	2 700.7	3 076.0	3 284.8	3 191.7	3 856.8	3 817.8	3 673.4	3 872.8
Mineral and energy assets	197.6	223.7	288.0	330.9	443.9	722.1	670.8	702.9	863.9	942.1
Energy										
Natural gas	55.6	60.0	66.8	67.3	81.7	121.7	111.2	121.0	154.1	170.9
Crude oil	34.9	39.9	45.2	48.5	65.6	80.3	71.5	65.5	62.2	51.1
Condensate	30.7	32.8	37.8	40.9	50.0	70.8	63.6	62.9	70.0	73.5
LPG	19.5	20.5	23.6	25.8	28.8	34.3	34.0	35.8	40.6	41.7
Black coal	5.4	5.0	18.6	12.9	63.8	169.2	151.5	123.8	130.9	55.9
Brown coal	0.7	0.8	0.9	1.5	2.0	2.5	1.0	0.5	0.3	0.2
Uranium	0.2	0.2	0.3	0.7	0.4	0.9	0.7	0.5	0.2	0.3
Minerals										
Copper, gold and antimony	21.6	23.2	40.3	51.9	64.2	95.5	98.3	103.8	127.6	139.3
Bauxite	16.2	15.8	13.4	10.5	6.1	5.3	1.2	0.9	1.0	1.0
Iron ore	6.9	19.7	31.3	39.1	48.3	93.5	95.4	149.1	243.3	366.0
Lead, zinc, silver and cadmium	0.5	0.9	5.0	15.7	16.4	23.1	21.6	17.3	13.3	15.2
Nickel, platinum and cobalt	1.5	2.1	2.9	15.0	15.2	22.1	18.0	14.7	2.8	1.5
Other minerals	3.9	2.8	1.9	1.1	1.4	2.9	2.8	7.1	17.6	25.5
Timber										
Plantation	7.4	7.6	7.9	8.4	9.7	9.3	9.4	9.7	9.8	9.6
Native standing	2.3	2.2	2.1	2.1	2.1	1.9	1.8	1.8	1.6	1.5
Total	2 456.6	2 664.1	2 998.7	3 417.4	3 740.5	3 925.0	4 538.8	4 532.2	4 548.7	4 826.0

(a) Economically demonstrated resources.

2003–04 2004–05 2005–06 2006–07 2007–08 2008–09 2009–10 2010–11 2011–12 2012–13

MINERAL AND ENERGY ASSETS

Energy

Natural gas	bcm	2 455.0	2 405.5	2 397.5	2 365.5	2 714.0	3 023.5	2 911.0	2 845.7	2 781.9	2 719.6
Crude oil	GL	180.5	179.2	166.7	161.0	174.5	178.5	161.5	146.3	132.4	119.9
Condensate	GL	237.0	227.5	223.5	209.5	259.5	314.5	312.5	307.5	302.7	297.9
LPG	GL	227.0	197.0	195.5	184.5	167.5	154.5	144.5	132.1	120.7	110.3
Black coal	Gt	39.4	39.8	39.4	39.3	39.1	41.5	42.8	49.7	59.3	63.0
Brown coal	Gt	37.5	37.5	37.4	37.3	37.3	37.2	38.2	41.7	44.2	44.1
Uranium	Kt	688.0	708.5	715.0	848.5	1 073.0	1 193.0	1 190.5	1 175.5	1 183.5	1 164.7

Minerals

Copper	Mt	41.1	41.8	41.9	50.9	68.6	79.1	83.0	86.1	88.9	93.5
Gold	t	5 485.5	5 407.0	5 352.5	5 659.5	6 047.0	6 827.0	7 904.5	8 776.0	9 525.5	10 324.7
Antimony	Kt	82.5	86.5	93.0	114.5	136.0	98.5	78.0	100.5	106.5	107.5
Iron ore	Gt	13.5	15.5	17.5	19.5	22.2	26.0	31.3	36.1	41.2	48.7
Lead	Mt	21.1	23.4	23.7	23.4	25.1	28.8	32.8	35.6	35.4	33.5
Silver	Kt	42.2	42.7	44.8	47.9	55.8	65.9	73.8	83.1	87.1	83.4
Cadmium	Kt	75.0	64.2	62.9	61.9	60.8	60.8	30.4	—	—	—
Nickel	Mt	22.7	23.3	23.8	24.8	26.1	25.2	22.4	20.6	19.1	16.5
Zinc	Mt	37.9	41.4	41.2	41.6	47.8	55.8	61.8	67.6	67.0	61.4
Bauxite	Gt	5.6	5.8	5.8	6.0	6.2	6.2	6.1	6.0	6.1	6.4

— nil or rounded to zero (including null cells)

(a) Economically demonstrated resources.

ENERGY ASSETS(a)—2007–08 to 2011–12

	2007-08	2008-09	2009-10	2010-11	2011-12
	PJ	PJ	PJ	PJ	PJ
Natural gas	106 700	140 219	145 476	na	na
Crude oil	6 459	6 609	5 969	na	na
Condensate	10 071	12 105	11 555	11 925	6 195
LPG	4 649	4 304	3 823	na	na
Black coal	1 054 350	1 442 200	1 477 948	1 341 711	1 601 370
Brown coal	363 770	362 790	374 135	409 018	433 077
Uranium	600 880	668 080	666 680	659 120	663 600

na not available

(a) Economically demonstrated resources.

SUPPLY OF DISTRIBUTED AND REUSE WATER, By industry—2008–09 to 2011–12

	2008–09	2009–10	2010–11	2011–12
	ML	ML	ML	ML
Agriculture, forestry and fishing	na	na	na	873
Mining	23 539	21 099	17 133	23 068
Manufacturing	13 791	13 108	11 243	7 205
Electricity, gas, water and waste services				
Electricity and Gas Supply	108 639	65 421	65 415	75 073
Water supply, sewerage and drainage services	9 053 633	8 844 812	7 363 045	11 366 671
Waste collection, treatment and disposal services	na	na	na	39
Other industries	na	na	na	4 823
Total	9 199 602	8 944 440	7 456 836	11 477 752

na not available

WATER USE (DISTRIBUTED AND REUSE), By industry and by households—2008–09 to 2011–12

	2008–09	2009–10	2010–11	2011–12
	ML	ML	ML	ML
Agriculture, forestry and fishing	3 666 161	3 867 862	2 798 928	6 412 297
Mining	148 582	78 450	76 760	89 549
Manufacturing	329 114	363 882	328 771	302 966
Electricity, gas, water and waste services				
Electricity and Gas Supply	234 338	220 794	210 440	243 607
Water supply, sewerage and drainage services	2 309 855	1 893 633	1 560 597	2 028 643
Waste collection, treatment and disposal services	2 329	2 829	2 832	2 656
Other industries	886 281	845 231	914 291	813 773
Total all industries	7 576 660	7 272 681	5 892 619	9 893 491
Households	1 622 945	1 671 761	1 564 218	1 584 261
Total	9 199 602	8 944 440	7 456 836	11 477 752

WATER CONSUMPTION, By industry and by households—2008–09 to 2011–12

	2008–09	2009–10	2010–11	2011–12
	ML	ML	ML	ML
Agriculture, forestry and fishing	7 314 364	7 203 980	7 350 375	9 586 846
Mining	506 207	489 170	540 259	677 469
Manufacturing	641 052	659 101	650 811	556 575
Electricity, gas, water and waste services				
Electricity and Gas Supply	324 884	298 008	298 164	384 511
Water supply, sewerage and drainage services	2 309 855	1 893 632	1 560 597	2 028 643
Waste collection, treatment and disposal services	7 536	9 603	9 801	6 447
Other industries	1 138 585	1 116 769	1 227 431	1 062 933
Total all industries	12 242 483	11 670 263	11 637 443	14 303 424
Households	1 818 330	1 844 252	1 699 256	1 715 173
Total	14 060 814	13 514 514	13 336 699	16 018 597

	2008–09	2009–10	2010–11	2011–12
	\$m	\$m	\$m	\$m
Agriculture, forestry and fishing	—	—	—	—
Mining	22	22	23	34
Manufacturing	9	9	10	9
Electricity, Gas and Waste	8	6	6	8
Water Supply(a)	11 481	12 828	13 973	15 696
Other industries	—	—	—	1
Total domestic sales	11 520	12 865	14 012	15 748
Imports	19	20	20	23
Taxes	67	107	109	105
Subsidies	-53	-64	-52	-41
Total	11 553	12 928	14 089	15 835

— nil or rounded to zero (including null cells)

(a) Includes Waste water, drainage and sewerage services.

EXPENDITURE ON WATER AND RELATED SERVICES(a), By industry, households and government, Current prices—2008–09 to 2011–12

	2008–09	2009–10	2010–11	2011–12
	\$m	\$m	\$m	\$m
.....				
Intermediate Consumption				
Agriculture, forestry and fishing	404	439	398	613
Mining	124	152	169	216
Manufacturing	726	783	842	888
Electricity, gas, water and waste				
Electricity and Gas,	78	77	72	110
Water and waste services	1 357	1 596	1 799	2 355
Other industries	2 549	2 601	2 869	2 884
Total Industry	5 238	5 647	6 150	7 066
Final Consumption				
Households	6 305	7 269	7 928	8 721
Exports	11	11	11	48
Total	11 553	12 927	14 088	15 835

(a) Includes Waste water, drainage and sewerage services.

SUPPLY OF DISTRIBUTED AND REUSE WATER, By state and territory—2008–09 to 2011–12

	2008–09	2009–10	2010–11	2011–12
	ML	ML	ML	ML
NSW	3 372 637	3 242 549	3 218 449	5 410 477
VIC	2 458 126	2 382 982	1 742 808	2 851 997
QLD	2 061 024	2 018 431	1 305 251	1 968 904
SA	404 465	411 181	340 734	379 102
WA	647 452	663 218	649 831	630 121
TAS	143 943	116 419	102 229	130 858
NT	66 391	63 812	56 005	61 026
ACT	45 565	45 848	41 529	45 265
Australia	9 199 603	8 944 440	7 456 836	11 477 750

WATER CONSUMPTION, By state and territory—2008–09 to 2011–12

	2008–09	2009–10	2010–11	2011–12
	ML	ML	ML	ML
NSW	4 555 470	4 323 494	5 040 539	6 261 892
VIC	2 951 021	2 904 247	2 359 409	3 332 992
QLD	3 340 954	3 112 451	2 964 407	3 374 884
SA	1 178 994	1 110 402	1 022 762	1 036 006
WA	1 360 765	1 385 912	1 368 841	1 420 421
TAS	465 772	464 045	371 036	367 561
NT	159 720	166 831	166 725	174 432
ACT	48 119	47 133	42 980	50 408
Australia	14 060 815	13 514 515	13 336 699	16 018 596

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EXPENDITURE ON WATER AND RELATED SERVICES(a), By state and territory, Current prices—2008–09 to 2011–12

	2008–09	2009–10	2010–11	2011–12
	\$m	\$m	\$m	\$m
NSW	3 254	3 608	3 794	3 890
VIC	2 447	2 865	3 224	3 845
QLD	2 806	3 217	3 560	4 285
SA	850	928	1 027	1 178
WA	1 585	1 681	1 804	1 858
TAS	243	205	223	247
NT	87	98	113	137
ACT	208	225	228	255
Australia	11 481	12 828	13 973	15 696

(a) Relates only to sales made by the water supply industry.

	2008-09		2009-10		2010-11		2011-12	
	ML	\$m	ML	\$m	ML	\$m	ML	\$m
NSW	548 093	984	556 232	1 179	526 703	1 260	508 413	1 321
VIC	331 247	535	323 467	633	310 912	728	316 349	881
QLD	340 200	657	356 498	810	310 613	853	345 613	940
SA	128 440	282	123 162	307	115 454	354	120 011	473
WA	334 760	329	347 510	376	310 335	425	307 879	465
TAS	68 879	86	72 701	95	68 805	99	56 448	102
NT	39 218	32	37 073	38	31 231	40	34 130	48
ACT	27 494	63	27 609	66	25 204	63	26 328	75
Australia	1 818 331	2 966	1 844 252	3 504	1 699 257	3 822	1 715 171	4 305

(a) Values are in current prices.

AVERAGE PRICE, HOUSEHOLD WATER CONSUMPTION, By state and territory, Current prices—2008–09 to 2011–12

	2008–09	2009–10	2010–11	2011–12
	\$/KL	\$/KL	\$/KL	\$/KL
NSW	1.80	2.12	2.39	2.60
VIC	1.62	1.96	2.34	2.78
QLD	1.93	2.27	2.75	2.72
SA	2.20	2.49	3.07	3.94
WA	0.98	1.08	1.37	1.51
TAS	1.25	1.31	1.44	1.81
NT	0.82	1.03	1.28	1.41
ACT	2.29	2.39	2.50	2.85
Australia	1.63	1.90	2.25	2.51

	2008–09		2009–10		2010–11		2011–12	
	\$m	ML	\$m	ML	\$m	ML	\$m	ML
Intermediate Consumption								
Agriculture, forestry and fishing	402	3 666	437	3 868	395	2 799	605	6 412
Mining	104	149	129	78	140	77	181	90
Manufacturing	330	329	366	364	367	329	438	303
Electricity, gas, water and waste								
Electricity and gas	70	234	70	221	65	210	94	244
Water and waste services	1 356	2 312	1 595	1 896	1 798	1 563	2 341	2 031
Other industries	1 304	886	1 364	845	1 413	914	1 384	814
Total Industry	3 566	7 577	3 961	7 273	4 178	5 893	5 043	9 893
Final Consumption								
Households	2 966	1 623	3 506	1 672	3 823	1 564	4 303	1 584
Total	6 532	9 200	7 467	8 944	8 001	7 457	9 346	11 478

GROSS VALUE, OF IRRIGATED AGRICULTURAL PRODUCTION (GVIAP), By commodity group,
Current prices—2008–09 to 2011–12

	2008–09	2009–10	2010–11	2011–12
	\$m	\$m	\$m	\$m
Cereals for grain and seed	317	143	160	203
Total hay production	170	192	112	149
Pastures for seed	60	—	28	—
Cotton	620	664	1 566	2 155
Rice	35	90	174	248
Sugar cane	537	750	374	646
Other broadacre crops	87	116	86	75
Fruit and nuts	2 390	2 242	2 523	2 429
Grapes	1 200	1 069	929	972
Vegetables for human consumption and seed	2 625	2 386	2 878	2 631
Nurseries, cut flowers and cultivated turf	983	1 037	909	884
Dairy production	2 274	1 826	2 143	2 055
Production from meat cattle	455	608	590	678
Production from sheep and other livestock	201	362	475	413
Total GVIAP	11 953	11 485	12 946	13 536

— nil or rounded to zero (including null cells)

	2008–09	2009–10	2010–11	2011–12
	PJ	PJ	PJ	PJ
.....				
Direct Extraction				
Agriculture, forestry and fishing	67	65	76	62
Mining	16 905	16 339	15 872	16 652
Manufacturing	105	128	112	115
Electricity(a)	801	819	838	843
Other industries(b)	—	—	1	1
Total Direct Extraction	17 877	17 351	16 898	17 672
<i>Of which</i> direct extraction by households	30	32	35	37
Imports	1 759	1 872	2 036	2 034
Total Net Supply	19 636	19 223	18 934	19 706

— nil or rounded to zero (including null cells)

(a) Includes Gas, Water supply and Waste services.

(b) Includes Construction, Transport and Commercial and services industries.

	2008–09	2009–10	2010–11	2011–12
	PJ	PJ	PJ	PJ
Direct Extraction				
Black Coal	9 015	9 765	9 215	9 672
Brown Coal	720	726	727	735
Natural Gas	np	np	np	np
Crude Oil and Feedstocks	1 042	1 004	977	944
LPG	np	np	np	np
Renewables(a)	252	288	299	285
Uranium	4 846	3 341	3 322	3 525
Total Direct Extraction	17 877	17 351	16 898	17 672
Imports				
Natural Gas	np	np	np	np
Crude Oil and Feedstocks	941	1 056	1 247	1 141
Refined products(b)	662	675	635	748
LPG	np	np	np	np
Total Imports	1 759	1 872	2 036	2 034
Net Supply				
Black Coal	9 015	9 765	9 215	9 672
Brown Coal	720	726	727	735
Natural Gas	1 997	2 205	2 356	2 503
Crude Oil and Feedstocks	1 982	2 060	2 224	2 085
Refined products(b)	662	675	635	748
LPG	161	165	156	154
Renewables(a)	252	288	299	285
Uranium	4 846	3 341	3 322	3 525
Total Net Supply	19 636	19 223	18 934	19 706

np not available for publication but included in totals where applicable, unless otherwise indicated

(a) Renewables includes biomass wood, bagasse, biofuels, hydroelectricity, solar and wind energy.

(b) Refined products includes petrol, diesel, aviation fuel, kerosene, heating oil, fuel oil, refinery fuel and naphtha.

	2008–09	2009–10	2010–11	2011–12
	PJ	PJ	PJ	PJ
Net use by industry				
Agriculture, forestry and fishing	83	86	92	96
Mining	466	463	503	504
Manufacturing	1 152	1 175	1 112	1 078
Electricity, gas, water and waste services	161	160	151	154
Construction	160	164	171	175
Transport	559	565	588	601
Commercial and services	324	337	349	348
Total net use by industry	2 905	2 950	2 964	2 955
Household use	1 002	1 018	1 033	1 041
Government use	82	85	85	86
Inventory Changes	140	-521	-587	-525
Exports	13 896	13 785	13 391	14 050
Conversions and losses	1 611	1 908	2 048	2 097
Total Net Energy Use	18 025	17 315	16 886	17 608
Total Energy Use	19 636	19 223	18 934	19 706

	2008–09	2009–10	2010–11	2011–12
	PJ	PJ	PJ	PJ
Industry Use				
Black Coal	122	118	101	101
Coke	6	6	7	6
Coal by-products(a)	34	45	29	18
Briquettes	3	4	3	2
Natural Gas	701	684	675	678
Crude Oil and Feedstock	118	122	124	109
Petrol	168	168	169	171
Diesel	602	623	671	695
Other refined fuels and products(b)	377	379	395	391
LPG	53	52	50	50
Electricity	626	631	637	630
Renewables(c)	94	117	104	104
Total Industry Use	2 905	2 948	2 964	2 955
Household Use				
Natural Gas	141	144	148	151
Petrol	470	472	479	484
Diesel	68	75	84	94
LPG	40	39	38	37
Electricity	216	221	215	208
Renewables(c)	66	67	68	67
Total Household Use	1 002	1 018	1 033	1 041
Total Government Use	82	85	85	86
Net Domestic Use				
Black Coal	122	118	101	101
Coke	6	6	7	6
Coal by-products(a)	34	45	29	18
Briquettes	3	4	3	2
Natural Gas	852	837	833	839
Crude Oil and Feedstock	118	122	124	109
Petrol	646	648	656	663
Diesel	683	713	768	804
Other refined fuels and products(b)	np	np	np	np
LPG	np	np	np	np
Electricity	885	896	896	882
Renewables(c)	160	184	172	171
Total Net Domestic Use	3 989	4 051	4 082	4 082

np not available for publication but included in totals where applicable, unless otherwise indicated

(a) Coal by-products include metallurgical coal, blast furnace gas, coal tar, benzene/toluene/xylene feedstock and coal oven gas.

(b) Other refined products includes aviation fuel, kerosene, heating oil, fuel oil, refinery oil and naphtha.

(c) Renewables includes biomass wood, bagasse, biofuels, hydroelectricity, solar and wind energy.

ENERGY EXPORTS, By energy product—2008–09 to 2011–12

	2008–09	2009–10	2010–11	2011–12
	PJ	PJ	PJ	PJ
Black Coal	7 411	8 327	8 053	8 516
Natural Gas	838	972	1 086	1 048
Crude Oil and Feedstocks	678	726	788	764
Petrol	8	8	6	6
Diesel	14	7	5	5
Other refined fuels and products	97	94	95	106
LPG	96	101	93	80
Uranium	4 754	3 551	3 267	3 525
Total Exports	13 896	13 785	13 391	14 050

ENERGY INTENSITY, By selected industry—2008–09 to 2011–12

	2008–09	2009–10	2010–11	2011–12
<i>Industry</i>	GJ/\$m IGVA	GJ/\$m IGVA	GJ/\$m IGVA	GJ/\$m IGVA
Agriculture, forestry and fishing	2 566	2 674	2 753	2 844
Mining	4 121	3 819	4 056	3 763
Manufacturing	11 995	11 760	11 554	11 535
Water and waste services	1 778	1 697	1 517	1 515
Construction	1 630	1 656	1 682	1 556
Transport	8 564	8 542	8 605	8 453
Commercial and services	455	448	449	448
All selected industries	2 507	2 449	2 442	2 370

2009–10

	PJ	\$m
Agriculture, forestry & fishing	8	381
Mining	76	1 713
Manufacturing	252	4 905
Electricity, gas, water and waste	126	4 163
Construction	14	602
Transport	20	644
Commercial and services	190	7 135
Households	221	10 959
Total domestic use	907	30 502

2009–10

'000 tonnes

.....	
Agriculture, forestry(a)	1 920
Mining(b)	267
Manufacturing	8 465
Electricity, gas, water services	680
Waste management services(c)	14
Construction	16 541
All other industries(d)	11 951
Industry total	39 838
Public administration	909
Households	12 425
Imports	554
Total supply of waste	53 726

-
- (a) Excludes fishing.
 - (b) Excludes mineral waste.
 - (c) Includes Waste Collection, Treatment and Disposal Services (ANZSIC Division D, subdivision 29).
 - (d) Includes ANZSIC Divisions F–S, excluding classification 7530.

2009–10

'000 tonnes

.....

Waste management services(a)	
Landfill	18 339
Recovery	13 668
Other industries(b)	
Landfill	6 512
Recovery	11 553
Total industries	
Landfill	24 851
Recovery	25 220
Exports	3 655
Total use of waste	53 726

.....

(a) Includes Waste Collection, Treatment and Disposal Services (ANZSIC Division D, subdivision 29).

(b) All other industries involved in waste management activities. For further information see Explanatory Notes of Waste Account, Australia, Experimental Estimates 2013 (cat. no. 4602.0.55.005).

	2009–10
	\$m
.....	
SUPPLY OF WASTE MANAGEMENT SERVICES	
Waste management services industry(a)	
Private(b)	
Non-recyclable	4 318
Recyclable	832
Local government authorities	
Non-recyclable	2 106
Recyclable	406
Other industries(c)	
Agriculture	na
Mining	127
Manufacturing	170
Construction	748
Wholesale	182
Retail	11
Transport, Postal and Warehousing	291
All other service industries	331
Total industry supply at basic prices	9 521
Taxes less subsidies on products	74
Imports	na
Total supply of waste management services	9 595

.....	
SUPPLY OF RECYCLABLE AND RECOVERABLE MATERIAL (d)	
Waste management services industry(a)	
Private(b)	
Paper and cardboard	505
Organic material	8
Metal	924
Other	794
Local government authorities	
Paper and cardboard	8
Organic material	5
Metal	16
Other	14
Other industries	
Agriculture	34
Mining	225
Manufacturing	723
Construction	114
Wholesale	547
Retail	550
Transport, Postal and Warehousing	na
All other service industries	48
Total supply of recyclable and recoverable material	4 515
Imports	
Paper and cardboard	1
Organic material	6
Metal	33
Other	28
Total supply of recyclable and recoverable material	4 582

na not available

(a) Includes Waste Collection, Treatment and Disposal Services.

(b) Includes Public Trading Enterprises.

(c) Non-recyclable and recyclable materials are combined.

(d) Income from sales of recyclable/recovered material is entirely comprised of Trade and Transport Margins since these materials are considered to have been purchased at a negligible cost.

	2009–10
	\$m
.....	
EXPENDITURE ON WASTE MANAGEMENT SERVICES	
Waste management services industry(a)	
Private	
Non–recyclable	1 346
Recyclable	108
Local government authorities	
Non–recyclable	991
Recyclable	457
Other industries(b)	
Agriculture	56
Mining	52
Manufacturing	714
Construction	1 643
Wholesale	240
Retail	301
Transport, Postal and Warehousing	291
All other industries	1 772
Total expenditure by industry at purchasers' prices	7 972
Households	1 623
Exports	na
Total use of waste management services	9 595

.....	
PURCHASES OF RECYCLABLE/RECOVERABLE MATERIAL	
Domestic Australian purchases(c)	2 870
Exports	
Paper and cardboard	228
Organic material	20
Metal	1 356
Other	108
Total use of recyclable/recoverable material	4 582

na not available

(a) Includes Public Trading Enterprises.

(b) Non–recyclable and recyclable materials are combined.

(c) Relates to purchases by Industry, Government and Households.

	2007–08	2008–09	2009–10	2010–11
	Mt	Mt	Mt	Mt
Agriculture, forestry and fishing(b)	128.4	118.5	109.3	103.0
Mining				
Coal mining	33.1	33.3	33.0	34.7
Oil and gas extraction	21.6	23.4	25.0	25.7
Other mining	6.7	7.1	7.2	8.1
Total mining	61.4	63.8	65.2	68.5
Manufacturing				
Food, beverages and tobacco	4.6	4.6	4.6	4.7
Wood, paper and printing	2.3	2.3	2.3	2.1
Petroleum, coal and chemical products	18.8	17.4	18.9	19.1
Non-metallic mineral products	12.5	11.7	11.8	11.8
Metal products	34.1	30.0	33.0	32.6
Other manufacturing	1.3	1.4	1.3	1.3
Total manufacturing	73.7	67.5	71.9	71.6
Electricity, gas, water and waste services	209.9	215.2	209.0	204.6
Construction	8.5	8.4	8.4	8.6
Transport				
Road transport	9.4	9.6	9.9	10.4
Other transport	26.6	26.3	27.4	28.2
Total transport	36.0	35.9	37.3	38.6
Commercial and services	26.9	27.0	27.6	27.3
Total emissions by industry	544.7	536.4	528.8	522.2
Emissions by households				
Transport	41.5	41.2	41.4	41.7
Non-transport	10.1	10.4	10.7	11.0
Total emissions by households	51.7	51.6	52.1	52.7
Total emissions, SEEA basis	596.3	588.0	580.8	574.9

(a) Inventories of GHG emissions compiled on a SEEA basis use a residence basis and differ marginally from GHG emissions compiled by the Department of Environment using the territory basis as required under the United Nations Framework Convention on Climate Change (UNFCCC).

(b) Includes GHG emissions related to Land Use, Land Use Change and Forestry (LULUCF).

	2003–04	2004–05	2005–06	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12
	\$m	\$m	\$m	\$m	\$m	\$m	\$m	\$m	\$m
Crude oil and LPG	13 532	14 352	14 075	14 658	15 085	15 594	15 769	16 305	16 925
Renewable energy certificates	83	101	90	113	282	359	386	874	1 557
Ozone protection and synthetic GHG	na	1	1	1	1	1	1	1	1
Stamp duty on vehicle registration	1 886	1 918	1 922	2 004	2 207	2 026	2 116	2 167	2 280
Other environmental taxes	3 240	3 497	3 672	3 911	4 179	4 432	4 876	5 294	5 604
Luxury car tax	323	298	324	387	456	384	499	489	441
Passenger motor vehicles duty (import)	na	na	na	na	na	na	1 226	774	850
Total	19 065	20 168	20 085	21 074	22 210	22 796	24 873	25 904	27 658

na not available

	2003–04	2004–05	2005–06	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12
	\$m	\$m	\$m	\$m	\$m	\$m	\$m	\$m	\$m
Agriculture, forestry and fishing	601	622	667	641	601	656	811	879	910
Mining	865	920	925	1 190	1 313	1 447	1 480	1 613	1 653
Manufacturing	4 827	5 192	4 904	4 968	5 018	4 865	4 961	5 145	5 308
Electricity, gas and water supply	290	338	316	361	607	712	796	1 365	2 070
Construction	365	381	396	418	908	1 021	1 151	1 306	1 241
Transport	2 432	2 651	2 780	3 009	2 904	3 063	3 308	3 413	3 531
Commercial and services	2 792	2 994	3 230	3 478	3 378	3 387	4 557	4 270	4 523
Households	6 893	7 071	6 868	7 009	7 481	7 646	7 809	7 913	8 423
Total	19 065	20 168	20 085	21 074	22 210	22 796	24 873	25 905	27 658

NET INCREASES (POSITIVE NUMBERS) AND DECREASES (NEGATIVE NUMBERS)

<i>Land cover</i>	<i>Primarily non-vegetated-terrestrial</i>	<i>Primarily non-vegetated-aquatic or regularly flooded</i>	<i>Cultivated and managed land-irrigated</i>	<i>Cultivated and managed land-rainfed</i>	<i>Herbaceous</i>	<i>Woody-shrubs</i>	<i>Woody-trees</i>	<i>Wetlands</i>
	'000 ha	'000 ha	'000 ha	'000 ha	'000 ha	'000 ha	'000 ha	'000 ha
Opening area, Jan 2001 – Dec 2002	1 243	11 504	2 053	56 257	383 097	75 340	236 962	1 816
Primarily non-vegetated-terrestrial	—	—	—	—	—	—	—	—
Primarily non-vegetated-aquatic or regularly flooded	—	—	—	—	-446	-41	-7	38
Cultivated and managed land-irrigated	—	—	—	—	-12	—	—	—
Cultivated and managed land-rainfed	—	—	—	—	304	22	-1 409	—
Herbaceous	—	446	12	-304	—	37 739	-18 879	968
Woody-shrubs	—	41	—	-22	-37 739	—	-4 086	151
Woody-trees	—	7	—	1 409	18 879	4 086	—	363
Wetlands	—	-38	—	—	-968	-151	-363	—
Closing area, Jan 2010 – Dec 2011	1 243	11 960	2 065	57 340	363 115	116 995	212 217	3 336

— nil or rounded to zero (including null cells)

EXPLANATORY NOTES

INTRODUCTION

1 This *Australian Environmental–Economic Accounts* (AEEA) contains accounts for key environmental themes. The style of the AEEA differs from the earlier ABS publications that applied environmental accounts to particular environmental issues, like green growth, sustainability and adapting to climate change. This issue-based approach was used in *Completing the Picture – Environmental Accounting in Practice* (cat. no. 4628.0.55.001) and *Towards the Australian Environmental–Economic Accounts* (cat. no. 4655.0.55.002). In contrast the AEEA is data focused, with minimal interpretation or analysis.

2 In the AEEA, accounts are provided for environmental assets, energy products, water, waste, GHG emissions, environmental taxes and land cover. Throughout the publication, tables and data are presented to emphasise socioeconomic aspects of environmental themes—either as drivers of environmental pressures, or as part of the policy response to these pressures. The publication highlights the capacity of environmental accounts to support analyses across various environmental themes and also between environmental and economic themes. For a full list of the statistics contained in this publication see List of tables. Where available, a time series of information has been provided for each of the environmental themes. As the ABS has developed its environmental accounting program incrementally, the different accounts have time series of varying lengths. A summary of work undertaken by the ABS in the area of environmental accounting is provided below. Information about the *System of Environmental–Economic Accounting* (SEEA) Central Framework, which provides the conceptual framework of the AEEA, also appears below. References are also made to related ABS environmental accounts publications for further guidance on data sources, concepts and estimation methodologies. Please see the Glossary for brief definitions and descriptions of terms used in the AEEA.

SYSTEM OF ENVIRONMENTAL–ECONOMIC ACCOUNTING

3 The AEEA is based on the SEEA Central Framework. The SEEA Central Framework is a conceptual framework designed to support understanding and measurement of the interactions between the economy and the environment, and the stocks and changes in stocks of environmental assets. The SEEA Central Framework was adopted by the UN Statistical Commission as an international statistical standard in 2012.

4 The SEEA Central Framework uses a systems approach to organise environmental and economic information, covering, as completely as possible, the stocks and flows that are relevant to the analysis of environmental and economic issues. In using this approach, the SEEA Central Framework applies the accounting concepts, structures, rules and principles of the *System of National Accounts* (SNA). In practice, environmental–economic accounting includes the compilation of physical supply and use tables, functional accounts (such as environmental taxation accounts and environmental expenditure accounts), and asset accounts for natural resources.

5 The integration of information concerning the economy and the environment is an interdisciplinary exercise. The SEEA Central Framework brings together, within one measurement system, information on water, minerals, energy, timber, fish, soil, land and ecosystems, pollution and waste, production, consumption and accumulation. Each of these areas has specific and detailed measurement approaches that are integrated in the SEEA Central Framework to provide a comprehensive view.

6 The SEEA Central Framework provides a foundation for related topic and theme specific statistical publications. A SEEA module related to water ('SEEA–Water') has been in operation since 2007, and modules related to energy and to agriculture and land are under development.

7 The SEEA Central Framework is accompanied by two additional parts: *SEEA Experimental Ecosystem Accounting*, and *SEEA Extensions and Applications*. *SEEA Experimental Ecosystem Accounting* provides the basis for the development of ecosystem accounting at the national and sub-national levels. *SEEA Extensions and*

EXPLANATORY NOTES *continued*

SYSTEM OF
ENVIRONMENTAL-ECONOMIC
ACCOUNTING *continued*

Applications presents various monitoring and analytical approaches that could be adopted using SEEA-based information.

ENVIRONMENTAL
ACCOUNTING IN THE ABS

8 The ABS first published environmental accounts in 1995, beginning with monetary estimates for a number of environmental assets within scope of the SNA asset boundary. In particular, estimates for subsoil assets¹³ and forests and land were developed within the ABS national accounts area and these are now an established feature of the national balance sheet within the *Australian System of National Accounts*. Also during the 1990's the ABS commenced a program of environmental accounts development within its environmental statistics area and this program continues to drive the development of these accounts within the ABS – often in partnership with other agencies.

ENVIRONMENTAL ACCOUNTS PRODUCED BY THE ABS

<i>Account type</i>	<i>Year First published</i>	<i>Frequency or status</i>	REFERENCE YEARS FOR WHICH ACCOUNTS ARE AVAILABLE			
			<i>Physical stock</i>	<i>Monetary stock</i>	<i>Physical flow</i>	<i>Monetary flow</i>
NATIONAL BALANCE SHEET						
Land	1995	Annual	1988–89 to	1988–89 to		
Minerals		from	2012–13	2012–13		
Energy		1995				
Timber						
Fish	2012	Experimental		2000–01, 2005–06 to 2009–10		
FISH	1999	Occasional	1996–97		1996–97	
ENERGY	1996	Annual	1988–89 to	1988–89 to	1993–94 to	2004–05;
		from	2011–12	2011–12	1996–97;	2009–10
		2011			2004–05;	
					2006–07;	
					2008–09 to	
					2011–12	
MINERALS	1998	Occasional	1985 to 1996		1992–93;	
					1993–94	
WATER	2000	Annual			1993–94 to	2003–04;
		from			1996–97	2004–05;
		2010			2000–01;	2008–09 to
					2004–05;	2011–12;
					2008–09 to	2009–10
					2011–12	
LAND COVER AND LAND USE VALUES (BY STATE) (a)	2011	Annual	2011	2012;	2013	2013
		from	2012	2013		
		2011	2013			
WASTE	2012	Annual			2009–10	2009–10
		from 2012				
GHG EMISSIONS – EMBEDDED IN FINAL DEMAND	2012	Experimental			2008–09;	
					2009–10	

(a) Land cover and use accounts are prepared for each state on a rotating schedule, with each state covered once in three years.

9 The table above summarises the range of environmental accounts produced by the ABS and broadly indicates, for each environmental domain, what types of accounts have been produced, their status, and reference years for which data are available.

¹³ SNA's 'subsoil assets' fall within the SEEA category of 'mineral and energy resources'

EXPLANATORY NOTES *continued*

ENVIRONMENTAL ASSETS

10 Estimates of the value of some environmental assets are included in the *Australian System of National Accounts* (ASNA) (cat. no. 5204.0) in inventories (e.g. plantation forests) and non-produced capital (e.g. land, minerals, timber in native forests), and are produced according to the SNA. The definition, classification, scope and valuation of environmental assets contained in AEEA is defined by the SEEA Central Framework. What the SEEA Central framework defines as environmental assets are in other contexts referred to as natural capital.

Scope

11 SEEA defines environmental assets as being "the naturally occurring living and non-living components of the Earth, together comprising the bio-physical environment that may provide benefits to humanity". Within the SEEA, assets are measured in both physical and monetary terms, whereas the SNA relates only to monetary information.

12 The notion of environmental assets used in this publication are consistent with the SEEA definition and has the potential to include:

- Mineral and energy resources
 - Oil resources
 - Natural gas resources
 - Coal and peat resources
 - Non-metallic mineral resources (excluding coal and peat resources)
 - Metallic mineral resources
- Land
- Soil resources
- Timber resources
 - Cultivated timber resources
 - Natural timber resources
- Aquatic resources
 - Cultivated aquatic resources
 - Natural aquatic resources
- Other biological resources (excluding timber resources and aquatic resources)
 - Water resources
 - Surface water
 - Groundwater
- Soil water

13 Monetary valuation of environmental assets is applied only to those assets meeting the SNA definition of an asset. SNA defines an asset as "a store of value representing a benefit or a series of benefits accruing to the economic owner by holding or using the entity over a period of time. It is a means of carrying forward value from one accounting period to another". The SNA and the SEEA Central Framework support consistent monetary valuation of environmental assets.

Coverage

14 In practice, the environmental assets included in the AEEA are land, mineral and energy assets and timber. Research is currently underway to extend the range of environmental assets for which monetary estimates can be generated (e.g. for water), but these are not yet available.

15 For estimates of mineral and energy assets, the ABS has adopted Australia's National Classification System for Mineral Resources (Geoscience Australia) to assign physical and monetary stocks based on Economic Demonstrated Resources (EDR) data.

16 EDRs are resources judged to be economically extractable and for which the quantity and quality are computed partly from specific measurements, and partly from extrapolation for a reasonable physical distance on geological evidence. ABS mineral and energy asset stocks align with Australia's *National Classification System for Mineral Resources*.

EXPLANATORY NOTES *continued*

Coverage continued

17 The physical asset account contained within the AEEA includes the following assets:

- Subsoil – Energy
 - Natural Gas
 - Crude oil
 - Condensate
 - Liquid Petroleum Gas
 - Black Coal
 - Brown Coal
 - Uranium
- Subsoil – Mineral
 - Copper
 - Gold
 - Antimony
 - Iron Ore
 - Lead
 - Silver
 - Cadmium
 - Nickel
 - Zinc
 - Bauxite
 - Diamonds
 - Lithium
 - Magnesite
 - Limenite
 - Rutile
 - Zircon
 - Platinum
 - Cobalt
 - Rare earths
 - Tin

18 Monetary asset accounts contained within the AEEA include estimates for:

- Land
- Subsoil – Energy
 - Natural gas
 - Crude oil
 - Condensate
 - LPG
 - Black Coal
 - Uranium
- Subsoil – Mineral
 - Copper, Gold and Antimony
 - Bauxite
 - Iron ore
 - Lead, Zinc, Silver and Cadmium
 - Nickel, Platinum and Cobalt
 - Other minerals
- Timber
 - Plantation
 - Native Standing

*Further information on
environmental assets*

19 Further information on data sources, concepts, and methods underpinning monetary and physical estimates of environmental assets can be found in *Australian System of National Accounts: Concepts, Sources and Methods* (cat. no. 5216.0).

EXPLANATORY NOTES *continued*

WATER

Physical supply and use of water

20 Water Account Australia (WAA) was developed using the SEEA Central Framework and SEEA–Water. Water supply and use tables provide a framework to link core components of the national accounts to physical information. Physical data are presented in supply and use tables, while linkages to economic data are also made.

21 The physical supply and use of water tables measure in physical terms (megalitres) the supply and use of all water within the Australian economy. The tables relate to freshwater and include the following categories of water: self–extracted, distributed, in–stream use and reuse.

22 The water tables include the following socioeconomic units:

- individuals and companies that directly extract water from surface water and groundwater sources for their own use (e.g. domestic, industrial, agricultural or other uses);
- households, government and businesses that use water supplied by water providers for domestic, industrial, agricultural or other uses;
- water providers that extract water from surface water, groundwater and sea water for desalination, and supply it to customers for use (e.g. domestic, industrial, or other use). The majority of water providers are in the water supply, sewerage and drainage services industry (ANZSIC 281) but the mining, manufacturing, and electricity and gas supply industries also supply a small amount of water; and
- water providers that provide reuse water to their customers; other large organisations who treat water and make it available for subsequent reuse; other large organisations who discharge water directly to the environment (e.g. power stations, mines); and major in–stream water users, for example aquaculture and hydro–electricity generation, where this information is available.

23 Items not covered by the water tables include:

- the volume of rainwater used by agricultural crops/pastures that are directly rain fed;
- discharges to the environment resulting from the run–off of irrigation water;
- the reuse/recycling of water on–farm or on–site (i.e. within homes or businesses);
- household water consumption from rainwater tanks (for households connected to mains supply);
- non–point/diffuse discharges; and
- the impact of storm water infiltration into the sewerage reticulation system.

Water consumption and water use

24 Water consumption is that part of water use not distributed to other economic units and does not return to the environment (to water resources, sea or ocean) because during use it has been incorporated into products, evaporated, transpired or otherwise consumed by households or businesses. The following accounting identities have been used:

- Total water use is equal to the sum of distributed water use, self–extracted water use and reuse water use;
- Water consumption is equal to the sum of distributed water use, self–extracted water use and reuse water use less water supplied to other users and less in–stream use. The use of distributed water by the environment is not included in total water consumption.

25 For most industries, water use and water consumption are the same, as most industries do not have in–stream use, nor do they typically supply water to other users. However, water consumption and use will vary considerably for some industries, specifically the water supply, sewerage and drainage services industry, electricity and gas supply industry and mining industry, where in–stream water use and water supply volumes are significant.

EXPLANATORY NOTES *continued*

Monetary supply and use of water

26 The monetary supply and use of water tables measure in monetary terms the supply and use of water within the Australian economy. Estimates are also provided for the supply and use of sewerage, waste water and drainage services (also referred to as water related services).

27 Monetary aggregates are provided for:

- supply of distributed water and water related services in the economy by the water supply, sewerage and drainage services, mining, manufacturing, and electricity and gas supply industries; and
- expenditure on water and water related services by industries, households and governments.

28 The scope of monetary estimates is limited to distributed water, reuse water and waste water, sewerage and drainage services. No estimates are made of the value of self-extracted water. Further, the scope is limited to 'net distributed water' which, is defined as water that has been supplied from one economic unit to another for a fee, creating a measurable economic transaction. Net distributed water excludes distribution losses and supply to the environment for which there is no matching economic transaction.

Gross value of irrigated agricultural production

29 Gross value of irrigated agricultural production (GVIAP) relates to the gross value of agricultural commodities produced with the assistance of irrigation. The gross value of commodities produced is the value placed on recorded production using wholesale prices as realised in the marketplace. This definition of GVIAP does not refer to the value that irrigation adds to production, or the 'net effect' that irrigation has on production.

Further information on water

30 For a detailed discussion of concepts, data sources and methods used in the water tables and of the methods used for calculating water supply and use (both physical and monetary) please refer to the explanatory notes of the *Water Account Australia* (cat. no. 4610.0). Similarly, a more detailed discussion of concepts, sources and methods used in the compilation of GVIAP can be found in the explanatory notes of *Gross Value of Irrigated Agricultural Production 2011–12* (cat. no. 4610.0.55.008).

ENERGY

Supply and use of energy

31 Energy Account Australia (EAA) uses the SEEA as the basis for its conceptual framework.

32 Energy tables in the AEEA record the physical supply and use of energy products within the Australian economy. Supply of energy includes both direct extraction of energy products (including renewables) and imports of energy products. The use of energy products relates to use by Australian industry, households and governments — including inventory changes and energy products used by non-residents (exports). The monetary supply and use of energy tables record monetary values for those flows where market (or near-market) transactions occur.

33 All energy accounts in the AEEA are compiled on a residence basis and therefore the national boundary relates to the activities of Australian resident units.

34 Energy flow accounts have been presented on a 'net' basis in this publication. Net measures of energy consider conversion losses associated with transforming one form of energy into another form. In this way, estimates for total net energy use avoid double-counting the amount of converted primary energy.

35 The net use of energy table records the different energy products consumed for final purposes (final use of energy plus energy losses due to conversions) and supplied to the rest of the world (exports), along with inventory changes. The main accounting identity underlying the net flow accounts for energy is:

36 Supply (imports + direct extraction) = Use (exports + final use of energy + energy losses due to conversions + inventory changes)

EXPLANATORY NOTES *continued*

Supply and use of energy continued

37 This accounting identity is valid only for the sum of all energy products in the economy and not for individual energy products. This is because the net supply table balances all energy use, whereas supply of an individual product will generally not equal use of that product due to losses and transformations.

38 Data contained in the net supply and use tables are used to compile time series of energy intensity. In concept, net supply and use of energy products most closely matches measures of monetary supply and use of energy.

Energy products

39 The energy supply and use tables include the following energy products (though not all products are separately identifiable):

- Black coal;
- Brown coal;
- Coal by-products (including blast furnace gas, coal tar, benzene/toluene/xylene feedstock and coke oven gas);
- Brown coal briquettes;
- Metallurgical coke;
- Natural gas (includes coal seam gas);
- Crude oil and feedstocks (including refinery feedstock, ethane and other petrochemical feedstocks);
- Propane, butane, LPG;
- Petrol;
- Diesel;
- Other refined products (including aviation turbine fuel, aviation gasoline, kerosene, heating oil, and fuel oil);
- Biofuels (including ethanol, biodiesel, landfill and sludge biogas, and other biofuels);
- Wood and wood waste;
- Bagasse;
- Electricity;
 - solar electricity
 - wind electricity
 - hydro-electricity
 - other (i.e. that generated from fossil fuels)
- Solar hot water; and
- Uranium

Industries

40 Industry classification used in the presentation of supply and use of energy follow the 2006 edition of the *Australian and New Zealand Standard Industry Classification* (ANZSIC). The following industry breakdown is used in the energy tables of the AEEA.

- Agriculture, forestry and fishing;
- Mining;
- Manufacturing;
- Construction;
- Transport;
- Electricity, gas, water supply and waste services; and
- Commercial and services.

Energy assets, in petajoules

41 Energy assets measured in petajoules (PJ), utilise the same scope as used for monetary valuation of energy assets in the AEEA, that is, EDR as defined in Australia's *National Classification System for Mineral Resources* (Geoscience Australia). The AEEA estimates of energy assets measured in petajoules are generated by Geoscience Australia.

42 Estimates of energy content is provided for the following assets:

- Black Coal
- Brown Coal
- Crude oil (includes condensate)

EXPLANATORY NOTES *continued*

*Energy assets, in petajoules
continued*

- Liquefied Petroleum Gas
- Natural gas (excludes shale gas and includes Coal Seam Gas for 2008–09 and 2009–10 only)
- Uranium.

Further Information on energy

43 For a detailed discussion of sources and methods used in the energy tables, including energy assets measured in petajoules please refer to the explanatory notes of *Energy Account Australia 2011–12* (cat. no. 4604.0).

WASTE

44 Information on Waste has been gathered from multiple sources and organised using the principles of the SEEA Central Framework to produce *Waste Account Australia Experimental Estimates* (WAAEE), 2013 (cat. no. 4602.0.55.005).

*Physical supply and use of
solid waste*

45 The WAAEE records the total supply of solid waste products within the economy (including imports) and the total use of solid waste products within the economy (including exports). The supply and use methodology underpinning the data presented here is based on the fundamental economic identity that supply of products equal use of products.

46 The SEEA defines solid waste as “discarded materials that are no longer required by the owner or user”. Where the unit discarding the materials receives no payment for the materials, the flow is considered a residual flow of solid waste. Where the unit discarding the materials receives a payment, but the actual residual value of the material is small, such as in the case of scrap metal sold to a recycling firm, this flow is considered a product flow of solid waste.

47 The physical supply and use of waste tables include the following waste materials:

- Paper and cardboard
- Glass
- Plastics
- Metals
- Organics
- Masonry
- Electrical and Electronic
- Hazardous
- Leather and Textiles
- Tyres and other Rubber
- Timber and Wood products
- Inseparable/unknown

48 The following waste materials are out of scope of the physical supply and use of waste tables:

- Liquid waste
- Radioactive waste
- Mineral waste from the mining industry
- Wastewater (untreated effluent, sewage water and trade waste).
- Emissions
- Fly ash
- Fishing waste

49 The industry classification used in the physical supply and use of waste tables follow the *Australian and New Zealand Standard Industrial Classification, 2006* (ANZSIC) (cat. no. 1292.0). The waste management services industry comprises ANZSIC Division D, subdivision 29 and the waste management activities of local governments.

50 The industry described as ‘Services’ in the physical supply and use of waste tables is an aggregation of the following industries:

- Wholesale trade

EXPLANATORY NOTES *continued*

Physical supply and use of solid waste continued

- Retail trade
- Accommodation and Food Services
- Transport, Postal and Warehousing
- Information Media and Telecommunications
- Financial and Insurance Services
- Rental, Hiring and Real Estate Services
- Professional, Scientific and Technical Services
- Administrative and Support Services
- Public Administration and Safety – excluding Class 7530
- Education and Training
- Health Care and Social Assistance
- Arts and Recreation Services
- Other Services

51 The Municipal Solid Waste (MSW) stream is a data source used to estimate household waste. MSW covers both direct waste collection (e.g. kerbside collection of recycling and waste to landfill) and indirect waste collection (e.g. householder drop-off at transfer stations) from households.

Monetary supply and use of solid waste

52 The monetary supply and use of waste tables present aggregates in monetary terms (\$million) for the supply and use of waste goods and services within the Australian economy. Monetary supply and use tables record economic transactions associated with the income generated by the supply of waste management services and sales of recovered waste material and expenditure on the use of waste management services and purchase of recovered waste material.

53 The monetary supply and use of waste tables record the following items:

- Income and expenditure (\$million) relating to waste management services (non-recyclable, recyclable)
- Income from sales (\$million) of recyclable/recoverable material (paper and cardboard, organic material, metals, other)
- Imports and exports (\$million) of waste material (paper and cardboard, organic material, metals, other)

Data sources

54 Data on the physical supply and use of waste are primarily derived from the report *Waste and Recycling in Australia* (WRiA) 2011 commissioned by the Australian Government Department of Environment (DoE). The WRiA reports solid waste and recycling data published by the states, territories and industry for the 2008–09 financial year. It presents data on the recycling of solid waste, energy recovery from solid waste, and the disposal of solid waste to landfill. The report presents data by material category and material type in terms of solid waste streams. The ABS has used the principles and structures of the SEEA to transform this data into a data framework able to support linkages between waste supply, waste use and the various economic aggregates contained in the Australian system of national accounts.

Further Information on waste

55 For a detailed discussion of data sources used in the waste tables and of methods used to calculate waste supply and use (both monetary and physical) please refer to the explanatory notes contained in the WAAEE 2013.

GREENHOUSE GAS EMISSIONS

56 Estimates of direct greenhouse gas (GHG) emissions contained in this publication are presented according to SEEA guidelines. In particular, the SEEA recommends converting the territory-based GHG emissions inventories produced according to UNFCCC guidelines onto a residence basis. When following the residence principle, the geographic boundary of a country is determined by the activities of economic units resident in that country.

EXPLANATORY NOTES *continued*

GREENHOUSE GAS EMISSIONS *continued*

57 The scope of GHG emissions included in this publication includes all emissions under the UNFCCC, and as defined by the Intergovernmental Panel on Climate Change (IPCC). These include energy sectors (including stationary energy and transport); industrial processes; solvent and other product use; agriculture; waste; and land use, land use change and forestry (LULUCF).

58 The primary data source for estimates of inventories of GHG emissions by industry and households in Australia is the Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education (DIICCSRTE) publication *Australian National Greenhouse Accounts – National Inventory by Economic Sector, 2010–11*. The DIICCSRTE notion of economic sector is consistent with ANZSIC.

59 DIICCSRTE produces its Australian National Greenhouse Accounts according to the United Nations Framework Convention on Climate Change (UNFCCC). GHG Emissions compiled on this basis are recorded using the territory principle. When using the territory principle, GHG emissions occurring within the geographic boundary of a country are attributed to that country.

60 The adjustments required to convert the presentation of data onto a SEEA (residence) basis relate to emissions attributed to travellers while abroad, and international bunkering (related to international transport, principally shipping and aircraft).

61 Within the AEEA, direct GHG emissions estimates relate to the following gases:

- carbon dioxide
- methane
- nitrous dioxide
- synthetic gases (HFCs, SF₆, CF₄, C₂F₆)

62 Direct GHG emissions figures relate to the following industries and to households:

- Agriculture, forestry and fishing
- Mining
- Manufacturing
- Electricity, gas, water and waste services
- Construction
- Transport
- Commercial and services.

Direct emissions

63 Direct emissions are produced from sources within the boundary of an organisation and as a result of that organisation's activities. These emissions mainly arise from the following activities:

- generation of energy, heat, steam and electricity, including carbon dioxide and products of incomplete combustion (methane and nitrous oxide);
- manufacturing processes which produce emissions (for example, cement, aluminium and ammonia production);
- transportation of materials, products, waste and people; for example, use of vehicles owned and operated by the reporting organisation;
- fugitive emissions: intentional or unintentional GHG releases (such as methane emissions from coal mines, natural gas leaks from joints and seals); and
- on-site waste management, such as emissions from landfill sites.

Emissions factors

64 Direct emission factors give the kilograms of carbon dioxide equivalent (CO₂-e) emitted per unit of activity at the point of emission release (i.e. fuel use, energy use, manufacturing process activity, mining activity, on-site waste disposal, etc.). All factors are standardised by being expressed as a carbon dioxide equivalent (CO₂-e). This is achieved by multiplying the individual gas emission factor by the respective gas global warming potential (GWP).

EXPLANATORY NOTES *continued*

Emissions factors continued

65 For a more detailed discussion of the emissions factors please refer to the DIICSRTE publication *Australian National Greenhouse Accounts – National Inventory by Economic Sector, 2010–11*.

SEEA-related adjustments

66 In order to represent GHG emissions information on a SEEA basis, two adjustments to UNFCCC-based data are made:

- An adjustment related to international travellers abroad is based on the Tourism Satellite Account¹⁴. Direct emissions related to road transport activities by residents abroad are added to Australian inventories, while emissions related to non-residents within Australian territory are subtracted; and
- a second adjustment related to international bunkering – fuel used by international transport operators (primarily marine and aviation). This adjustment involves the addition to inventories of relevant GHG emissions produced by resident operators and the subtraction of GHG emissions produced by non-resident operators.

ENVIRONMENTAL TAXES

67 SEEA defines environmental taxes as "those taxes which have a tax base with a proven negative impact on the environment", thereby increasing the price on activities and products that are harmful to the environment.

68 Environmental taxes include taxes on production and imports, capital taxes and current taxes on income and wealth. Environmental taxes contained in this publication relate to energy and to transport. The Carbon Pricing Mechanism ('Carbon tax') and the Mineral Resource Rent Tax came into operation on 1 July 2012. The data included in the AEEA pre-date the introduction of these taxes.

69 The estimates of environmental taxes contained in the AEEA are presented by type of tax, and by paying industry and households. Specifically, estimates of environmental taxes contained in this publication relate to the following types of taxes:

- Crude oil and LPG
- Renewable Energy Targets (RETs) / Renewable Energy Certificates (RECs)
- Ozone Protection and Synthetic GHG
- Vehicle stamp duty
- Vehicle import duty
- Luxury Car tax
- Other

70 Environmental taxes have been produced in respect of the following industries; and households.

- Agriculture, fisheries and forestry
- Mining
- Manufacturing
- Electricity, gas, water and waste services
- Construction
- Transport
- Commercial and services

Further information on environmental taxes

71 Estimates of environmental taxes contained in the AEEA follow the concepts, sources and methods set out in *Discussion Paper: Environmental Taxes in Australia – Experimental new statistics, 2000–2011* (cat. no. 4629.0.55.001).

LAND COVER

72 Land is a unique environmental asset that delineates the space in which economic activities and environmental processes take place. Land accounts cover the total area of a country, including areas covered by inland water resources, such as rivers and lakes.

73 While a range of different types of land accounts can be prepared, the core land accounts relate to land use and land cover.

¹⁴ *Australian National Accounts: Tourism Satellite Account* (cat. no. 5249.0)

EXPLANATORY NOTES *continued*

LAND COVER *continued*

74 Land use reflects both (i) the activities undertaken and (ii) the institutional arrangements put in place; for a given area for the purposes of economic production, or the maintenance and restoration of environmental functions (SEEA Central Framework, paragraph 5.246).

75 Land cover refers to the observed physical and biological cover of the Earth's surface and includes natural vegetation and abiotic (non-living) surfaces (SEEA Central Framework, paragraph 5.257).

76 Experimental land accounts for land cover and land use have been prepared for the states of Victoria and Queensland, and within these there are data presented for: natural resource management (NRM) regions; interim biogeographic regional areas (IBRA); and Statistical Areas Level 4 (SA4).

Further information on land cover

77 Estimates of land cover change contained in the AEEA are sourced from Geoscience Australia. For further information on Australia's Dynamic Land Cover Dataset please see <http://www.ga.gov.au/earth-observation/landcover.html>.

RELATED ENVIRONMENTAL ACCOUNTS PUBLICATIONS *ABS publications*

TOWARDS THE AUSTRALIAN ENVIRONMENTAL-ECONOMIC ACCOUNTS, March 2013 (CAT. NO. 4655.0.55.002)

78 *Towards the Australian Environmental-Economic Accounts* (AEEA) uses a themes-based presentation to showcase the range of ABS environmental accounts. The publication provides a depth of commentary to explain environmental accounts and to describe their potential to inform environmental policy decisions. It is a prelude to the initial release of the annual Australian Environmental-Economic Accounts publication.

COMPLETING THE PICTURE: ENVIRONMENTAL ACCOUNTING IN PRACTICE, May 2012 (CAT. NO. 4628.0.55.001)

79 *Completing the picture: environmental accounting in practice* was released on 10 May 2012. This publication examines a number of complex issues facing policy makers in Australia, such as climate change and natural resource management, and illustrates how environmental accounts can be used to further improve the decision-making process. It also includes a range of accounts, based on the SEEA, that highlight the various interactions between the environment and economy.

WATER ACCOUNT, AUSTRALIA 2011-12 (CAT. NO. 4610.0)

80 The 2011-12 edition of *Water Account, Australia* (WAA) was released on 13 November 2013. This publication presents information on the supply and use of water in the Australian economy in 2011-12 in both physical (i.e. volumetric) and monetary terms. The focus of WAA is on the interactions between users within the economy and the environment.

ENERGY ACCOUNT, AUSTRALIA 2011-12 (CAT. NO. 4604.0)

81 The 2011-12 edition of *Energy Account, Australia* was released on 26 November 2013. This publication presents information on energy intensity and on the supply and use of energy in the Australian economy for 2011-12 in both physical (i.e. joules) and monetary terms.

WASTE ACCOUNT, AUSTRALIA, EXPERIMENTAL ESTIMATES 2013 (CAT. NO. 4602.0.55.005)

82 The 2013 edition of *Waste Account, Australia, Experimental Estimates* was released on 19 February 2013. It provides tables showing experimental data on the generation and disposal of waste to landfills or to recycling facilities, the supply of recycled materials in the economy and related financial flows.

EXPLANATORY NOTES *continued*

ABS publications *continued*

DISCUSSION PAPER: ENVIRONMENTAL TAXES IN AUSTRALIA – EXPERIMENTAL STATISTICS 2000–2011 (CAT. NO. 4629.0.55.001)

83 Market based instruments are widely used by governments to drive change in socioeconomic behaviour and taxation is a typical example of such market based instruments. This discussion paper, released on 13 December 2012, elaborates and proposes the development of a body of statistics on environmental taxes for Australia. The paper provides information on environmental taxes in Australia and a comparison with concurrent work being conducted by the OECD.

LAND ACCOUNT, QUEENSLAND, EXPERIMENTAL ESTIMATES, 2013 (CAT. NO. 4609.0.55.003)

84 The 2013 edition of *Land Account, Queensland, Experimental Estimates* was released on 28 August 2013. It provides data in the form of statistical tables as well as spatial format. Statistical tables record land use classified by land cover. The account combines Google Earth® with data for each of the 11,039 Statistical Area Level 1 (SA1) areas in Queensland. It also provides an SA1 socio-economic spatial layer in tab delimited text, MapInfo and ESRI Geodatabase formats. These enable users to overlay the socio-economic layer with other bio-physical layers (e.g. soil condition, elevation and slope) to undertake further analysis.

GROSS VALUE OF IRRIGATED AGRICULTURAL PRODUCTION, 2011–12 (CAT. NO. 4610.0.55.008)

85 The 2011–12 edition of *Gross Value of Irrigated Agricultural Production, 2011–12* was released on 3 October 2013. This publication presents information on Gross Value of Irrigated Agricultural Production (GVIAP), by type of agricultural product, for Australia, the States and Territories and the Murray–Darling Basin, as well as by Natural Resource Management (NRM) area. Estimates of Gross Value of Agricultural Production (GVAP) are also provided.

Non-ABS publications

BUREAU OF METEOROLOGY, NATIONAL WATER ACCOUNT

86 The *National Water Account* is produced annually by the Bureau of Meteorology. It provides a picture of water resources management for the previous financial year for nine nationally significant water regions: Adelaide, Canberra, Daly, Melbourne, Murray–Darling Basin, Ord, Perth, South East Queensland and Sydney. It discloses information about water stores and flows, water rights and water use, as well as reporting on volumes of water traded, extracted and managed for economic, social, cultural and environmental benefits.

DIICSRTE, AUSTRALIAN NATIONAL GREENHOUSE ACCOUNTS – NATIONAL INVENTORY BY ECONOMIC SECTOR

87 The Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education (DIICSRTE) produces the *Australian National Greenhouse Accounts | National Inventory by Economic Sector* on an annual basis. The publication provides information on national greenhouse gas emissions on a Kyoto accounting (territory) basis, disaggregated by ANZSIC industry.

ACKNOWLEDGEMENTS

88 The evolution of environmental accounting at the ABS began in 1996 with the publication of *Natural Resource Accounting – Australian Energy Account, Australia* (cat. no. 4604.0) and the *Mineral Account, Australia* (cat. no. 4608.0). Since then the development of the accounts at the ABS has been assisted through partnerships and consultations with various agencies, including the: Bureau of Meteorology; Department of the Environment; Victorian Department of Environment and Primary Industry; Queensland Department of Natural Resources and Mines; Wentworth Group of Concerned Scientists; United Kingdom’s Office of National Statistics and Department of Food and Regional Affairs; Statistics Canada; Statistics Netherlands; Statistics Sweden;

EXPLANATORY NOTES *continued*

ACKNOWLEDGEMENTS *continued*

European Environment Agency; OECD; United Nations Statistical Division and the World Bank. In addition valuable input has been provided by a range of academics from: the Australian National University; Monash University; Queensland University; University of Melbourne; and University of Sydney.

ABBREVIATIONS

\$b	billion (thousand million) dollars
\$m	million dollars
ABS	Australian Bureau of Statistics
AEEA	Australian Environmental-Economic Accounts
AFF	agriculture, forestry and fishing
AG	agriculture
ANZSIC	Australian and New Zealand Standard Industrial Classification
ASNA	Australian System of National Accounts
bcm	billion cubic metres
BoM	Bureau of Meteorology
C&S	commercial and services
C₂F₆	Hexaflouroethane
CF₄	Tetraflouromethane
CONST	construction
CO₂	carbon dioxide
DIICCSRTE	Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education
DoE	Tasmanian Department of Education
EAA	Energy Account, Australia
EDR	economic demonstrated resources
EG	electricity and gas
EGW&W	Electricity, Gas, Water and Waste Services industry
GDP	gross domestic product
GHG	greenhouse gas (emissions)
GJ	gigajoule
GL	gigalitre
Gt	gigatonne
GVA	gross value added
GVAP	gross value of agricultural production
GVIAP	gross value of irrigated agricultural production
ha	hectare
HFC	hydrofluorocarbon
HH	household
IBRA	Interim Biogeographic Regionalisation for Australia
IGVA	industry gross value added
KL	kilolitre
kt	kilotonne
LPG	liquefied petroleum gas
LULUCF	Land Use, Land-Use Change and Forestry
mfg	manufacturing
ML	megalitre
MNG	mining
MSW	municipal solid waste
Mt	megatonne
NRM	natural resource management
OECD	Organisation for Economic Co-operation and Development

ABBREVIATIONS *continued*

PJ	petajoule
RECs	Renewable Energy Certificates
RET	Renewable Energy Target
SEEA	System of Environmental-Economic Accounting
SEEAW	System of Environmental-Economic Accounting for Water
SF ₆	Sulphur hexafluoride
SNA	System of National Accounts
t	tonne
TRANS	transport
UNFCCC	United Nations Framework Convention on Climate Change
WAA	Water Account, Australia
WAAEE	Waste Account Australia, Experimental Estimates
WRiA	Waste and Recycling in Australia
WS	water supply

GLOSSARY

Aluminium	A chemical element and a soft, ductile metal.
Australian and New Zealand Standard Industrial Classification (ANZSIC)	The ANZSIC is the standard classification used in Australian and New Zealand for the collection, compilation, and publication of industry statistics.
Basic prices	The amount receivable by the producer from the purchaser for a unit of a good or service produced as output, minus any tax payable plus any subsidy receivable, on that unit as a consequence of its production or sale; it excludes any transport charges invoiced separately by the producer.
Bauxite	An aluminium ore and the world's main source of aluminium.
Black coal	A sedimentary organic rock consisting of anthracite, bituminous and sub-bituminous rank coals. Black coal is primarily used as a solid fuel to raise steam to generate electricity and to produce coke for steelmaking.
Brown coal	Also known as lignite, is a low rank, brownish-black coal with a high moisture content of around 60%.
CO₂	Carbon dioxide.
Condensate	A liquid mixture of pentanes and heavier hydrocarbons that form part of the vapour phase of natural gas in the reservoir and become liquid under standard field separation conditions.
Construction	The process which involves adding structure to real property or the building or assembling of infrastructure. It includes the additions, alterations, reconstruction, installation and maintenance and repairs of buildings and other structures.
Copper	A chemical element and a ductile metal with very high thermal and electrical conductivity. It is used as a conductor of heat and electricity, a building material, and a constituent of various metal alloys.
Crude oil	A mixture of hydrocarbons, existing in the liquid state; both in natural underground reservoirs and at atmospheric pressure after passing through surface separating facilities.
Distributed water	Water supplied to a user including through a natural (e.g. a river) or non-natural network (piped or open channel), and where an economic transaction has occurred for the exchange of this water. The majority of distributed water is supplied by the Water, sewerage and drainage services industry (ANZSIC Division 28). The water supply component consists of units mainly engaged in storage, purification or distribution of water by pipeline or carrier. It also includes the operation of irrigation systems that supply water to a farm and the supply of steam and hot water. Distributed water can include potable, mains and raw water but does not include reuse or bulk water.
Economic asset	A store of value representing a benefit or series of benefits accruing to the economic owner by holding or using the entity over a period of time. It is a means of carrying forward value from one accounting period to another.
Economic Demonstrated Resource (EDR)	Resources judged to be economically extractable and for which the quantity and quality are computed partly from specific measurements, and partly from extrapolation for a reasonable physical distance on geological evidence.
Electricity	The flow of electrical power or charge. It is commonly derived from burning organic matter, especially coal and natural gas. Other sources include hydroelectricity, solar photovoltaic, wind and nuclear.
Emission	The release of a particular gas to the atmosphere as a result of a certain activity. Emissions can be of the following four types: 1) generated – the gross result of a process or activity; 2) recovered – the diversion of emissions for use in a secondary process, such as power generation; 3) sinks – the process of removing carbon from the atmosphere;

GLOSSARY *continued*

and 4) net emissions – remaining gas released to the atmosphere after generation, recovery and sinks are taken into account.

Energy intensity	A measure of the energy consumed to produce one unit of economic output, measured here in gigajoules of energy per million dollars of Industry Gross Value Added (GJ/\$m IGVA).
Environmental asset	The naturally occurring living and non-living components of the Earth, together comprising the bio-physical environment, that may provide benefits to humanity.
Environmental tax	A tax whose base is a physical unit (or a proxy of it) of something that has a proven specific negative impact on the environment. The SEEA Central Framework allocates environmental taxes to four categories: energy taxes; transport taxes; pollution taxes; and resource taxes.
Excise duty	This is levied on a variety of petroleum products, including gasoline (petrol), diesel, aviation fuels, kerosene, heating and fuel oil, and crude oil and condensate. Excise is also levied on non-petroleum based fuels, including ethanol and biodiesel fuels (includes the Product Stewardship for Oil Program).
Exports	The export of goods represents the quantity of goods sent to other countries or for which ownership changes from residents to non-residents.
Fossil fuel	Any natural fuel derived from decomposed or partly decomposed organic matter (e.g. oil, natural gas and coal).
GDP (gross domestic product)	Is the total market value of goods and services produced in Australia within a given period after deducting the cost of goods and services used up in the process of production but before deducting allowances for the consumption of fixed capital. Thus GDP, as here defined, is 'at market prices'. It is equivalent to gross national expenditure plus exports of goods and services less imports of goods and services.
GHG emissions intensity	A measure of GHG emissions arising from economic production; GHG emissions (tonnes) emitted per million dollars of GVA in chain volume terms.
Gigajoule (GJ)	A unit of energy equal to one billion (i.e. 1,000,000,000) joules, which is roughly equivalent to the energy content of 29 litres of petrol or 280 kilowatt hours of electricity.
Gigalitre (GL)	One thousand million litres.
Gigatonne (Gt)	One thousand million tonnes.
Gold	A chemical element and a dense, soft, malleable, ductile metal.
Government energy use	Use of energy by the general government sector. The principal function of the general government sector is to provide non-market goods and services (e.g. roads, hospitals, libraries) primarily financed by taxes, to regulate and influence economic activity, to maintain law and order, and to redistribute income by means of transfer payments. This sector covers the Commonwealth Government, state governments and local government municipalities, as well as associated agencies and non-departmental bodies. Public universities are also included in this sector. Public non-financial corporations are excluded from this sector.
Greenhouse gases (GHG)	Those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and re-emit infrared radiation. The three key greenhouse gases are carbon dioxide (CO ₂), nitrous oxide (N ₂ O) and methane (CH ₄).
Gross energy	Is the energy contained in primary energy (energy sourced directly from nature) as well as the energy derived from it.
Gross value of irrigated agricultural production (GVIAP)	Refers to the gross value of agricultural commodities that are produced with the assistance of irrigation.

GLOSSARY *continued*

Households	A group of two or more related or unrelated people who usually reside in the same dwelling, who regard themselves as a household, and who make common provision for food or other essentials for living; or a person living in a dwelling who makes provision for his/her own food and other essentials for living, without combining with any other person.
Hydropower	A process in which flowing water is harnessed to generate power, especially electricity.
Imports	The import of goods represents the quantity of goods received from other countries or for which ownership changes from non-residents to residents.
Industry gross value added (IGVA)	The value of an industry's output at basic prices, minus the value of goods and services consumed as inputs during the process of production. Basic prices valuation of output removes the distortion caused by variations in commodity taxes and subsidies across the output of individual industries.
Iron ore	Rocks and minerals from which metallic iron can be economically extracted.
Kilolitre (KL)	One thousand litres.
Kilotonne (Kt)	One thousand tonnes.
Landfill	A site used for disposal of solid material by burial in the ground between layers of earth.
Liquefied petroleum gas (LPG)	Is a combination of propane and butane, along with trace amounts of other compounds, recovered in either natural gas extraction or oil refining. The gases are transformed into a liquid to assist in transport.
Manufacturing	The process where units are engaged in the physical or chemical transformation of materials, substances or components into new products (except agriculture and construction). The materials, substances or components transformed by units in this division are raw materials that are products of agriculture, forestry, fishing and mining or products of other manufacturing units.
Megalitre (ML)	One million litres.
Megatonne (Mt)	One megatonne, or 1,000 tonnes (t).
Mining	The process where units extract naturally occurring mineral solids, such as coal and ores; liquid minerals, such as crude petroleum; and gases, such as natural gas from the earth, from an ore body, vein or seam. The term also includes the removal of soil. The term mining is used in the broad sense to include: underground or open-cut mining; dredging; quarrying; well operations or evaporation pans; recovery from ore dumps or tailings as well as beneficiation activities (i.e. preparing, including crushing, screening, washing and floatation) and other preparation work customarily performed at the mine site, or as part of mining activity.
Natural gas	A combustible mixture of hydrocarbon gases. While natural gas is formed primarily of methane, its composition can vary widely, commonly including ethane, propane, butane and pentane.
Net energy	Total net energy accounts for the conversion losses associated with transforming one form of energy into another form. In this way, estimates for total net energy use avoid double-counting the amount of converted primary energy.
Organic material	Component of the waste stream from plant or animal sources that is readily biodegradable.
Other industries	Industries other than those included in ANZSIC Division A Agriculture, Division B Mining, Division C Manufacturing, Division D Electricity, Gas, Water, Division E Construction, subdivision 29 Waste Collection, Treatment and Disposal Services and Class 7530 Local Government Administration.
Output	Consists of those goods and services produced within a business that became available for use outside that business, plus any goods and services produced for own final use.

GLOSSARY *continued*

Paper and cardboard	Various forms of paper and cardboard which can be recycled and reused include cardboard boxes, newspaper, office paper, envelopes, junk mail, cards, milk and juice cartons. The main component of paper and cardboard is cellulose.
Petajoule (PJ)	A petajoule is equal to one million gigajoules, or 10 ¹⁵ joules. Petajoules are typically used to measure national or industry energy production and consumption.
Petroleum	Is a naturally occurring hydrocarbon or mixture of hydrocarbons as oil or gas, or in solution, found in sedimentary rocks.
Potable water	Treated water that is suitable for human consumption, e.g. drinking water.
Purchaser's price	The amount paid by the purchaser, excluding and tax deductible by the purchaser, in order to take delivery of a unit of a good or service at the time and place required by the purchaser. The purchaser's price of a good includes any transport charges paid separately by the purchaser to take delivery at the required time and place.
Recovered/recoverable	Process of converting or modifying waste into useful material or energy so that they do not need to be disposed. Also referred to as materials or resource recovery; includes sorting, separating and baling.
Recycling	A resource recovery method involving the collection and/or processing of waste for use as a raw material in the manufacture of the same, or similar, non-waste product.
Refined products	Includes products derived from crude oil and other refinery feedstock (e.g. car petrol and diesel, aviation petrol and turbine fuel, kerosene and heating oil, industrial diesel and fuel oil, naphtha and petroleum coke used as fuel).
Renewable Energy Certificates (RECs)	Are a financial instrument to promote renewable energy production. The liability to surrender RECs is with respect to wholesale acquisitions of electricity and give rise to a tax.
Renewable Energy Target (RET)	Is split into two parts: the large-scale renewable energy target and the small-scale renewable energy scheme. These schemes create a financial incentive for investment in renewable energy sources through the creation and sale of certificates.
Residence principle	When following this principle, the geographic boundary of a country is determined by the activities of economic units resident in that country.
Reuse water	Drainage, waste or storm water that has been used again without first being discharged to the environment. It may have been treated to some extent. It excludes 'on-site' recycling.
Silver	A chemical element and a soft transition metal with the highest electrical conductivity of any element and the highest thermal conductivity of any metal.
Solar energy	Refers to solar energy used for electricity generation (by photovoltaic conversion or solar thermal generation) and solar energy used to heat water in solar hot water systems.
Subsoil assets	Proven reserves of mineral and energy resources located on or below the Earth's surface that are economically exploitable, given current technology and relative prices.
System for Integrated Economic and Environmental Accounting (SEEA)	It is a framework used to develop environmental accounts by integrating environmental information into an accounting framework. The SEEA publication provides the conceptual basis for developing a framework to describe the inter-relationship between the natural environment and the economy.
Territory basis	Statistics produced on this basis use a geographic boundary relating to activity taking place within the national territory.
Timber assets	Includes native standing timber and plantation standing timber.
United Nations Framework Convention on Climate Change (UNFCCC)	Is an international environmental treaty negotiated at the UN Conference on Environment and Development (Rio de Janeiro, 1992). The objective of the treaty is to 'stabilise greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system'.

GLOSSARY *continued*

Uranium	A heavy, radioactive metallic element, used as a source of nuclear energy. A heavy, radioactive metallic element, used as a source of nuclear energy.
Vehicle import duty	Is a levy on applications to import a vehicle into Australia. Passenger vehicles duty (import) is between 5–10% of customs value (original country purchase price, which may be subject to depreciation allowance, or rated on the Australian value as landed value).
Vehicle stamp duty	Is a levy on applications to either register a vehicle or to transfer registration of a vehicle; registration taxes vary significantly across states. All states and territories (except Victoria) have a fixed fee component and a component that increases with some measure of vehicle size, measured as either weight or cylinder size.
Waste	Waste consists of the following: any substance that is discarded, emitted or deposited in the environment in such volume, constituency or manner as to cause an alteration in the environment; any discarded, rejected, unwanted, surplus or abandoned substance; and/or any otherwise discarded, rejected, unwanted, surplus or abandoned substance intended for sale or for recycling, reprocessing, recovery, or purification by a separate operation from that which produced the substance.
Waste intensity	A measure of waste generation arising from economic production; waste (tonnes) generated per million dollars of GVA in chain volume terms.
Waste Management Services Industry	Can include any combination of collection, transport, recycling, treatment, processing, disposal, managing and monitoring of waste materials (ANZSIC Division D, subdivision 29).
Water consumption	Water consumption is equal to distributed water use plus self-extracted water use plus reuse water use minus in-stream water use minus distributed water supplied to other users minus water supplied to the environment as 'environmental flows'.
Water intensity	A measure of water consumption arising from economic production; water (GL) consumed per million dollars of GVA in chain volume terms.
Water supply services	Refers to the provision of reticulated water supply (including desalinated water), irrigation water, recycled (reuse) water, bulk and/or retail water supply service.
Wind power	The conversion of wind energy into electricity using wind turbines.

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